FINAL
Preliminary Assessment Report Waiawa Gulch Training Site and Unit Training and Equipment Site, Oahu, Hawai'i

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

September 2020

Prepared for:

Army National Guard Bureau
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UNCLASSIFIED

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AECOM	AECOM Technical Services, Inc.
AFFF	aqueous film forming foam
AOI	area of interest
ARNG	Army National Guard
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSM	conceptual site model
DON	Department of the Navy
EDR™	Environmental Data Resources, Inc.™
FTA	fire training area
HA	Health Advisory
HIARNG	Hawai'i Army National Guard
PA	Preliminary Assessment
PFAS	per- and poly-fluoroalkyl substances
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
SI	Site Inspection
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UTES	Unit Training and Equipment Site
VSI	visual site inspection

Executive Summary

The Army National Guard (ARNG) is performing Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) Impacted Sites at ARNG Facilities Nationwide. A PA for per- and polyfluoroalkyl substances (PFAS)-containing materials was completed for Waiawa Gulch Training Site and Unit Training and Equipment Site (UTES) facility (also referred to as the "facility"), to assess potential PFAS release areas and exposure pathways to receptors. Waiawa Gulch Training Site and UTES provides training and vehicle maintenance for the various units that support the Hawai'i Army National Guard (HIARNG). The facility includes several buildings associated with Waiawa Gulch Training Site and UTES functions, including maintenance and office related buildings, warehouse, storage buildings, and wash rack. The US Navy historically owned the facility property beginning 3 August 1945. On 21 July 1959, the property was transferred from the Navy to the HIARNG (Argonne National Laboratory 1993).

The performance of this PA included the following tasks:

- Reviewed available administrative record documents and Environmental Data Resources, Inc. (EDR)^{TM} report packages to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, Sanborn maps, and environmental compliance actions in the area surrounding the facility;
- Conducted a site visit on 30 April 2019 and completed visual site inspections at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Interviewed current Waiawa Gulch Training Site and UTES personnel during the site visit, including the Facility Manager;
- Developed a preliminary conceptual site model (CSM) to outline the potential release and pathway of PFAS for the area(s) of interest (AOIs) and the facility.

Two AOIs related to potential PFAS releases were identified at the Waiawa Gulch Training Site and UTES facility during the PA. The date of potential release for the AOIs is estimated based on secondary data; exact dates are unknown. The AOIs are shown on **Figures ES-1** and described in **Table ES-1** below. The preliminary CSM for the two AOIs at Waiawa Gulch Training Site and UTES facility is presented in **Figure ES-2**.

Table ES- 1 AOIs at Waiawa Gulch Training Site and UTES

Area of Interest	Name	Used by	Potential Release Dates
AOI 1	Firetruck Pump Test Area	HIARNG	Monthly testing; first date of testing is unknown
AOI 2	Vehicle Maintenance Area, Firetruck Parking, and Storage Buildings	HIARNG	Latest known early 2000s.

Based on the potential release concerning the AFFF at the facility, there is potential for exposure to PFAS contamination in media at or near the facility. The preliminary CSM for the Waiawa Gulch Training Site and UTES**,** which presents the potential receptors and media impacted, is shown on **Figure ES-2**. Based on the US Environmental Protection Agency's (USEPA) Unregulated Contaminant Monitoring Rule 3 data, it was indicated that no PFAS were detected in a public water system above the USEPA's Lifetime Drinking Water Health Advisory (HA) within 20 miles of the facility. The HA is 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed in 2016 had method detection limits that were higher than currently

achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3 but might be detected if analyzed today.

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Summary of Findings

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Figure ES-1

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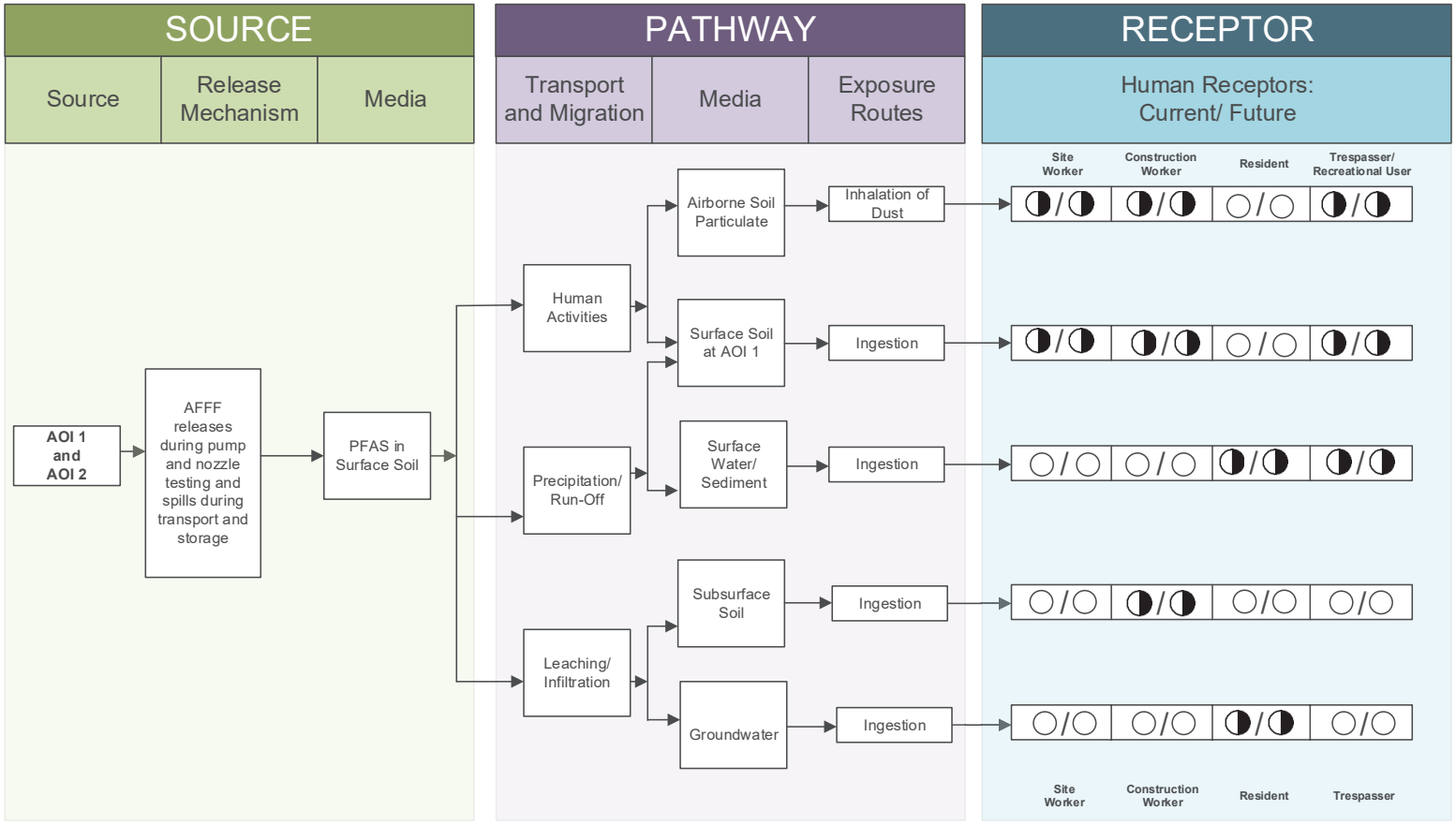

LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial / Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Complete Pathway

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

Figure ES-2
Preliminary Conceptual Site Model
Waiawa Gulch Training Site and UTES, HI

1. Introduction

1.1 Authority and Purpose

The Army National Guard (ARNG)-G9 is the lead agency in performing *Preliminary Assessments (PAs) and Site Inspections (SIs) for Perfluorooctane Sulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA) at Impacted Sites at ARNG Facilities Nationwide.* This work is supported by the United States (US) Army Corps of Engineers (USACE) Baltimore District and their contractor AECOM Technical Services, Inc (AECOM) under Contract Number W912DR-12D-0014, Task Order W912DR17F0192, issued 11 August 2017.

The ARNG is assessing potential effects on human health related to processes at their facilities that used per- and poly-fluoroalkyl substances (PFAS) (a suite of related chemicals), primarily releases of aqueous film forming foam (AFFF) although other sources of PFAS are possible. In addition, the ARNG is informally assessing businesses or operations adjacent to the ARNG facility (not under the control of ARNG) that could potentially be responsible for a PFAS release.

PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. PFAS formulations contain highly diverse mixtures of compounds. Thus, the fate of these PFAS compounds in the environment varies. The regulatory framework at both federal and state levels continues to evolve. The US Environmental Protection Agency (USEPA) issued Lifetime Drinking Water Health Advisory (HA) for PFOA and PFOS in May 2016, but there are currently no promulgated national standards regulating PFAS in drinking water. The HA is 70 parts per trillion for PFOS and PFOA, individually or combined.

This report presents findings of a PA for PFAS-containing materials at Waiawa Gulch Training Site and Unit Training and Equipment Site (UTES) facility (also referred to as the "facility") in Pearl City, Hawai'i in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300), and Army requirements and guidance.

This PA Report documents potential locations where PFAS containing materials are stored and have the potential to be released into the environment at or adjacent to the Waiawa Gulch Training Site and UTES. The term PFAS will be used throughout this report to encompass all PFAS chemicals being evaluated, including PFOS and PFOA, which are key components of AFFF.

1.2 Preliminary Assessment Methods

The performance of this PA included the following tasks:

- Reviewed available administrative record documents and Environmental Data Resources, Inc. (EDR)™ report packages to obtain information relevant to potential PFAS releases, such as: drinking water well locations, historical aerial photographs, Sanborn maps, and environmental compliance actions in the area surrounding the facility;
- Conducted a site visit on 30 April 2019 and completed visual site inspections (VSIs) at locations where PFAS-containing materials were suspected of being stored, used, or disposed;
- Interviewed current Waiawa Gulch Training Site and UTES personnel during the site visit including the Facility Manager;

- Developed a preliminary conceptual site model (CSM) to outline the potential release and pathway of PFAS for the area(s) of interest (AOIs) and the facility.

1.3 Report Organization

This report has been prepared in accordance with the USEPA *Guidance for Performing Preliminary Assessments under CERCLA* (USEPA, 1991). The report sections and descriptions of each are as follows:

- **Section 1** – **Introduction:** identifies the project purpose and authority and describes the facility location, environmental setting, and methods used to complete the PA
- **Section 2** – **Fire Training Areas:** describes the fire training areas (FTAs) at the facility identified during the site visit
- **Section 3** – **Non-Fire Training Areas:** describes other locations of potential PFAS releases at the facility identified during the site visit
- **Section 4** – **Emergency Response Areas:** describes areas of potential PFAS release at the facility, specifically in response to emergency situations
- **Section 5** – **Adjacent Sources:** describes sources of potential PFAS release adjacent to the facility that are not under the control of ARNG
- **Section 6** – **Preliminary Conceptual Site Model:** describes the pathways of potential PFAS transport and receptors at the facility
- **Section 7** –**Conclusions:** summarizes the data findings and presents the conclusions and uncertainties of the PA
- **Section 8** – **References:** provides the references used to develop this document
- **Appendix A** – Data Resources
- **Appendix B** – Preliminary Assessment Documentation
- **Appendix C** – Photographic Log

1.4 Facility Location and Description

Waiawa Gulch Training Site and UTES facility is located north of Pearl Harbor, on the island of Oahu (**Figure 1-1**). The facility falls 0.75 miles northeast of the H1-H2 merge. The facility is bordered to the north and south by industrial activities, and to the west by a privately-operated junk yard. The Waiawa Gulch Training Site and UTES facility comprise approximately 20 acres.

Waiawa Gulch Training Site and UTES facility provides training and maintenance for the various units that support the Hawai'i Army National Guard (HIARNG). The Waiawa Gulch Training Site and UTES facility consists of office areas, a wash bay, maintenance shop, motor pool, and various small storage buildings. Historical aerial photography indicates that a large motor pool and storage facility was located on the northern portion of the property, prior to 2014. The US Navy historically had ownership of the facility property from 3 August 1945. On 21 July 1959, the property was transferred to the HIARNG (Argonne National Laboratory 1993).

1.5 Facility Environmental Setting

The Waiawa Gulch Training Site and UTES facility is located approximately 1.25 miles north of Middle Loch. Throughout Waiawa Gulch Training Site and UTES, the natural terrain slopes south

towards Pearl Harbor and west towards Waiawa Stream, ranging from a maximum elevation of 90 feet above mean sea level (amsl) to 50 feet amsl.

1.5.1 Geology

Two major volcanic mountain ranges forming the island of Oahu are the Waianae Range in the west and the much younger Koolau Range in the east. Both ranges are the eroded remnants of the large elongate Waianae and Koolau shield volcanoes. After a long period of erosion, volcanic activity resumed with the Honolulu Volcanic Series and its eruption of vents and lava flows. The eruptions produced by these features tended to be discrete, explosive events that produced volumes of ash that blanketed older sloping Koolau basalt baserock.

On the central and eastern side of Oahu, the underlying baserock extrusive volcanic layers are lava flows from the Koolau shield volcano. Layers of A'a flows, pahoehoe flows, and clinker boundaries can be found in the subsurface (McDonald et. al, 1983). Geology beneath the facility is older alluvium (Sherrod, et al. 2007).

The facility lies predominately on soil consisting of fill materials originating from dredging or hauled in from nearby areas (Argonne National Laboratory 1993). This soil is composed of primarily silty clay and sandy clay. The soil along the boundaries of the facility consists of Kawaihapai stony clay loam (Department of the Navy [DON] 2016). The total thickness of the soil formation decreases from north to south, with maximum depth to bedrock at 200 feet below ground surface (bgs) (DON 1990).

1.5.2 Hydrogeology

The basal aquifer that underlies Waiawa Gulch Training Site and UTES is part of the Pearl Harbor Aquifer, the most productive aquifer in the state. As such, multiple industrial, agricultural, and domestic wells are located directly downgradient of the facility (**Figure 1-2**). An Environmental Data Resources, Inc (EDR)^{TM} report conducted a well search for a 1-mile radius surrounding the facility (Appendix A). Using additional online resources, such as state and local GIS databases, wells were researched to a 4-mile radius of the facility. Numerous wells of various use exist in all directions surrounding the facility. Directly downgradient of the facility, there are multiple domestic and irrigation wells. Municipal water supply wells are located both east and west of the facility within 4 miles. Drinking water at Waiawa Gulch Training Site and UTES is resourced from public drinking water wells that are located cross-gradient, approximately 0.75 miles west of the facility. Based on the USEPA Unregulated Contaminant Monitoring Rule 3 (UCMR3) data, it was indicated that no PFAS were detected in a public water system above the HA within 20 miles of the facility. The HA is 70 parts per trillion for PFOS and PFOA, individually or combined. PFAS analyses performed in 2016 had method detection limits that were higher than currently achievable. Thus, it is possible that low concentrations of PFAS were not detected during the UCMR3, but might be detected if analyzed today. The basal groundwater originates as rainwater falling in higher drainage basins to the north and northeast of the facility. The basal groundwater generally migrates seaward towards Pearl Harbor (**Figure 1-2**) through zones of clinkers (McDonald, Abbott, and Peterson 1983). The basal aquifer can be divided into three zones: upper, middle, and lower. The upper basal aquifer consists of a mixture of rainfall recharge, irrigation return, and subsurface inflow (DON 1990).

The hydrologic and geologic classification of the upper aquifer in the Waiawa aquifer system (Aquifer Code 3-02-02-111, Status Code 11111) describes the aquifer as a basal, unconfined aquifer in horizontally extensive flank basalt lava flows. The groundwater status for the upper aquifer is classified as the following: a currently used drinking water source that is ecologically important; fresh water (salinity less than 250 mg/L chloride); irreplaceable in uniqueness; and

highly vulnerable to contamination (Mink and Lau 1990). Based on information provided by HIARNG, depth to groundwater at the facility is approximately 12 to 15 feet bgs.

1.5.3 Hydrology

The facility is located within the main Pearl Harbor Watershed, which encompasses 110 square miles and is made of nine subwatersheds. The facility lies within the Waiawa subwatershed, which consists of Waiawa Stream and its tributaries. Waiawa Stream partially borders Waiawa Gulch Training Site and UTES along the southwestern boundary (**Figure 1-3**). Waiawa Stream drains south to Middle Loch within Pearl Harbor, approximately 1.25 miles away, and subsequently to the Pacific Ocean. Storm water runoff at the facility is directed towards a series of storm drains and a seepage pit located in the southwest corner of the property, near the storage buildings. A dry-well system formerly existed at the facility but has been capped and is no longer functional. The seepage pit was constructed in 2019 and receives storm water discharge from the wash rack. Facility storm drains ultimately discharge into Waiawa Stream. Specific details on the seepage pit were not available at the time of the PA.

1.5.4 Climate

Oahu is located in the tropics, with a climate characterized by mild temperatures, northeasterly trade winds year-round, and moderate humidity. Hawai'i 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 Oahu 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 to 250 inches on the Koolau mountain peaks (McDonald et.al, 1983) Waiawa Gulch Training Site and UTES has a mean annual rainfall of approximately 70 inches.

1.5.5 Current and Future Land Use

Current Waiawa Gulch Training Site and UTES operations include training and maintenance for the various units that support the HIARNG. In addition to vehicle maintenance and support for HIARNG, periodic training exercises and course work for the National Guard/Army Reserve units are conducted at the facility. The facility is staffed by both full- and part-time employees.

Portions of the northern and southern borders of Waiawa Gulch Training Site and UTES are abutted primarily by industrial land use. A junk yard abuts the northwestern boundary of the facility. Across the road of the eastern border is a small industrial park. The closest urban center is Pearl City, approximately 0.1 miles to east.

Reasonably anticipated future land use is not expected to change from the current land use described above.

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Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	RG	3/12/2020

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 1-1

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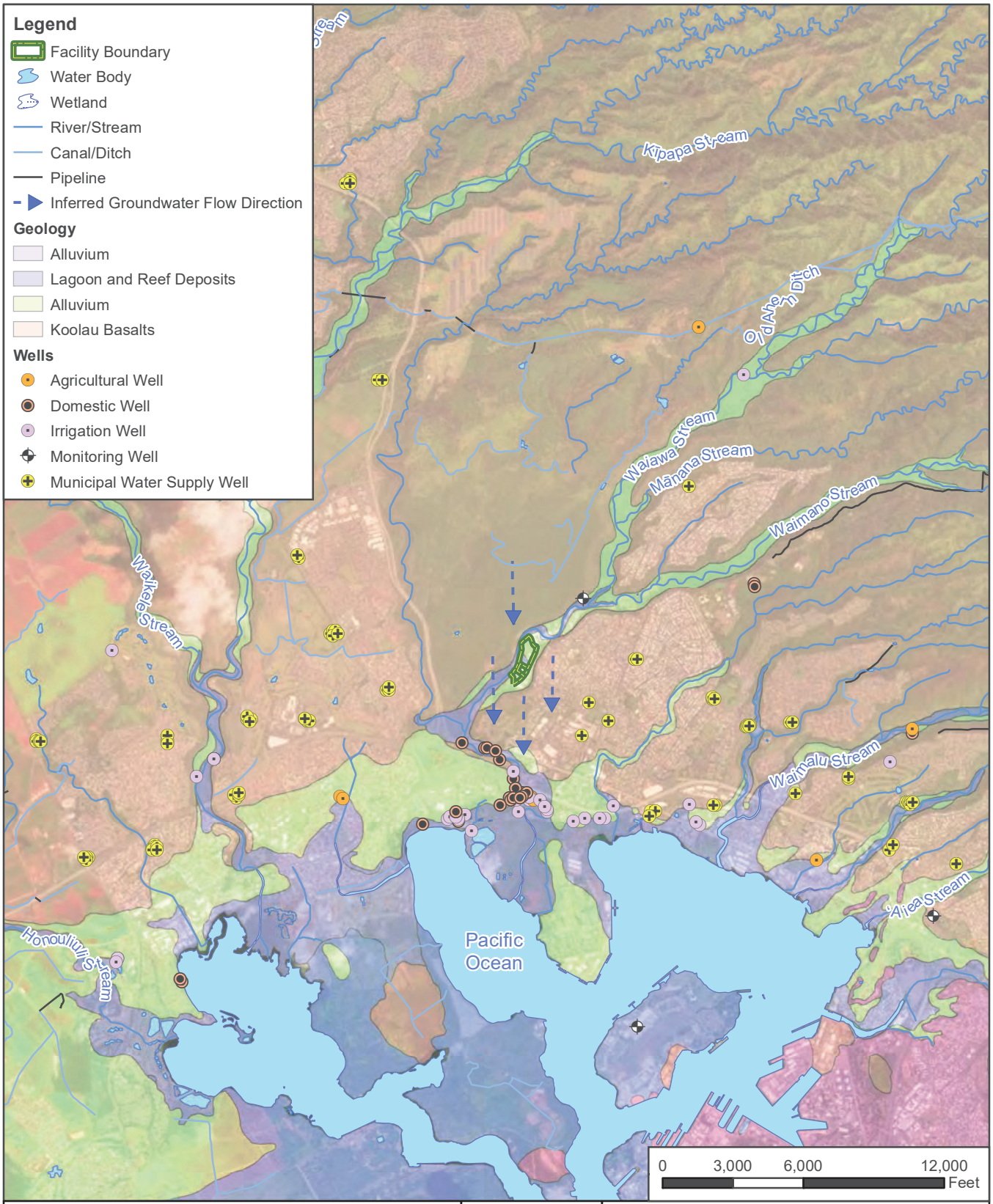

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Groundwater Features

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Figure 1-2

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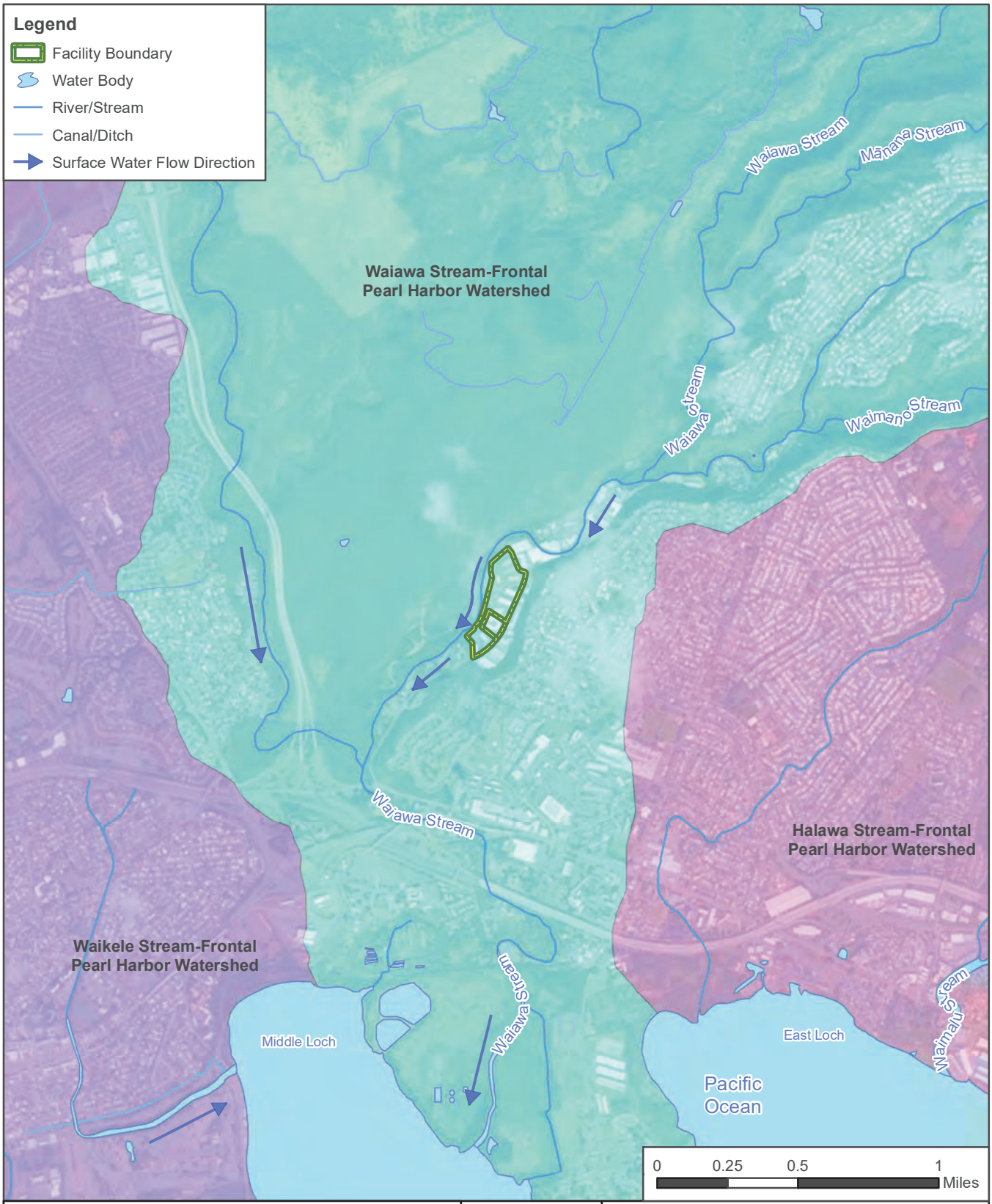

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Surface Water Features

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Figure 1-3

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2. Fire Training Areas

No FTAs were identified within the facility during the PA through interviews (**Appendix B**), Environmental Data Resource (EDR™) reports (**Appendix A**), or from observations made during the VSI. The personnel interviewed had institutional knowledge spanning from 1985 to present.

3. Non-Fire Training Areas

In addition to FTAs, the PA evaluated areas where PFAS-contining materials may have been broadly used, stored, or disposed. This may include buildings with fire suppression systems, paint booths, AFFF storage areas, and areas of compliance demonstrations. Information on these features obtained during the PA are included in **Appendices A** and **B**. Three non-FTAs were identified during the PA. A description of each non-FTA is presented below, and the non-FTAs are shown on **Figure 3-1**. Photographs of each non-FTA appear in **Appendix C**.

3.1 Storage Buildings

There are multiple storage buildings for hazardous and non-hazardous materials located on the southern end of the facility, adjacent to the wash rack. One 55-gallon drum of 3% Ansulite AFFF was originally located in the metal portable storage units located north of the maintenance building. Later, the drum was moved to the right side of a hazardous materials storage building. During the VSI, the 55-gallon drum of 3% Ansulite was still present within the hazardous materials storage building. No leaks or releases, emergency or otherwise, have been reported or documented from the storage containers, and no evidence of leaking was observed during the VSI. Trench drains are located adjacent to the storage containers and the maintenance building. These drains carry stormwater runoff flow from the maintenance building to Waiawa Stream.

3.2 Firetruck Pump Test Area

There is one firetruck located on the facility that is foam capable. According to interviewees, the AFFF tank is kept empty and is only filled when needed. The firetruck is parked on a grassy area east of the storage buildings. According to interviews, the pumps on the truck are tested once a month by spraying water at a tree located within the northern portion of the facility (**Figure 3-1**). During the pump testing, the firetruck is parked in the northern portion of the facility. The current fire captain at the facility started in 2008; since that time, only water has been used for testing. It is unknown if similar testing practices occurred prior to 2008 with the tanks filled with AFFF. Additionally, it is not known if residual AFFF remains in the empty tanks/ pumps and is subsequently released during the testing.

3.3 Vehicle Maintenance Facility

During interviews, it was confirmed that the firetruck was filled with 3% AFFF concentrate in the early 2000s, and that an unknown quantity of foam was released in a large open area covered in asphalt between the maintenance buildings adjacent to Waiahona Street. There are two storm drains located within the reported area of release that release to Waiawa Stream. One storm drain is located northwest of the release area, and the second is located southeast of the release area.

In addition, vehicle maintenance staff stated that portable Tri-Max™ units filled with AFFF were brought from HIARNG at Wheeler Army Airfield to the Waiawa Gulch Training Site and UTES facility for nozzle testing. Interviewees stated that the nozzle testing of AFFF included discharging an unspecified volume of foam into trash bags for disposal. It was reported that foam was not released onto the asphalt or into the environment; however, the disposition of the reportedly bagged discharged AFFF is unknown.

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Base Map: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community		PM	RG	3/12/2020

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Non-Fire Training Areas

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Figure 3-1

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4. Emergency Response Areas

Emergency responses to crashes sometimes require flame suppression, which may result in the release of PFAS to the environment in the form of AFFF. No emergency response areas were identified within the facility during the PA through interviews or EDR™ reports (**Appendix A**). In the event of an emergency, the Honolulu Fire Department is called to respond. The facility firefighting unit works to mitigate hazards prior to the arrival of the Honolulu Fire Department in times of emergency.

5. Adjacent Sources

No potential off-site sources of PFAS were identified during the PA; however, fires have been documented at the adjacent privately-owned junk yard. Interviewees noted that a large explosion historically occurred in the 1990s at the adjacent junk yard. The explosion caused items from within the junk yard to be projected over onto the facility property. According to interviewee's knowledge of the associated firefighting efforts, the fires were put out with water.

6. Preliminary Conceptual Site Model

Based on the PA findings, two AOIs were identified at Waiawa Gulch Training Site and UTES: Firetruck Pump Test Area (AOI 1) and the Vehicle Maintenance Facility, Firetruck Parking Area, and Storage Buildings (AOI 2). The following sections describe the CSM components and the specific preliminary CSMs developed for the AOIs. The CSM identifies the three components necessary for a potentially complete exposure pathway: (1) source, (2) pathway, and (3) receptor. If any of these elements are missing, the pathway is considered incomplete.

In general, the potential PFAS exposure pathways 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 PFAS toxicological study (National Ground Water Association, 2018). Receptors at Waiawa Gulch Training Site and UTES include site workers, construction workers, trespassers, and off-facility residents. The preliminary CSM for Waiawa UTES indicates which specific receptors could potentially be exposed to PFAS. The preliminary CSM for the AOIs at Waiawa Gulch Training Site and UTES is shown in **Figure 6-2**.

6.1 AOI 1: Firetruck Pump Test Area

AOI 1 comprises a grassy area in the north portion of the facility. Because there is little knowledge regarding historical pump testing activities, AFFF may have been released within the grassy area where testing occurred. The AOI is an open grassy area that is used for vehicle storage and for pump testing of the firetruck. The testing activities may have released AFFF into the grass and potentially had surface run-off to the adjacent Waiawa Stream.

Because AFFF may have been released directly to surface soil at AOI 1, surface soil at the AOI is considered a potentially complete pathway to site workers, construction workers, and trespassers via ingestion and inhalation of soil particulates. PFAS may have also infiltrated from surface soil to the subsurface, and ground-disturbing activities within the AOI may expose construction workers to potential PFAS in subsurface soil via ingestion and inhalation.

PFAS are water soluble and can migrate readily from soil to groundwater via leaching; however, drinking water at Waiawa Gulch Training Site and UTES is resourced from public drinking water wells that are located cross-gradient, approximately 0.75 miles west of AOI 1. No drinking water wells exist at the facility, and groundwater is approximately 12 to 15 feet bgs in the area of AOI 1. As such, groundwater is considered an incomplete pathway for site workers, construction workers, and trespassers via ingestion. Several domestic wells exist within 1 mile downgradient of the AOI to the south and southwest. Therefore, there is a potentially complete pathway for groundwater to off-facility residents using private wells.

Stormwater runoff at AOI 1 is captured by storm drains that ultimately discharge into Waiawa Stream located in the vicinity of the storage buildings. The stream flows south to Middle Loch, within Pearl Harbor, and subsequently the Pacific Ocean. It is possible that PFAS may have been transported to Pearl Harbor via this drainage network. As such, the pathway for PFAS exposure via surface water and sediment to off facility residents and recreational users is considered potentially complete. The preliminary CSM for AOI 1 is shown on **Figure 6-2**.

6.2 AOI 2: Vehicle Maintenance Facility, Firetruck Parking Area, and Storage Buildings

AOI 2 comprises the southern portion of the facility that includes the vehicle maintenance facility and surrounding areas where AFFF was discharged from the facility firetruck in the early 2000s,

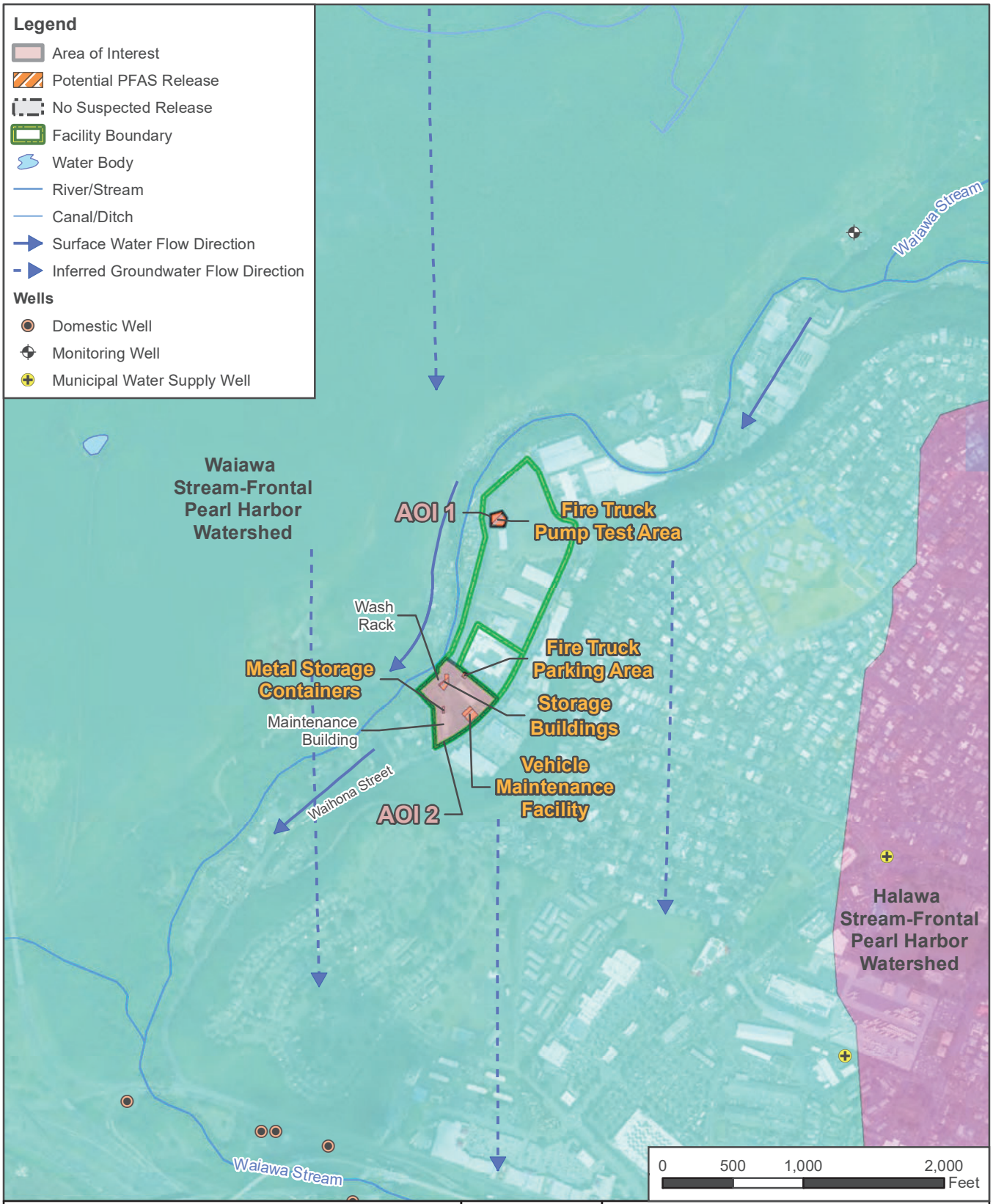
the grassy firetruck parking area, and the storage buildings on the edge of the grassy area where AFFF has been stored. AOI 2 also includes the paved area outside the vehicle maintenance facility where portable Tri-Max™ units were serviced by discharging a volume of foam from the extinguishers into plastic trash bags.

AFFF discharge and storage within AOI 2 may have resulted in the release of PFAS in grassy areas at the firetruck parking area and the storage buildings. AFFF was also released to paved surfaces, and may have migrated from paved surfaces to nearby grassy areas. It is also possible that AFFF released to paved surface could have infiltrated the subsurface via cracks or joints between paved areas.

Because AFFF may have been directly or indirectly released to grassy surfaces at AOI 2, surface soil at the AOI is considered a potentially complete pathway to site workers, construction workers, and trespassers via ingestion and inhalation of soil particulates. PFAS may have also infiltrated the subsurface via infiltration through surface soil. As a result, ground-disturbing activities within the AOI may expose construction workers to potential PFAS in subsurface soil via ingestion and inhalation. Accidental ingestion of groundwater is considered an incomplete pathway for exposure to PFAS during construction activities due to the depth to groundwater being an estimated 12 to 15 feet bgs.

During the VSI, two storm drains were observed on the northwest and southeast sides of the vehicle maintenance facility release area. AFFF released to the pavement may have drained to either of these storm drains, both of which discharge to an outfall located along Waiawa Stream. Stormwater runoff at AOI 2 is captured by storm drains that ultimately discharge into Waiawa Stream located in the vicinity of the storage buildings. The stream ultimately flows to the Pacific Ocean, similarly to stormwater from AOI 1. As such, the pathway for PFAS exposure via surface water and sediment from AOI 2 to off facility residents and recreational users is considered potentially complete.

Groundwater pathways to receptors at AOI 2 are the same as for AOI 1, therefore, the pathway to downgradient off-facility residents is potentially complete. Pathways-receptor relationships for AOI 2 are illustrated in the preliminary CSM shown in **Figure 6-2**.



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REVISED	7/31/2020	GIS BY	MS	7/31/2020
SCALE	1:12,000	CHK BY	CR	7/31/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	7/31/2020

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Areas of Interest

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Figure 6-1

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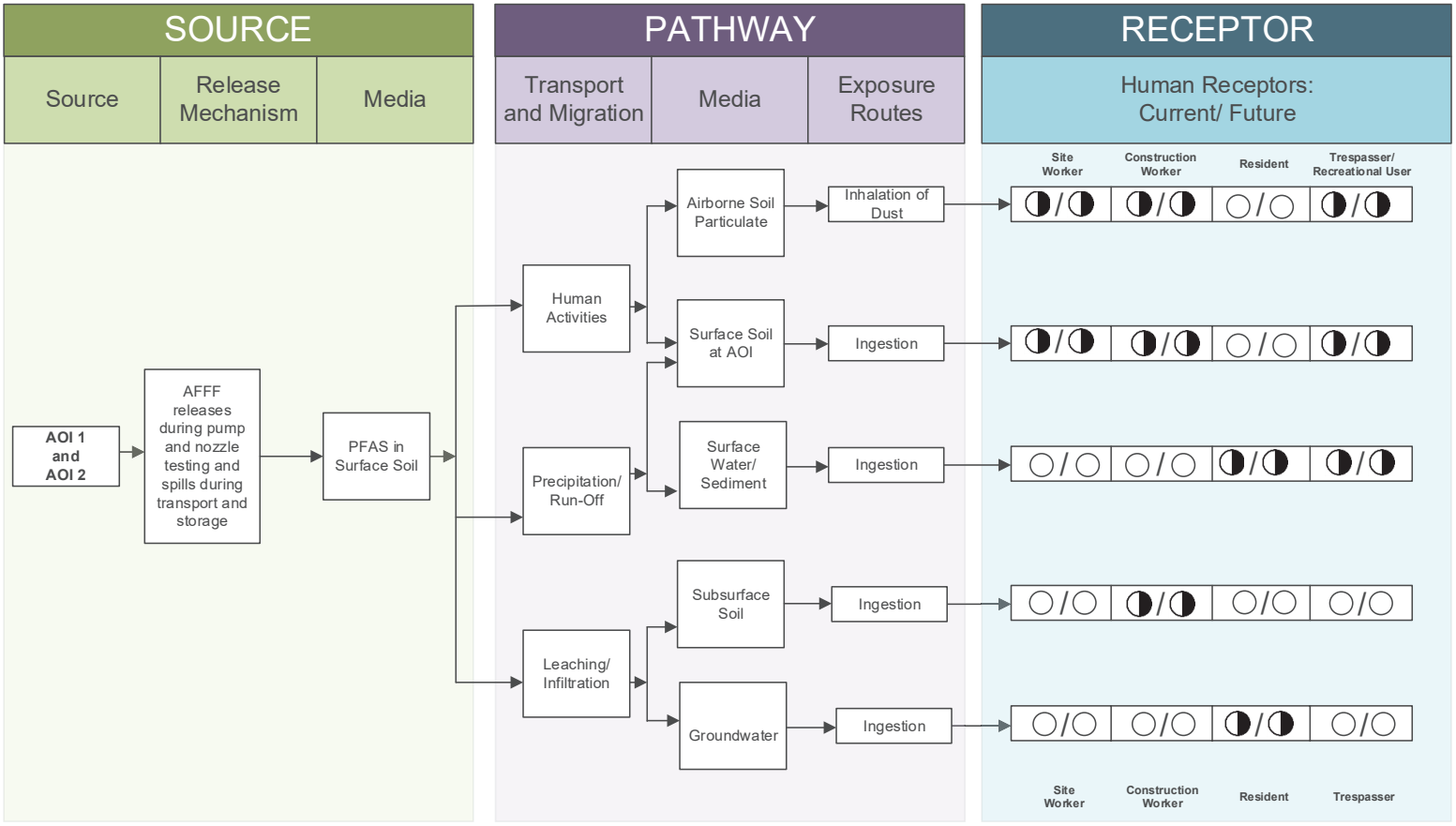

LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial / Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Complete Pathway

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

Figure 6-2
Preliminary Conceptual Site Model, AOI 1
Waiawa Gulch Training Site and UTES, HI

7. Conclusions

This report presents a summary of available information gathered during PA efforts on the use and storage of AFFF and other PFAS-related activities at the Waiawa Gulch Training Site and UTES. The PA findings are based on personnel interviews, historical documents, and the VSI (**Appendix A** and **Appendix B**).

7.1 Findings

Two AOIs related to potential PFAS releases were identified at the Waiawa Gulch Training Site and UTES based on PA data (**Figure 7-1**), and they are summarized in **Table 7-1**.

Table 7-1 AOIs at Waiawa Gulch Training Site and UTES

Area of Interest	Name	Used by	Potential Release Dates
AOI 1	Firetruck Pump Test Area	HIARNG	Monthly testing; first date of testing is unknown
AOI 2	Vehicle Maintenance Facility, Firetruck Parking, and Storage Buildings.	HIARNG	Latest known early 2000s.

Based on the known or potential PFAS release at the AOIs, there is potential for exposure to PFAS contamination in surface soil and subsurface soil at the facility to site workers, construction workers, and trespassers. Off facility groundwater, surface water, and sediment pathways are potentially complete for off-facility residents and recreational users. The preliminary CSM for the AOIs at Waiawa Gulch Training Site and UTES details the specific pathways and receptors for the AOIs and are shown on **Figures 6-2**.

7.2 Uncertainty

A number of information sources were investigated during this PA to determine the potential for PFAS-containing materials to have been present, used, or released at the facility. Historically, documentation of PFAS use was not required because PFAS were considered benign. Therefore, records were not typically kept by the facility or available during the PA on the use of PFAS in training, firefighting, or other non-traditional activities, or on its disposition.

The conclusions of this PA are based on all available information, including: previous environmental reports, EDRs™, observations made during the VSI, and interviews. Interviews of personnel with direct knowledge of a facility generally provided the most useful insights regarding a facility's historical and current PFAS-containing materials. Sometimes the provided information was vague, such as whether AFFF was used during historical pump testing of the firetruck. Gathered information has a degree of uncertainty due to the absence of written documentation, the limited number of personnel with direct knowledge due to staffing changes, the time passed since PFAS was first used (1969 to present), and a reliance on personal recollection. Inaccuracies may arise in potential PFAS release locations, dates of release, volume of releases, and the concentration of AFFF used. There is also a possibility the PA has missed a source of PFAS, as the science of how PFAS may enter the environment continually evolves.

In order to minimize the level of uncertainty, readily available data regarding the use and storage of PFAS were reviewed, current personnel were interviewed, multiple persons were interviewed for the same potential source area, and potential source areas were visually inspected.

Table 7-2 summarizes the uncertainties associated with the PA.

Table 7-2 Uncertainties

Location	Source of Uncertainty
AOI 1 – Firetruck Pump Test Area	Information regarding historical testing practices prior to 2008 are unknown. It is not known if AFFF were used during tests prior to 2008, it is also unknown if residual AFFF in the firetruck tanks/lines may have been mixed with water during recent testing activities.
AOI 2 – Vehicle Maintenance Facility: Tri-Max™ Maintenance	The exact dates, frequency, volume, and concentration of AFFF sprayed during Tri-Max™ nozzle testing is unknown. The fate of the trash bags containing spent AFFF is also unknown.
AOI 2 – Vehicle Maintenance Facility: Firetruck Discharge	The exact dates, frequency, and volume of AFFF sprayed during this release are unknown.
AOI 2 – Storage Buildings	Information regarding the storage and transport of the AFFF historically are unknown. It is unknown if any spillage occurred during transport of the AFFF containers or during storage.

7.3 Potential Future Actions

The degree of uncertainties associated with the interviews and data collected during the PA indicate that current or former ARNG activities may have resulted in potential PFAS releases at the two AOIs identified during the PA. Based on the CSMs developed for the AOIs, there is potential for receptors to be exposed to PFAS contamination in surface soil, subsurface soil, and off-facility surface water, sediment, and groundwater at these AOIs. **Table 7-3** summarizes the rationale used to determine if the AOI should be considered for further investigation under the CERCLA process and undergo an SI.

Table 7-3 PA Findings Summary

Area of Interest	AOI Location	Rationale	Potential Future Action
AOI 1 – Firetruck Pump Test Area	21°24'20.62"N; 157°58'36.22"W	Monthly firetruck pump tests occur in this area. AFFF has historically been stored in truck tanks and may have been used during testing prior to 2008.	Proceed to an SI; focus on soil, groundwater, and surface water and/or sediment that is discharged from the facility
AOI 2 – Vehicle Maintenance Facility, Firetruck Parking Area, and Storage Buildings	21°24'34.03"N; 157°58'39.10"W	Reported release of AFFF from the firetruck and potential incidental release of AFFF from Tri-Max™ extinguisher testing at the Vehicle Maintenance Building. Potential releases may have also occurred as a result of AFFF storage in the Firetruck Parking Area and Storage Buildings.	Proceed to an SI; focus on soil, groundwater, and surface water and/or sediment that is discharged from the facility

ARNG will evaluate the need for an SI at Waiawa Gulch Training Site and UTES based on the potential receptors, the potential migration of PFAS contamination off the facility, and the availability of resources.

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SCALE	1:3,600	CHK BY	CR	3/12/2020
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS,		PM	RG	3/12/2020

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Summary of Findings

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Figure 7-1

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