FINAL
Site Inspection Report
Army Aviation Support Facility
Santa Fe, New Mexico

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

October 2023

Prepared for

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

UNCLASSIFIED

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Farhenheit
%	Percent
µg/kg	Microgram(s) per kilogram
AASF	Army Aviation Support Facility
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film-forming foam
amsl	Above mean sea level
AOI	Area of Interest
ARNG	Army National Guard
ASTM	ASTM International
bgs	Below ground surface
btoc	Below top of casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
City	City of Santa Fe
CSM	Conceptual site model
DoD	Department of Defense
DPT	Direct-push technology
DQO	Data quality objective
DUA	Data Usability Assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
ELAP	Environmental Laboratory Accreditation Program
EM	Engineer Manual
EB	Equipment blank
FB	Field blank
FD	Field duplicate
FedEx	Federal Express
ft	Foot (feet)
GPS	Global Positioning System
HDPE	High-density polyethylene
HFPO-DA	Hexafluoropropylene oxide dimer acid
ID	Identification
IDW	Investigation-derived waste
ITRC	Interstate Technology Regulatory Council

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

J	Estimated concentration
J+	Estimated concentration, biased high
LC/MS/MS	Liquid chromatography with tandem mass spectrometry
mg/kg	Milligram(s) per kilogram
MS	Matrix spike
MSD	Matrix spike duplicate
NA	Not applicable
ng/L	Nanogram(s) per liter
NMARNG	New Mexico Army National Guard
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the Engineer
No.	Number
OSD	Office of the Secretary of Defense
P&A	Plugged and abandoned
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
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QSM	Quality Systems Manual
RI	Remedial Investigation
SAF	Santa Fe Airport
SI	Site Inspection
SL	Screening level
TOC	Total organic carbon
TPP	Technical Project Planning
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

WWTP	Wastewater Treatment Plan

EXECUTIVE SUMMARY

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

The PA identified one Area of Interest (AOI) where PFAS-containing materials may have been stored, disposed, or released historically (**Table ES-2** for AOI locations). The objective of the SI is to determine whether there has been a release to the environment from the AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on a comparison of SI results to SLs for the relevant compounds. This SI was completed at the Army Aviation Support Facility (AASF) in Santa Fe, New Mexico, and determined further evaluation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is warranted for AOI 1. The Santa Fe AASF will be referred to as the “Facility” throughout this document.

The Facility, operated by the New Mexico ARNG (NMARNG), encompasses approximately 22 acres in Santa Fe, New Mexico, approximately 10 miles southwest of downtown. The original Facility was constructed in 1979 in the northwest corner of the Santa Fe Regional Airport. The Facility was renovated with a new, larger AASF building in 2012. The AASF and surrounding area consists of piedmont slopes underlain by late Cenozoic basin-filling deposits, or the Santa Fe marls. Basin-fill aquifers of the Santa Fe Group are the principal groundwater resource for the cities of Santa Fe, Española, and six Pueblo nations (AECOM Technical Services, Inc. 2020).

The PA identified one AOI for investigation during the SI phase. SI sampling results from the AOI were compared to OSD SLs. **Table ES-2** summarizes the SI results for the AOI. Based on the results of this SI and following the CERCLA process, a remedial investigation (RI) is warranted for AOI 1. Note that based on historical aerial photographs, application of biosolids extended into the current Santa Fe AASF lease area; biosolid surface disposal extended to the north end of the current AASF building prior to the 2012 renovations of the facility. This area was therefore designated for further evaluation during the SI planning phases.

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

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using U.S. Environmental Protection Agency's Regional SL Calculator. Hazard Quotient = 0.1. May 2022.
2. Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the CSM developed during the PA and revised based on SI findings, the presence of HFPO-DA is not anticipated at the facility because HFPO-DA is generally not a component of MIL-SPEC aqueous 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.

bgs = Below ground surface
ft = Foot (feet)
µg/kg = Microgram(s) per kilogram
ng/L = Nanogram(s) per liter

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

Area	Potential Release Area	Soil	Groundwater- On-site	Groundwater – Facility Boundary	Future Action
AOI 1	Former Firetruck Bay and Tri-Max™ Hand Truck Storage Area	●	●	○	Proceed to RI
Historical WWTP Biosolid Surface Disposal Site	Historical WWTP Biosolid Surface Disposal Site	●	◑	○	Further Evaluation[1]

Notes:
1. This area will be assessed during the RI to determine if the contamination present poses a detrimental impact on human health for personnel at the facility or the environment.

WWTP = Wastewater Treatment Plant

1. INTRODUCTION

1.1 PROJECT AUTHORIZATION

The Army National Guard (ARNG) G-9 is the lead agency in performing Preliminary Assessments (PAs) and Site Inspections (SIs) at ARNG facilities nationwide based on the current or potential historical use of per- and polyfluoroalkyl substances (PFAS) with a focus on six compounds presented in the memorandum from the Office of the Secretary of Defense (OSD) dated 6 July 2022 (Assistant Secretary of Defense 2022). The six compounds listed in the OSD memorandum will be referred to as "relevant compounds" throughout this document and include perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorobutanesulfonic acid (PFBS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), and hexafluoropropylene oxide-dimer acid (HFPO-DA)[2] at ARNG facilities nationwide. The ARNG performed this SI at the Army Aviation Support Facility (AASF) in Santa Fe, New Mexico. The Santa Fe AASF will be referred to as the "Facility" throughout this report.

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

1.2 SITE INSPECTION PURPOSE

A PA was performed at the Facility (AECOM Technical Services, Inc. [AECOM] 2020) that identified one Area of Interest (AOI) where PFAS-containing materials were used, stored, and/or disposed, or areas where known or suspected releases to the environment occurred. The objective of the SI is to identify whether there has been a release to the environment from the AOI identified in the PA and determine whether further investigation is warranted, a removal action is required to address immediate threats, or no further action is required based on screening levels (SLs) for the relevant compounds. During the SI planning phase and review of the historical aerial photographs, it was noted that surface disposal of biosolids extended on to the current Santa Fe AASF lease area to the north end of the current AASF building prior to the 2012 renovations of the Facility. This area was therefore designated for further evaluation under this SI.

[2] Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the 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. SITE BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The Santa Fe AASF is located within the incorporated limits of and approximately 10 miles southwest of downtown Santa Fe, New Mexico. The 22-acre Facility is located on the northwest corner of the Santa Fe Regional Airport (SAF) and is leased to the New Mexico Army National Guard (NMARNG) by the City of Santa Fe (City). The land was acquired in 1976, and the original Facility was constructed in 1979. The original facility consisted of an AASF building and hangar and a small parking apron for helicopters. In 2012, the Facility was completely renovated with a new, larger AASF building constructed adjacent to the former AASF building, and the former AASF building converted to the Santa Fe Readiness Center (AECOM 2020).

The properties immediately surrounding the AASF are also owned by the City, with the Santa Fe Wastewater Treatment Plant (WWTP) to the north, and the Santa Fe Regional Airport immediately to the west, south, and east (**Figure 2-1**) (AECOM 2020).

2.2 FACILITY ENVIRONMENTAL SETTING

The AASF is at an elevation of approximately 6,330 feet (ft) above mean sea level (amsl). The Facility is covered by the U.S. Geological Survey Turquoise Hill 7.5-minute quadrangle topographic map. The geographic coordinates for the center of the Facility are 106°18'31.454"W; 35°37'27.146"N. The Facility is developed with two large buildings, three small structures, and a helicopter parking apron. One building, built in 1979 and renovated in 2012, is the former AASF and the current administration headquarters for the Santa Fe Readiness Center. The second building is the current AASF, which is comprised of a 75,000-square-foot (ft^2) hangar/ administration building. A 16,400- ft^2 storage building; a guard house; fuel storage area; and 455,000 ft^2 of concrete airfield paving also exist on the property (AECOM 2020). Topography of the area is displayed in **Figure 2-2**. The regional geology and groundwater features are shown on **Figure 2-3**. The regional surface water features and drainage basins are shown on **Figure 2-4**. Groundwater elevations and contours, if applicable, are presented on **Figures 2-5** and **2-6**.

2.2.1 Geology

The City of Santa Fe, New Mexico, is located on the east border of the Rio Grande trough, in the Española Basin, within the Rio Grande Rift. The basin formed during 25 million years of plate tectonic stress pulling the land apart and causing a vast expanse of land to subside. When these basins formed, large amounts of sediment filled the basin from the ancient flow of the Rio Grande and from volcanic eruptions. These sediments, which fill the basin, make up an aquifer system that contains the primary source of water for most residents who live in the basin (AECOM 2020).

The Española basin in north-central New Mexico comprises the central portion of the Rio Grande rift, which formed in response to rifting as early as Oligocene epoch. There are four main physiographic units associated with the Santa Fe area: a complex of metamorphic and igneous rocks from the Pre-Cambrian encompassing the Sangre de Cristo mountains in the eastern area; sedimentary and volcanic rocks Neogene to Quaternary in age in the southwest; basalt flows of

Quaternary in the western Mesa; and basin fill sediments of the Santa Fe group in the intervening piedmont (AECOM 2020).

Most of the area consists of piedmont slopes underlain by late Cenozoic basin-filling deposits called the Santa Fe marls. These marls are composed of silty sandstones, sand, and gravel approximately 300 ft thick. This layer lies overtop of a bedrock floor that is made up of sedimentary and igneous rocks (AECOM 2020).

Soils encountered during the SI were dominated by well-graded sand with interbedded gravel, silt, and clay. Samples for grain size analyses were collected at two locations, AOI101-01 and AOI01-02, and analyzed via ASTM International (ASTM) Method D-422. The results indicate that the soil samples are comprised primarily of sand (30.5 to 50.3 percent [%]) and silt (57.3 to 41.3%). These results and field observations are consistent with the reported depositional environment of the region. pH in soil samples ranged from 8.7 to 8.9. Total organic carbon (TOC) concentrations ranged from 2,400 to 4,600 milligrams per kilogram (mg/kg).

2.2.2 Hydrogeology

Primary aquifers in the Española Basin are contained within the Tertiary-Quaternary Santa Fe Group. Basin-fill aquifers of the Santa Fe Group are the principal groundwater resource for the cities of Santa Fe, Española, and six Pueblo nations. The Santa Fe Group thickens to the west and north, ranging from approximately 250 ft thick south of the City to greater than 10,000 ft beneath the Pajarito Plateau west of Española. The Ancha Formation is a locally important shallow aquifer that is present in the vicinity of the Facility (Johnson et al 2016). The Ancha Formation is comprised of alluvial deposits associated with the ancestral Santa Fe River and the alluvial slope deposits originating from the southwestern Sangre de Cristo Mountains. The Tesuque Formation lies beneath the Ancha Formation and is in hydraulic communication with aquifers within the overlying Ancha and Puye Formations. The highly heterogeneous and complex nature of the Tesuque aquifer reflects its depositional environment of coalescing alluvial fans, a heterogeneity that is compounded by discontinuities created by faulting. The Santa Fe Group aquifers are in hydraulic communication with Precambrian rocks along the eastern margin of the basin where most of the recharge occurs. Paleozoic limestones underlying the basin-fill aquifers, fractured Tertiary intrusive rocks, and Tertiary volcanics of the Jemez volcanic field also locally produce water. Recharge within the basin is assumed to occur primarily from the higher elevations with little or no recharge from the lower elevations because of high evapotranspiration and low precipitation (AECOM 2020).

Regional groundwater studies indicate that the Facility is near a groundwater divide and that groundwater may travel southwest toward the Santa Fe River or south toward Arroyo Hondo/Cienega Creek (Johnson et al 2016). Based on the SI, regional groundwater flows south-southwest at the Facility. Numerous wells are located south and southwest of the Facility. The nearest domestic well is located approximately 1 mile southwest of the Facility. A municipal well located at the Santa Fe Airport is located a 0.5 mile southeast of the Facility (New Mexico Office of the Engineer [NMOSE] 2022). These and other wells identified during the PA are displayed on **Figure 2-3**.

Santa Fe's drinking water comes from a nearly even split between groundwater from the Buckman and City Well Fields, and surface water from the Santa Fe and Rio Grande rivers. The City well fields are located within or northeast of Santa Fe (AECOM 2020), which are hydrologically upgradient of the Facility. Additionally, the community of La Cienega is located adjacent to, and presumed to be downgradient of the Facility. La Cienega residents rely exclusively on groundwater for drinking water, provided by individual residential wells and two public water systems, one of which derives its drinking water from a well approximately 1.8 miles potentially downgradient from the Facility.

During the SI, perched groundwater was observed on the west side of the Facility at depths of 110–111 ft below ground surface (bgs). Groundwater flow direction of the perched groundwater could not be calculated since it was encountered in only two drilling locations (**Figure 2-5**). Depth to regional groundwater was observed at 176–185 ft bgs, which is consistent with observations made at Santa Fe WWTP monitoring wells located east of the Facility (New Mexico Environment Department [NMED] Ground Water Quality Bureau 2011). Measurements made during the SI indicate that regional groundwater flows south-southwest with a gradient of 0.001 ft/ft (**Figure 2-6**).

2.2.3 Hydrology

The Facility's topography is relatively flat. It straddles two watersheds with the northern portion within the Headwaters Santa Fe River Watershed and the southern portion within the Outlet Santa Fe River Watershed. The surface water flow direction is generally to the southwest on both sides of the watershed divide. The Santa Fe River cuts through undeveloped land approximately 0.5 miles north of the Facility (AECOM 2020). Water features near the Facility are shown in **Figure 2-4.**

Consistent with regional surface water flow directions, historical imagery indicates that stormwater flowed to the southwest from the historical helicopter parking apron and other paved areas. Stormwater also appears to have accumulated on either side of the taxiway historically. There are two stormwater retention basins that currently receive water from the tarmac. A stormwater detention pond north of the Readiness Center currently receives runoff and has an outflow that is directed north. Historical imagery suggests that those areas were constructed during the 2012 facility renovations and did not previously receive runoff. Current and historical areas that receive or appear to have received stormwater runoff are displayed in **Figure 2-4**.

The City of Santa Fe's surface water comes from the Santa Fe River and San Juan-Chama Project water via the Rio Grande, both of which are treated through conventional and advanced treatment processes to meet current permit regulations. The City of Santa Fe has a license to store up to 3,985-acre ft (combined) of Santa Fe River water in McClure and Nichols Reservoirs. Both municipal drinking water supply reservoirs are located east of Santa Fe (AECOM 2020).

2.2.4 Climate

Santa Fe is located in north central New Mexico at an elevation of approximately 7,000 ft amsl. January is the coldest month, with an average temperature of 30.5 degrees Fahrenheit (ºF), while July is the hottest month, with an average temperature of 70.1ºF. Santa Fe receives an average of

14.2 inches of precipitation annually, with 5.85 inches falling during summer months. The City receives an annual snowfall amount of 23 inches per year (AECOM 2020).

2.2.5 Current and Future Land Use

Presently, Santa Fe AASF resides on SAF property. The Facility is comprised of one hangar, multiple administrative buildings, a paved parking area, a fueling station, and a small, paved parking area. The current land use is listed as I-1 Light Industrial. Future land use is not anticipated to change (AECOM 2020). The Facility is fenced and has restricted access. Land directly to the north and east of the Facility is currently a WWTP surface disposal site owned by the City of Santa Fe.

2.2.6 Critical Habitat and Threatened/Endangered Species

A wildlife survey has not occurred at the Facility, and the Facility does not have any significant areas of habitat. The following species have not been identified at the Facility but may be present in the surrounding area.

The following species are listed as federally endangered, threatened, proposed, and/or candidate species in Santa Fe County, New Mexico (U.S. Fish and Wildlife Service 2022):

- Birds: Mexican Spotted Owl, *Strix occidentalis lucida* (Threatened); Southwestern Willow Flycatcher, *Empidonax traillii extimus* (Endangered); and Yellow-billed Cuckoo, *Coccyzus americanus* (Threatened)

- Fishes: Rio Grande Cutthroat Trout, *Oncorhynchus clarkii virginalis* (Candidate); and Rio Grande Silvery Minnow, *Hybognathus amarus* (Endangered)

- Insects: Monarch Butterfly, *Danaus plexippus* (Candidate)

- Amphibians: Jemez Mountains Salamander, *Plethodon neomexicanus* (Endangered)

- Mammal: New Mexico Meadow Jumping Mouse, *Zapas hudsonius luteus* (Endangered).

2.3 HISTORY OF PFAS USE

Two potential PFAS release areas were identified at the Facility during the PA (AECOM 2020). The areas include the former AASF building and former Tri-Max™ 70/30 hand-truck storage area, which consists of the flight line and paved parking apron. These two potential source areas are in close proximity to one another and have co-mingling stormwater runoff. As a result, these areas were combined and together comprise AOI 1.

Personnel interviews confirmed that a firetruck parked within the former AASF building stored aqueous film-forming foam (AFFF). Personnel indicate that it was never used because no one at the Facility was qualified to use it; however, there is a possibility that the firetruck stored inside the former AASF Facility may have leaked AFFF or may have had its AFFF tank flushed out during maintenance. There are no records or recollection of the AFFF stored on this firetruck being used or spilled.

Prior to the 2012 facility renovation, Tri-Max™ 70/30 hand trucks were stored in various places around the flight line and paved parking apron and constitute a potential PFAS source within AOI 1. The hand trucks were regularly serviced. Service for Tri-Max™ 70/30 hand trucks may include nozzle checks that can result in an AFFF discharge. According to personnel, the Tri-Max™ hand trucks were only used for 4 to 5 years in the mid-2000s and were turned in because they were too expensive to maintain. There is no recollection or record of any training conducted with these units or nozzle testing performed. A description of AOI 1 and its potential release areas are presented in **Section 3**.

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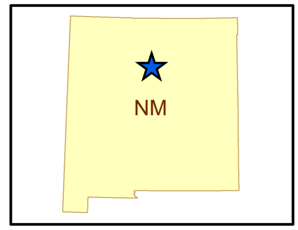
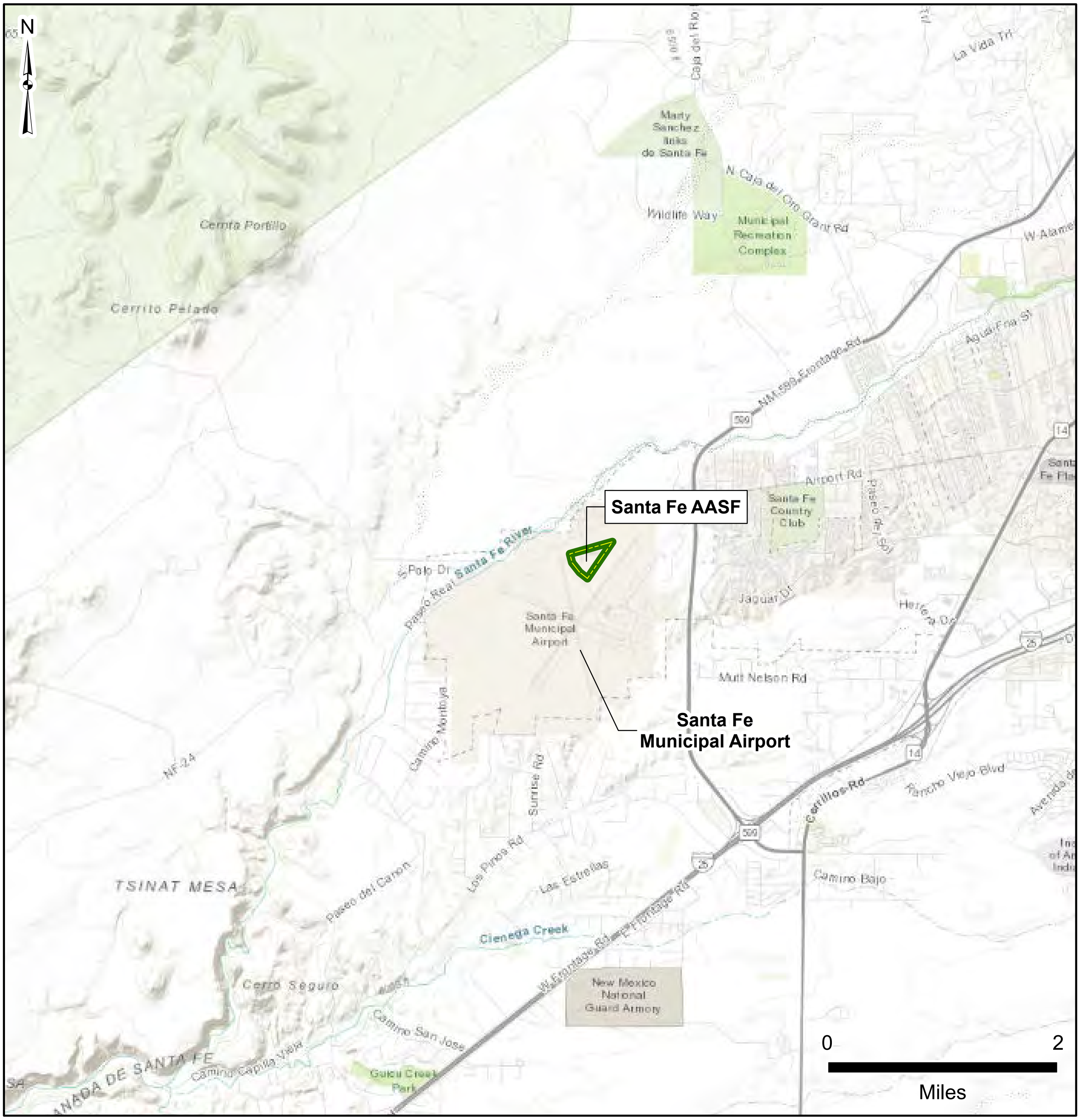
Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

Figure 2-1
Facility Location





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Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:................................July 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 13N

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Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

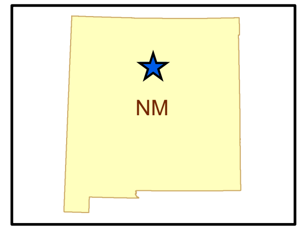
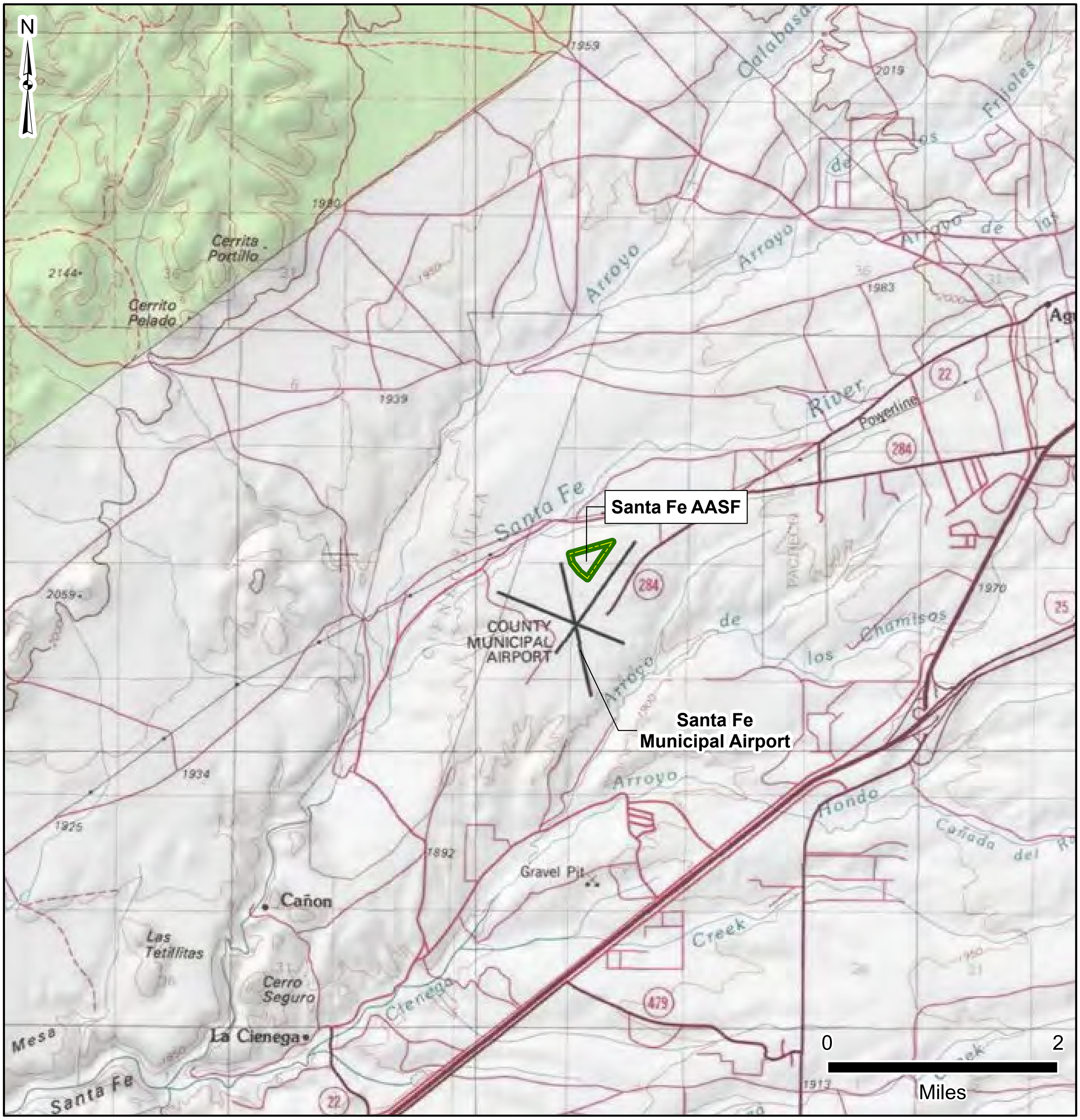


Figure 2-2
Facility Topography



Facility Data

Facility Boundary

Data Sources:
ESRI 2020
AECOM 2020

Date:................................July 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 13N

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Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

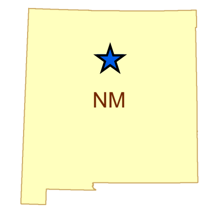
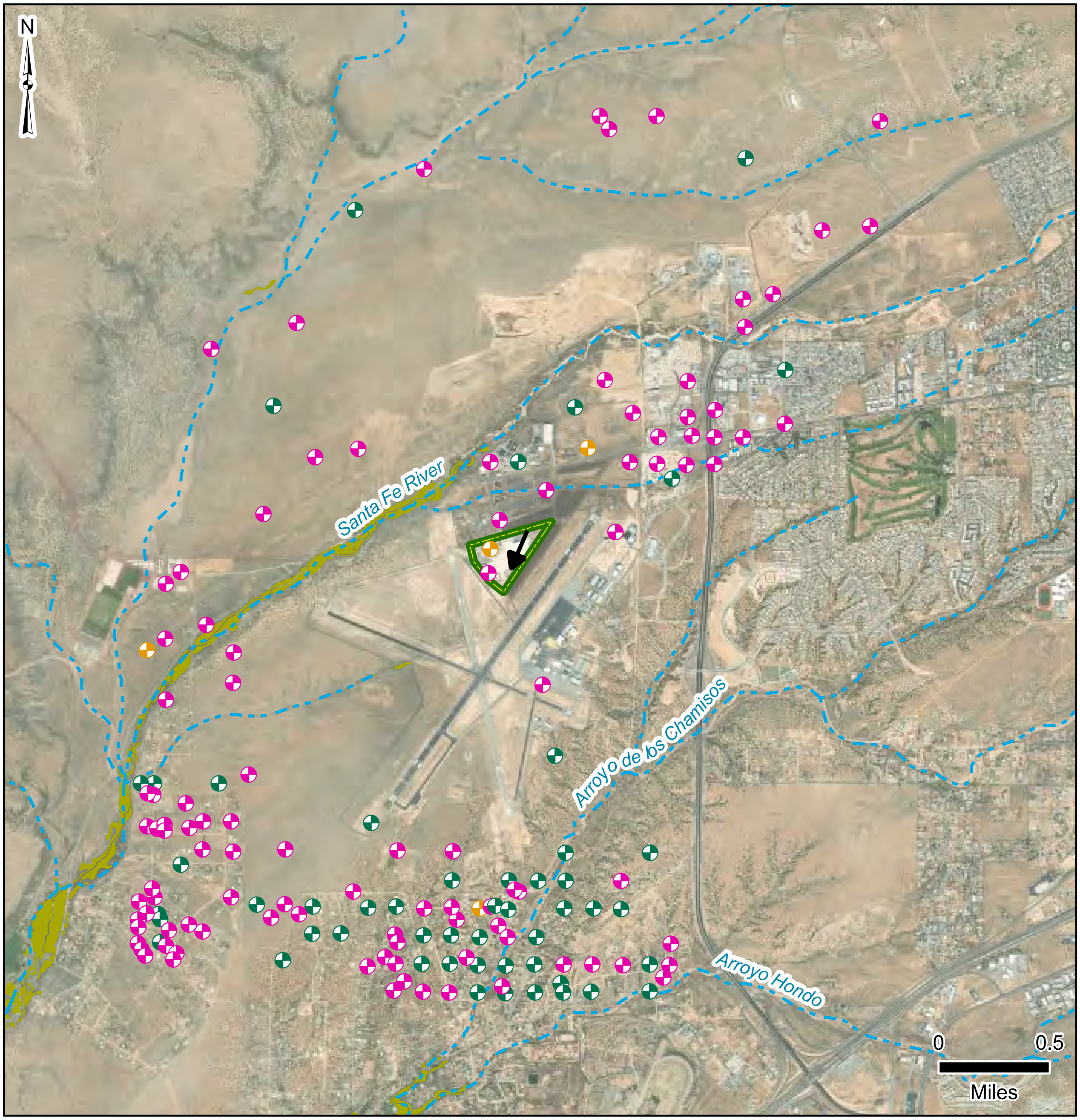


Figure 2-3
Groundwater Features



Facility Data

Facility Boundary

Well Type

Domestic Well
Irrigation Well
Unknown/Other Well

Hydrology/Hydrogeology

Groundwater Flow Direction (Deep Water-Bearing Zone)
Perennial Creek/Stream
Intermittent Creek/Stream
Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:................................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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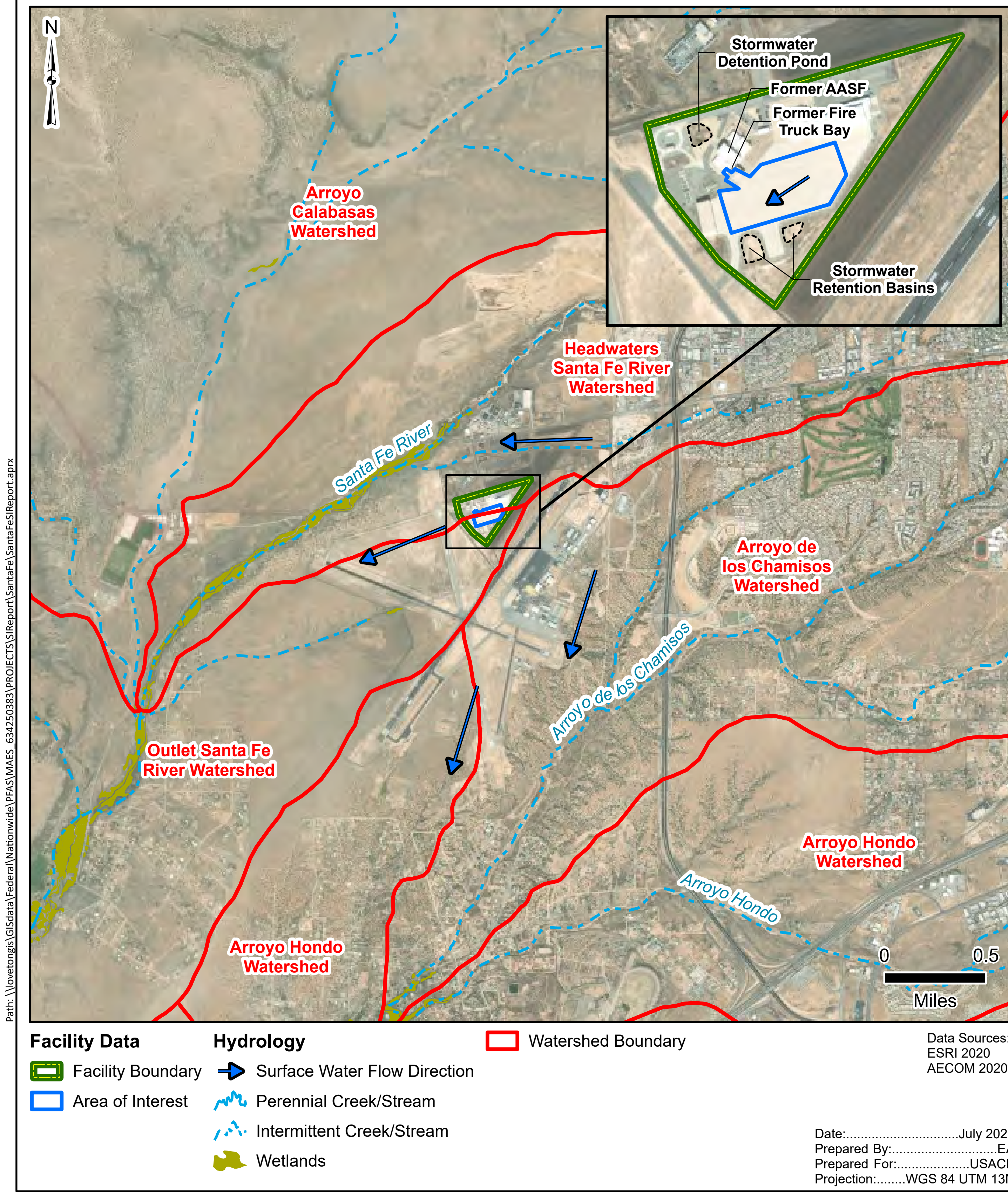
Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

Figure 2-4
Surface Water Features



Data Sources:
ESRI 2020
AECOM 2020

Date:...............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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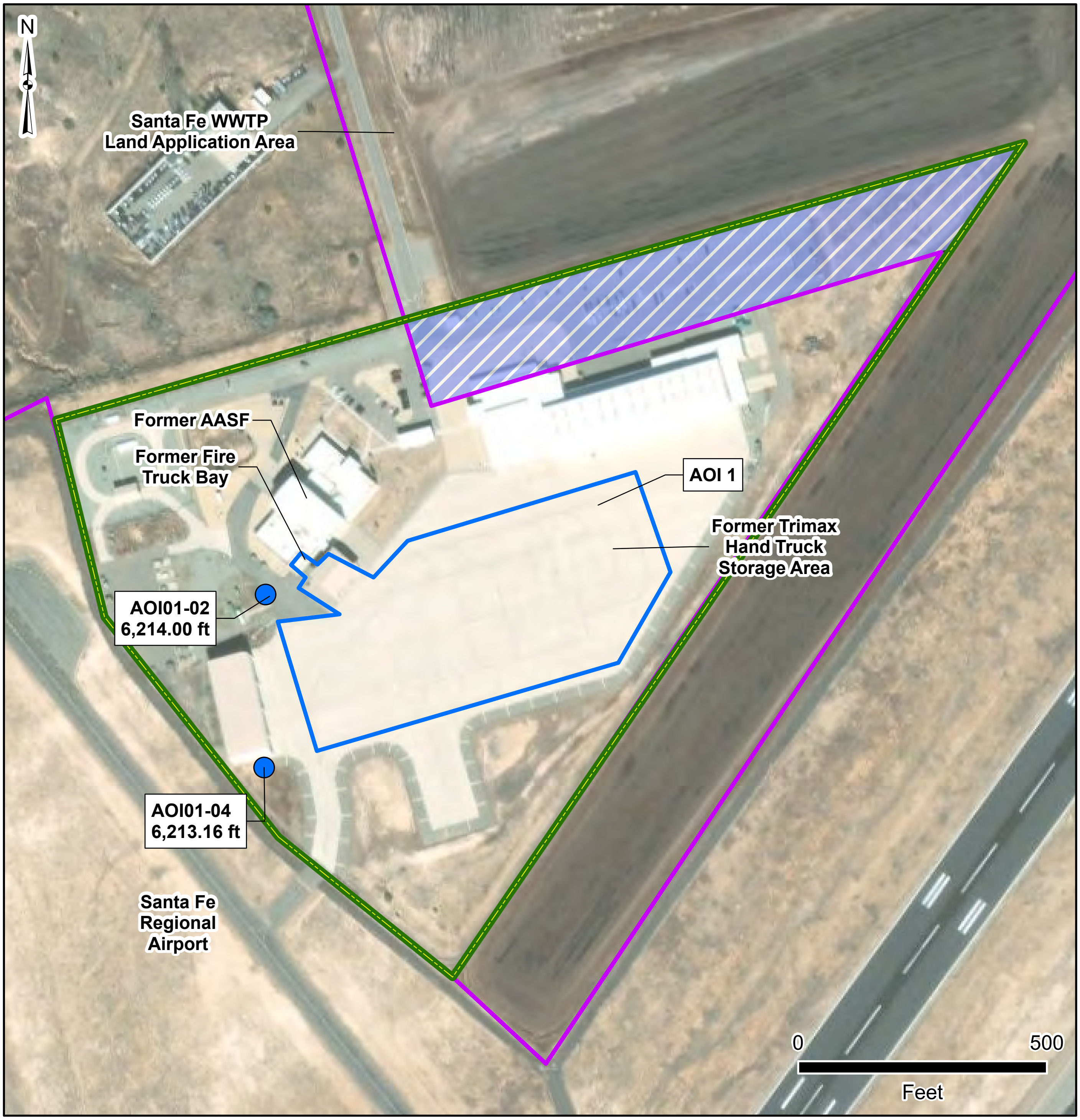
Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

Figure 2-5
Groundwater Elevations, Perched (June 2022)



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Facility Data

- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Sample Locations

- Sonic Soil Boring/Monitoring Well

Note:
Groundwater elevation is provided in feet above mean sea level.

Data Sources:
ESRI 2022
AECOM 2020

Date:................................July 2023
Prepared By:.............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 13N

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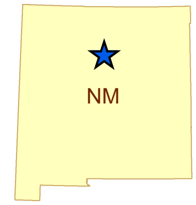
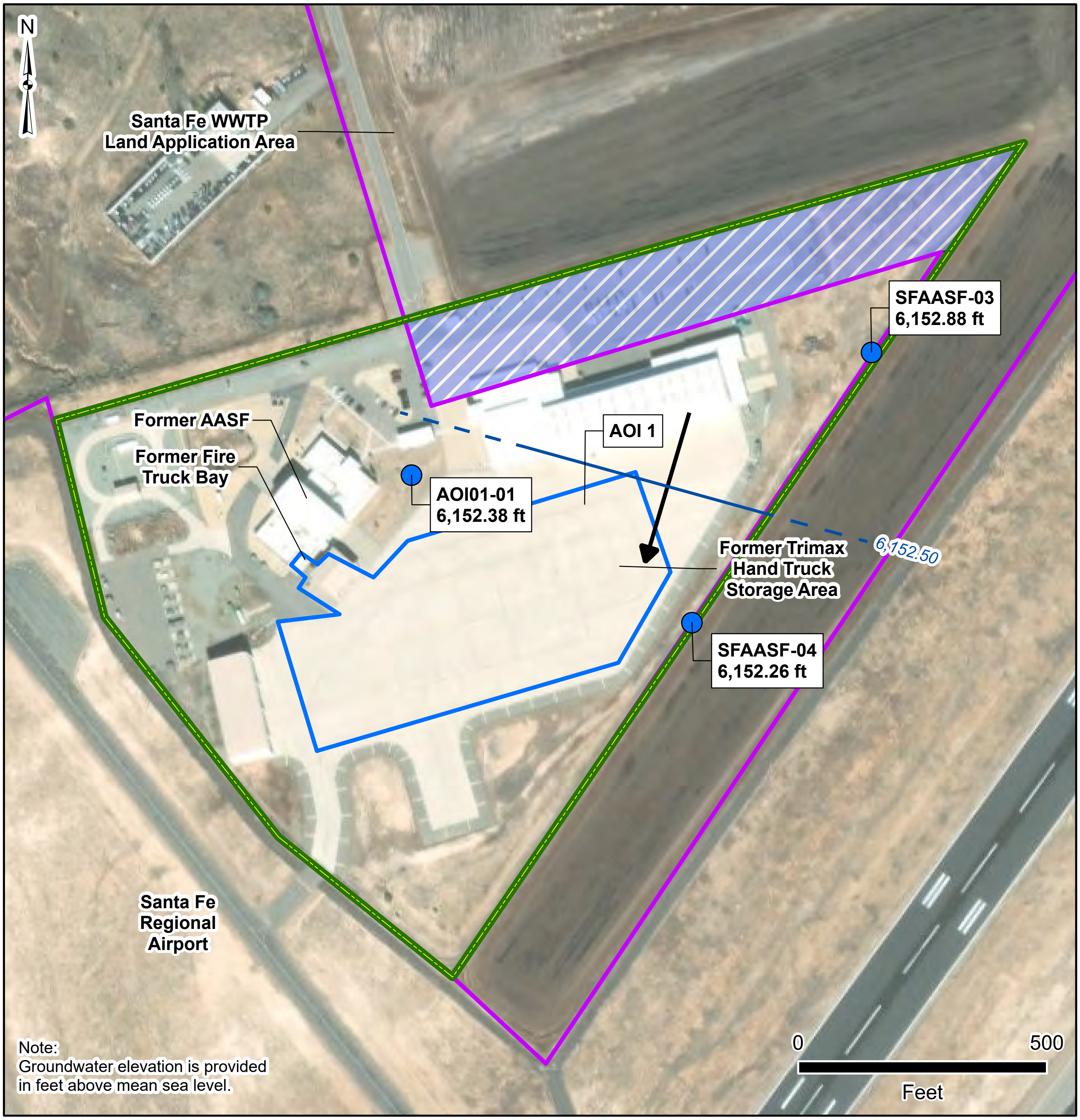
Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

Figure 2-6
Groundwater Elevations, Regional (June 2022)





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Facility Data
- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Sample Locations
- Sonic Soil Boring/Monitoring Well

Hydrology/Hydrogeology
- Groundwater Flow Direction
- Groundwater Elevation Deep Water Contour Interval
- Dashed where Inferred

Data Sources:
ESRI 2022
AECOM 2020

Date:...............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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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, one potential release area was identified at the Santa Fe AASF: AOI 1 Former Firetruck Bay and Tri-Max™ Hand Truck Storage Area. Additionally, there are off-facility potential source areas as detailed in **Section 3.2**. The potential source areas are shown on **Figure 3-1** and described in subsequent sections.

3.1 AOI 1 – FORMER FIRETRUCK BAY AND TRI-MAX™ HAND TRUCK STORAGE AREA

AOI 1 consists of the Santa Fe AASF Former Firetruck Bay and Tri-Max™ Hand Truck Storage Area. Each of these areas is described below and shown on **Figure 3-1**.

3.1.1 Former Firetruck Bay

The former AASF building, which is now the current Santa Fe Readiness Center, is located on the western portion of the Facility and historically housed a single firetruck within a bay. The firetruck was stored in this bay for an unknown length of time, but it was sold in 2005 to the Santa Fe Fire Department. Personnel interviews confirmed that the firetruck stored AFFF foam, but it was never used because no personnel at the Facility were qualified to use it. There are no records or recollection of the use or release of the AFFF stored on the firetruck; however, there is a possibility that the firetruck stored may have leaked AFFF or had its AFFF tank flushed out during maintenance.

The building was renovated in 2012 and received a new roof, exterior wall openings and finishes, interior walls, floor finishes, ceilings, and lighting. Mechanical, electrical, plumbing, fire protection, telecommunication, and security systems were replaced as well. There is no floor drain in the remodeled bay and no evidence one was previously present. The current Santa Fe Readiness Center building does not currently house any materials containing AFFF (AECOM 2020).

3.1.2 Former Tri-Max™ Hand Truck Storage Area

The flight line and paved parking apron currently stretch across the majority of the Facility and are directly adjacent to both the current and former AASF buildings. The area was expanded and repaved in 2012 during the construction and renovation of the Facility. Prior to the 2012 renovation, Tri-Max™ 70/30 hand trucks were stored in various places around the flight line and parking apron and were regularly serviced. Service for Tri-Max™ 70/30 hand trucks may include nozzle checks that can result in an AFFF discharge. According to personnel, the Tri-Max™ hand trucks were only used for 4 to 5 years in the mid-2000s and their use was discontinued because they were too expensive to maintain. There is no recollection or record of any training conducted with these units or nozzle testing performed. Interviewees were unsure about when or where, specifically, the Tri-Max™ units were turned in, but they no longer exist at the Facility and have since been replaced with fire extinguishers that do not contain PFAS (AECOM 2020).

3.2 ADJACENT AND HISTORICAL POTENTIAL SOURCES

Two potential off-facility sources of PFAS are located adjacent to the Facility and are not under the control of the NMARNG. A description of each potential off-facility source is presented below and shown on **Figure 3-1**.

3.2.1 Santa Fe Regional Airport

The SAF is a public airport that opened in 1941 and covers 2,128 acres. The SAF has three active asphalt runways. Interviews with NMARNG facility staff and a historical records search provided little information regarding use of AFFF at SAF; however, the records search detailed two emergency incidents that happened on or near the runway on 27 November 2018, and on 8 April 2019. According to a local news source, the first crash occurred when a single-engine Mooney M20 crashed just short of the runway and burst into flames. The second crash happened several months later, when a two-seater aircraft crashed and burst into flames at the airport on a secondary runway just south of the AASF Facility (AECOM 2020). Fire Station 10 supports the Santa Fe Airport with a crash rescue fire truck (City of Santa Fe 2022), which is presumably AFFF-enabled.

Historically, certain training and foam testing were required by the Federal Aviation Administration (FAA), and are assumed to have occurred at the Santa Fe Regional Airport. Since 2018, FAA has worked on reducing releases of AFFF on airports under their jurisdiction, and has adopted the use of testing procedures that do not require dispensing foam.

As a result, the entirety of the airport is considered a potential AFFF release area. The Santa Fe Regional Airport is located upstream of surface water flow and cross-gradient to groundwater flow at the time of gauging.

3.2.2 Santa Fe WWTP, Associated Surface Disposal Site, and Solar Panel Farm

The Santa Fe WWTP is located north of the Santa Fe AASF. Areas to the north and east of the Santa Fe AASF are currently used as surface disposal sites for the surface disposal of biosolids. Based on historical aerial photographs, the biosolids surface disposal site extended into the current Santa Fe AASF lease area. This biosolids surface disposal site also extended to the north end of the current AASF building prior to the 2012 renovations of the Facility (**Figure 3-1**). Although WWTPs are not usually primary potential release areas of PFAS, sludges and liquids from areas of potential release that are treated at WWTPs can create a secondary source of contamination.

A solar panel farm exists within the Santa Fe WWTP surface disposal site. Although research is conflicted about the potential of PFAS in the construction of solar panels, the solar farm is considered a potential PFAS source due to incomplete data regarding solar panel construction and the possible use of PFAS-containing insulated electrical wires and cables within the solar farm.

Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

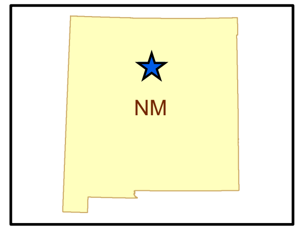
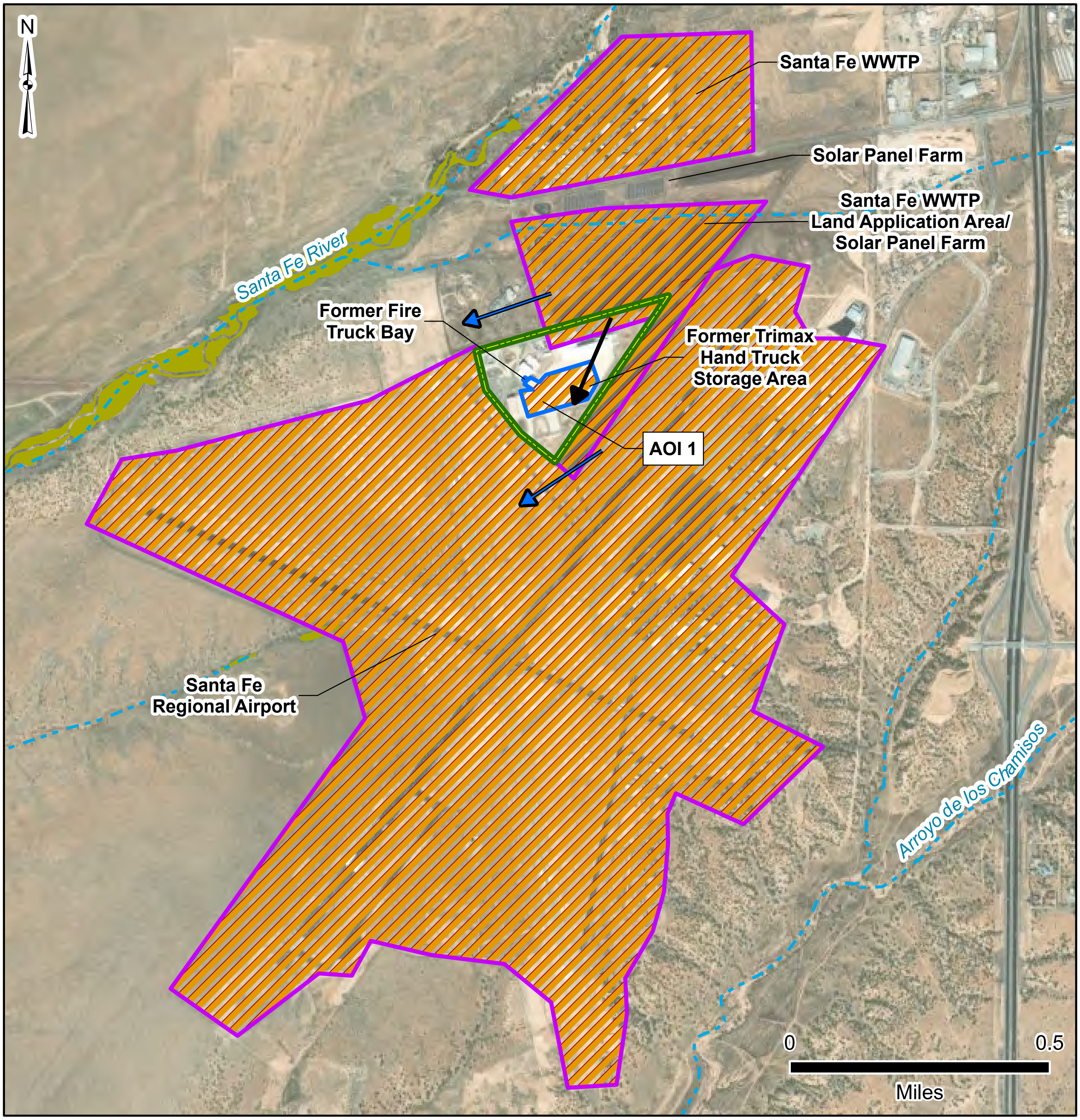


Figure 3-1
Areas of Interest



Facility Data

- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Potential PFAS Release

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)
- Intermittent Creek/Stream
- Wetlands

Data Sources:
ESRI 2020
AECOM 2020

Date:...............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SantaFe\SantaFeSIReport.aprx

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4. PROJECT DATA QUALITY OBJECTIVES

As identified during the data quality objective (DQO) process and outlined in the SI Uniform Federal Policy- (UFP) Quality Assurance Project Plan (QAPP) Addendum (EA Engineering, Science, and Technology, Inc., PBC [EA] 2021a), the objective of the SI is to identify whether there has been a release to the environment at the AOI identified in the PA. For each AOI, ARNG determines if further investigation is warranted, a removal action is required to address immediate threats, or whether no further action is warranted. This SI evaluated groundwater and soil for presence or absence of relevant compounds at the sampled AOI.

4.1 PROBLEM STATEMENT

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

4.2 INFORMATION INPUTS

Primary information inputs for the SI include the following:

- The PA Report for the Santa Fe AASF (AECOM 2020)
- Analytical data collected during other environmental sampling efforts at each ARNG facility
- Groundwater and soil sample data collected as part of this SI in accordance with the site-specific UFP-QAPP Addendum (EA 2021a)
- Field data collected including groundwater elevation and water quality parameters measured at the time of sampling.

4.3 STUDY BOUNDARIES

The scope of the SI was bounded horizontally by the property limits of the Facility (**Figure 2-2**). Off-facility sampling was not included in the scope of this SI. If future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s). The scope of the SI was vertically bounded as follows: groundwater (110–185 ft bgs), soil from hand-auger borings (0–2 ft bgs), soil from direct-push technology (DPT) borings (15 ft bgs), and soil from sonic drilling borings (197 ft bgs). Temporal boundaries were limited to the earliest available time field resources were available to complete the study.

4.4 ANALYTICAL APPROACH

Samples were analyzed in accordance with Department of Defense (DoD) Quality Systems Manual (QSM) Version 5.3 by Eurofins Lancaster Laboratories Environmental, LLC, accredited under the DoD Environmental Laboratory Accreditation Program (ELAP) (DoD ELAP;

Accreditation No. 1.01). PFAS data underwent 100 % Stage 2B validation in accordance with the DoD General Data Validation Guidelines (2019) and DoD Data Validation Guidelines Module 3: Data Validation Procedure of PFAS Analysis by QSM Table B-15 (2020).

Data were compared to applicable SLs and decision rules as defined in the UFP-QAPP Addendum (EA 2021b).

4.5 DATA USABILITY ASSESSMENT

The Data Usability Assessment (DUA), which is provided in **Appendix A**, is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment determines whether project execution and the resulting data have met installation-specific DQOs. Both sampling and analytical activities are considered to assess whether the collected data are of the right type, quality, and quantity to support the decision-making (DoD 2019a, 2019b; USEPA 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 UFP-QAPP Addendum (EA 2021b).

5. SITE INSPECTION ACTIVITIES

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

- *Final Preliminary Assessment Report, Santa Fe Army Aviation Support Facility,* dated August 2020 (AECOM 2020)
- *Final Programmatic Uniform Federal Policy-Quality Assurance Project Plan, Site Inspections for Per- and Polyfluoroalkyl Substances Impacted Sites, ARNG Installations, Nationwide,* dated December 2020 (EA 2020a)
- *Final Site Inspection Uniform Federal Policy-Quality Assurance Project Plan Addendum, Santa Fe Army Aviation Support Facility, Santa Fe, New Mexico* dated December 2021 (EA 2021b)
- *Final Programmatic Accident Prevention Plan, Revision 1,* dated November 2020 (EA 2020b)
- *Final Accident Prevention Plan/Site Safety and Health Plan Addendum, Santa Fe Army Aviation Support Facility, New Mexico,* dated August 2021 (EA 2021a).

The SI field activities were conducted during two mobilizations. Field activities for the first mobilization were conducted from 7 to 8 February 2022 and consisted of hand augering and surface soil sample collection. The second mobilization was conducted 25 April through 3 June 2022. Field activities included sonic and DPT drilling, collection of soil samples, installation of permanent monitoring wells, groundwater gauging and sampling, and collection of spatial data. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as noted in **Section 5.8**.

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

- Eighteen (18) surface soil samples collected by hand auger from 16 locations
- Fifteen (15) shallow subsurface samples collected by direct push/sonic drilling from 10 locations
- Eight (8) deep subsurface samples collected from 6 locations by sonic drilling
- Six (6) groundwater samples from 5 groundwater monitoring wells
- Nineteen (19) field blanks

- Twenty-one (21) equipment rinsate samples.

Figure 5-1 provides the sample locations for all media across the Facility. **Figure 5-2** displays the sample locations with historical imagery to show features and Facility layout before the facility renovation. **Table 5-1** presents the list of samples collected for each medium. Field documentation is provided in **Appendix B**. A log of Daily Notice of Field Activity was completed throughout the SI field activities, which is provided in **Appendix B1**. Field notes are provided in **Appendix B2**. Survey data is presented in **Appendix B3**. Field change request forms are provided in **Appendix B4**. Additionally, a photographic log of field activities is provided in **Appendix C**.

5.1 PRE-INVESTIGATION ACTIVITIES

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

5.1.1 Technical Project Planning

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

A combined TPP Meeting 1 and 2 was held on 1 October 2021, prior to SI field activities and included a site walk with stakeholders. The combined TPP Meeting 1 and 2 was conducted in general accordance with EM 200-1-2. The stakeholders for this SI include ARNG, NMARNG, USACE, and the NMED, representatives familiar with the Facility, the regulations, and the community. Stakeholders were provided the opportunity to make comments on the technical sampling approach and methods at the combined TPP Meeting 1 and 2. The outcome of the combined TPP Meeting 1 and 2 was memorialized in the UFP-QAPP Addendum (EA 2021b).

A TPP Meeting 3 was held on 4 April 2023 to discuss the results of the SI. Meeting minutes for TPP 3 are included in **Appendix D** of this report. Future TPP meetings will provide an opportunity to discuss the results and findings, and future actions, where warranted.

5.1.2 Utility Clearance

EA contracted MT Private Utility Locating Services, LLC, a private utility location service, to perform utility clearance at the Facility. Utility clearance was performed at each of the proposed boring locations on 7 February 2022 with input from the EA field team. It was discovered that incorrect locations received utility clearance for AOI01-02 and AOI01-06. As a result, the corrected locations were surveyed on 27 April 2022. General locating services were used to complete the clearance. Additionally, the first 5 ft of each boring were pre-cleared by EA's drilling subcontractors using a hand auger to verify utility clearance in shallow subsurface where utilities would typically be encountered.

5.1.3 Source Water and PFAS Sampling Equipment Acceptability

The potable water source used for decontamination of drilling equipment was sampled prior to the start of field activities and confirmed to be acceptable for this use during the SI. A potable water source sample was collected at the wash rack on 14 October 2021, prior to mobilization, and analyzed for PFAS by LC/MS/MS compliant with QSM Version 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 **Appendices F** and **G**. 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 PFAS sampling environment. The checklist of acceptable materials for use in the PFAS sampling environment was provided in the Standard Operating Procedures provided as **Appendix B** to the Programmatic UFP-QAPP (EA 2020a).

5.2 SOIL BORINGS AND SOIL SAMPLING

A hand auger was used to collect surface soil samples from 0 to 2 ft bgs. It was also used to collect soil from the top 5 ft of the boring in compliance with utility clearance procedures. For boring locations advanced to a depth greater than 5 ft, soil samples were collected via sonic or DPT drilling methods in accordance with 025 *Standard Operating Procedure for Soil Sampling* (EA 2021b). Soil borings associated with monitoring wells were installed with a truck-mounted Boart LS600 full-sized sonic rig. Continuous soil cores were collected to the target depth. For 15-ft borings, a Geoprobe® 7822DT dual-tube sampling system was used.

At hand auger borings, a soil sample was collected from 0 to 2 ft bgs with a total depth of 2 ft bgs. Three discrete soil samples were collected for chemical analysis from all other soil borings: one sample at the surface (0 to 2 ft bgs) and two subsurface soil samples. In 15-ft DPT borings, subsurface soil samples were collected at 6–8 ft bgs and 13–15 ft bgs. In deeper soil borings associated with monitoring wells and drilled with sonic, one subsurface soil sample was collected at the 13–15 ft bgs interval, and one sample was collected approximately 1 ft above the groundwater table. Total depth for soil borings associated with monitoring wells ranged from 110 to 184 ft bgs. Note that subsurface soil samples were not collected at SFAASF-03; concentrations in sub-surface soil are considered to be represented by the samples collected at SFAASF-03-PA due to the close proximity of the two borings.

All soil sample locations are shown on **Figures 5-1** and **5-2** and boring sample depths are provided in **Table 5-1**. The soil boring locations were selected based on the AOI information provided in the PA (AECOM 2020) and as agreed upon by stakeholders during the TPP and review of the UFP-QAPP Addendum (EA 2021b), with several exceptions. Soil boring locations AOI01-06B, AOI01-09, and SFAASF-03-PA are not included in the UFP-QAPP Addendum but are discussed in **Section 5.8**.

During drilling, soil cores were continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System. A photoionization detector (PID) was used to screen the breathing zone during boring activities as a part of personal safety requirements. Observations and measurements were recorded boring log forms in a non-treated field logbook. Depth interval, recovery thickness, PID concentrations, moisture, relative density, Munsell color, and Unified Soil Classification System texture were recorded. Soil borings SFAASF-03 and AOI01-09 were not logged due to their close proximity (17 ft or less) to soil borings SFAASF-03-PA and AOI01-01, respectively. The boring logs are provided in **Appendix E**.

Boreholes advanced to a maximum depth of 2 ft bgs were filled with bentonite. Boreholes advanced to a maximum depth of 15 ft bgs were backfilled with material removed from the borehole and then bentonite pellets filled the remainder to land surface except for boring AOI01-06B which was filled with bentonite and the cuttings were drummed.

Each sample was collected into a laboratory-supplied PFAS-free high-density polyethylene (HDPE) bottle and labeled using a PFAS-free marker or pen. Samples were packaged on ice and transported via Federal Express (FedEx) under standard chain-of-custody procedures to the laboratory and analyzed for PFAS (LC/MS/MS compliant with QSM Version 5.3 Table B-15), TOC (USEPA Method 9060A) and pH (USEPA Method 9045D) in accordance with the UFP-QAPP Addendum (EA 2021b).

Field duplicate (FD) samples were collected at a rate of 10% and analyzed for the same parameters as the accompanying samples. Matrix spike (MS)/matrix spike duplicates (MSDs) were collected at a rate of 5% and analyzed for the same parameters as the accompanying samples. In instances when non-dedicated sampling equipment was used, such as a hand auger for the shallow soil samples, one equipment blank (EB) was collected per day and analyzed for the same parameters as the soil samples. One field blank (FB) was collected per day. A temperature blank was placed in each cooler to ensure that samples were preserved at or below 6 degrees Celsius (°C) during shipment. After removal of the drilling equipment, boreholes were abandoned using bentonite chips. In borings installed on paved surfaces, the borings were abandoned by backfilling with bentonite chips. Borings were installed in unpaved areas to avoid disturbing concrete or asphalt surfaces.

5.3 MONITORING WELL INSTALLATION AND GROUNDWATER GRAB SAMPLING

Monitoring wells were installed using a truck-mounted Boart LS600 full-sized sonic rig. Once the borehole was advanced to the desired depth, a monitoring well was constructed of a 20-ft section of 2-inch Schedule 80 polyvinyl chloride (PVC) screen with sufficient casing to reach the ground surface. The screen intervals for the monitoring wells are provided in **Table 5-2**.

Two wells were installed and subsequently plugged and abandoned due to the lack of water production (AOI01-09) or the presence of grout in the well (SFAASF-03-PA). Upon the completion of SFAASF-03-PA, the well was gauged and found to contain grout. The well was abandoned by filling the PVC pipe with bentonite chips from a depth of 197 to 138.8 ft and adding water to hydrate overnight. The next day the top 5 ft of PVC was removed and a tremie pipe was inserted to fill the rest of the well/borehole with mixed grout 136 ft to ground surface. After AOI01-09 was completed to the target depth, the well was left overnight to allow any groundwater to accumulate. No groundwater accumulated so the well was abandoned by removing the entire PVC pipe and pumping mixed grout to fill the open borehole to ground surface.

Groundwater samples were collected using a PFAS-free Geosub pump and PFAS-free HDPE tubing. Samples were collected at least 1 week after well development. Each sample was collected in laboratory-supplied PFAS-free HDPE bottles and labeled using a PFAS-free marker or pen. The monitoring wells were purged at a rate determined in the field to reduce turbidity and draw down prior to sampling. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, and oxidation-reduction potential) were measured using a water quality meter and recorded on the field sampling form (**Appendix B2**) before each grab sample was collected in a separate container. Samples were packaged on ice and transported via FedEx under standard chain-of-custody procedures to the laboratory and analyzed for PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 in accordance with the UFP-QAPP Addendum (EA 2021b). Additionally, a separate groundwater sample was collected for the purpose of conducting a field-administered shake test to observe the presence or absence of foam.

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 FB per day was collected in accordance with the UFP-QAPP Addendum (EA 2021b). A minimum of one EB was collected per day and analyzed for the same parameters as the groundwater samples due to the use of a non-dedicated pump. 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

Groundwater levels were measured and used to calculate facility-wide groundwater elevations and assess groundwater flow direction. Synoptic water-level elevation measurements were collected on 3 June 2022 from the groundwater monitoring wells, taken from the survey mark on the northern side of the well casing. Groundwater elevation maps for perched and regional groundwater are provided in **Figures 2-5** and **2-6**, respectively. Groundwater elevation data are provided in **Table 5-3**.

5.5 SURVEYING

The northern side of each new temporary well casing was surveyed using a Trimble R10 real-time kinematic differential Global Positioning System (GPS). Positions are provided in the applicable Universal Transverse Mercator zone projection with North American Datum 1983 (horizontal) and North American Vertical Datum 1988 using Geoid 18 (vertical). Surveying data were collected on 3 June 2022 and are provided in **Appendix B3**.

GPS locations for soil borings and land application of soil cuttings were collected using a Trimble Geo 7x by EA on 19–20 May 2022 and 17 June 2022. Coordinates were differentially corrected, and point locations meet accuracy objectives outlined in the UFP-QAPP Addendum Worksheet #22 (EA 2021b). Coordinates are presented in **Appendix B3**.

5.6 INVESTIGATION-DERIVED WASTE

As of the date of this report, the disposal of PFAS investigation-derived waste (IDW) is not regulated federally. PFAS IDW generated during the SI is considered non-hazardous waste. The waste was managed according to a set of decision rules approved by ARNG, NMARNG, and NMED and documented in Field Change Request 1. PFAS concentrations from Mobilization 1 were compared to the industrial screening levels published in the Risk Assessment Guidance for Investigations and Remediation, Volume 1 (NMED 2021) for the purpose of directing IDW management for Mobilizations 1 and 2.

Surface soil collected during Mobilization 1 had concentrations below NMED industrial SLs. In accordance with the IDW decision rules outlined in Section 5.8, these cuttings were land applied. All land application areas were recorded with a GPS. **Appendix B3** contains maps displaying land application areas and a table of coordinates.

For Mobilization 2, in accordance with the IDW decision rules outlined in Section 5.8, in cases where PFAS concentrations in surface soil were less than the NMED industrial SLs, cuttings generated during Mobilization 2 from surface to the capillary fringe were land applied. Soil cuttings from Mobilization 2 were drummed in borehole-specific drums if they were sourced from the capillary fringe or below. Soil cuttings from above the capillary fringe were land applied, with the exception of DPT boring location AOI01-06B. Cuttings from AOI01-06B were drummed due to the lack of surface soil analytical results that could be used to characterize the cuttings. All land application areas were recorded with a GPS. **Appendix B3** contains maps displaying land application areas and a table of coordinates.

Liquid IDW (i.e., purge water, development water, and decontamination fluids) generated during the SI activities were drummed. All liquid and solid IDW drums are currently stored at the Facility.

Other solids such as spent personal protective equipment, plastic sheeting, tubing, and unused monitoring well construction materials utilized during the field activities were disposed of as municipal waste.

5.7 LABORATORY ANALYTICAL METHODS

Samples were analyzed by LC/MS/MS compliant with QSM Version 5.3 Table B-15 at Eurofins Lancaster Laboratories Environmental, LLC, in Lancaster, Pennsylvania, a DoD ELAP-certified laboratory. Soil samples were also analyzed for TOC using USEPA Method 9060A and pH by USEPA Method 9045D.

5.8 DEVIATIONS FROM UFP-QAPP ADDENDUM

The following deviations from the UFP-QAPP Addendum occurred based on conditions encountered during the field investigation activities. These deviations were discussed between

EA, ARNG, USACE, NMARNG, and the NMED and are documented in a Field Change Request Form (**Appendix B4)**. Deviations from the UFP-QAPP Addendum are noted below:

- The UFP-QAPP Addendum indicates that non-hazardous waste generated during SI activities would be containerized in 55-gallon drums. Based on discussions with ARNG and with the NMED, surface soil samples from each of the drilling locations were collected during a first mobilization. PFAS concentrations were reviewed and compared to state industrial standards for purposes of IDW management. NMED approved the land application of soil cuttings down to the capillary fringe in borings where surface soil concentrations did not exceed state standards. NMED granted approval via email on January 18, 2022 (J. Rhoderick, email). Areas of land application were recorded with a GPS. Locations are provided in a table and a map in **Appendix B3**. Solid IDW from the capillary fringe down were containerized in drums.

- The UFP-QAPP Addendum states that borings will be advanced with air rotary or sonic drilling; however, DPT was used to install 15-ft borings. The alternate technology was used to reduce the length of the field event, as the DPT rig could install 15-ft boreholes while the sonic rig was installing deeper boreholes.

- The UFP-QAPP Addendum identifies AOI01-01 as a 15-ft soil boring and AOI01-03 as a soil boring/monitoring well location. Due to the results of the surface soil sampling during the first mobilization, the project team decided to convert AOI01-01 a soil boring/monitoring well and AOI01-03 to a 15-ft soil boring.

- Soil boring AOI01-06B was installed as a replacement for soil boring AOI01-06. The location of the 0–2 ft surface soil sample from AOI01-06 was collected from the lowest point in the area rather than from the edge of the pavement, as depicted in the UFP-QAPP Addendum (Figure 17-1). Soil boring AOI01-06B was installed at a location in closer proximity to the former parking apron, which was identified as a possible PFAS source.

- An additional soil boring (AOI01-09) was installed 11 ft northeast of monitoring well AOI01-01, which was screened in regional groundwater. The purpose of the installing AOI01-09 was to characterize the groundwater and capillary fringe of perched groundwater if present. Perched groundwater was not observed during drilling and a monitoring well was not installed at the location.

Additional deviations from the UFP-QAPP not included in the Field Change Request Form (**Appendix B4**) are described below:

- Monitoring wells installed in perched groundwater were constructed with 10 ft of screen rather than 20 ft of screen due to the limited thickness of the water-bearing zone.

- The deep soil sample from AOI01-01 was collected at 181–182 ft bgs, which was the 1-ft interval above observed moisture in soil. Groundwater was later observed at 176 ft bgs. As a result, the deep sample collected from AOI01-01 may represent PFAS concentrations in saturated soil rather than the capillary fringe.

**Table 5-1. Samples by Medium
AASF, Santa Fe, New Mexico
Site Inspection Report**

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
Soil Samples							
AOI01-01-SB-0-2	2/8/2022	0-2	X				
AOI01-01-SB-13-15	4/25/2022	13-15	X				
AOI01-01-SB-135-136	4/25/2022	135-136				X	
AOI01-01-SB-181-182	4/26/2022	181-182	X				
AOI01-02-SB-0-2	2/8/2022	0-2					
AOI01-02-SB-0-2-D	2/8/2022	0-2	X				FD
AOI01-02-SB-13-15	4/27/2022	13-15	X				
AOI01-02-SB-113-115	4/28/2022	113-115	X				
AOI01-02-SB-113-115-DUP	4/28/2022	113-115	X				FD
AOI01-02-SB-119-120	4/28/2022	119-120				X	
AOI01-03-SB-0-2	2/7/2022	0-2	X	X	X		
AOI01-03-SB-6-8	5/4/2022	6-8	X				
AOI01-03-SB-13-15	5/4/2022	13-15	X				
AOI01-04-SB-0-2	2/7/2022	0-2	X				
AOI01-04-SB-13-15	5/3/2022	13-15	X				
AOI01-04-SB-109-110	5/4/2022	109-110	X				
AOI01-04-SB-109-110- DUP	5/4/2022	109-110	X				FD
AOI01-05-SB-0-2	2/7/2022	0-2	X				
AOI01-05-SB-6-8	5/4/2022	6-8	X				
AOI01-05-SB-13-15	5/4/2022	13-15	X				
AOI01-06-SB-0-2	2/7/2022	0-2	X				
AOI01-06B-SB-0-2	5/4/2022	0-2	X				
AOI01-06B-SB-6-8	5/4/2022	6-8	X				
AOI01-06B-SB-13-15	5/4/2022	13-15	X				
AOI01-07-SB-0-2	2/8/2022	0-2	X				
AOI01-08-SB-0-2	2/8/2022	0-2	X				
AOI01-09-SB-0-2	5/9/2022	0-2	X				
AOI01-09-SB-13-15	5/5/2022	13-15	X				
AOI01-09-SB-111-112	5/6/2022	111-112	X				
SFAASF-01-SB-0-2	2/8/2022	0-2	X				
SFAASF-02-SB-0-2	2/8/2022	0-2	X	X	X		
SFAASF-02-SB-0-2-D	2/8/2022	0-2	X				FD
SFAASF-03-SB-0-2	5/7/2022	0-2	X				
SFAASF-03-PA-SB-0-2	2/7/2022	0-2	X				
SFAASF-03-PA-SB-13-15	5/1/2022	13-15	X				
SFAASF-03-PA-SB-183-184	5/2/2022	183-184	X				
SFAASF-04-SB-0-2	2/7/2022	0-2	X				
SFAASF-04-SB-13-15	4/28/2022	13-15	X				
SFAASF-04-SB-180-181	4/30/2022	180-181	X				

Table 5-1. Samples by Medium
AASF, Santa Fe, New Mexico
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
SFAASF-05-SB-0-2	2/7/2022	0-2	X				
SFAASF-05-SB-6-8	5/4/2022	6-8	X				
SFAASF-05-SB-13-15	5/4/2022	13-15	X				
SFAASF-05-SB-13-15-DUP	5/4/2022	13-15	X				FD
Groundwater Samples							
AOI01-01-GW	5/20/2022	NA	X				
AOI01-02-GW	5/20/2022	NA	X				
AOI01-02-GW-DUP	5/20/2022	NA	X				FD
AOI01-04-GW	5/20/2022	NA	X				
SFAASF-03-GW	5/19/2022	NA	X				
SFAASF-04-GW	5/19/2022	NA	X				
Blank Samples							
SFAASF-EB-01	2/7/2022	NA	X				EB
SFAASF-EB-02	2/8/2022	NA	X				EB
SFAASF-EB-03	4/25/2022	NA	X				EB
SFAASF-EB-04	4/26/2022	NA	X				EB
SFAASF-EB-05	4/26/2022	NA	X				EB
SFAASF-EB-06	4/27/2022	NA	X				EB
SFAASF-EB-07	4/28/2022	NA	X				EB
SFAASF-EB-08	4/28/2022	NA	X				EB
SFAASF-EB-09	4/29/2022	NA	X				EB
SFAASF-EB-10	4/30/2022	NA	X				EB
SFAASF-EB-11	5/1/2022	NA	X				EB
SFAASF-EB-12	5/2/2022	NA	X				EB
SFAASF-EB-13	5/3/2022	NA	X				EB
SFAASF-EB-14	5/4/2022	NA	X				EB
SFAASF-EB-15	5/4/2022	NA	X				EB
SFAASF-EB-16	5/5/2022	NA	X				EB
SFAASF-EB-17	5/6/2022	NA	X				EB
SFAASF-EB-18	5/7/2022	NA	X				EB
SFAASF-EB-19	5/9/2022	NA	X				EB
SFAASF-EB-20	5/19/2022	NA	X				EB
SFAASF-EB-21	5/20/2022	NA	X				EB
SFAASF-FB-01	2/7/2022	NA	X				FB
SFAASF-FB-02	2/8/2022	NA	X				FB
SFAASF-FB-03	4/25/2022	NA	X				FB
SFAASF-FB-04	4/26/2022	NA	X				FB
SFAASF-FB-05	4/27/2022	NA	X				FB
SFAASF-FB-06	4/28/2022	NA	X				FB
SFAASF-FB-07	4/29/2022	NA	X				FB

Table 5-1. Samples by Medium
AASF, Santa Fe, New Mexico
Site Inspection Report

Sample Identification	Sample Collection Date	Sample Depth (ft bgs)	PFAS (USEPA Method 537 Modified)	TOC (USEPA Method 9060A)	pH (USEPA Method 9045D)	Grain Size (ASTM D422)	Comments
SFAASF-FB-08	4/30/2022	NA	X				FB
SFAASF-FB-09	5/1/2022	NA	X				FB
SFAASF-FB-10	5/2/2022	NA	X				FB
SFAASF-FB-11	5/3/2022	NA	X				FB
SFAASF-FB-12	5/4/2022	NA	X				FB
SFAASF-FB-13	5/5/2022	NA	X				FB
SFAASF-FB-14	5/6/2022	NA	X				FB
SFAASF-FB-15	5/7/2022	NA	X				FB
SFAASF-FB-16	5/8/2022	NA	X				FB
SFAASF-FB-17	5/9/2022	NA	X				FB
SFAASF-FB-18	5/19/2022	NA	X				FB
SFAASF-FB-19	5/20/2022	NA	X				FB

Notes:
EB = Equipment blank
FB = Field blank
FD = Field duplicate
NA = Not applicable

**Table 5-2. Soil Boring Depths and Well Screen Intervals
AASF, Santa Fe, New Mexico
Site Inspection Report**

Areas of Interest	Boring Location	Soil Boring Depth (ft bgs)	Well Screen Interval (ft bgs)	Current Well Status
1	AOI01-01	192	170-190	Existing
	AOI01-02	119	107-117	Existing
	AOI01-03	15	-	-
	AOI01-04	115	105-115	Existing
	AOI01-05	15	-	-
	AOI01-06	2	-	-
	AOI01-06b	15	-	-
	AOI01-07	2	-	-
	AOI01-08	2	-	-
	AOI01-09	115	110-115	P&A
Historical WWTP Surface Disposal Site	SFAASF-01	2	-	-
	SFAASF-02	2	-	-
Santa Fe AASF Boundary	SFAASF-03	197	175-195	Existing
	SFAASF-03-PA	197	175-195	P&A
	SFAASF-04	193	171-191	Existing
	SFAASF-05	15	-	-

Notes:
P&A = Plugged and abandoned

Table 5-3. Groundwater Elevation

**AASF, Santa Fe, New Mexico
Site Inspection Report**

Monitoring Well ID	Top of Casing Elevation (ft amsl)	Depth to Water[1] (ft btoc)	Groundwater Elevation (ft amsl)
AOI01-01	6,328.84	176.46	6,152.38
AOI01-02	6,324.96	110.96	6,214.00
AOI01-04	6,323.20	110.04	6,213.16
SFAASF-03	6,337.69	184.81	6,152.88
SFAASF-04	6,332.85	180.59	6,152.26

Notes:
1. Measured on 3 June 2022.
btoc = Below top of casing
ID = Identification

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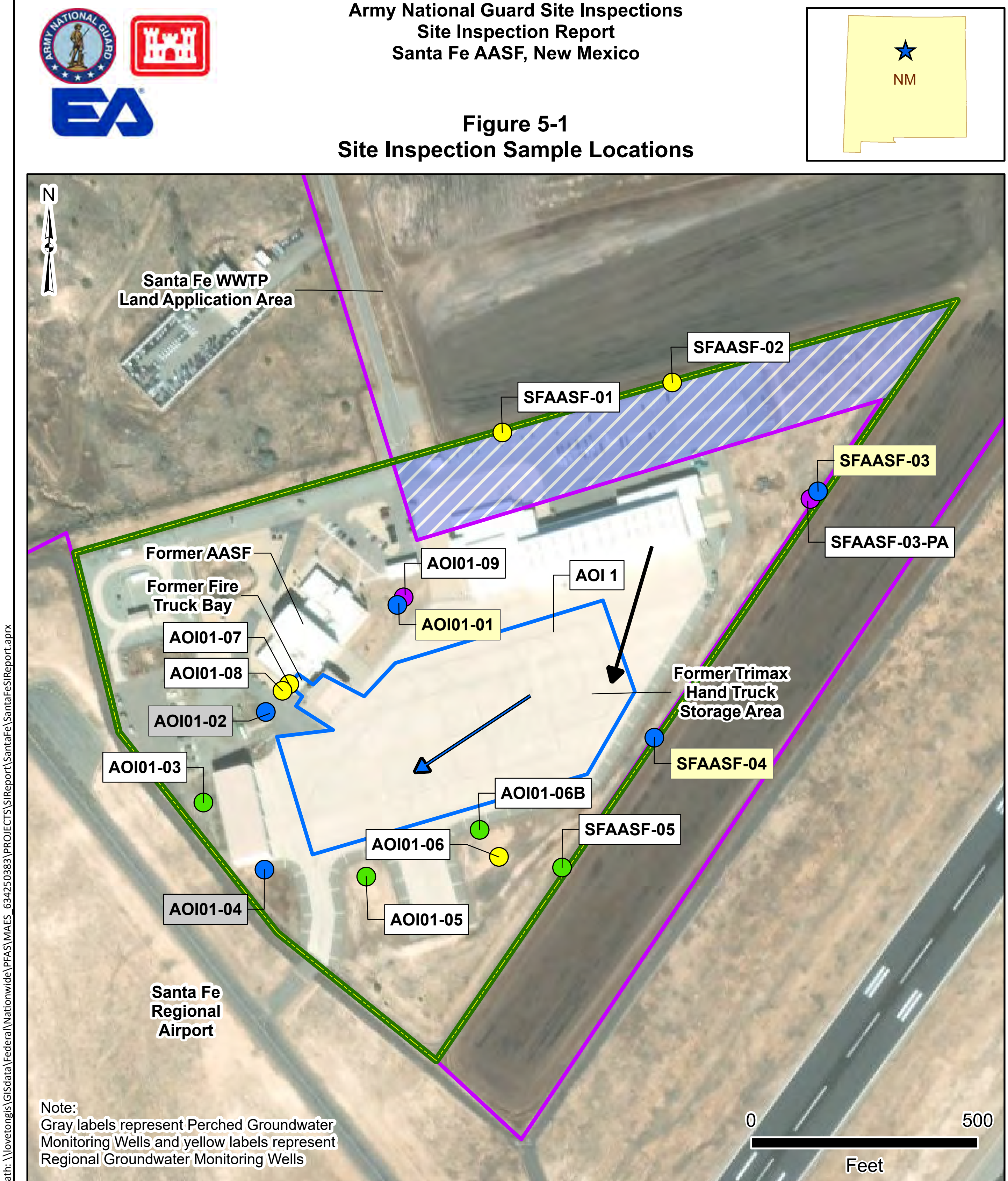
Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

Figure 5-1
Site Inspection Sample Locations



Facility Data
- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Sample Locations
- DPT Soil Boring
- Hand Auger Soil Boring
- Sonic Soil Boring
- Sonic Soil Boring/Monitoring Well

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

Data Sources:
ESRI 2022
AECOM 2020

Date:...............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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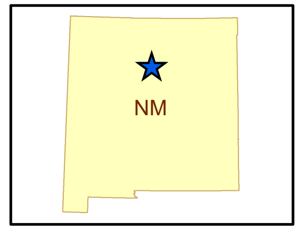
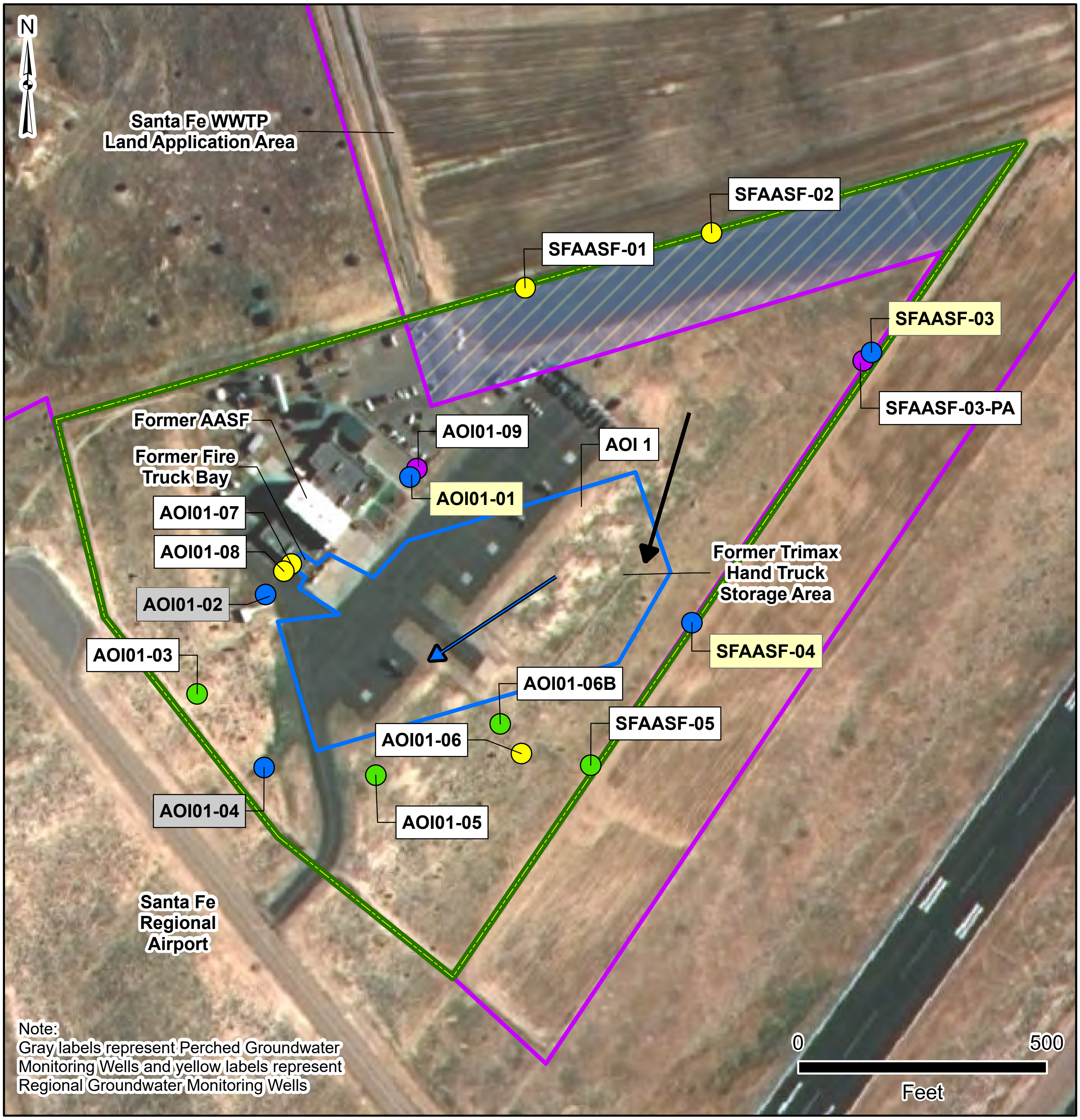
Army National Guard Site Inspections
Site Inspection Report
Santa Fe AASF, New Mexico

Figure 5-2
Site Inspection Sample Locations with Historical Imagery





Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SantaFe\SantaFeSIReport.aprx

Facility Data
- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Sample Locations
- DPT Soil Boring
- Hand Auger Soil Boring
- Sonic Soil Boring
- Sonic Soil Boring/Monitoring Well

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

Data Sources:
AECOM 2020
RGIS UNM 2005

Date:...............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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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 is provided in **Sections 6.3** and **6.4**. **Table 6-1** provides applicable screening levels. **Tables 6-2** through **6-5** present PFAS results for the relevant compounds in soil and groundwater. 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 concentration for sampled media exceed the SLs established in the OSD memorandum, the AOI may proceed to the next phase under CERCLA. The SLs established in the OSD memorandum apply to the five compounds presented on **Table 6-1**.

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

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

Notes:
1. Assistant Secretary of Defense. 2022. Risk-Based Screening Levels in Groundwater and Soil using USEPA's Regional Screening Level Calculator. Hazard Quotient = 0.1. May 2022.
2. Of the six PFAS compounds presented in the 6 July 2022 OSD memorandum, HFPO-DA (commonly referred to as GenX) was not included as an analyte at the time of this SI. Based on the 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.

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

The data in the subsequent sections are compared against the SLs presented in **Table 6-1**. The SLs for groundwater are based on direct ingestion. The SLs for soil are based on incidental ingestion and are applied to the depth intervals reasonably anticipated to be encountered by the receptors identified at the facility: the residential scenario is applied to surface soil results (0–2 ft bgs) and the industrial/commercial worker scenario is applied to all shallow subsurface soil results (2–15 ft bgs). The SLs are not applied to deep subsurface soil results (greater than 15 ft bgs) because 15 ft is the anticipated limit of construction activities.

6.2 SOIL PHYSICOCHEMICAL ANALYSES

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

The data collected in this investigation will be used in subsequent investigations, where appropriate, to assess fate and transport of PFAS contaminants. According to the Interstate Technology Regulatory Council (ITRC), several important PFAS partitioning mechanisms include hydrophobic and lipophobic effects, electrostatic interactions, and interfacial behaviors. At relevant environmental pH values, certain PFAS are present as organic anions; and are therefore, relatively mobile in groundwater (Xiao et al. 2015) but tend to associate with the organic carbon fraction that may be present in soil or sediment (Higgins and Luthy 2006; Guelfo and Higgins 2013). When sufficient organic carbon is present, organic carbon normalized distribution coefficients can help in evaluating transport potential, though other geochemical factors (e.g., 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, which includes Former Firetruck Bay and Tri-Max™ Hand Truck Storage Area. The soil and groundwater results are summarized on **Tables 6-2** through **6-5**. Soil and groundwater results are presented on **Figures 6-1** through **6-7**.

In the sections below, estimated analyte concentrations are followed by a ‘J’ qualifier. Concentrations that are estimated and biased higher are followed by a ‘J+’ qualifier.

6.3.1 AOI 1 - Soil Analytical Results

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

Soil was sampled at 10 boring locations associated with potential release areas at AOI 1. Soil was sampled from three intervals at locations AOI01-01, AOI01-02, AOI01-03, AOI01-04, AOI01-05, AOI01-06B, and AOI01-09; and one interval at locations AOI01-06, AOI01-07, and AOI01-08.

PFOS was detected in seven of 10 surface soil sample locations with concentrations exceeding the applicable SL in three surface soil sample locations (AOI01-02, AOI01-07, and AOI01-08). The highest PFOS concentration of 920 µg/kg was detected at AOI01-07. PFOA, PFNA, and PFHxS were detected in surface soil at AOI 1 at concentrations that did not exceed the applicable residential SLs. PFOA was detected in 8 of 10 surface soil sample locations at concentrations below the SL of 19 µg/kg. PFOA had a maximum reported concentration of 1.2 µg/kg (AOI01-

07). PFHxS was detected in 5 the 10 surface soil sample locations at concentrations below the SL of 130 µg/kg. PFHxS had a maximum reported concentration of 8.3 µg/kg (AOI01-07). PFNA was detected in 3 of the 10 surface soil sample locations at concentrations below the SL of 19 µg/kg. PFNA had a maximum reported concentration of 3.8 µg/kg (AOI01-07). PFBS was not detected in any of the 10 surface soil sample locations at AOI 1.

Shallow subsurface soil[3] samples collected from 2 to 15 ft bgs did not exceed the SLs for the relevant compounds in any of the sample locations. PFOS was detected in AOI01-02, AOI01-03, and AOI01-04 at concentrations ranging up to 5.9 µg/kg. PFOA was detected in two locations, AOI01-02 and AOI01-04, with a maximum concentration of 0.59 J µg/kg (AOI01-02). PFHxS was detected in three soils samples, AOI01-02, AOI01-03, and AOI01-04, with a maximum concentration of 3 µg/kg (AOI01-02). PFNA was detected in one location (AOI01-04) at a concentration of 0.37 J µg/kg.

PFBS was not detected in any of the deep subsurface soil samples. In AOI01-02, PFHxS was detected at a concentration of 0.32 J µg/kg. In AOI01-04, PFOS, PFOA, PFHxS, and PFNA were detected at concentrations of 2.2 J+ µg/kg, 0.48 J µg/kg, 1.1 J µg/kg, and 0.32 J µg/kg, respectively.

6.3.2 AOI 1 - Groundwater Results

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

Groundwater samples were collected from three permanent monitoring wells associated with the potential release area AOI 1. Two wells, AOI01-02 and AOI01-04, are screened in perched groundwater between 105 to 117 ft bgs; one well, AOI01-01, is screened regional groundwater between 170 to 190 ft bgs. PFOA and PFHxS were detected in perched groundwater at concentrations exceeding the applicable SLs. The maximum concentrations of PFOA and PFHxS of 38 ng/L and 230 ng/L, respectively, were detected at AOI01-04. PFBS was detected below the applicable SL in both perched groundwater wells. PFOS and PFNA were not detected in perched groundwater.

PFOS, PFOA, PFBS, PFHxS, and PFNA were not detected in AOI01-01, which is screened in regional groundwater.

A shake test was administered to samples collected from each of the three monitoring wells in AOI 1. Foam was not observed in any of the samples.

6.3.3 AOI 1 - Conclusions

Based on the results of the SI, four relevant compounds (PFOA, PFOS, PFHxS, and PFNA) were detected in AOI 1. PFOS exceeded the SL in surface soil. Three of the five relevant compounds (PFOA, PFHxS, and PFBS) were detected in groundwater at AOI 1. PFOA and PFHxS exceeded

[3] Shallow subsurface soil also referred to as intermediate depth.

SLs in groundwater. Based on the exceedance of the SLs, further evaluation at AOI 1 is warranted.

6.4 HISTORICAL WASTEWATER TREATMENT PLANT BIOSOLID SURFACE DISPOSAL SITE SAMPLE LOCATIONS

Based on historical aerial photographs, biosolid surface disposal extended into the current Santa Fe AASF lease area; biosolid surface disposal extended to the north end of the current AASF building prior to the 2012 renovations of the facility. This section presents the analytical results for soil in comparison to SLs for sample locations within the historical WWTP biosolid surface disposal site that extends onto the current Santa Fe AASF lease area. **Tables 6-2** through **6-5** summarize detected compounds in soil. **Figures 6-1** through **6-5** present the ranges of detections in soil.

6.4.1 Historical Wastewater Treatment Plant Biosolid Surface Disposal Site – Soil Analytical Results

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

Soil was sampled at two boring locations (SFAASF-01 and SFAASF-02) within the historical WWTP biosolid surface disposal site, as identified using historical aerial photography. Only surface soil was sampled at these locations.

PFOS and PFOA concentrations in surface soils exceeded SLs both sample locations within the historical WWTP biosolid surface disposal site. PFBS, PFNA, and PFHxS in soil, when detected, did not exceed the SLs. PFOS exceeded the applicable SL in both surface soil sample locations. The highest PFOS concentration of 60 µg/kg was detected at SFAASF-02. PFOA was detected in both surface soil sample locations with the concentration exceeding the applicable SL in one surface soil sample locations (SFAASF-02), which had a reported concentration of 33 µg/kg. PFHxS and PFNA were detected below their respective applicable SLs in both sample locations. PFBS was detected below the applicable SL in surface soil at one location (SFAASF-02).

6.4.2 Historical Wastewater Treatment Plant Biosolid Surface Disposal Site – Groundwater Results

Groundwater was not sampled within the historical WWTP biosolid surface disposal site; however, groundwater samples at AOI01-01 are considered downgradient from the historical WWTP biosolid surface disposal site and upgradient of AOI 1, and samples from SFAASF-03 and SFAASF-04 are also considered downgradient from the offsite biosolid surface disposal site. There were no detections of the relevant compounds in these samples. Subsurface soil was not sampled at these locations and perched water was not encountered, thus the fate and transport of the relevant compounds in the surface soil is unknown.

6.4.3 Historical Wastewater Treatment Plant Biosolid Surface Disposal Site – Conclusions

During the SI, PFBS, PFNA, and PFHxS were detected below SLs in surface soil samples. PFOS and PFOA were detected above SLs. Elevated PFAS concentrations within the historical WWTP biosolid surface disposal site may be a result of the historical application of WWTP biosolids to the land currently leased by NMARNG or the current surface disposal of WWTP biosolids on the adjacent property. Sub-surface soils and groundwater were not sampled at these locations. Based on the exceedance of SLs in surface soil within the historical WWTP biosolid surface disposal site, further evaluation is warranted.

6.5 BOUNDARY SAMPLE LOCATIONS

This section presents the analytical results for soil and groundwater in comparison to SLs for the boundary sample locations. **Tables 6-2** through **6-5** summarize the detected compounds in soil and groundwater. **Figures 6-1** through **6-7** present the ranges of detections in soil and groundwater.

6.5.1 Boundary Sample Locations – Soil Analytical Results

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

Soil was sampled at four boring locations associated with the facility boundary. Soil was sampled from three intervals at locations SFAASF-03-PA, SFAASF-04, and SFAASF-05. Only surface soil was sampled at SFAASF-03.

PFOS and PFOA were detected below SLs in surface soils at the facility boundary. PFBS, PFNA, and PFHxS were not detected. PFOS was detected below the SL in three of four boundary surface soil samples. The highest PFOS concentration of 0.94 µg/kg was detected at SFAASF-04. PFOA was detected below the SL in three of four surface soil sample locations with a maximum concentration of 0.96 µg/kg at SFAASF-05. PFHxS, PFNA, and PFBS were not detected. Relevant compounds were not detected in subsurface soil collected from these locations.

6.5.2 Boundary Sample Locations – Groundwater Results

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

Groundwater samples were collected from two well locations along the facility boundary (SFAASF-03 and SFAASF-04). The boundary wells were completed in regional groundwater due to the lack of observed perched groundwater. None of the relevant compounds were detected in groundwater samples collected from boundary wells.

A shake test was administered to samples collected from both monitoring wells along the facility boundary. Foam was not observed in either sample.

6.5.3 Boundary Sample Locations – Conclusions

Based on the results of the SI, PFBS, PFNA, and PFHxS were not detected in samples at the facility boundary. PFOS and PFOA were detected below SLs in surface soil. Relevant compounds were not detected in sub-surface soil.

Relevant compounds were not detected in groundwater monitoring wells installed for the purpose of characterizing off-facility contamination. Samples representing off-facility groundwater quality to the west (SFAASF-03 and SFAASF-04) and to the northwest (AOI01-01) suggest that PFAS compounds are not present in the regional groundwater upgradient of AOI 1. Perched groundwater was not observed at boundary monitoring well locations during the SI.

Based on the lack of SL exceedances in groundwater and soil at the boundary, further evaluation is not warranted.

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

	Location ID	AOI01-01		AOI01-02		AOI01-02		AOI01-03		AOI01-04		AOI01-05		AOI01-06		AOI01-06B		AOI01-07	
	Sample Name	AOI01-01-SB-0-2		AOI01-02-SB-0-2		AOI01-02-SB-0-2-D		AOI01-03-SB-0-2		AOI01-04-SB-0-2		AOI01-05-SB-0-2		AOI01-06-SB-0-2		AOI01-06B-SB-0-2		AOI01-07-SB-0-2	
	Parent Sample ID					AOI01-02-SB-0-2													
	Sample Date	2/8/2022		2/8/2022		2/8/2022		2/7/2022		2/7/2022		2/7/2022		2/7/2022		5/4/2022		2/8/2022	
	Depth (bgs ft)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Analyte[1,2]	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																			
Perfluorobutanesulfonic acid (PFBS)	1900	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	0.41	J	0.5	J	0.96		1.4		0.64		ND	U	ND	U	ND	U	8.3	
Perfluorononanoic acid (PFNA)	19	ND	U	0.32	J	0.51	J	ND	U	ND	U	ND	U	ND	U	ND	U	3.8	
Perfluorooctanesulfonic acid (PFOS)	13	3.1		61		86		6.5		3.6		ND	U	ND	U	ND	U	920	
Perfluorooctanoic acid (PFOA)	19	0.64		0.26	J	0.53	J	0.39	J	0.36	J	ND	U	ND	U	ND	U	1.2	

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

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

	Location ID	AOI01-08		AOI01-09		SFAASF-01		SFAASF-02		SFAASF-02		SFAASF-03-PA		SFAASF-03		SFAASF-04		SFAASF-05	
	Sample Name	AOI01-08-SB-0-2		AOI-01-09-SB-0-2		SFAASF-01-SB-0-2		SFAASF-02-SB-0-2		SFAASF-02-SB-0-2-D		SFAASF-03-PA-SB-0-2		SFAASF-03-SB-0-2		SFAASF-04-SB-0-2		SFAASF-05-SB-0-2	
	Parent Sample ID									SFAASF-02-SB-0-2									
	Sample Date	2/8/2022		5/9/2022		2/8/2022		2/8/2022		2/8/2022		2/7/2022		5/7/2022		2/7/2022		2/7/2022	
	Depth (bgs ft)	0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2		0-2	
Analyte[1,2]	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																			
Perfluorobutanesulfonic acid (PFBS)	1900	ND	U	ND	U	ND	U	0.58	J	0.59	J	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	130	ND	J	ND	U	2.7		4.5		4.7		ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	19	ND	U	0.4	J	1.8		2.9		2.9		ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	13	21		7.5		42		60		49		0.48	J	ND	U	0.94		0.93	
Perfluorooctanoic acid (PFOA)	19	0.47	J	0.68		19		30		33		0.53	J	ND	U	0.6	J	0.96	

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

Table 6-3. PFOA, PFOS, PFBS, PFNA, and PFHxS Detections in Shallow Subsurface Soil, Site Inspection Report, Santa Fe AASF

	Location ID	AOI01-01		AOI01-02		AOI01-03		AOI01-03		AOI01-04		AOI01-05		AOI01-05		AOI01-06B	
	Sample Name	AOI01-01-SB-13-15		AOI01-02-SB-13-15		AOI01-03-SB-13-15		AOI01-03-SB-6-8		AOI01-04-SB-13-15		AOI01-05-SB-13-15		AOI01-05-SB-6-8		AOI01-06B-SB-13-15	
	Parent Sample ID																
	Sample Date	4/25/2022		4/27/2022		5/4/2022		5/4/2022		5/3/2022		5/4/2022		5/4/2022		5/4/2022	
	Depth (bgs ft)	13-15		13-15		13-15		6-8		13-15		13-15		6-8		13-15	
Analyte[1,2]	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																	
Perfluorobutanesulfonic acid (PFBS)	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1600	ND	U	3		0.27	J	0.23	J	1.2		ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	ND	U	ND	U	ND	U	ND	U	0.37	J	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	ND	U	1.2		5.9		0.66		3.2		ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	250	ND	U	0.59	J	ND	U	ND	U	0.52	J	ND	U	ND	U	ND	U

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

Table 6-3. PFOA, PFOS, PFBS, PFNA, and PFHxS Detections in Shallow Subsurface Soil, Site Inspection Report, Santa Fe AASF

	Location ID	AOI01-06B		AOI01-09		SFAASF-03-PA		SFAASF-04		SFAASF-05		SFAASF-05		SFAASF-05	
	Sample Name	AOI01-06B-SB-6-8		AOI01-09-SB-13-15		SFAASF-03-PA-SB-13-15		SFAASF-04-SB-13-15		SFAASF-05-SB-13-15		SFAASF-05-SB-13-15-DUP		SFAASF-05-SB-6-8	
	Parent Sample ID											SFAASF-05-SB-13-15			
	Sample Date	5/4/2022		5/5/2022		5/1/2022		4/28/2022		5/4/2022		5/4/2022		5/4/2022	
	Depth (bgs ft)	6-8		13-15		13-15		13-15		13-15		13-15		6-8	
Analyte[1,2]	**Screening Level[1,2]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)															
Perfluorobutanesulfonic acid (PFBS)	25000	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	1600	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	160	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	250	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U

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

Table 6-4. PFOA, PFOS, PFBS, PFNA, and PFHxS Detections in Deep Subsurface Soil, Site Inspection Report, Santa Fe AASF

Location ID	AOI01-01		AOI01-02		AOI01-02		AOI01-04		AOI01-04		AOI01-09		SFAASF-03-PA		SFAASF-04	
Sample Name	AOI01-01-SB-181-182		AOI01-02-SB-113-115		AOI01-02-SB-113-115-DUP		AOI01-04-SB-109-110		AOI01-04-SB-109-110-DUP		AOI01-09-SB-111-112		SFAASF-03-PA-SB-183-184		SFAASF-04-SB-180-181	
Parent Sample ID					AOI01-02-SB-113-115				AOI01-04-SB-109-110							
Sample Date	4/26/2022		4/28/2022		4/28/2022		5/4/2022		5/4/2022		5/6/2022		5/2/2022		4/30/2022	
Depth (bgs ft)	181-182		113-115		113-115		109-110		109-110		111-112		183-184		180-181	
Analyte[1]	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (µg/kg)																
Perfluorobutanesulfonic acid (PFBS)	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	ND	U	0.32	J	ND	U	1.1	J	ND	UJ	ND	U	ND	U	ND	U
Perfluorononanoic acid (PFNA)	ND	U	ND	U	ND	U	0.32	J	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	ND	U	ND	U	ND	U	2.2	J+	ND	UJ	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	ND	U	ND	U	ND	U	0.48	J	ND	U	ND	U	ND	U	ND	U

Notes:
J = Estimated concentration.
U = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD).
J+ = Estimated concentration, biased high.
UJ = The analyte was not detected at a level greater than or equal to the adjusted Limit of Detection (LOD). However, the associated numerical value is approximate.
µg/kg = Microgram(s) per kilogram.
ft bgs = Foot (feet) below ground surface.
ND = Analyte not detected above the LOD (LOD values are presented in Appendix F).
Qual = Qualifier.

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Table 6-5. PFOA, PFOS, PFBS, PFNA, and PFHxS Results in Groundwater, Site Inspection Report, Santa Fe AASF

	Location ID	AOI01-01		AOI01-02		AOI01-02		AOI01-04		SFAASF-03		SFAASF-04	
	Sample Name	AOI01-01-GW		AOI01-02-GW		AOI01-02-GW-DUP		AOI01-04-GW		SFAASF-03-GW		SFAASF-04-GW	
	Parent Sample ID					AOI01-02-GW							
	Sample Date	5/20/2022		5/20/2022		5/20/2022		5/20/2022		5/19/2022		5/19/2022	
Analyte[1]	**Screening Level[1]**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**	**Result**	**Qual**
PFAS by LC/MS/MS compliant with QSM Version 5.3 Table B-15 (ng/L)													
Perfluorobutanesulfonic acid (PFBS)	601	ND	U	120		130		30		ND	U	ND	U
Perfluorohexanesulfonic acid (PFHxS)	39	ND	U	72		74		230		ND	U	ND	U
Perfluorononanoic acid (PFNA)	6	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanesulfonic acid (PFOS)	4	ND	U	ND	U	ND	U	ND	U	ND	U	ND	U
Perfluorooctanoic acid (PFOA)	6	ND	U	2.5		2.3	J+	38		ND	U	ND	U

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

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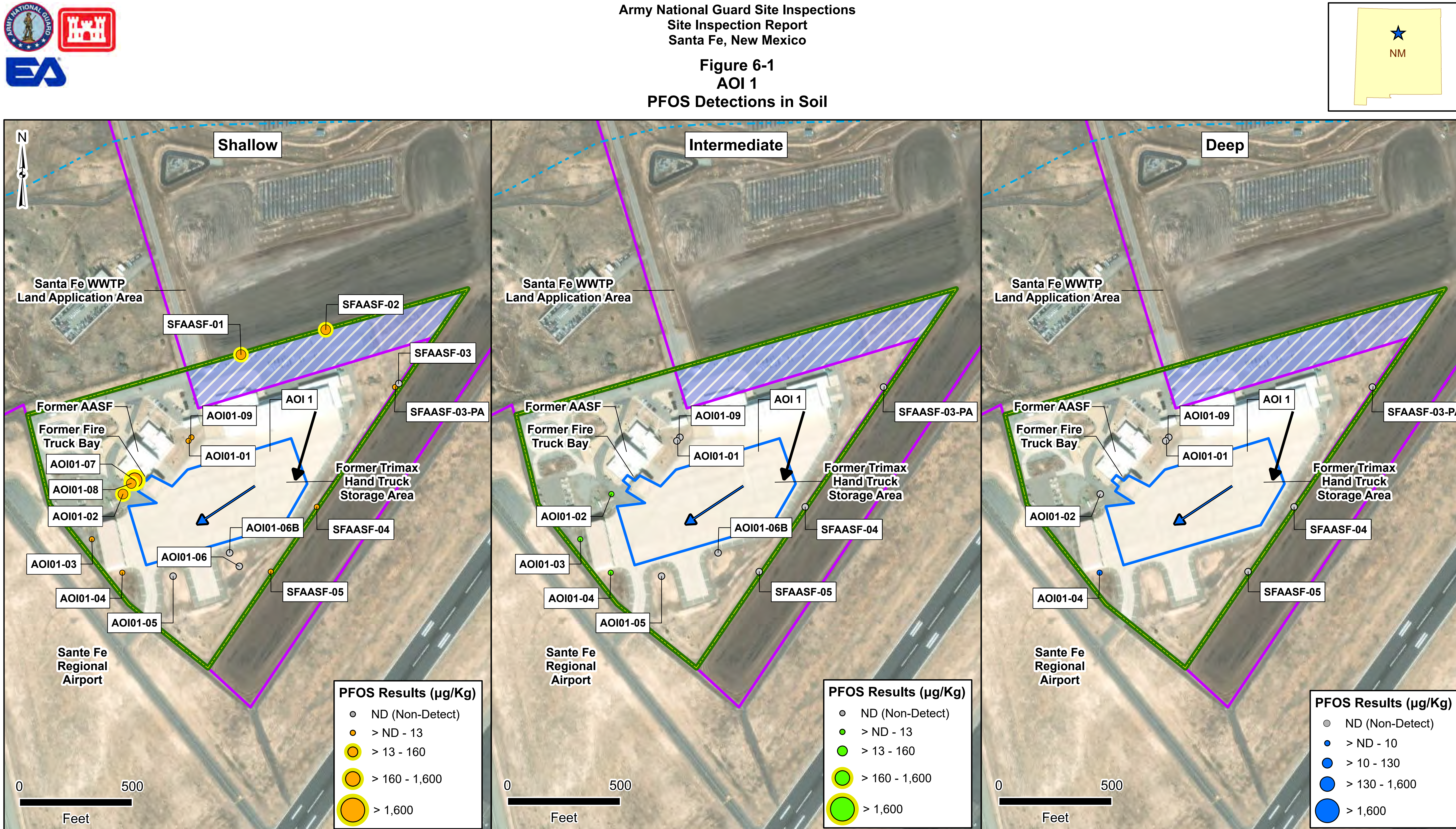
Army National Guard Site Inspections
Site Inspection Report
Santa Fe, New Mexico

Figure 6-1
AOI 1
PFOS Detections in Soil



Facility Data

Facility Boundary
Area of Interest
Adjacent Potential Source Areas
Historical WWTP Biosolid Surface Disposal Site

Hydrology/Hydrogeology

Surface Water Flow Direction
Groundwater Flow Direction (Regional)

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

Data Sources:
ESRI 2022
AECOM 2019

Date:...............................July 2023
Prepared By:...............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 13N

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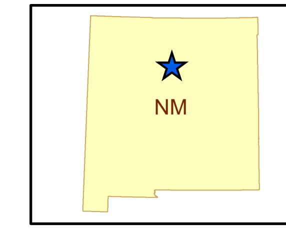
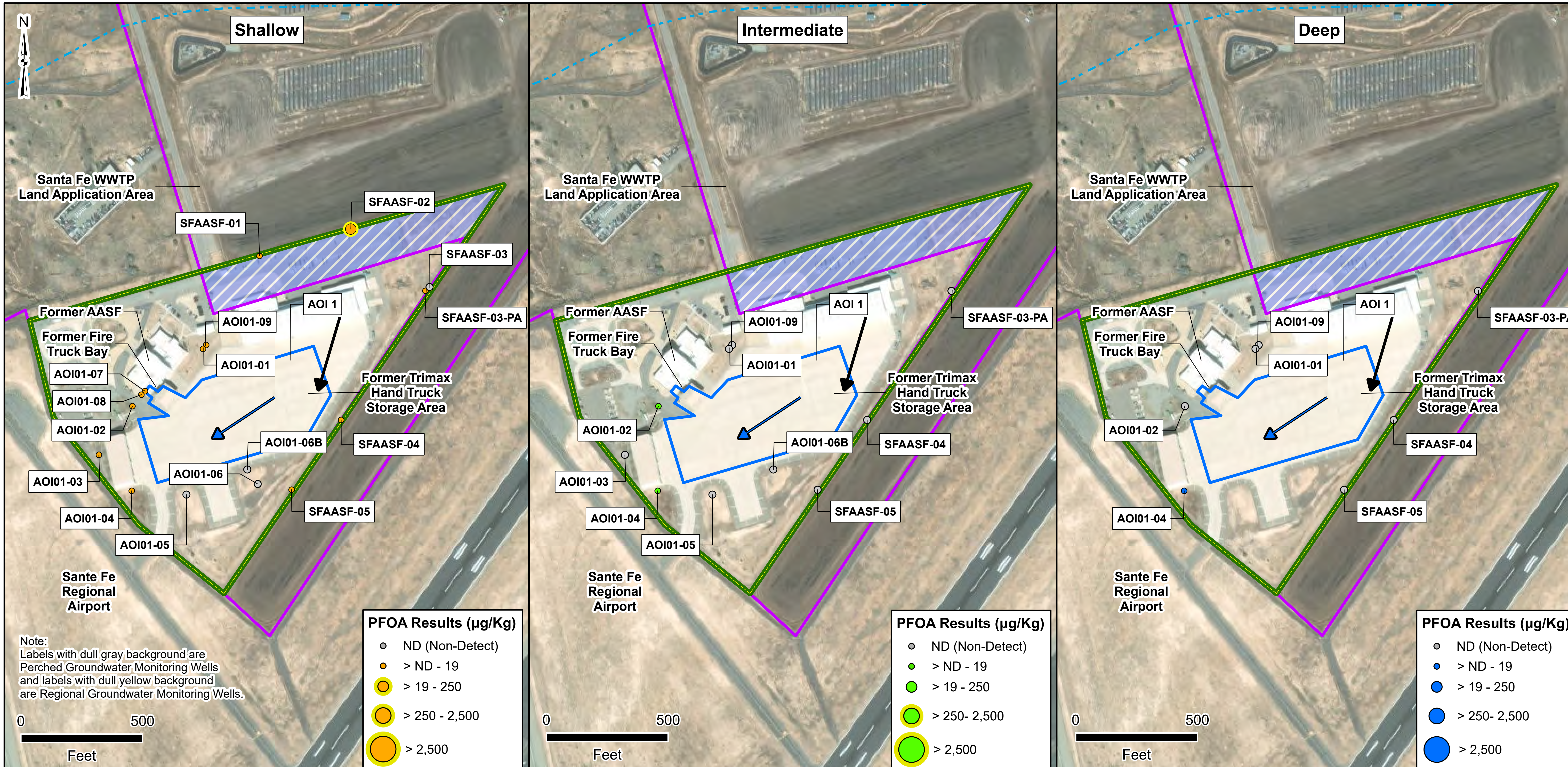
Army National Guard Site Inspections
Site Inspection Report
Santa Fe, New Mexico

Figure 6-2
AOI 1
PFOA Detections in Soil





Facility Data

- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

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

Data Sources:
ESRI 2022
AECOM 2019

Date:...............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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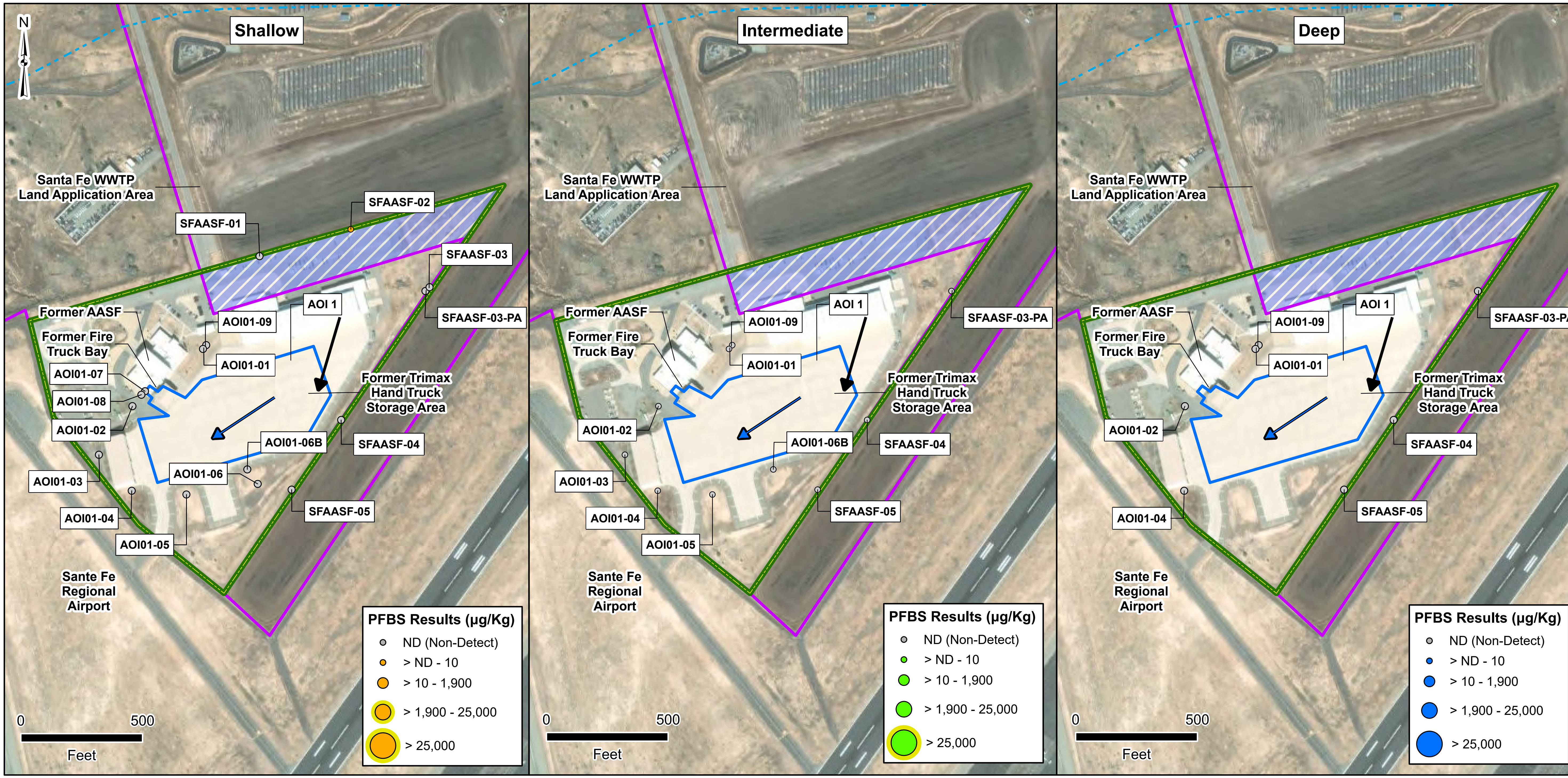
Army National Guard Site Inspections
Site Inspection Report
Santa Fe, New Mexico

Figure 6-3
AOI 1
PFBS Detections in Soil



Facility Data

- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

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

Data Sources:
ESRI 2022
AECOM 2019

Date:................................July 2023
Prepared By:...............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 13N

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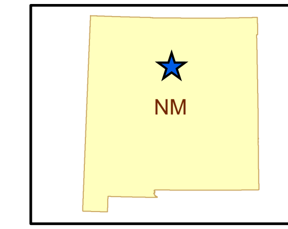
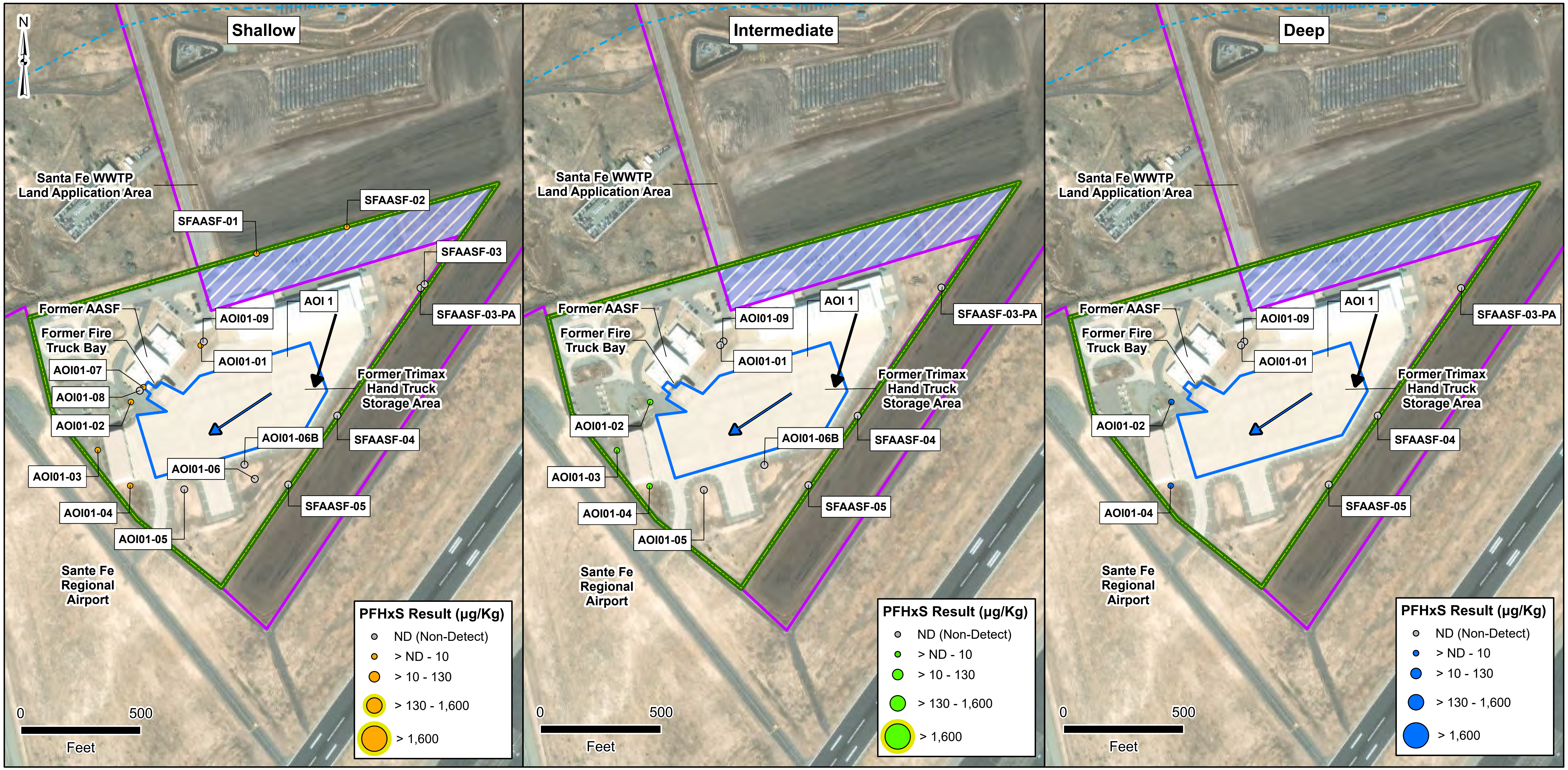
Army National Guard Site Inspections
Site Inspection Report
Santa Fe, New Mexico

Figure 6-4
AOI 1
PFHxS Detections in Soil





Facility Data

- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

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

Data Sources:
ESRI 2022
AECOM 2019

Date:...............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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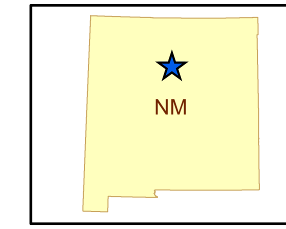
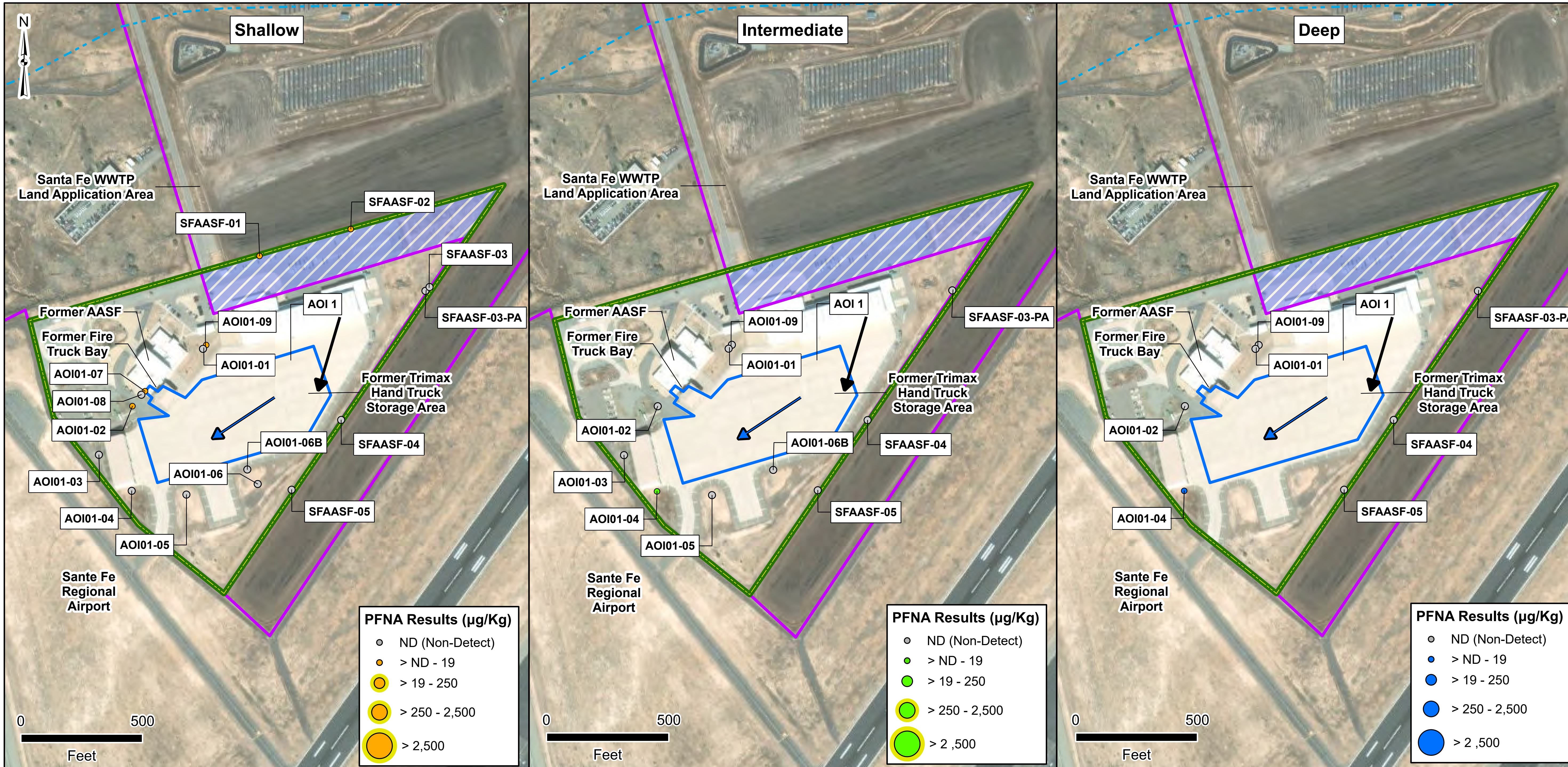
Army National Guard Site Inspections
Site Inspection Report
Santa Fe, New Mexico

Figure 6-5
AOI 1
PFNA Detections in Soil





Facility Data
- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Hydrology/Hydrogeology
- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

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

Data Sources:
ESRI 2022
AECOM 2019

Date:................................July 2023
Prepared By:.............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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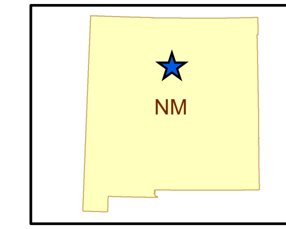
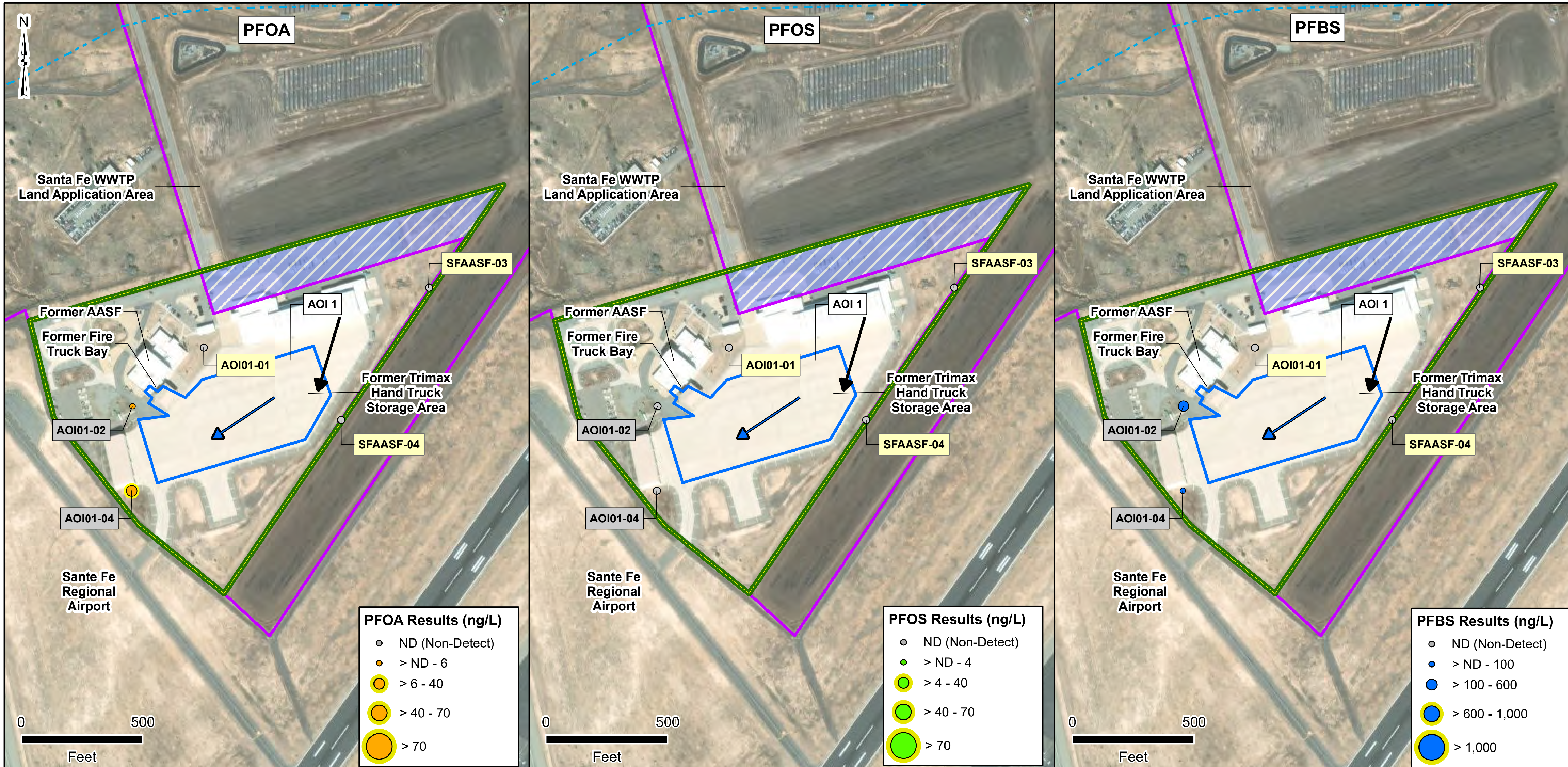
Army National Guard Site Inspections
Site Inspection Report
Santa Fe, New Mexico

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





Facility Data

- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

Notes:
PFOA = Perfluorooctanesulfonic acid
PFOS = Perfluorooctanoic acid
PFBS = Perfluorobutanesulfonic acid
Exceedances of the OSD SL are depicted with a yellow halo.
Gray labels represent Perched Groundwater Monitoring Wells and yellow labels represent Regional Groundwater Monitoring Wells

Data Sources:
ESRI 2022
AECOM 2019

Date:..............................July 2023
Prepared By:............................EA
Prepared For:...................USACE
Projection:........WGS 84 UTM 13N

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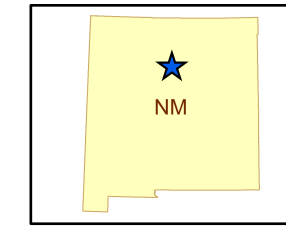
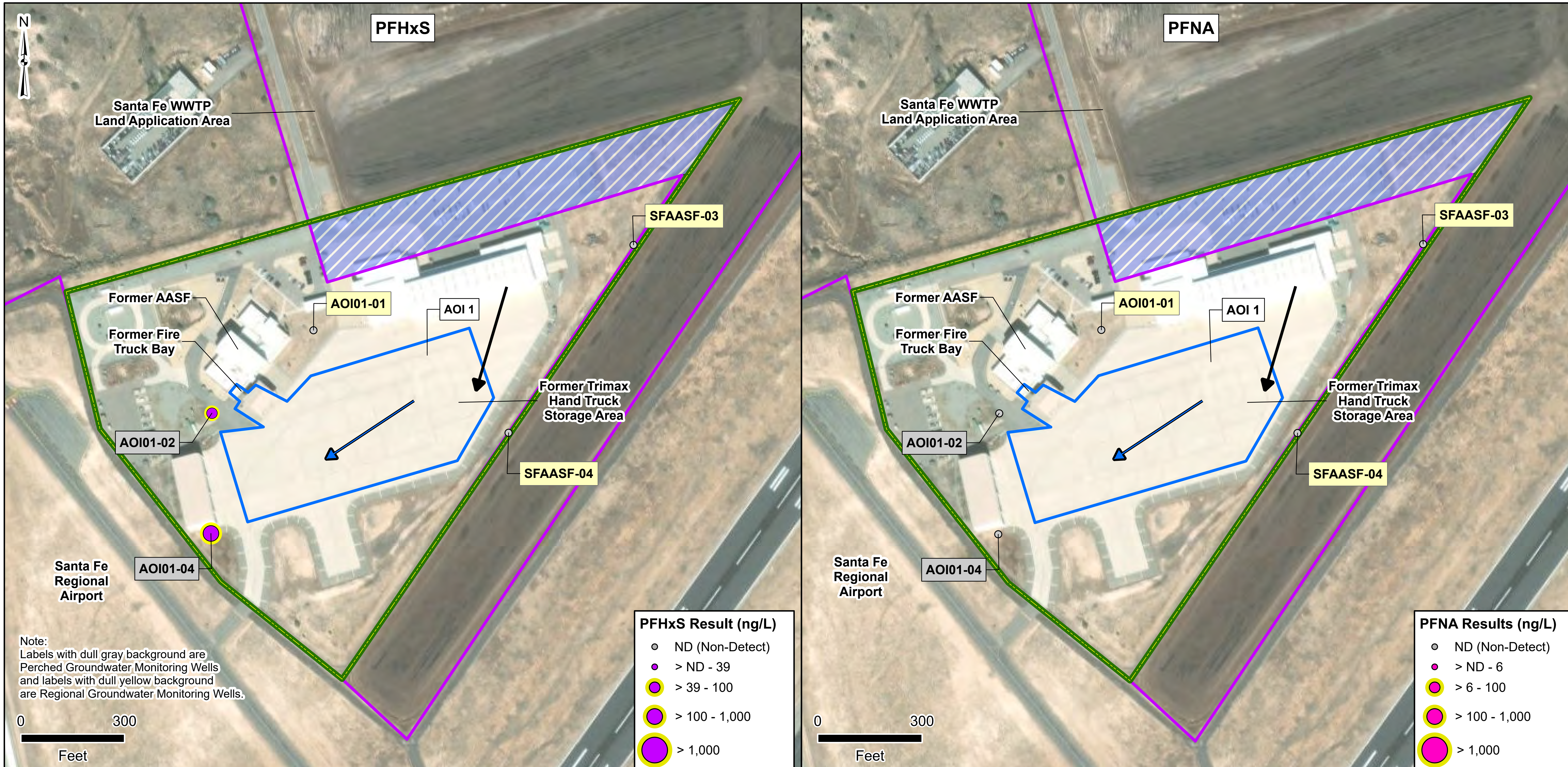
Army National Guard Site Inspections
Site Inspection Report
Santa Fe, New Mexico

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





Facility Data

- Facility Boundary
- Area of Interest
- Adjacent Potential Source Areas
- Historical WWTP Biosolid Surface Disposal Site

Hydrology/Hydrogeology

- Surface Water Flow Direction
- Groundwater Flow Direction (Regional)

Notes:
PFHxS = Perfluorohexanesulfonic acid
PFNA = Perfluorononanoic acid
Exceedances of the OSD SL are depicted with a yellow halo.
Gray labels represent Perched Groundwater Monitoring Wells and yellow labels represent Regional Groundwater Monitoring Wells

Data Sources:
ESRI 2020
AECOM 2020

Date:................................July 2023
Prepared By:...............................EA
Prepared For:....................USACE
Projection:........WGS 84 UTM 13N

Path: \\lovetongis\GISdata\Federal\Nationwide\PFAS\MAES_634250383\PROJECTS\SIReport\SantaFe\SantaFeSIReport.aprx

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7. EXPOSURE PATHWAYS

The conceptual site model (CSM) for the AOI, revised based on the SI findings, is presented on **Figure 7-1**. Please note that while the CSM discussion assists in determining if a receptor may be impacted, the decision to move from SI to RI or interim action is determined based upon exceedances of the SLs for the relevant compounds and whether the release is more than likely attributable to the DoD. A CSM was also created for the Historical WWTP Biosolid Surface Disposal Site. Because the potential source of contamination in this area is not likely a result of DoD activities, a complete pathway will not initiate the decision to move from SI to RI or to trigger a removal action but can result in additional investigation.

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
5 Potentially exposed populations.

If any of these elements are missing, the pathway is incomplete. The CSM figure uses an empty circle symbol to represent an incomplete exposure pathway. Areas with no identified complete pathway generally warrant no further action. However, the pathway is considered potentially complete if the relevant compounds are detected, in which case the CSM figure uses a half-filled circle symbol to represent a potentially complete exposure pathway. Additionally, a completely filled circle symbol is used to indicate when a potentially complete exposure pathway has detections of relevant compounds above the SLs. Areas with an identified potentially complete pathway that have detections of the relevant compounds above the SLs may warrant further investigation. Although the CSM indicates whether potentially complete exposure pathways may exist, the recommendation for future study in a 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 PFAS exposure pathways are ingestion and inhalation. Human exposure via the dermal contact pathway may occur, and current risk practice suggests it is an insignificant pathway compared to ingestion; however, exposure data for dermal pathways are sparse and continue to be the subject of PFAS toxicological study. The receptors evaluated are consistent with those listed in USEPA guidance for risk screening (USEPA 2001). Receptors at the Facility include facility workers (e.g., staff and visiting soldiers), and construction workers. Construction workers are only considered as potential future receptors due to the lack of current construction activity at the Facility. Receptors also include off-facility residential for drinking water receptors. Trespassers are not considered as receptors due to the presence of secured entry and exit points at the Facility. The CSM for AOI 1, revised based on the SI findings, is presented on **Figure 7-1**. The CSM created for the Historical WWTP Biosolid Surface Disposal Site is presented on **Figure 7-2**.

7.1 SOIL EXPOSURE PATHWAY

The SI results for soil were used to determine whether a potentially complete pathway exists between the source and potential receptors at AOI 1 or the historical WWTP biosolid surface disposal site based on the aforementioned criteria.

7.1.1 AOI 1

AOI 1 encompasses potential PFAS release areas associated with an AFFF-equipped firetruck parked within the former AASF building and Tri-Max™ 70/30 hand trucks stored at various places around the flight line and paved parking apron. AFFF releases could have occurred directly onto surface soil but may also have infiltrated soil via cracks in pavement or joints between areas that are paved with different materials.

PFOS was detected at 7 of 10 surface soil sample locations with concentrations exceeding the applicable SL in three surface soil sample locations completed at AOI 1. PFOA, PFHxS, and PFNA were detected at concentrations less than SLs at multiple locations within AOI 1. Facility workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathways for facility workers and construction workers are potentially complete.

PFOS, PFOA, PFHxS, and PFNA were detected in sub-surface soil at concentrations less than SLs. Ground disturbing activities to subsurface soil could also result in exposure to those compounds by construction workers via ingestion. Therefore, the exposure pathways for inhalation and ingestion are potentially complete for future construction workers. The CSM is presented in **Figure 7-1**.

PFAS were detected in AOI 1 groundwater samples, indicating a complete soil to perched groundwater pathway. It is not known if the perched groundwater is in hydrologic communication with the deeper regional aquifer.

7.1.2 Historical Wastewater Treatment Plant Biosolid Surface Disposal Site

The historical WWTP Biosolid Surface Disposal Site encompasses the potential PFAS release area located within the facility boundary. Historical biosolid surface disposal may have contained PFAS.

PFOS was detected at both surface soil sample locations with concentrations exceeding the applicable SL. PFOA was detected at both locations, with the concentration exceeding the SL at SFAASF-02. PFBS, PFHxS, and PFNA were detected at concentrations less than SLs at one or more locations. Facility workers and construction workers could contact constituents in surface soil via incidental ingestion and inhalation of dust. Therefore, the surface soil exposure pathway for facility workers and construction workers are potentially complete.

Subsurface soil samples were not collected during the SI. As a result, the pathways of subsurface soil to construction workers via inhalation and ingestion are considered potentially complete pending further assessment.

Due to the presence of PFAS in soil, a potentially complete soil to groundwater pathway exists. The CSM is presented in **Figure 7-2**.

7.2 GROUNDWATER EXPOSURE PATHWAY

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

7.2.1 AOI 1

PFHxS and PFOA were detected above applicable SLs in AOI 1 perched groundwater. PFBS was detected below the SL. Domestic wells are present in a direction that is potentially downgradient of AOI 1. Although it is unclear if the contaminated perched groundwater is in communication with the regional aquifer, the potential for a complete pathway is present. As a result, the groundwater exposure pathway is considered potentially complete for off-facility residents via ingestion. The CSM is presented in **Figure 7-1**.

7.2.2 Historical Wastewater Treatment Plant Biosolid Surface Disposal Site

Relevant compounds were not detected in groundwater downgradient from the historical wastewater treatment plant surface disposal site. However, subsurface soil was not sampled and perched water was not encountered, and the fate and transport of PFAS at this location is unknown. As a result, the groundwater exposure pathway to off-facility residents via ingestion is potentially complete pending further assessment. The CSM is presented in **Figure 7-2**.

7.3 SURFACE WATER/ SEDIMENT EXPOSURE PATHWAY

Surface water flow at the Facility is generally to the southwest. Two stormwater retention basins are present adjacent to the tarmac and a stormwater detention pond is present north of the former AASF. PFAS was not detected in surface soil collected from the stormwater retention basins adjacent to the tarmac; however, samples were not collected from the stormwater retention pond. The stormwater retention pond may receive runoff from PFAS-contaminated areas. As a result, the surface water/sediment exposure pathway is considered potentially complete.

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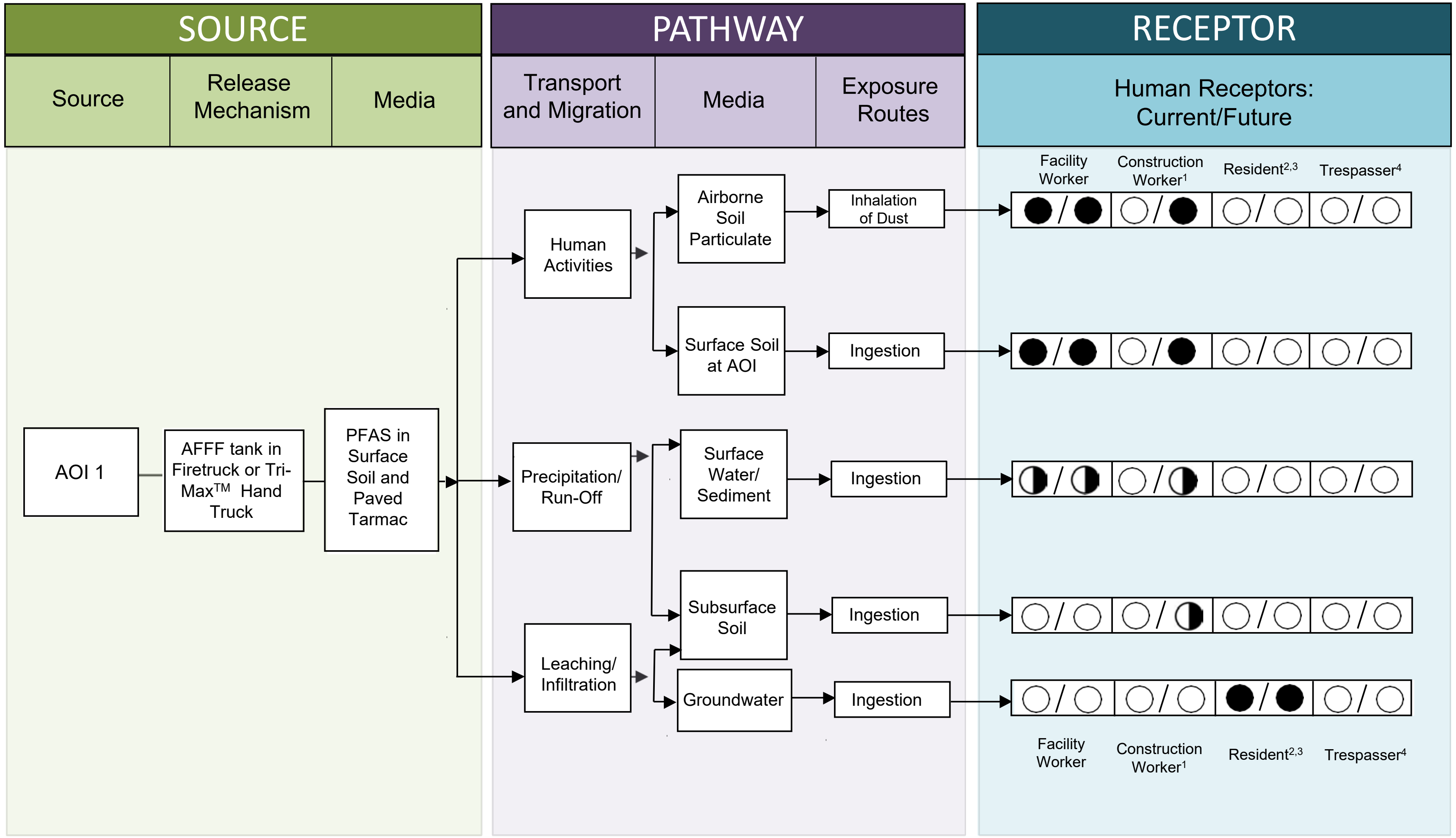

LEGEND

Flow-Chart Stops

Flow-Chart Continues

Partial / Possible Flow

Incomplete Pathway

Potentially Complete Pathway

Potentially Complete Pathway with Exceedance of Screening Level

Notes:

1. No current active construction at the facility.
2. The resident refers to off-Facility drinking water receptors.
3. Inhalation of dust for off-Facility receptors is likely insignificant.
4. Trespassers are not considered likely due to the high level of security at the facility.

Figure 7-1
Conceptual Site Model
AOI 1 Santa Fe AASF

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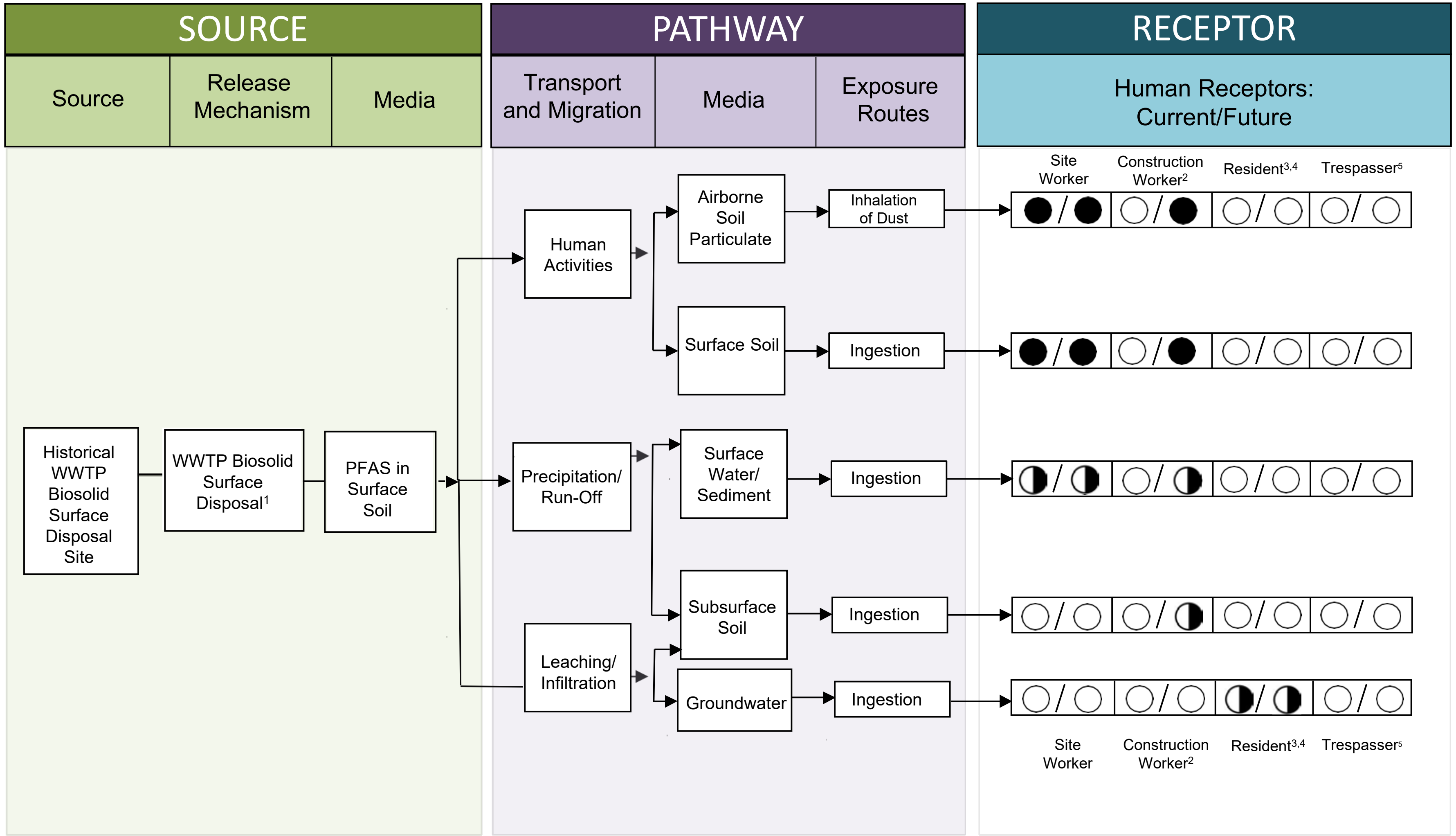

LEGEND

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

Notes:

1. Likely release mechanism for contaminated media is not the result of DoD activities.
2. No current active construction at the facility.
3. The resident refers to off-Facility drinking water receptors.
4. Inhalation of dust for off-Facility receptors is likely insignificant.
5. Trespassers are not considered likely due to the high level of security at the facility.

Figure 7-2
Conceptual Site Model
Historical WWTP Biosolid Surface Disposal Site
Santa Fe AASF

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8. SUMMARY AND OUTCOME

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

8.1 SITE INSPECTION ACTIVITIES SUMMARY

The SI field activities were conducted during two mobilizations. Field activities for the first mobilization were conducted from 7 to 8 February 2022 and consisted of hand augering and surface soil sample collection. The second mobilization was conducted 25 April through 3 June 2022. Field activities included sonic and DPT drilling, collection of soil samples, installation of permanent monitoring wells, groundwater gauging and sampling, and collection of spatial data. Field activities were conducted in accordance with the UFP-QAPP Addendum (EA 2021a), except as noted in **Section 5.8**.

To fulfill the project DQOs set forth in the approved SI UFP-QAPP Addendum (EA 2021), samples were collected and analyzed for a subset of 24 compounds by LC/MS/MS compliant with QSM 5.3 Table B-15. The 24 PFAS analyzed as part of the ARNG SI program are specified in **Section 5.6** of this SI Report. Samples collected and analyzed are as follows:

- Thirty-eight (38) soil grab samples from 16 boring locations
- Five (5) grab groundwater samples from five permanent monitoring wells
- Forty-six (46) quality assurance/quality control 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 the AOI 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 CSM was refined to assess whether a potentially complete pathway exists between the source and potential receptors for potential exposure at the AOI, which is described in **Section 7**.

8.2 OUTCOME

Based on the results of this SI, further evaluation under CERCLA is warranted in an RI for AOI 1 (**Table 8-1**). The Historical WWTP Biosolid Surface Disposal Site will also be assessed to determine if the contamination present poses a detrimental impact on human health for personnel at the Facility or the environment. Based on the CSMs developed and revised based on the SI findings, the exposure pathways are potentially complete for facility workers and construction workers during surface soil-disturbing activities and to construction workers during subsurface soil-disturbing activities from historical DoD activities. These pathways are also potentially complete from historical non-ARNG activities at the historical WWTP biosolid surface disposal site. Additionally, there are potentially complete exposure pathways for residential drinking water receptors from releases during historical DoD activities and from historical non-ARNG sources at the Facility. Sample analytical concentrations collected during this SI were compared against the project SLs in soil and groundwater, as described in **Table 6-1**.

A summary of the results of the SI data relative to the SLs is as follows:

- At AOI 1:
  - PFOS was detected in surface soil above the SL in three of the 10 sampling locations with a maximum concentration of 920 µg/kg. PFOA, PFNA, and PFHxS were detected in soil samples at concentrations which did not exceed the SLs. PFBS was not detected in any soil samples collected from AOI 1.
  - PFOA and PFHxS were detected in groundwater at concentrations above the SL with a maximum concentration of 38 ng/L and 230 ng/L, respectively. PFHxS exceeded the SL in two of the three groundwater wells. Both wells with exceedances are screened in perched groundwater, downgradient of the suspected source area. PFBS was detected in both downgradient wells, but concentrations did not exceed the SL. PFOA and PFNA were not detected in groundwater at AOI 1.
- At the Historical WWTP Biosolid Surface Disposal Site:
  - PFOA was detected in both surface soil sample locations and exceeded the SL in one location with a maximum concentration of 33 µg/kg.
  - PFOS was detected in both surface soil sample locations above the SL with a maximum concentration of 60 µg/kg.
  - PFBS, PFHxS, and PFNA were detected below SLs in one or more surface soil samples.
  - Neither subsurface soil nor groundwater were sampled in this area.
- At the facility boundary:
  - PFOA and PFOS were detected in three of four surface soil samples at concentrations below SLs. PFNA, PFBS, and PFHxS were not detected in surface soil samples.
  - PFOA, PFOS, PFBS, PFNA, and PFHxS were not detected in shallow or deep subsurface soil samples.
  - PFOA, PFOS, PFBS, PFNA, and PFHxS were not detected in groundwater samples.

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 AOI 1 should be considered for further investigation under CERCLA and undergo an RI. It also summarizes SI results to determine if the historical WWTP biosolid surface disposal site should be considered for non-CERCLA evaluation.

Table 8-1. Summary of Site Inspection Findings

Area	Potential Release Area	Soil	Groundwater-On-Site	Groundwater – Facility Boundary	Future Action
AOI 1	Former Firetruck Bay and Tri-Max™ Hand Truck Storage Area	●	●	○	Proceed to RI
Historical WWTP Biosolid Surface Disposal Site	Historical WWTP Biosolid Surface Disposal Site	●	◑	○	Further Evaluation[1]

Notes:
1. This area will be assessed during the RI to determine if the contamination present poses a detrimental impact on human health for personnel at the facility or the environment

WWTP = Wastewater Treatment Plant

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