FINAL
Site Inspection Report
Mather Army Aviation Support Facility
Sacramento, California

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

September 2023

Prepared for:

Army National Guard Bureau
111 S. George Mason Drive
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Table of Contents

Appendices

Figures

Tables

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Acronyms and Abbreviations

%	percent
°C	degrees Celsius
°F	degrees Fahrenheit
µg/kg	micrograms per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
Aerostar	Aerostar SES LLC
AFB	Air Force Base
AFCEC	Air Force Civil Engineering Center
AFFF	aqueous film-forming foam
AOI	Area of Interest
ARFF	Aircraft Rescue and Firefighting
ARNG	Army National Guard
ASE	Aviation Support Equipment
ASTM	American Society for Testing and Materials
bgs	below ground surface
BRAC	Base Realignment and Closure
CAARNG	California Army National Guard
CAL FIRE	California Department of Forestry and Fire Protection
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CoC	chain of custody
CSM	conceptual site model
DA	Department of the Army
DoD	Department of Defense
DOT	Department of Transportation
DQO	data quality objective
DUA	data usability assessment
DTSC	Department of Toxic Substances Control, California
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
FedEx	Federal Express
FTA	Fire Training Area
GPRS	Ground Penetrating Radar Systems
HDPE	high-density polyethylene
HFPO-DA	hexafluoropropylene oxide dimer acid
IDW	investigation-derived waste
ITRC	Interstate Technology Regulatory Council
LC/MS/MS	liquid chromatography with tandem mass spectrometry
MGD	million gallons per day
MIL-SPEC	military specification
MS	matrix spike
MSD	matrix spike duplicate
NELAP	National Environmental Laboratory Accreditation Program

ng/L	nanograms per liter
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 UFP-QAPP
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
SOP	standard operating procedure
TOC	total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
US	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

Executive Summary

The Army National Guard (ARNG) G-9 is performing Preliminary Assessments (PAs) and Site Inspections (SIs) 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) dated 6 July 2022 (Assistant Secretary of Defense, 2022). The six compounds listed in the OSD memorandum include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS). These compounds are collectively referred to as "relevant compounds" throughout the document, and the applicable screening levels (SLs) are provided in **Table ES-1**.

The PA identified two Areas of Interest (AOIs) where PFAS-containing materials may have been used, stored, disposed, or released historically (see **Table ES-2** for AOI locations). Additionally, during development of the SI Quality Assurance Project Plan (QAPP) Addendum, based on discussion between ARNG and Department of the Air Force, additional joint fire training areas (FTAs) were identified as potential release areas at locations adjacent to the facility. These FTAs were identified as three additional AOIs. 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 during the SI planning and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on SLs for relevant compounds. This SI was completed at the Mather Army Aviation Support Facility (AASF) in Sacramento, California and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for each of the five AOIs. The Mather AASF will also be referred to as the "facility" throughout this document.

Mather AASF is located about 11 miles east of Sacramento and occupies 31 acres of land. The facility is an operational maintenance shop for California ARNG aircraft. The facility borders the Sacramento Mather Airport to the northeast and is situated in the Sacramento metropolitan area and Sacramento Valley.

The PA and SI QAPP Addendum identified five AOIs for investigation during the SI phase. SI sampling results from the five AOIs were compared to OSD SLs. **Table ES-2** summarizes the SI results for each AOI. Based on the results of this SI, further evaluation under CERCLA is warranted in a Remedial Investigation (RI) for each of the five AOIs.

[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.

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

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter

a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.

b.) 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 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	Wash Rack	◐	●	●	Proceed to RI
2	Airfields and AFFF Storage Areas	◐	●	●	Proceed to RI
3	ARNG and Air Force FTA #1	◐	●	N/A	Proceed to RI
4	ARNG and Air Force FTA #2	◐	●	N/A	Proceed to RI
5	ARNG and Air Force FTA #3	◐	●	N/A	Proceed to RI

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the 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) 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) 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 perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA)[1], and perfluorobutanesulfonic acid (PFBS) at ARNG facilities nationwide. The ARNG performed this SI at the Mather Army Aviation Support Facility (AASF) in Sacramento, California. The Mather AASF is also referred to as the "facility" throughout this document.

The SI project elements were performed in compliance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; United States [US] 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 US Department of the Army (DA) requirements and guidance for field investigations.

1.2 SI Purpose

A PA was performed at Mather AASF (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. Furthermore, during development of the SI Quality Assurance Project Plan (QAPP) Addendum, based on discussion between ARNG and Department of the Air Force, additional joint fire training areas (FTAs) were identified as potential release areas at locations adjacent to the facility. These FTAs were identified as three additional AOIs. The objective of the SI is to identify whether there has been a release to the environment from these AOIs and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds.

[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.

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2. Facility Background

2.1 Facility Location and Description

Mather AASF is an operational maintenance shop for California ARNG (CAARNG) aircraft. The facility is in Mather Field, which is the former flightline operations area of Mather Air Force Base (AFB) and was granted for use and occupation by CAARNG under a 25-year land license beginning on 1 November 1985. Mather AFB was designated for realignment under the Base Realignment and Closure (BRAC) Commission in 1988, and closure occurred in 1993 (Amec Foster Wheeler, 2015). Following closure, the AASF was officially transferred from the Department of the Air Force to the DA, with the disclaimer that the Department of the Air Force would be responsible for the remediation of any environmental contamination caused by and resulting from Air Force activities. In 1994, the license for Mather AASF was amended to extend the licensing term indefinitely.

The facility borders the Sacramento Mather Airport to the northeast and is situated in the Sacramento metropolitan area and Sacramento Valley (**Figure 2-1**). The facility is about 11 miles east of downtown Sacramento as the distance from the nearest part of Sacramento city limits is only about 3 miles from the Mather AASF.

2.2 Facility Environmental Setting

Mather AASF occupies 31 acres of land, approximately 97 percent (%) of which is composed of impervious surfaces (HazCon, 2017). The areas surrounding Mather AASF are primarily the cargo and general aviation facilities at the Sacramento Mather Airport. Other surrounding areas include the Mather Regional Park, Mather Commerce Center, a Veteran Affairs hospital complex, day care and elementary schools, churches, and residential communities to the north and south (Amec Foster Wheeler, 2015). The facility sits at an elevation of 92 feet above mean sea level, with a slight general topographic gradient to the west/southwest. There are no significant natural topographic features surrounding the facility (**Figure 2-2**).

2.2.1 Geology

Mather AASF is located within the Great Valley geomorphic province, an alluvial plain located between the uplands of the Coast Ranges and the Sierra Nevada provinces (California Geological Survey, 2002). At the facility, Pleistocene-aged terrace sand, gravel, and cobbles overlie the deeper Pliocene-aged Laguna Formation, which unconformably overlies the Early Pliocene Mehrten Formation (Amec Foster Wheeler, 2016; Marchand and Allwardt, 1981; **Figure 2-3**).

The uppermost geologic units at Mather AASF comprise three alluvial terrace deposits, which, from youngest to oldest, include the Riverbank, undifferentiated alluvial gravel, and Arroyo Seco formations (Shlemon et al., 2000). Mather AASF sits upon only the Riverbank terrace deposits; older terrace deposits are located south of the AASF. These deposits occur within nested fluvial-fill terraces and ancient and active river channels and are each characterized by sand, gravel, and cobbles within silt and clay matrices of varying thickness and lateral extent. The Arroyo Seco Formation truncates the underlying Laguna Formation, which is a westward thickening alluvial wedge of interbedded clay and silt, sand, and gravel within a sandy to silty matrix (Marchand and Allwardt, 1981). The Laguna Formation directly overlies and is coeval to the Mehrten Formation, which comprises two interbedded units of gray to black sand and blue to brown clay, silt, and sand with some gravel. In the vicinity of Mather AASF, the Laguna Formation ranges from 200 to 400 feet thick, and the Mehrten Formation ranges from 200 to 500 feet thick (Amec Foster Wheeler, 2016).

During the SI, well-graded gravel and low plasticity silts were observed as the dominant lithology of the unconsolidated sediments below the Mather AASF. The borings were completed at depths between 115 and 135 feet below ground surface (bgs). Isolated layers of silty sand were also observed in the borings with thicknesses ranging from approximately 2 to 15 feet. Since layers of clay were observed at location MAT-MW007, a sample for grain size analysis was collected and analyzed via American Society for Testing and Materials (ASTM) Method D-422. The results indicate that the soil sample is comprised primarily of silt (59.07%) and clay (23.25%). Boring logs are presented in **Appendix E** and grain size results are presented in **Appendix F**.

2.2.2 Hydrogeology

The following hydrogeologic units were identified through previous investigations at Mather AFB (Aerostar, 2020b):

- Unit Ap (upper unit of the Laguna Formation)
- Unit A (upper unit of the Laguna Formation)
- Unit Bu (middle unit of Laguna Formation)
- Unit B (middle unit of the Laguna Formation)
- Unit C (lower unit of the Laguna Formation)
- Unit D (lower unit of the Laguna Formation)
- Mehrten Formation (Laguna-Mehrten Transition (LMT) Zone)

Unit Ap contains a perched water-bearing zone, and Unit B generally has the highest potential for contaminant migration due to a high transmissivity. Units A through C are transected by the water table going from east to west across the former Mather AFB (Amec Foster Wheeler, 2016). Two primary aquifers exist within the unconsolidated deposits of the Laguna and Mehrten Formations. The majority of potable wells are screened within hydrostratigraphic Units B, D and the LTM Zone Aerostar, 2020b).

Regional groundwater flow is generally in the southwest direction but may be influenced by groundwater pumping for potable use, agriculture, and industrial uses. Localized groundwater flow is also generally in the southwest direction, with an average hydraulic gradient of 0.002 feet per feet (Amec Foster Wheeler, 2015). However, a large potentiometric depression had formed along the northwestern installation boundary of former Mather AFB due to remedial pumping in extraction wells; therefore, local groundwater variations are expected (URS Group, Inc., 2014). Depth to groundwater was measured at approximately 40 feet bgs for the perched aquifer and 90 feet bgs for the deeper aquifer, both of which lie within the Laguna Formation (Amec Foster Wheeler, 2015). However, the perched aquifer did not appear to be present beneath the AASF. Groundwater features are presented on **Figure 2-3**.

Mather AASF is located in the Sacramento County Water Agency's Zone 40 North Service Area, which receives potable water from the existing water distribution system at former Mather AFB. The Mather AFB water distribution system was conveyed in 1998 via an easement to Sacramento County. Currently, the water distribution system includes two groundwater wells and a six million gallons per day (MGD) water treatment plant located at the Independence of Mather residential development (US Army Corps of Engineers [USACE], 2012). However, potable water was additionally derived from wells located in the weapons storage area/K-9 compound prior to Mather AFB closure and from four main base wells prior to 1997 (Amec Foster Wheeler, 2015).

In 2022, the County water system pulled water from four of their five wells and usually used more than two at any given time. One well in that system was not used by the County because it was too close to a sewer line, but was used by the AF. Depths to water measured in April 2022 during the SI ranged from 93.06 to 96.97 feet bgs. Groundwater elevation contours from the SI are presented on **Figure 2-4** and indicate the localized groundwater flow direction at the AASF is primarily to the southwest.

2.2.3 Hydrology

A drainage ditch located near the northeastern portion of the AASF flows south beneath the runways to the South Ditch and then to Morrison Creek that eventually flows to the Sacramento River. Storm water in the northeastern airfield and refueling pads is drained in the northeast direction, towards the drainage ditch. All other storm water is diverted to storm drain inlets on and around the AASF that connect to the drainage system of Mather Field (HazCon, 2017). There are no identified wetlands within the AASF property, but several seasonal wetlands exist in undeveloped portions of Mather Field due to the presence of an underlying impermeable soil layer of clay or hardpan (Amec Foster Wheeler, 2015).

Surface water runoff generally follows the slope of the American River valley and drains west-southwest. While large-scale watershed maps show most of Mather AASF in the Lake Greenhaven-Sacramento River Watershed, constructed drainage systems direct water from the facility into the Upper Morrison Creek Watershed. Morrison Creek is located approximately 1.5 miles to the southeast and is a tributary of the Sacramento River, located approximately 12 miles west of Mather AASF. Surface water in the drainage system of Mather Field is also captured in various drainage ditches such as the West Ditch and South Ditch. Surface water features are presented on **Figure 2-5**.

2.2.4 Climate

Mather AASF is in a semi-arid, Mediterranean climate zone. The winter “rainy season” extends from November to February, and the summer “dry season” extends from June to August. The average annual rainfall is approximately 20 inches. Summer temperatures peak in July, with an average high of 94 degrees Fahrenheit (°F) and an average low of 61 °F. Winter temperatures are lowest in December, with an average high of 55 °F and an average low of 40 °F. Prevailing wind speeds are southerly year-round due to the orientation of the Sacramento Valley and influence of the Sierra Nevada Mountains. Snowfall is extremely rare, but frost occasionally occurs (Cline, Neigher, and Bellinder; 2010).

2.2.5 Current and Future Land Use

Mather AASF serves as a CAARNG aviation maintenance and storage facility for rotary and fixed-wing aircraft. Mather AASF is comprised of a hangar, maintenance and storage areas, operations and administrative buildings, and related infrastructure including parking lots, aircraft parking areas, wash rack, and refueling pads, and is categorized as a small-quantity hazardous waste generator. The facility is fenced with secured access. Reasonably anticipated future land use is not expected to change from the current land use described above.

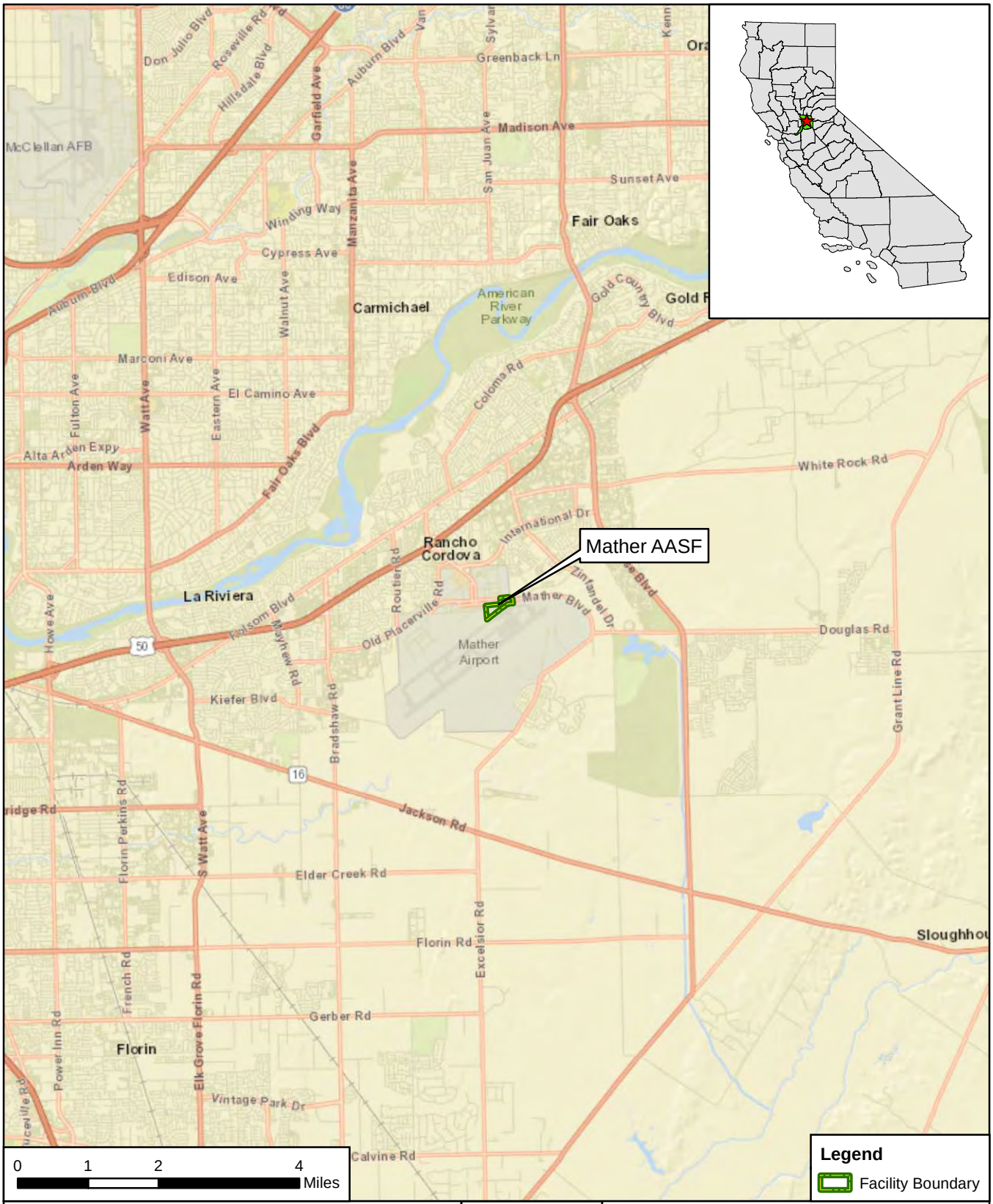
2.2.6 Sensitive Habitat and Threatened/ Endangered Species

The following amphibians, birds, crustaceans, fishes, plants, insects, mammals, and reptiles are federally endangered, threatened, proposed, and/ or are listed as candidate species in Sacramento County, California (US Fish and Wildlife Service [USFWS], 2022). While identified in the county, these species may not be present at the facility.

- **Amphibians:** California tiger Salamander, *Ambystoma californiense* (threatened); California red-legged frog, *Rana draytonii* (threatened);
- **Birds:** Yellow-billed Cuckoo, *Coccyzus americanus* (threatened); Least Bell's vireo, *Vireo bellii pusillus* (endangered); California clapper rail, *Rallus longirostris obsoletus* (endangered); Western snowy plover, *Charadrius nivosus nivosus* (threatened); California least tern, *Sterna antillarum browni* (endangered);
- **Crustaceans:** Vernal pool fairy shrimp, *Branchinecta lynchi* (threatened); Conservancy fairy shrimp, *Branchinecta conservation* (endangered); Vernal pool tadpole shrimp, *Lepidurus packardi* (endangered);
- **Fishes:** Delta smelt, *Hypomesus transpacificus* (threatened); longfin smelt, *Spirinchus thaleichthys* (candidate);
- **Flowering Plants:** Sacramento Orcutt grass, *Orcuttia viscida* (endangered); Ione manzanita, *Arctostaphylos myrtifolia* (threatened); Palmate-bracted bird's beak, *Cordylanthus palmatus* (endangered); Fleshy owl's-clover, *Castilleja campestris ssp. succulenta* (threatened); Slender Orcutt grass, *Orcuttia tenuis* (threatened); Colusa grass, *Neostapfia colusana* (threatened); El Dorado bedstraw, *Galium californicum ssp. sierrae* (endangered); Pine Hill ceanothus, *Ceanothus roderickii* (endangered); Layne's butterweed, *Senecio layneae* (threatened); Stebbins' morning-glory, *Calystegia stebbinsii* (endangered); Soft bird's-beak, *Cordylanthus mollis ssp. mollis* (endangered); Ione (incl. Irish Hill) buckwheat; *Eriogonum apricum (incl. var. prostratum)* (endangered); Pine Hill flannelbush, *Fremontodendron californicum ssp. decumbens* (endangered);
- **Insects:** Monarch butterfly, *Danaus plexippus* (candidate); Valley elderberry longhorn beetle, *Desmocerus californicus dimorphus* (threatened);
- **Mammals**: Riparian brush rabbit, *Sylvilagus bachmani riparius* (endangered);
- **Reptiles**: Giant garter snake, *Thamnophis gigas* (threatened).

2.3 History of PFAS Use

Four potential release areas were identified at Mather AASF during the PA where AFFF may have been used or released historically (AECOM, 2020). AFFF may have historically been released at the facility during familiarization training exercises, fire training activities, and AFFF storage may have occurred as early as 1998. During development of the SI QAPP Addendum, three adjacent, off-facility FTAs were identified where combined ARNG and Air Force fire training activities occurred from as early as 1998 until approximately 2003 (AECOM 2020). Training by the Air Force did not continue beyond closure of Mather AFB in 1993. The seven potential release areas were grouped into five AOIs based on proximity to one another and presumed groundwater flow. A description of each AOI is presented in **Section 3**.



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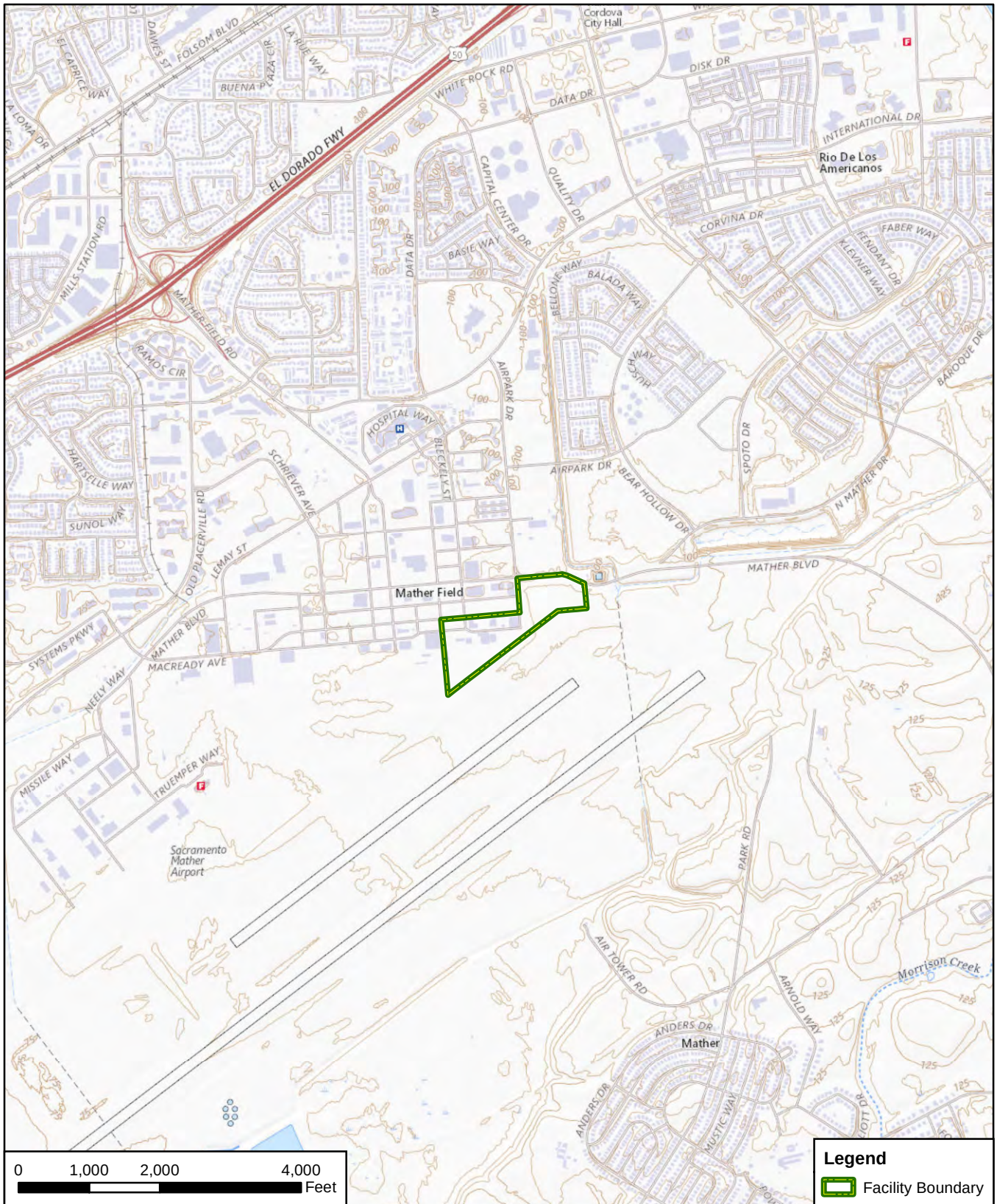
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI,		PM	CM	11/3/2022

Facility Location

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-1



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Base Map: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program,		PM	CM	4/20/2023

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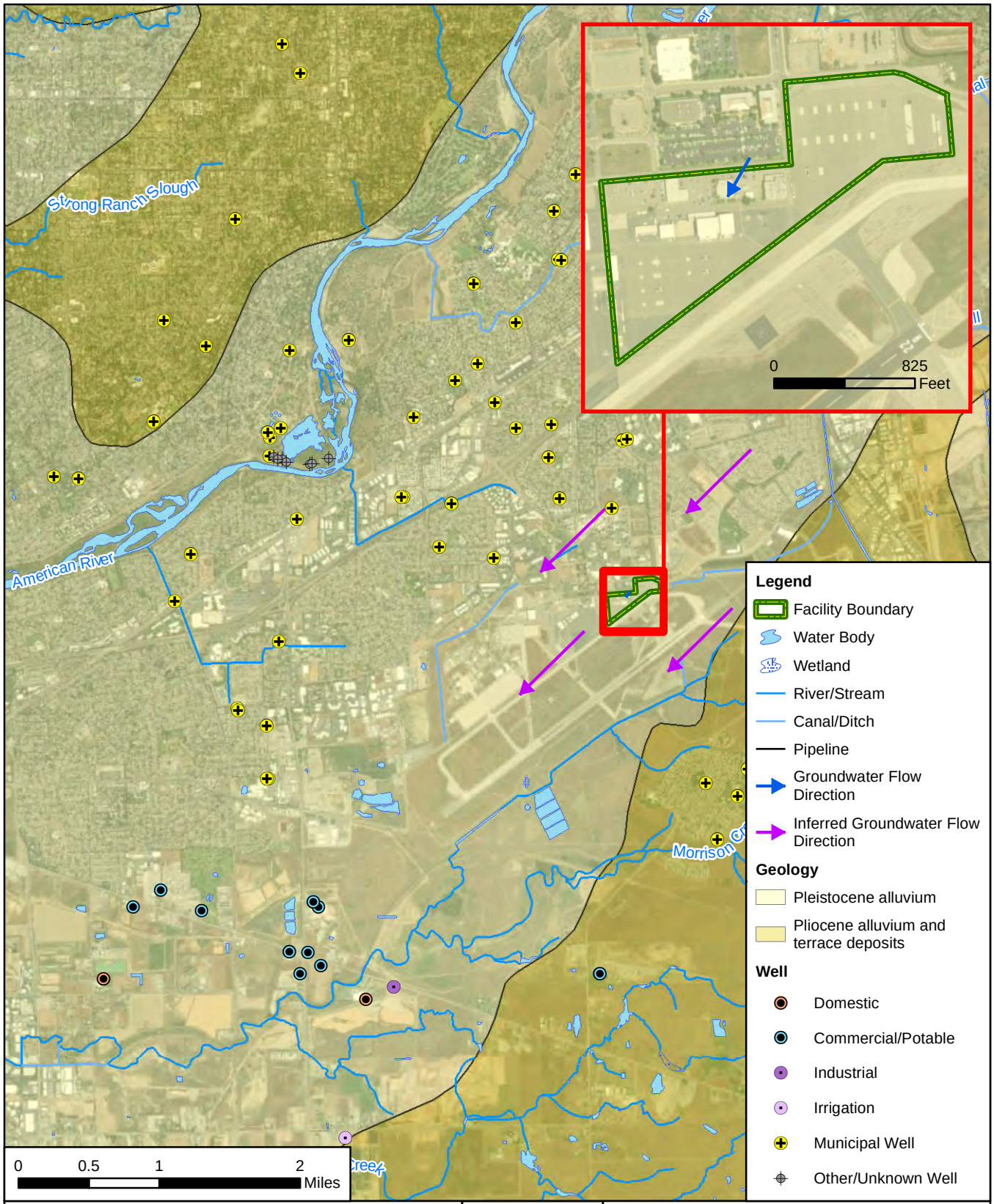
Facility Topography

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-2



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Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	5/11/2023

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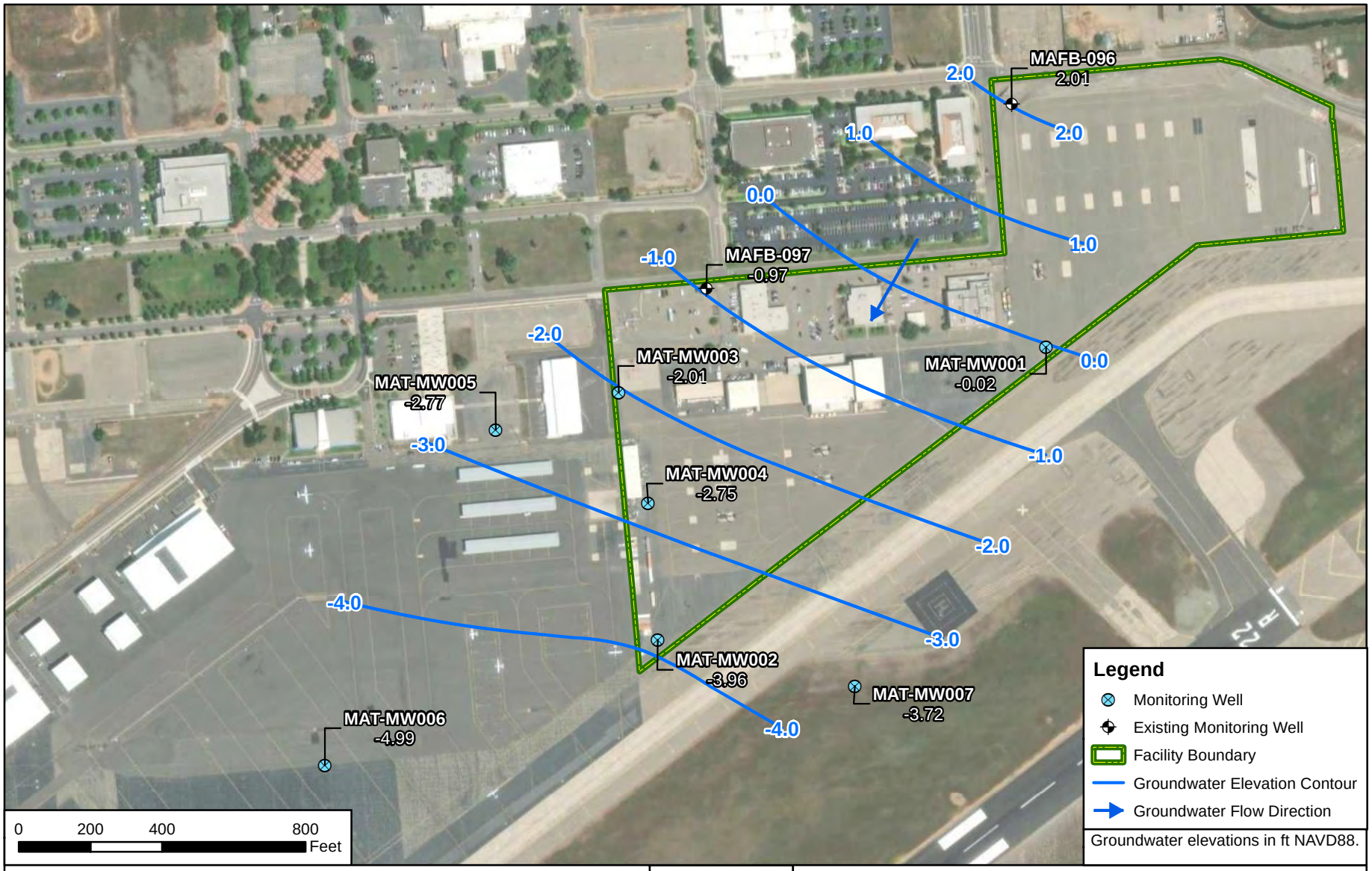
Groundwater Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-3



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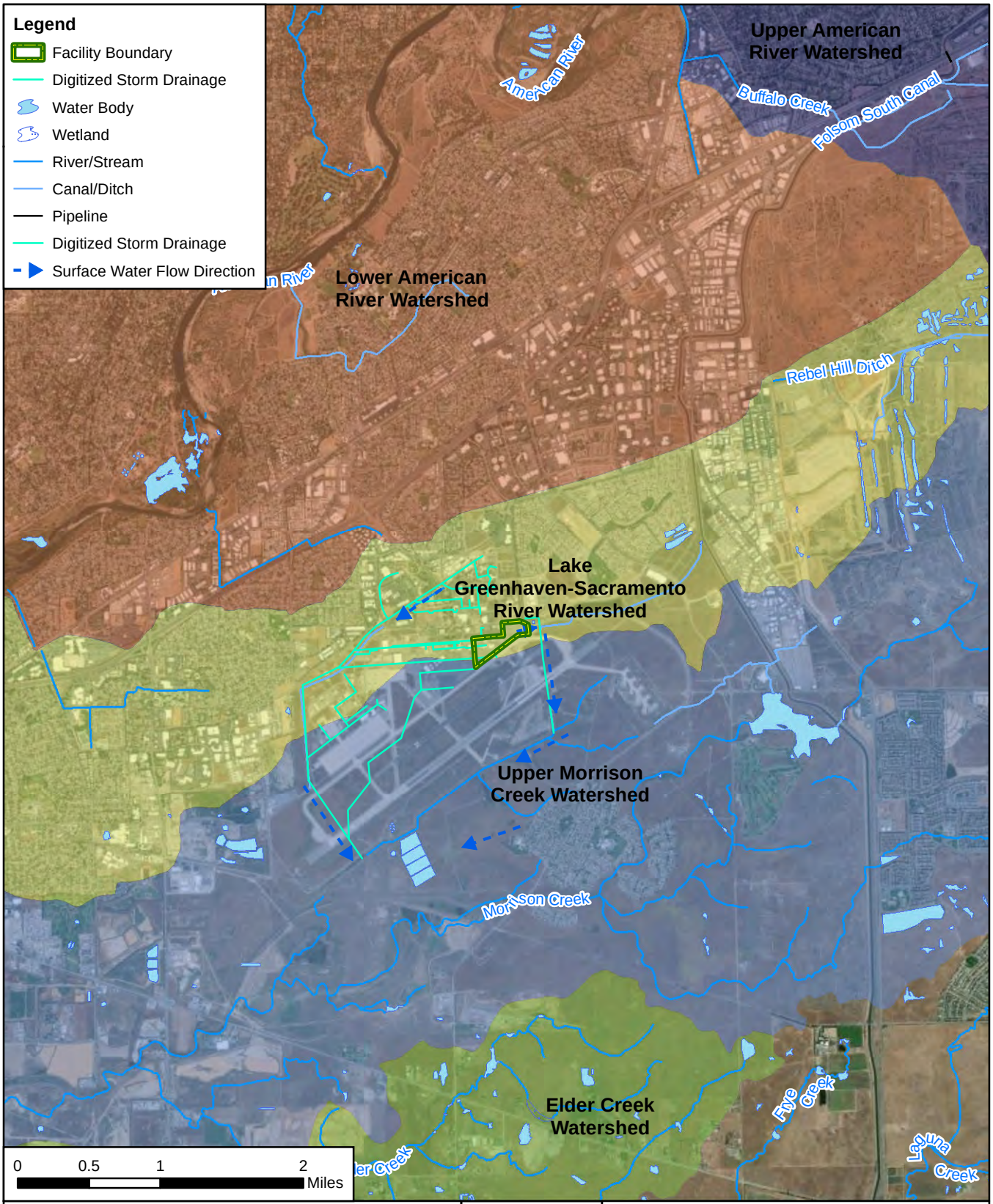
Groundwater Elevations, April 2022

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-4



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Surface Water Features

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 2-5

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3. Summary of Areas of Interest

The PA evaluated areas where PFAS-containing materials may have been used, stored, disposed, or released historically. Based on the PA findings, four potential release areas were identified at Mather AASF and grouped into two AOIs (AECOM, 2020). Additionally, during development of the SI QAPP Addendum (AECOM, 2021), three adjacent, off-facility joint ARNG/Air Force FTAs were identified and grouped into three additional AOIs. A resulting total of five AOIs were investigated during the SI. The potential release areas are shown on **Figure 3-1**.

3.1 AOI 1 Wash Rack

AOI 1 is the wash rack, where one instance of a fire training exercise occurred in approximately 2010 and may have resulted in a potential AFFF release. The fire training event involved the discharge of Tri-Max™ fire extinguishers of which the exact contents are unknown.

The drains in the wash rack area lead to an oil water separator and then flow into the sanitary sewer system. Therefore, potential discharges of AFFF in the wash rack would primarily release directly into the sanitary sewer system. The sanitary sewer system is serviced by the Sacramento Regional County Sanitation District and Sacramento Area Sewer District. Wastewater is conveyed to the Sacramento Regional Wastewater Treatment Plant, which provides secondary wastewater treatment, participates in biosolids recycling/ land disposal, and discharges approximately 150 MGD into the Sacramento River, located about 14 miles southwest of the AASF (USACE, 2012). However, any runoff not captured by the oil water separator could reach nearby surface drainages that lead into tributaries of the Sacramento River.

3.2 AOI 2 Airfields and AFFF Storage Areas

AOI 2 is comprised of the three AASF airfields: the Aviation Support Equipment (ASE) Storage Building, the C-12 Hangar, and the Storage Shed. Familiarization training exercises with Tri-Max™ fire extinguishers took place at the three AASF airfields (Northeast Airfield, Center Airfield, and Southwest Airfield) and occurred approximately annually during the confirmed years of 1998 to 2003. The ASE Storage Building and C-12 Hangar contained storage of decommissioned Tri-Max™ fire extinguishers, and the Storage Shed contained storage of AFFF in 5-gallon containers.

3.3 AOI 3 ARNG and Air Force FTA #1

AOI 3 is the first of three adjacent, off-facility FTAs identified where combined ARNG and Air Force extraction type exercises may have involved extinguishing live fire with either water or an unknown type of foam. The FTA exercises took place as early as 1988 until approximately2003 (AECOM 2020). Training by the Air Force did not continue beyond closure of Mather AFB in 1993.

3.4 AOI 4 ARNG and Air Force FTA #2

AOI 4 is the second of three adjacent, off-facility FTAs identified where combined ARNG and Air Force extraction type exercises may have involved extinguishing live fire with either water or an unknown type of foam. The FTA exercises took place as early as 1988 until approximately 2003 (AECOM 2020). Training by the Air Force did not continue beyond closure of Mather AFB in 1993.

3.5 AOI 5 ARNG and Air Force FTA #3

AOI 5 is the third of three adjacent, off-facility FTAs identified where combined ARNG and Air Force extraction type exercises may have involved extinguishing live fire with either water or an

unknown type of foam. The FTA exercises took place as early as 1988 until approximately 2003 (AECOM 2020). Training by the Air Force did not continue beyond closure of Mather AFB in 1993.

3.6 Adjacent Sources

Numerous off-facility, potential sources were identified adjacent to the Mather AASF during the PA and are not associated with ARNG activities. The adjacent potential sources are shown on **Figure 3-1** and described in the following sections for informational purposes only and will not be investigated as part of this SI.

3.6.1 Former Mather Air Force Base

Former Mather AFB was located on an approximately 5,845-acre property. Mather AFB began operations in 1918 and was designated for realignment under BRAC in 1988. Closure occurred in 1993 and the installation transitioned to civilian use (Amec Foster Wheeler, 2015).

Operations related to the use and/or storage of AFFF have historically occurred at various locations at former Mather AFB. A 2015 PA report on PFAS identified 10 potential PFAS release locations (Amec Foster Wheeler, 2015). One area, the former Mather AFB FTA site FT011P, was investigate during a 2016 SI report that confirmed that PFOS concentrations in soil exceeded USAF-calculated screening values derived from the the Office of Superfund Remediation and Technology Innovation (OSRTI) residential direct contact soil criteria (5 milligrams per kilogram [mg/kg] for PFOS and 12 mg/kg for PFOA in soil and sediment), and PFOS and PFOA concentrations in groundwater exceeded the Health Advisories (Amec Foster Wheeler, 2016). The former Mather AFB PFAS investigation reports are included in the PA (AECOM, 2020). Three areas were categorized as no further action (Mather AFB West Ditch, Mather AFB South Ditch and Mather AFB Main Runway [**Figure 3-1**]), and the remaining seven areas were investigated in a later SI between December 2016 and July 2018 (Aerostar SES LLC [Aerostar], 2020a). The relevant compounds were detected in groundwater with the following maximum concentrations: PFOA at 3,130 nanograms per liter (ng/L); PFOS at 26,000 ng/L; PFHxS at 31,200 ng/L; PFNA at 16.5 ng/L; and PFBS at 1,270 ng/L (Aerostar, 2020a). The relevant compounds were detected in soil with the following maximum concentrations: PFOA at 58.1 micrograms per kilogram (µg/kg); PFOS at 1,780 J µg/kg; PFHxS at 126 µg/kg; PFNA at 7.37 µg/kg; and PFBS at 41.7 µg/kg (Aerostar, 2020a).

An expanded SI was completed in 2020 to further determine the presence or absence of PFOA and PFOS in the drinking water aquifer (Aerostar, 2020b). Summary information below can be found in Figure 4-4 of Aerostar, 2020b. Data included in this figure was collected over the span of 2014 through 2020. A PFOA/PFOS plume, associated with the Main Base Strategic Air Command Area groundwater treatment plant, was documented cross-gradient, less than 0.5-miles west of Mather AASF, in hydrogeologic Unit D (Figure 4-4, Aerostar, 2020b). Within the plume, PFOA and PFOS were detected at concentrations up to 99 ng/L and 255 ng/L, respectively. A second comingled PFOA/PFOS plume, associated with six potential release areas, was identified less than 1-mile downgradient of Mather AASF, in hydrogeologic Units B and C (Figure 4-4, Aerostar, 2020b). These six release areas are divided into two source areas: a northern source area containing AFFF Areas 3, 4, and 5 and a southern source area containing AFFF Area 10, FT011, and Site 7. Within the southern source area, groundwater samples were collected from hydrogeologic Unit A (32.5 – 67 feet bgs). From this source area, PFOA and PFOS were detected at concentrations up to 19,000 ng/L and 891,000 ng/L, respectively. Within the associated downgradient plume in hydrogeologic Units B and C, PFOA and PFOS were detected at concentrations up to 549 ng/L and 1,020 ng/L, respectively (Figure 4-4, Aerostar, 2020b). Limited data were available upgradient of Mather AASF. In July 2020, PFOA and PFOS were detected at concentrations of 2.4 J ng/L and 1.5 J ng/L, respectively, in well STSW-175A (screened at 275-295 feet bgs), located less than 1-mile upgradient of Mather AASF. During the same event, PFOA

was also detected directly north of Mather AASF, at a concentration of 14.3 ng/L in well STSW-105C (screened at 380-400 feet bgs).

Additionally, quarterly monitoring events have been conducted under the former Mather AFB groundwater remediation and monitoring program. During the third quarter of 2022, a selection of 18 locations were sampled and analyzed for PFAS. Results indicated the presence of the relevant compounds with the following maximum concentrations: PFOA at 75 ng/L; PFOS at 23 ng/L; PFHxS at 32 ng/L; PFNA at 2 ng/L; and PFBS at 8 ng/L (Air Force Civil Engineering Center [AFCEC], 2022).

3.6.2 Elite Air Interiors

Elite Air Interiors is a private aviation company present at Sacramento Mather Airport. The company provides interior refurbishment services for aviation aircrafts. The company's website advertises using "the highest quality, fire retardant, HR upholstery foams". PFAS contamination from these industrial applications is unknown but possible (Elite Air Interiors, n.d.). The Elite Air Interiors hangar was previously a Mather AFB maintenance hangar (Building 7015) that stored AFFF and contained an AFFF fire suppression system. The Mather AFB maintenance hangar was identified as a potential PFAS release area in the former Mather AFB PA report (Amec Foster Wheeler, 2016).

3.6.3 Fire Training Area

During an interview with Mather AASF personnel, the area located northeast of the Sacramento Mather Airport was identified as an FTA. The FTA's geographic coordinates are 38°34'08.5"N; 121°15'47.6"W, and the area is not within the boundary of the former Mather AFB. The parcel number is 072-2860-003-0000, is owned by Sacramento Metropolitan Fire District. and a Federal Express (FedEx) airplane is apparently parked in the area at all times. The property was last transferred on 5 October 2007 No further details, such as AFFF usage or fire training activities, are known about the FTA.

3.6.4 California Department of Forestry and Fire Protection

The California Department of Forestry and Fire Protection (CAL FIRE) maintains a hangar located adjacent to Elite Air Interiors. The CAL FIRE hangar was previously a Mather AFB maintenance hangar (Building 7040) that stored AFFF and contained an AFFF fire suppression system. The Mather AFB maintenance hangar was identified as a potential PFAS release area in the former Mather AFB PA report (Amec Foster Wheeler, 2016).

3.6.5 Mather Aircraft Rescue and Firefighting

Mather Aircraft Rescue and Firefighting (ARFF) has a fire station on Sacramento Mather Airport property that provides emergency response to aircraft emergencies. According to an interview with two Mather ARFF firefighters, Mather ARFF has occupied the fire station since 2000, after the Emery Worldwide Flight 17 crash incident prompted the need for a municipal fire and emergency response unit at Sacramento Mather Airport. The ARFF stores AFFF in their firetrucks, although they do not currently conduct fire training with AFFF at the station and are in the midst of transitioning out of AFFF usage. However, the ARFF firefighters indicated that they participated in a helicopter crash fire training exercise at the airport airfield in approximately 2011. The exact location and what the fire training exercise entailed, such as if AFFF were used, was not specified.

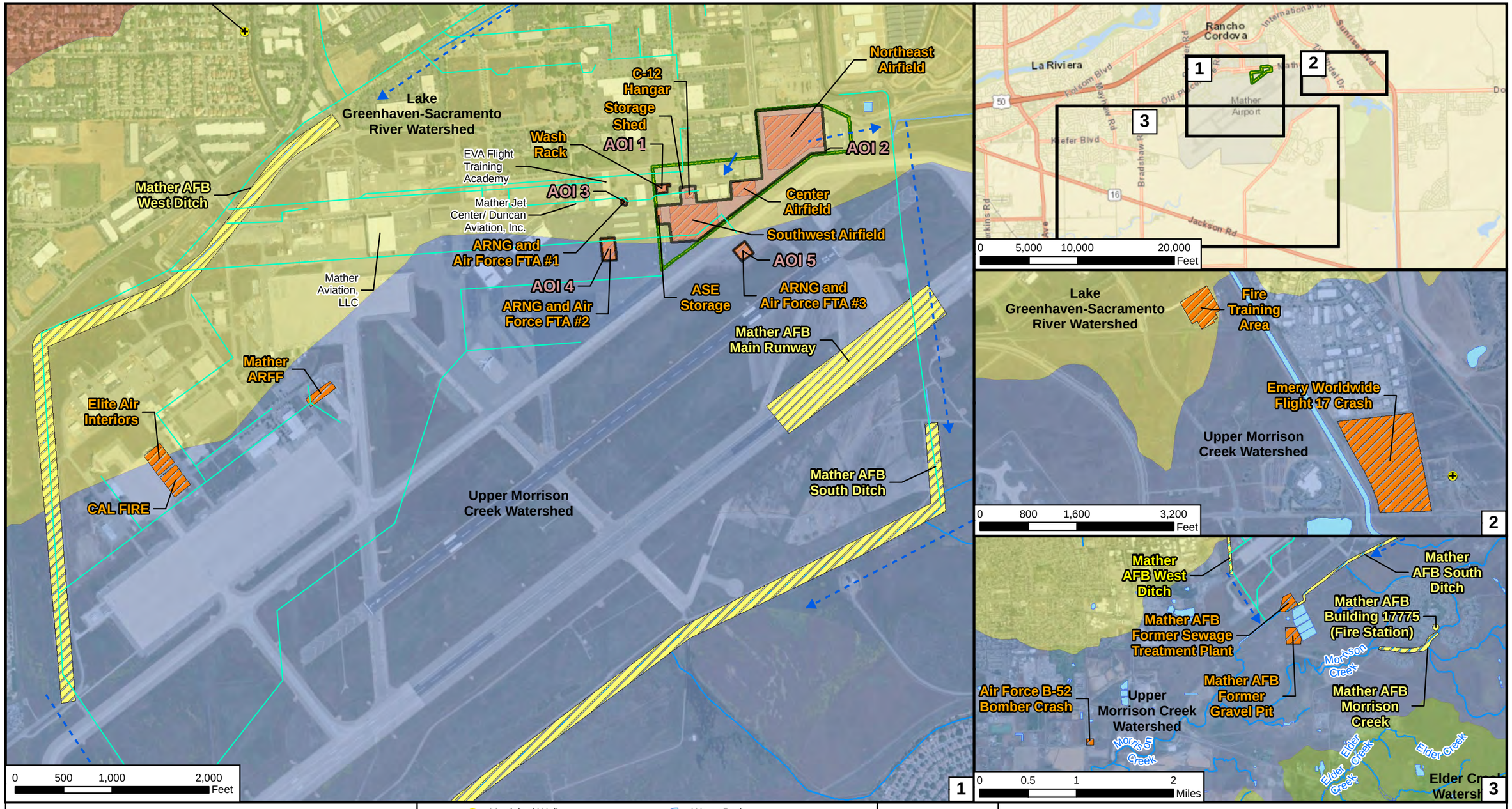
The fire station was previously occupied by the Mather AFB firefighting unit, who stored their crash response trucks in the station. The fire station (Building 7075) was also identified as a potential PFAS release area in the former Mather AFB PA report (Amec Foster Wheeler, 2016).

3.6.6 Emery Worldwide Flight 17 Crash

On 16 February 2000, Emery Worldwide Airlines, Inc. (Emery Worldwide) Flight 17 crashed into an auto salvage yard, approximately 2.5 miles east of the Sacramento Mather Airport. The airplane was attempting to return to the airport after experiencing a loss of pitch control (National Transportation Safety Board, 2003). The auto salvage yard contained 573 cars, some of which were set ablaze by the crash. According to eyewitness accounts, jet fuel was spilled on the ground and “flames went up about 200 to 300 feet in the air” (Curiel et al., 2000). Due to the presence of a fuel fire, firefighting response with foam is likely, although the type of foam (Class A or AFFF) and quantity used are unknown.

3.6.7 Air Force B-52 Bomber Crash

On December 1982, an Air Force B-52 bomber plane crashed into a cow pasture while practicing simulated combat takeoff exercises. The crash location was approximately one mile west of the Mather AFB runway and nearby a busy intersection (McKinley, 1982). Due to the historical usage of AFFF by former Mather AFB, it is possible that AFFF may have been used in the emergency response.



CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	8/29/2023	GIS BY	MS	8/29/2023
SCALE	1:12,000	CHK BY	AP	8/29/2023
Base Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c)		PM	CM	8/29/2023

- Municipal Well
- Area_of_Interest
- Potential Release Area
- Area investigated by Air Force recommended for NFA
- Facility Boundary
- Water Body
- River/Stream
- Canal/Ditch
- Digitized Storm Drainage
- Groundwater Flow Direction
- Surface Water Flow Direction

N

Areas of Interest

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 3-1

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4. Project Data Quality Objectives

As identified during the Data Quality Objective (DQO) process and outlined in the SI QAPP Addendum (AECOM, 2021), the objective of the SI is to identify whether there has been a release to the environment at the AOIs. 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 an AOI for Remedial Investigation (RI) if related soil and groundwater samples have concentrations of the relevant compounds above the OSD risk-based SLs. The SLs are presented in **Section 6.1** of this report.

4.2 Information Inputs

Primary information inputs included:

- The PA for Mather AASF (AECOM, 2020);
- Analytical data from groundwater and soil samples collected as part of this SI in accordance with the site-specific Uniform Federal Policy (UFP)-QAPP Addendum (AECOM, 2021); and
- 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 the property limits of the facility with the addition of three nearby AOIs outside the facility boundaries. (**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 spring season, which was the earliest available time field resources were available to complete the study.

4.4 Analytical Approach

Samples were analyzed by Pace Analytical Gulf Coast, accredited under the Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP; Accreditation Number 74960) and the National Environmental Laboratory Accreditation Program (NELAP; Certificate Number 01955). Data were compared to applicable SLs within this document and decision rules as defined in the SI QAPP Addendum (AECOM, 2021).

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; DoD, 2019b; USEPA, 2017).

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 SI QAPP Addendum (AECOM, 2021).

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 implemented in accordance with the following approved documents:

- *Final Site Inspection Programmatic Uniform Federal Policy-Quality Assurance Project Plan (PQAPP)* dated March 2018 (AECOM, 2018a);
- *Final Programmatic Accident Prevention Plan* dated July 2018 (AECOM, 2018b);
- *Final Preliminary Assessment Report, Mather AASF, California* dated February 2020 (AECOM, 2020);
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Mather Army Aviation Support Facility, Sacramento, California* dated November 2021 (AECOM, 2021); and
- *Final Site Safety and Health Plan, Mather Army Aviation Support Facility, Sacramento, California* dated March 2022 (AECOM, 2022).

The SI field activities were conducted from 28 March 2022 to 16 April 2022 and consisted of utility clearance, hand augering, sonic boring, soil sample collection, permanent monitoring well installation, groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021), except as noted in **Section 5.8**.

The following samples were collected during the SI and analyzed for a subset of 18 compounds by liquid chromatography with tandem mass spectrometry (LC/MS/MS) compliant with Quality Systems Manual (QSM) 5.3 Table B-15 to fulfill the project DQOs:

- Twenty-three (23) soil samples from seven boring locations and two hand auger locations;
- Eight groundwater samples from eight permanent monitoring wells;
- Eighteen (18) 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 media. 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**. Sampling forms and well development forms are provided in **Appendix B2.** A Field Change Request Form is provided in **Appendix B3**. A Nonconformance and Corrective Action Report is provided in **Appendix B4**, and land survey data are provided in **Appendix B5**. 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 for each of these activities are presented below.

5.1.1 Technical Project Planning

The USACE TPP Process, Engineer Manual (EM) 200-1-2 (USACE, 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 6 April 2021, prior to SI field activities. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include the ARNG, CAARNG, USACE, California Regional Water Quality Control Board, California Department of Toxic Substances Control (DTSC), US Air Force BRAC, and USEPA Region 9. 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 SI QAPP Addendum (AECOM, 2021).

A TPP Meeting 3 was held on 12 July 2023 to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report.

5.1.2 Utility Clearance

AECOM placed a ticket with the USA north 811 “Call Before You Dig” California utility clearance provider to notify them of intrusive work on 21 March 2022. Additionally, AECOM contracted Ground Penetrating Radar Systems (GPRS), a private utility location service, to perform utility clearance. GPRS performed utility clearance of the proposed boring locations on 28 March 2022 with input from the AECOM field team and Mather AASF facility staff. General locating services and ground-penetrating radar were used to complete the clearance. Additionally, the first five feet of each boring were pre-cleared using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and Sampling Equipment Acceptability

A potable water source at Mather AASF was sampled on 15 October 2021 to assess usability for decontamination of drilling equipment. Results of the sample collected at the wash rack spigot (MAT-DECON-01) confirmed this source to be acceptable for use in this investigation; therefore, it was used throughout the field activities. Specifically, the samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15. The results of the decontamination water sample associated with the wash rack spigot source used during the SI are provided in **Appendix F**. A discussion of the results is presented in the DUA (**Appendix A**).

Materials that were used within the sampling zone were confirmed as acceptable for use in the sampling environment. The checklist of acceptable materials for use in the sampling environment was provided in the Standard Operating Procedures (SOPs) appendix to the SI QAPP Addendum (AECOM, 2021). Prior to the start of field work each day, a Sampling Checklist was completed as an additional layer of control. The checklist served as a daily reminder to each field team member regarding the allowable materials within the sampling environment.

5.2 Soil Borings and Soil Sampling

Soil samples were collected via hand auger and Sonic drilling methods, in accordance with the SI QAPP Addendum (AECOM, 2021). Hand augers were used at locations designated for collection of surface soil samples (0 to 2 feet bgs). A Fraste Eijkelkamp FS250 rotosonic drill rig was used to collect continuous soil cores to the target depth at each boring location; however, a hand auger was used to collect soil from the top five feet of the boring, in accordance with AECOM utility clearance procedures. The soil boring locations are shown on **Figure 5-1**, and depths are provided **Table 5-2**.

In general, three discrete soil samples were collected from the vadose zone for chemical analysis from each soil boring: one surface soil sample (0 to 2 feet bgs), one subsurface soil sample from 13 to 15 feet bgs, and one subsurface soil sample approximately 2 feet above the groundwater table. At boring MAT-MW007, asphalt was observed to be approximately 2 feet thick, so the 0 to 2 feet bgs surface soil sample was collected at the soil interface at 2 feet bgs.

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

Soil borings completed during the SI found well-graded gravel and low plasticity silts as the dominant lithology of the unconsolidated sediments below the Mather AASF. The borings were completed at depths between 115 and 135 feet bgs. Isolated layers of silty sand were also observed in the boring logs at thicknesses ranging from approximately 2 to 15 feet.

Each soil sample was collected into laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottles and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via FedEx under standard chain of custody (CoC) procedures to the laboratory and analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15, total organic carbon (TOC) (USEPA Method 9060A), pH (USEPA Method 9045D), and grain size (ASTM Method D-422) in accordance with the SI QAPP Addendum (AECOM, 2021).

Field duplicate samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike (MS)/MS 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, equipment rinsate blanks were collected at a rate of 5% 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.

Once the sonic boreholes had been advanced to the specified depth, a permanent monitoring well was installed in accordance with the SI QAPP Addendum (AECOM, 2021). Surface soil-only boring locations AOI01-01 and AOI01-02, collected via hand auger, were abandoned using hydrated bentonite chips.

5.3 Permanent Well Installation and Groundwater Sampling

During the SI, seven permanent monitoring wells were installed within or downgradient of potential source areas. The locations of the wells are shown on **Figure 5-1**.

A Fraste Eijkelkamp FS250 rotosonic drill rig was used to install seven 2-inch diameter monitoring wells. The monitoring wells were constructed with Schedule 40 polyvinyl chloride (PVC), flush threaded 10-foot sections of riser, 0.010-inch slotted well screen, and a sand trap bottom. A filter pack of 2/12 Monterrey sand was installed in the annulus around the well screen and placed at least 2 feet above the top of the well screen. A minimum of a 2-foot-thick bentonite seal was placed above the filter sand and hydrated. Bentonite grout was placed in the well annulus from the top of the bentonite seal to approximately 2 feet bgs for the completion of a flush-mount well vault. The bentonite grout was allowed to set for 24 hours prior to well completion in accordance with the SI QAPP Addendum (AECOM, 2021). The screen interval of each groundwater monitoring well is provided in **Table 5-3**, and construction details are provided in **Appendix E**.

Development and sampling of wells were completed in accordance with the SI QAPP Addendum (AECOM, 2021). The newly installed monitoring wells were developed no sooner than 24 hours following installation by pumping and surging using a variable speed submersible pump. Samples were collected no sooner than 24 hours following development via low-flow sampling methods using a Geotech bladder pump with disposable PFAS-free, HDPE tubing. New tubing was used at each well and the pumps were decontaminated between each well. The wells were purged at a rate determined in the field to reduce 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**). Water levels were measured to the nearest 0.01 inch and recorded. Additionally, a subsample of each groundwater sample was collected in a separate container, and a shaker test was completed to identify if there were any foaming. No foaming was noted in any of the groundwater samples.

Each sample was collected into laboratory-supplied PFAS-free HDPE bottles 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 by LC/MS/MS compliant with QSM 5.3 Table B-15 in accordance with the SI QAPP Addendum (AECOM, 2021).

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. One field reagent blank was collected in accordance with the PQAPP (AECOM, 2018a). A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 °C during shipment.

5.4 Synoptic Water Level Measurements

A synoptic groundwater gauging event was performed on 15 April 2022. Groundwater elevation measurements were collected from the seven new permanent monitoring wells and two existing monitoring wells. Water level measurements were taken from the northern side of the well casing. A groundwater flow contour map is provided in **Figure 2-4**. Groundwater elevation data are provided in **Table 5-3**.

5.5 Surveying

The northern side of each well casing was surveyed by California-licensed land surveyors following guidelines provided in the SOPs provided in the SI QAPP Addendum (AECOM, 2021). Survey data from the newly installed wells on the facility were collected on 14 April 2022 in the applicable Universal Transverse Mercator zone projection with North American Datum 1983 (NAD83) datum (horizontal) and North American Vertical Datum 1988 (vertical). The surveyed well data are provided in **Appendix B5**.

5.6 Investigation-Derived Waste

As of the date of this report, the disposal of 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 (AECOM, 2021) and with the DA Guidance for Addressing Releases of PFAS, Q18 (DA, 2018).

Soil IDW (i.e., soil cuttings) generated during the SI activities were contained in labeled, 55-gallon Department of Transportation (DOT)-approved steel drums and left onsite in a designated waste storage area. The soil IDW was not sampled and assumes the characteristics of the associated soil samples collected from that source location. ARNG will coordinate waste profiling, transportation, and disposal of the solid IDW under a separate contract.

Liquid IDW generated during SI activities (i.e., purge water, development water, and decontamination fluids) were contained in labeled, 55-gallon DOT-approved steel drums, and left onsite in a designated waste storage area. The liquid IDW was not sampled and assumes the characteristics of the associated groundwater samples collected from that source location. Management and disposal of containerized IDW is being handled by EA Engineering, Science, and Technology, Inc. (EA) under a separate contract with USACE in accordance with SOP No. 042A (EA, 2021)

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 at a licensed solid waste landfill.

5.7 Laboratory Analytical Methods

Samples were analyzed by LC/MS/MS compliant with QSM 5.3 Table B-15 at Pace Analytical Gulf Coast in Baton Rouge, Louisiana, 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 SI QAPP Addendum

Two deviations from the SI QAPP Addendum were identified during review of the field documentation as noted below:

- During installation of monitoring wells, 2-inch diameter Schedule 40 PVC was used instead of 4-inch diameter Schedule 80 PVC as specified in the SI QAPP Addendum. The decision was based on the driller's recommendation and extensive experience at the drilling site. The proposed change was in conformance with Sacramento County Environmental Management Department well construction standards, and the revised design ensured DQOs were achieved. This action was documented in a field change request form provided in **Appendix B3**.
- Dedicated sampling equipment was observed in existing permanent well MAFB-096. Efforts to remove the equipment were unsuccessful; therefore, a groundwater sample from existing permanent well MAFB-096 could not be collected. This action was documented in a nonconformance report dated 15 April 2022 and is provided in **Appendix B4**.

While not noted on the Log of Daily Notice, the pump for well MAFB-097 was reinstalled after sampling and before AECOM demobilized from the site.

AFCEC was involved during review of the field documentation, and the actions of these two deviations were coordinated with AFCEC.

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Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Mather AASF, California

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Soil Samples							
AOI01-01-SB-0-2	4/6/2022 9:10	0 - 2	x				
AOI01-01-SB-0-2-D	4/6/2022 9:10	0 - 2	x				FD
AOI01-02-SB-0-2	4/7/2022 8:15	0 - 2	x	x	x		pH/TOC
AOI01-02-SB-0-2-MS	4/7/2022 8:15	0 - 2		x	x		MS
AOI01-02-SB-0-2-MSD	4/7/2022 8:15	0 - 2		x	x		MSD
MAT-MW001-SB-0-2	4/8/2022 8:30	0 - 2	x				
MAT-MW001-SB-13-15	4/8/2022 8:45	13 - 15	x				
MAT-MW001-SB-97-99	4/8/2022 16:15	97 - 99	x				
MAT-MW002-SB-0-2	4/1/2022 12:50	0 - 2	x				
MAT-MW002-SB-0-2-MS	4/1/2022 12:50	0 - 2	x				MS
MAT-MW002-SB-0-2-MSD	4/1/2022 12:50	0 - 2	x				MSD
MAT-MW002-SB-13-15	4/1/2022 13:45	13 - 15	x				
MAT-MW002-SB-13-15-D	4/1/2022 13:45	13 - 15	x				FD
MAT-MW002-SB-114-116	4/4/2022 12:05	114 - 116	x				
MAT-MW003-SB-0-2	4/7/2022 10:30	0 - 2	x				
MAT-MW003-SB-13-15	4/7/2022 10:50	13 - 15	x				
MAT-MW003-SB-13-15-MS	4/7/2022 10:50	13 - 15	x				MS
MAT-MW003-SB-13-15-MSD	4/7/2022 10:50	13 - 15	x				MSD
MAT-MW003-SB-110-112	4/7/2022 15:30	110 - 112	x				
MAT-MW004-SB-0-2	4/6/2022 11:20	0 - 2	x	x	x		pH/TOC
MAT-MW004-SB-13-15	4/6/2022 11:45	13 - 15	x				
MAT-MW004-SB-103-105	4/6/2022 17:20	103 - 105	x				
MAT-MW005-SB-0-2	3/30/2022 16:20	0 - 2	x	x	x		pH/TOC
MAT-MW005-SB-13-15	3/30/2022 17:15	13 - 15	x				
MAT-MW005-SB-122-124	3/31/2022 13:10	122 - 124	x				
MAT-MW005-SB-122-124-D	3/31/2022 13:10	122 - 124	x				FD
MAT-MW006-SB-0-2	4/5/2022 8:20	0 - 2	x	x	x		pH/TOC
MAT-MW006-SB-0-2-D	4/5/2022 8:20	0 - 2	x	x	x		FD, pH/TOC
MAT-MW006-SB-13-15	4/5/2022 8:45	13 - 15	x				
MAT-MW006-SB-101-103	4/5/2022 15:45	101 - 103	x				
MAT-MW007-SB-0-2	3/29/2022 8:02	0 - 2	x	x	x		pH/TOC
MAT-MW007-SB-13-15	3/29/2022 8:55	13 - 15	x				
MAT-MW007-SB-95-100	3/30/2022 9:25	95 - 100				x	Grain Size
MAT-MW007-SB-98-100	3/30/2022 10:00	98 - 100	x				
Groundwater Samples							
MAT-MW001-GW	4/14/2022 17:13	NA	x				
MAT-MW001-GW-MS	4/14/2022 17:13	NA	x				MS
MAT-MW001-GW-MSD	4/14/2022 17:13	NA	x				MSD
MAT-MW002-GW	4/16/2022 11:23	NA	x				
MAT-MW003-GW	4/13/2022 12:50	NA	x				
MAT-MW004-GW	4/13/2022 10:05	NA	x				
MAT-MW005-GW	4/14/2022 14:58	NA	x				
MAT-MW006-GW	4/14/2022 12:05	NA	x				
MAT-MW006-GW-D	4/14/2022 12:05	NA	x				FD
MAT-MW007-GW	4/14/2022 9:33	NA	x				
MAFB-097-GW	4/16/2022 9:05	NA	x				

Table 5-1
Site Inspection Samples by Medium
Site Inspection Report, Mather AASF, California

Sample Identification	Sample Collection Date/Time	Sample Depth (feet bgs)	LC/MS/MS compliant with QSM 5.3 Table B-15	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D-422)	Comments
Quality Control Samples							
MAT-FRB-01	3/31/2022 7:35	NA	x				FRB
MAT-ERB-01	3/31/2022 7:30	NA	x				drill bit
MAT-ERB-02	4/7/2022 17:05	NA	x				hand auger
MAT-ERB-03	4/14/2022 1405	NA	x				bladder pump
MAT-DECON-01	10/15/2021 12:10	NA	x				wash rack spigot

Notes:
AASF = Army Aviation Support Facility
AOI = area of interest
ASTM = American Society for Testing and Materials
bgs = below ground surface
Decon = decontamination
ERB = equipment rinsate blank
FD = field duplicate
FRB = field reagent blank
GW = groundwater
LC/MS/MS = Liquid Chromatography Mass Spectrometry
MAFB = Mather Air Force Base
MAT = Mather
MS/MSD = matrix spike/ matrix spike duplicate
MW = monitoring well
QSM = Quality Systems Manual
SB = soil boring
TOC = total organic carbon
USEPA = United States Environmental Protection Agency

Table 5-2
Soil Boring Depths
Site Inspection Report, Mather AASF, California

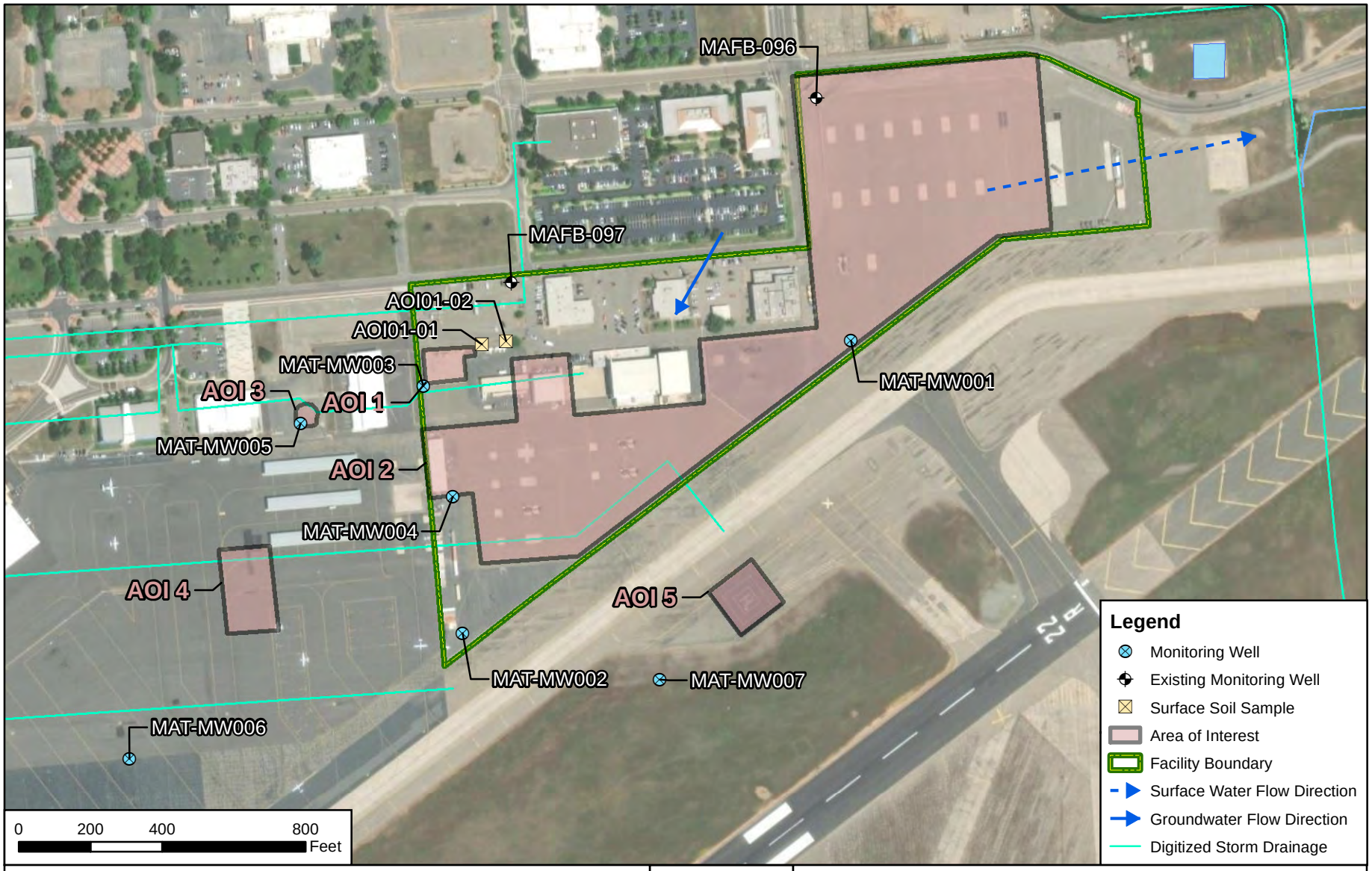
Area of Interest	Boring Location	Soil Boring Depth (feet bgs)
1	MAT-MW003	122
2	MAT-MW001	115
	MAT-MW002	127
	MAT-MW004	115
3	MAT-MW005	135
4	MAT-MW006	115
5	MAT-MW007	115

Notes:
AASF = Army Aviation Support Facility
bgs = below ground surface
MAT = Mather
MW = monitoring well

Table 5-3
Permanent Monitoring Well Screen Intervals, Groundwater Elevations
Site Inspection Report, Mather AASF, California

Area of Interest	Boring Location	Permanent Well Screen Interval (feet bgs)	Top of Casing Elevation (feet NAVD88)	Ground Surface Elevation (feet NAVD88)	Depth to Water (feet btoc)	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)
1	MAT-MW003	112 - 122	93.07	93.55	95.08	95.56	-2.01
2	MAT-MW001	99 - 109	93.91	94.24	93.93	94.26	-0.02
	MAT-MW002	116 - 126	92.66	93.01	96.62	96.97	-3.96
	MAT-MW004	105 - 115	93.05	93.38	95.80	96.13	-2.75
	MAFB-096	83.15 - 93.15	94.18	95.07	92.17	93.06	2.01
	MAFB-097	101 - 111	91.42	92.29	92.39	93.26	-0.97
3	MAT-MW005	124 - 134	92.01	92.37	94.78	95.14	-2.77
4	MAT-MW006	103 - 113	90.92	91.38	95.91	96.37	-4.99
5	MAT-MW007	100 - 110	91.23	91.53	94.95	95.25	-3.72

Notes:
AASF = Army Aviation Support Facility
bgs = below ground surface
btoc = below top of casing
MAFB = Mather Air Force Base
MAT = Mather
MW = monitoirng well
NA = not applicable
NAVD88 = North American Vertical Datum 1988



CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	5/3/2023	GIS BY	MS	5/3/2023
SCALE	1:4,800	CHK BY	AP	5/3/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	5/3/2023

N

Site Inspection Sample Locations

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 5-1

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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 each AOI is provided in **Section 6.3** through **Section 6.7**. **Table 6-2** through **Table 6-5** present results in 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** below.

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

Analyte[b]	Residential (Soil) (µg/kg)[a] 0-2 feet bgs	Industrial/ Commercial Composite Worker (Soil) (µg/kg)[a] 2-15 feet bgs	Tap Water (Groundwater) (ng/L)[a]
PFOA	19	250	6
PFOS	13	160	4
PFBS	1,900	25,000	601
PFHxS	130	1,600	39
PFNA	19	250	6

Notes:
bgs = below ground surface; µg/kg = micrograms per kilogram; ng/L = nanograms per liter

a.) Assistant Secretary of Defense, 2022. Risk Based Screening Levels in Groundwater and Soil using United States Environmental Protection Agency's (USEPA's) Regional Screening Level Calculator. Hazard Quotient (HQ) = 0.1. 6 July 2022.

b.) 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.

The data in the subsequent sections are compared to 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 feet bgs) and the industrial/commercial worker scenario is applied to shallow subsurface soil results (2 to 15 feet bgs). The SLs are not applied to deep subsurface soil results (>15 feet bgs) because 15 feet is the anticipated limit of construction activities.

6.2 Soil Physicochemical Analyses

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

6.3 AOI 1

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 1: Wash Rack. The soil and groundwater results are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.3.1 AOI 1 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs) from boring locations AOI01-01, AOI01-02, and MAT-MW003. Soil was also sampled from shallow subsurface soil (13 to 15 feet bgs) and deep subsurface soil intervals (110 to 112 feet bgs) from boring locations MAT-MW003. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

The relevant compounds were detected below their SLs in at least one surface soil sample, with the following maximum concentrations: PFOA at 1.12 µg/kg, PFOS at 2.71 µg/kg, PFHxS at 0.318 J µg/kg, PFNA at 0.164 J µg/kg, and PFBS at 0.161 J µg/kg.

PFOS was detected below the SL in shallow subsurface soil, with a concentration of 0.050 J µg/kg. The other relevant compounds were not detected in shallow subsurface soil. No relevant compounds were detected in deep subsurface soil.

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 was sampled from monitoring newly installed monitoring well MAT-MW003, downgradient of the suspected release area. The following detections were measured with regards to the SLs:

- PFOA was detected above the SL of 6 ng/L at MAT-MW003, with a concentration of 11.4 ng/L.
- PFHxS was detected above the SL of 39 ng/L at MAT-MW003, with a concentration of 55.1 ng/L.

- PFOS and PFBS were detected below their SLs, with a concentration of 2.91 J ng/L and 6.19 ng/L, respectively.
- PFNA was not detected at either location.

6.3.3 AOI 1 Conclusions

Based on the results of the SI, the relevant compounds were detected in soil at concentrations below their SLs. PFOA and PFHxS were detected in groundwater, at concentrations above their SLs. Based on exceedances of the SLs in groundwater, further evaluation at AOI 1 is warranted.

6.4 AOI 2

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 2: Airfields and AFFF Storage Areas. The results in soil and groundwater are summarized on **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.4.1 AOI 2 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (between 97 to 116 feet bgs) from boring locations MAT-MW001, MAT-MW002, and MAT-MW004. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOA, PFOS, PFHxS, and PFNA were detected below their SLs in at least one surface soil sample, with the following maximum concentrations: PFOA at 0.091 J µg/kg, PFOS at 1.20 µg/kg, PFHxS at 0.055 J µg/kg, and PFNA at 0.046 J µg/kg. PFBS was not detected in surface soil at AOI 2.

PFOS was detected below the SL in shallow subsurface soil at MAT-MW001, with a concentration of 0.097 J µg/kg. The other relevant compounds were not detected in shallow subsurface soil. No relevant compounds were detected in deep subsurface soil.

6.4.2 AOI 2 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 was sampled from newly installed monitoring wells MAT-MW001, MAT-MW002, and MAT-MW004 within and downgradient of the suspected release areas. Groundwater was also sampled from existing monitoring well MAFB-097, approximately downgradient of the Northeast Airfield suspected release area. The following detections were measured with regards to the SLs:

- PFOA was detected above the SL of 6 ng/L at all four wells, with concentrations ranging from 13.7 ng/L to 123 ng/L.
- PFOS was detected above the SL of 4 ng/L at MAT-MW001 and MAT-MW002, with concentrations of 111 ng/L and 14.2 ng/L, respectively. PFOS was detected below the SL at MAT-MW004 and MAFB-097, with a maximum concentration of 3.07 J ng/L.
- PFHxS was detected above the SL of 39 ng/L at all four wells, with concentrations ranging from 73.3 ng/L to 278 ng/L.
- PFNA was detected below the SL of 6 ng/L at MAT-MW001, with a concentration of 1.32 J ng/L.

- PFBS was detected below the SL of 601 ng/L at all four wells, with a maximum concentration of 27.9 ng/L.

6.4.3 AOI 2 Conclusions

Based on the results of the SI, the relevant compounds were detected in soil at concentrations below their SLs. PFOA, PFOS, and PFHxS were detected in groundwater at concentrations above their respective SLs. Based on exceedances of the SLs in groundwater, further evaluation at AOI 2 is warranted.

6.5 AOI 3

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 3: ARNG and Air Force FTA #1. The results in soil and groundwater are presented in **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**.

6.5.1 AOI 3 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (122 to 124 feet bgs) from boring location MAT-MW005. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOS and PFHxS were detected below their SLs in surface soil, with concentrations of 0.477 J µg/kg and 0.051 J µg/kg, respectively. PFOA, PFNA, and PFBS were not detected in surface soil.

PFOS was detected below the SL in shallow subsurface soil, with a concentration of 0.074 J µg/kg. The other relevant compounds were not detected in shallow subsurface soil. No relevant compounds were detected in deep subsurface soil.

6.5.2 AOI 3 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 was sampled from monitoring well MAT-MW005. The following detections were measured with regards to the SLs:

- PFOA was detected above the SL of 6 ng/L, with a concentration of 10.6 ng/L.
- PFHxS was detected above the SL of 39 ng/L, with a concentration of 58.4 ng/L.
- PFOS and PFBS were detected below their SLs, with concentrations of 3.71 J ng/L and 9.60 ng/L, respectively.
- PFNA was not detected.

6.5.3 AOI 3 Conclusions

Based on the results of the SI, the relevant compounds were detected in soil below their SLs. PFOA and PFHxS were detected in groundwater at concentrations above their SLs. Based on exceedances of the SLs in groundwater, further evaluation at AOI 3 is warranted.

6.6 AOI 4

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 4: ARNG and Air Force FTA #2. The results in soil and groundwater are presented in **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**. The well installed to assess AOI 4 (MAT-MW006) had to be placed downgradient of, not within, the AOI due to airport logistics.

6.6.1 AOI 4 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (101 to 103 feet bgs) from boring location MAT-MW006. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOS was detected below the SL in surface soil, with a maximum concentration of 0.153 J µg/kg in the field duplicate sample (MAT-MW006-SB-0-2-D). The other relevant compounds were not detected in surface soil.

PFOS was detected below the SL in shallow subsurface soil, with a concentration of 0.056 J µg/kg. The other four relevant compounds were not detected in shallow subsurface soil. No relevant compounds were detected in deep subsurface soil.

6.6.2 AOI 4 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 was sampled from monitoring well MAT-MW006. The following detections were measured with regards to the SLs:

- PFOA was detected above the SL of 6 ng/L, with a maximum concentration of 9.91 ng/L in the field duplicate sample (MAT-MW006-GW-D).
- PFHxS was detected above the SL of 39 ng/L, with a maximum concentration of 66.7 ng/L in the field duplicate sample.
- PFOS and PFBS were detected below their SLs, with maximum concentrations of 2.47 J ng/L and 11.8 ng/L, respectively, in the field duplicate sample.
- PFNA was not detected in the parent or duplicate sample.

6.6.3 AOI 4 Conclusions

Based on the results of the SI, PFOS was detected in soil below the SL. PFOA and PFHxS were detected in groundwater, at concentrations above their SLs. Based on exceedances of the SLs in groundwater, further evaluation at AOI 4 is warranted.

6.7 AOI 5

This section presents the analytical results for soil and groundwater in comparison to SLs for AOI 5: ARNG and Air Force FTA #3. The results in soil and groundwater are presented in **Table 6-2** through **Table 6-5**. Soil and groundwater results are presented on **Figure 6-1** through **Figure 6-7**. The well installed to assess AOI 5 (MAT-MW007) had to be placed downgradient of, not within, the AOI due to airport logistics.

6.7.1 AOI 5 Soil Analytical Results

Soil was sampled from surface soil (0 to 2 feet bgs), shallow subsurface soil (13 to 15 feet bgs), and deep subsurface soil (98 to 100 feet bgs) from boring location MAT-MW007. **Figure 6-1** through **Figure 6-5** present the ranges of detections in soil. **Table 6-2** through **Table 6-4** summarize the soil results.

PFOA, PFOS, and PFHxS were detected below their SLs in surface soil, with concentrations of 0.464 J µg/kg, 0.393 J µg/kg, and 0.386 J µg/kg, respectively. PFNA and PFBS were not detected in surface soil. No relevant compounds were detected in shallow subsurface soil. PFOS was detected in deep subsurface soil, with a concentration of 0.069 J µg/kg.

6.7.2 AOI 5 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 was sampled from monitoring well MAT-MW007. The following detections were measured with regards to the SLs:

- PFOA was detected above the SL of 6 ng/L, with a concentration of 134 ng/L.
- PFOS was detected above the SL of 4 ng/L, with a concentration of 45 ng/L.
- PFHxS was detected above the SL of 39 ng/L, with a concentration of 309 ng/L.
- PFBS was detected below the SL of 601 ng/L, with a concentrations of 34.4 ng/L.
- PFNA was not detected.

6.7.3 AOI 5 Conclusions

Based on the results of the SI, PFOA, PFOS, and PFHxS were detected below their SLs in soil. PFOA, PFOS, and PFHxS were detected in groundwater, at concentrations above their SLs. Based on the exceedances of the SLs in groundwater, further evaluation at AOI 5 is warranted.

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, Mather Army Aviation Support Facility

Area of Interest		AOI01								AOI02						AOI03		AOI04	
Sample ID		AOI01-01-SB-0-2		AOI01-01-SB-0-2-D		AOI01-02-SB-0-2		MAT-MW003-SB-0-2		MAT-MW001-SB-0-2		MAT-MW002-SB-0-2		MAT-MW004-SB-0-2		MAT-MW005-SB-0-2		MAT-MW006-SB-0-2	
Sample Date		04/06/2022		04/06/2022		04/07/2022		04/07/2022		04/08/2022		04/01/2022		04/06/2022		03/30/2022		04/05/2022	
Depth		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft		0-2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																			
PFBS	1900	0.144	J	0.161	J	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	130	0.214	J	0.318	J	ND	U	0.038	J	0.055	J	ND	U	ND	U	0.051	J	ND	U
PFNA	19	0.109	J	0.164	J	ND	U	ND	U	0.046	J	ND	U	ND	U	ND	U	ND	U
PFOA	19	0.711	J	1.12		ND	U	ND	U	0.091	J	ND	U	ND	U	ND	U	ND	U
PFOS	13	1.93		2.71		0.153	J	0.234	J	1.20		0.080	J	ND	U	0.477	J	0.122	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on residential scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
MAT	Mather
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-2
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Surface Soil
Site Inspection Report, Mather Army Aviation Support Facility

	Area of Interest	AOI04		AOI05	
	Sample ID	MAT-MW006-SB-0-2-D		MAT-MW007-SB-0-2	
	Sample Date	04/05/2022		03/29/2022	
	Depth	0-2 ft		0-2 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)					
PFBS	1900	ND	U	ND	U
PFHxS	130	ND	U	0.386	J
PFNA	19	ND	U	ND	U
PFOA	19	ND	U	0.464	J
PFOS	13	0.153	J	0.393	J

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022. Soil screening levels based on residential scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
MAT	Mather
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-3
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Shallow Subsurface Soil
Site Inspection Report, Mather Army Aviation Support Facility

Area of Interest		AOI01		AOI02								AOI03		AOI04		AOI05	
Sample ID		MAT-MW003-SB-13-15		MAT-MW001-SB-13-15		MAT-MW002-SB-13-15		MAT-MW002-SB-13-15-D		MAT-MW004-SB-13-15		MAT-MW005-SB-13-15		MAT-MW006-SB-13-15		MAT-MW007-SB-13-15	
Sample Date		04/07/2022		04/08/2022		04/01/2022		04/01/2022		04/06/2022		03/30/2022		04/05/2022		03/29/2022	
Depth		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft		13-15 ft	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																	
PFBS	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	1600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	160	0.050	J	0.097	J	ND	U	ND	U	ND	U	0.074	J	0.056	J	ND	U

Grey Fill — Detected concentration exceeded OSD Screening Levels

References
a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022.
Soil screening levels based on industrial/commercial composite worker scenario for incidental ingestion of contaminated soil.

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes
ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
MAT	Mather
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
USEPA	United States Environmental Protection Agency
µg/kg	micrograms per kilogram

Table 6-4
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Deep Subsurface Soil
Site Inspection Report, Mather Army Aviation Support Facility

Area of Interest	AOI01		AOI02						AOI03				AOI04		AOI05	
Sample ID	MAT-MW003-SB-110-112		MAT-MW001-SB-97-99		MAT-MW002-SB-114-116		MAT-MW004-SB-103-105		MAT-MW005-SB-122-124		MAT-MW005-SB-122-124-D		MAT-MW006-SB-101-103		MAT-MW007-SB-98-100	
Sample Date	04/07/2022		04/08/2022		04/04/2022		04/06/2022		03/31/2022		03/31/2022		04/05/2022		03/30/2022	
Depth	110-112 ft		97-99 ft		114-116 ft		103-105 ft		122-124 ft		122-124 ft		101-103 ft		98-100 ft	
Analyte	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
Soil, LCMSMS compliant with QSM 5.3 Table B-15 (µg/kg)																
PFBS	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFHxS	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFNA	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOS	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	0.069	J

Interpreted Qualifiers
J = Estimated concentration
U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes
ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
ft	feet
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
MAT	Mather
ND	analyte not detected above the LOD
QSM	Quality Systems Manual
Qual	interpreted qualifier
SB	soil boring
µg/kg	micrograms per kilogram

Table 6-5
PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater
Site Inspection Report, Mather Army Aviation Support Facility

Area of Interest	Area of Interest	AOI01		AOI02								AOI03		AOI04				AOI05	
Sample ID	Sample ID	MAT-MW003-GW		MAT-MW001-GW		MAT-MW002-GW		MAT-MW004-GW		MAFB-097-GW		MAT-MW005-GW		MAT-MW006-GW		MAT-MW006-GW-D		MAT-MW007-GW	
Sample Date	Sample Date	04/13/2022		04/14/2022		04/16/2022		04/13/2022		04/16/2022		04/14/2022		04/14/2022		04/14/2022		04/14/2022	
Analyte	OSD Screening Level [a]	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Water, LCMSMS compliant with QSM 5.3 Table B-15 (ng/l)																			
PFBS	601	6.19		24.2		27.9		9.56		10.3		9.60		10.1		11.8		34.4	
PFHxS	39	55.1		278		226		73.3		75.8		58.4		58.4		66.7		309	
PFNA	6	ND	U	1.32	J	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
PFOA	6	11.4		123		80.1		16.5		13.7		10.6		8.33		9.91		134	
PFOS	4	2.91	J	111		14.2		3.07	J	2.67	J	3.71	J	2.08	J	2.47	J	45.0	

Grey Fill — Detected concentration exceeded OSD Screening Levels

References

a. Assistant Secretary of Defense, July 2022. Risk Based Screening Levels Calculated for PFOA, PFOS, PFBS, PFHxS, and PFNA in Groundwater or Soil using USEPA's Regional Screening Level Calculator. HQ=0.1, May 2022 Groundwater screening levels based on residential scenario for direct ingestion of groundwater.

Interpreted Qualifiers

J = Estimated concentration

U = The analyte was not detected at a level greater than or equal to the adjusted DL

Notes

ND = Analyte not detected above the LOD. LOD values are presented in Appendix F.

Chemical Abbreviations

PFBS	perfluorobutanesulfonic acid
PFHxS	perfluorohexanesulfonic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid

Acronyms and Abbreviations

AASF	Army Aviation Support Facility
AOI	Area of Interest
D	duplicate
DL	detection limit
GW	groundwater
HQ	hazard quotient
ID	identification
LCMSMS	liquid chromatography with tandem mass spectrometry
LOD	limit of detection
MAFB	Mather Air Force Base
MAT	Mather
ND	analyte not detected above the LOD
OSD	Office of the Secretary of Defense
QSM	Quality Systems Manual
Qual	interpreted qualifier
USEPA	United States Environmental Protection Agency
ng/l	nanogram per liter

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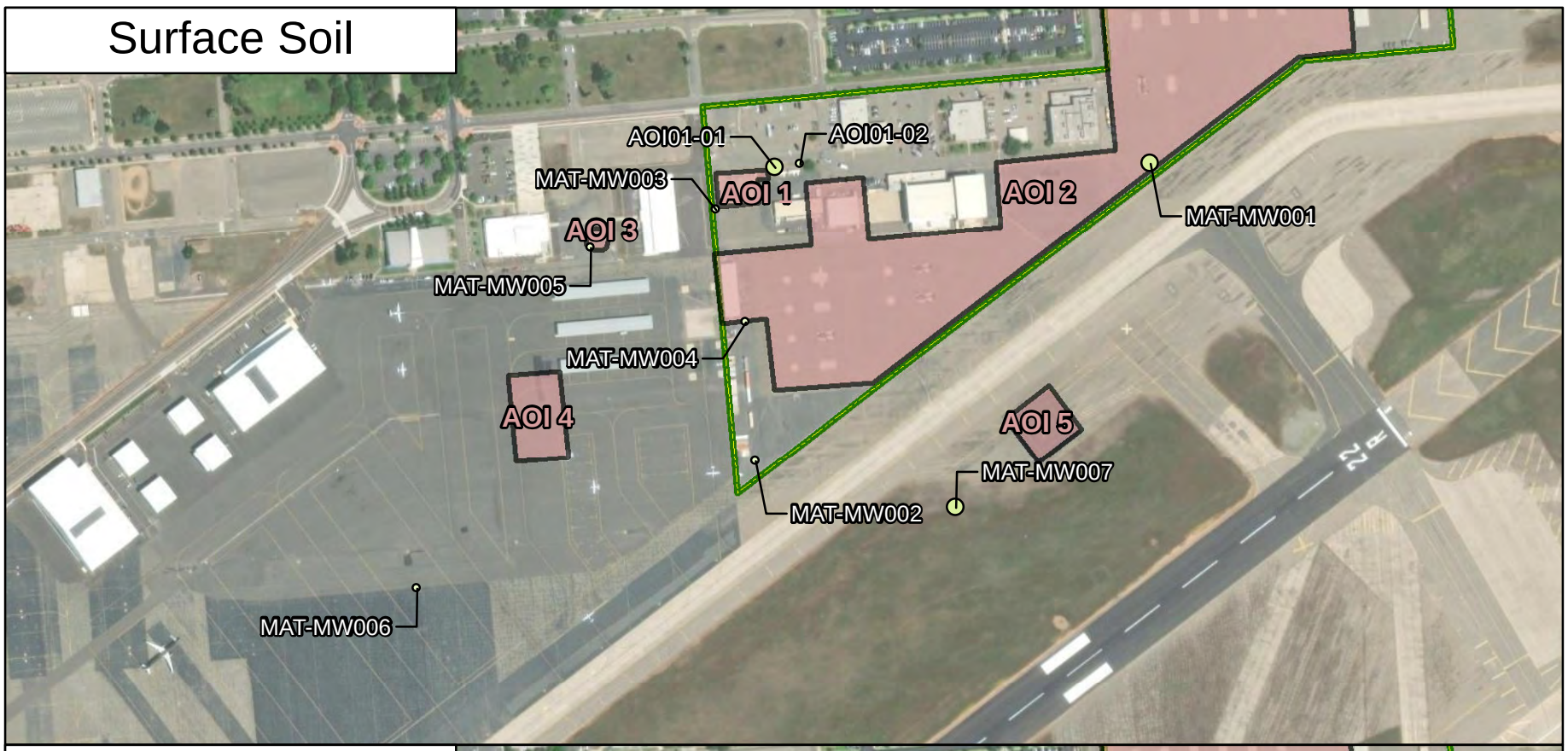
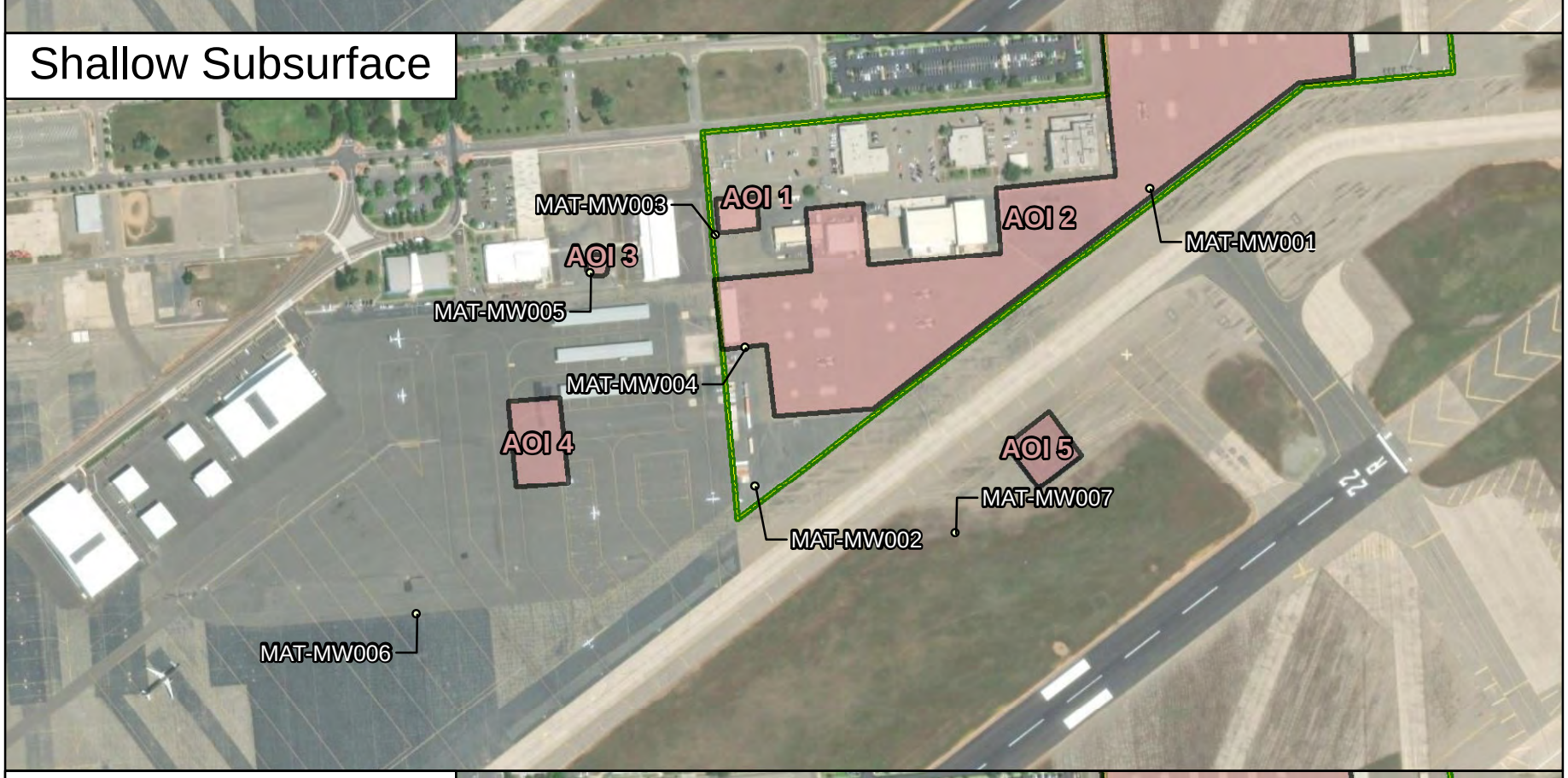
Surface Soil



Shallow Subsurface



Deep Subsurface

Legend

- Area of Interest
- Facility Boundary

PFOA Results (µg/Kg)

- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 225 450 900 Feet

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

PFOA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	9/27/2023	GIS BY	MS	9/27/2023
SCALE	1:5,400	CHK BY	AP	9/27/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/27/2023

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Figure 6-1

Surface Soil

Shallow Subsurface

Deep Subsurface

Legend

- Area of Interest
- Facility Boundary

PFOS Results (µg/Kg)

- ND
- >ND - 13
- >13 - 160
- >160 - 1,600
- >1,600

N

0 225 450 900 Feet

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

PFOS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	9/27/2023	GIS BY	MS	9/27/2023
SCALE	1:5,400	CHK BY	AP	9/27/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/27/2023

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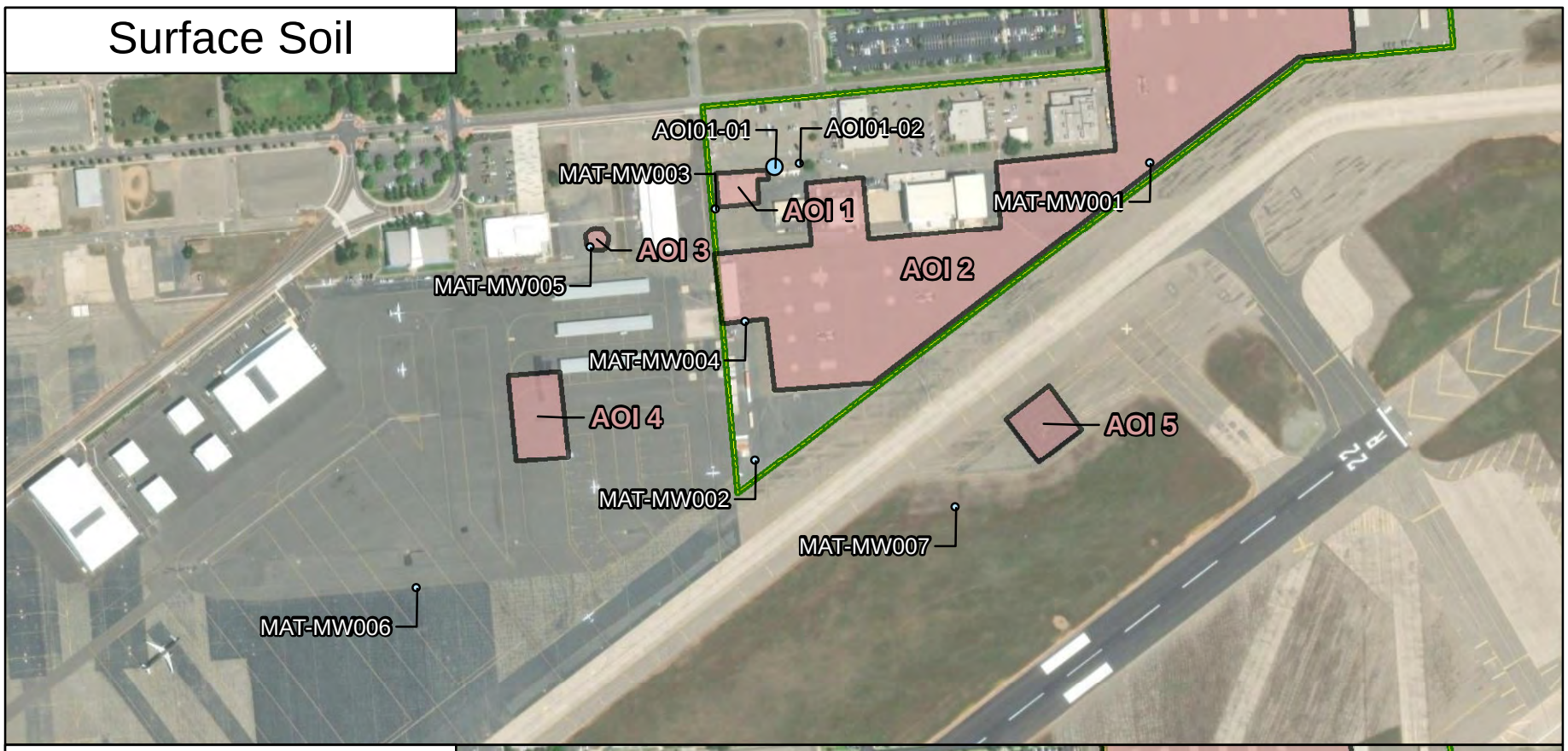
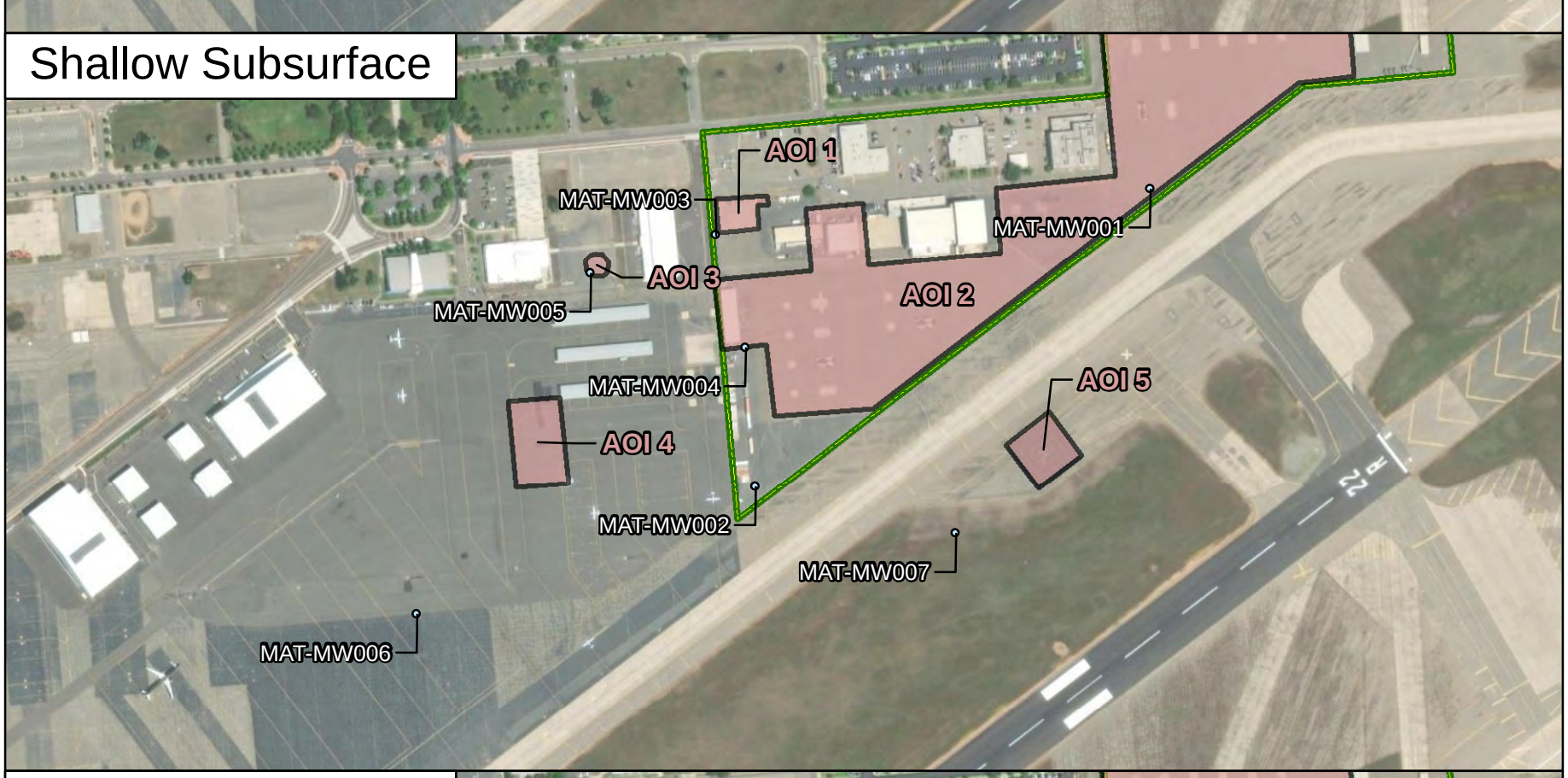
Figure 6-2

Surface Soil



Shallow Subsurface



Deep Subsurface

Legend

- Area of Interest
- Facility Boundary

PFBS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 1,900
- >1,900 - 25,000
- >25,000

N

0 225 450 900 Feet

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

PFBS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	9/27/2023	GIS BY	MS	9/27/2023
SCALE	1:5,400	CHK BY	AP	9/27/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/27/2023

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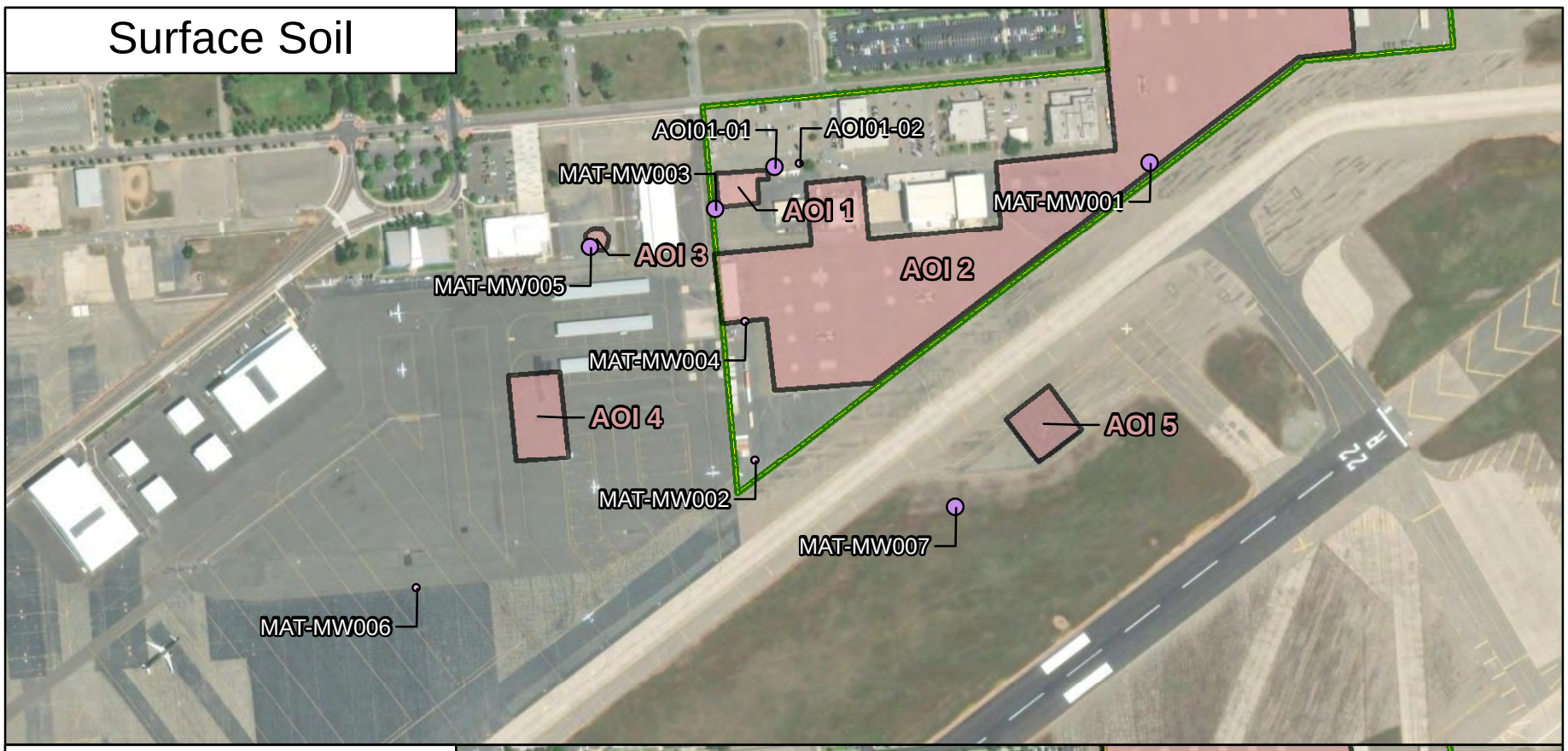
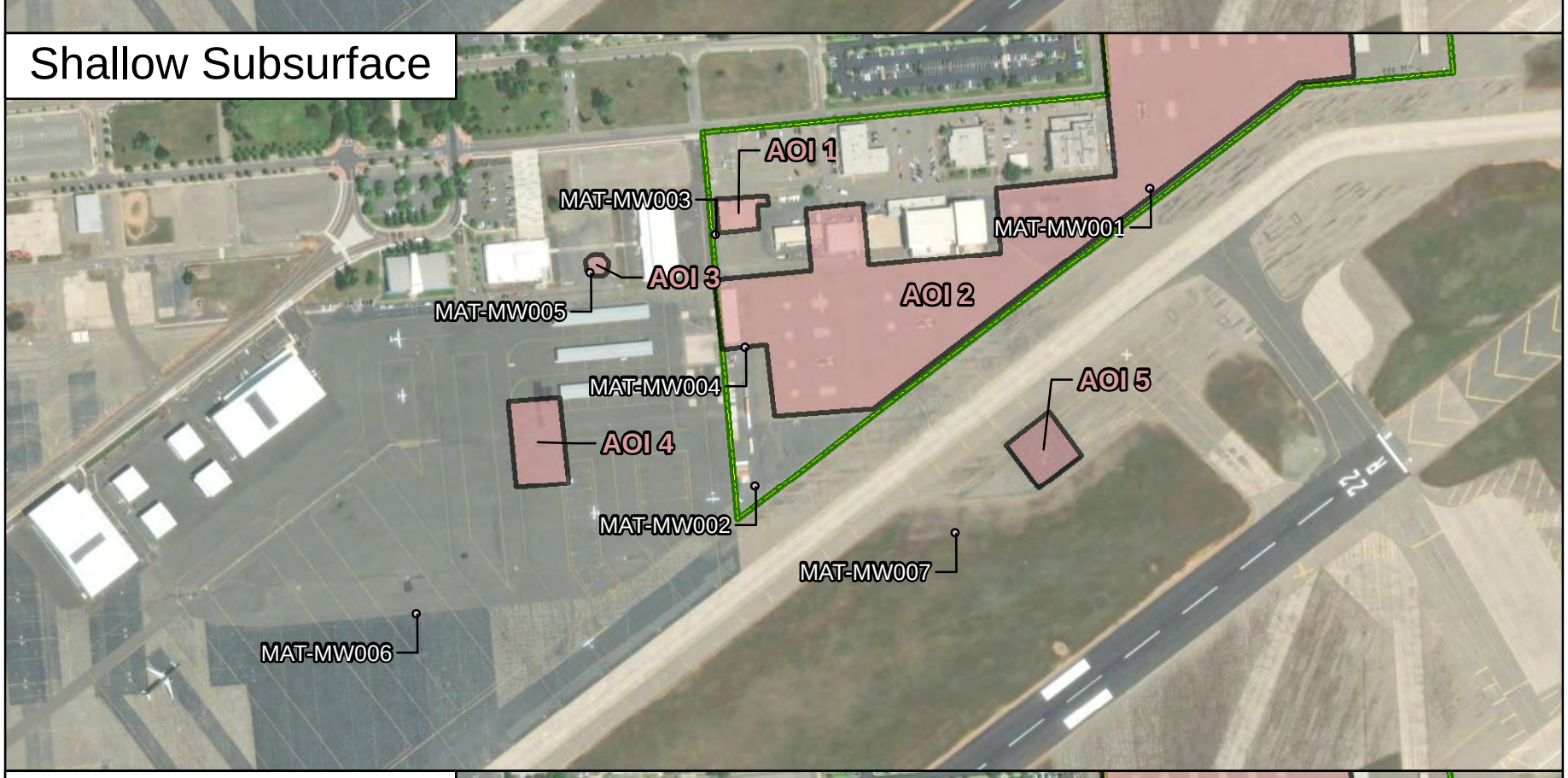
Figure 6-3

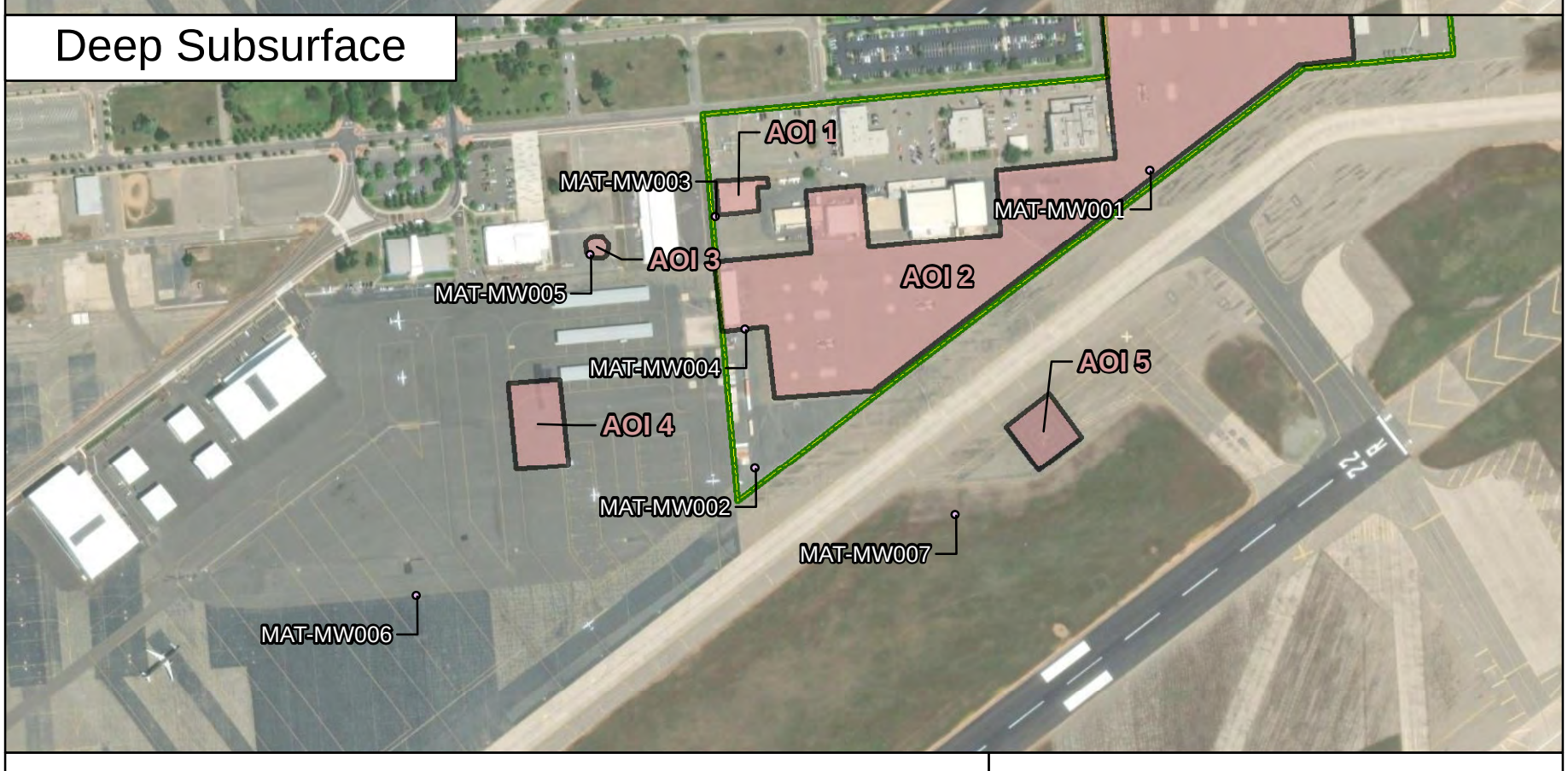
Surface Soil



Shallow Subsurface



Deep Subsurface



Legend

- Area of Interest
- Facility Boundary

PFHxS Results (µg/Kg)

- ND
- >ND - 10
- >10 - 130
- >130 - 1,600
- >1,600

N

0 225 450 900 Feet

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

PFHxS Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	9/27/2023	GIS BY	MS	9/27/2023
SCALE	1:5,400	CHK BY	AP	9/27/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/27/2023

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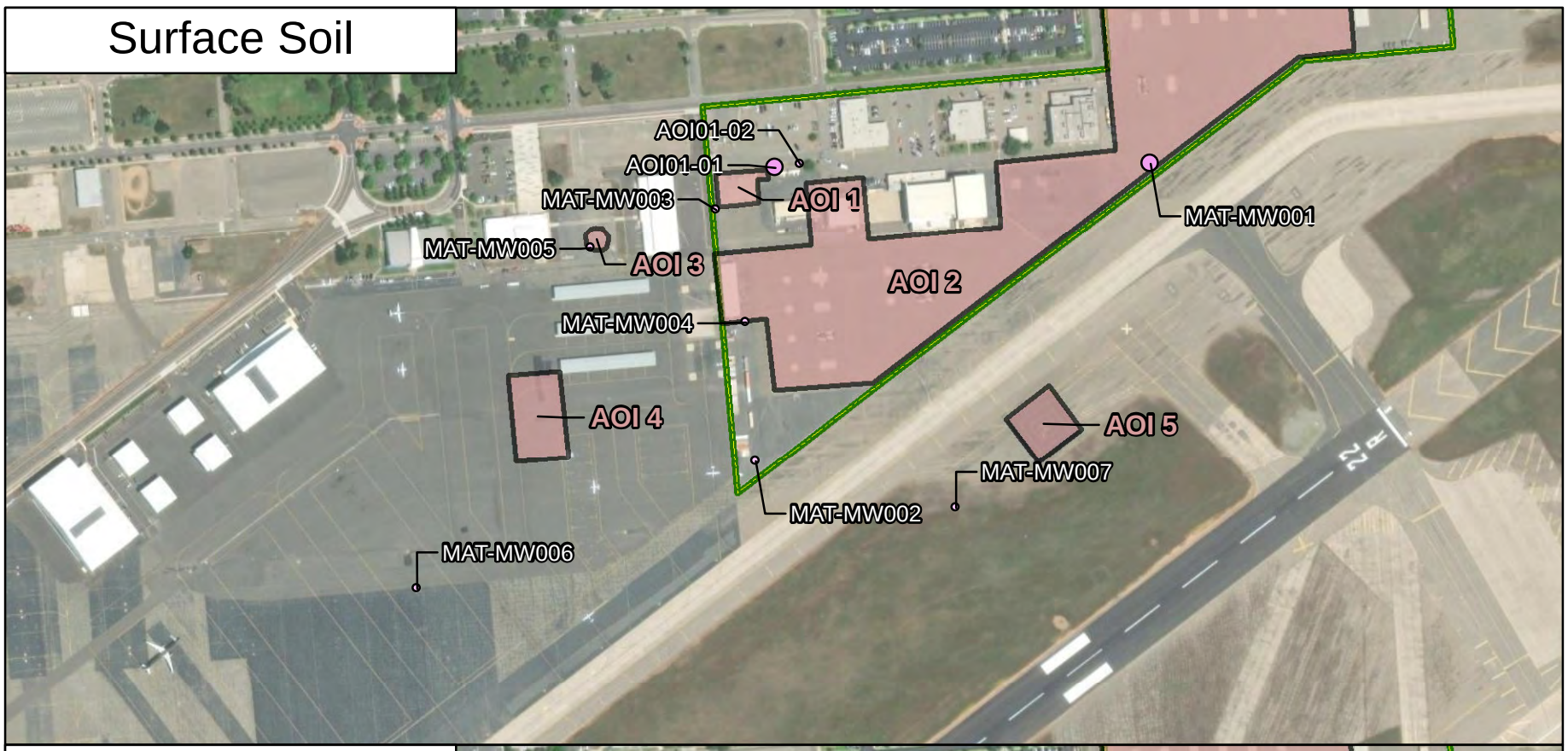
Figure 6-4

Surface Soil



Shallow Subsurface

Deep Subsurface

Legend

- Area of Interest
- Facility Boundary

PFNA Results (µg/Kg)

- ND
- >ND - 19
- >19 - 250
- >250 - 2,500
- >2,500

N

0 225 450 900 Feet

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

PFNA Detections in Soil

CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	9/27/2023	GIS BY	MS	9/27/2023
SCALE	1:5,400	CHK BY	AP	9/27/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	9/27/2023

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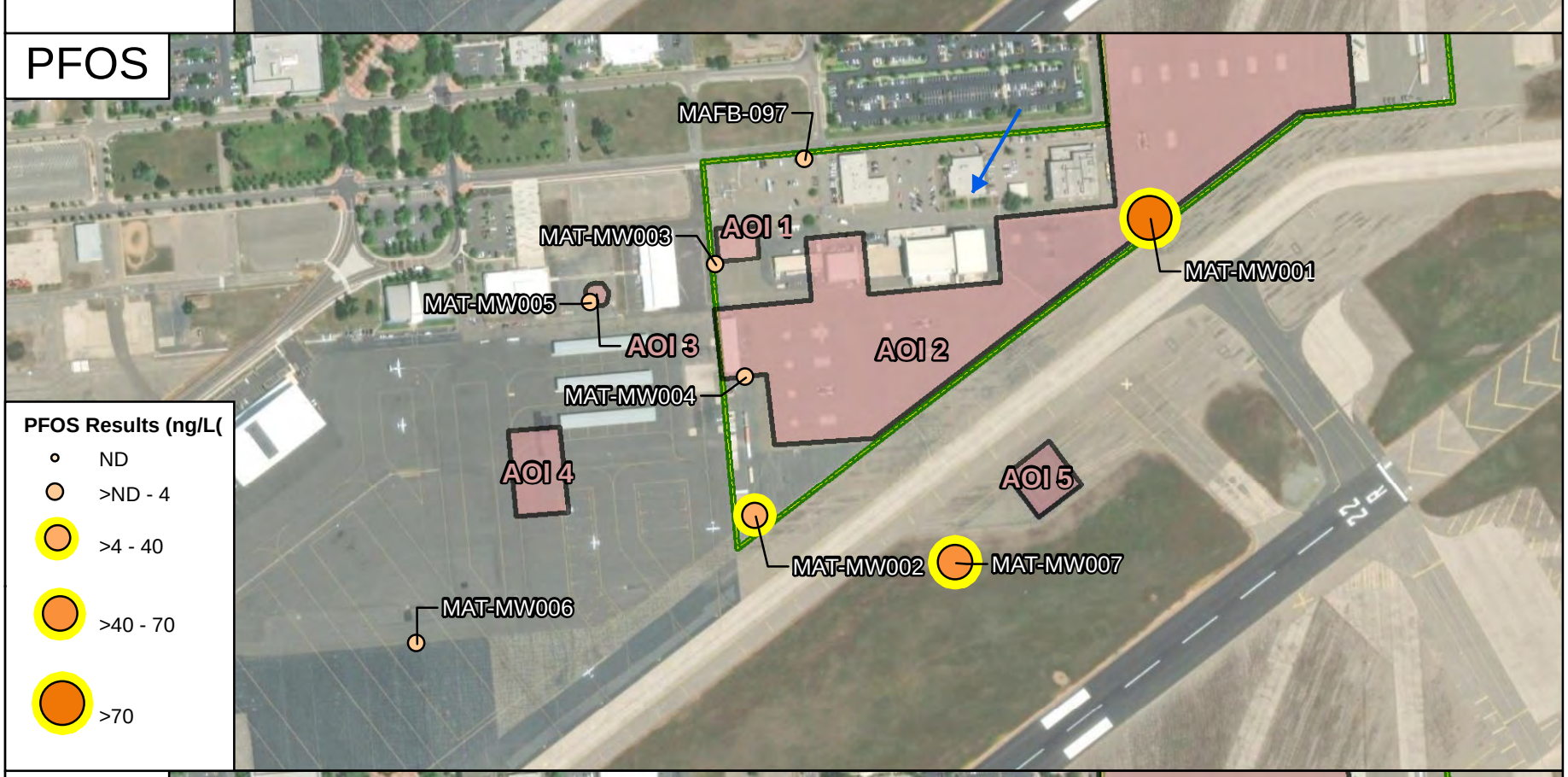
Figure 6-5

PFOA

PFOS



PFBS

Legend

- Area of Interest
- Facility Boundary
- Groundwater Flow Direction

N

0 225 450 900 Feet

Exceedances of the OSD SL are depicted with a yellow halo.

PFOA, PFOS, and PFBS Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	8/15/2023	GIS BY	MS	8/15/2023
SCALE	1:5,400	CHK BY	AP	8/15/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/15/2023

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Figure 6-6

PFHxS

PFNA

Legend

- Area of Interest
- Facility Boundary
- Groundwater Flow Direction

N

0 175 350 700 Feet

Exceedances of the OSD SL are depicted with a yellow halo.

PFHxS and PFNA Detections in Groundwater

CLIENT	ARNG			
PROJECT	Site Inspection at Mather AASF, CA			
REVISED	8/15/2023	GIS BY	MS	8/15/2023
SCALE	1:4,200	CHK BY	AP	8/15/2023
Base Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community		PM	CM	8/15/2023

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Figure 6-7

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7. Exposure Pathways

The CSMs for each AOI, revised based on the SI findings, are presented on **Figure 7-1** and **Figure 7-2**. 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 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:

1. Contaminant source;
2. Environmental fate and transport;
3. Exposure point;
4. Exposure route; and
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 an incomplete 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 an RI or no action at this time is based on the comparison of the SI analytical results for the relevant compounds to the SLs.

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 site workers (e.g., facility staff and visiting soldiers), construction workers, trespassers (though unlikely due to restricted access), residents outside the facility boundary, and recreational users outside of the facility boundary.

7.1 Soil Exposure Pathway

The SI results in soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 through AOI 5 based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 is the Wash Rack, where one instance of a fire training exercise occurred in approximately 2010 and may have resulted in a potential AFFF release.

The relevant compounds were detected below their SLs in surface and shallow subsurface soil at AOI 1. Site workers and construction workers could contact constituents in surface soil via

incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers, future construction workers and trespassers are potentially complete. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 1 is presented on **Figure 7-1**.

7.1.2 AOI 2

AOI 2 consists of the Airfields and AFFF Storage areas, where familiarization training exercised with Tri-Max™ fire extinguishers took place and storage areas contained Tri-Max™ units and AFFF.

The relevant compounds were detected below their SLs in surface and shallow subsurface soil at AOI 2. Site workers, construction workers and trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers and future construction workers are potentially complete. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 2 is presented on **Figure 7-1**.

7.1.3 AOI 3

AOI 3 is the ARNG and Air Force FTA #1, where combined ARNG and Air Force extraction type exercises may have involved extinguishing live fire with either water or an unknown type of foam.

The relevant compounds were detected below their SLs in surface and shallow subsurface soil at AOI 3. Site workers, construction workers and trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers and future construction workers are potentially complete. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 3 is presented on **Figure 7-1**.

7.1.4 AOI 4

AOI 4 is the ARNG and Air Force FTA #2, where combined ARNG and Air Force extraction type exercises may have involved extinguishing live fire with either water or an unknown type of foam.

PFOS was detected below the SL in surface and shallow subsurface soil at AOI 4. Site workers, construction workers and recreational users/trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers and future construction workers are potentially complete. Construction workers could contact constituents in subsurface soil via incidental ingestion, and therefore, the subsurface soil exposure pathway for construction workers is potentially complete. The CSM for AOI 4 is presented on **Figure 7-1**.

7.1.5 AOI 5

AOI 5 is the ARNG and Air Force FTA #3, where combined ARNG and Air Force extraction type exercises may have involved extinguishing live fire with either water or an unknown type of foam.

The relevant compounds were detected in surface soil at AOI 5. Site workers, construction workers and recreational users/trespassers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for site workers and construction workers are potentially complete. No relevant compounds were

detected in shallow subsurface soil, and therefore, the subsurface soil exposure pathway for construction workers is considered incomplete. The CSM for AOI 5 is presented on **Figure 7-2**.

7.2 Groundwater Exposure Pathway

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

7.2.1 AOI 1 through AOI 5

PFOA, PFOS, and/or PFHxS were detected above their SLs in groundwater samples collected at AOI 1 through AOI 5. Due to the presence of public water supply wells located southwest (i.e., downgradient) of the facility, the pathway for exposure to off-facility residents via ingestion of groundwater is considered potentially complete. The facility drinking water supply wells are located cross-gradient, approximately 2 miles south of the AASF; therefore, the exposure pathway for groundwater to the site worker via ingestion of groundwater is considered incomplete. Depths to water measured in April 2022 during the SI ranged from 93.06 to 96.97 feet bgs; therefore, construction workers would not reasonably encounter groundwater, and the ingestion exposure pathway for future construction workers is considered incomplete. The CSM for AOI 1, AOI 2, AOI 3, and AOI 4 is presented on **Figure 7-1**, and the CSM for AOI 5 is presented on **Figure 7-2**.

7.3 Surface Water and Sediment Exposure Pathway

The SI results in soil and groundwater, in combination with knowledge of the fate and transport properties of PFAS, were used to determine whether a potentially complete pathway exists between the source and potential receptors.

7.3.1 AOI 1

PFAS are water soluble and can migrate readily from soil to surface water via leaching and run-off. Because the relevant compounds were detected in soil at AOI 1, it is possible that those compounds may have migrated from soil to surface water. The drains in the wash rack area led to an oil water separator and then flow into the sanitary sewer system. Therefore, potential discharges of AFFF in the wash rack would primarily release directly into the sanitary sewer system. However, any runoff not captured by the oil water separator could reach nearby surface drainages that lead into tributaries of the Sacramento River. Due to recreational use of the Sacramento River, the surface water and sediment exposure pathway for recreational users is considered potentially complete. No surface water bodies are present on the facility; therefore, the surface water and sediment ingestion exposure pathway for site workers and construction workers is considered incomplete. The CSM for AOI 1 is presented on **Figure 7-1**.

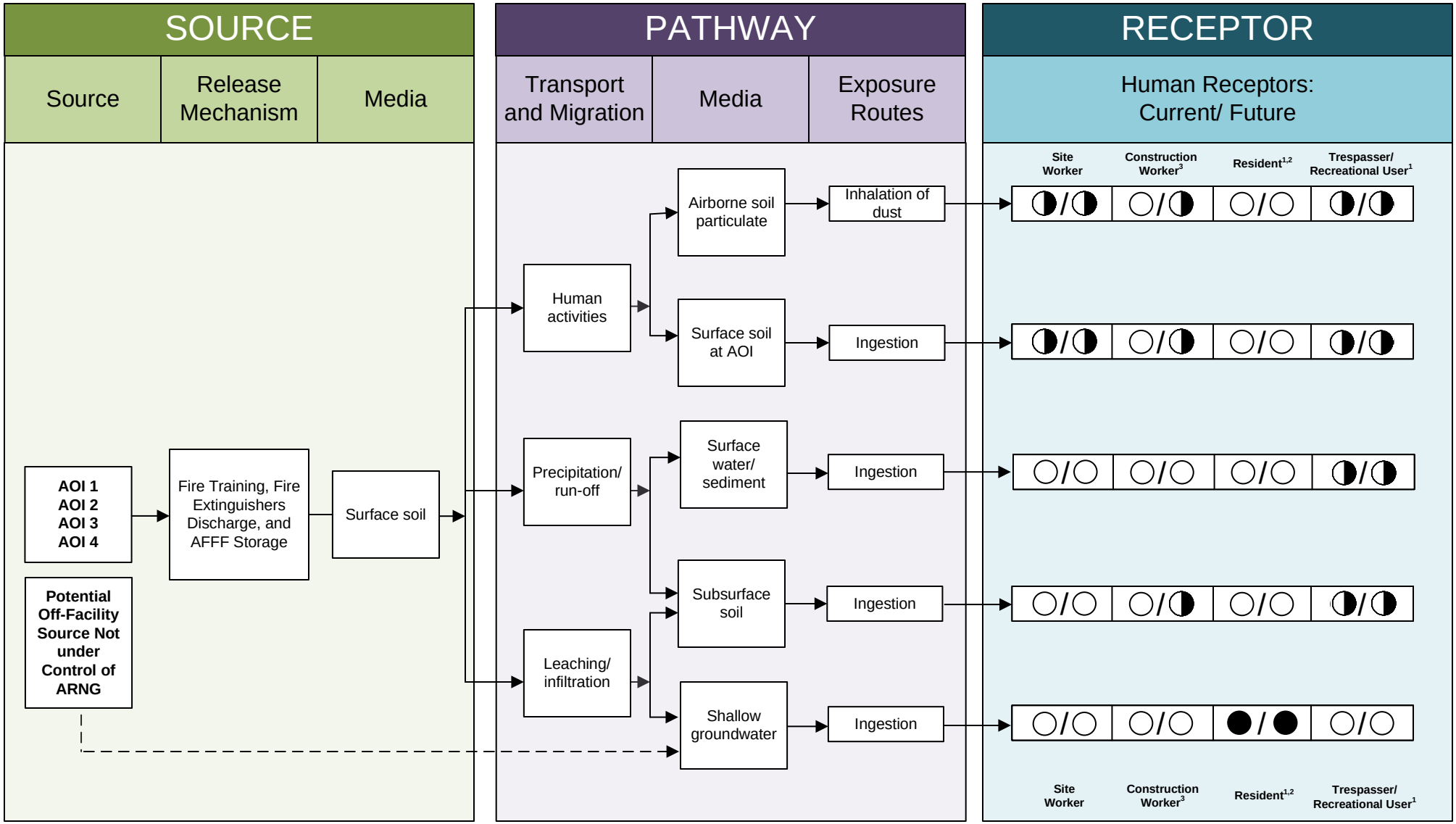
7.3.2 AOI 2

Because the relevant compounds were detected in soil at AOI 2, it is possible that those compounds may have migrated from soil to surface water. While large scale watershed maps show AOI 2 lies within the Lake Greenhaven-Sacramento River Watershed, constructed drainage systems direct water to the Upper Morrison Creek Watershed, and surface water from the entire AASF is drained by tributaries to the Sacramento River. Due to recreation use of the Sacramento River, the surface water and sediment exposure pathway for recreational users is considered potentially complete. The Northeast Airfield drains via constructed drainage systems to the South Canal, and then to Morrison Creek and eventually the Sacramento River. No surface water bodies are present on the facility; therefore, the surface water and sediment ingestion exposure pathway

for site workers and construction workers is considered incomplete. The CSM for AOI 2 is presented on **Figure 7-1**.

7.3.3 AOI 3, AOI 4, and AOI 5

AOI 3, AOI 4, and AOI 5 are located on paved surfaces, where potential releases of surface water run-off may drain into stormwater inlets that drain into tributaries of the Sacramento River. Therefore, the surface water and sediment exposure pathway for recreational users is considered potentially complete. AOI 3, AOI 4, and AOI 5 are located off-facility, therefore, the surface water and sediment exposure pathway for site workers and construction workers is considered incomplete. The CSM for AOI 3 and AOI 4 is presented on **Figure 7-1**, and the CSM for AOI 5 is presented on **Figure 7-2**.



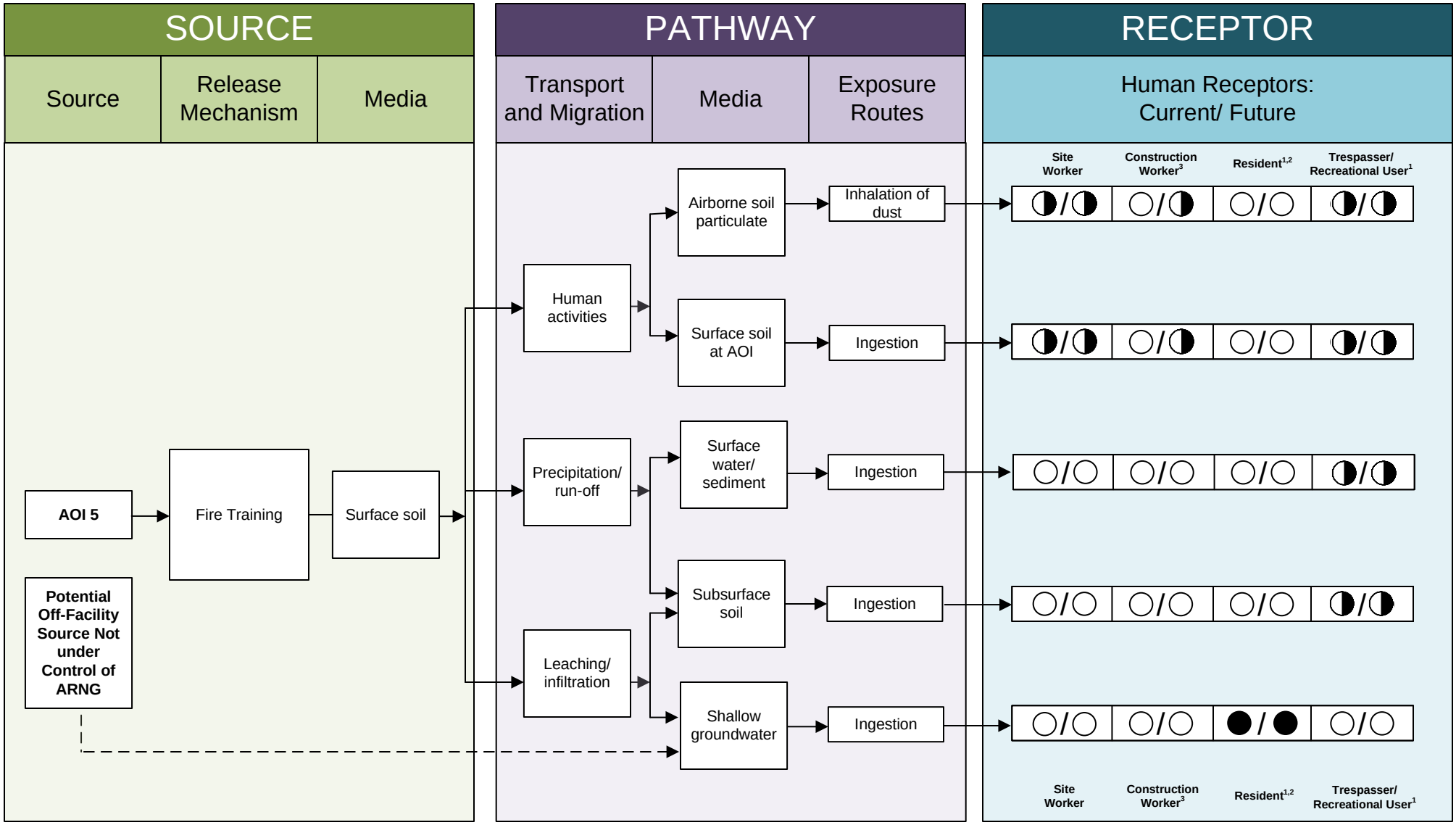
LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.

Figure 7-1
Conceptual Site Model, AOI 1 through AOI 4
Mather AASF



LEGEND

- Flow-Chart Stops
- Flow-Chart Continues
- Partial/ Possible Flow
- Incomplete Pathway
- Potentially Complete Pathway
- Potentially Complete Pathway with Exceedance of SL

Notes:

1. The resident and recreational users refer to off-site receptors.
2. Inhalation of dust for off-site receptors is likely insignificant.
3. No current active construction at the facility.

Figure 7-2
Conceptual Site Model, AOI 5
Mather AASF

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 SI Activities

The SI field activities were conducted from 28 March 2022 to 16 April 2022 and consisted of utility clearance, hand augering, sonic boring, soil sample collection, permanent monitoring well installation, groundwater sample collection, and land surveying. Field activities were conducted in accordance with the SI QAPP Addendum (AECOM, 2021), except as previously noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI QAPP Addendum (AECOM, 2021), samples were collected and analyzed for a subset of 18 compounds by LC/MS/MS compliant with QSM 5.3 Table B-15 as follows.

- Twenty-three (23) soil samples from seven boring locations and two hand auger locations;
- Eight groundwater samples from eight permanent monitoring wells;
- Sixteen (16) 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 each of the five AOIs. Based on the CSMs developed and revised in light of the SI findings, there is potential for exposure to drinking water receptors from each of the five AOIs from sources on and adjacent to the facility resulting from historical DoD activities. Sample analytical concentrations collected during the SI were compared to the project SLs in soil and groundwater, as described in **Table 6-1**. A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
    - The detected concentrations of the relevant compounds in soil at AOI 1 were below their SLs.
    - PFOA and PFHxS in groundwater exceeded their SLs. PFOA exceeded its SL of 6 ng/L, with a concentration of 11.4 ng/L at location MAT-MW003. PFHxS exceeded its SL of 39 ng/L, with a concentration of 55.1 ng/L at location MAT-MW003. The detected concentrations of the other relevant compounds were below their SLs.
    - Based on exceedances of SLs in groundwater, further evaluation of AOI 1 is warranted in an RI.
- At AOI 2:

  - The detected concentrations of the relevant compounds in soil at AOI 2 were below their SLs.
  - PFOA, PFOS, and PFHxS in groundwater exceeded their SLs. PFOA exceeded its SL of 6 ng/L, with a maximum concentration of 123 ng/L at MAT-MW001. PFOS exceeded the SL of 4 ng/L, with a maximum concentration of 111 ng/L at location MAT-MW001. PFHxS exceeded the SL of 39 ng/L, with a maximum concentration of 278 ng/L at location MAT-MW001. The detected concentrations of the other relevant compounds were below their SLs.
  - Based on exceedances of SLs in groundwater, further evaluation of AOI 2 is warranted in an RI.
- At AOI 3:
  - The detected concentrations of relevant compounds in soil at AOI 3 were below their SLs.
  - PFOA and PFHxS in groundwater exceeded their SLs at location MAT-MW005. PFOA exceeded its SL of 6 ng/L, with a concentration of 10.6 ng/L. PFHxS exceeded its SL of 39 ng/L, with a concentration of 58.4 ng/L. The detected concentrations of the other relevant compounds were below their SLs.
  - Based on exceedances of SLs in groundwater, further evaluation of AOI 3 is warranted in an RI.
- At AOI 4:
  - The detected concentrations of relevant compounds in soil at AOI 4 were below their respective SLs.
  - PFOA and PFHxS in groundwater exceeded their SLs at location MAT-MW006. PFOA exceeded the SL of 6 ng/L, with a maximum concentration of 9.91 ng/L in the field duplicate sample. PFHxS exceeded the SL of 39 ng/L, with a concentration of 66.7 ng/L in the field duplicate sample. The detected concentrations of the other relevant compounds were below their SLs.
  - Based on exceedances of SLs in groundwater, further evaluation of AOI 4 is warranted in an RI.
- At AOI 5:
  - The detected concentrations of relevant compounds in soil at AOI 5 were below their SLs.
  - PFOA, PFOS, and PFHxS in groundwater exceeded their SLs at location MAT-MW007. PFOA exceeded its SL of 6 ng/L, with a concentration of 134 ng/L. PFOS exceeded its SL of 4 ng/L, with a concentration of 45 ng/L. PFHxS exceeded its SL of 39 ng/L, with a concentration of 309 ng/L. The detected concentrations of the other relevant compounds were below their SLs.
  - Based on exceedances of SLs in groundwater, further evaluation of AOI 5 is warranted in an 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	Wash Rack	◐	●	●	Proceed to RI
2	Airfields and AFFF Storage Areas	◐	●	●	Proceed to RI
3	ARNG and Air Force FTA #1	◐	●	N/A	Proceed to RI
4	ARNG and Air Force FTA #2	◐	●	N/A	Proceed to RI
5	ARNG and Air Force FTA #3	◐	●	N/A	Proceed to RI

Legend:
N/A = not applicable
● = detected; exceedance of the screening levels
◐ = detected; no exceedance of the screening levels
○ = not detected

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