DRAFT FINAL

UNIFORM FEDERAL POLICY–
QUALITY ASSURANCE PROJECT PLAN
ADDENDUM

REMEDIAL INVESTIGATIONS FOR PER- AND POLYFLUOROALKYL SUBSTANCES AT MULTIPLE AIR NATIONAL GUARD INSTALLATIONS

TRUAX FIELD, WISCONSIN

Prepared for:

ANG Readiness Center
NGB/A4VR

December 2021

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Draft Final
Uniform Federal Policy–
Quality Assurance Project Plan Addendum

Remedial Investigations for Per- and Polyfluoroalkyl Substances at Multiple Air National Guard Installations

Truax Field, Wisconsin

Prepared for:

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December 2021
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EA Project No. 6332106

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
°F	Degrees Fahrenheit
µg/L	Microgram(s) per liter
AEC	Anion exchange capacity
AFFF	Aqueous film-forming foam
Amec Foster Wheeler	Amec Foster Wheeler Environment and Infrastructure, Inc.
ANG	Air National Guard
APP	Accident Prevention Plan
ASD	Assistant Secretary of Defense
ASTM	ASTM International
B.A.	Bachelor of Arts
bgs	Below ground surface
BRRTS	Bureau for Remediation and Redevelopment Tracking System
B.S.	Bachelor of Science
C	Carbon
CA	Corrective Action
CEC	Cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIH	Certified Industrial Hygienist
CMQ/OE	Certified Manager of Quality/Organizational Excellence
COPC	Chemical of potential concern
CQCS	Contractor Quality Control Supervisor
CSM	Conceptual site model
CSP	Certified Safety Professional
DCRA	Dane County Regional Airport
DoD	Department of Defense
DPT	Direct-push technology
DQO	Data quality objective
DUA	Data usability assessment
EA	EA Engineering, Science, and Technology, Inc., PBC
EC	Electrical conductivity
ELAP	Environmental Laboratory Accreditation Program
EM	Environmental Manager
EPA	U.S. Environmental Protection Agency
ES	Enforcement standard
Eurofins	Eurofins TestAmerica Sacramento, California or Eurofins Lancaster Laboratories Environmental

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

foc	Fraction organic carbon
ft	Foot/feet
FTA	Fire Training Area
gal	Gallon(s)
GIS	Geographic information system
HA	Health Advisory
HDPE	High-density polyethylene
HEF	High expansion foam
HPT	Hydraulic profiling tool
HTRW	Hazardous, toxic, and radioactive waste
IDW	Investigation-derived waste
IDQTF	Intergovernmental Data Quality Task Force
Kd	Distribution coefficient
Koc	Organic carbon partition coefficient
LC/MS/MS	Liquid chromatography tandem mass spectrometry
m	Meter(s)
mg/kg	Milligram(s) per kilogram
mL	Milliliter(s)
MMSD	Madison Metropolitan Sewerage District
M.S.	Master of Science
MS	Matrix spike
MSD	Matrix spike duplicate
MW	Monitoring well
NGB/A4VR	National Guard Bureau/Environmental Restoration Branch
ng/g	Nanogram(s) per gram
ng/L	Nanogram(s) per liter
No.	Number
Oscar Meyer	Oscar Meyer and Company
PA	Preliminary Assessment
Pace	Pace Mobile Laboratory
PE	Professional Engineer
PFAA	Perfluoroalkyl acid

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PFAS	Per- and polyfluoroalkyl substances
PFBS	Perfluorobutane sulfonate
PFC	Perfluorinated compound
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctane sulfonate
PG	Professional Geologist
PhD	Doctor of Philosophy
PM	Project Manager
POC	Point of Contact
POL	Petroleum, oil, and lubricant
PPE	Personal protective equipment
PRL	Potential Release Location
QA	Quality assurance
QAPP	Quality Assurance Project Plan
QC	Quality control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
Reyco	Reyco Madison, Inc.
Reynolds	Reynolds Transfer and Storage Co., Inc.
RI	Remedial investigation
RPM	Restoration Program Manager
SCS	SCS Engineers
SI	Site inspection
SL	Screening Level
SOP	Standard operating procedure
SSHP	Site Safety and Health Plan
SVOC	Semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TO	Task Order
TOC	Total organic carbon
TOP	Total oxidizable precursor
UFP	Uniform Federal Policy
USACE	U.S. Army Corps of Engineers
VOC	Volatile organic compound

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

WDNR	Wisconsin Department of Natural Resources
WIANG	Wisconsin Air National Guard
WPDES	Wisconsin Pollutant Discharge Elimination System
WWTP	Wastewater Treatment Plant

INTRODUCTION

This Draft Final Uniform Federal Policy (UFP)-Quality Assurance Project Plan (QAPP) Addendum, Remedial Investigations (RIs) for Per- and Polyfluoroalkyl Substances (PFAS) at Multiple Air National Guard (ANG) Installations has been prepared to support RI activities for PFAS at Truax Field ANG Base Truax Field/the Base), Wisconsin (Figure I-1).

EA Engineering, Science, and Technology, Inc., PBC (EA) has prepared this UFP-QAPP Addendum under contract with the U.S. Army Corps of Engineers (USACE)–Omaha District, W9128F-18-D-0026; Task Order (TO) Number (No.) W9128F20F0325 for the National Guard Bureau/Environmental Restoration Branch (NGB/A4VR). Services covered under this Programmatic UFP-QAPP are defined in the Performance Work Statement, dated 17 August 2020, and includes investigations to evaluate the nature and extent of PFAS from the identified potential release locations (PRLs) and other potential non-aqueous film-forming foam (AFFF) and secondary PFAS releases at Truax Field.

The RI includes site characterization activities to delineate the nature and extent of PFAS resulting from past AFFF releases and other potential non-AFFF (e.g., chrome plating facilities, car washes) and secondary PFAS releases (e.g., landfills, oil/water separators). Activities also include updating the conceptual site model (CSM) and completing a risk assessment. For the purposes of this RI, delineation is defined as the lateral and vertical extent of PFAS in all impacted media. At the conclusion of RI activities, the data should be sufficient to:

- Develop a comprehensive understanding of the vertical and lateral extent of PFAS in soil, groundwater, sediment, and surface water

- Determine the source strength of residual PFAS in soil within the unsaturated source zones

- Identify potential exposure pathways to humans (and incorporate into the CSM)

- Complete a human health risk assessment.

This UFP-QAPP Addendum has been prepared in accordance with the UFP for QAPPs (Intergovernmental Data Quality Task Force [IDQTF] 2005a, 2005b, and 2005c), using optimized UFP-QAPP Worksheets in accordance with IDQTF guidance (IDQTF 2012). This document provides the detailed strategy for conducting the RI at Truax Field; defines the sampling objectives and methods that will be used; and includes the project organization, data quality objective (DQO) process, generic schedule, current CSM, project quality objectives, and techniques that may be applied to sites and decision criteria. This site-specific QAPP includes an Accident Prevention Plan (APP) that discusses the site-specific hazards associated with this work (Appendix A).

Table I-1 illustrates the installation-specific UFP-QAPP Addendum worksheets that were modified as part of the Installation-Specific Addenda.

Table I-1: Comparison of Programmatic UFP-QAPP to Installation-Specific Addenda

Worksheet	Applicable Document
Worksheets #1 and #2 – Title and Approval Page and QAPP Identifying Information	Programmatic/Site-Specific
Worksheets #3 and #5 – Project Organization and QAPP Distribution	Programmatic/Site-Specific
Worksheets #4, #7, #8 – Personnel Qualifications and Sign-off Sheet	Programmatic/Site-Specific
Worksheet #6 – Communication Pathways	Programmatic/Site-Specific
Worksheet #9 – Project Planning Session Summary	Programmatic/Site-Specific
Worksheet #10 – CSM	Site-Specific
Worksheet #11 – Project/DQOs	Programmatic/Site-Specific
Worksheet #12 – Measurement Performance Criteria	Programmatic
Worksheet #13 – Secondary Data Uses and Limitations	Site-Specific
Worksheets #14 and #16 – Project Tasks and Schedule	Programmatic/Site-Specific
Worksheet #15 – Screening Limits and Laboratory-Specific Detection/ Quantitation Limits	Programmatic
Worksheet #17 – Sampling Design and Rationale	Site-Specific
Worksheet #18 – Sampling Locations and Methods	Site-Specific
Worksheets #19 and #30 – Sample Containers, Preservation and Hold Times	Programmatic
Worksheet #20 – Field Quality Control (QC) Summary	Programmatic/Site-Specific
Worksheet #21 – Field Standard Operating Procedures (SOPs)	Programmatic
Worksheet #22 – Field Equipment Calibration, Maintenance, Testing, and Inspection	Programmatic
Worksheet #23 – Analytical SOPs	Programmatic
Worksheet #24 – Analytical Instrument Calibration	Programmatic
Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection	Programmatic
Worksheets #26 and #27 – Sample Handling, Custody, and Disposal	Programmatic
Worksheet #28 – Analytical QC and Corrective Actions (CAs)	Programmatic
Worksheet #29 – Project Documents and Records	Programmatic
Worksheets #31, #32 and #33 – Assessments and CA	Programmatic
Worksheet #34 – Data Verification and Validation Inputs	Programmatic
Worksheet #35 – Data Verification Procedures	Programmatic
Worksheet #36 – Data Validation Procedures	Programmatic
Worksheet #37 – Data Usability Assessment (DUA)	Programmatic

All personnel involved in fieldwork will be required to review the Programmatic UFP-QAPP and associated SOPs as well as this UFP-QAPP Addendum prior to performing fieldwork.

1. BACKGROUND

PFAS are classified as emerging environmental contaminants based on increasing regulatory interest, potential risk to human health and the environment, and evolving regulatory standards. U.S. Environmental Protection Agency (EPA) issued drinking water lifetime Health Advisories (HAs) for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) in May 2016 (EPA 2016a, 2016b).

In 2019, the Department of Defense (DoD) adopted screening levels (SLs) for soil and groundwater, as described in a memorandum from the Office of the Assistant Secretary of Defense (ASD) titled Investigating PFAS Substances within the DoD Cleanup Program, dated 15 October 2019 (ASD 2019). The ANG program under which these RIs will be performed follows this DoD policy, with an updated memorandum issued in 2021 (ASD 2021). During the site inspection (SI) at Truax Field, multiple PRLs were investigated (Figure I-2). Based on results of the SI, the next phase executed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process is the RI. The ASD SLs apply to three compounds: PFOS, PFOA, and perfluorobutanesulfonic acid (PFBS). In April 2021, EPA issued an updated toxicity assessment that included human health toxicity values for PFBS that lowered the SL (EPA 2021). SLs to be used in the RI are summarized in Worksheet #15 of the Programmatic UFP-QAPP (EA 2021).

2. PURPOSE AND SCOPE OF WORK

The overall goal of this project is to conduct the RI at Truax Field where AFFF or other PFAS containing materials were stored/used and releases confirmed in the SI, in compliance with CERCLA, as amended; the National Contingency Plan (40 Code of Federal Regulations Part 300); and in compliance with USACE Requirements and Guidance for field investigations including specific requirements for sampling for PFAS. RI activities will be consistent with the ANG guidance for conducting investigations under the Environmental Restoration Program (ERP) (ANG 2009).

The site-specific addenda in addition to the Programmatic UFP-QAPP (EA 2021) will provide instruction and guidance to support the collection, analysis, and reporting of data generated under this TO to ensure that data are scientifically valid, legally defensible, and meet the established quality assurance (QA) and QC objectives. These documents have been developed to address the data acquisition, management, sampling locations, sample analysis, installation information, and DQOs.

3. PLAN ORGANIZATION

This UFP-QAPP Addendum includes the optimized UFP-QAPP worksheets (listed in Table I-1) that were updated from the Programmatic UFP-QAPP (EA 2021). This UFP-QAPP Addendum for Truax Field is intended to provide the site-specific problem definition, approach to resolving the problem, and QA/QC activities to ensure that the data collected are useable. The table of contents of this document presents a listing of all the UFP-QAPP worksheets.

The appendix to this UFP-QAPP, provided as a separate tab, is as follows:

- Appendix A – APP/Site Safety and Health Plan (SSHP).

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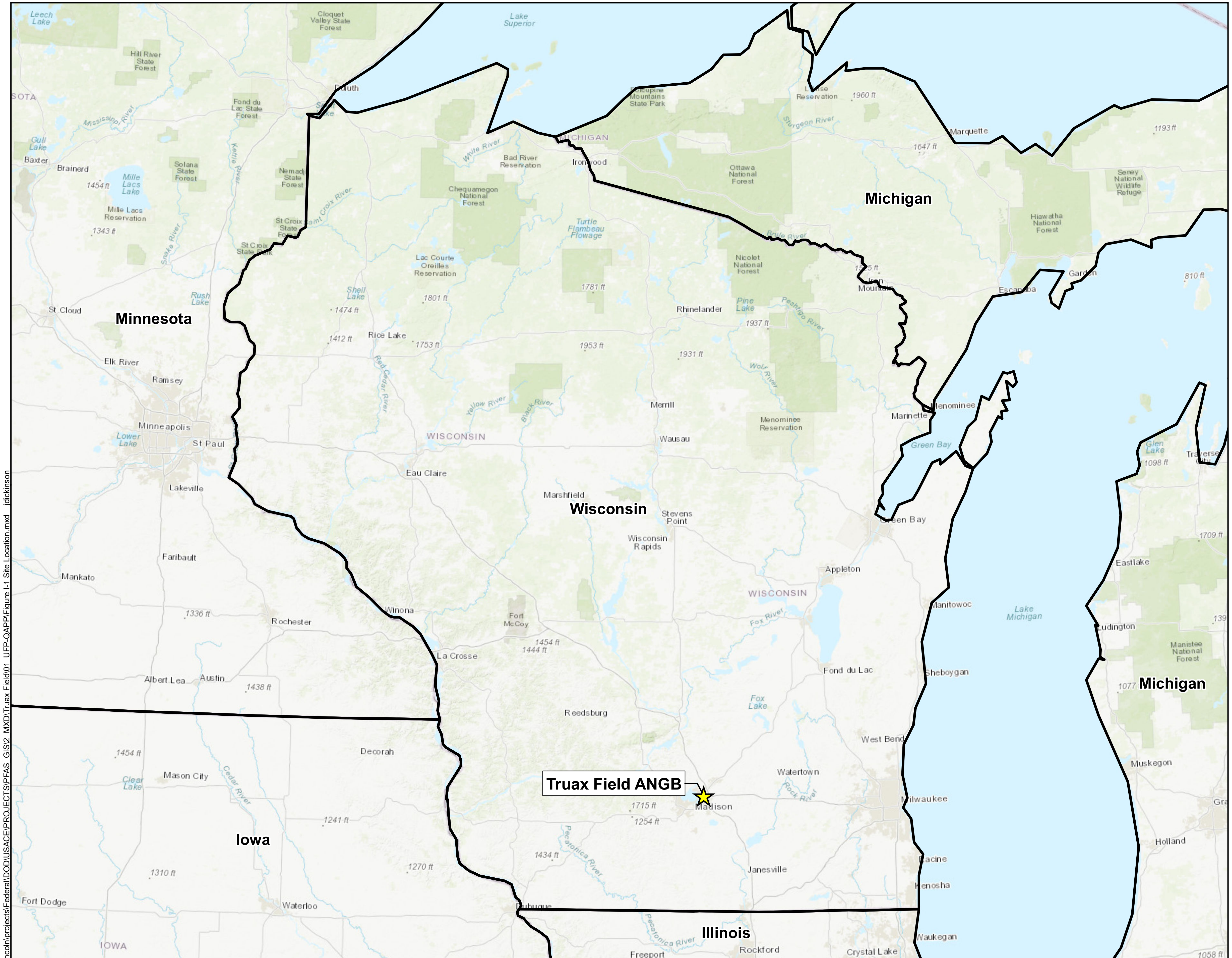

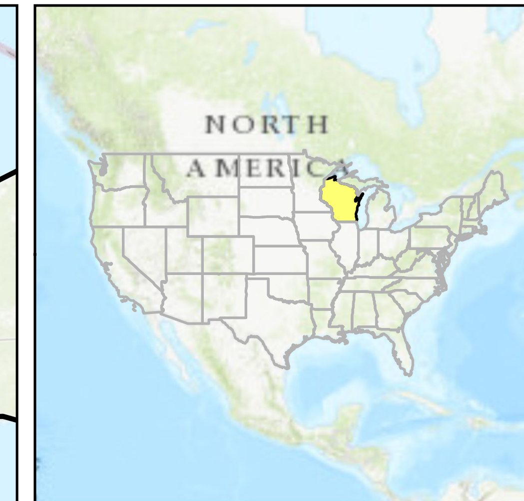

☆ Site Location

Map Date: 10/12/2021

Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet

N

0 35 70

Miles

1 in = 35 miles

Figure I-1
Truax Field Air National Guard Base
Site Location Map
RIs at Multiple ANG Installations
Madison, Wisconsin

\\lincoln\projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure I-1 Site Location.mxd jdickinson

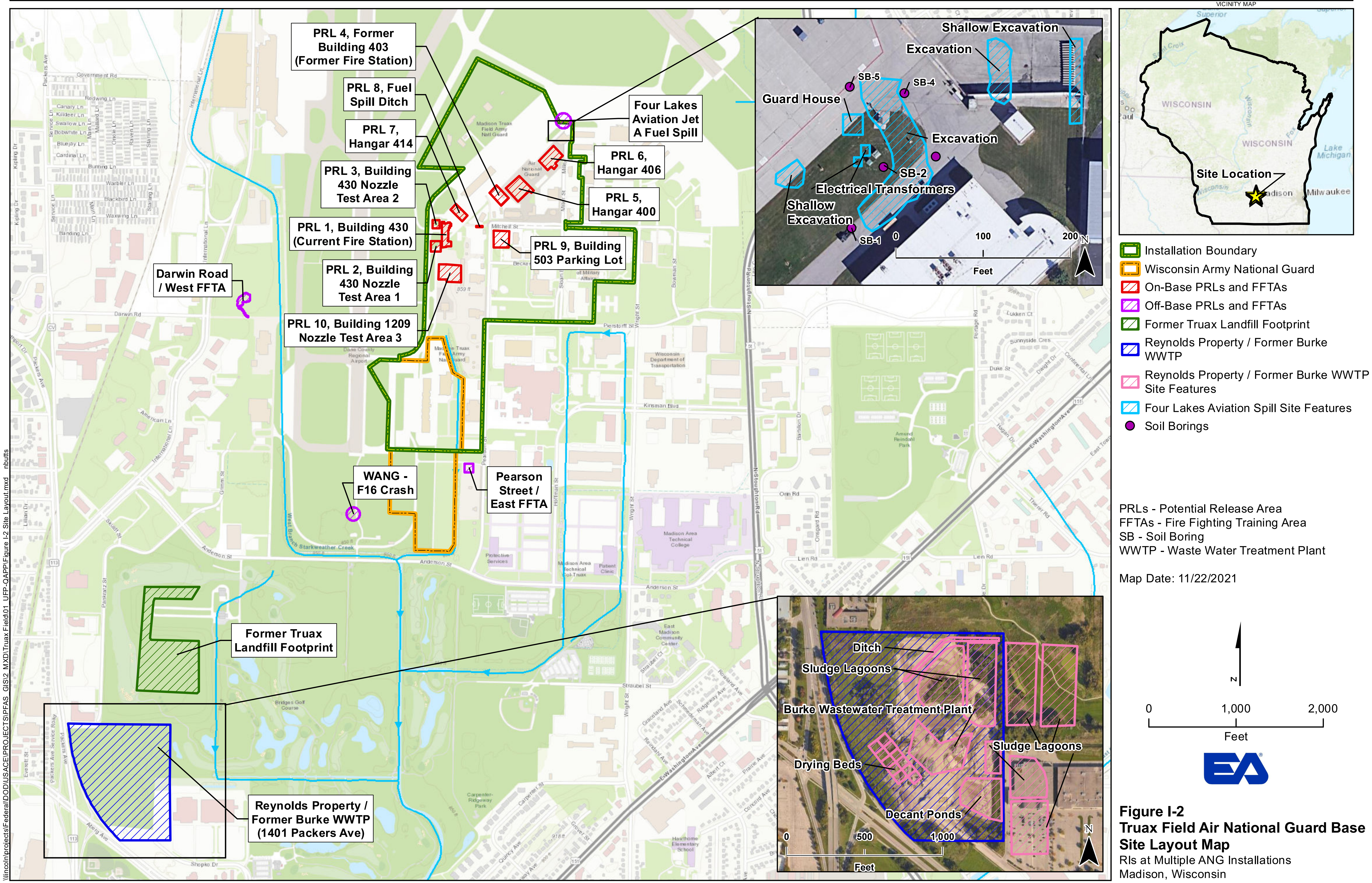

Figure I-2
Truax Field Air National Guard Base
Site Layout Map
RIs at Multiple ANG Installations
Madison, Wisconsin

QAPP Worksheets #1 & 2: Title and Approval Page

Site Number/Code: Truax Field, Wisconsin

Contractor Name: EA

Contract Number: W9128F-18-D-0026

Work Assignment Number: TO W9128F20F0325

Document Title: UFP–QAPP Addendum, RIs for PFAS at Multiple ANG Installations, Truax Field, Wisconsin

Project Lead: NGB/A4VR

Preparation Date: December 2021

Investigative Organization
Signature/Date: ______________________________
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Project Lead
Signature/Date: ______________________________
Printed Name/Title: Bill Myer, Professional Geologist (PG)/NGB/A4VR Restoration Program Manager (RPM) (Truax Field)

Contracting Organization PM
Signature/Date: ______________________________
Printed Name/Title: Richard Anderson, PG/USACE–Omaha District PM

Other Approval
Signature/Date: ______________________________
Printed Name/Title: Jon Ritterling, PE/EA Senior Technical Reviewer

Other Approval
Signature/Date: ______________________________
Printed Name/Title: Samantha Saalfield, Doctor of Philosophy (PhD)/EA Program Chemist

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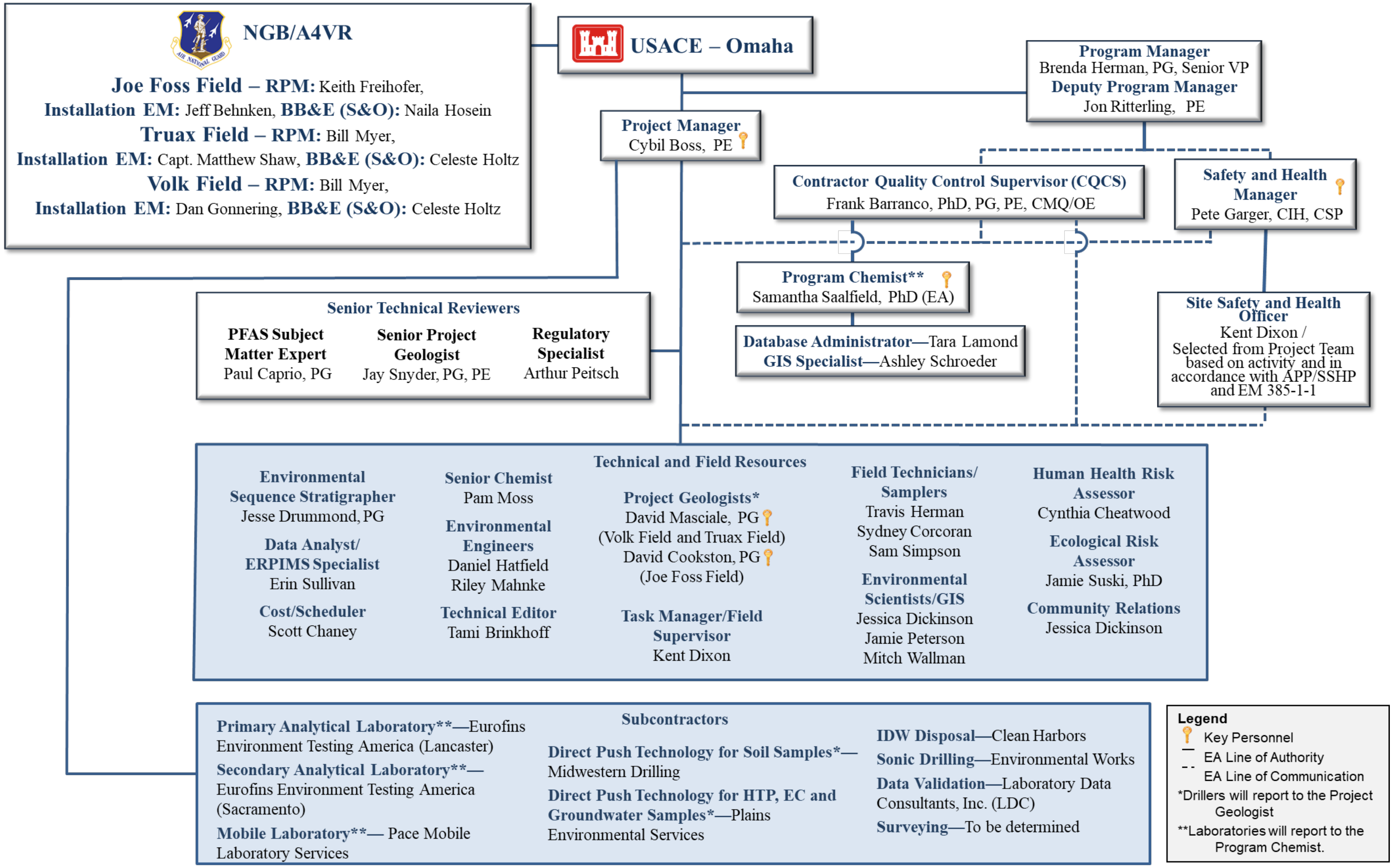
QAPP Worksheets #3 & 5: Project Organization and QAPP Distribution



Distribution List:

Draft: 2 Electronic copies to USACE PM
2 Electronic copies NGB/A4VR RPM
1 Hard Copy and 2 Electronic Copies to Installation Environmental Manager (EM)

Draft-Final and Final: 2 Electronic copies to USACE PM
2 Electronic copies NGB/A4VR RPM
1 Hard Copy and 2 Electronic Copies to Installation EM
1 Hard Copy and 2 Electronic Copies to WDNR

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QAPP Worksheets #4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Organization: EA				
Brenda Herman	EA Program Manager	Master of Science (M.S.) Geology, Bachelor of Science (B.S.) Biology; 30 years of experience managing environmental contracts and projects, including 18 years of experience as a Program Manager for USACE contracts	PG	
Jon Ritterling	EA Deputy Program Manager	M.S. Civil Engineering, B.S. Civil Engineering; 25+ years of experience in environmental remediation, including managing hazardous, toxic, and radioactive waste (HTRW) projects at multiple locations across the United States, including more than 20 military installations, both active and inactive. More than 15 years of experience providing oversight of RIs.	PE, PM (EA)	
Cybil Boss	EA PM	B.S. Chemical Engineering; 15+ years of experience in environmental remediation and project management, including planning, investigation, remedial design, task and field manager supervision, data analysis and reporting, and regulatory/stakeholder engagement and coordination at multiple U.S. Air Force installations.	PE, PM (EA)	
Frank Barranco	EA Contractor Quality Control Supervisor (CQCS)	B.S. Geology, PhD Environmental Science and Engineering; 25 years of experience in environmental site investigation, providing technical and quality direction on contaminated groundwater/soil/sediment projects. 11 years as Corporate QC Officer for $600 million of federal contracts, including remediation activities at HTRW and emerging contaminants (PFAS) sites. 2,000+ hours of training in quality management, HTRW field sampling protocol, sustainability, DQO development, contaminant transport, and environmental engineering.	PhD, PG, PE, Certified Manager of Quality/Operational Excellence (CMQ/OE)	
Samantha Saalfield	EA Program Chemist	PhD Earth Sciences, Bachelor of Arts (B.A.) Geology-Chemistry; 15 years of environmental chemistry experience. Supported chemistry needs on 50+ project sites with environmental contamination, including PFAS at 5 sites. Ensures laboratories used have proper	PhD	

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
		DoD Environmental Laboratory Accreditation Program (ELAP) method/lab-specific accreditations. Oversees analytical method selection, laboratories, and data validators.		
Pete Garger	EA Health and Safety Manager	M.S. Environmental Health Science, B.A. Chemistry; 33 years of experience in managing and conducting industrial hygiene services including inspections and oversight on environmental remediation projects. Oversees development of: APP/SSHP; identification/evaluation of chemical, physical, radiological, and biological hazards; medical surveillance programs; personal protective equipment; employee training requirements; environmental monitoring; and proper reporting.	Certified Industrial Hygienist (CIH) Certified Safety Professional (CSP)	
Organization: Eurofins Lancaster Laboratories Environmental (Analytical Laboratory)				
Vanessa Badman	PM	B.S. in Biology, 18 years of environmental laboratory experience.	Not applicable	
Dorothy Love	Director, QA	B.S. Environmental Health; 30 years of experience in laboratory analyses and quality control.	Not applicable	

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Organization: Eurofins TestAmerica Sacramento, California (Analytical Laboratory)				
David Alltucker	PM	B.A. Chemistry, 13 years of experience in laboratory project management.	Not applicable	
Lisa Stafford	QA Manager	B.S. Chemistry, 13 years of experience in the analytical industry to her current role in the QA Department.	Not applicable	
Organization: Pace Mobile Laboratory (Onsite Screening Laboratory)				
Mike Rossi	PM	B.S. Chemistry, M.S. Environmental Engineering, 30 years of experience.	Not applicable	
Patrick Letterer	QA Manager	B.A. Biology, 35 years of experience	Not applicable	
Organization: Laboratory Data Consultants (Data Validation)				
Stella Cuenco	Principal Chemist and Program Manager	B.S. Chemistry; over 27 years of environmental laboratory and data validation experience under DoD and EPA guidelines. Experience includes performance of data validation in liquid chromatography tandem mass spectrometry (LC/MS/MS) for PFAS.	Not applicable	
Pei Geng	PM	M.S. Chemistry; 28 years of overall laboratory and data validation experience, and 21 years of data validation experience. Performs data validation for LC/MS/MS PFAS analyses, and serves as a peer reviewer in the initial validation review process.	Not applicable	

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QAPP Worksheet #6: Communication Pathways

Discussion with stakeholders in the decision process will be aided by the submittal of monthly progress reports detailing activities at ANG installations.

Communication Drivers	Responsible Entity	Name	Phone Number	Role/Procedure (Timing, pathways, etc.)
Modifications to Program	USACE PM	Richard Anderson	402-995-2295	Primary point of contact (POC) for USACE. Programmatic information, coordination issues, and draft and final reports. Coordination and resolution of issues between USACE/NBG/A4VR/ ANG/State Regulatory Agencies. Modifications to the program require approval by the POC prior to implementation. By email or phone as needed.
Modifications of Contractual Responsibilities	USACE Contracting Officer	Lisa Sirois	402-995-2072	All contracting, work/invoice approval/authorization. By email or phone as needed.
Contractual Modification and/or Program Performance	EA Program Manager	Brenda Herman	402-584-7000 410-913-1681 (cell)	Communicates with USACE Contracting Officer and other USACE personnel at the programmatic level regarding overall performance.
Manage All Project Phases/Overall Technical Leads	EA PM	Cybil Boss	402-817-7613 402-304-3243 (cell)	Responsible for overall management and execution of the project. Maintains lines of communication with USACE, NGB/A4VR and ANG. Communicates field changes to the USACE/NGB/A4VR/ ANG and discusses options prior to implementation. Receives direction from the USACE regarding communications with other stakeholders.
Project Safety	EA Health and Safety Supervisor	Pete Garger	410-527-2425	Communicates with EA PM regarding safety issues. Reviews and approves safety plans, conducts audits, and exercises stop-work authority, if needed.
Project QA/QC and CAs	EA CQCS	Frank Barranco, PhD, PG, PE, CMQ/OE	410-584-7000	Communicates with EA PM regarding QC/QA issues. Reviews and approves CA plans.
Modifications to Analytical CAs	EA Program Chemist	Samantha Saalfield, PhD	410-584-7000	Reports on the adequacy, status, and effectiveness of the QA program by phone or email during weekly progress calls and as needed. Reports project nonconformance issues to the USACE Chemist within 2 business days of notification from the Laboratory PMs. Any analytical or laboratory CAs or modifications will be approved by the USACE Chemist prior to implementation.

Communication Drivers	Responsible Entity	Name	Phone Number	Role/Procedure (Timing, pathways, etc.)
Laboratory CAs and QA Modifications	Eurofins Lancaster Laboratory QA Manager	Dorothy Love	717-556-7327	Reports project nonconformance issues within 1 week to the Laboratory PM in person or by phone, or email.
Laboratory CAs and QA Modifications	Eurofins TestAmerica Sacramento QA Manager	Lisa Stafford	916-373-5600	Reports project nonconformance issues within 1 week to the Laboratory PM in person or by phone, or email.
Laboratory CAs and QA Modifications	Pace Mobile Laboratory (Pace) QA Manager	Patrick Letterer	608-221-8700	Report project nonconformance issues within 1 week to the Laboratory PM in person or by phone, or email.
Modifications to Eurofins analytical responsibilities	Eurofins Lancaster PM	Vanessa Badman	717-556-9762	Report project nonconformance issues within 1 week to the Program Chemist by phone, or email
Modifications to Eurofins analytical responsibilities	Eurofins TestAmerica Sacramento PM	David Alltucker	906-373-5600	Report project nonconformance issues within 1 week to the Program Chemist by phone, or email
Modifications to Pace analytical responsibilities	Pace PM	Mike Rossi	802-839-0544	Report project nonconformance issues within 1 week to the Program Chemist by phone, or email
Modification to data validation responsibilities	Data Validation PM	Pei Geng	760-827-1100	Report project nonconformance issues within 1 week to the Program Chemist by phone, or email.
Installation Interface	NGB/A4VR RPM and Installation EM	Bill Myer Captain Matthew Shaw	240-612-8473 608-245-4739	Communicate project scope/schedule and coordinate logistics between project team and installation personnel on an as-needed basis, documented via phone records and emails. Facilitate information transfer between contractor and installation and support contractor acquisition of site-specific information (i.e., drawing layers, access information, utility maps, etc.) as needed to conduct the RI.
Regulatory Agency Interface	NGB/A4VR RPM and/or Installation EM	Bill Myer Captain Matthew Shaw	240-612-8473 608-245-4739	Communicate technical approaches, schedule, and decisions directly to regulatory agencies' representative(s) on an as-needed basis, documented via phone records and emails. Facilitate/support setup of project planning meeting(s) with regulator, USACE and NGB/A4VR, document distribution and comment/response process.

QAPP Worksheet #9: Project Planning Session Summary

INTRODUCTORY REGULATORY CALL (TRUAX FIELD)

Title: Introductory Regulatory Call
Meeting Location: Teleconference
Date of Session: 3 February 2021

Participants:

Attendees	Organization/TO Role
Stephen Ales	WDNR/PM for Airport Activities
Steve Martin	WDNR/Regional Team Supervisor for Remediation and Redevelopment Program
Mike Kirchner	DCRA/Marketing
Amy Tutwiler	DCRA/Attorney
Tim Astfalk	DCRA/Water and Wastewater PM
Theresa Brandabur	DCRA/Representing Army properties at the DCRA
Lt. Col. Daniel Statz	115th Fighter Wing/Acting Vice Commander
Lt. Col. Michael Dunlap	115 CES/Base Civil Engineer
Michael Hinma	115 CES/CEIE/EM, Truax Field (Acting)
Susan Gustke	115 CES/CEIE/State EM
Penny Ripperger	115th Fighter Wing/Director of Public Affairs
Bridget Esser	115th Fighter Wing/Legislative Liaison
Jim King	NGB/A4VR/Environmental Restoration Manager, Volk Field and Truax Field
Keith Freihofer	NGB/A4VR/Environmental Restoration Manager, Joe Foss Field
Celeste Holtz	BB&E, Inc./POC for Volk Field and Truax Field
Richard Anderson	USACE/PM
Andrea Sansom	USACE/Project Chemist
Brian Boccellato	USACE/Project Geologist
Cybil Boss	EA/PM
Jon Ritterling	EA/Senior PM
Jessica Dickinson	EA/Environmental Scientist

Notes/Comments:

1. Introductions

- Introductions were provided from WDNR, 115th Fighter Wing (Truax Field), USACE–Omaha District Project Delivery Team, National Guard Bureau (NGB) team, and EA. The list of attendees is provided under Participants.

2. Current/Future PFAS Activities at Truax Field (115th Fighter Wing)

- Lt. Col. Dunlap stated that the NGB contracted through USACE with EA for the RI at Truax Field. Stephen requested an organizational chart to understand the project hierarchy.

- The F-35 Beddown sampling has been completed in collaboration with Steve (WDNR) and constitutes approximately 18-19 construction projects. This also includes demolition of existing buildings to create space for new buildings. Soil samples were collected at over 95 locations. Sample results are still coming in and additional sampling (7 locations) is planned.

- As part of the F-35 Beddown sampling, a Materials Management Plan was prepared by the 115th Fighter Wing for submittal to WDNR (Steve). Media samples were analyzed for 36 PFAS in addition to volatile organic compounds (VOCs). For the purposes of waste management, soil was categorized as a solid waste. A discharge permit for de-watering is not anticipated as part of the construction activities. The excess soil will have hauled off-Base to a landfill.

3. Investigation Activities

- For the off-Base SI, a scoping meeting is planned for early March 2021. The objective of the off-Base SI is to evaluate potential drinking water wells (both public and private) in Summer 2021.

- Steve asked if WDNR can have input on the off-Base SI? He mentioned that WDNR has the ability to connect with people who have knowledge of wells within the area. He also stated that WDNR would like to provide input on the sampling criteria prior to being finalized.

- Wisconsin has state rules governing environmental investigations (NR 700) like CERCLA that should be followed as part of the investigative process. NR 140 and NR 141 (monitoring wells [MWs]) were also mentioned. In instances where NR 141 cannot be met, a variance can be issued.

- Wisconsin does not have a promulgated standard for PFAS but is moving toward 20 parts per trillion PFOS, PFOA, or combined as the SL.

- NR 716 (SIs) was also mentioned.

4. Dane County Regional Airport

- The Guard is a tenant at DCRA. Mike mentioned that DCRA is planning to treat water at the ANG outfalls. DCRA may have analytical results to release as part of their efforts to identify the source of groundwater issues.

- Mike also mentioned that DCRA is conducting a treatability study.

- DCRA has conducted extensive sampling for PFAS at outfalls and accessible storm sewer locations.

- Stephen mentioned that as we build a CSM of the storm sewer system at the airport, PFAS has moved around through the system.

- Mike mentioned that DCRA is lining 2 storm sewers and removing sediment. The treatability study is being conducted at 2 outfalls that are significant contributors of PFAS.

- Steve inquired about ANG capacity to facilitate interim actions and mentioned that WDNR required a Work Plan for interim action from the ANG by mid-April 2021.

- Jim mentioned that ANG is letting data drive the decisions instead of jumping to solutions such as isolating one area and planning a dig and haul activity.

- Mike mentioned that DCRA has detailed information collected from numerous locations and described that the high-water table conditions within the area have allowed groundwater to infiltrate into the stormwater system and then move around within the system.

- Mike mentioned that DCRA has identified loading and sources and the WDNR stated that they feel like data has been collected by DCRA to facilitate some decision-making.

- Steve asked if the F-16 crash area on the south side of the runway will be excluded, and EA indicted that this location will be investigated during the RI.

5. Community Involvement

- Mike requested to be part of the review process for documents on behalf of DCRA.

- ANG is working on funding/contracting for a Community Involvement Plan and Restoration Advisory Board in Madison in conjunction with this effort. ANG has coordinated with the airport at other installations and DCRA will be part of the process.

- Lt. Col. Statz indicted that follow-up may occur as ANG is working on funding avenues at the local level.

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QAPP Worksheet #10: Conceptual Site Model

This project involves review of the existing CSM from the preliminary assessment (PA)/SI as well as utilizing any newly acquired information pertaining to source area(s), migration pathways, and receptors including hydrology, hydrogeology, geology, topography, and sampling results at Truax Field and the surrounding areas to inform the proposed sampling strategy and complete the RI. The preliminary CSM supporting the RI for Truax Field is described in this worksheet.

The Wisconsin Air National Guard (WIANG) is located at Truax Field at DCRA in south-central Wisconsin approximately 6 miles northeast of the City of Madison (Figure I-1). In 1942, the Madison Municipal Airport was renamed Truax Field when operation of the airfield was transferred to the U.S. Army Air Corps. Following the conclusion of World War II, the U.S. Army Air Corps was deactivated, and the field was returned to the City of Madison. WIANG was established in 1948 and stationed at Truax Field. In 1952, the installation was returned to active duty by the U.S. Air Force and renamed Truax Air Force Base. In 1968, the portions of Truax Air Force Base not reverted to civilian control (deeded to the City of Madison) were turned over to WIANG as Truax Field ANG Base. WIANG has operated multiple aircraft from Truax Field under several different unit designations. Truax Field is currently the home of the 115th Fighter Wing. WIANG has exclusive licensed rights to approximately 130 acres of the airport property under a U.S. Air Force lease (Leidos 2015). The following preliminary CSM is intended to support the objective of identifying, evaluating, and remediating areas of PFAS releases that occurred as a result of WIANG.

10.1 PREVIOUS INVESTIGATIONS

Several investigations have been conducted at Truax Field to identify potential locations of historic environmental releases of AFFF from usage and storage. The objectives and findings of these investigations are summarized below.

In August 2015, PA activities for Truax Field were conducted by BB&E, Inc. The objective of the PA was to identify potential sites of historic environmental releases of PFAS, specifically from AFFF usage and storage. The PA site visit process included review of any documented Fire Training Areas (FTAs) in operation since 1970, and any other use or release of AFFF, and the completion of a site reconnaissance. No former or current FTAs were identified within the boundaries of Truax Field. Based on past use and storage of AFFF at the Base, the PA identified nine PRLs where releases of perfluorinated compounds (PFCs) might have occurred, including hangars, fire stations, storage areas, firefighting equipment testing areas, etc. It should be noted that the term PFC used during the PA/SI stage of investigation has been superseded by “PFAS” for accuracy. The findings of AFFF use and storage at each of the PRLs are documented in the December 2015 PFC PA Site Visit Report (BB&E, Inc. 2015). The PRLs included in this RI are described in detail in Section 10.9 – Nature and Extent of PFAS. One potential PRL, Building 510 (Supply), was recommended for no further action as a result of the PA. Building 510 is the location of indoor storage of four drums of AFFF on a wooden pallet, with no potential release mechanism (i.e., floor drains or nearby doors) and no documented releases.

In November 2017, SI activities were conducted by Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler). The objectives of the SI were to determine the presence or absence of PFAS at each PRL and the Base Boundary and, based on the findings:

- Determine if PRL is eligible for a decision of no further action
- Assess if PFAS are migrating off-Base
- Provide data which can be used for developing DQOs if further investigations are recommended.

The SI activities included the following:

- Thirty soil borings to a maximum depth of 15 feet (ft) below ground surface (bgs), or first encountered groundwater, at the PRLs using direct-push technology (DPT) methods. Two soil samples were collected from each of the 27 borings associated with PRLs.
- Twelve temporary MWs were installed at locations assumed to be hydraulically downgradient of the PRL areas (including the Base Boundary) using DPT methods. One groundwater sample was collected at each temporary well.

Amec Foster Wheeler recommended further investigations of each of the nine PRLs as a result of groundwater and/or soil exceedances. The findings of the SI are documented in the Final Phase 1 Regional SIs for PFCs Report (Amec Foster Wheeler 2019) and are summarized in Section 10.9 – Nature and Extent of PFAS.

Multiple previous environmental investigations were also conducted at Truax Field related to other contaminants or site construction activities. Information obtained from the investigation reports (summarized in Worksheet #13) was also used in development of this CSM.

10.2 SITE FEATURES

Current and historical site features and land use relevant to the CSM are discussed in this section.

10.2.1 Facility Surface and Subsurface Structures

Sanitary sewer management structures at Truax Field discharge to the Madison Metropolitan Sewerage District (MMSD). According to interviews conducted as part of the PA, the Base had received calls from MMSD inquiring about the potential presence of foam (PFAS) in sanitary sewer discharges (BB&E, Inc. 2015). As discussed further in Section 10.9.1 (Potential Release Locations Inside the Base Boundary), several PRLs contained floor drains and/or oil-water separators that discharged to the sanitary sewer lines. The locations of sanitary sewer lines are shown on Figure 10-1.

Stormwater management structures at Truax Field direct precipitation and other runoff through surface and subsurface infrastructure such as ditches, culverts, and storm sewers that outfall to Starkweather Creek. In addition to discharging directly to the creek, the runoff from Truax Field also enters the DCRA stormwater system. The location of the outfalls and their drainage areas are shown on Figure 10-1. The following description of outfall locations and drainage areas for DCRA was provided to WDNR by DCRA as part of the Wisconsin Pollutant Discharge Elimination System (WPDES) Permit No. WI 0048747-04-0 renewal application process in 2019 (Kirchner 2019).

The drainage area for Outfalls 001, 002, and 034 is the same and includes the west ramp and the two deicing pads located adjacent to the south ramp. Outfall 001 is for stormwater runoff during the non-deicing season (typically mid-May to mid-October) and for runoff during the deicing season that meets the discharge requirements of the WPDES permit. Water that does not meet the discharge requirements of the WPDES permit is discharged to Outfall 002 (a sanitary sewer) after being pumped to underground storage tanks. Runoff that is pumped to the underground storage tanks and found to meet the WPDES permit discharge requirements, can be discharged to Outfall 034. Outfall 003 drains an area north and east of the west ramp. The Outfall 003 drainage area includes taxiways, runways, and infield areas. Outfall 032 drains an area east of the west ramp and includes the east ramp, the south ramp, part of the Truax Field WIANG base, taxiways, runways, and infield areas. The Outfall 101 drainage area includes the containment areas for the WIANG fuel tanks and fuel transfer areas. The Outfall 102 drainage area includes the containment area for the WIANG base fueling truck parking area.

In April, May, and June 2019, Mead & Hunt collected samples at the request of WDNR at outfalls that are sampled as part of the Airport's WPDES permit. Monitoring was conducted during wet and dry weather conditions, and the results were reported to WDNR on 7 October 2019 (Kirchner 2019). Additional sampling by Mead & Hunt was completed to evaluate the presence of PFAS in the Airport's stormwater system as part of the DCRA Initial SI Work Plan for Bureau for Remediation and Redevelopment Tracking System (BRRTS) Activity No. 02-13-584472 (Mead & Hunt 2020a). Monitoring was conducted during dry weather conditions in February 2020. The locations and results of the sampling are presented in Section 10.9 – Nature and Extent of PFAS.

DCRA is planning a construction project to line the stormwater pipes to prevent inflow and infiltration. Historic documentation does not suggest that an inflow and infiltration study has been completed for DCRA or Truax Field.

10.2.2 Land Use

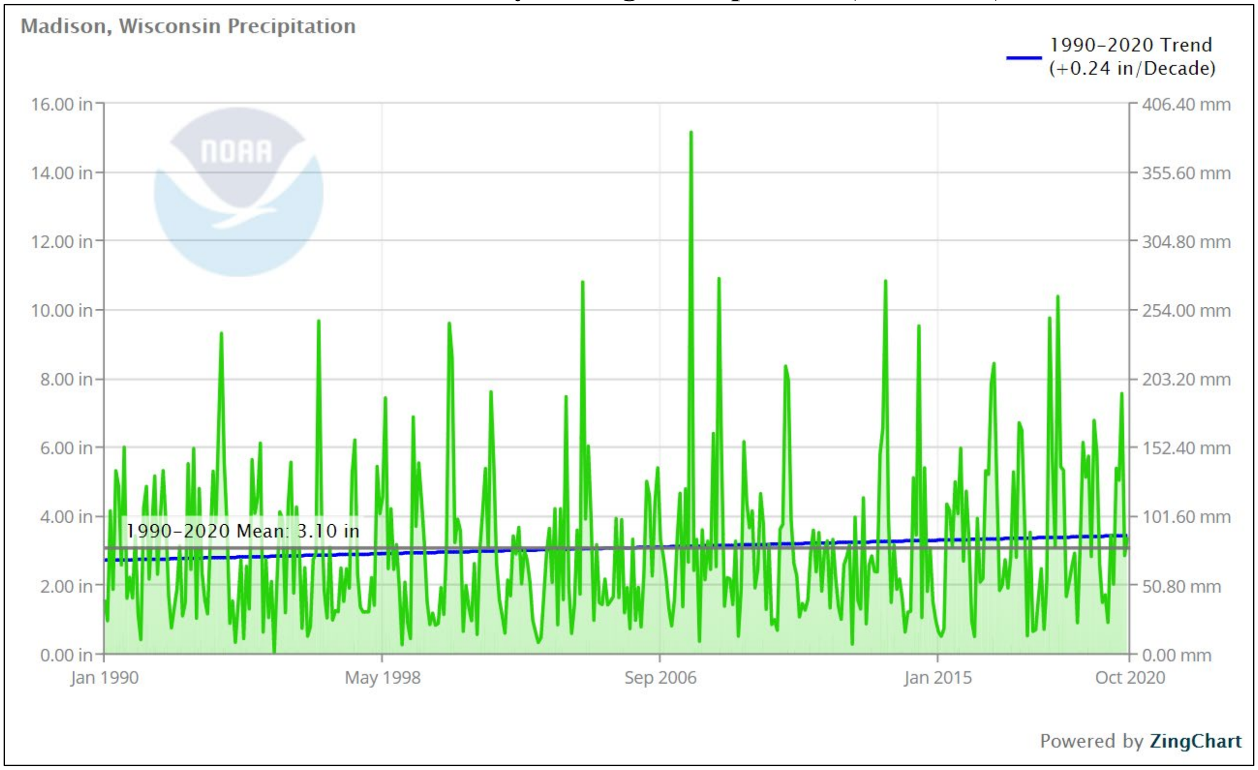
WIANG has exclusive licensed rights to the approximately 130 acres that comprise Truax Field (entirely located within the DCRA boundary) under a U.S. Air Force lease (Leidos 2015). The airport is zoned as for airport district usage and surrounded by properties zoned for industrial, business, and residential use (Amec Foster Wheeler 2019). Undeveloped areas (open space areas) include airfield buffers, open fields, and areas set aside to comply with safety requirements related to weapons storage and maintenance. The southeastern portion of the installation is densely developed with pavements and facilities supporting the 115th Fighter Wing operations. Land uses in these areas include airfield pavement areas, aircraft maintenance, aircraft operations, industrial, command and support, and special categories. Historical land uses inside and outside the Base boundary that are potential (or confirmed) PFAS release areas are discussed in Section 10.9 (Nature and Extent of PFAS).

To the north and west, the installation is bordered by DCRA runways, taxiways, and open space. To the southeast, the installation is bordered by a developed commercial industrial area with Covance (renaming as Labcorp Drug Development) and Madison Area Technical College as the larger entities. Bridges Golf Course is located to the south of the installation.

10.3 CLIMATE

Dane County, Wisconsin, including the City of Madison and Truax Field, has a humid continental climate, which is characterized by variable weather patterns and a large seasonal temperature variance. Overnight low temperatures can be well below freezing in winter, with moderate to occasionally heavy snowfall and temperatures reaching 0 degrees Fahrenheit (°F) (-18 degrees Celsius [°C]). High temperatures in summer average in the lower 80s°F (27–28°C), often accompanied by high humidity levels (Amec Foster Wheeler 2019). According to the National Oceanic and Atmospheric Administration (2021), the mean monthly precipitation (Exhibit 1) for the period 1990–2020 is 3.10 inches (87.43 centimeters). The 30-year trend in all three values suggests Dane County, like the region overall, is experiencing an increase in minimum temperature (+0.6°F/decade), maximum temperatures (+0.4°F/decade), and precipitation (+0.24 inches/decade).

Exhibit 1 Monthly Average Precipitation (1990-2020)



Because much of the Base is paved, infiltration and evapotranspiration of surface water are negligible (Amec Foster Wheeler 2019). Truax Field stormwater management infrastructure and surface water drainage are discussed further in Sections 10.2.1 (Facility Surface and Subsurface Structures) and 10.5 (Surface Water).

10.4 TOPOGRAPHY

Truax Field is located near the western margin of the Great Lakes Section of the Central Lowlands Physiographic Province within an area that was covered by the Laurentide Ice Sheet during the Wisconsin Glaciation. The regional topography is generally characterized by a hummocky surface of the unconsolidated sediment. Numerous northeast-southwest oriented glacial drumlins are interspersed with outwash streams and marshes that drain toward major lakes of the region, and ultimately southeast to the Yahara River. The Base is located on predominantly a flat plain with an elevation of approximately 890 ft (271 meters [m]) above mean sea level. Except for the southern border, the entire province is bordered by topography that is higher in elevation (Peer Consultants, P.C. 1988).

10.5 SURFACE WATER

The Yahara River sequentially feeds three lakes located near the Base along with numerous smaller tributaries. The closest, Lake Mendota, is approximately 2.5 miles to the west and southwest. Lakes Monona and Lake Waubesa are located further south. As discussed in Section 10.2.1 (Facility Surface and Subsurface Structures), surface water drainage from Truax Field is directed by man-made stormwater management ditches and culverts that connect to West Branch Starkweather Creek, which surrounds the Base on the north, west, and south sides (Amec Foster Wheeler 2019). West Branch Starkweather Creek passes through Bridges Golf Course directly south of the Base; the golf course also contains numerous small ponds. East Branch Starkweather Creek is located approximately 2 miles southeast of Truax Field and merges with West Branch Starkweather Creek in the vicinity of Sherry Park before emptying into Lake Monona approximately 3.25 miles south of the Base. Figure 10-1 illustrates the directions of surface water runoff at the Base and surface water features in the vicinity.

According to the WDNR Geographic Information System (GIS) Wetland Inventory (2021), several areas within a 1-mile radius of Truax Field are classified as various types of wetlands, including surface water features and areas adjacent the West Branch Starkweather Creek on the Bridges Golf Course and Madison Area Technical College-Truax Campus properties directly south of the Base, as shown on the Potentially Environmentally Sensitive Areas Map generated by Environmental Data Report and previously included with the 2015 PA report (BB&E, Inc. 2015).

10.6 GEOLOGY

10.6.1 Regional Geology

Truax Field is located in eastern Dane County, a region of relatively low relief and poor drainage. Consequently, the area includes many lakes and swamps. The Base lies within the Yahara River Valley Physiographic area, which is dominated by post-glacial geomorphic features, including drumlins and glacial lakes (Cline 1965). Numerous hydrologic studies have been carried out in Dane County and provide significant insights into the potential control of sedimentary facies and structural features at the Base.

Situated on the southernmost flank of the Wisconsin Arch, this region has not experienced significant tectonic activity since the formation of the Mid-Continent Rift system (which frames most of Wisconsin) associated with Grenville Orogeny, which occurred in the Late Precambrian (Hoffman 1998). The geology of the Base and surrounding area is thus comprised of Quaternary glacial deposits at the surface and Upper Precambrian and Lower Paleozoic units at depth (Brown et al. 2013). Tectonic activity recorded at the eastern margin of the North American craton, including the Appalachian Orogeny in the Permian (Hatcher 1988) and subsequent formation of the Atlantic Ocean basin in the Triassic (Klitgord et al. 1988), likely influenced the orientation and extent of numerous fault and fracture systems that can be observed in the Upper Precambrian and Lower Paleozoic sequences of southern Wisconsin.

10.6.1.1 Precambrian and Early Paleozoic Bedrock

Regionally, bedrock beneath the glacial deposits is comprised of crystalline Precambrian igneous and metamorphic rocks including granite, metavolcanic rocks, rhyolite, and quartzite. These Precambrian rocks are then nonconformably overlain by a Cambro-Ordovician succession of sandstone and dolomites as described, from oldest to youngest below (NOTE: The stratigraphic nomenclature for various units has evolved over the time and through various reports published on the geology and hydrology of southern Wisconsin and Dane County: Cline 1965; Emrich 1966; Ostrom 1968; Bradbury et al. 1999; Brown et al. 2013). The nomenclature used in this report follows that published by Brown et al. 2013. Flat to gently inclined dips of bedrock strata are controlled by numerous domes and uplifts. Structural studies indicate northwest and northeast oriented fracture sets are common (Morgan 2019).

Upper Cambrian sequences in the area are made up three stratigraphic groups including (from older to youngest) the Elk Mound, Tunnel City, and Trempealeau groups.

From oldest to youngest, the Elk Mound Group is made up of the Mt. Simon, Eau Claire, and Wonewoc formations. Except for limited exposures of Wonewoc Formation sandstone, the Elk Mound Group is known only in the subsurface in Dane County. The Mt. Simon Formation is primarily medium- to coarse-grained quartz sandstone, with a pebble conglomerate near the basal contact with the Precambrian. Thickness in Dane County ranges from approximately 300 ft (90 m) to over 600 ft (180 m). The Eau Claire Formation is fine to very fine, silty, shaly, and/or dolomitic quartz sandstone. Thickness varies from absent in northeastern Dane County to approximately 80 ft (24 m) in western Dane County. The Eau Claire is not exposed at the surface. The Wonewoc Formation (including both the Ironton and Galesville members) is a quartz sandstone, medium grained, brownish yellow to white, with medium to large-scale cross bedding commonly seen in outcrop. It reaches a maximum thickness of 165 ft (50 m) in the subsurface and is exposed in northwestern Dane County along the Wisconsin River valley.

The Tunnel City Group is made up of medium to very fine-grained quartz sandstone, locally very glauconitic. The maximum thickness in Dane County is approximately 150 ft (46 m).

The Trempealeau Group consists of two formations, the Jordan and the underlying St. Lawrence, which were combined as one mappable unit of quartz sandstone, dolomitic siltstone, silty dolomite, and sandy dolomite. The total thickness of the group in this area is approximately 75 ft (23 m) where not eroded.

Lower Ordovician sequences in the area are also made up of three stratigraphic groups including (from oldest to youngest) the Prairie du Chien, Ancell, and Sinnipee groups.

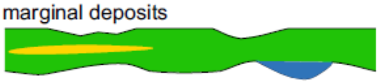
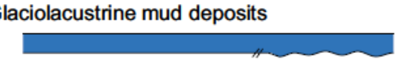
As illustrated in Figures 10-3 and 10-4, the Tunnel City and Trempealeau groups, as well as units of the overlying Ordovician units, may be absent in the deeply incised pre-glacial valleys (Brown et al. 2013). Due to their lack of substantial thickness and limited areal extent, these units, unlike the older, thicker, and areal extensive Mt. Simon and Eau Claire formations, do not tend to form regionally continuous hydrostratigraphic units in Dane County. The geologic contacts illustrated in Figure 10-3 are incorporated as a GIS layer from the Preliminary Bedrock Geology of Dane County (Brown et al. 2013). Although the map includes data control points within the vicinity of the Base, the author does note that the map should not be used to guide site-specific decisions without verification.

10.6.1.2 Unconsolidated Quaternary Deposits

The most significant geologic processes shaping the region for the last 400 million years include erosion of early Paleozoic sequences forming a complex dendritic landscape of incised valleys and ridges, followed by relatively recent glacial processes associated with advance and retreat of the Laurentide ice sheets (Hoffman 1998; Clayton et al. 2006). Unconsolidated sediment in the region is extensive and is made up primarily of glacial till, glaciofluvial, or glaciolacustrine deposits of the Horicon Member, Holy Hill Formation (Harvey et al. 2019). These deposits consist primarily of gravelly, clayey, silty sand and often serves as a confining, or partially confining, unit for underlying coarser-grained sediment. The thick, unlithified deposits are believed to have infilled pre-glacial valleys formed as the ancestral Yahara River incised the Paleozoic bedrock surface prior to glaciation (Parsen et al. 2016). The thickness of glacial sediment is as much as 372 ft in buried valleys and under lakes in the area (e.g., Lake Mendota; Brown et al. 2013). Examination of regional distribution of glacial sediments in the area suggests that Truax field and the surrounding area sits roughly 10 miles to the northeast of a northwest–southeast trending terminal moraine associated with southern extent of the Johnston Phases of the Laurentide glaciation (roughly 16,000 years ago) (Clayton et al. 2006).

Detailed studies of surficial glacial deposits and underlying basement have been conducted in the Village of Cottage Grove near Madison, Wisconsin (Meyer 2016; Harvey et al. 2019). The Cottage Grove site is analogous to Truax Field due to the proximity of the two sites (less than 10 miles apart) and their common setting with respect to the Milton Moraine (both roughly 10-15 miles northeast of the moraine). As discussed in Exhibit 2, the characteristics of the facies architectural elements found at the Cottage Grove site (Harvey et al. 2019) are likely pertinent to understanding the hydrostratigraphic controls (preferential flow pathways and barriers to flow) for PFAS fate and transport at Truax Field. Hydraulic properties of each architectural element will vary and can depend on the parent material deposited by glaciers and fractures. The proximity of the Cottage Grove site to Truax Field suggests that many of these features (architectural elements that make up the subsurface of ice marginal land systems) may exist in the study area and play a role in determining the fate and transport of any PFAS plume in the area.

Exhibit 2 Facies Architectural Elements *(Harvey et al. 2019)*

Architectural Elements	Scale	Description	Select References
1. Thick amalgamated till sheets with interbeds 	1 to 10s of m thick km's long	***1. Facies***: Dm; clay content will vary depending on sediment available during deposition; may contain interbeds of sand and gravel or mud; ***Geometry***: typically laterally extensive, but with non uniform thickness; can be multiple stacked till sheets; ***Other***: may be fractured or deformed; may occupy large buried valleys.	***Till:*** Stephenson et al. 1988 Boyce and Eyles 2000 Evans et al. 2006 Kessler et al. 2012
2. Thin till sheets 	metres thick 100s m to kms long	***2. Facies:*** Dm; ***Geometry:*** similar to 1. but thinner due to deposition or erosion; ***Other:*** may have erosive or discontinuous top and/or bottom boundary.	
3. Channelized glaciofluvial deposits 	1 to 10s m wide 1 to 10s m thick 100s m to km's long	***3. Facies:*** commonly sand and gravel but may contain mud; ***Geometry:*** channelized (directionality important for groundwater); ***Other:*** erosive basal boundary; may occupy large buried valleys	***Glaciofluvial:*** Benn and Evans 2010 Pisarska-Jamroży and Zelliński 2014 Slomka and Eyles 2013
4. Glaciofluvial sheets 	kms wide and long 10s m thick	***4. Facies:*** commonly sand and gravel but may contain mud; ***Geometry:*** gentle slope and irregular surface; sand can be deposited as sheets or amalgamated cut and full geometries; ***Other:*** erosive basal bounding surface	
5. Ice marginal deposits 	variable	***5. Facies:*** commonly contains diamict, glaciolacustrine mud, and glaciofluvial sand and gravel deposits; ***Geometry:*** laterally extensive with lateral facies changes.	***Ice marginal:*** Colgan et al. 2003 Atkinson et al. 2014 Slomka and Eyles 2015
6. Glaciolacustrine mud deposits 	1 to 10s m thick 1 to 10s km in area	***6. Facies:*** primarily mud, may contain subaqueous fan deposit or thin bedded sand; may contain laminations; ***Geometry:*** flat topped; can have irregular bottom; ***Other:*** may be fractured; associated with relatively large glacial lakes; may occupy large buried valleys	***Glaciolacustrine:*** Desloges and Gilbert 1994 Eyles and Eyles 2010 Person et al. 2012 Evans et al. 2013
7. Eskers 	1 to 10s m thick 10s to 100s m wide 100s m to 10 kms long	***7. Facies:*** primarily sand and gravel; ***Geometry:*** meandering narrow ridge; may be discontinuous; may have erosive basal boundary **Quaternary Facies Associations** Diamict, Gravelly Sand, Sand, Mud, Mud and Sand	***Eskers:*** Brennand 2000 Eyles and Eyles 2010 Cummings et al. 2011

Typical architectural elements that make up the subsurface of ice-marginal landsystems. Individual sites may not contain all elements depending on the local glacial history. All architectural elements can be affected by erosion: laterally extensive subglacial erosion, or, local erosion due to fluvial activity. During erosional events, more than one element/unit could be eroded. Each architectural element may also experience some degree of ductile or brittle deformation at varying scales. Hydraulic properties of each architectural element will vary and can depend on the parent material deposited by glaciers and fractures. Dm, diamict. See text for discussion

10.6.1.3 Regional Structural Elements

Outcrops of Paleozoic sequences in southern Wisconsin and surrounding regions often exhibit northwest and northeast trending joint sets, bed parallel joints or fractures, and subsurface studies have provided evidence of east-west trending, high angle normal faults (Kuntz and Perry 1976; Brown et al. 2013; Morgan 2019). The specific nature, number, and orientation of these features is an area of ongoing debate (Morgan 2019); however, hydrologic investigations in the area do demonstrate that their role in vertical groundwater flow in the Paleozoic sequence may be significant (Meyer 2016).

10.6.2 Truax Field Geology

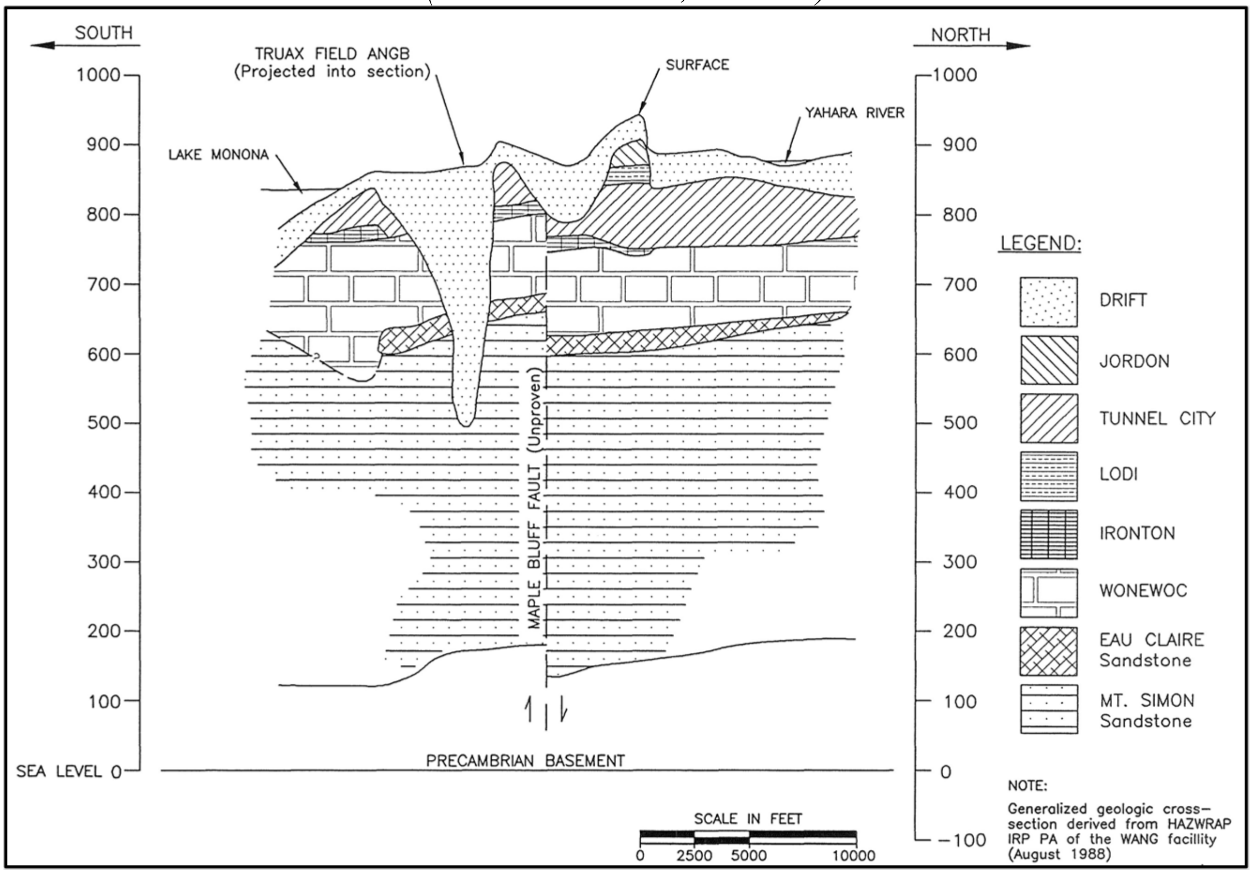
Truax Field is approximately 15 miles east and northeast of the terminal moraines marking the southwestern extent of glaciation during the Wisconsin Period (Advanced Sciences, Inc. 1991).

Truax field is located on a wedge of glacial drift (Holy Hill Member) that overlies the Mt. Simon Sandstone. Maps included with previous investigations for Truax Field and local well drillers' logs available online indicate that unconsolidated sediments extend to depths ranging from approximately 200–300 ft bgs in the vicinity of the Base.

The uppermost glacial deposits near Truax Field are mostly lacustrine silts and clays deposited in the former Lake Yahara, which existed during a glacial period that ended approximately 11,500 years ago (Clayton et al. 1991; Clayton et al. 2006). Beneath the fine-grained lake sediments, outwash sands and gravels (glacial till) can generally be found near former glacial lake shorelines and within a few feet of the surface (Advanced Sciences, Inc. 1991). These depositional environments are best considered in the context of the facies architectural elements presented in the previous section. These facies represent the range of features potentially present at Truax Field. The geometry and scale for each of these facies largely regulate the direction and rate of groundwater flow responsible for PFAS fate and transport. Lithologic data collected during the RI and as part of prior investigations at and in the vicinity of the Base will be evaluated in this context to provide a refined understanding of the depositional features present and how they relate to PFAS plume migration.

Geologic cross sections and maps included with previous investigations for Truax Field indicate that the bedrock surface topography and geologic formations that subcrop in the vicinity of the Base are highly variable, suggesting the pre-glacial landscape was dominated by incised dendritic drainage. The Mt. Simon Formation is believed to underlie Truax Field with a thickness of approximately 350 ft and other formations likely subcrop below downgradient areas (Figure 10-5). Previous investigations (Advanced Sciences, Inc. 1994) have suggested that high angle basement faults and associated fracture zones (Exhibit 3) may have been active in the area after deposition of the Paleozoic sequence. The existence and possible significance of these structural elements in the location of preglacial dendritic drainage patterns, the variable thickness of glacial deposits, or hydrogeology of the area is unclear and will be further evaluated as part of the RI.

Exhibit 3 Generalized Geologic Cross Section for Truax Field and Vicinity
(Advanced Sciences, Inc. 1994)



10.7 HYDROGEOLOGY

10.7.1 Regional Aquifers

Regionally, groundwater is found in the unconsolidated glacial deposits and underlying bedrock formations. All groundwater in Dane County originates as precipitation (rainfall and snowmelt) in or just outside the county (Bradbury et al. 1999). The uppermost (unlithified) aquifer in Dane County consists of saturated Quaternary age aquifer materials that range in lithology from clayey lake sediment to sand and gravel. In general, the water table mimics the county's topography. The depth to groundwater ranges from zero at the fringes of lakes and wetlands to over 200 ft beneath the ridges in the southwest portion of the county. Shallow groundwater tends to migrate radially away from local groundwater divides.

The variability of hydraulic conductivity amongst the different glacial facies in Dane County has been evaluated. Swanson (1996) grouped the surficial materials into three distinct hydrogeologic units based on existing hydraulic conductivity data to derive composite vertical and horizontal k-value estimates. The three unlithified hydrogeologic units show high variability of hydraulic conductivity. The study noted that k-values range over approximately 4 orders of magnitude for the sand and gravel deposits, approximately 3.5 orders of magnitude for the silt and clay deposits, and approximately 5 orders of magnitude for the sandy diamicton (Bradbury et al. 1999). The table below presents the geometric mean (mean of log-transformed values) of hydraulic conductivity for each of the material types.

Hydrogeologic Unit	Log k	k, ft/day Geometric Mean (std dev)
Sand and Gravel	0.15	1.4 (1.04)
Sandy Diamicton	-0.22	0.6 (1.23)
Silt and Clay	-1	0.1 (0.98)

The bedrock aquifers comprise the principal water supply aquifers in Dane County. As discussed further in Section 10.8 (Existing Wells/Drinking Water Receptors), private water supply wells in the region are commonly screened within the upper Paleozoic aquifer and the Mt. Simon aquifer is the most important aquifer in Dane County for the purposes of water supply to high-capacity wells including municipal water supply wells. The upper Paleozoic aquifer consists of all saturated Paleozoic rocks between the top of the Eau Claire aquitard and the bedrock surface (Bradbury et al. 1999). The thickness of the upper Paleozoic aquifer ranges from zero, where absent, to over 200 ft in the western part of the county. Within this aquifer, the Tunnel City and St Lawrence Formations act as a leaky confining unit in the Madison area (Bradbury et al. 1999). The Eau Claire aquitard, where present, is a leaky confining unit that impedes the exchange of water between the Mt. Simon aquifer and overlying aquifers. As shown previously in Figure 10-5 and Exhibit 3, the Eau Claire may not be present in the immediate vicinity of the Truax Field. The Mt. Simon aquifer consists of sandstones of the lower Eau Claire and Mt. Simon Formations. The underlying Precambrian age basement rock forms the bottom of the aquifer system (Bradbury et al. 1999). The table below presents a summary of pumping tests conducted in wells completed in the Mt. Simon aquifer within the Madison metropolitan area (Bradbury et al. 1999).

Statistics	Transmissivity, square ft/day	Thickness, ft	Hydraulic conductivity, ft/day	Storage Coefficient
Min	3,499	480	6	1.80E-10
Max	16,400	630	31	8.40E-04
Mean	6,356	565	11	2.20E-04
Geometric Mean	5,899	563	10	-

Drawdown of the water table in various areas of Dane County is commonly collocated with municipal water supply or other high-capacity production wells. The potentiometric surface of the Mt. Simon aquifer beneath Madison is lower than the level of the Yahara Lakes due to long-term pumping of municipal wells there. The Mt. Simon aquifer is recharged via downward vertical gradients with surface water, the unlithified aquifer, and from the upper Paleozoic aquifer system. Figure 10-6 illustrates areas of recharge to and discharge from the Mt. Simon Aquifer and simulated drawdown in the water table and potentiometric surface of the Mt. Simon Aquifer based on average hydrogeologic conditions between 2006 and 2010, as published by the Wisconsin Geological and Natural History Survey in the 2016 Groundwater Flow Model for Dane County, Wisconsin (Parsen et al. 2016). North of Lake Mendota and Lake Monona, groundwater of the bedrock aquifer migrates toward cones of depression (southeast, northwest, and southwest of the Base) generated by the pumping of municipal wells for the City of Madison (Parsen et al. 2016). The cones of depression for the water table indicate the direction of localized groundwater flow within the unlithified aquifer and where recharge to the Paleozoic aquifer is induced by pumping of the Mt. Simon aquifer. Note that areas of recharge are present to the south of the Base. These recharge areas are at greater risk for vertical migration of PFAS downward from the water table to the bedrock aquifer. The potential for communication between the unlithified aquifer and the Mt. Simon aquifer in the vicinity of the Base will be further evaluated as part of the RI.

10.7.2 Local Groundwater Conditions

Based on information collected during previous investigation activities, MWs within the water table zone at the Base indicate shallow groundwater flow at the Base has changed over time as discussed below. The water table is generally encountered at depths of 5-10 ft bgs; groundwater flow velocities have been estimated at less than 1 ft per day. Comparison of groundwater elevation contour maps developed for previous investigations at the Base are illustrated in Figure 10-7. In January 1993, the groundwater flow direction was to the southeast based on a large set of data from wells distributed across the Base (Advanced Sciences, Inc. 1994). In June 2010, the groundwater flow direction was to the northwest and in October 2010, flow was bifurcated along an apparent groundwater divide to the northwest and southwest based on a subset of the original well network located in the central portion of the Base (MWH Americas, Inc. 2011). Environmental reports associated with studies conducted at the Truax Landfill and Former Burke Wastewater Treatment Plant (WWTP) south of the Base indicate that groundwater flow directions within the unlithified aquifer in the surrounding area vary based on localized conditions. For example, preferential flow paths at the former Burke WWTP have been attributed to subsurface stormwater infrastructure (Section 10.9.3.2) and radial flow in the vicinity of the Truax Landfill has been observed due to a mounding effect from the Landfill (Section 10.9.3.3).

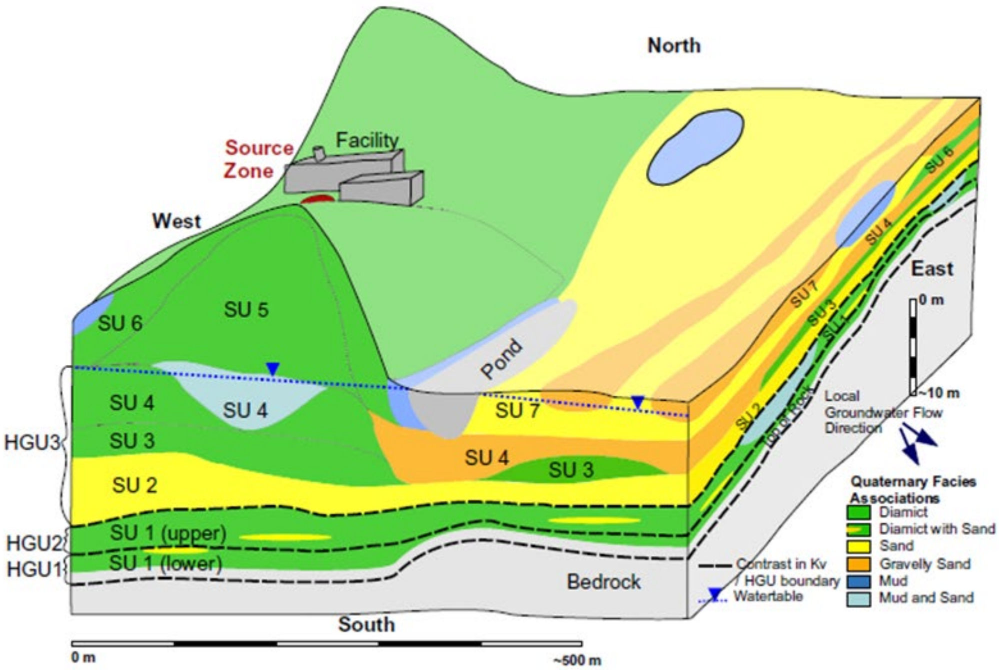
Aquifer testing conducted in five MWs previously installed at the Base within intervals of fine- to medium-grained sand resulted in calculated hydraulic conductivity values (k-values) ranging from 2.9 to 27.2 ft/day (Dames & Moore 1992). Calculated k-values in two of the wells ranged from 15 to 27.2 ft/day, whereas k-values from the remaining wells ranged from 2.9 to 7.7 ft/day.

Limited data were found related to bedrock aquifer conditions in the immediate vicinity of the Base during development of this CSM. Further evaluation of the bedrock aquifer conditions in the study area will be conducted as part of the RI.

10.7.3 Potential Significance of Lithofacies Controls on Groundwater Flow

Groundwater flow and transport within the unconsolidated glacial till in the area are likely controlled by the distribution of high and low conductivity zones within the sequence. These zones predominantly reflect the primary porosity and permeability of the glaciofluvial and glaciolacustrine sediments (Exhibit 4). Secondary porosity (e.g., fractures in till) may also influence groundwater flow paths, if present. Therefore, identification of the various lithofacies at the Base including their specific character, distribution, and extent are important to determine and predict groundwater flow paths and PFAS distribution in the subsurface more effectively.

Exhibit 4 Hydraulically Constrained Geologic CSM at the Cottage Grove Site
(Harvey et al. 2019)



Examination of the available driller logs from the Truax Field study area indicates that many of the same lithofacies may occur in the area, suggesting flow and transport within the unconsolidated till may exploit high conductivity zones associated with courser sediments, which occur in bodies of currently unknown extent and geometry. Studies conducted at Cottage Grove (Meyer 2016; Harvey et al. 2019) do suggest that the role of these hydrostratigraphic units can be elucidated using Environmental Sequence Stratigraphic techniques as proposed by EPA (Schultz et al. 2017). These driller logs, in combination with published bedrock subcrop maps (Brown et al. 2013) and potentiometric surface maps (Parsen et al. 2016) suggest the potential exists that hydrologic communication between transmissive bodies within the unconsolidated sediments and underlying bedrock aquifers (Paleozoic and Mt. Simon aquifers). Consideration should be given to establishing the existence and significance of such hydrologic communication. Potential locations for groundwater-surface water interaction (discharge or recharge) to be further evaluated during the RI include West Branch Starkweather Creek, East Branch Starkweather Creek, and locations of springs or wetlands.

10.8 EXISTING WELLS/DRINKING WATER RECEPTORS

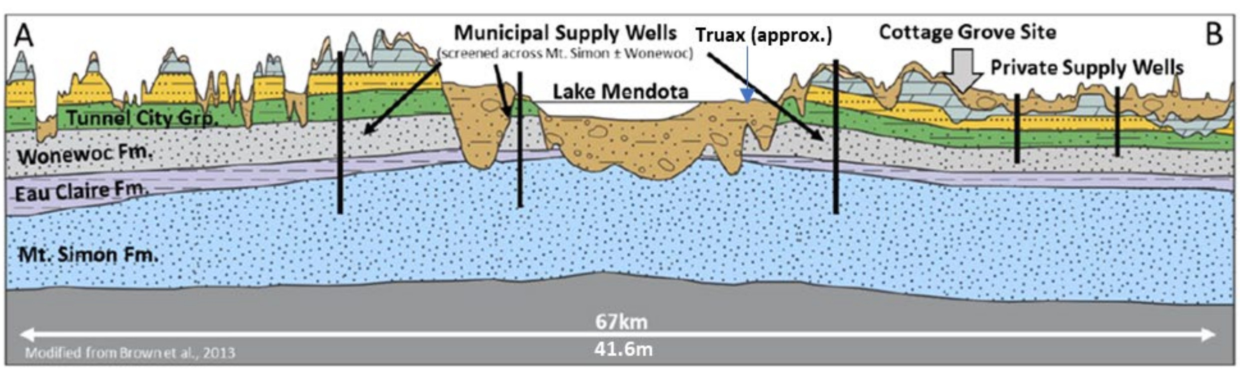
There are currently no known drinking water supply wells at Truax Field and the shallow groundwater system in the area of the Base is reportedly not currently used as a source of drinking water (Amec Foster Wheeler 2019). Drinking water is supplied to Truax Field and the surrounding residential population by the municipal water distribution system operated by the City of Madison. The City of Madison obtains its public water supply from a network of pumping wells screened across the Wonewoc and Mt. Simon Sandstones (Exhibit 5). As shown in Figure 10-5, the nearest active municipal water supply well is located approximately 1.5 miles southwest and potentially hydraulically downgradient of the Base (Amec Foster Wheeler 2019).

WDNR established a statewide wellhead protection program that has developed wellhead protection plans for all active (or recently inactivated) municipal wells in their system. The wellhead protection plan website contains water quality reports, well protection plans, and maps indicating the radius of influence (capture zone) of the individual wells. Individual well head protection plans include well construction details and geologic information, which will be reviewed as part of this RI to improve the CSM. Based on water quality reports available on the website, several wells in the region have reported PFAS concentrations during periodic sampling. Further discussion of the PFAS sampling results and water quality reports for municipal water supply wells is included in Section 10.9 – Nature and Extent of PFAS.

Historically, numerous private potable and non-potable supply wells in the region were installed within shallow bedrock formations (Exhibit 5). Review of local drillers' logs identified several wells previously installed in areas potentially downgradient of the Base that may have influenced groundwater flow and potentially generated vertical gradients for PFAS migration. The source of irrigation water at the Bridges Golf Course should also be investigated. Further review of historical well records (including evaluating the source of irrigation water for the Bridges Golf Course) and sampling results will be conducted as part of the RI.

In 2021, activities to identify and sample private drinking water wells within the vicinity of Truax Field were completed under a separate contract. The results of the survey process resulted in sampling one private drinking water well located south of the installation. PFOS was detected at 27 nanograms per liter (ng/L).

Exhibit 5 Cross Section of Dane County, Wisconsin, Looking North
(Morgan 2019, modified from Brown et al. 2013)



10.9 NATURE AND EXTENT OF PFAS

Determination of the nature and extent of PFAS in the Truax Field study area is an objective of the RI field activities proposed in this QAPP. As such, limited analytical data have been collected to date and additional sampling is needed to determine the horizontal and vertical delineation of source areas, source strength, and the downgradient extent of PFAS in excess of applicable screening criteria.

The 2019 SI included soil and groundwater sampling at each the 9 PRLs listed below and at 3 Base boundary locations. At each PRL, three soil borings and one temporary MW (TW-01 through TW-09) were installed to facilitate collection of shallow (0-2 ft bgs) and deep (4-9.5 ft bgs) soil samples and one groundwater sample to analyze for the presence of PFAS. At each Base Boundary location, one temporary MW (TW-BB01 through TW-BB03) was installed to facilitate groundwater sampling. A summary of the PRL and Base Boundary sampling results are summarized in **Figure 10-8** and compared against the SLs proposed for the RI.

10.9.1 Potential Release Locations Inside the Base Boundary

The following sections summarize the identified PRLs located within the base boundary. Operations, activities, and practices for PRLs 1-9 presented in the SI Report (Amec Foster Wheeler 2019) are summarized below with minor revisions for readability. PRL 10 was identified during materials management activities related to ongoing construction at the Base.

The following table presents a summary of maximum detected concentrations at each PRL, as presented in the SI Report (Amec Foster Wheeler 2019) and the Truax PFAS Sampling WisDOT Project Report (Bay West 2021).

PRL Name	Sample ID	Sample Type	PFOS	PFOA	PFBS
PRL 1	01-SB01	Soil (0.5 – 1.0 ft bgs)	1.32 mg/kg	0.00241 mg/kg	0.00039 mg/kg
	01-SB03 (duplicate)	Soil (0.5 – 1.0 ft bgs)			0.000386 mg/kg
	TW-01 (01-SB01)	Groundwater (5-10 ft bgs)	39,000 ng/L	841 ng/L	357 ng/L
PRL 2	02-SB03	Soil (0.5 – 1.0 ft bgs)	30.1 mg/kg	0.118 mg/kg	0.0161 mg/kg
	TW-02 (02-SB01)	Groundwater (5-10 ft bgs)	28,400 ng/L	349 ng/L	134 ng/L
PRL 3	03-SB03	Soil (0.5 – 1.0 ft bgs)	0.169 mg/kg	0.00257 mg/kg	No samples at PRL above LOD
	TW-03 (03-SB01)	Groundwater (5-10 ft bgs)	13,800 ng/L	528 ng/L	133 ng/L
PRL 4	04-SB02	Soil (5.0-5.5 ft bgs)	0.611 mg/kg	0.00431 mg/kg	No samples at PRL above LOD
	TW-04 (04-SB01)	Groundwater (5-10 ft bgs)	149 ng/L	84.9 ng/L	16.3 ng/L
PRL 5	05-SB03	Soil (0.5-1.0 ft bgs)	0.333 mg/kg		No samples at PRL above LOD
	05-SB01	Soil (0.5-1.0 ft bgs)		0.00458 mg/kg	
	TW-05 (05-SB01)	Groundwater (5-10 ft bgs)	174 ng/L	64.9 ng/L	13 ng/L

PRL Name	Sample ID	Sample Type	PFOS	PFOA	PFBS
PRL 6	06-SB02	Soil (0.5-1.0 ft bgs)	0.0164 mg/kg		No samples at PRL above LOD
	06-SB01	Soil (0.5-1.0 ft bgs)		0.000818 mg/kg	
	TW-06 (06-SB01)	Groundwater (5-10 ft bgs)	121 ng/L	20.2 ng/L	12.7 ng/L
PRL 7	07-SB03	Soil (0.5-1.0 ft bgs)	0.175 mg/kg	0.00125 mg/kg	No samples at PRL above LOD
	TW-07 (07-SB01)	Groundwater (5-10 ft bgs)	3,560 ng/L	116 ng/L	21.9 ng/L
PRL 8	08-SB01	Soil (5.0-5.5 ft bgs)	0.0463 mg/kg		
	08-SB02	Soil (5.0-5.5 ft bgs)		0.00092 mg/kg	0.000322 mg/kg
	TW-08 (08-SB01)	Groundwater (5-10 ft bgs)	7,980 ng/L	89.8 ng/L	42.1 ng/L
PRL 9	09-SB01	Soil (9.0-9.5 ft bgs)	0.00191 mg/kg	No samples at PRL above LOD	No samples at PRL above LOD
	TW-09 (09-SB01)	Groundwater (10-15 ft bgs)	300 ng/L	16.4 ng/L	4.15 ng/L
PRL 10	SB-01	Soil (0.5 – 1.0 ft bgs)	1500 mg/kg	4.4 mg/kg	
	SB-04	Soil (4-5 ft bgs)			2.1 mg/kg
	TW-01	Groundwater	72,000 ng/L	2,400 ng/L	300 ng/L

Analysis and quality control for the sample analysis results for PRLs 1-9, presented in the SI Report (Amec Foster Wheeler 2019), were carried out in compliance with DoD Quality Systems Manual (QSM) Version 5.1 (DoD and Department of Energy 2017) Table B-15.

Analysis for the sample analysis results for PRL 10, presented in the Truax PFAS Sampling WisDOT Project Report (Bay West 2021), was carried out in compliance with DoD QSM, Version 5.3 (DoD and Department of Energy 2019) Table B-15.

Analysis and quality control for the sample analysis results for the F-35 Beddown Area, presented in the USACE Report (USACE 2020), were carried out in compliance with DoD QSM, Version 5.3 (DoD and Department of Energy 2019) Table B-15.

10.9.1.1 PRL 1, Building 430 Current Fire Station

AFFF had been used by the Truax Field Fire Department for more than 20 years and had been stored in Building 430 since it was built around 1995. At the time of the PA in 2015, there were 471 gallons (gal) of AFFF in Fire Department trucks and 821 gal serving as a backup supply, stored in the fire station. In September 2016, the conversion from legacy AFFF (C8) to the newer formulation (C6) was completed at Truax Field. AFFF was transferred to vehicles within the fire station via an overhead fill. Vehicles were washed within the fire station or in the outside truck bays when necessary. AFFF releases due to vehicle washing would be captured by trench drains, which discharge into the sanitary sewer system.

Analytical results from soil samples collected from grassy areas located on the east side of the building indicated that the six PFAS analyzed for were detected above the laboratory reporting limit, with the shallow sample (0.5-1.0 ft bgs) in 01-SB01 exceeding SI screening criteria of 1.26 milligrams per kilogram (mg/kg) for PFOS. PFOS was detected at an estimated concentration of 1.32 mg/kg and PFOA was detected at a concentration of 0.00241 mg/kg.

Analytical results from the temporary groundwater MW sample (TW-01, 5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with two compounds exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at a concentration of 39,000 ng/L and PFOA was detected at a concentration of 841 ng/L. The combined concentration of PFOS and PFOA was approximately 40,000 ng/L.

10.9.1.2 PRL 2, Building 430 Nozzle Test Area 1

AFFF nozzle systems on Fire Department vehicles had been tested every 6 months in the grassy areas near Building 430. Nozzle Test Area 1 is located southwest of Building 430. AFFF released in porous green spaces has the potential to seep into the subsurface and groundwater.

Analytical results from soil samples indicated that the six PFAS analyzed for were detected above the laboratory reporting limit, with three samples having PFOS concentrations exceeding SI screening criteria of 1.26 mg/kg. Sample 02-SB02-0.5-1.0 was found to have a PFOS concentration of 3.33 mg/kg and a PFOA concentration of 0.0141 mg/kg. Sample 02SB03-0.5-1.0 was found to have an estimated PFOS concentration of 30.1 mg/kg and a PFOA concentration of 0.118 mg/kg. The duplicate to sample 02-SB03-0.5-1.0 was found to have an estimated PFOS concentration of 36.8 mg/kg and a PFOA concentration of 0.151 mg/kg.

Analytical results from the temporary groundwater MW sample (TW-02, 5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with two compounds exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at a concentration of 28,400 ng/L and PFOA was detected at a concentration of 349 ng/L. The combined concentration of PFOS and PFOA was approximately 28,800 ng/L.

10.9.1.3 PRL 3, Building 430 Nozzle Test Area 2

AFFF nozzle systems on Fire Department vehicles had been tested every 6 months in the grassy areas near Building 430. Nozzle Test Area 2 is located northwest of Building 430. AFFF released in porous green spaces has the potential to seep into the subsurface and groundwater.

Analytical results from soil samples indicated that five of the six PFAS analyzed for were detected above the laboratory reporting limit. There were no exceedances of the SI screening criteria of 1.26 mg/kg in the soil samples collected from PRL 3.

Analytical results from the temporary groundwater MW sample (TW-03, 5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with two compounds exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at a concentration of

13,800 ng/L and PFOA was detected at a concentration of 528 ng/L. The combined concentration of PFOS and PFOA was approximately 14,300 ng/L.

10.9.1.4 PRL 4, Former Building 403 Former Fire Station

Prior to moving to Building 430, the Fire Department was stationed in Building 403, which was demolished. AFFF had been in use since at least 1988, and was stored in Former Building 403. Water was transferred into fire trucks through an overhead fill; foam was stored in drums and 5-gal containers. Fire Department vehicles were likely washed within the fire station or outside. An oil-water separator and associated underground waste oil storage tank were removed during demolition. The reported location of the oil-water separator and underground storage tank was the eastern corner of the former building (Leidos 2015).

Analytical results from soil samples indicated that the five of the six PFAS analyzed for were detected above the laboratory reporting limit; however, no compounds exceeded the SI screening criteria of 1.26 mg/kg in any of the soil samples collected from PRL 4.

Analytical results from the temporary groundwater MW sample (TW-04, 5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with two compounds exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at a concentration of 149 ng/L and PFOA was detected at a concentration of 84.9 ng/L. The combined concentration of PFOS and PFOA was 234 ng/L.

10.9.1.5 PRL 5, Hangar 400

Hangar 400 was equipped with an AFFF fire suppression system until approximately 2009, when the system was retrofitted for use of high expansion foam (HEF). Hangar fire suppression systems are tested annually; foam is discharged every other year during testing. AFFF releases during testing or accidental release within the hangar would have been routed to trench drains that historically led to an oil-water separator, which then discharged into the sanitary sewer system. However, it is possible that AFFF could have been released into the environment during testing through cracks in the floor or through doorways. The oil-water separator was removed in 2009. HEF is currently stored in the mechanical room of Hangar 400 and AFFF may have been stored in the mechanical room prior to the switch to HEF. Floor drains are present, which discharge to the sanitary sewer system.

Analytical results from soil samples indicated that five of the six PFAS analyzed for were detected above the laboratory reporting limit; however, no compounds exceeded the SI screening criteria of 1.26 mg/kg in any of the soil samples collected from PRL 5.

Analytical results from the temporary groundwater MW sample (TW-05, 5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with one compound exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at a concentration of 174 ng/L. The combined concentration of PFOS and PFOA was 239 ng/L.

10.9.1.6 PRL 6, Hangar 406

Hangar 406 was equipped with an AFFF fire suppression system until approximately 2006, when the system was retrofitted for use of HEF. Hangar fire suppression systems are tested annually; foam is discharged every other year during testing. AFFF releases during testing or accidental release within the hangar would have been routed to trench drains, which then discharged into the sanitary sewer system. However, it is possible that AFFF could have been released into the environment during testing through cracks in the floor or through doorways. At the time of the PA in 2015, HEF was stored in the mechanical room of Hangar 406 and AFFF may have been stored in the mechanical room prior to the switch to HEF. Floor drains were present, which discharge to the sanitary sewer system.

Analytical results from soil samples indicate that five of the six PFAS analyzed for were detected above the laboratory reporting limit; however, no compounds exceeded the SI screening criteria of 1.26 mg/kg in any of the soil samples collected from PRL 6.

Analytical results from the temporary groundwater MW sample (TW-06, 5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with one compound exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at an estimated concentration of 121 ng/L. The combined concentration of PFOS and PFOA was 141 ng/L.

10.9.1.7 PRL 7, Hangar 414

Hangar 414 was equipped with an AFFF fire suppression, which was installed in 1994. Hangar fire suppression systems had been tested annually; foam was discharged every other year during testing. Any AFFF releases during testing or accidental release within the hangar would have been routed to the trench drains that discharge into the sanitary sewer system.

Analytical results from soil samples indicated that five of the six PFAS analyzed for were detected above the laboratory reporting limit; however, no compounds exceeded the SI screening criteria of 1.26 mg/kg in any of the soil samples collected from PRL 7.

Analytical results from the temporary groundwater MW sample (TW-07, 5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with two compounds exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at a concentration of 3,560 ng/L and PFOA was detected at a concentration of 116 ng/L. The combined concentration of PFOS and PFOA was approximately 3,680 ng/L.

10.9.1.8 PRL 8, Fuel Spill Ditch

On 6 March 1981, approximately 2,000 gal of JP-4 jet fuel spilled due to an overflow during refilling at the petroleum, oil, and lubricant (POL) pump house (Building 405). In response to the spill, an existing drainage ditch (approximately 100 ft long) next to the spill was dammed off (ditch northwest of Building 415). The fire department foamed the fuel and flushed it toward the ditch, where it soaked into the ground and was covered with straw. By 9 April 1981, the affected soil in the bottom of the ditch was removed to a depth of approximately 6 ft and to the limit of odor detection on side slopes. The type of foam used may have been AFFF based on its historic use.

Analytical results from soil samples indicated that the six PFAS analyzed for were detected above the laboratory reporting limit; however, no compounds exceeded the SI screening criteria of 1.26 mg/kg in any of the soil samples collected from PRL 8.

Analytical results from the temporary groundwater MW sample (5-10 ft bgs) indicated that six PFAS were detected at concentrations above the laboratory detection limit, with two compounds exceeding EPA lifetime HA of 70 ng/L. PFOS was detected at a concentration of 7,980 ng/L and PFOA was detected at a concentration of 89.8 ng/L. The combined concentration of PFOS and PFOA was approximately 8,070 ng/L.

10.9.1.9 PRL 9, Building 503 Parking Lot

The soil removed from the 1981 POL spill area (PRL 8 described in Section 10.9.1.8) was relocated to what is now the parking lot west of Building 503. The soil was placed on four concrete pads, spread at a depth of 6–10 inches, and was turned throughout Summer 1981 to enhance volatilization. In Summer 1982, the contaminated soil was removed, the area was excavated to a depth of 3 ft, and the materials were transported off-Base for disposal. The area was paved the same year. AFFF runoff from this area could have impacted soil and may have impacted groundwater.

Analytical results from soil samples indicated that two of the six PFAS analyzed for were detected above the laboratory reporting limit; however, no compounds exceeded the SI screening criteria of 1.26 mg/kg in any of the soil samples collected from PRL 9.

Analytical results from the temporary groundwater MW sample (10-15 ft bgs) indicated that five PFAS were detected at concentrations above the laboratory detection limit, with one compound exceeding EPA lifetime HA 70 ng/L. PFOS was detected at a concentration of 300 ng/L. The combined concentration of PFOS and PFOA was 300 ng/L.

10.9.1.10 PRL 10, Building 1209 Nozzle Test Area 3

Nozzle Test Area 3 is located southeast of Building 430 and west of Building 1209. The area was used for testing AFFF nozzle systems on Fire Department vehicles. AFFF released in porous green spaces has the potential to seep into the subsurface and groundwater. Soil and groundwater samples were collected in May 2021 from this area.

Shallow soil (0.5–1.0 ft bgs) and deep soil (4.0–5.0 ft bgs) samples were collected from six soil borings at Nozzle Test Area 3. PFOS was detected at a maximum concentration of 1.5 mg/kg. PFOA was detected at a maximum concentration of 0.0044 mg/kg. The maximum combined concentration of PFOS and PFOA was 1.5044 mg/kg. PFBS was detected at a maximum concentration of 0.0041 mg/kg.

Groundwater samples were collected from three temporary MWs at Nozzle Test Area 3. PFOS was detected at a maximum concentration of 72,000 ng/L. PFOA was detected at a maximum concentration of 2,400 ng/L. The maximum combined concentration of PFOS and PFOA was 74,400 ng/L. PFBS was detected at a maximum concentration of 300 ng/L.

10.9.1.11 F-35 Beddown Areas

The F-35 beddown areas are not considered potential release locations for PFAS; however, multiple construction projects (or future construction projects) are located within the northern portion of the installation adjacent to or overlapping some of the PRLs. In support of construction activities associated with the arrival of the F-35A aircraft at Truax Field, soil and groundwater sampling for PFAS was completed within these construction areas. The sampling results associated with construction activities are shown on Figure 10-8, in addition to sampling results from the SI.

In general, sampling locations supporting the ongoing construction activity at Truax Field are located outside or adjacent to the PRLs, except for PRL 10 where sampling was completed within the site boundary. The combined concentration of PFOS and PFOA in soil ranged from not detected to 1.5 mg/kg, and the combined concentration of PFOS and PFOA in groundwater ranged from 15 to 74,400 ng/L.

10.9.1.12 Potential Release Locations Outside the Base Boundary

Several off-Base PRLs associated or potentially associated with Truax Field activities have been identified that were not investigated as part of the SI because they were located outside the Base Boundary. The location, history, and current status of these additional off-Base PRLs are summarized below.

10.9.2 Four Lakes Aviation Tanker Spill

On 25 April 1993, a fueling tanker associated with Four Lakes Aviation tipped over on the tarmac on the east side of the airport near the WIANG hangars (Figure I-2). Approximately 1,500–1,800 gal of Jet A fuel was spilled as a result, and multiple fire departments responded to control the runoff and apply AFFF on the truck to prevent a fire.

Superior Environmental Services personnel responded the same day to the airport to pump jet fuel from a sump dug by ANG personnel and remove product and sand from the tarmac. Approximately 1,600 gal of jet fuel, water and firefighting foam were pumped from the sump and tarmac. This material was transported to Mineral Springs Corporation in Port Washington, Wisconsin for disposal since it was rejected at U.S. Oil Company in Green Bay due to its high foam content. During the next 3 days, Superior personnel excavated and containerized nine roll-off boxes (approximately 110-125 yards) of contaminated sand and soil next to the tarmac on the east side of the airport. The contaminated sand was delivered to the Payne & Dolan asphalt plant in DeForest, Wisconsin on Friday, 21 May 1993, for disposal. Approximately 2 cubic yards of absorbent booms were disposed at the Hechimovich Landfill in Horicon, Wisconsin (WDNR Site File Identification No. 1493).

10.9.2.1 F-16 Crash Site

A WIANG F-16 slid off the south end of the runway. This PRL was not included in the SI due to the off-Base location. Limited information is available for this PRL (either on the BRRTS website or in the Air Force Administrative Record). The Truax Field fire department responded to the crash. Further evaluation is required during the RI to assess the potential for PFAS releases due to the crash and associated emergency response.

10.9.2.2 Practice Burn Pit Fire Training Areas

According to an October 2019 Memo from the City of Madison’s City Attorney’s office to the WDNR Remediation and Redevelopment Program, The City of Madison along with Dane County and the WIANG were named as responsible parties for the PFAS releases to Starkweather Creek (BRRTS Activity No. 02-13-584369), partly due to an asserted involvement with historic burn pits on the DCRA property (the Darwin Road/West Former FTA and Pearson Street/East Former FTA [also known as the Dane County Burn Pits]). It should be noted that the City of Madison has contested its inclusion as a responsible party for releases associated with the burn pits.

The following information regarding the history of the Dane County Burn Pit (Pearson Street FTA) presented in the memo is described as based on communication from Madison Fire Department Chief Steven Davis. The area was used for fire training activities by multiple parties between 1988 and roughly the early 2000s. The facility, built by ANG, was lined and self-contained to recover and treat any materials used. The FTA was the subject of an earlier clean up order (BRRTS Activity No. 02-13- 231618).

The following information regarding the history of the Darwin Burn Pit (Darwin Road FTA) presented in the 1989 Engineering Report on contamination at Truax Field prepared for the USACE (Envirodyne 1989). The burn pit is described as having been approximately 200 ft by 100 ft in area and located about 200 ft north of Darwin Road, 400 ft east of International Lane, and 400 ft west of a creek, illustrated as (West Branch) Starkweather Creek in Figure 3-4 of the original report. (Figure 10-2). The area was used for fire-fighting training during the period 1953–1987. It may have been used prior to 1953. It is believed to have been constructed by the DoD. Training exercises were conducted by U.S. Air Force personnel during the 1950s, by the ANG during the 1960s, and later by the City of Madison, Dane County, and volunteer fire departments. It is estimated that fire training took place 10–15 times per year. The practice was terminated in 1987.

DCRA completed a soil and groundwater sampling event on 7-8 July 2020, at both of the practice burn pit FTAs described above (Mead & Hunt 2020b). Six locations at each of the FTAs were sampled using a direct-push drill rig. A summary of the results is provided below:

- Borings at the Pearson Street/East FTA were advanced to 15 ft bgs, with groundwater encountered approximately 10-12 ft bgs. The maximum reported concentration in soil was 619 nanogram per grams (ng/g) PFOS at SBP20-06 (6-6.5 ft bgs). The maximum reported concentration in groundwater was 21,200 ng/L combined PFOS and PFOA (mostly PFOS) at SBP20-05.

- Borings at the Darwin Road/West FTA were advanced to 15-25 ft bgs, with groundwater encountered approximately 11-18 ft bgs. The maximum concentration in soil was reported as 363 ng/g PFOS at SBT20-03 (0-1 ft bgs). The maximum concentration in groundwater was reported as 68,660 ng/L combined PFOS and PFOA (mostly PFOA) at SBT20-01. Because the groundwater concentrations were predominantly PFOA it should be noted that the second highest concentration in soil was reported as 279 ng/g at SBT20-01 (10.5-11 ft bgs).

10.9.3 Additional Potential Off-Base Source Areas

Publicly available environmental reports from several adjacent/nearby properties were reviewed during development of this CSM. These reports indicate that off-Base sources could potentially be contributing PFAS to surface water and/or groundwater in the vicinity of the Base. Further review of environmental reports related to potential off-Base source areas will be conducted as part of the RI.

10.9.3.1 Dane County Regional Airport Outfalls

In April, May, and June 2019, Mead & Hunt collected samples at the request of WDNR at outfalls that are sampled as part of DCRA's WPDES permit. Monitoring was conducted during wet and dry weather conditions, and the results were reported to WDNR on 7 October 2019 (Kirchner 2019). Elevated PFAS were reported in sampling results for outfalls associated with the airport stormwater system. Sample results indicated the presence of several PFAS at Outfalls 003, 032, 001, 034, and 102. Concentrations were generally similar during wet and dry conditions and overall average highest concentrations were observed at Outfall 032. The average reported result for Outfall 032 was 738.8 ng/L combined PFOS and PFOA (Kirchner 2019). The locations and results of the sampling are presented on Figure 10-9.

In February 2020, Mead & Hunt completed additional sampling at 23 drainage basin outfalls and 18 junctions within the drainage basin network under dry winter weather conditions (Mead & Hunt 2020a). Sample results suggested that PFAS mass loading is largely associated with Outfalls 021 and 032. The reported results of combined PFOS and PFOA for Outfalls 021 and 032 were 18,116, and 1,263.3 ng/L, respectively. The locations and results of the sampling are presented on Figure 10-10. DCRA plans to complete a pilot study using booms to treat the discharge at Outfall 021 and evaluate targeted pipe segments for inflow/infiltration and sediment deposits.

10.9.3.2 Reynolds Property/Former Burke Wastewater Treatment Plant

The former Town of Burke WWTP property is located at 1401 Packers Avenue, south of the Former City of Madison Truax Landfill (current location of the Bridges Golf Course) and potentially downgradient of Truax Field and DCRA. Multiple previous environmental reports related to the property were reviewed during development of this QAPP including Midwest Environics 2002; Resource Engineering Associates 2002; Ivertech LLC 2012; Seymour Environmental Services 2018; SCS Engineers (SCS) 2020, 2021. The following history of the property is summarized from the findings of a file review published in the Phase I Environmental Site Assessment for the property (Midwest Environics 2002):

- The City of Madison constructed the WWTP and operated it from 1914 to 1933.

- MMSD owned and operated the WWTP from 1933 to 1936 when it was inactivated.

- In 1942, the U.S. government took ownership of the site and used the plant to treat and dispose of sewage from Truax Field between 1942 and 1946.

- Ownership of the plant reverted to MMSD in 1947 after a period of operation by the city.

- Oscar Meyer and Company (Oscar Meyer) began using the facility in 1950, and entered a lease dated 7 September 1951 for pretreatment of wastewater from its meat packing plant, which continued until 1978. Between 1951 and 1961, Oscar Meyer constructed six sludge lagoons. A seventh sludge lagoon was constructed in 1968. Sludge from the sludge lagoons and ash from the coal-fired boilers are known to have been disposed of at the property during this time.

- MMSD sold the property in 1981 to Reynolds Transfer and Storage Co., Inc. (Reynolds).

- In 1981, Reynolds deeded the property to Edward and David Reynolds, who subsequently deeded the property to Reyco Madison, Inc. (Reyco) in 1984. In the late 1980s and early 1990s. the former WWTP facilities except the concrete sludge drying beds were razed and/or filled in and buried at the property.

- During the entire time of operation, the WWTP did not receive stormwater.

- Investigations were reportedly made to determine if contamination from the landfill was impacting the Reynolds property, and vice versa.

The WWTP was formerly located and operated on the property from approximately 1914 to 1976. Sludge lagoons associated with the WWTP were installed to the east of the treatment plant between 1955 and 1962. At some point prior to complete demolition of the plant, municipal solid waste was placed in a portion of the facility as part of an academic research study. The treatment plant was demolished in the late 1980s or early 1990s, and available records suggest that the plant structures were either buried in place or were demolished and buried on the property. The property has been undergoing redevelopment and is referred to as the Reynolds property in recent environmental reports. Figure I-2 depicts the historic layout of the WWTP. A summary of PFAS-related investigations at the Reynolds property is provided below.

An SI report was prepared in June 2020 by SCS on behalf of Madison Gas and Electric for the WDNR (SCS 2020). The report presented the following conclusions and recommendations:

- Two of the seven water table MWs sampled at the property contain combined PFOA and PFOS concentrations greater than the WDNR proposed groundwater enforcement standard (ES) of 20 ng/L. The maximum reported concentration in groundwater was 41 ng/L combined PFOS and PFOA at TW-4 on 26 February 2019.

- The two wells where PFAS exceeds the WDNR proposed ES are located in areas where buried wastewater treatment sludge was identified. PFAS concentrations in the sludge are variable.

- Based on the apparent prevailing groundwater flow to the southwest and the relatively low PFAS concentrations detected in TW-2, TG-2, and MW-5, the elevated PFAS concentrations in groundwater associated with the buried sludge are not migrating off-property. It should be noted that groundwater flow directions have historically changed over time and likely vary within the study area (Figure 10-7).

- Given the fact that the lagoons were closed approximately 40 years ago, it appears that conditions at the property are stable. Active remediation to address the residual PFAS concentrations in the sludge is not necessary at this time.

SCS recommended setting up a call with Madison Gas and Electric and WDNR to discuss the next steps for this property.

Based on the confirmed presence of PFAS in soil and groundwater at the property and suspected volume of buried source material (WWTP sludge), WDNR requested the installation of additional MWs and piezometers along the western and southern property boundaries (SCS 2021). The apparent water table was observed between 6 and 16 ft bgs. Piezometers were installed to total depths ranging between 47 and 50 ft bgs and were constructed with 5-ft screens. Water table MWs installed adjacent to each piezometer were blind drilled using hollow stem augers to a depth of 15–24.5 ft bgs and were constructed with 10-ft screens. SCS sampled the new MWs and measured water levels at all property wells on 20 January 2021, and sampled all property wells on 29 and 30 March 2021. Based on the January 2021 water levels, the water table contours indicated converging flow approximately mid-way across the property (Figure 10-7). The data provided by the new MWs lead to the investigation and sampling of a network of storm sewers that cross near the middle of the property from west to east. The report presented the following conclusions:

- Three of the 10 water table MWs sampled contained combined PFOA and PFOS concentrations greater than the proposed ES of 20 ng/L. The maximum reported concentration in groundwater was 29.0 ng/L combined PFOS and PFOA at TW-4 on 20 March 2021.

- The three wells where PFAS exceed the proposed ES are located in areas where buried wastewater treatment sludge was previously identified.

- None of the piezometers had combined concentrations of PFOA and PFOS in excess of the proposed ES.

- PFAS concentrations greater than the proposed ES did not appear to be migrating off-property in groundwater.

- Groundwater flow at the property appeared to be influenced by the network of storm sewers that run east-west mid-way across the property.

- Three of the four stormwater manholes sampled at the property contained combined PFOA+PFOS concentrations greater than the proposed ES of 20 ng/L; however, the detected PFOA+PFOS concentrations in the ditch/creek downstream from the storm sewer pipe outfall did not exceed the 20 ng/L threshold. The maximum reported concentration in stormwater was 69.0 ng/L combined PFOS and PFOA at STR-020 on 29 March 2021.

- Given consistency of the groundwater sampling results and the fact that the lagoons were closed approximately 40 years ago, it appeared that conditions at the property were stable.

10.9.3.3 Former City of Madison Truax Landfill (Bridges Golf Course)

According to the 1989 Engineering Report for the Contamination Evaluation at Truax Field (Envirodyne 1989), DoD excavated a sand and gravel pit in the 1930s or 1940s and may have disposed of some wastes in this area, which was later used by Oscar Mayer as an open burning pit until 1953 and then as a landfill until 1972 by the City of Madison. According to the 2002 Phase I Environmental Site Assessment for the Reynolds property (adjacent to the south), Truax Landfill was an active landfill from 1948 until 1972 with ash, noncombustables, and trash having been disposed of at the site. The landfill was constructed as an unengineered landfill without a liner or a leachate collection system. The landfill was used as an open burning dump in the 1930s, a landfill for the U.S. Army in the 1940s, and a landfill for the City of Madison from 1953 to 1972. Groundwater contamination has been previously detected at the site and the direction of groundwater flow was determined to be to the northwest. A methane gas ventilation system was also in operation at the site since the early 1990s. There is some potential that PFAS-contaminated waste was previously disposed of at the Truax Landfill. However, further document review is needed to determine the current status of environmental investigations and potential PFAS releases related to this site.

According to the 2012 Reyco SI Work Plan for 1401 Packers Avenue (Reynolds Property/Former Burke WWTP), multiple environmental investigations have occurred at the Former landfill (IverTech LLC 2012). Several observations relevant to the CSM derived from those previous investigations are presented in the work plan, including:

- "Groundwater flow over the eastern portion of the landfill appears to be to the east toward (West Branch) Starkweather Creek..." and "Groundwater flow near the southern edge of the landfill is south, east, and west, or away from the groundwater mound created by the perched water condition in this area of the site."

- "Shallow groundwater at the site flows radially away from the landfill. This interpretation is historically consistent." "Regional groundwater likely flows southwesterly toward the Yahara River/Lake Mendota."

It should be noted that groundwater flow directions have historically changed over time and likely vary within the study area (Figure 10-7).

10.9.4 Downgradient Extent of PFAS

As previously discussed, limited analytical data have been collected to date and additional sampling is needed to determine the horizontal and vertical delineation of PFAS downgradient of the Base. The following is a summary of PFAS groundwater sampling completed at Base boundary locations as part of the 2019 SI and PFAS surface water and groundwater sampling completed by WDNR as part of regional PFAS investigations. Temporary MW and municipal water supply well locations showing detected compounds are illustrated on Figure 10-11. Surface water sample locations and results are indicated on Figure 10-12.

10.9.4.1 Base Boundary Locations

Analytical results from temporary groundwater MW samples indicate that six PFAS were detected at concentrations above the laboratory detection limits in both TWBB-01 and TWBB-02, and three PFAS were detected at concentrations above the laboratory detection limit for TWBB-03. PFAS concentrations exceeding EPA lifetime HA standards of 70 ng/L were found for two compounds in TWBB-01 and TWBB-02; however, no PFAS concentrations exceeding EPA lifetime HA standards were found in TWBB-03. In TWBB-01 PFOS was detected at a concentration of 569 ng/L and PFOA was detected at a concentration of 95.3 ng/L. In TWBB-02, PFOS was detected at a concentration of 509 ng/L and PFOA was detected at a concentration of 126 ng/L. Combined PFOS and PFOA were detected at concentrations of 664, 635, and 40.4 ng/L for TWBB-01, TWBB-02, and TWBB-03, respectively. The concentration of PFBS at TWBB-02 was 1,050 ng/L, which is above the current EPA Regional SL of 600 ng/L.

10.9.4.2 Starkweather Creek

In June 2019, WDNR collected surface water samples at four locations within East and West Branches of Starkweather Creek. Several PFAS were detected in both East Branch and West

Branch of the creek with a maximum reported result of 270 ng/L PFOS at the Fair Oaks Avenue location on the West Branch (combined PFOA+PFOS concentration was 313 ng/L). This location is approximately 1.5 miles downstream of DCRA, and the PFOS result was over three times higher than the concurrent sample result at the Anderson Street location (79 ng/L PFOS and 102 ng/L combined PFOA+PFOS), which is immediately downstream of the Airport (Mead & Hunt 2020a).

In October 2019, WDNR collected surface water samples at 11 additional locations from Starkweather Creek, 5 locations in Lake Monona, and fish tissue samples from Starkweather Creek and Lake Monona. The highest PFOS concentration was reported for a sample collected on an unnamed tributary to the West Branch of Starkweather Creek just east of where the West Branch of Starkweather Creek crosses Anderson Street. This location is south of the DCRA and WIANG property.

On 7 October 2019, WDNR notified WIANG that they were considered a Responsible Party. According to WDNR, other historical sources of PFAS are likely located in the watershed; therefore, the source of PFAS in Starkweather Creek is not yet confirmed and is considered a data gap to be addressed as part of this RI.

10.9.4.3 City of Madison Municipal Wells

PFAS concentrations in groundwater (combined PFOA+PFOS) reported in water quality reports for the wellhead protection program have been detected in groundwater samples collected from municipal water supply wells in the region below the EPA lifetime HA of 70 ng/L (City of Madison 2021a). Wellhead protection program documents included the well construction details, water quality reports, and sample results for the wells (City of Madison 2021b). According to the WDNR, other historical sources of PFAS are likely located in the groundwater basin; therefore, the sources of PFAS in these municipal water supply wells are not yet confirmed and are considered a data gap to be addressed as part of this RI. Figure 10-11 depicts the location and groundwater sample results for the municipal wells within the vicinity of Truax Field. Key observations from water quality reports of municipal wells potentially located downgradient of the Base are summarized below:

- All samples were analyzed via a modified EPA Method 537. A subset of wells was also analyzed via additional laboratory methods for comparison. Although EPA Method 537.1 is the only EPA approved method for drinking water, Madison Water Utility prefers the modified EPA Method 537 because they believe EPA Method 537.1 may underreport the “true” amount of PFAS present in a water sample (City of Madison 2019). For completeness and consistency, municipal well sample results analyzed via modified Method 537 are shown on Figure 10-11 and discussed below:

  — ***Well 7***—The water quality report for Well 7 is believed to have not been updated between April 2014 and April 2021. The 2014 report stated that the Well 7 facility was scheduled to be completely reconstructed and no recent (post-2013) sample results were available for review until the 2020 sample results were published in the

2021 report. In 2020, five different PFAS were found at Well 7. The combined PFOA+PFOS concentration was estimated at 4.8 ng/L. A small amount of tetrachloroethylene (<1 micrograms per liter [µg/L]) was also detected at Well 7.

— ***Well 8***—In 2019, eight different PFAS were found at Well 8. The combined PFOA+PFOS concentration was estimated at 2.8 ng/L. Well 8 is considered a seasonal well and is used primarily in summer and fall due to elevated levels of iron and manganese in the water. In recent years, pumping at Well 8 was reduced due to concerns about the long-term potential movement of groundwater contaminants from the Madison Kipp Corporation plume toward Well 8. The Madison Kipp Corporation site (BRRTS No. 02-13-558625) is located at 201 Waubesa Street, approximately 3 miles south of Truax Field and west of the confluence of East Branch and West Branch Starkweather Creek near Lake Monona (Figure I-2). It is unknown if PFAS has been analyzed for in groundwater samples associated with the site. In 2020, eight different PFAS were found at Well 8. The combined PFOA+PFOS concentration was estimated at 8.4 ng/L.

— ***Well 11***—In 2019, eight different PFAS were confirmed present; three others were quantified and may also be present. The combined PFOA+PFOS concentration was estimated at 1.8 ng/L. Routine testing showed the continued presence of low concentrations of tetrachloroethylene (0.75 µg/L), cis 1,2-dichloroethylene (0.39 µg/L), and trichlorofluoromethane (0.64 µg/L), and 1,4-dioxane (0.4 µg/L). In 2020, nine different PFAS were found at Well 11. The combined PFOA+PFOS concentration was estimated at 11 ng/L.

— ***Well 13***—In 2019, six different PFAS were found at Well 13. The combined PFOA+PFOS concentration was estimated at 6 ng/L. In 2020, nine different PFAS were found at Well 13. The combined PFOA+PFOS concentration was 14 ng/L.

— ***Well 15***—On 4 March 2019, Madison Water Utility made the decision to take Well 15 out of service. PFAS were first detected at Well 15 in 2017. Since that time, 10 different PFAS have been detected. In 2018, a groundwater modeling study was conducted by RJN Environmental Services, LLC for Well 15 to evaluate if groundwater near potential PFAS sources at Truax Field could be drawn to the capture zone for Well 15. The study concluded that under several simulated pumping scenarios, several potential PFAS release areas at Truax Field are likely to fall within the 50-year or 100-year capture zone (RJN Environmental Services, LLC 2018). In 2019, the combined PFOA+PFOS concentration was estimated at 12 ng/L. Tetrachloroethylene and trichloroethylene were also noted as being removed from the source water by the air stripper installed in 2013. Periodic testing also found small amounts of 1,4-dioxane (0.1–0.2 µg/L). Routine samples were not collected from Well 15 in 2020.

— ***Well 29***—In 2019, one type of PFAS (n-ethyl perfluorooctane sulfonamide) was found at Well 29. The combined PFOA+PFOS concentration was reported as non-detect. In 2020, five different PFAS were found at Well 29. The combined PFOA+PFOS concentration was 6.0 ng/L.

10.10 FATE AND TRANSPORT OF PFAS

Determination of the transport mechanisms and migration routes of PFAS in the Truax Field study area is an objective of the proposed RI field activities. As such, limited data have been collected to date and additional sampling is needed to identify the discrete flow pathways responsible for PFAS fate and transport in the Truax Field study area.

10.10.1 Transport Mechanisms and Migration Routes

Surface water and groundwater migration routes at and in the vicinity of Truax Field are largely regulated by flow pathways (and barriers to flow) associated with facility infrastructure and the architecture of geologic features in the subsurface. Where infiltration is limited by impervious surfaces, surface water runoff follows the drainage and stormwater management infrastructure.

For groundwater in the unlithified and bedrock aquifers, the stratigraphic depositional environments described in Sections 10.6 and 10.7 (Geology and Hydrogeology) are associated with several lithofacies types that have common and predictable flow pathways based on the depositional history of subsurface sediments. Similarly, the stratigraphic and structural features associated with the bedrock formations underlying the unlithified aquifer regulate of the flow direction and velocity of groundwater in the bedrock aquifer in conjunction with influences from regional water withdrawal.

10.10.1.1 PFAS-Specific Fate and Transport Considerations

PFAS have a high solubility and are thus mobile; however, they are retarded by sorption on organic carbon (C) due to hydrophobic effects. Distribution coefficients (Kd) can be estimated by employing the organic carbon partition coefficient (Koc) multiplied by the fraction organic carbon (foc). For points of reference, Log Koc of 2.06 and 2.57 have been measured for PFOA and PFOS, respectively. This places PFOA and PFOS at similar levels of retardation as many chlorinated solvents (e.g., trichloroethylene). The retardation factor for a given solute can be determined from Kd and soil physical properties. Generally, longer chain PFAS (e.g., PFOS and PFOA) will sorb (due to hydrophobic effects) and be more strongly retarded than shorter chain compounds (e.g., PFBS).

Some PFAS are cationic (positively charged) or zwitterionic (mixed charges), influencing their fate and transport in the environment through electrostatic interactions with mineral matter. Cationic and zwitterionic PFAS tend to be less mobile in quartz-dominated media than anionic perfluoroalkyl acids (PFAAs) and so they can potentially be retained longer in source zones.

PFAS are not particularly volatile, though certain ionic species of PFAS (e.g., ionized PFOA and not the salt) can have Henry's constants that illustrate a particular affinity to air interfaces. Finally, and of primary significance to the transport and transformation of PFAS, PFOS, and

PFOA can be generated over time in the subsurface by abiotic and biological transformation of precursors via oxidation processes.

Commonly, precursors, such as fluorotelomers and other polyfluorinated precursors will, with time and distance of migration, abiotically and/or biologically transform to become PFAAs, like PFOA and PFOS, that act as persistent "dead end" daughter products. PFAAs have not generally illustrated a tendency to be biodegraded. This general recalcitrance to degradation and high degree of mobility often leads to long PFAA plumes.

10.10.1.2 Truax Field-Specific Fate and Transport Considerations

- The presence of organic-rich marshy deposits has particular significance for retention of PFAS mass in source areas.

- PRLs 1, 2, and 3 are on the western portion of Truax Field and located closest to potential surface water migration pathways. Additional potential sources identified in Sections 10.9.2 and 10.9.3 are also located near potentially downgradient surface water migration pathways.

- Groundwater flow direction from PRLs relative to other potential off-Base sources has implications for source attribution and potentially co-mingled plumes.

- Groundwater delineation is most important to the southeast, southwest, and northwest of the Truax Field, based on observed changes to regional groundwater flow over time and the potential for groundwater-surface water interaction in these directions.

- Well 15 to the southeast (within 1 mile), other municipal water supply wells, and shallow potable water supply wells could have historically (or actively be) influencing groundwater flow direction and/or downward migration.

- The 2016 Groundwater Flow Model for Dane county, Wisconsin (Parsen et al. 2016) illustrates that groundwater drawdown occurs in both the overburden and bedrock aquifers in the vicinity of Truax Field, which could have implications for plume migration downward from surface water and/or the unlithified aquifer to the bedrock aquifer.

- Review of local well drillers' logs indicate that clay-rich glacial till is common in the vicinity of the Truax Field; however, thick intervals of sand and gravels are frequently noted and may present preferential pathways for vertical or lateral migration where present.

- The shallow depth to groundwater at the Base, presence of marshy deposits, and low permeability of underlying glacial deposits are good indicators that vertical migration pathways for the plume may be limited. However, historic maps indicate that the marshy deposits are absent in potentially downgradient directions.

10.11 NATURAL RESOURCES

According to the U.S. Fish and Wildlife Service, the following animals and plants are federally endangered, threatened, proposed, and/or listed as candidate species in Dane County, Wisconsin:

- *Myotis septentrionalis* (Northern Long-eared Bat) – Threatened
- *Grus americanus* (Whooping Crane) – Non-essential Experimental Population
- *Lampsilis higginsii* (Higgins eye pearly mussel) – Endangered
- *Plethobasus cyphyus* (Sheepnose mussel) – Endangered
- *Bombus affins* (Rusty patched bumblebee) – Endangered
- *Platanthera leucophaea* (Eastern prairie fringed orchid) – Threatened
- *Asclepias meadii* (Mead's milkweed) – Threatened
- *Lespedeza leptostachya* (Prairie bush-clover) – Threatened
- *Lycaeides melissa samuelis* (Karner blue butterfly) – Endangered.

None of these species are known to reside or have been sighted at Truax Field.

10.12 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT CONCEPTUAL SITE EXPOSURE MODELS

The human health and ecological conceptual site exposure models identify the current and future receptor populations at Truax Field, both on-Base and off-Base, that may be exposed to chemicals of potential concern (COPCs) from the identified potential release locations. These conceptual site exposure models draw upon the geologic and hydrogeologic CSM to determine COPC transport mechanisms from source releases to receptors and, thereby, define relevant exposure pathways.

The human health and ecological conceptual site exposure models will further describe which exposure pathways are potentially complete and significant and which are incomplete or insignificant. Complete or potentially complete pathways will be evaluated quantitatively in the risk assessments, whereas incomplete or insignificant ones will not. Pathways considered unknown will be reconsidered after data gaps have been filled prior to completing the risk assessments.

10.12.1 General Exposure Pathway Analysis

This section presents the preliminary human health CSM and summarizes information on sources of site COPCs, affected environmental media, chemical release and transport mechanisms, potentially exposed receptors, and potentially complete exposure pathways for each receptor. Figure 10-13 presents the preliminary CSM.

Section 10.9 summarizes the nature and extent of PFAS. As shown in Figure 10-13, sources for COPC exposure may include surface soil, subsurface soil, sediment, surface water, groundwater, and air. PRLs at the installation have been identified as the current fire station, former fire station, nozzle testing areas, hangars, former fuel spill location, and an area where contaminated soil from the former fuel spill location was temporarily located. Other identified areas include the off-Base F-16 crash location on the south side of the runway.

Residual soil source area(s) have resulted in COPC releases to soil (e.g., vadose zone), sediment, surface water, groundwater, and air. Further information regarding chemical releases is a potential data gap that may be filled by future investigatory activities.

The quantitative human health risk assessment will be limited to three of the PFAS—PFOS, PFOA, and PFBS—for water samples (groundwater and surface water) per U.S. Air Force guidance. Additional PFAS may be included in the assessment if toxicity values become available during the project.

10.12.2 Preliminary Identification of Human Receptors

According to EPA guidance (1989), a complete exposure pathway consists of four elements:

1. A source and mechanism of chemical release

2. A retention or transport medium (or media in cases involving transfer of chemicals)

3. A point of potential human contact with the contaminated medium (referred to as the "exposure point")

4. An exposure route (i.e., ingestion) at the exposure point.

If any of these elements are missing, then the exposure pathway is considered incomplete. For example, if receptor contact with the source or transport medium does not occur, then the exposure pathway is considered incomplete and is not quantitatively evaluated. Similarly, if human contact with an exposure medium is not possible, the exposure pathway is considered incomplete and is not evaluated.

The preliminary CSM (Figure 10-13) summarizes information on sources of PFAS, affected environmental media, PFAS release and transport mechanisms, potentially exposed receptors, and potential exposure pathways for each receptor. Complete exposure pathways are designated by the symbol "●" in the preliminary CSM. Potentially complete exposure pathways are designated by the symbol "◑" in the preliminary CSM. Incomplete exposure pathways are designated by the symbol "◯." Because some of these pathways are based on hypothetical-future exposure, they are considered potentially complete, but may not actually be complete for all receptors in the future.

Exposure routes for each receptor associated with the potentially complete exposure pathways are described in the following sections for the following potential receptors:

- Onsite current and future commercial/industrial workers

- Onsite current and future construction workers
- Onsite future residential water users
- Offsite current and future residents
- Offsite current and future recreational users
- Trespasser.

These receptors and their associated exposure pathways are further described below.

10.12.2.1 Onsite Current and Future Commercial/Industrial Worker Exposure

This receptor population represents current and future industrial workers involved in non-invasive grounds maintenance or other work-related outdoor activities. Workers may encounter impacted surface soil but are not expected to encounter groundwater through their work activities because of the depth to groundwater. With respect to potable groundwater use at the Truax Field, current workers are not exposed to groundwater because potable water is provided by the City of Madison (BB&E, Inc. 2015).

Onsite and future industrial workers could be exposed to surface water in unnamed onsite ponds/conveyances and related sediment if maintenance activities are required in or near the onsite ponds/conveyances. However, sampling of these media is needed to determine whether they contain PFAS; surface water sampling will be conducted as part of this RI. Industrial workers would not be expected to consume fish that may exist in the ponds/conveyances as part of their work-related responsibilities.

Complete exposure pathways for this receptor population include:

- Surface soil: incidental ingestion, dermal contact, and particulate inhalation.

Exposure pathways to be evaluated:

- Subsurface soil: incidental ingestion, dermal contact
- Groundwater: ingestion,
- Surface water: incidental ingestion, dermal contact
- Sediment: incidental ingestion, dermal contact.

10.12.2.2 Onsite Current and Future Construction Worker Exposure

This receptor population includes workers engaging in construction or redevelopment activities at the installations. Because of subsurface penetration around the PRL or other impacted areas, they would be exposed to surface soil, subsurface soil, and groundwater. If construction workers perform heavy maintenance in PRL areas, they could be exposed to surface water and sediment. Construction workers would not be expected to consume fish that may exist in the ponds/conveyances as part of their work-related responsibilities. Data collected during the RI will be evaluated as to whether surface water and sediment have been impacted by PFAS.

Complete exposure pathways for this receptor population include:

- Surface soil: incidental ingestion, dermal contact, particulate inhalation
- Subsurface soil: incidental ingestion, dermal contact, particulate inhalation
- Groundwater: incidental ingestion, dermal contact.

Potentially complete exposure pathways for this receptor population include:

- Surface water: incidental ingestion, dermal contact
- Sediment: incidental ingestion, dermal contact

10.12.2.3 Onsite Future Residential Water Users

This receptor population includes (though unlikely) future residential drinking water consumers.

Potentially complete exposure pathway for this receptor population include:

- Groundwater: ingestion, dermal contact
- Surface water: incidental ingestion, dermal contact.

10.12.2.4 Offsite Current and Future Residents

This receptor population includes adult and children offsite residents extracting downgradient groundwater from wells for potable use. The offsite current and future resident also includes any users of municipal wells impacted by site activities if impacts are identified. Current well samples will indicate whether this pathway is complete.

Potentially complete exposure pathways for this receptor population include:

- Surface soil: incidental ingestion, dermal contact, particulate inhalation
- Groundwater: ingestion, dermal contact
- Surface water: incidental ingestion, dermal contact
- Sediment: incidental ingestion, dermal contact
- Fish: ingestion.

10.12.2.5 Offsite Current and Future Recreational User Exposure

This receptor population includes adults and children using the offsite, downgradient areas near the installations for recreational activity and, in some cases, fishing. They would be exposed to surface water, sediment, and fish. Data collected during the RI will be evaluated to assess whether surface water, sediment, and fish have been impacted by PFAS.

Potentially complete exposure pathways for this receptor population include:

- Surface soil: incidental ingestion, dermal contact, particulate inhalation

- Groundwater: ingestion, dermal contact
- Surface water: incidental ingestion, dermal contact
- Sediment: incidental ingestion, dermal contact
- Fish: ingestion.

10.12.2.6 Trespasser Exposure

This receptor population includes trespassers onsite.

Potentially complete exposure pathways for this receptor population include:

- Surface soil: incidental ingestion, dermal contact, particulate inhalation
- Groundwater: ingestion, dermal contact
- Surface water: incidental ingestion, dermal contact
- Sediment: incidental ingestion, dermal contact
- Fish: ingestion.

10.12.3 Ecological Conceptual Site Exposure Models

A quantitative Screening Level Ecological Risk Assessment (if warranted and based on funding) will be prepared to evaluate the potential for adverse ecological effects attributable to site releases, specifically from PFAS.

10.12.3.1 Contaminants of Potential Ecological Concern

Of the 24 PFAS being evaluated for this RI, PFBS, PFOA, PFOS, perfluorohexanesulfonic acid, perfluorohexanoic acid, and 6:2 fluorotelomer sulfonic acid are frequently found in the environment, particularly on DoD installations (Ankley et al. 2020; East et al. 2020). These chemicals are highly persistent in the environment and have varying potential to accumulate over time.

Exposures adjacent to or downgradient of initial AFFF release areas are expected to pose the highest risks to ecological resources. The relatively high water solubility of PFAS (compared to other persistent organic chemicals) results in a high potential for transport via groundwater, surface water, and stormwater, as well as erosion of impacted soils and sediment. Offsite transport is likely to result in a wide variety of exposure scenarios for ecological receptors (Interstate Technology and Regulatory Council 2020; Ankley et al. 2020).

10.12.3.2 Exposure Pathways Analysis

Figure 10-14 is a diagram showing the ecological conceptual site exposure models for Truax Field. Terrestrial receptors may be exposed to PFAS at the sites via a number of pathways including, but not limited to, the following:

- Terrestrial plants and soil invertebrates (i.e., earthworms) can be directly exposed to PFAS in soil and uptake these compounds into their tissues.

- The accumulation of PFAS in the terrestrial food web may result in exposures to terrestrial wildlife (e.g., mammals and birds), which may also be exposed to PFAS in soil and surface water during foraging and grooming.

Aquatic environments located downgradient of AFFF releases could be habitat for aquatic or aquatic-dependent wildlife. In many cases, offsite receptors are sensitive to lower levels of PFAS relative to on-Site exposures and risks and may drive the investigation (Conder et al. 2019). Aquatic receptors that inhabit the installations (i.e., "onsite") as well as those outside of the installation (i.e., "offsite") could be exposed to PFAS by a number of pathways including, but not limited to, the following:

- Aquatic organisms such as invertebrates and fish may be at risk of the direct toxic effects and bioconcentration of PFAS in water.

- Benthic organisms living in aquatic sediments can be adversely affected from direct exposure to PFAS and can accumulate these chemicals in their tissues.

- The accumulation of PFAS in the aquatic food web may result in exposures to higher trophic- level wildlife (e.g., mammals and birds), which also may be exposed to PFAS in sediment and surface water during foraging and grooming.

10.12.3.3 Ecological Receptors of Concern

An Integrated Natural Resources Management Plan was not conducted at Truax Field; however, a bat survey conducted from May to June 2018 identified four species, including the big brown (*Eptesicus fuscus*), eastern red (*Lasirus borealis*), hoary (*Lasiurus cinereus*), and silver-haired (*Lasionycteris noctivagans*) bats, whose conservation status listing is of least concern, indicating stable populations (Truax Field 2018a).

There are no threatened and/or endangered flora species found on Truax Field (Truax Field 2018b). Common tree species are typical for the Midwest (e.g., various oaks, cottonwood, sycamore, box elder, silver maple, red cedar, and cherry). Truax Field is completely developed with buildings and roads and also features heavily altered and/or man-made aquatic wetland habitat areas.

Based on the exposure pathways and the features of the Site that could result in exposure to ecological receptors, the proposed receptors to be evaluated that may have been impacted by PFAS include the following:

Terrestrial receptors when PFAS-impacted soils are present (limited to onsite):

- Plants and soil invertebrates exposed directly to soil

- Small terrestrial insectivores or omnivores (birds, mammals, and reptiles) exposed directly to soil (incidental ingestion) and ingest surface water and dietary items (e.g., soil invertebrates, and plants) that have accumulated PFAS from soil

- Large carnivorous birds and mammals that consume surface water and prey on smaller terrestrial birds and mammals.

Aquatic receptors when PFAS-impacted surface water bodies are present (both onsite and offsite):

- Pelagic invertebrates, amphibians, and fish exposed directly to water

- Benthic invertebrates exposed directly to sediment

- Aquatic-dependent mammals and avian wildlife exposed to sediment (incidental ingestion) and ingest surface water and dietary items (e.g., fish and benthic invertebrates) that have accumulated PFAS.

Differences in species sensitivities, analytical methods, environmental substrate, test conditions, and reproducibility of results make it difficult to generalize overall effects, and some species may be more or less sensitive than others. Although there are numerous studies on the toxicity of some PFAS to aquatic invertebrates, these studies are generally limited to a small number of PFAS (typically PFOS and PFOA) and the studies indicate a wide range of effects levels (Interstate Technology and Regulatory Council 2020). However, many publications indicate PFOS as a driver of toxicity and potentially having greater bioaccumulation potential compared to other PFAS (Giesy et al. 2010; Ankley et al. 2020). There are significantly fewer toxicity studies available for other groups of aquatic or benthic organisms; however, some studies are available for avian or mammalian wildlife or plants (as cited in Interstate Technology and Regulatory Council 2020; Dennis et al. 2020a, 2020b).

10.13 CONCEPTUAL SITE MODEL DATA GAPS

The following CSM data gaps have been identified for Truax Field:

- Current groundwater flow direction(s) in the study area

- Source of irrigation water at the Bridges Golf Course

- PFAS source strength and delineation of PFAS extent in soil above RI SLs

- PRLs where soil samples did not confirm a source area

- PRL (F-16 Crash Site) where environmental samples were not collected during the SI

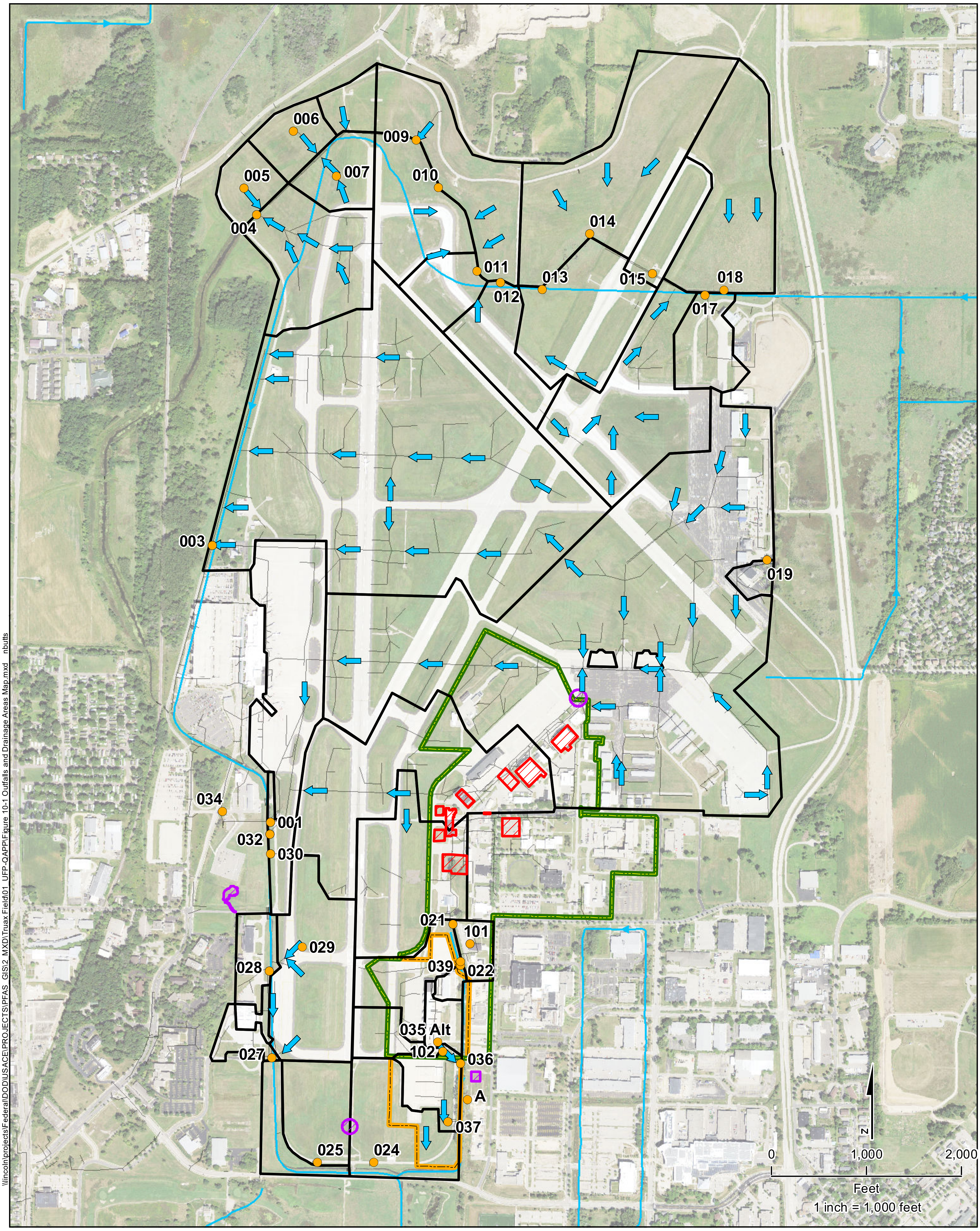
- PRL 10 (Building 1209 Nozzle Test Area 3)

- Downgradient delineation of PFAS in groundwater and surface water above RI SLs

- Fate and Transport – Potential for preferential pathways and barriers to flow, potential vertical gradients, mass flux, bedrock fracture flow vs primary porosity, surface water-groundwater interaction

- Potential off-Base sources, including but not limited to: Former Practice Burn Pit FTA, Former Truax Landfill, and the Burke WWTP/Reynolds property

- Human Health and Ecological Conceptual Site Exposure Models – PFAS concentrations in on-Base and off-Base surface water, sediment, fish, and in groundwater in off-Base potable wells.



Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs
Drainage Areas
Stormwater Sewer Lines
Stormwater Flow Direction
Stormwater Outfall

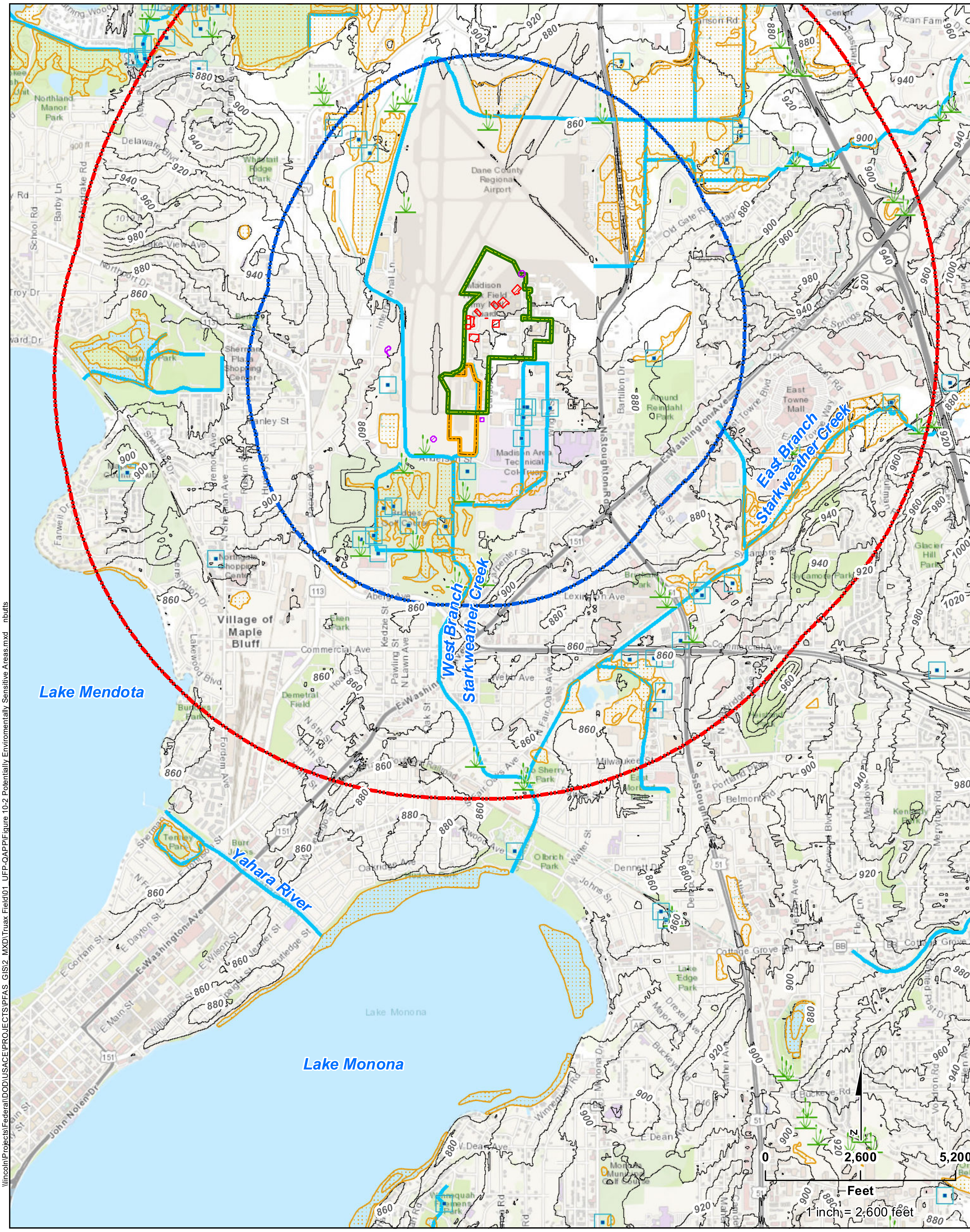
PRL - Proposed Release Areas
FFTA - Fire Fighting Training Area

Figure 10-1
Outfalls and Drainage Areas Map
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

Map Date: 11/22/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet

\\lincoln\projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 10-1 Outfalls and Drainage Areas Map.mxd nbutts



\\lincoln\Projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 10-2 Potentially Enviromentally Sensitive Areas.mxd nbutts

- Installation Boundary
- Wisconsin Army National Guard
- On-Base PRLs and FFTAs
- Off-Base PRLs and FFTAs
- 1-mile Buffer
- 2-mile Buffer
- Wetland Class Areas
- Wetland Class Areas
- Filled Wetland Areas
- Excavated pond
- Wetland too small to delineate
- 20-ft Surface Elevation Contours

PRL - Proposed Release Areas
FFTA - Fire Fighting Training Areas

Wetland Spatial Data Source:
Wisconsin Wetland Inventory

Figure 10-2
Potentially Environmentally Sensitive Areas Map
Truax Field Air National Guard
RIs at Multiple ANG Installations
Madison, Wisconsin
Map Date: 11/23/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet

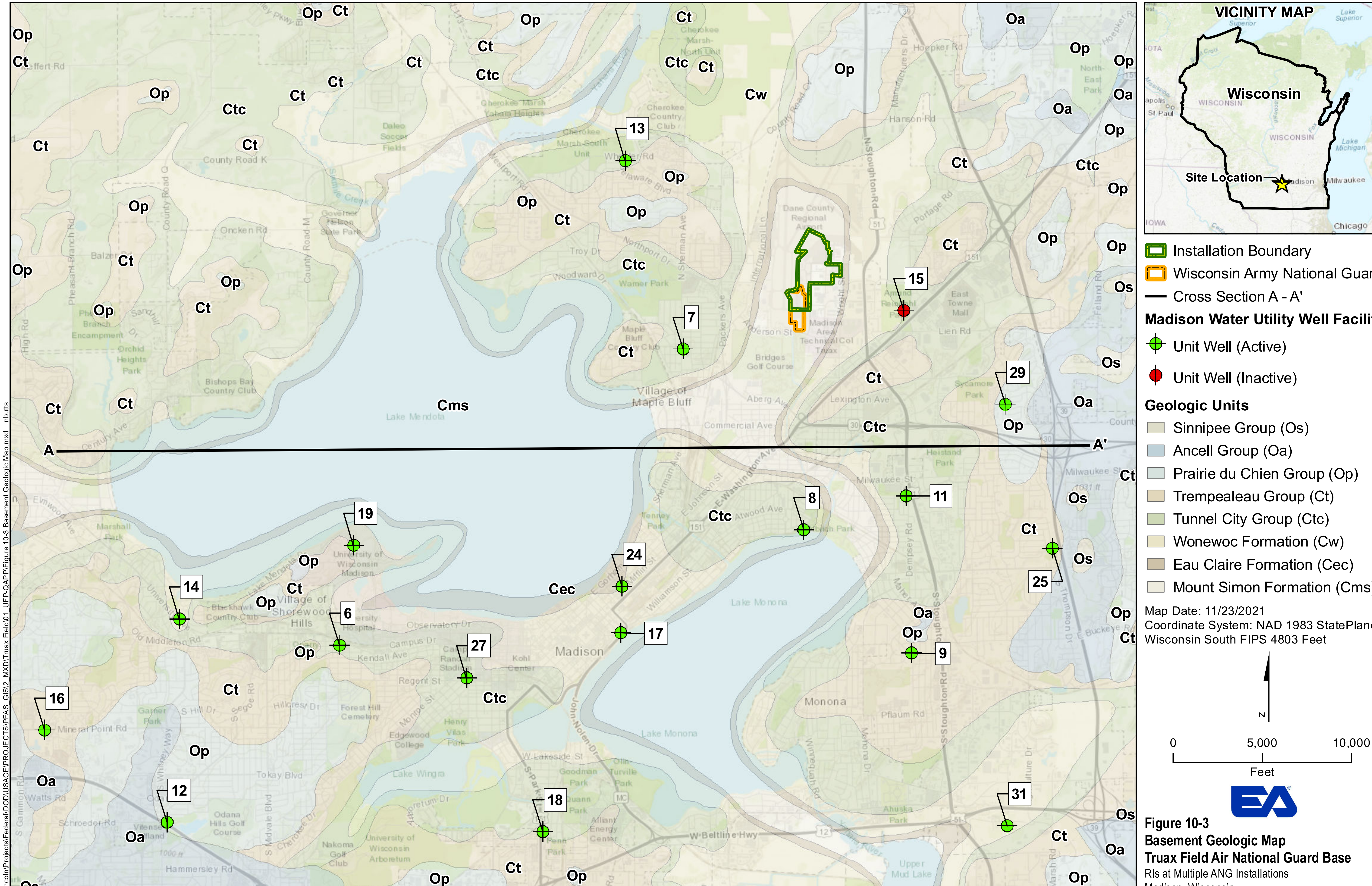
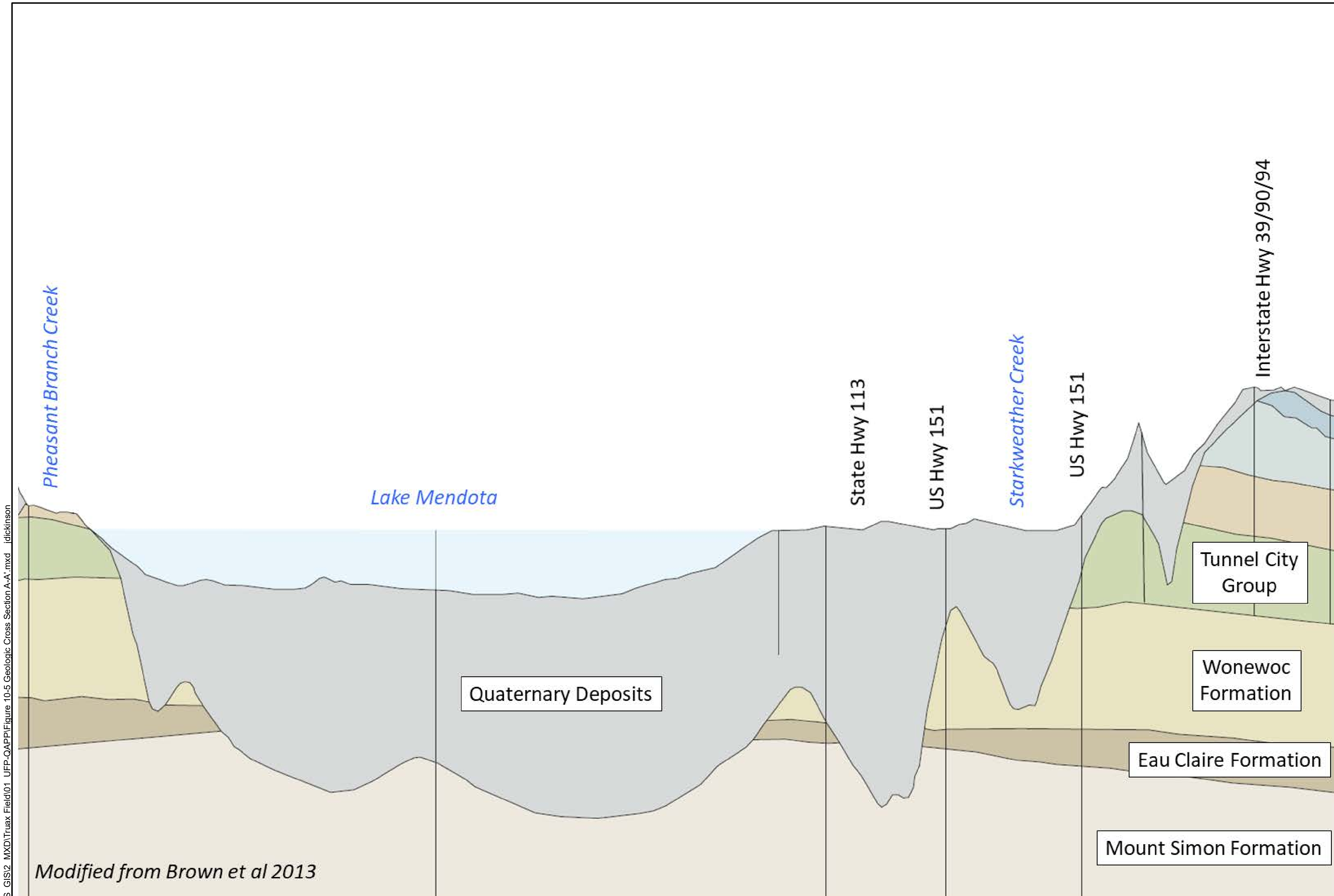
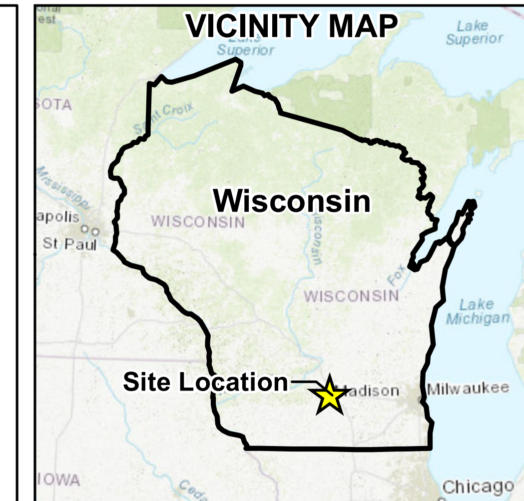


Figure 10-3
Basement Geologic Map
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

\\lincoln\Projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 10-3 Basement Geologic Map.mxd nbutts

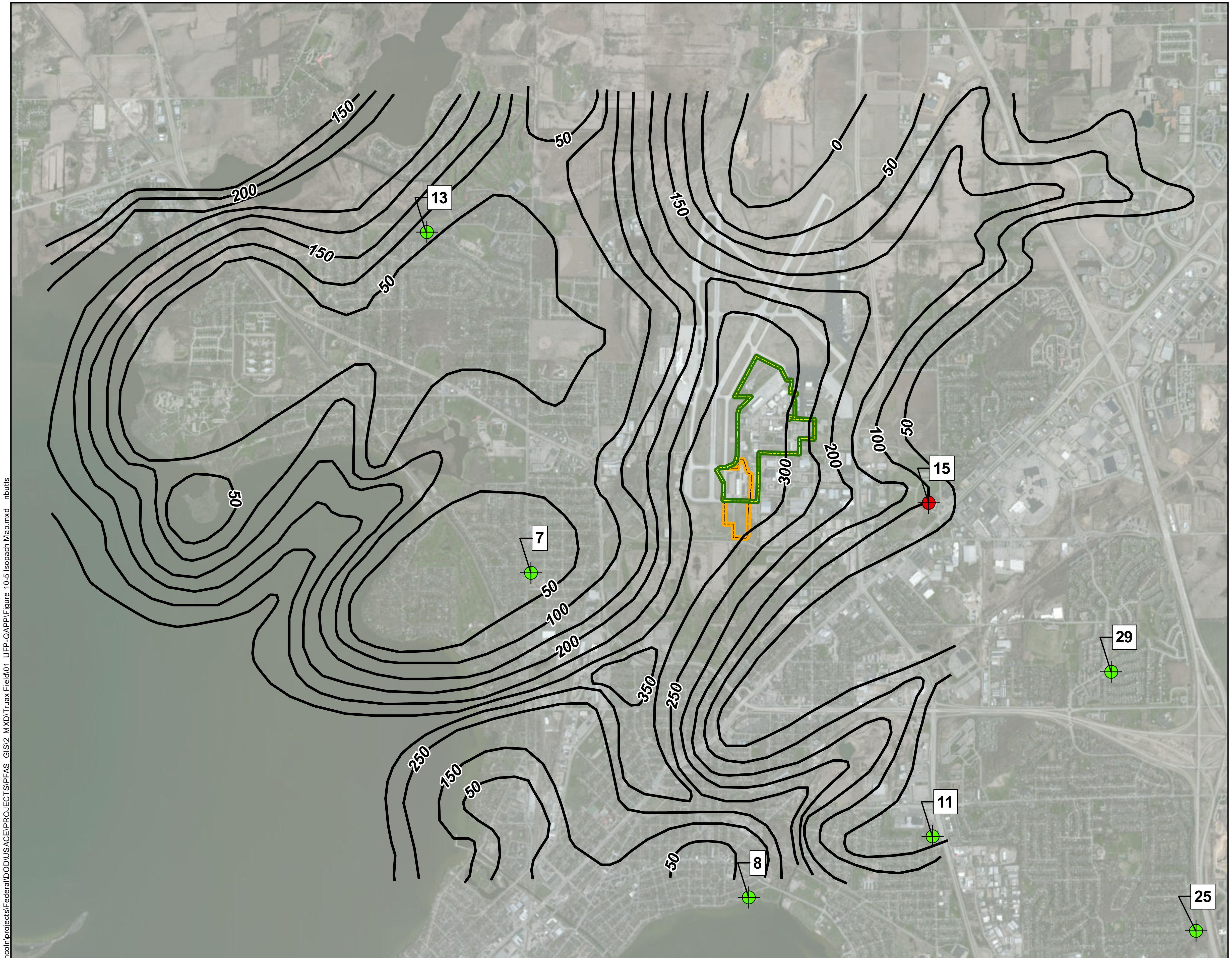




Map Date: 7/1/2021

Figure 10-4
Geologic Cross Section A-A'
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

F:\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 10-5 Geologic Cross Section A-A'.mxd idickinson



Installation Boundary

Wisconsin Army National Guard

Madison Water Utility Well Facilities

Unit Well (Active)

Unit Well (Inactive)

Thickness of Glacial Drift (Adapted from 1988 Preliminary Assessment Report, PEER Consultants)

See Exhibit 3 (in-text) for cross sectional view of incised bedrock surface and overlying glacial drift deposits in the vicinity of Truax Field

Map Date: 11/22/2021
Coordinate System: NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet

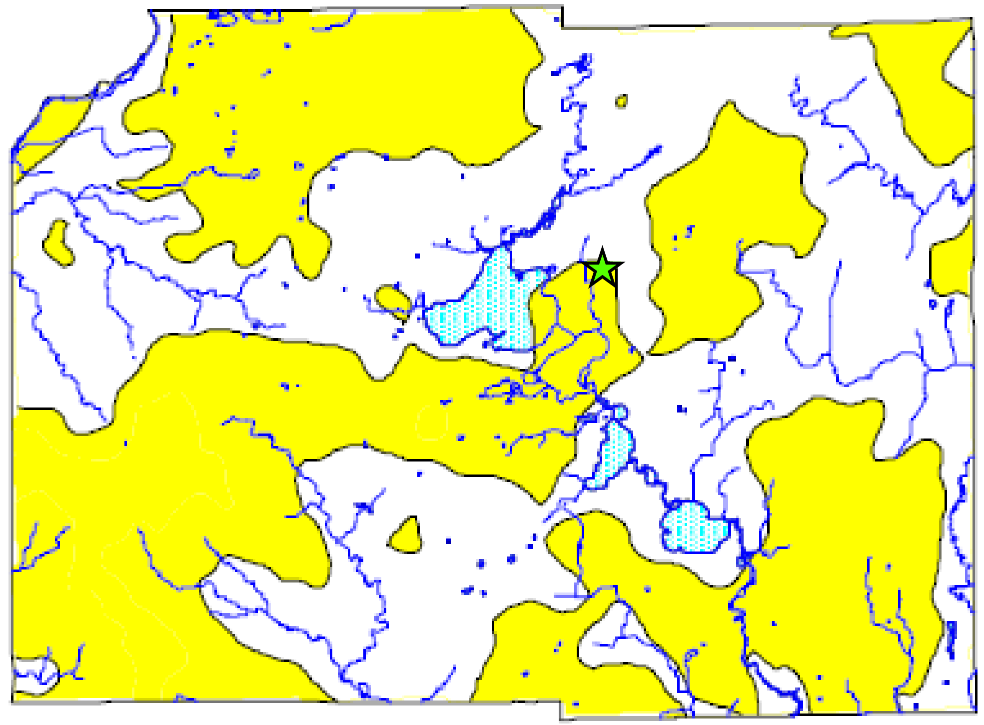
N

0 3,000 6,000
Feet
1 inch = 3,000 feet

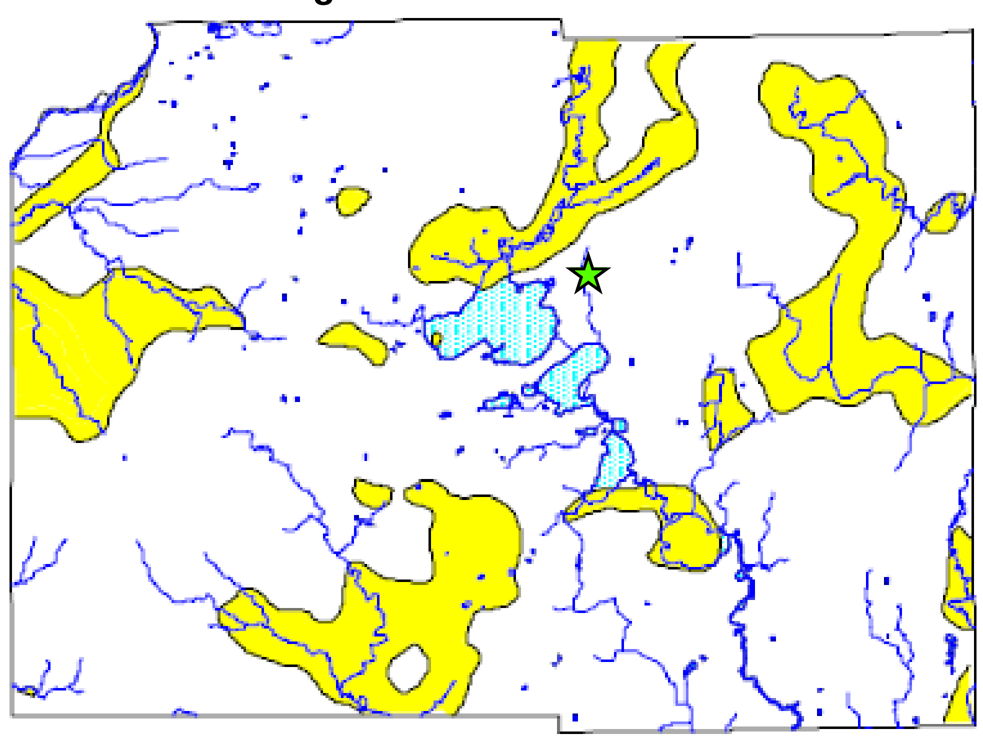
Figure 10-5
Isopach Map
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

\\lincoln\projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 10-5 Isopach Map.mxd nbutts

Areas of Recharge

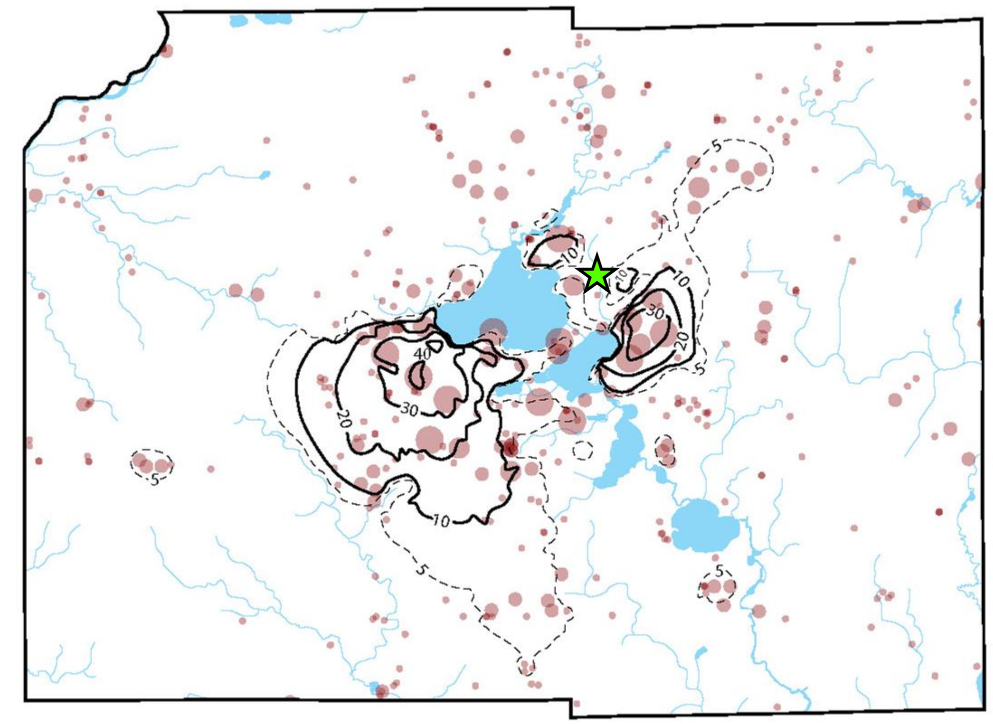


Areas of Discharge

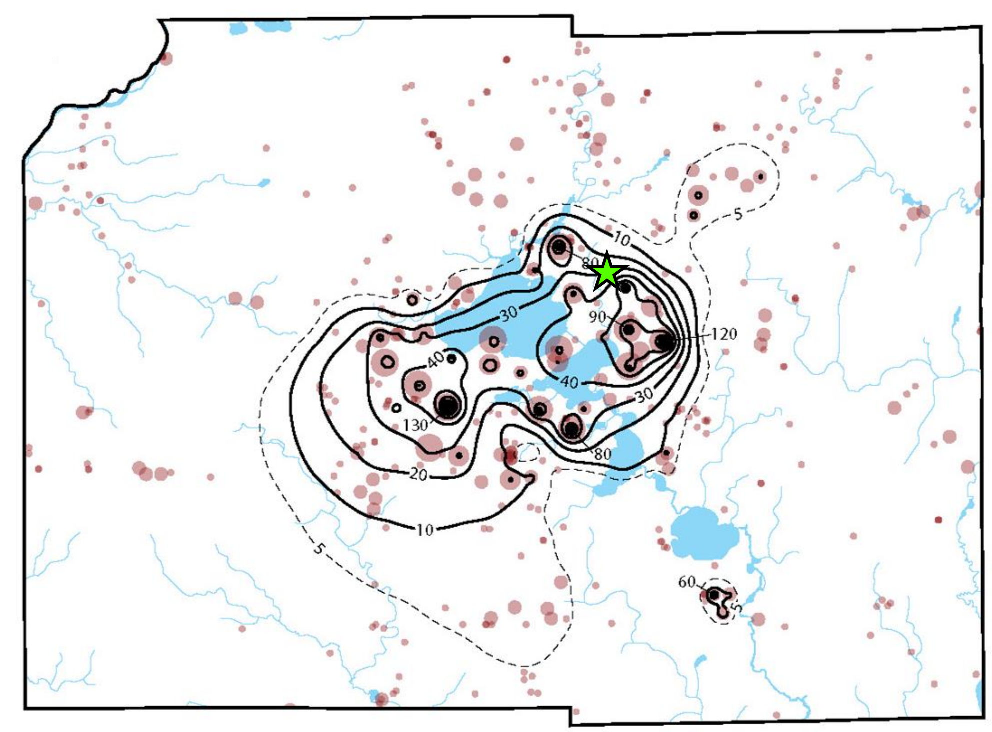


Dane county areas of recharge to and discharge from the Mount Simon aquifer based on water level measurements.

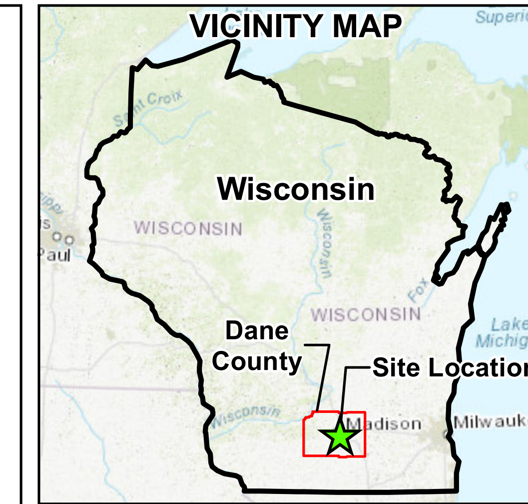
Drawdown in Water Table



Drawdown in Potentiometric Surface, Mount Simon



Dane county simulated steady-state drawdown, comparing predevelopment and 2010 conditions.



5 ft of drawdown

Drawdown, in 10 ft intervals

Well pumping rate (mgd)

- <0.1
- 0.1 - 0.5
- 0.5 - 1.0
- >1.0

Major streams and lakes

Truax Field ANGB Site Location

N

0 1 2 3 4 miles

Adapted from Parsen et al 2016 and Bradbury et al 1999

Figure 10-6
Areas of Recharge to Discharge and Simulated Steady-State Drawdown
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

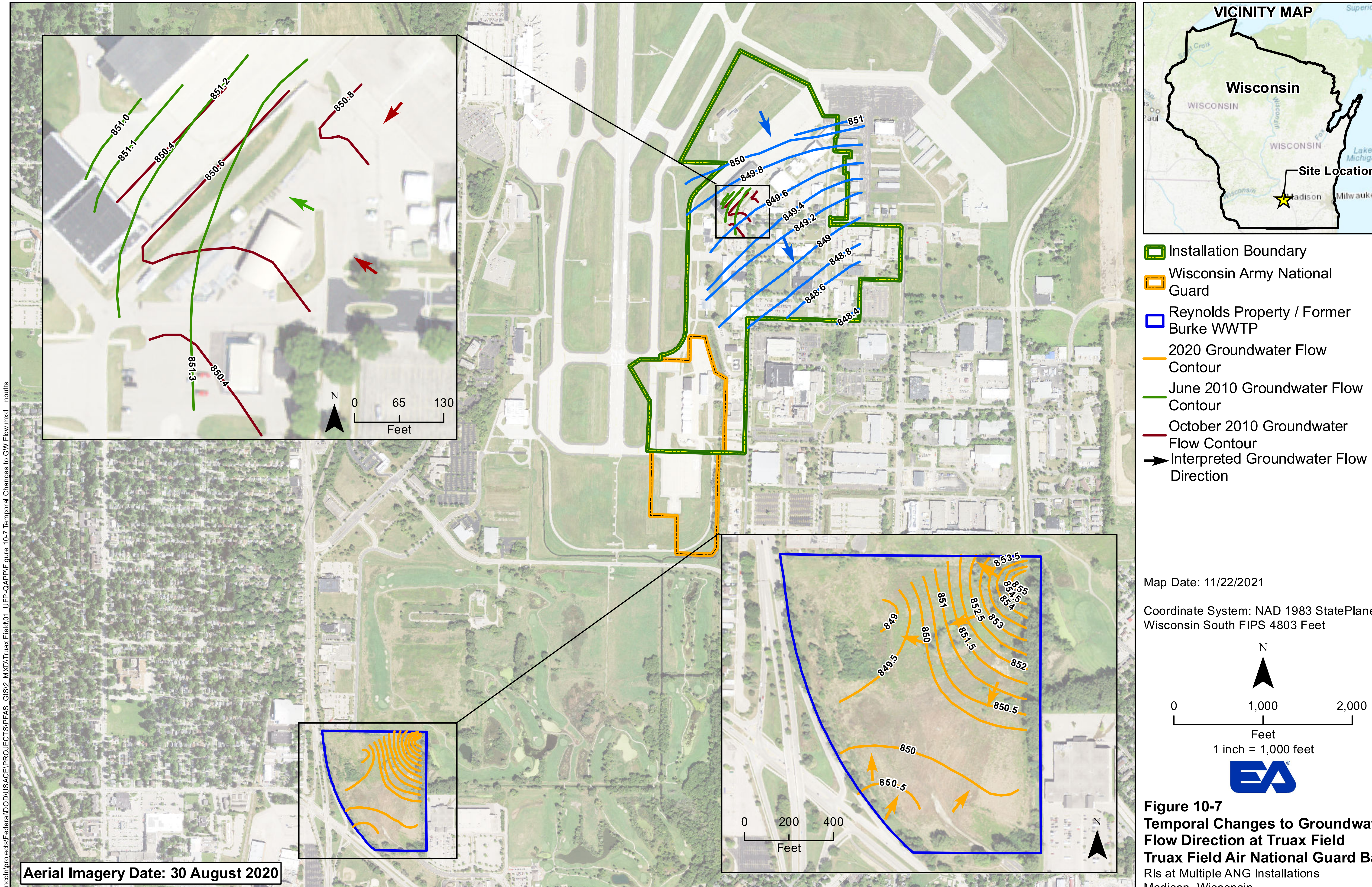
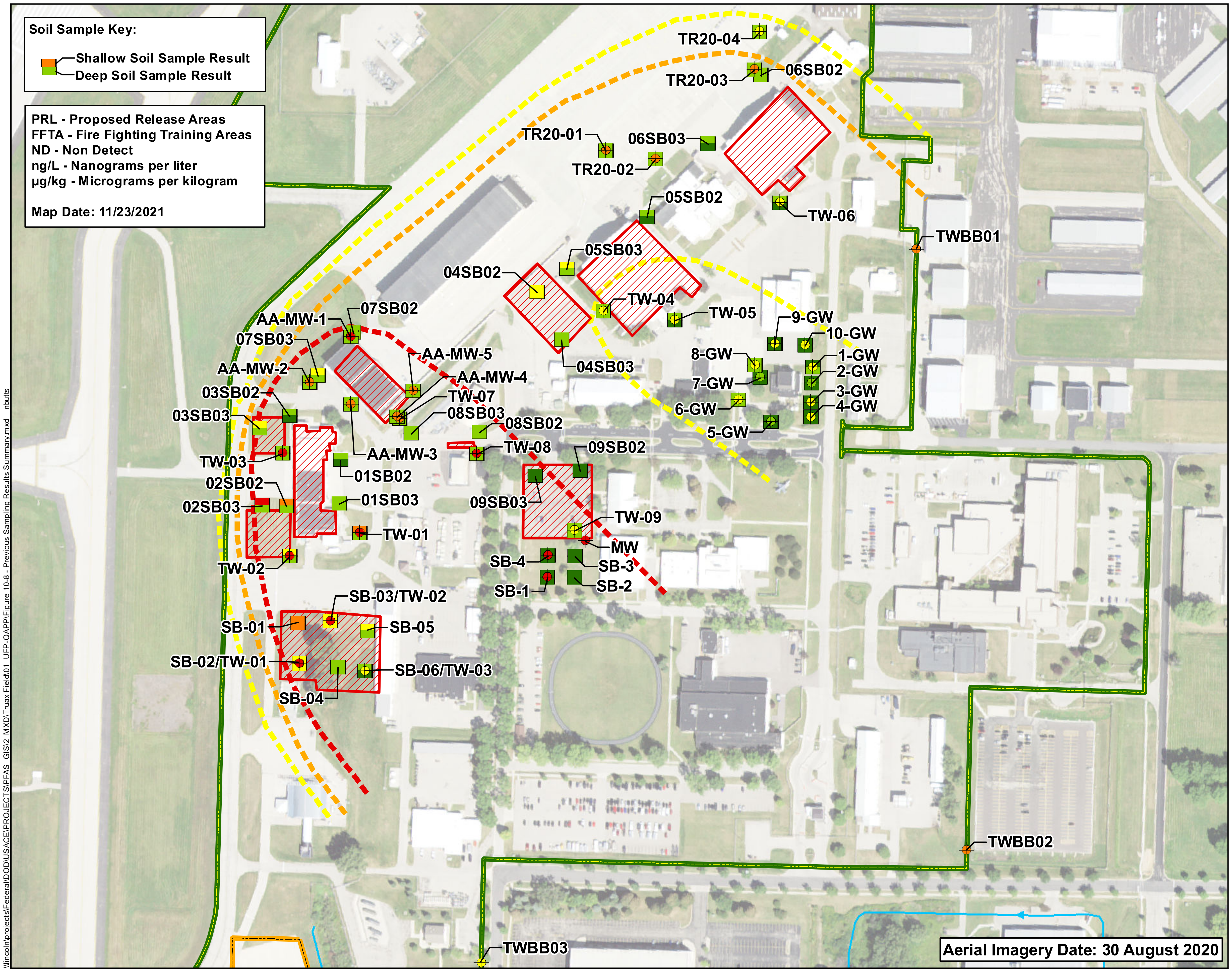


Figure 10-7
Temporal Changes to Groundwater Flow Direction at Truax Field
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

\\lincoln\projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01 UFP-QAPP\Figure 10-7 Temporal Changes to GW Flow.mxd nbutts



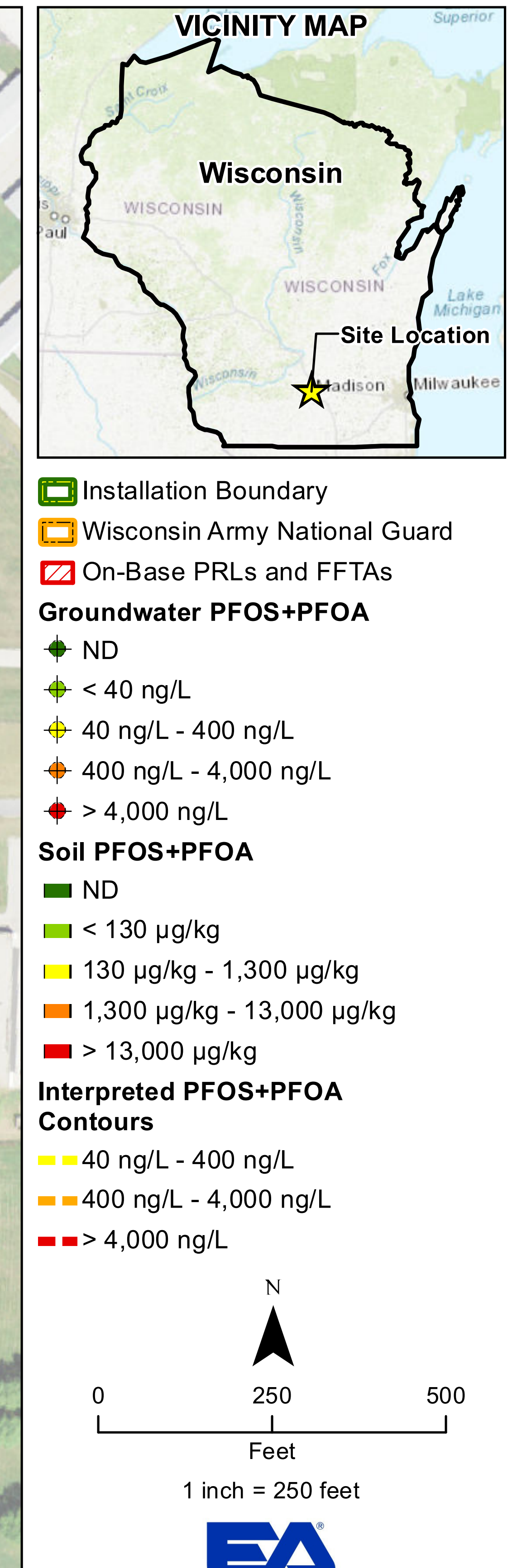
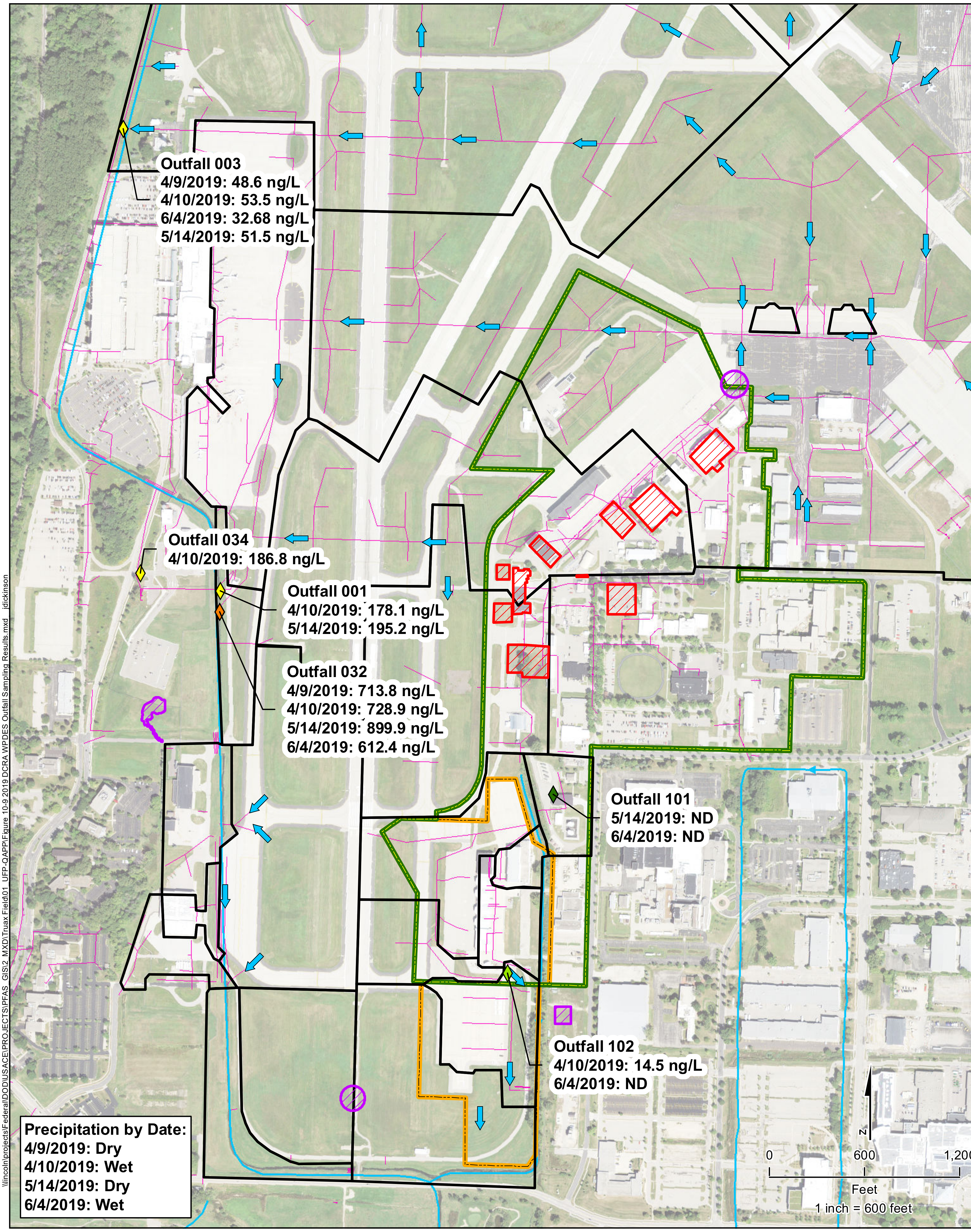


Figure 10-8
Previous Sampling Results Summary
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin



Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs
Drainage Areas
Storm Sewer Lines
Stormwater Sewer Flow Direction

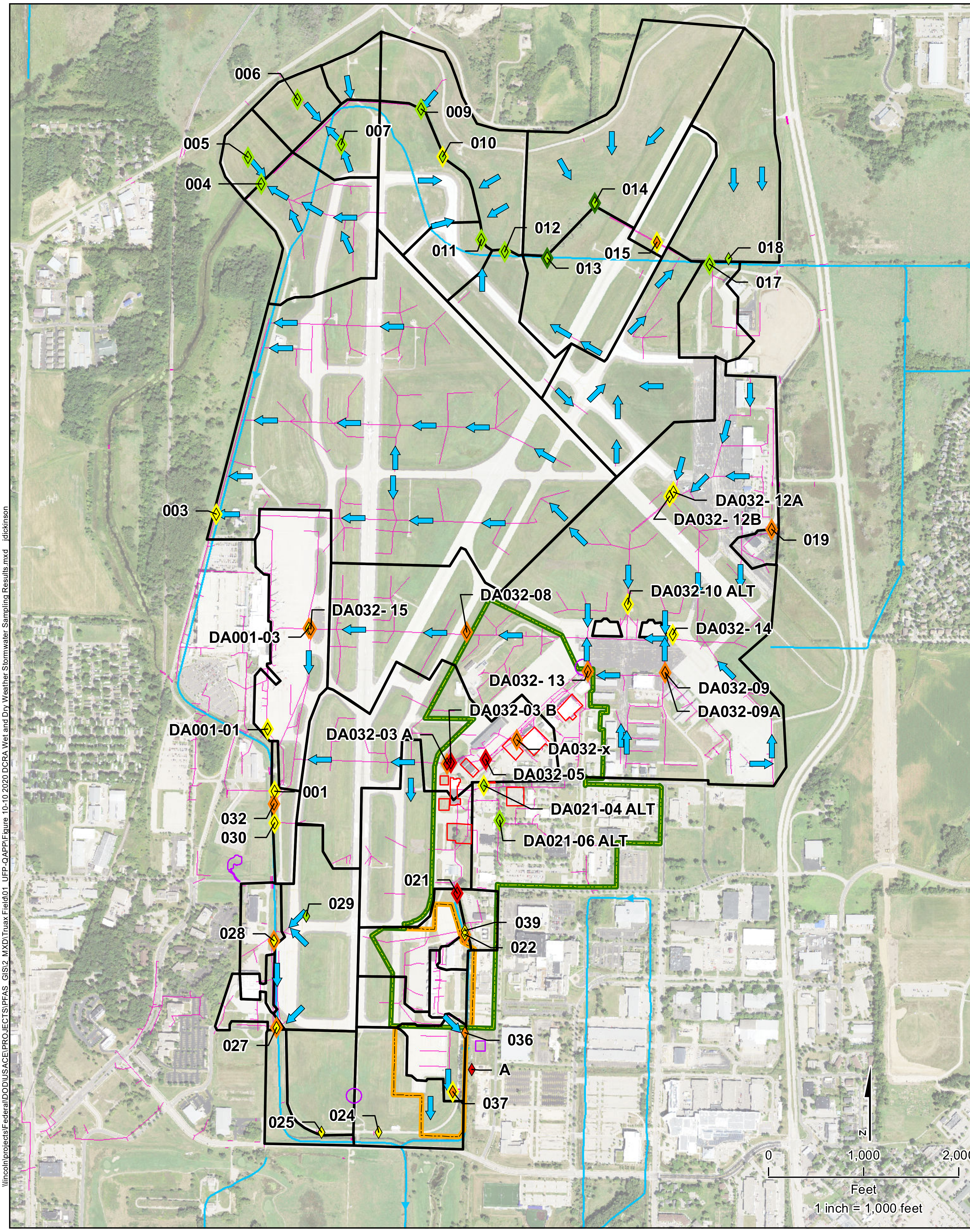
Surface Water PFOS+PFOA

- ND
- < 40 ng/L
- 40 ng/L - 400 ng/L
- 400 ng/L - 4,000 ng/L
- > 4,000 ng/L

PRL - Proposed Release Areas
FFTA - Fire Fighting Training Areas
ND - Non Detect
ng/L - Nanograms per liter

Figure 10-9
2019 DCRA WPDES Outfall Sampling Results
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

Map Date: 12/13/2021
Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet



Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs
Drainage Areas
Storm Sewer Lines
Stormwater Sewer Flow Direction

Sample locations with halos indicate sampling in both February 2020 (halo) and July 2020 (interior diamond)

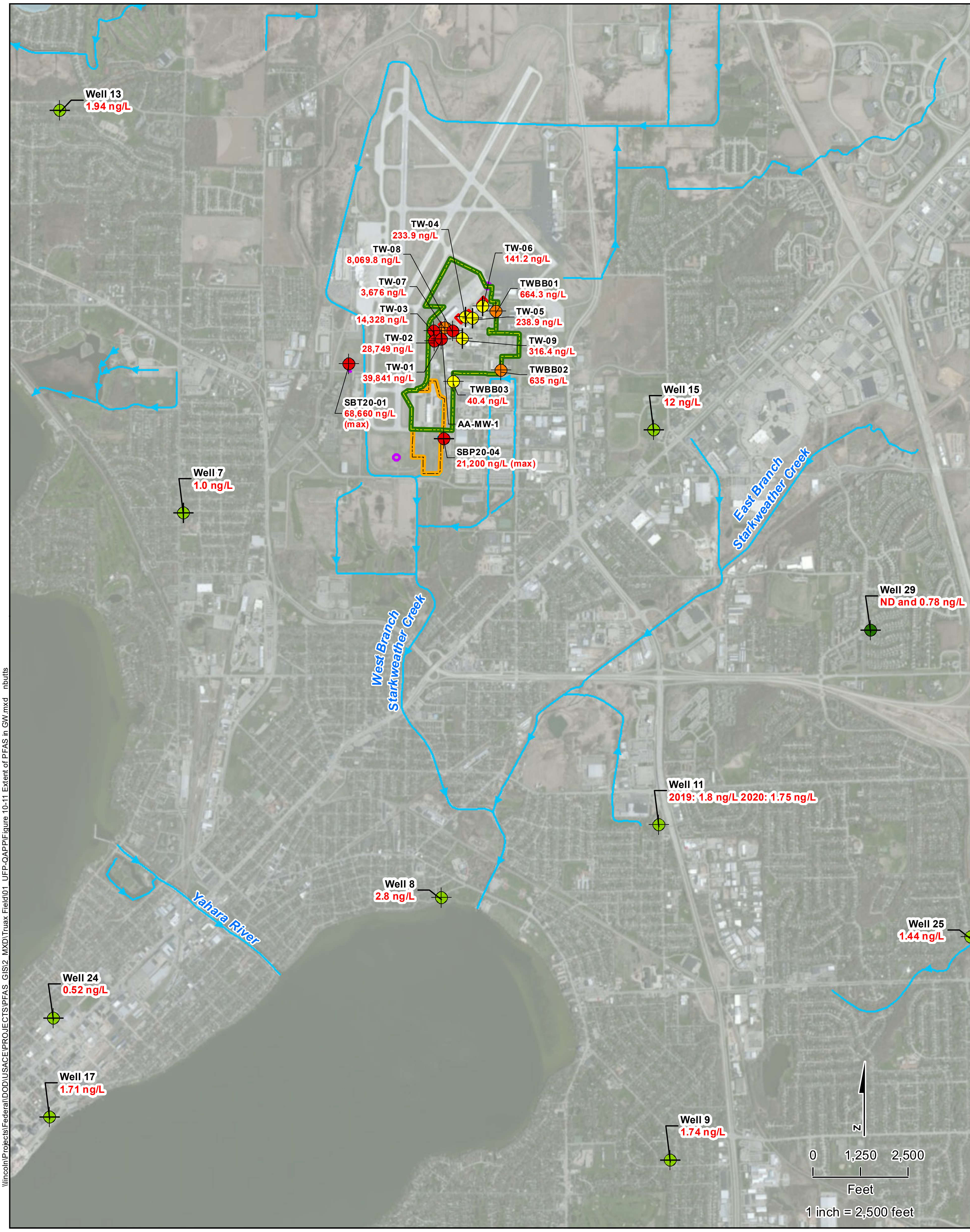
Surface Water PFOS+PFOA

- ND
- < 40 ng/L
- 40 ng/L - 400 ng/L
- 400 ng/L - 4,000 ng/L
- > 4,000 ng/L

PRL - Proposed Release Areas
FFTA - Fire Fighting Training Area
ND - Non Detect
ng/L - Nanograms per liter

Figure 10-10
2020 DCRA Wet and Dry Weather Stormwater Sampling Results
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

Map Date: 12/13/2021
Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet



Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs

PRL - Proposed Release Areas
FFTA - Fire Fighting Training Areas
ND - Non Detect
ng/L - Nanograms per liter

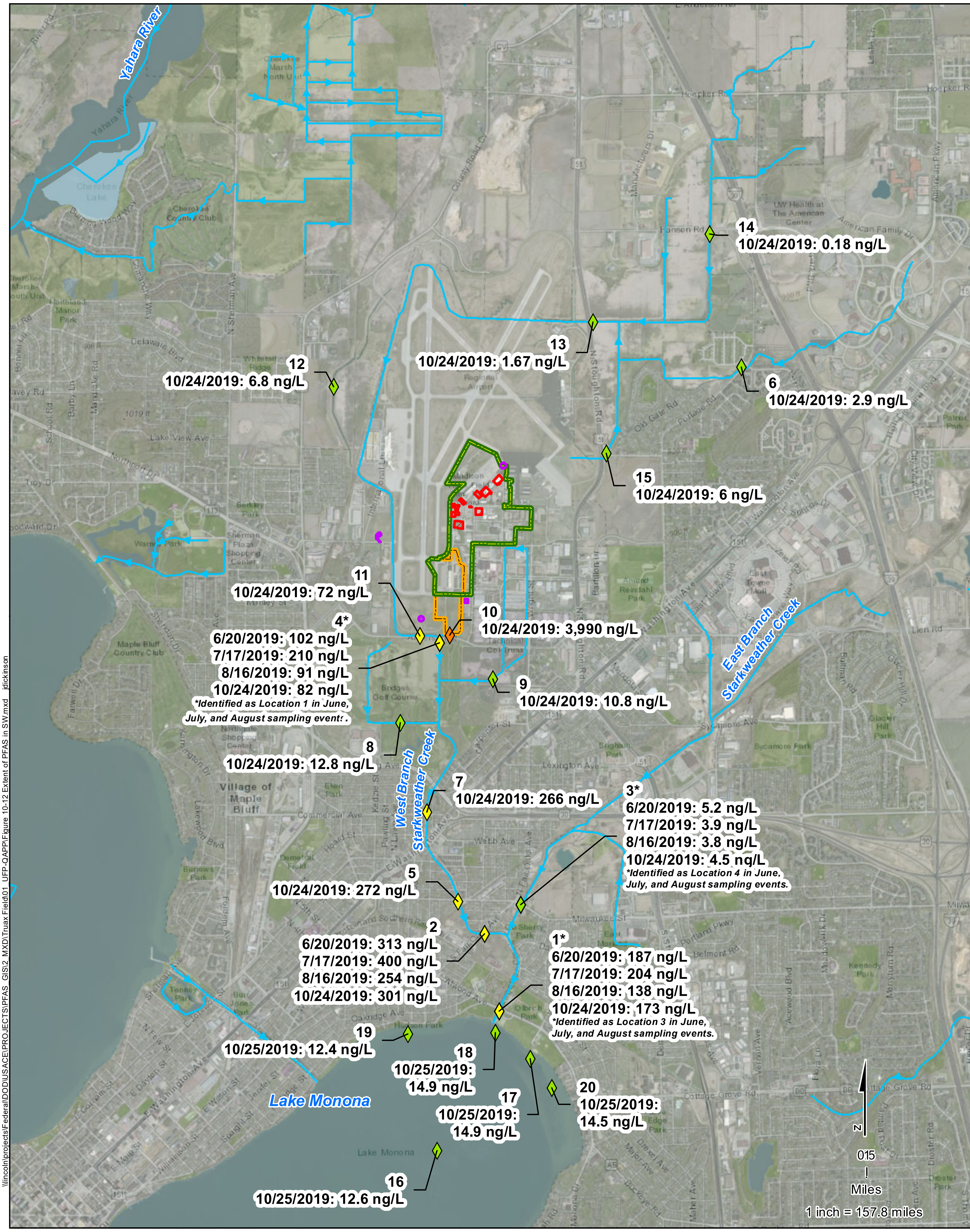
Groundwater PFOS+PFOA

- ND
- < 40 ng/L
- 40 ng/L - 400 ng/L
- 400 ng/L - 4,000 ng/L
- > 4,000 ng/L

Figure 10-11
Extent of PFAS in Groundwater
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

Map Date: 11/23/2021
Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet

\\lincoln\Projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 10-11 Extent of PFAS in GW.mxd nbutts



Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs

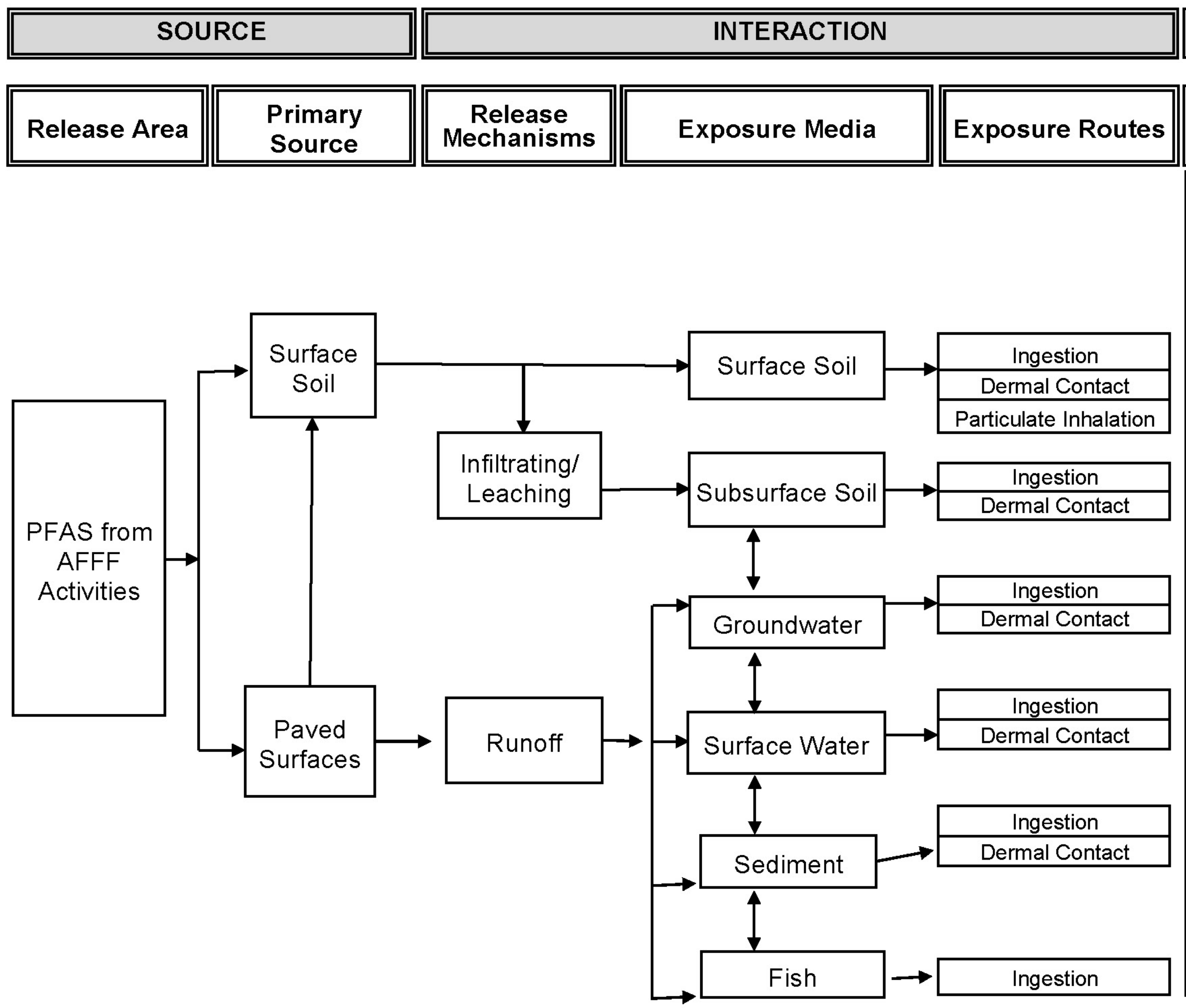
PRL - Proposed Release Area
FFTA - Fire Fighting Training Area
ND - Non Detect
ng/L - Nanograms per liter

Surface Water PFOS+PFOA

- ND
- < 40 ng/L
- 40 ng/L - 400 ng/L
- 400 ng/L - 4,000 ng/L
- > 4,000 ng/L

Figure 10-12
Extent of Downgradient PFAS Contamination in Surface Water
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

Map Date: 12/13/2021
Coordinate System:
NAD 1983 StatePlane Wisconsin South FIPS 4803 Feet



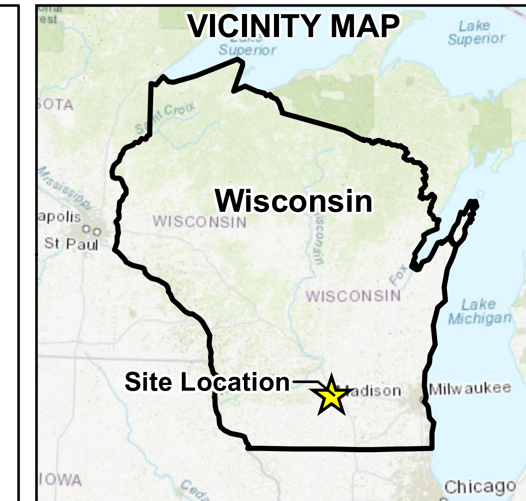
RECEPTORS

Human Receptors

Exposure Media	Exposure Routes	Onsite Current and Future Commercial or Industrial Workers	Onsite Current and Future Construction Workers	Onsite Future Residential Water Users	Offsite Current and Future Residents	Offsite Current and Future Recreational Users	Trespasser
Surface Soil	Ingestion	●	●	○	◑	◑	◑
	Dermal Contact	●	●	○	◑	◑	◑
	Particulate Inhalation	●	●	○	◑	◑	◑
Subsurface Soil	Ingestion	◑	●	○	○	◑	◑
	Dermal Contact	◑	●	○	○	◑	◑
Groundwater	Ingestion	○	●	◑	◑	◑	◑
	Dermal Contact	○	●	◑	◑	◑	◑
Surface Water	Ingestion	◑	◑	◑	◑	◑	◑
	Dermal Contact	◑	◑	◑	◑	◑	◑
Sediment	Ingestion	◑	◑	○	◑	◑	◑
	Dermal Contact	◑	◑	○	◑	◑	◑
Fish	Ingestion	○	○	○	◑	◑	◑

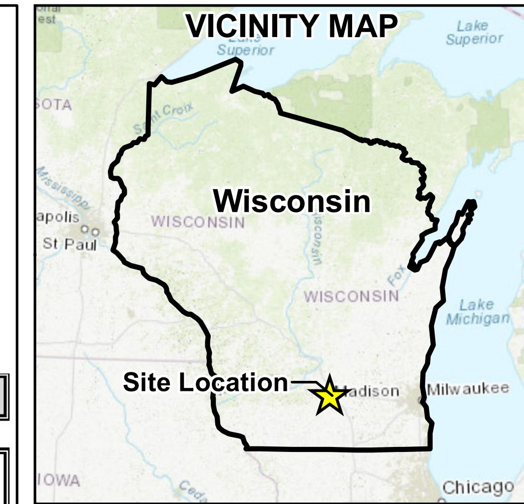
LEGEND

- ● Complete Exposure Pathway; quantitatively evaluated
- ◑ Potentially Complete Exposure Pathway; exposure is unknown or evaluated qualitatively
- ○ Incomplete Pathway (no expected exposure); not significant

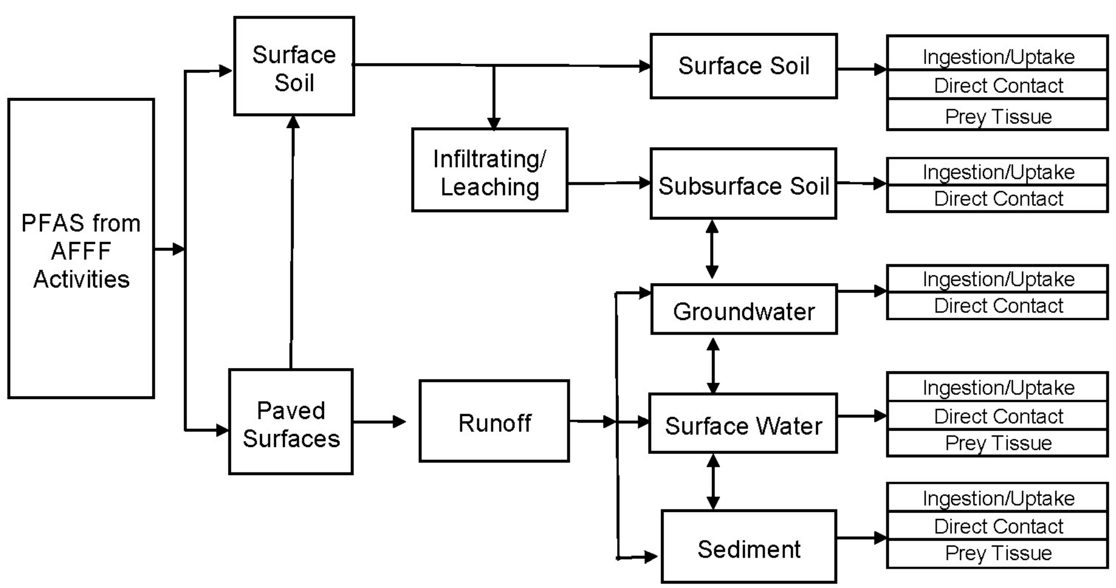


Map Date: 10/12/2021

Figure 10-13
Human Health Risk Assessment Conceptual Site Model
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin



SOURCE		INTERACTION			RECEPTORS
Release Area	Primary Source	Release Mechanisms	Exposure Media	Exposure Routes	Ecological Receptors



Exposure Media	Exposure Routes	On-Site Terrestrial Receptors: Plants	Soil Invertebrates	Birds	Mammals	Amphibians and Reptiles	On-Site and Off-Site Aquatic Receptors: Benthic Invertebrates	Aquatic Life (fish, water column invertebrates)	Aquatic Birds	Aquatic Mammals
Surface Soil	Ingestion/Uptake	●	●	●	●	◑	○	○	○	○
	Direct Contact	●	●	◑	◑	◑	○	○	○	○
	Prey Tissue	○	○	●	●	◑	○	○	○	○
Subsurface Soil	Ingestion/Uptake	◑	◑	◑	◑	◑	○	○	○	○
	Direct Contact	◑	◑	◑	◑	◑	○	○	○	○
Groundwater	Ingestion/Uptake	◑	◑	○	○	○	○	○	○	○
	Direct Contact	○	○	○	○	○	○	○	○	○
Surface Water	Ingestion/Uptake	○	○	●	●	◑	◑	●	●	●
	Direct Contact	○	○	◑	◑	◑	◑	●	◑	◑
	Prey Tissue	○	○	●	◑	◑	○	○	●	●
Sediment	Ingestion/Uptake	○	○	●	○	◑	●	●	●	●
	Direct Contact	○	○	◑	○	◑	●	◑	◑	◑
	Prey Tissue	○	○	●	○	◑	○	◑	●	●

LEGEND

- ● Complete Exposure Pathway; quantitatively evaluated
- ◑ Potentially Complete Exposure Pathway; exposure is unknown or evaluated qualitatively
- ○ Incomplete Pathway (no expected exposure); not significant

Date: 7/7/2021

Figure 10-14
Ecological Risk Assessment
Conceptual Site Model
Truax Field Air National Guard Base
RIs at Multiple ANG Installations
Madison, Wisconsin

QAPP Worksheet #11: Project/Data Quality Objectives

The DQOs for the RI at Truax Field are outlined below. These DQOs will follow EPA's seven-step iterative process for DQO development (EPA 2006). DQOs are influenced by the ongoing project planning discussions with stakeholders and will be updated if new consensus decisions materialize.

Step 1: State the Problem

PFAS are a group of synthetic fluorinated compounds that can be found in a number of industrial and consumer products, including AFFF, which is commonly used at military installations. There is a potential for AFFF to be released to the environment during fire suppression training activities, during active emergency response petroleum-fire suppression, as well as other routine base operational activities. The chemical structure of PFAS makes them resistant to breakdown in the environment, which may impact surface water, groundwater, soils, and drinking water at or near areas where it is released. The extent of PFAS, which may pose a risk to human health or the environment, in environmental media at Truax Field is currently unknown. PFAS are classified as emerging environmental contaminants that are garnering increasing regulatory interest due to their potential risks to human health and the environment. The regulatory framework for managing PFAS at both the federal and state level continues to evolve.

The PA (BB&E, Inc. 2015) and SI (Amec Foster Wheeler 2019) identified a total of nine suspected sources of PFAS to environmental media or PRLs within and near Truax Field (Figure I-2). The PRLs require completion of an RI to determine the nature and extent of the PFAS in soil, sediment, surface water, porewater, and groundwater, and to evaluate the potential for unacceptable human health and/or ecological risks due to exposure to PFAS in site media.

Step 2: Identify the Goal of the Study

The goals of the RI include the following:

- Determine the extent of PFAS at or above RI SLs (Worksheet #15) at sources and in all pathways at Truax Field.

- Collect or develop data to evaluate the releases (including source strength).

- Determine the concentration of PFOA, PFOS, and PFBS at or above SLs (Worksheet #15) in soil, groundwater, surface water, vadose zone porewater, and sediment, both in source areas and all pathways, to establish concentration gradients.

- Determine the horizontal and vertical boundaries of PFAS sources and pathways of migration.

- Determine the mechanism(s) of PFAS release to pathways and direction of pathway transport.

- Determine the route(s) of exposure to human and ecological receptors and evaluate risk.

Step 3: Identify the Information Inputs

The following data and informational needs for each PRL and the general area within Truax Field are required to achieve project goals:

- Collect historical and installation-specific information through document reviews, site visits, ANG records, public GIS databases, and conference calls.

Hydraulic Profiling Tool/Electrical Conductivity/Groundwater Borings

To obtain additional data to enhance the understanding of the nature and extent of PFAS in groundwater at the site and to provide additional hydrogeologic data, HPT/EC/groundwater sampling points will be used. The HPT/EC/groundwater borings will provide the following data:

- Aquifer permeability estimates continuously throughout the depth profiles (anticipated depth of 100 ft bgs; general limit for direct-push investigations) using the HPT.

- Evaluations of subsurface lithology through use of the EC sensor as integral to the HPT probe. The EC sensor will provide a continuous log of the EC of the aquifer materials as an indicator of grain size, and hence relative permeability.

- Collection of discrete grab groundwater samples for PFAS analysis at various depth intervals to provide nature and extent data for PFAS in the aquifer (laterally and vertically). Preference will be given to collecting samples in zones that are indicated to be of higher hydraulic conductivity.

The proposed HPT/EC/Groundwater borings will be completed in Mobilization 1 (initial borings shown on Figure 17-1), with subsequent HPT/EC/Groundwater borings and transects to be completed based on the initial results. Correlation soil borings will be completed adjacent to a subset of the HPT/EC/Groundwater borings (up to five locations) as described below under "Soil Sampling" to confirm soil lithology interpreted from HPT/EC data.

Soil Sampling/Lithologic Logging

To obtain additional data to enhance the understanding of the nature and extent of PFAS in soil at the site and at background concentrations, soil borings will be used. The soil borings will provide the following data:

- Sampling of surface and subsurface vadose zone soil to depths of 10 ft (estimated depth based on historic groundwater elevation; may be shallower or deeper depending on observations while in the field) at known AFFF release/impacted areas using DPT, with analysis for PFAS.

- Select soil samples within the suspected source areas may also be analyzed for total oxidizable precursors (TOP) assay analysis to aid in the fate and transport analysis for PFAS. This analysis will be used to evaluate the presence of precursors in source areas that may be co-located with other sources creating anerobic redox conditions.

- Continuous soil coring will be completed from the ground surface to 100 ft bgs (or bedrock/refusal if encountered before 100 ft bgs) to observe lithology and correlate with up to five HPT/EC probe locations to be used for evaluating release areas and to refine the CSM.

- Sampling of surface and subsurface vadose soil to depths of 10 ft at selected locations (total of 8 soil borings) representative of background conditions (i.e., unaffected by PFAS, to help evaluate risk) using DPT, with analysis for PFAS.

Monitoring Well Drilling/Installation

Based on the results of the HPT/EC/Groundwater data collection, a series of new MWs will be installed in locations appropriate for the continued evaluation and monitoring of PFAS groundwater plumes identified at Truax Field during RI activities. It is anticipated that up to 24 new MWs will be installed across the extent of PFAS in groundwater. Installation of MWs will provide the following data:

- Monitoring well borings will be drilled using sonic drilling techniques, with continuous soil logging. Tentative well depths are 30–50 ft bgs but will ultimately be determined after assessment of all available data is completed with emphasis placed on zones of higher expected hydraulic conductivity and vertical plume delineation.

- Sampling of surface and subsurface vadose and saturated zone soil to depths of 10 ft at select new MW locations, with analysis for PFAS and geotechnical parameters (pH, grain size, permeability, total organic carbon [TOC], and anion exchange capacity [AEC]/cation exchange capacity [CEC]). Analysis for geotechnical parameters will be focused in/near release areas.

Groundwater Sampling

Following the installation and development of new MWs, sampling of MWs will provide the following data:

- Baseline groundwater sampling event will be completed to include an estimated 24 new MWs. Prior to the baseline sampling event, a synoptic round of water levels will be collected from all MWs. The groundwater samples will be analyzed for PFAS. Water quality parameters including pH and oxidation reduction potential will be collected on groundwater samples in the field prior to sample collection using a water quality meter. Low-flow sampling techniques will be used for the baseline event.

Surface Water/Stormwater/Sediment

The sampling of surface water for PFAS analysis from identified conveyances that potentially transport PFAS-contaminated surface water off-Base will be completed as part of the RI. Surface water, stormwater, and sediment are planned to be sampled during Mobilization 1. Where exceedances are detected in surface water or sediment, additional sampling/monitoring will be considered for Mobilization 2, as concentrations could fluctuate depending on the season, amount of rainfall, etc.

- Surface water/stormwater and collocated sediment samples collected from stormwater conveyances (both ditch and storm sewer system) and Starkweather Creek (Figure 17-3).

- The main surface water body that is planned to be sampled is Starkweather Creek, beginning near Outfall 021 (tributary to West Branch Starkweather Creek) and continuing to the junction where West Branch Starkweather Creek heads south to the junction with East Branch Starkweather Creek and discharges into Lake Monona.

- Surface water/stormwater/sediment samples will be collected at locations coming onto the installation, within the storm sewer system, and leaving the installation, to compare differences and evaluate potential contribution of on-installation sources. Samples will also be collected at outfalls of key on-installation storm drainage areas.

Lysimeter Installation/Porewater Sampling

Based on results of the soil and groundwater data collection, a series of new lysimeters will be installed in release areas (i.e., locations where PFAS concentrations in soil exceed the RI SLs) to evaluate the potential for PFAS in soil to leach to groundwater. It is anticipated that up to 15 new lysimeters will be installed. Installation of lysimeters will provide the following data:

- Sampling of porewater from new lysimeters on a quarterly basis for 1 year, with analysis for PFAS.

Surveying

- Surveying for location and elevation control at sampling points and new MWs and boring locations by a professional land surveyor located in the state of Wisconsin.

Laboratory Analysis – Eurofins TestAmerica, Sacramento, California

- Analysis of soil/sediment, groundwater, porewater, and surface water samples for PFAS by LC/MS/MS in accordance with DoD QSM Version 5.3 (DoD 2020) (or most recent version) Table B-15.

Laboratory Analysis – Pace Mobile Laboratory (Screening), Onsite

- Analysis of soil/sediment, groundwater, porewater, and surface water samples for PFOA, PFOS, and PFBS by LC/MS/MS in accordance with DoD QSM Version 5.3 (DoD 2020) (or most recent version) Table B-15.

Laboratory Analysis – Eurofins Lancaster Laboratories Environmental, LLC, Lancaster, Pennsylvania

- Analysis of a subset of samples will be analyzed for PFAS using TOP assay.

Geotechnical Laboratory Analysis – Eurofins Lancaster Laboratories Environmental, LLC, Lancaster, Pennsylvania

- Analysis of soil samples for pH by SW-846 Method 9045C.

- Analysis of soil samples for grain size using ASTM International (ASTM) Method D422.

- Analysis of soil samples for TOC using SW9060A.

Geotechnical Laboratory Analysis – Geo Testing Express, Boston, Massachusetts

- Analysis of soil samples for permeability using ASTM Method D5084.

Laboratory Analysis – Eurofins TestAmerica, Corpus Christi, Texas

- Analysis of soil samples for CEC by SW-846 Method 9081.

Laboratory Analysis – Colorado State University, Fort Collins, Colorado

- Analysis of soil samples for AEC by the method for AEC (P-Fixation).

Step 4: Define the Boundaries of the Study

The spatial boundaries will define the physical area to be studied and where samples will be collected (in general terms). The spatial boundaries for this project are those associated with the boundaries of the Truax Field installation and the downgradient extent of PFAS plume(s) upon delineation to SLs. The vertical boundary for direct-push groundwater sampling is 100 ft bgs. Vertical delineation may be required to bedrock, estimated between 200 and 300 ft bgs in the vicinity of the base. Offsite sampling areas are anticipated to include:

- DCRA property adjacent to the northeast, north, west, and south of Truax Field
- Covance Laboratories to the south
- Additional unknown properties that will be required for plume delineation.

The spatial boundaries of the soil investigation at potential release locations will generally be confined to the limits of the former/current site features. The vertical limit for soil sampling is approximately 10 ft bgs. The spatial boundaries of surface water and sediment sampling is dependent upon observations in the field regarding the presence of surface water in conveyances and knowledge of the established pathways for surface water discharge. Surface water sampling is planned within Starkweather Creek to the west and south of the installation.

The temporal boundaries describe the project time frame and when samples will be taken. The temporal boundaries include from Spring to Fall 2022. Fieldwork is expected to occur through approximately mid- to late 2022. Quarterly porewater sampling will continue into 2023.

Step 5: Develop the Project Data Collection and Analysis Approach

Data collected during the RI will be used to support decision making at the site including a risk assessment for human and ecological receptors. The approach to data collection and analysis is discussed in detail in Worksheet #17, Sampling Design and Rationale. Anticipated tasks and general methodologies are described in Worksheets #14 & 16 and Worksheet #18. Analytical testing methods for collected samples are provided in Worksheet #15 of the Programmatic UFP-QAPP.

Step 6: Specify Performance or Acceptance Criteria

The data need to be of adequate quality to make decisions established for the project. The purpose of this is to minimize the possibility of making erroneous conclusions or failing to keep uncertainty estimates to within acceptable levels. Worksheet #12 of the Programmatic UFP-QAPP presents the applicable measurement performance criteria. Worksheet #15 of the Programmatic UFP-QAPP presents the project SLs. Worksheet #37 of the Programmatic UFP-QAPP presents information regarding the DUA.

Step 7: Develop the Detailed Plan for Obtaining Data

The overall approach to RI data collection is presented in Worksheet #17. Following the initial data collection phase (Mobilization 1), results will be reviewed and discussed by the stakeholders. The stakeholders include NGB/A4VR, USACE, 115th Fighter Wing (Truax Field), and WDNR. All stakeholders will be involved in determining the locations of the new MWs, the locations of the new lysimeters, and locations for additional sample collection (soil, groundwater, surface water, and sediment) in a stepwise approach, as needed. After each round of sampling, the stakeholders will determine if additional sampling is required or if the collected data are sufficient for achieving the RI objectives.

Analytical design requirements are provided in Worksheets #19 & #30 of this document and Worksheets #24 through #28 of the Programmatic UFP-QAPP. The final detailed sampling approach is described in Worksheets #14 &16, Worksheet #17, Worksheet #18, and Worksheet #20.

QAPP Worksheet #13: Secondary Data Uses and Limitations

The following worksheet identifies data used in the generation of the UFP-QAPP Addendum for Truax Field.

Data Type	Data Source (Originating Organization, Report Title, and Date)	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
Background data	Peer Consultants, P.C., Final Installation Restoration Program Preliminary Assessment, Wisconsin Air National Guard, Truax Field, August 1988.	Background information and CSM development	None
Background data	Kapur and Associates, Inc. with Warzyn Engineering Inc. (Final) Site Investigation, Wisconsin Air National Guard. Truax Field, September 1990.	Background information and CSM development	None
Background data	Advanced Sciences, Inc. Final Site Assessment Report, Truax Field, Dane County Regional Airport, November 1991.	Background information and CSM development	None
Background data	Dames & Moore, Subsurface Investigation, Wisconsin Air National Guard, Truax Field, July 1992.	Background information and CSM development	None
Background data; Past site use	Advanced Sciences, Inc., Final Site Assessment/Closure Assessment Report, Underground Storage Tank 401-2, Wisconsin Air National Guard, 128th Fighter Wing, Dane County Airport, Truax Field, March 1994.	Background information and CSM development	None
Background data	Montgomery Watson, Final Remedial Action Plan, Truax Field POL Facility, Wisconsin Air National Guard, June 1998.	Background information and CSM development	None
Background data; Past site use	MWH Americas, Inc., Final 2010 Annual Groundwater Monitoring Report, Truax Field – Former POL Area/IRP Site 4, Wisconsin Air National Guard 115th Fighter Wing, August 2011.	Background information and CSM development	None
Concentrations of PFAS in soil and groundwater	Leidos, Final Preliminary Assessment/Site Investigation Report For Compliance Restoration Program, Wisconsin Air National Guard At Truax Field, February 2015.	CSM development; site-specific PFAS analytical data	None

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QAPP Worksheets #14 & 16: Project Tasks and Schedule

These worksheets provide an overview of the project tasks, describe the procedures to be followed, and presents a summary of the project deliverables to be prepared in support of the planned project tasks. Field tasks will be conducted in accordance with 40 Code of Federal Regulations 300.420(c)(4) applicable WDNR regulations, and the planning documents supporting this project. The sampling design and rationale are discussed in Worksheet #17. Worksheet #18 summarizes planned sampling locations and methods. Field SOPs are listed in Worksheet #21 and are provided in Appendix A of the Programmatic UFP-QAPP (EA 2021). Field forms used during field tasks are provided in Appendix B of the Programmatic UFP-QAPP. A general project schedule detailing the specific tasks and planned start and end dates is presented below.

The field activities are anticipated to begin in early 2022. The general schedule for RI fieldwork at Truax Field may vary and will follow the general task sequence in the table below. Fieldwork will be conducted in accordance with the SOPs provided in Appendix A of the Programmatic UFP-QAPP (EA 2021).

14.1 GENERAL SCHEDULE

Task	Start Date	End Date
Pre-Mobilization 1	31 January 2022	1 April 2022
Mobilization 1	4 April 2022	5 April 2022
HPT/EC Investigation	5 April 2022	26 April 2022
Direct-Push Groundwater Investigation	27 April 2022	17 May 2022
Direct-Push Soil Investigation	2 May 2022	17 May 2022
Surface Water/Sediment Sampling	11 May 2022	13 May 2022
Step Out Sampling	18 May 2022	2 June 2022
Demobilization 1	3 June 2022	3 June 2022
Data Review/Validation	23 May 2022	1 July 2022
Interim Reporting/Planning Meetings	To be determined (June/July 2022)	To be determined (June/July 2022)
Pre-Mobilization 2	5 July 2022	29 July 2022
Mobilization 2	1 August 2022	1 August 2022
MW Installation	15 August 2022	9 September 2022
MW Development	12 September 2022	16 September 2022
MW Sampling	3 October 2022	7 October 2022
Lysimeter Installation/Sampling	19 September 2022	23 September 2022
Demobilization 2	7 October 2022	7 October 2022
Data Review/Validation	10 October 2022	11 November 2022
Reporting	November 2022	March 2023

14.2 FIELD INVESTIGATION TASKS

The general schedule for the project is provided in the table above. A summary of the field investigation tasks is included below, and the specific field procedures for completing and documenting the work are included in Worksheet #17.

14.2.1 Mobilization/Demobilization Tasks

Mobilization includes the procurement of field equipment and supplies and mobilization of field staff. The following tasks will be conducted prior to mobilization:

- Notify NGB/A4VR POCs prior to mobilizing equipment and field personnel to the base

- Obtain the necessary information from field personnel to meet installation access requirements

- Coordinate with field and subcontractors as needed

- Obtain necessary access and escorts

- Determine staging areas for equipment

- Order sampling containers and field monitoring equipment.

Sample bottle requirements are summarized in Worksheets #19 and #30. The equipment necessary to execute the fieldwork and complete the project tasks is detailed below and in SOPs identified in Worksheet #21 of the Programmatic UFP-QAPP.

Entrance briefing and safety meetings will be conducted prior to the start of fieldwork to familiarize the team personnel with site health and safety requirements, the objectives and scope of field activities, and chain-of-command. Personnel mobilized to the site will meet requirements for Occupational Safety and Health Administration hazardous waste operations training and medical surveillance requirements as specified in the APP/SSHP, which was included in the Programmatic UFP-QAPP (EA 2021). Site personnel will also be trained to perform the specific tasks to which they are assigned. At no time will site personnel be tasked with performing an operation or duty for which they do not have appropriate training. The field team will be familiar with sample locations and will identify related field support areas and requirements.

Demobilization includes removing field equipment and supplies, returning rented equipment, managing investigation-derived waste (IDW) as described below, performing general cleanup and site restoration, and organizing and finalizing field documentation.

14.2.2 Investigation-Derived Waste Disposal

Handling and disposal if IDW generated during RI activities will be completed in accordance with the IDW Management Plan included in the Programmatic UFP-QAPP (EA 2021). IDW collected at the site during the RI will include soils from soil boring cuttings, aqueous solutions from MW purging and sampling and equipment decontamination activities, and solid waste from field supplies and personal protective equipment (PPE); the latter could include gloves, Tyvek (uncoated when sampling for PFAS, or coated when completing non-PFAS sampling activities), plastic bags, paper towels, tape, and other solid waste derived from the RI field activities. Solid waste such as PPE, plastic and paper, and other field derived debris will be treated like domestic refuse and will be bagged in plastic trash bags and disposed in a designated dumpster present on Truax Field. The other types of IDW, soil and aqueous, will be handled during the fieldwork as follows:

- ***Aqueous IDW***—All aqueous IDW will be transported by EA to a large holding tank (frac tank or polyethylene agricultural tank[s]), which will be stored at the Truax Field holding area. If storage is unavailable at the Truax Field holding area, EA will take responsibility of coordinating with the hazardous waste storage manager to find an alternate storage method.

- ***Soil IDW***—All collected soil cuttings will be placed into 10- or 20-cubic yard roll-off containers, which will be stored and covered at the on-Base waste storage area. EA will be responsible for finding a waste storage area if the storage yard does not have sufficient space for the 10-or 20-cubic yard roll-off containers. As a backup, soil cuttings may be stored in 55-gal steel containers if necessary.

Aqueous and soil IDW will be sampled and characterized by EA at the conclusion of all RI fieldwork. Following sampling for waste characterization and receipt of results, the results will be submitted to the selected waste subcontractor for waste profiling and manifesting, and ultimately transportation and disposal offsite. Disposal of IDW will consider any U.S. Air Force guidance for addressing releases for PFAS-containing material.

14.2.3 Sampling and Data Collection Tasks

The following list of sampling and data collection tasks shall be completed as described in Worksheet #17:

- Direct-Push Surface and Subsurface Vadose Zone Soil Sampling at nine PRLs and the off-base F-16 crash location

- Direct-Push HPT/EC/Grab Groundwater Sampling Borings – up to 32 initial locations

- MW Drilling/Installation/Soil Sampling – up to 24 MWs

- MW Surveying

- Groundwater Sampling (Baseline) of New MWs including Synoptic Groundwater Level Measurement

- Surface Water and Sediment Sampling

- Lysimeter Installation and Quarterly Sampling – 1 Year.

14.2.4 Equipment Decontamination Tasks

Non-disposable equipment that contacts or potentially could contact samples, including the water level indicator, will be decontaminated prior to starting work on the first sampling location, and between sampling locations in accordance with SOPs. Non-disposable PPE or clothing that becomes contaminated during site work will be appropriately cleaned before reuse or will be disposed of and replaced.

Purging and sampling equipment will be protected from contamination until ready for use. In addition, care will be taken to prevent samples from coming into contact with potentially contaminating substances, such as tape, oil, engine exhaust, corroded surfaces, and dirt.

14.3 FIELD QUALITY CONTROL TASKS

QC tasks will be overseen by EA Field Team Leaders and the QC Manager. Requirements for calibration, maintenance, testing, and inspection of field equipment are summarized in Worksheet #22 of the Programmatic UFP-QAPP, and related forms are provided in Appendix B of the Programmatic UFP-QAPP.

Field QC samples are intended to provide an indication of the consistency of sample collection and analyses over the course of the program. The analytical laboratory will analyze QC samples in accordance with the documents and procedures listed in Worksheet #28 of the Programmatic UFP-QAPP. Field QC samples are listed in Worksheet #20.

14.3.1 Field Documentation

A non-waterproof bound field logbook or loose-leaf paper (per SOP No. 073) will be used to record information about each field activity, including field personnel at the site, daily weather conditions, site conditions, tasks completed, general field notes, samples collected, field screening results, and deviations from the approved UFP-QAPP and other plans as detailed in SOP No. 59. Field logbooks are the main reference documents. Field activities will be recorded daily in non-waterproof pen or pencil (per SOP No. 073). Each page of field notes shall be numbered and dated showing, and initials of all crew members will be defined. Errors shall be crossed out with a single line, initialed, and dated, and correct data entered adjacent to the error.

Pertinent information will be logged in the field book as follows:

- Date and time of sample collection
- Weather conditions
- Location number and name
- Location of sampling point
- Sample identification number
- Type of sample
- Condition of MW or sample location
- Field observations

- References, such as maps or photographs of the sampling site.
- Collection of QC samples.

The field logbook procedures listed below will be followed:

- Ensure that the cover of each field logbook lists the project name, location, activities, name of contact and phone number, and start/end date and time of logbook entries.

- Ensure that the date and start/end time of activities, personnel on site, site conditions (including presence of airborne particulates [soot, dust, etc. from heavy truck traffic], and presence of unusual odors) and visitors on site (as well as arrival and departure times) for each day are recorded.

- Ensure that weather entry for each day includes cloud cover (partly cloudy, full sun, etc.), precipitation (type and intensity), wind direction, temperature, wind speed, and humidity.

- Ensure that well condition, including signs of damage or vandalism, is recorded.

- Ensure that the PPE, contract documents being followed, serial numbers of equipment utilized, serial/tracking number of shipments, deviances from the site plan, and times onsite and offsite are listed in field logbooks and/or appropriate field forms.

- Ensure specific times are listed for each activity observed at the site in the field logbook.

- Ensure when author releases a specific field logbook that the new author must print one's name and sign the field logbook prior to making entries in the field logbook.

Field forms will be maintained by the sampling team to provide a daily record of significant events, observations, and measurements taken during the field investigation. The field forms are intended to provide sufficient data and observations to enable the field team to reconstruct events that occur during the project. Field sheets will include daily field logs, daily calibration forms and checklists, sample forms, and sample collection checklists. Additional field forms including health and safety forms (provided in the APP-SSHP) will be completed for this project.

Photographs will be used to document unusual conditions observed during field activities. Before taking photographs, a camera pass or other appropriate approval will be obtained from Truax Field, if required.

Hard copy data (field notebooks, photographs, hard copies of chain-of-custody records, airbills, etc.) will be kept in the project files. Field notes, field forms, photographs, and chain-of-custody records will also be included in an appendix to the RI Report.

14.4 SAMPLE MANAGEMENT TASKS

Sample management is the process by which field samples are handled once collected. This process encompasses sample labeling, preservation, documentation, and shipment to the laboratory. Sample containers will be provided by the analytical laboratory, as detailed in Worksheets #19 and #30. Samples will be placed in an iced cooler and maintained at less than 6°C immediately upon collection. Additional details on sample handling, custody, and disposal are presented in Worksheets #26 and #27 of the Programmatic UFP-QAPP.

Sample labels with sample identification numbers will be affixed to each sample container. Sample labels will indicate the site location, sample name, date, time, sampler's initials, parameters to be analyzed, preservative, and pertinent comments.

The sample identification number will uniquely identify the sample in relation to a specified sampling location. A sample identification system has been developed to provide uniform classification and to assist project personnel with interpretation of data reports and field notes.

Field duplicate samples will be given a unique sample identification and sample time independent of the primary sample to disguise the duplicate sample from the analytical lab, as presented in Worksheet #18. Samples will be named using the same convention for primary samples, discussed in Worksheets #26 and #27 of the Programmatic UFP-QAPP.

Sample custody documentation provides a written record of sample collection and analysis, and sample custody procedures provide for specific identification of samples associated with an exact location, the recording of pertinent information associated with the sample, and a chain-of-custody record that serves as physical evidence of sample custody. Sample chain-of-custody documents and documentation will be generated in accordance with SOP No. 002. Analytical samples will be labeled, packed/shipped to the analytical laboratory, and tracked by secure chain-of-custody protocol in accordance with SOP Nos. 001 and 004 as detailed in Worksheets #26 and #27 of the Programmatic UFP-QAPP.

14.5 LABORATORY TASKS

Laboratory tasks will be conducted by TestAmerica Sacramento (DoD ELAP-certified laboratory) for PFAS analysis; by Pace Mobile Laboratory (DoD ELAP-certified laboratory) for PFOS, PFOA, and PFBS analysis; by Eurofins Lancaster Laboratories Environmental (DoD ELAP-certified laboratory) for TOP assay, pH, grain size, TOC, and IDW characterization analysis; by Geo Testing Express for permeability analysis; by Eurofins TestAmerica Corpus Christi for the CEC analysis; and by Colorado State University for the AEC analysis as presented in Worksheets #19 and #30.

The tasks to be completed by the labs will include the following (described in Worksheet #17):

- Laboratory analysis of groundwater, surface water, and porewater samples
- Laboratory analysis of soil and sediment samples

- Laboratory analysis of soil samples for geotechnical parameters
- Laboratory analysis of solid and aqueous samples for IDW characterization
- QC measures
- Data review and verification
- Submittal of analytical data packages and electronic data deliverables.

14.6 ASSESSMENT/AUDIT TASKS

SOPs will be reviewed prior to the performance of tasks. Technical system audits will be performed as required (Worksheets #31, #32, and #33 of the Programmatic UFP-QAPP). Independent technical review and deliverable checks will be performed to assess the quality of field and reporting tasks. The project development team will perform interdisciplinary checks to ensure minimal interference between tasks. The EA PM will be responsible for responding to the assessment findings, including corrective actions.

The Laboratory QA Manager will conduct assessments of the laboratory procedures, and data as described in the laboratory's QA Manual.

14.7 REPORTING

All major deliverables (UFP-QAPP Addendum, Interim Investigative Reports such as the Direct-Push Investigation Report, and the RI Report) will be submitted in three phases unless otherwise coordinated with NGB/A4VR and USACE. Draft submissions will be for Government-only review; EA will respond to each comment in writing and make appropriate revisions to the draft document.

A revised draft of each major deliverable will be submitted as a Draft Final document for wider regulatory review. EA will respond to each regulatory comment in writing and make appropriate revisions to each Draft Final document. Responses from EA to all regulatory agency comments will be reviewed by Government project delivery team before submission of comment responses to the wider regulatory agencies. If a comment resolution meeting is scheduled, EA will record meeting minutes and include in the minutes comments and responses provided by EA. The revised Draft Final document will be then submitted as the Final document.

At least one electronic copy of any final document submission to NGB/A4VR and USACE will include pertinent electronic files and all QC data, drawings, and GIS information, with original files including figures delivered in Microsoft Office file format and database formats as appropriate.

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QAPP Worksheet #17: Sampling Design and Rationale

The detailed approach to complete the RI at Truax Field is described below. This worksheet describes the sampling design and basis for selection for each sampling location (including information on the number and locations of samples proposed for the RI at Truax Field). If a sample cannot be collected where planned, the decision process for changing the location is also identified.

The RI approach for Truax Field will utilize a transect concept across the upgradient, source, downgradient, and installation boundary areas to evaluate PFAS extent in multiple media as well as stratigraphy and mass flux. Transect placement was selected to focus on evaluation of source areas and migration away from these areas to/past the installation boundary. The primary data generated during transect investigation activities will be estimates of hydraulic conductivity, identification of higher permeability transport zones in the subsurface, and soil and groundwater analytical data. The transect data will be used to optimize placement of step-out sampling locations beyond the installation boundary. Additional soil analytical data will be collected from known or suspected release areas and background locations using DPT. Grab samples for surface water and sediment analytical data will be collected to evaluate contributions to, source areas, and discharges from the installation.

Data generated during the RI will be a combination of definitive analytical results and quantitative screening analytical results. The definitive analytical results will be used for decision making, delineation, and risk assessment purposes. All definitive samples will be analyzed at a fixed-base laboratory (Worksheet #15 of the Programmatic UFP-QAPP) and will include surface and subsurface soil, groundwater, surface water, porewater, and sediment samples.

Screening-level data will also be collected during Mobilization 1 to facilitate rapid decision making for delineation while in the field. The data will not be used in the risk assessments or for final decision making. For example, the screening data may be used to determine where additional data is required to further define the extent of PFAS or inform the location and screen interval placement for new MWs. The screening data will also be used to identify soil and groundwater samples to be sent for definitive analysis. Sample media for screening purposes will include soil, surface water, and groundwater and will be analyzed for PFOA, PFOS, and PFBS (Worksheet #15 of the Programmatic UFP-QAPP).

MOBILIZATION 1

Mobilization 1 includes source investigations and groundwater transects. Field activities during the initial mobilization will include: (1) DPT soil and groundwater investigation, including use of HPT/EC/Groundwater borings and a mobile PFAS lab, and (2) initial surface water/sediment sampling. Table 17-1 includes the rationale for sample placement based on known or suspected source locations and transects covering the investigation area.

The RI field activities will be completed in accordance with the Programmatic UFP-QAPP (EA 2021) and UFP-QAPP Addendum for Truax Field, in addition to the Geology Supplement to the Performance Work Statement (USACE 2020) and ANG guidance for conducting investigations under the ERP (ANG 2009). Equipment to be used onsite will be reviewed ahead of mobilization to evaluate the compatibility for PFAS investigative work and evaluated again when the equipment is physically onsite prior to the start of field activities. Equipment and material compatibility will be in accordance with the PFAS Chemistry Instructions for Scopes of Services for Contracted Environmental Studies (USACE 2020).

Source Characterization

The source strength and mass loading of the known or suspected source areas will be evaluated during Mobilization 1 using a combination of soil and groundwater sampling. To the extent practicable, soil borings will be located within the best source area estimate at each identified PRL. For PRLs associated with hangars, the soil borings were placed within the most likely flow path for AFFF discharge from hangar doors during system use or testing. At PRLs used for nozzle testing activities, the soil borings were placed within a grid pattern given the unknown spray characteristics during testing activities. Groundwater samples will be collected at select transect locations co-located with soil borings to evaluate release areas. Details regarding the soil and groundwater sampling activities are described below.

Soil Sampling

Soil samples (surface and subsurface) will be collected to evaluate the extent of PFAS in soil and to evaluate the source strength and mass loading. Soil samples will be analyzed for PFAS (Worksheet #15 of the Programmatic UFP-QAPP), with a subset of samples analyzed for TOP assay. Soil samples for geotechnical analysis will be focused within source areas and collected MW installation activities (Mobilization 2). Soil lithologic descriptions will be continuously logged and recorded on field forms. Soil samples will be collected using DPT in accordance with the SOPs in the Programmatic UFP-QAPP (EA 2021) from 55 borings during Mobilization 1. Soil samples will also be collected from 8 soil borings co-located with transect borings, for a total of 63 soil borings. Hand trowels may be used to collect surface soil samples.

Prior to collection of samples from soil borings as described below, surface soil sampling will be completed at grid points at each PRL (Figures 17-2 through 17-8). Surface soil samples to a depth of 0.5 ft bgs will be collected at each unpaved point within the grid area and analyzed for PFAS (screening-level). The data will be used refine placement of the soil borings, as appropriate, to define the source area(s).

To the extent practicable, soil borings are located in the center, upgradient, downgradient, and cross gradient areas of the suspected release areas (Figures 17-1 and 17-2, Figures 17-4 through 17-8). For areas associated with the potential release from a hangar, soil boring locations were selected based on the probable flow path for discharge from the hangar doors during use of the fire suppression system or based on locations of current and former features such as oil/water separators and drains. The following soil samples will be collected from each soil boring:

- Surface soil (0–0.5 ft bgs)

- Subsurface soil (estimated 2.0–3.0 ft bgs, to be located within the vadose zone based on observed water table and professional judgement)
- Subsurface soil (estimated 5.0–6.0 ft bgs, to be located within the vadose zone based on observed water table and professional judgement)

Final coordination of soil boring locations will be completed based on field conditions and infrastructure (where present). Locations will be adjusted in the field to avoid utilities, concrete (especially airfield concrete), or asphalt (where possible) and will be surveyed by a licensed surveyor. Subject to approval, sample depths and locations may also be adjusted based on field observations during drilling of soil borings that indicate the presence of other sources or contaminants (e.g., hydrocarbons).

HPT/EC Logging

The HPT provides real-time downhole discrete measurement of aquifer permeability (i.e., an indication of preferential flow paths) by continuously injecting PFAS-clean water at a constant flow rate as the tool is advanced. Injection pressure is recorded, which is inversely proportional to permeability (i.e., high pressure indicates low permeability). The EC sensor records the degree of soil electrical conductivity (fine-grained soils are more conductive, but less permeable). Pressure bleed tests can be run at select intervals to obtain hydraulic heads to determine vertical gradient and static water level. At each probe location, EC, injection pressure, and aquifer permeability are logged continuously. Each HPT/EC log will be analyzed by a stratigrapher to interpret soil lithology and propose DPT groundwater sample intervals for consideration by the project team.

The source of PFAS-free water to be used during HPT deployment will be the same as that identified for use in decontamination and by drillers in the Programmatic UFP-QAPP (EA Engineering, Science, and Technology, Inc., PBC 2021). A sample from an identified hose bib or hydrant will be collected for PFAS analysis by LC/MS/MS compliant with QSM Version 5.3. Aqueous samples will also be collected for identical analysis to verify the water vessels used by drillers are PFAS-free.

Groundwater Sampling

Groundwater samples will be collected to evaluate the lateral and vertical extent of PFAS and update the CSM. Groundwater samples will be collected from DPT locations during Mobilization 1 (transect locations) and newly installed MWs during Mobilization 2.

A total of 32 borings will be drilled to collect groundwater samples from transect locations across the installation (Figures 17-1 and 17-2). An estimated 3-4 grab samples will be collected from each boring location, with 3 samples anticipated within 50 ft bgs and targeting the higher permeable zones identified during HPT/EC activities. One sample will be collected at a depth of approximately 100 ft bgs, which is the planned depth of each transect boring. Additional grab samples may be collected in the field if a higher number of permeable zones are identified in the boring during HPT/EC activities.

Table 17-1 summarizes the proposed groundwater sampling locations for each of the investigation areas. All groundwater samples will be analyzed for PFAS, and sampling activities will be completed in accordance with the SOPs in the Programmatic UFP-QAPP (EA 2021) to include collection of general field parameters (pH, oxidation reduction potential, temperature, dissolved oxygen, specific conductance, and turbidity) during sampling. A subset of samples will also be analyzed for TOP assay (e.g., samples with low oxidation reduction potential in source areas).

Surface Water and Sediment Sampling

Surface water/stormwater and sediment samples (co-located) will be collected from stormwater drainage features/conveyances and within the storm sewer system to evaluate the concentration of PFAS in surface water at the installation. Sample locations within storm sewer infrastructure will be designated as stormwater samples. The surface water, stormwater, and sediment samples will be collected during Mobilization 1, and during a rain event to the extent practicable. Grab samples will be collected from 27 locations shown on Figure 17-3 and listed in Table 17-1. At sample locations within the storm sewer and where possible, the elevation of the bottom of the storm sewer will be collected.

Surface water or stormwater samples will be collected prior to sediment sampling at each location. To the extent practicable, surface water and stormwater samples will be collected by direct dipping of the sample container while facing upstream and without disturbing the bottom sediment. When sample locations are in close proximity to one another, downstream samples will be collected first prior to moving upstream.

Surface water samples are planned for Spring 2022, likely during the high flow/wet season. Surface water samples will be collected before sediment samples to reduce siltation. Surface water samples will be analyzed for PFAS in accordance with the SOPs in the Programmatic UFP-QAPP (EA 2021) and general field parameters (pH, oxidation reduction potential, temperature, dissolved oxygen, specific conductance, and turbidity). Coordinates for surface water/sediment sampling locations will be recorded using a handheld Global Positioning System, and detailed descriptions of the sample locations will be included on the sample collection field sheets.

Table 17-1: Sampling Rationale and Decision Logic

Area	Sampling Rationale	Decision Logic for Detections above Screening Level(s)
Transect A	4 HPT/EC/Groundwater sampling locations north of the PRLs	Groundwater – Collect additional samples at or beyond the northern installation boundary
Transect B	2 HPT/EC/Groundwater sampling locations (1 co-located for soil) north of PRLs 3 and 7	No soil or groundwater step outs are planned; coverage provided by Transects A and C
Transect C	4 HPT/EC/Groundwater sampling locations (2 co-located for soil) north of PRLs 2, 4, 5, and 6 and south of PRL 7	Soil – Step out to the east of PRL 2 Groundwater – No step outs are planned; coverage provided by Transects B, D, and E; additional sampling to the east of the Installation may be required based on analytical results
Transect D	3 HPT/EC/Groundwater sampling locations (2 co-located for soil) south of PRLs 2, 4, 5, and 6 and north of PRLs 9 and 10	No soil or groundwater step outs are planned; coverage provided by Transects C and E; additional sampling to the west and east of the Installation may be required based on analytical results
Transect E	4 HPT/EC/Groundwater sampling locations (2 co-located for soil) south of the PRLs and north of the installation boundary	Collect additional samples past the installation boundary in the direction of groundwater flow (historically southeast)
Transect F	4 HPT/EC/Groundwater sampling locations between the PRLs and the installation boundary	Step out along the groundwater flow path (likely to the southeast)
Transect G	4 HPT/EC/Groundwater sampling locations (includes locations off the installation) along the southern installation boundary	Step out along the groundwater flow path (likely to the southeast)
Transect H	4 HPT/EC/Groundwater sampling locations (off the installation boundary) south of the installation	Step out along the groundwater flow path (likely to the southeast)
F-16 Crash Site	3 HPT/EC/Groundwater sampling locations (1 co-located for soil) with 4 additional soil sampling locations	Soil – Step out in all directions Groundwater – Collect additional samples along the groundwater flow path
PRL 1	4 soil sampling locations north and east (PRLs 2 and 3 located to the west and PRL 10 to the south)	Step out to the north, east, or west
PRL 2	6 soil sampling locations (PRL 3 to the north, PRL 1 to the east, and PRL 10 to the south)	Step out in all directions; step outs may be limited based on the presence of airfield pavement
PRL 3	5 soil sampling locations (PRL 2 to the south and PRL 1 to the east)	Step out in all directions; step outs may be limited based on the presence of airfield pavement
PRL 4	5 soil sampling locations (PRL 5 to the northeast and PRL 9 to the south)	Step outs may be limited by existing/new infrastructure; evaluate in the field

Area	Sampling Rationale	Decision Logic for Detections above Screening Level(s)
PRL 5	4 soil sampling locations (PRL 4 to the southwest and PRL 6 to the northeast)	Step outs may be limited by existing/new infrastructure; evaluate in the field
PRL 6	2 soil sampling locations	Step outs may be limited by existing/new infrastructure; evaluate in the field
PRL 7	7 soil sampling locations (PRLs 1 and 3 to the southwest)	Step outs may be limited by existing/new infrastructure; evaluate in the field
PRL 8	5 soil sampling locations	Step out in all directions
PRL 9	5 soil sampling locations	Step out in all directions
PRL 10	8 soil sampling locations (PRLs 1 and 2 to the north)	Step out in all directions

Area	Sampling Rationale	Decision Logic for Detections above Screening Level(s)
Surface Water/Stormwater/ Sediment	STW01 – Evaluate contributions from north of Truax Field to storm sewer system STW02 – Evaluate concentration leaving Truax Field on the northwest side in storm sewer system STW03 – Evaluated contributions from northeast of Truax Field in storm sewer system STW04 – Evaluate contributions from east of Truax Field in storm sewer system STW05 – Evaluate contributions from multiple PRLs in the middle of Truax Field in storm sewer system STW06/STW07 – Evaluate contributions from the middle of Truax Field, east of multiple PRLs in storm sewer system SFW08 – Evaluate contributions from east of Truax Field in drainage ditch STW09 – Evaluate concentration leaving Truax Field from identified source areas in storm sewer system STW10 – STW12 – Evaluate contributions from multiple PRLs in storm sewer system STW13 – Evaluate trench drain in front of fire station STW14 – Near PRL 9 in storm sewer system STW15 – In storm sewer system immediately upgradient of discharge to Starkweather Creek tributary SFW16, SFW17 – Evaluate concentrations in Starkweather Creek tributary on west side of installation STW18 – Evaluate concentration from airfield in storm sewer system prior to discharge into Starkweather Creek tributary SFW19, SFW20 – Evaluate concentrations in Starkweather Creek tributary on west side on installation prior to discharge (near Outfalls 21, 22, and 36) SFW21 – SFW24 – Evaluate concentrations in east Starkweather Creek tributary prior to confluence with west tributary SFW25 – Evaluate concentration in combined Starkweather Creek tributary near point of confluence SFW26, SFW27 – Evaluate concentrations in west Starkweather Creek tributary prior to confluence with east tributary	No step outs are planned during Mobilization 1; evaluate data gaps for additional sampling during Mobilization 2 as needed
Background	8 soil sampling locations outside known areas of PFAS and at higher elevations	No step outs are planned for background sampling

Mobilization 2

Mobilization 2 includes installation of new MWs, baseline groundwater monitoring, installation of lysimeters, and addressing remaining data gaps following Mobilization 1 (if needed). Field activities during the second mobilization will include: (1) MW installation using sonic drilling methods; (2) development and sampling of newly installed MWs; (3) installation and sampling of lysimeters; and (4) collection of soil, groundwater, surface water, or sediment samples as needed to address data gaps remaining. The mobile laboratory will not be utilized during Mobilization 2 and all samples will be submitted to the fixed-base laboratory for definitive analysis.

Monitoring Well Installation, Development, and Sampling

Following the initial characterization of nature and extent completed during Mobilization 1, up to 24 new MWs will be installed at select locations to evaluate concentration trends over time and support remedial decisions. Selection of the new MW locations will be completed by the project team following Mobilization 1 and will focus on areas representing primary flow path(s) for PFAS migration in groundwater and the approximate extent of the PFAS plume(s). Table 17-2 describes the rationale for MW placement during Mobilization 2.

Monitoring wells will be installed using sonic drilling methods by a licensed well driller in the state of Wisconsin, with oversight provided by EA in the form of a licensed geologist or engineer. Soil samples will be collected from sonic drilling soil cores and analyzed for PFAS (Worksheet #15 of the Programmatic UFP-QAPP), with a subset of samples (up to 3 per release area) analyzed for geotechnical parameters (pH, grain size, permeability, TOC, and CEC/AEC). Soil samples for geotechnical analysis will be focused within source areas. Select soil samples from within source areas will also be analyzed for TOP assay. Soil lithologic descriptions will be continuously logged and recorded on field forms.

Monitoring wells will be 2-inch diameter polyvinyl chloride wells with continuous wrap, wire slot screens. The screened interval will be 10 ft in length and installed at target depths based on data generated during Mobilization 1. The filter pack will be washed, quartz sand extending 1 ft below the bottom of the well screen and extending 3-5 ft above the well screen. The bentonite seal placed above the filter pack will be pellets or chips and approximately 3-5 ft in length. The annular seal will be placed above the bentonite seal to the ground surface. Tremie pipe will be used during well construction to prevent bridging. Surface completions will be either flush mount or aboveground and will depend on final well location. Installation of MWs will comply with the USACE Geology Scope of Services (USACE 2020) and applicable state of Wisconsin regulations governing MWs. Additional details regarding MW construction will be added once locations are finalized.

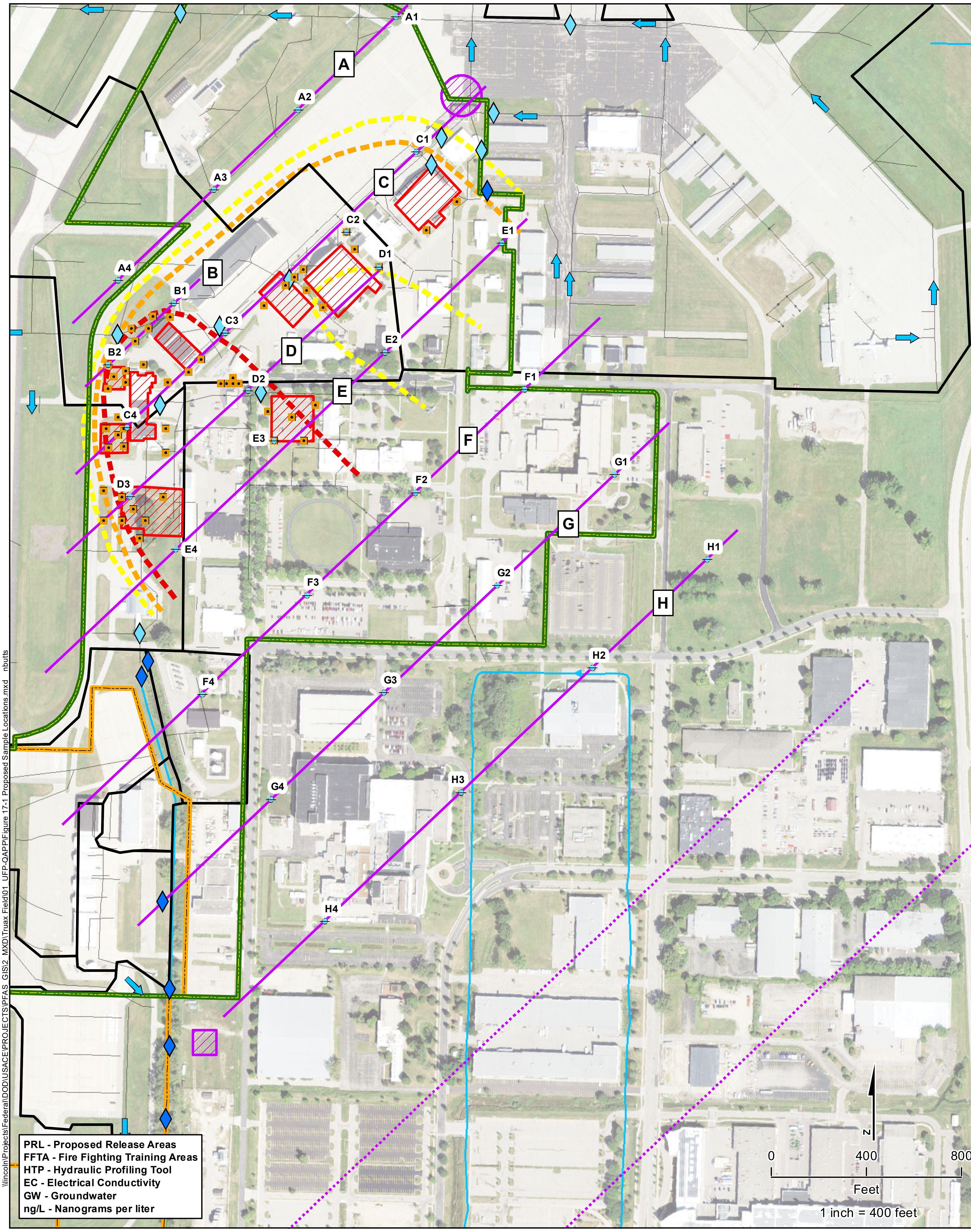
Well development will be completed following installation using a pumping method and in accordance with SOP No. 19 in the Programmatic UFP-QAPP (EA 2021). Use of a surge block for well development will be evaluated as an option, based on appropriateness given the observed soil classification and material compatibility for PFAS sampling. During well development, a minimum of 4 times the water column volume will be removed. Pumping will continue until the groundwater is clear of fines and water quality parameters have stabilized. Water levels will be measured prior to and during well development. Purged water generated during development will be containerized and handled in accordance with the Waste Management Plan (Appendix E of the Programmatic UFP-QAPP). Following installation and development, new MWs will be professionally surveyed for location and elevation coordinates.

Table 17-2: Rationale for Monitoring Well Placement

Location	Rationale
Source Area(s)	Locations will target upgradient locations (representing background or potential additional sources), areas of elevated PFAS concentrations within the source zones, and sidegradient locations to support determination of plume width. Locations will be used to monitor the change in PFAS concentrations over time and provide information needed to support remedial action decisions within the source area(s).
Primary Flow Path(s)	Locations will target the primary flow path(s) of PFAS migration in groundwater from source zones to the extent of presence above SLs. Screened interval will target the areas of highest permeability based on the HPT/EC activities completed during Mobilization 1. Locations will be used to monitoring PFAS migration in groundwater and PFAS concentration changes/trends over time.
Plume Extent	Locations will target the distal extent of identified PFAS plume(s) to SLs. Screened intervals will coordinate with the high permeability flow paths previously identified. Locations will be used to monitoring plume stability/concentration trends over time.

Lysimeter Installation and Sampling

Lysimeters will be installed to evaluate and monitor porewater concentrations within source areas. The locations and depth will be based on soil and groundwater data collected during Mobilization 1, and lysimeters will be installed and sampled during Mobilization 2. Up to 15 lysimeters will be installed within source areas determined to be representative of subsurface conditions at Truax Field. Four quarterly porewater samples will be collected from each lysimeter, if possible.



\\lincoln\Projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 17-1 Proposed Sample Locations.mxd nbutts

- Installation Boundary
- Wisconsin Army National Guard
- On-Base PRLs and FFTAs
- Off-Base PRLs and FFTAs
- Drainage Areas
- Stormwater Sewer Lines
- Stormwater Sewer Flow Direction
- Sampling Transect
- Potential Step-Out Transect
- Proposed HTP/EC/GW Sample Locations
- Proposed Soil Sample Locations
- Proposed Surface Water / Sediment Sample Locations
- Proposed Stormwater / Sediment Sample Locations (In Storm Sewer System)

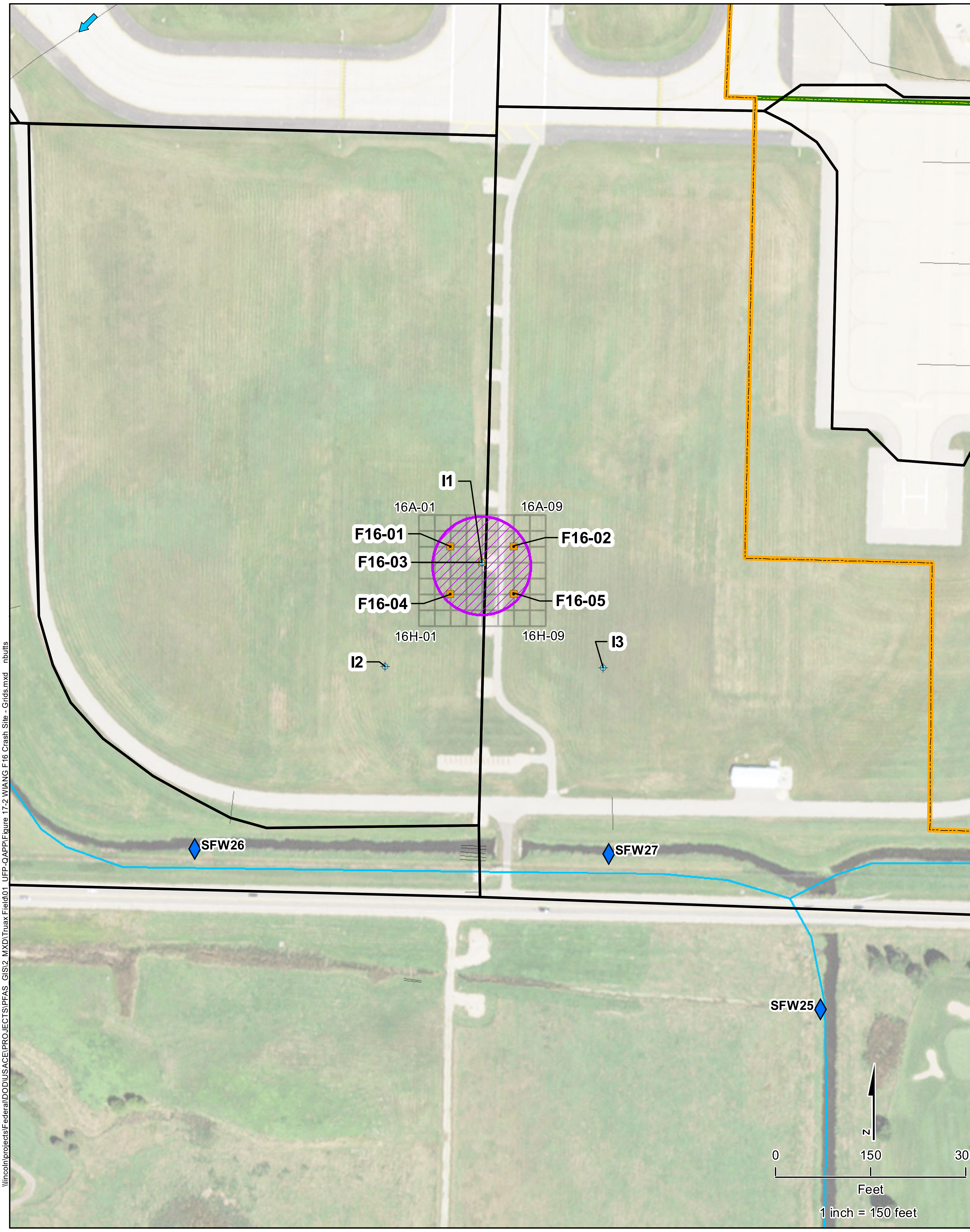
Interpreted PFOS+PFOA Contours

- 40 ng/L - 400 ng/L
- 400 ng/L - 4,000 ng/L
- > 4,000 ng/L

Figure 17-1
Proposed Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations

Map Date: 11/23/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet



Installation Boundary
Wisconsin Army National Guard
Off-Base PRLs and FFTAs
Drainage Areas
Stormwater Sewer Lines
Stormwater Sewer Flow Direction
Proposed HTP/EC/GW Sample Locations
Proposed Soil Sample Locations
Surface Soil Sampling Grids

Proposed Surface Water / Sediment Sample Locations
Proposed Stormwater / Sediment Sample Locations (In Storm Sewer System)

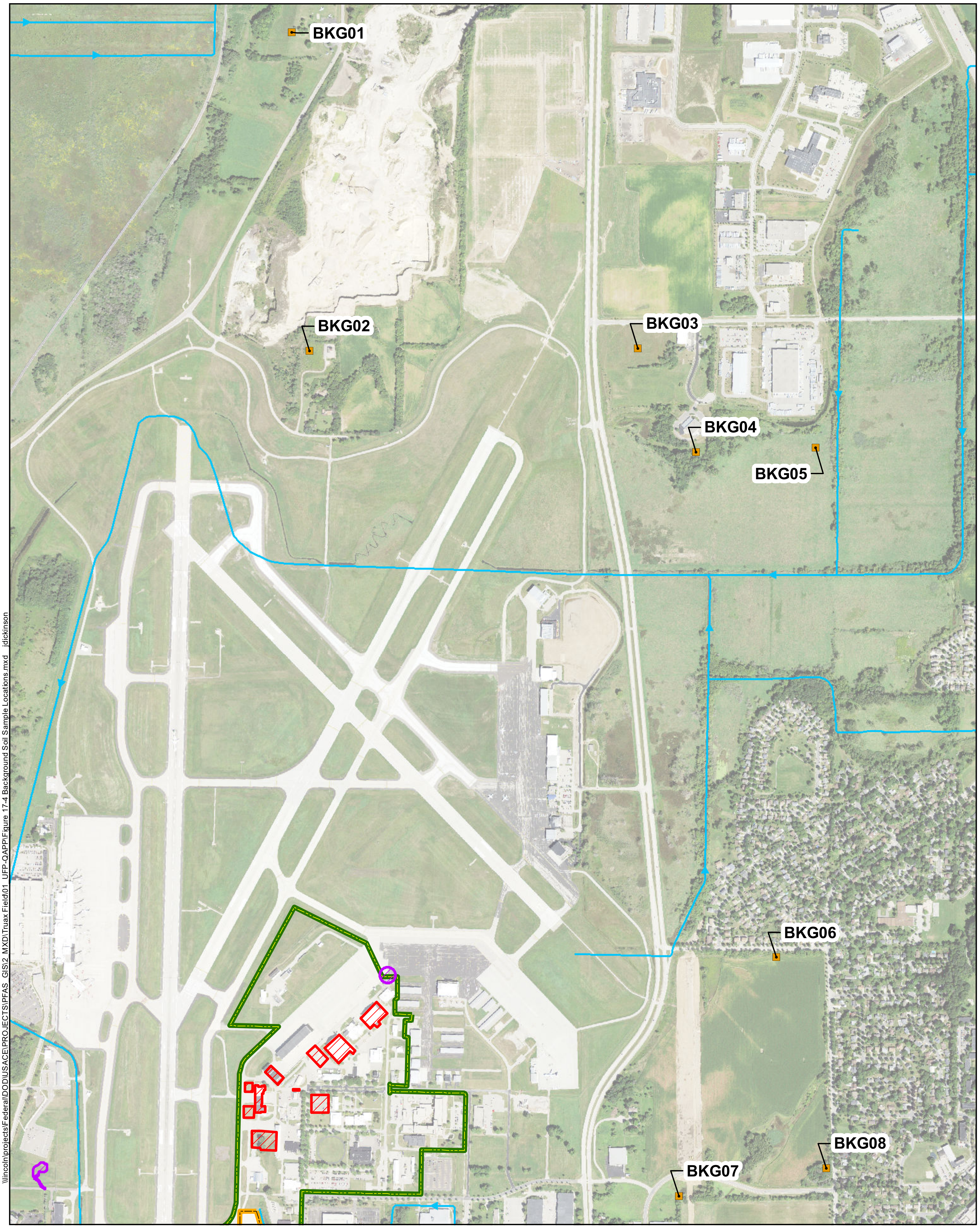
PRL - Proposed Release Areas
FFTA - Fire Fighter Training Areas
HTP - Hydraulic Profiling Tool
EC - Electrical Conductivity
GW - Groundwater

Figure 17-2
WIANG F16 Crash Site
Proposed Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations

Map Date: 11/22/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet

Figure 17-3
Proposed Surface Water, Stormwater, and Sediment Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations
Madison, Wisconsin



\\lincoln\projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 17-4 Background Soil Sample Locations.mxd jdickinson

Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs
Proposed Background Soil Boring

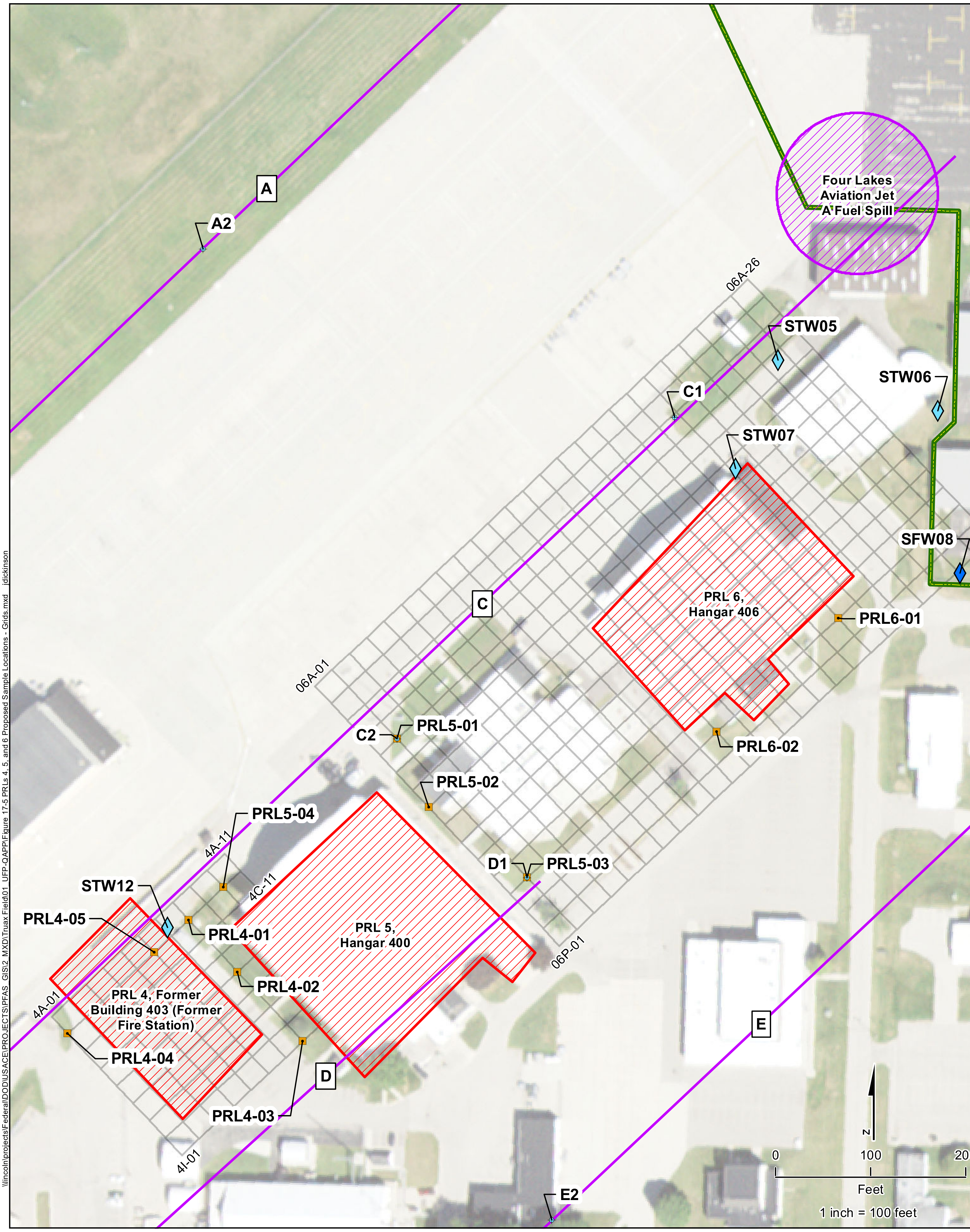
PRL - Proposed Release Area
FFTA - Fire Fighting Training Area

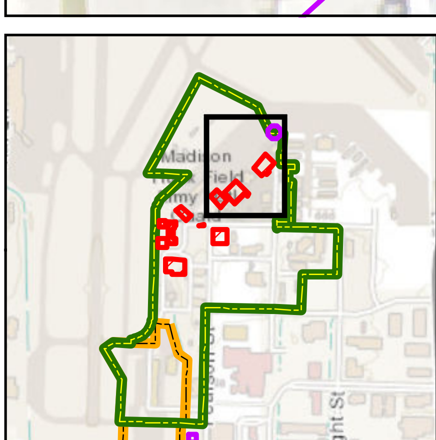
N

0 1,000 2,000
Feet
1 inch = 1,000 feet

Figure 17-4
Proposed Background Soil Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations
Madison, Wisconsin
Map Date: 12/13/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet



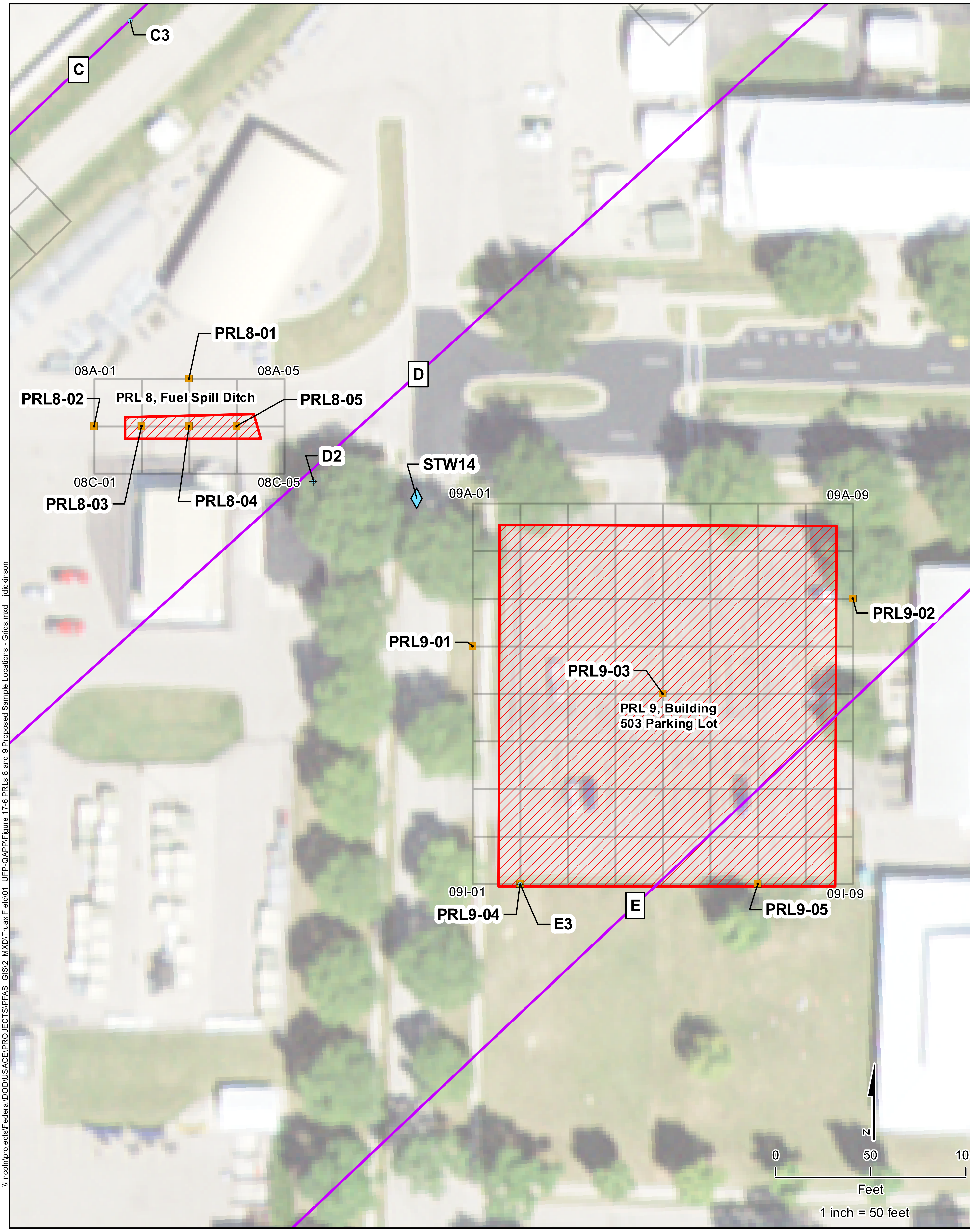


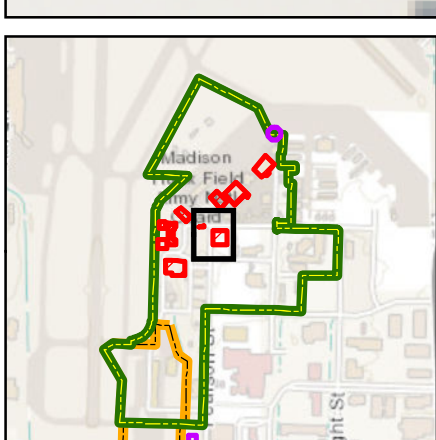
- Installation Boundary
- Wisconsin Army National Guard
- On-Base PRLs and FFTAs
- Off-Base PRLs and FFTAs
- Sampling Transects
- Proposed HTP/EC/GW Sample Locations
- Proposed Soil Sample Locations
- Surface Soil Sampling Grids
- Proposed Surface Water / Sediment Sample Locations
- Proposed Stormwater / Sediment Sample Locations (In Storm Sewer System)

PRL - Proposed Area Locations
FFTA - Fire Fighting Training Areas
HTP - Hydraulic Profiling Tool
EC - Electric Conductivity
GW - Groundwater

Figure 17-5
PRLs 4, 5, and 6
Proposed Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations
Madison, Wisconsin
Map Date: 12/13/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet





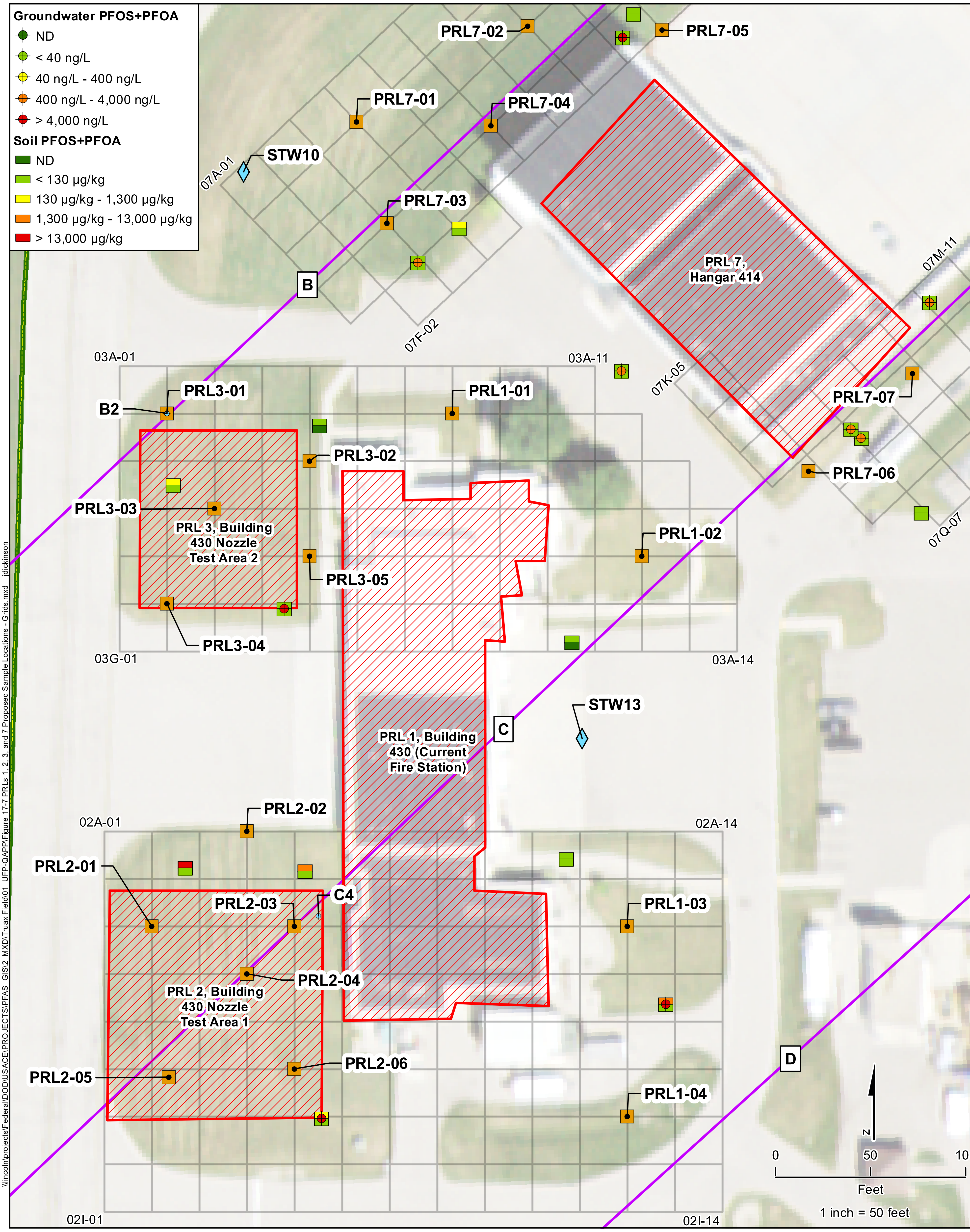
Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs
Sampling Transects
Proposed HTP/EC/GW Sample Locations
Proposed Soil Sample Locations
Surface Soil Sampling Grids

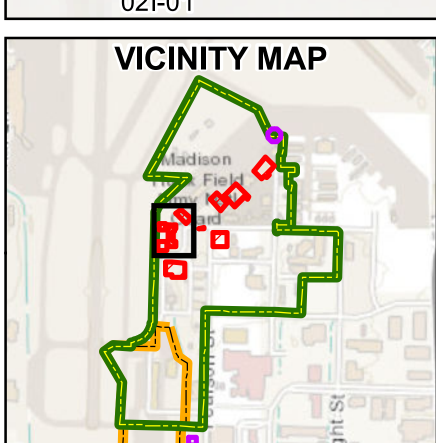
Proposed Stormwater / Sediment Sample Locations (In Storm Sewer System)

PRL - Proposed Area Locations
FFTA - Fire Fighting Training Area
HTP - Hydraulic Profiling Tool
EC - Electric Conductivity
GW - Groundwater

Figure 17-6
PRLs 8 and 9
Proposed Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations
Madison, Wisconsin
Map Date: 12/13/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet





Installation Boundary
Wisconsin Army National Guard
On-Base PRLs and FFTAs
Off-Base PRLs and FFTAs
Sampling Transects
Proposed HTP/EC/GW Sample Locations
Proposed Soil Sample Locations
Surface Soil Sampling Grids

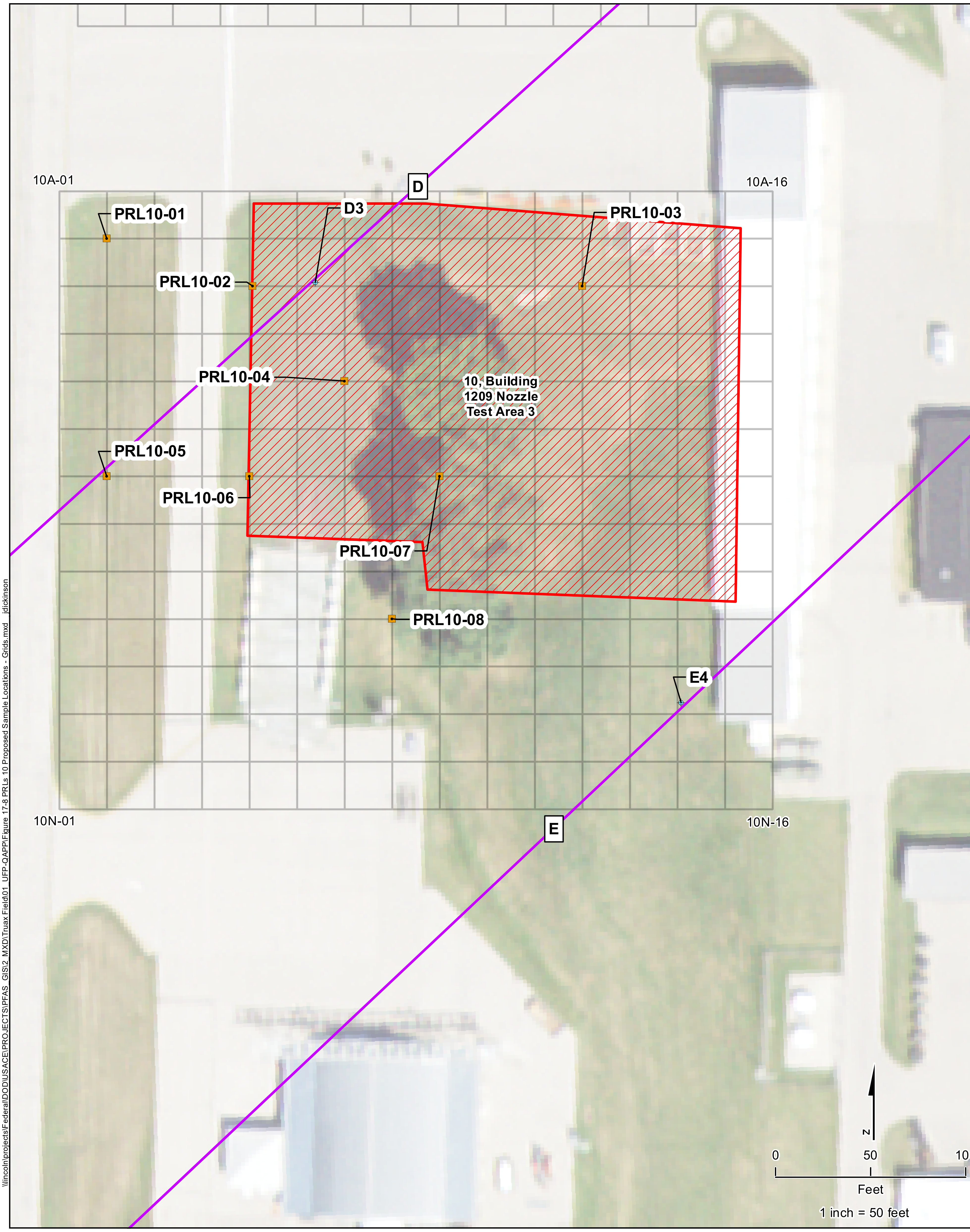
Proposed Stormwater / Sediment Sample Locations (In Storm Sewer System)

PRL - Proposed Release Area
FFTA - Fire Fighting Training Area
HTP - Hydraulic Profiling Tool
EC - Electric Conductivity
GW - Groundwater
ND- Non Detect
ng/L - Nanograms per liter
µg/kg - Micrograms per kilogram

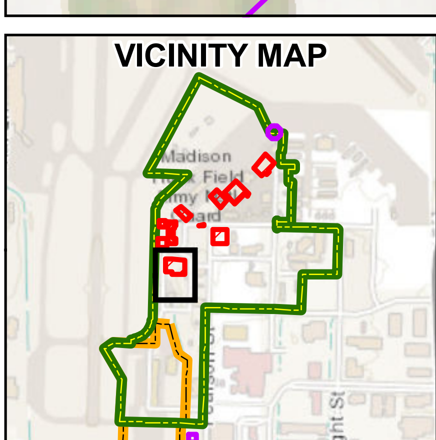
Figure 17-7
PRLs 1, 2, 3, and 7
Proposed Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations

Madison, Wisconsin
Map Date: 12/13/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet



\\lincoln\projects\Federal\DOD\USACE\PROJECTS\PFAS_GIS\2_MXD\Truax Field\01_UFP-QAPP\Figure 17-8 PRLs 10 Proposed Sample Locations - Grids.mxd jdickinson



- Installation Boundary
- Wisconsin Army National Guard
- On-Base PRLs and FFTAs
- Off-Base PRLs and FFTAs
- Sampling Transects
- Proposed HTP/EC/GW Sample Locations
- Proposed Soil Sample Locations
- Surface Soil Sampling Grids

PRL - Proposed Release Area
FFTA - Fire Fighting Training Area
HTP - Hydraulic Profiling Tool
EC - Electric Conductivity
GW - Groundwater

Figure 17-8
PRL 10 Proposed Sample Locations
Truax Field Air National Guard
RIs at Multiple ANG Installations
Madison, Wisconsin

Map Date: 12/13/2021

Coordinate System:
NAD 1983 StatePlane Wisconsin
South FIPS 4803 Feet

QAPP Worksheet #18: Sampling Locations and Methods

The proposed sampling locations, estimated depth, and associated analytes are described below. Sampling locations are shown on Figures 17-1 through 17-8. The identification protocol for samples is:

- Each sample location will begin with an installation identifier to associate the sample with Truax Field.

- For samples associated with a transect or specific PRL, a location identifier will be included after the installation identifier.

- At each location, a media identifier and sequential numerical identified will be added to the sample identification.

- Following the media and numerical identifier, the date (MMDDYY) and depth (if applicable) will be added.

Example sample identifiers include:

- For the first groundwater sample collected at location A2 along transect A on 25 April 2022 from 10 to 11 ft bgs, the sample identifier is:

  — TF-A2-GW01-042522-10-11

- The fifth groundwater sample at the same location from a depth of 97–100 ft bgs is:

  — TF-A2-GW05-042522-97-100

- For a surface water sample collected at location SFW10 on 05 May 2022, the sample identifier is:

  — TF-SFW10-050522.

Table 18-1 summarizes the proposed sample identifications, matrix, and methods for the proposed sample locations described in Worksheet #17. For the purposes of capturing proposed sample identifications, soil borings were estimated to include 3 soil samples (SB01 through SB03) and groundwater borings were estimated to include 3 groundwater samples (GW01 through GW03) for brevity within the table. These numbers are representative only and additional sequential sample identifiers will be added during investigative work based on conditions observed in the field.

This worksheet will be updated prior to Mobilization 2 to include the sampling proposed for that field effort once locations are finalized by the project team.

3097 **Table 18-1: Summary of Sampling Identifications and Methods**

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
Transect A					
TF-A1-GW01-MMDDYY-#-#	Transect A	Groundwater	Water table	Grab (DPT)	PFAS
TF-A1-GW02-MMDDYY-#-#	Transect A	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-A1-GW03-MMDDYY-#-#	Transect A	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-A2-GW01-MMDDYY-#-#	Transect A	Groundwater	Water table	Grab (DPT)	PFAS
TF-A2-GW02-MMDDYY-#-#	Transect A	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-A2-GW03-MMDDYY-#-#	Transect A	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-A3-GW01-MMDDYY-#-#	Transect A	Groundwater	Water table	Grab (DPT)	PFAS
TF-A3-GW02-MMDDYY-#-#	Transect A	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-A3-GW03-MMDDYY-#-#	Transect A	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-A4-GW01-MMDDYY-#-#	Transect A	Groundwater	Water table	Grab (DPT)	PFAS
TF-A4-GW02-MMDDYY-#-#	Transect A	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-A4-GW03-MMDDYY-#-#	Transect A	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
Transect B					
TF-B1-GW01-MMDDYY-#-#	Transect B	Groundwater	Water table	Grab (DPT)	PFAS
TF-B1-GW02-MMDDYY-#-#	Transect B	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-B1-GW03-MMDDYY-#-#	Transect B	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-B2-GW01-MMDDYY-#-#	Transect B	Groundwater	Water table	Grab (DPT)	PFAS
TF-B2-GW02-MMDDYY-#-#	Transect B	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-B2-GW03-MMDDYY-#-#	Transect B	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-B2-SB01-MMDDYY-#-#	Transect B	SB	Surface	Grab (DPT)	PFAS
TF-B2-SB02-MMDDYY-#-#	Transect B	SB	Subsurface	Grab (DPT)	PFAS
TF-B2-SB03-MMDDYY-#-#	Transect B	SB	Subsurface	Grab (DPT)	PFAS
Transect C					
TF-C1-GW01-MMDDYY-#-#	Transect C	Groundwater	Water table	Grab (DPT)	PFAS
TF-C1-GW02-MMDDYY-#-#	Transect C	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-C1-GW03-MMDDYY-#-#	Transect C	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-C2-GW01-MMDDYY-#-#	Transect C	Groundwater	Water table	Grab (DPT)	PFAS
TF-C2-GW02-MMDDYY-#-#	Transect C	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-C2-GW03-MMDDYY-#-#	Transect C	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-C2-SB01-MMDDYY-#-#	Transect C	SB	Surface	Grab (DPT)	PFAS
TF-C2-SB02-MMDDYY-#-#	Transect C	SB	Subsurface	Grab (DPT)	PFAS
TF-C2-SB03-MMDDYY-#-#	Transect C	SB	Subsurface	Grab (DPT)	PFAS
TF-C3-GW01-MMDDYY-#-#	Transect C	Groundwater	Water table	Grab (DPT)	PFAS
TF-C3-GW02-MMDDYY-#-#	Transect C	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-C3-GW03-MMDDYY-#-#	Transect C	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-C4-Groundwater01-MMDDYY-#-#	Transect C	Groundwater	Water table	Grab (DPT)	PFAS
TF-C4-Groundwater02-MMDDYY-#-#	Transect C	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-C4-Groundwater03-MMDDYY-#-#	Transect C	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
Transect D					
TF-D1-Groundwater01-MMDDYY-#-#	Transect D	Groundwater	Water table	Grab (DPT)	PFAS
TF-D1-Groundwater02-MMDDYY-#-#	Transect D	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-D1-Groundwater03-MMDDYY-#-#	Transect D	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-D1-SB01-MMDDYY-#-#	Transect D	SB	Surface	Grab (DPT)	PFAS
TF-D1-SB02-MMDDYY-#-#	Transect D	SB	Subsurface	Grab (DPT)	PFAS
TF-D1-SB03-MMDDYY-#-#	Transect D	SB	Subsurface	Grab (DPT)	PFAS
TF-D2-Groundwater01-MMDDYY-#-#	Transect D	Groundwater	Water table	Grab (DPT)	PFAS
TF-D2-Groundwater02-MMDDYY-#-#	Transect D	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-D2-Groundwater03-MMDDYY-#-#	Transect D	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-D3-Groundwater01-MMDDYY-#-#	Transect D	Groundwater	Water table	Grab (DPT)	PFAS
TF-D31-Groundwater02-MMDDYY-#-#	Transect D	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-D3-Groundwater03-MMDDYY-#-#	Transect D	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-D3-SB01-MMDDYY-#-#	Transect D	SB	Surface	Grab (DPT)	PFAS
TF-D3-SB02-MMDDYY-#-#	Transect D	SB	Subsurface	Grab (DPT)	PFAS
TF-D3-SB03-MMDDYY-#-#	Transect D	SB	Subsurface	Grab (DPT)	PFAS
Transect E					
TF-E1-Groundwater01-MMDDYY-#-#	Transect E	Groundwater	Water table	Grab (DPT)	PFAS
TF-E1-Groundwater02-MMDDYY-#-#	Transect E	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-E1-Groundwater03-MMDDYY-#-#	Transect E	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-E2-Groundwater01-MMDDYY-#-#	Transect E	Groundwater	Water table	Grab (DPT)	PFAS
TF-E2-Groundwater02-MMDDYY-#-#	Transect E	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-E2-Groundwater03-MMDDYY-#-#	Transect E	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-E3-Groundwater01-MMDDYY-#-#	Transect E	Groundwater	Water table	Grab (DPT)	PFAS
TF-E3-Groundwater02-MMDDYY-#-#	Transect E	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-E3-Groundwater03-MMDDYY-#-#	Transect E	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-E3-SB01-MMDDYY-#-#	Transect E	SB	Surface	Grab (DPT)	PFAS
TF-E3-SB02-MMDDYY-#-#	Transect E	SB	Subsurface	Grab (DPT)	PFAS
TF-E3-SB03-MMDDYY-#-#	Transect E	SB	Subsurface	Grab (DPT)	PFAS
TF-E4-Groundwater01-MMDDYY-#-#	Transect EC	Groundwater	Water table	Grab (DPT)	PFAS
TF-E4-Groundwater02-MMDDYY-#-#	Transect E	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-E4-Groundwater03-MMDDYY-#-#	Transect E	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-E4-SB01-MMDDYY-#-#	Transect E	SB	Surface	Grab (DPT)	PFAS
TF-E4-SB02-MMDDYY-#-#	Transect E	SB	Subsurface	Grab (DPT)	PFAS
TF-E4-SB03-MMDDYY-#-#	Transect E	SB	Subsurface	Grab (DPT)	PFAS
Transect F					
TF-F1-Groundwater01-MMDDYY-#-#	Transect F	Groundwater	Water table	Grab (DPT)	PFAS
TF-F1-Groundwater02-MMDDYY-#-#	Transect F	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-F1-Groundwater03-MMDDYY-#-#	Transect F	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-F2-Groundwater01-MMDDYY-#-#	Transect F	Groundwater	Water table	Grab (DPT)	PFAS
TF-F2-Groundwater02-MMDDYY-#-#	Transect F	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-F2-Groundwater03-MMDDYY-#-#	Transect F	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-F3-Groundwater01-MMDDYY-#-#	Transect F	Groundwater	Water table	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-F3-Groundwater02-MMDDYY-#-#	Transect F	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-F3-Groundwater03-MMDDYY-#-#	Transect F	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-F4-Groundwater01-MMDDYY-#-#	Transect F	Groundwater	Water table	Grab (DPT)	PFAS
TF-F4-Groundwater02-MMDDYY-#-#	Transect F	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-F4-Groundwater03-MMDDYY-#-#	Transect F	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
Transect G					
TF-G1-Groundwater01-MMDDYY-#-#	Transect G	Groundwater	Water table	Grab (DPT)	PFAS
TF-G1-Groundwater02-MMDDYY-#-#	Transect G	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-G1-Groundwater03-MMDDYY-#-#	Transect G	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-G2-Groundwater01-MMDDYY-#-#	Transect G	Groundwater	Water table	Grab (DPT)	PFAS
TF-G2-Groundwater02-MMDDYY-#-#	Transect G	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-G2-Groundwater03-MMDDYY-#-#	Transect G	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-G3-Groundwater01-MMDDYY-#-#	Transect G	Groundwater	Water table	Grab (DPT)	PFAS
TF-G3-Groundwater02-MMDDYY-#-#	Transect G	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-G3-Groundwater03-MMDDYY-#-#	Transect G	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-G4-Groundwater01-MMDDYY-#-#	Transect G	Groundwater	Water table	Grab (DPT)	PFAS
TF-G4-Groundwater02-MMDDYY-#-#	Transect G	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-G4-Groundwater03-MMDDYY-#-#	Transect G	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
Transect H					
TF-H1-Groundwater01-MMDDYY-#-#	Transect H	Groundwater	Water table	Grab (DPT)	PFAS
TF-H1-Groundwater02-MMDDYY-#-#	Transect H	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-H1-Groundwater03-MMDDYY-#-#	Transect H	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-H2-Groundwater01-MMDDYY-#-#	Transect H	Groundwater	Water table	Grab (DPT)	PFAS
TF-H2-Groundwater02-MMDDYY-#-#	Transect H	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-H2-Groundwater03-MMDDYY-#-#	Transect H	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-H3-Groundwater01-MMDDYY-#-#	Transect H	Groundwater	Water table	Grab (DPT)	PFAS
TF-H3-Groundwater02-MMDDYY-#-#	Transect H	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-H3-Groundwater03-MMDDYY-#-#	Transect H	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-H4-Groundwater01-MMDDYY-#-#	Transect H	Groundwater	Water table	Grab (DPT)	PFAS
TF-H4-Groundwater02-MMDDYY-#-#	Transect H	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-H4-Groundwater03-MMDDYY-#-#	Transect H	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
Transect I (F-16 Crash Site)					
TF-I1-Groundwater01-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Water table	Grab (DPT)	PFAS
TF- I1-Groundwater02-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF- I1-Groundwater03-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-I1-SB01-MMDDYY-#-#	Transect I	SB	Surface	Grab (DPT)	PFAS
TF-I1-SB02-MMDDYY-#-#	Transect I	SB	Subsurface	Grab (DPT)	PFAS
TF-I1-SB03-MMDDYY-#-#	Transect I	SB	Subsurface	Grab (DPT)	PFAS
TF-I2-Groundwater01-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Water table	Grab (DPT)	PFAS
TF-I2-Groundwater02-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-I2-Groundwater03-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-I3-Groundwater01-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Water table	Grab (DPT)	PFAS
TF-I3-Groundwater02-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Higher permeability zone(s)	Grab (DPT)	PFAS
TF-I3-Groundwater03-MMDDYY-#-#	Transect I (F-16 Crash Site)	Groundwater	Boring termination (estimated 100 ft bgs)	Grab (DPT)	PFAS
TF-F16-01-SB01-MMDDYY-#-#	F-16 Crash Site	SB	Surface	Grab (DPT)	PFAS
TF-F16-01-SB02-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
TF-F16-01-SB03-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
TF-F16-02-SB01-MMDDYY-#-#	F-16 Crash Site	SB	Surface	Grab (DPT)	PFAS
TF-F16-02-SB02-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
TF-F16-02-SB03-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
TF-F16-03-SB01-MMDDYY-#-#	F-16 Crash Site	SB	Surface	Grab (DPT)	PFAS
TF-F16-03-SB02-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
TF-F16-03-SB03-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
TF-F16-04-SB01-MMDDYY-#-#	F-16 Crash Site	SB	Surface	Grab (DPT)	PFAS
TF-F16-04-SB02-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
TF-F16-04-SB03-MMDDYY-#-#	F-16 Crash Site	SB	Subsurface	Grab (DPT)	PFAS
PRL 1					
TF-PRL1-01-SB01-MMDDYY-#-#	PRL 1	SB	Surface	Grab (DPT)	PFAS
TF-PRL1-01-SB02-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL1-01-SB03-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL1-02-SB01-MMDDYY-#-#	PRL 1	SB	Surface	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-PRL1-02-SB02-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL1-02-SB03-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL1-03-SB01-MMDDYY-#-#	PRL 1	SB	Surface	Grab (DPT)	PFAS
TF-PRL1-03-SB02-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL1-03-SB03-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL1-04-SB01-MMDDYY-#-#	PRL 1	SB	Surface	Grab (DPT)	PFAS
TF-PRL1-04-SB02-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL1-04-SB03-MMDDYY-#-#	PRL 1	SB	Subsurface	Grab (DPT)	PFAS
PRL 2					
TF-PRL2-01-SB01-MMDDYY-#-#	PRL 2	SB	Surface	Grab (DPT)	PFAS
TF-PRL2-01-SB02-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-01-SB03-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-02-SB01-MMDDYY-#-#	PRL 2	SB	Surface	Grab (DPT)	PFAS
TF-PRL2-02-SB02-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-02-SB03-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-03-SB01-MMDDYY-#-#	PRL 2	SB	Surface	Grab (DPT)	PFAS
TF-PRL2-03-SB02-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-03-SB03-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-04-SB01-MMDDYY-#-#	PRL 2	SB	Surface	Grab (DPT)	PFAS
TF-PRL2-04-SB02-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-04-SB03-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-05-SB01-MMDDYY-#-#	PRL 2	SB	Surface	Grab (DPT)	PFAS
TF-PRL2-05-SB02-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-05-SB03-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-06-SB01-MMDDYY-#-#	PRL 2	SB	Surface	Grab (DPT)	PFAS
TF-PRL2-06-SB02-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL2-06-SB03-MMDDYY-#-#	PRL 2	SB	Subsurface	Grab (DPT)	PFAS
PRL 3					
TF-PRL3-01-SB01-MMDDYY-#-#	PRL 3	SB	Surface	Grab (DPT)	PFAS
TF-PRL3-01-SB02-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-01-SB03-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-02-SB01-MMDDYY-#-#	PRL 3	SB	Surface	Grab (DPT)	PFAS
TF-PRL3-02-SB02-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-02-SB03-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-03-SB01-MMDDYY-#-#	PRL 3	SB	Surface	Grab (DPT)	PFAS
TF-PRL3-03-SB02-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-03-SB03-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-04-SB01-MMDDYY-#-#	PRL 3	SB	Surface	Grab (DPT)	PFAS
TF-PRL3-04-SB02-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-04-SB03-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-05-SB01-MMDDYY-#-#	PRL 3	SB	Surface	Grab (DPT)	PFAS
TF-PRL3-05-SB02-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL3-05-SB03-MMDDYY-#-#	PRL 3	SB	Subsurface	Grab (DPT)	PFAS
PRL 4					
TF-PRL4-01-SB01-MMDDYY-#-#	PRL 4	SB	Surface	Grab (DPT)	PFAS
TF-PRL4-01-SB02-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-01-SB03-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-02-SB01-MMDDYY-#-#	PRL 4	SB	Surface	Grab (DPT)	PFAS
TF-PRL4-02-SB02-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-PRL4-02-SB03-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-03-SB01-MMDDYY-#-#	PRL 4	SB	Surface	Grab (DPT)	PFAS
TF-PRL4-03-SB02-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-03-SB03-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-04-SB01-MMDDYY-#-#	PRL 4	SB	Surface	Grab (DPT)	PFAS
TF-PRL4-04-SB02-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-04-SB03-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-05-SB01-MMDDYY-#-#	PRL 4	SB	Surface	Grab (DPT)	PFAS
TF-PRL4-05-SB02-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL4-05-SB03-MMDDYY-#-#	PRL 4	SB	Subsurface	Grab (DPT)	PFAS
PRL 5					
TF-PRL5-01-SB01-MMDDYY-#-#	PRL 5	SB	Surface	Grab (DPT)	PFAS
TF-PRL5-01-SB02-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL5-01-SB03-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL5-02-SB01-MMDDYY-#-#	PRL 5	SB	Surface	Grab (DPT)	PFAS
TF-PRL5-02-SB02-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL5-02-SB03-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL5-03-SB01-MMDDYY-#-#	PRL 5	SB	Surface	Grab (DPT)	PFAS
TF-PRL5-03-SB02-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL5-03-SB03-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL5-04-SB01-MMDDYY-#-#	PRL 5	SB	Surface	Grab (DPT)	PFAS
TF-PRL5-04-SB02-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL5-04-SB03-MMDDYY-#-#	PRL 5	SB	Subsurface	Grab (DPT)	PFAS
PRL 6					
TF-PRL6-01-SB01-MMDDYY-#-#	PRL 6	SB	Surface	Grab (DPT)	PFAS
TF-PRL6-01-SB02-MMDDYY-#-#	PRL 6	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL6-01-SB03-MMDDYY-#-#	PRL 6	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL6-02-SB01-MMDDYY-#-#	PRL 6	SB	Surface	Grab (DPT)	PFAS
TF-PRL6-02-SB02-MMDDYY-#-#	PRL 6	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL6-02-SB03-MMDDYY-#-#	PRL 6	SB	Subsurface	Grab (DPT)	PFAS
PRL 7					
TF-PRL7-01-SB01-MMDDYY-#-#	PRL 7	SB	Surface	Grab (DPT)	PFAS
TF-PRL7-01-SB02-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-01-SB03-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-02-SB01-MMDDYY-#-#	PRL 7	SB	Surface	Grab (DPT)	PFAS
TF-PRL7-02-SB02-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-02-SB03-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-03-SB01-MMDDYY-#-#	PRL 7	SB	Surface	Grab (DPT)	PFAS
TF-PRL7-03-SB02-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-03-SB03-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-04-SB01-MMDDYY-#-#	PRL 7	SB	Surface	Grab (DPT)	PFAS
TF-PRL7-04-SB02-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-04-SB03-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-05-SB01-MMDDYY-#-#	PRL 7	SB	Surface	Grab (DPT)	PFAS
TF-PRL7-05-SB02-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-05-SB03-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-06-SB01-MMDDYY-#-#	PRL 7	SB	Surface	Grab (DPT)	PFAS
TF-PRL7-06-SB02-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-06-SB03-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-PRL7-07-SB01-MMDDYY-#-#	PRL 7	SB	Surface	Grab (DPT)	PFAS
TF-PRL7-07-SB02-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL7-07-SB03-MMDDYY-#-#	PRL 7	SB	Subsurface	Grab (DPT)	PFAS
PRL 8					
TF-PRL8-01-SB01-MMDDYY-#-#	PRL 8	SB	Surface	Grab (DPT)	PFAS
TF-PRL8-01-SB02-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-01-SB03-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-02-SB01-MMDDYY-#-#	PRL 8	SB	Surface	Grab (DPT)	PFAS
TF-PRL8-02-SB02-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-02-SB03-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-03-SB01-MMDDYY-#-#	PRL 8	SB	Surface	Grab (DPT)	PFAS
TF-PRL8-03-SB02-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-03-SB03-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-04-SB01-MMDDYY-#-#	PRL 8	SB	Surface	Grab (DPT)	PFAS
TF-PRL8-04-SB02-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-04-SB03-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-05-SB01-MMDDYY-#-#	PRL 8	SB	Surface	Grab (DPT)	PFAS
TF-PRL8-05-SB02-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL8-05-SB03-MMDDYY-#-#	PRL 8	SB	Subsurface	Grab (DPT)	PFAS
PRL 9					
TF-PRL9-01-SB01-MMDDYY-#-#	PRL 9	SB	Surface	Grab (DPT)	PFAS
TF-PRL9-01-SB02-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-01-SB03-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-02-SB01-MMDDYY-#-#	PRL 9	SB	Surface	Grab (DPT)	PFAS
TF-PRL9-02-SB02-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-02-SB03-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-03-SB01-MMDDYY-#-#	PRL 9	SB	Surface	Grab (DPT)	PFAS
TF-PRL9-03-SB02-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-03-SB03-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-04-SB01-MMDDYY-#-#	PRL 9	SB	Surface	Grab (DPT)	PFAS
TF-PRL9-04-SB02-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-04-SB03-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-05-SB01-MMDDYY-#-#	PRL 9	SB	Surface	Grab (DPT)	PFAS
TF-PRL9-05-SB02-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL9-05-SB03-MMDDYY-#-#	PRL 9	SB	Subsurface	Grab (DPT)	PFAS
PRL 10					
TF-PRL10-01-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS
TF-PRL10-01-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-01-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-02-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS
TF-PRL10-02-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-01-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-03-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS
TF-PRL10-03-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-03-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-04-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS
TF-PRL10-04-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-04-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-05-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-PRL10-05-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-05-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-06-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS
TF-PRL10-06-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-06-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-07-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS
TF-PRL10-07-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-07-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-08-SB01-MMDDYY-#-#	PRL 10	SB	Surface	Grab (DPT)	PFAS
TF-PRL10-08-SB02-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
TF-PRL10-08-SB03-MMDDYY-#-#	PRL 10	SB	Subsurface	Grab (DPT)	PFAS
Surface Water/Stormwater					
TF-STW01-MMDDYY	North	SW	Surface	Grab	PFAS
TF-SD01-MMDDYY-#-#	North	SD	Surface	Grab	PFAS
TF-STW02-MMDDYY	North	SW	Surface	Grab	PFAS
TF-SD02-MMDDYY-#-#	North	SD	Surface	Grab	PFAS
TF-STW03-MMDDYY	North	SW	Surface	Grab	PFAS
TF-SD03-MMDDYY-#-#	North	SD	Surface	Grab	PFAS
TF-STW04-MMDDYY	East	SW	Surface	Grab	PFAS
TF-SD04-MMDDYY-#-#	East	SD	Surface	Grab	PFAS
TF-STW05-MMDDYY	North	SW	Surface	Grab	PFAS
TF-SD05-MMDDYY-#-#	North	SD	Surface	Grab	PFAS
TF-STW06-MMDDYY	East	SW	Surface	Grab	PFAS
TF-SD06-MMDDYY-#-#	East	SD	Surface	Grab	PFAS
TF-STW07-MMDDYY	PRL 6	SW	Surface	Grab	PFAS
TF-SD07-MMDDYY-#-#	PRL 6	SD	Surface	Grab	PFAS
TF-SFW08-MMDDYY	East	SW	Surface	Grab	PFAS
TF-SD08-MMDDYY-#-#	East	SD	Surface	Grab	PFAS
TF-STW09-MMDDYY	West	SW	Surface	Grab	PFAS
TF-SD09-MMDDYY-#-#	West	SD	Surface	Grab	PFAS
TF-STW10-MMDDYY	West	SW	Surface	Grab	PFAS
TF-SD10-MMDDYY-#-#	West	SD	Surface	Grab	PFAS
TF-STW11-MMDDYY	PRL 7	SW	Surface	Grab	PFAS
TF-SD11-MMDDYY-#-#	PRL 7	SD	Surface	Grab	PFAS
TF-STW12-MMDDYY	PRL 4	SW	Surface	Grab	PFAS
TF-SD12-MMDDYY-#-#	PRL 4	SD	Surface	Grab	PFAS
TF-STW13-MMDDYY	PRL 1	SW	Surface	Grab	PFAS
TF-SD13-MMDDYY-#-#	PRL 1	SD	Surface	Grab	PFAS
TF-STW14-MMDDYY	PRL 9	SW	Surface	Grab	PFAS
TF-SD14-MMDDYY-#-#	PRL 9	SD	Surface	Grab	PFAS
TF-STW15-MMDDYY	Outfall 021	SW	Surface	Grab	PFAS
TF-SD15-MMDDYY-#-#	Outfall 021	SD	Surface	Grab	PFAS
TF-SFW16-MMDDYY	Outfall 021	SW	Surface	Grab	PFAS
TF-SD16-MMDDYY-#-#	Outfall 021	SD	Surface	Grab	PFAS
TF-SFW17-MMDDYY	Outfall 021	SW	Surface	Grab	PFAS
TF-SD17-MMDDYY-#-#	Outfall 021	SD	Surface	Grab	PFAS
TF-STW18-MMDDYY	Southwest	SW	Surface	Grab	PFAS
TF-SD18-MMDDYY-#-#	Southwest	SD	Surface	Grab	PFAS
TF-SFW19-MMDDYY	Outfall 036	SW	Surface	Grab	PFAS

Sample Identifier	Site/Location	Matrix	Depth (ft bgs)	Sample Method	Analytes
TF-SD19-MMDDYY-#-#	Outfall 036	SD	Surface	Grab	PFAS
TF-SFW20-MMDDYY	Outfall 036	SW	Surface	Grab	PFAS
TF-SD20-MMDDYY-#-#	Outfall 036	SD	Surface	Grab	PFAS
TF-SFW21-MMDDYY	South	SW	Surface	Grab	PFAS
TF-SD21-MMDDYY-#-#	South	SD	Surface	Grab	PFAS
TF-SFW22-MMDDYY	South	SW	Surface	Grab	PFAS
TF-SD22-MMDDYY-#-#	South	SD	Surface	Grab	PFAS
TF-SFW23-MMDDYY	South	SW	Surface	Grab	PFAS
TF-SD23-MMDDYY-#-#	South	SD	Surface	Grab	PFAS
TF-SFW24-MMDDYY	South	SW	Surface	Grab	PFAS
TF-SD24-MMDDYY-#-#	South	SD	Surface	Grab	PFAS
TF-SFW25-MMDDYY	South	SW	Surface	Grab	PFAS
TF-SD25-MMDDYY-#-#	South	SD	Surface	Grab	PFAS
TF-SFW26-MMDDYY	South	SW	Surface	Grab	PFAS
TF-SD26-MMDDYY-#-#	South	SD	Surface	Grab	PFAS
TF-SFW27-MMDDYY	South	SW	Surface	Grab	PFAS
TF-SD27-MMDDYY-#-#	South	SD	Surface	Grab	PFAS
Background					
TF-BKG01-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG01-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG01-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG02-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG02-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG02-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG03-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG03-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG03-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG04-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG04-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG04-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG05-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG05-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG05-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG06-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG06-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG06-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG07-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG07-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG07-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG08-SB01-MMDDYY-#-#	Background	SB	Surface	Grab (DPT)	PFAS
TF-BKG08-SB02-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS
TF-BKG08-SB03-MMDDYY-#-#	Background	SB	Subsurface	Grab (DPT)	PFAS

Notes:
# = Numerical digit representing depth in feet below ground surface.
MMDDYY = Numerical month, day, and year (2 digits each).
Matrices:
SB = Soil
SD = Sediment.

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QAPP Worksheet # 20: Field QC Summary

Matrix	Analyte/Analytical Group	Concentration Level	Field Samples	Field Duplicates	MS/MSD	Field Blank	Equipment Blank	Total # Samples to Lab[1]
Water	PFAS	Low/Medium/High	Variable	10%	5%	1 per day	1 per day[2]	To be determined
Soil/Sediment	PFAS	Low/Medium/High	Variable	10%	5%	1 per day	1 per day[2]	To be determined

Notes:

1. Number of samples collected will vary based on the investigative nature of the RI and the requirement for additional sampling beyond the initial proposed locations. Frequencies listed for QC samples will be collected during field activities.
2. Equipment blanks will be collected for all water samples involving reusable equipment. No equipment blanks will be collected with samples that are collected directly from a tap/faucet.

MS = Matrix spike.
MSD = Matrix spike duplicate.

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Appendix A

Accident Prevention Plan/Site Safety and Health Plan

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Appendix A
Accident Prevention Plan/ Site Safety and Health Plan

Programmatic Uniform Federal Policy
Quality Assurance Project Plan
Addendum

Remedial Investigations for per- and polyfluoroalkyl substances at Multiple Air National Guard Installations

Truax Field Air National Guard Base, Madison, Dane County, Wisconsin

Prepared for:

U.S. Army Corps of Engineers, Omaha District
1616 Capital Avenue, Suite 9000
Omaha, NE 68102-4901

Prepared by:

EA Engineering, Science, and Technology, Inc., PBC
221 Sun Valley Boulevard, Suite D
Lincoln, NE 68528

December 2021
Contract No. W9128F18D0026, Task Order No. W9128F20F0325
EA Project No. 6332106

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LIST OF ACRONYMS

ABIH	American Board of Industrial Hygiene
AFFF	Aqueous film-forming foam
AHA	Activity Hazard Analysis
ANGB	Air National Guard Base
APP	Accident Prevention Plan
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
COR	Contracting Officer's Representative
CSP	Certified Safety Professional
DPT	Direct-push technology
EA	EA Engineering, Science, and Technology, Inc., PBC
EC	Electrical conductivity
EM	Engineer manual
ERPIMS	Environmental Resources Program Information Management System
ft	foot/feet
HPT	Hydraulic profiling tool
IDW	Investigative derived waste
LC/MS/MS	Liquid chromatography tandem mass spectroscopy
MLS	Mobile lab service
MW	Monitoring wells
NGB/A4VR	National Guard Bureau/Environmental Restoration Branch
OSHA	Occupational Safety and Health Administration
PFAS	Per- and Polyfluoroalkyl Substances
PFBS	perfluorobutane sulfonate
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonic acid
PM	Project Manager
QSM	Quality Systems Manual
RI	Remedial Investigation
RPM	Restoration Program Manager

LIST OF ACRONYMS (con't)

SOW	Scope of Work
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
UFP-QAPP	Uniform Federal Policy Quality Assurance Project Plan
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
WIANG	Wisconsin Air National Guard

1. INTRODUCTION

This Accident Prevention Plan (APP) / Site Safety and Health Plan (SSHP) has been prepared by EA Engineering, Science, and Technology, Inc., PBC (EA) to provide services to perform a Remedial Investigation (RI) for per- and polyfluoroalkyl substances (PFAS) contamination resulting from aqueous film-forming foam (AFFF), non-AFFF, and secondary PFAS releases at Truax Field Air National Guard Base ([ANGB] Truax Field), Wisconsin. Work conducted under this contract will be performed in accordance with applicable federal, state, and local safety and occupational health laws and regulations, including Occupational Safety and Health Administration (OSHA) standards (e.g., 29 Code of Federal Regulations [CFR] 1910 and 29 CFR 1926) and the United States Army Corps of Engineers (USACE) Safety and Health Requirements Manual (Engineer Manual [EM] 385-1-1, 30 November 2014). The contents of the APP/SSHP are subject to review and revision as new information becomes available.

2. SIGNATURE SHEET

Plan Preparer:
This APP Addendum has been prepared by a qualified, Competent Person.

Name:	Ashley Schroeder	Date
Title:	Environmental Scientist	7 July 2021
Company:	EA	
Telephone:	402-476-3766	

Plan Approvals:
This APP has been prepared under the supervision of, and has been reviewed and approved by, a Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene (ABIH).

Name:	Rob Marcase, CIH, CSP, CHMM ABIH No. 9283CP, CSP No. 21609, CHMM No. 15935	Date 7 July 2021
Title:	Corporate Health and Safety Supervisor	
Company:	EA	
Telephone:	410-329-5192	

Certification/Concurrence:
Project and Program Management have concurred with the elements of this APP. Site worker concurrence will be documented through signature on the Programmatic APP/ SSHP review form.

Name:	Cybil Boss, P.E.	Date
Title:	Project Manager	7 July 2021
Company:	EA	
Telephone:	402-817-7613	

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3. BACKGROUND INFORMATION

This section presents a brief description of the project, scope of work (SOW), key personnel, and phases of work.

3.1 CONTRACTOR INFORMATION

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, MD 21031
(410) 584-7000

3.2 PROJECT NAME AND ADDRESS

PFAS RI at Truax Field
3110 Mitchell St
Madison, WI 53704

3.3 PROJECT DESCRIPTION

The USACE Omaha District has contracted EA to perform RIs for PFAS resulting from AFFF, non-AFFF, and secondary PFAS releases at multiple Air National Guard (ANG) Installations. Truax Field is one of the identified installations and its location is shown in Figure I-1 of the installation-specific Uniform Federal Policy Quality Assurance Project Plan (UFP-QAPP). Remedial investigative activities include, but are not limited to: records review, sampling and analysis of soil, groundwater, sediment, and surface water; installation of lysimeters where required; data validation and interpretation; and generation of analysis reports and supplemental materials. EA will be contracting local subcontractors and overseeing work in coordination with USACE Omaha District and the National Guard Bureau/Environmental Restoration Branch (NGB/A4VR).

3.4 SCOPE OF WORK

The primary field tasks to be performed under this SOW that will require an activity hazard analysis (AHA) include:

- Mobilization
- Complete direct-push technology (DPT) investigation with completion of hydraulic profiling tool (HPT)/electrical conductivity (EC)
- Install new monitoring wells (MWs) and complete geotechnical analysis
- Collect and analyze soil, groundwater, sediment, and surface water samples
- Install lysimeters
- Demobilization.

The AHAs are included as Attachment B to the APP (Appendix D) of the Programmatic UFP-QAPP (EA 2020).

3.5 CONTRACTOR SAFETY INFORMATION

Safety and health information will be maintained onsite by the Installation-Specific Site Safety and Health Officer (SSHO). It is not anticipated that a work trailer will be necessary for the site work. Therefore, the information will be contained in a mobile file located in the SSHO's vehicle and available to all workers and oversight personnel. The information will include a map illustrating the route to the nearest hospital, emergency phone numbers, a copy of the APP that includes copies of AHAs, OSHA Form 300A, Safety and Occupational Health Deficiency Tracking Log, and field logbooks, documenting daily health and safety meetings.

4. RESPONSIBILITY AND LINES OF AUTHORITY

EA is responsible for implementing a safety and occupational health program for protection of employees in the workplace and as addressed in the Programmatic APP and this Installation Specific Addendum for Truax Field. EA has established roles and responsibilities for implementing the safety program at the corporate, project management, and field/task levels. This APP presents the site-specific requirements that will ensure compliance with EA's corporate program while maintaining compliance with federal and client requirements. EA retains full responsibility for the implementation of this APP. Site personnel are responsible for adherence to this APP during the performance of their work. No person may work in a manner that conflicts with the intent of, or the inherent safety and environmental precautions expressed in, these procedures. Furthermore, employees working onsite have the authority to stop work if unsafe conditions exist.

4.1 IDENTIFICATION OF INSTALLATION SPECIFIC PROJECT PERSONNEL

The key roles and personnel filling required roles at Truax Field are presented below. EA maintains separate lines of authority for installation specific task management and safety in order to limit conflicts of interest between the need to maintain project deliverables, budget, schedule, and safety. Training certificates for key personnel are provided in Attachment 1.

4.1.1 Task Manager

Mr. David Cookston is the Task Manager for field activities at Truax Field. His duties include:

- Reporting to Project Manager (PM) on progress of work and potential quality or safety issues.
- Ensuring adherence to the requirements of the Quality Control Plan and documenting non-compliance issues (quality or safety) and reporting to the PM.
- Coordinating activities with the SSHO and documenting safety activities and inspections.
- Instruct and train employees in the hazards of anticipated job activities, and the appropriate safe work practices.
- Periodically monitor employee activities to ensure conformance with safe work practices.
- Investigate and report accidents, injuries, and occupational illnesses as required.
- Investigate employee reports of hazardous conditions, taking actions as appropriate.

4.1.2 Site Safety and Health Officer

Mr. David Cookston will also be the SSHO. His responsibilities as the SSHO will include:

- Ensuring onsite adherence to the APP.

- Ensuring all personnel have the required training and certifications to complete field work.
- Ensuring that personnel are trained in the use, calibration, and maintenance of safety equipment.
- Recognizing and predicting unsafe conditions/hazards.
- Stopping work if unsafe conditions exist.
- Mitigating unsafe conditions.
- Ensuring that assigned safety and monitoring equipment is properly used, calibrated, and maintained.
- Taking the lead on initial, onsite investigation of accidents, near misses, and occupational illnesses, and providing copies of incident reports to the Corporate Health and Safety Supervisor and PM.
- Ensuring that personnel onsite (employees and subcontractors) have the required training and appropriate medical surveillance/clearance to perform site tasks.
- Ensuring that air sampling or air monitoring is conducted for appropriate field operations.
- Reviewing Installation Specific APPs and SSHPs.
- Performing onsite safety related briefings, training, and inspections.
- Providing copies of inspections, as needed, to the Task Manager, PM, and Corporate Health and Safety Supervisor.
- Investigating employee reports of hazardous conditions and taking actions as appropriate.
- Coordinating with the Corporate Health and Safety Supervisor for issues that cannot be resolved.

4.2 LINES OF AUTHORITY

Safety personnel have the authority to require and implement changes regarding site safety. The SSHO will report safety issues to the Corporate Health and Safety Supervisor. The SSHO has the authority to stop work and can require changes to the APP. The SSHO will inform the Program Manager and PM of the required changes. If there is disagreement between safety and management at the SSHO and Project Management level, the disagreement will be elevated to Corporate Health and Safety Supervisor and the Program Manager for resolution. The Corporate Health and Safety Supervisor and the Program Manager can elevate safety issues to the President and Chief Executive Officer, if required for resolution. Work related to the identified safety issue or hazard will not resume until a safe resolution is agreed upon. The USACE Contracting Officer’s Representative (COR), USACE PM, and NGB/A4VR Restoration Program Manager

(RPM) will be notified of safety issues that result in a work stoppage or require changes to the APP. Contact information for key personnel is provided in **Table 3-1**. **Figure 3-1** shows the lines of authority and communication at Truax Field.

Table 3-1. Contact Information of Key Personnel

Name	Organization (Role)	Office Number	Cell Number
Richard Anderson	USACE (PM)	402-995-2295	
Bill Meyer	Truax Field (RPM)	240-612-8473	
Brenda Herman	EA (Program Manager)	402-584-7000	410-913-1681
Cybil Boss	EA (PM)	402-476-3766	402-817-7613
Rob Marcase	EA (Corporate Health and Safety Supervisor)	410-527-2425	410-790-6338
David Cookston	EA (Task Manager and SSHO)	402-476-3766	402-304-2049

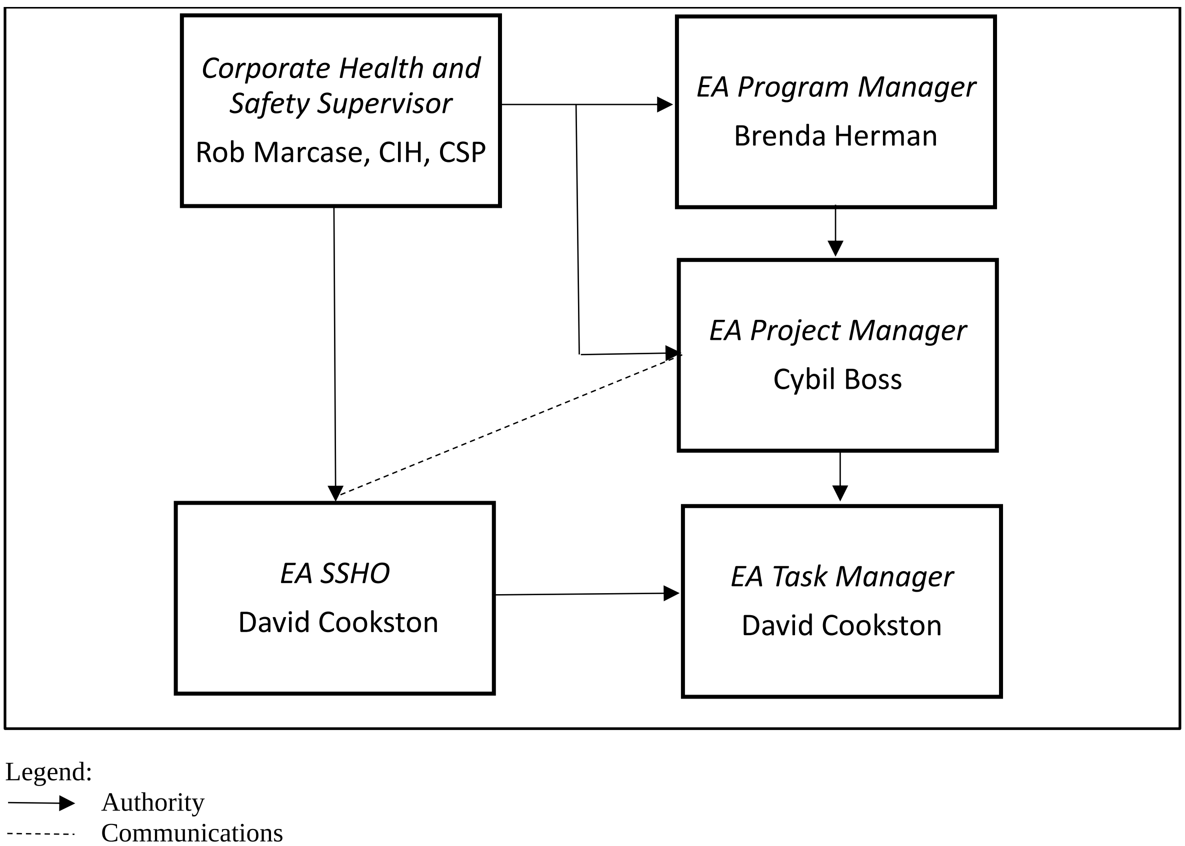

Figure 3-1. Lines of Authority and Communication

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5. SUBCONTRACTORS AND SUPPLIERS

Subcontractors and suppliers will be responsible for compliance with this APP, contract requirements, laws, regulations, and EM 385-1-1.

5.1 SUBCONTRACTOR INFORMATION

The following subcontractors have been identified to support the PFAS RI at Truax Field:

- **Plains Environmental Services:** Direct-push technology for HPT, EC and groundwater samples
- **Midwestern Drilling:** Direct-push technology for soil sampling.
- **Environmental Works:** Sonic drilling services for MW installation.
- **Eurofins Environmental Testing America (Sacramento):** Primary laboratory for analyses of environmental samples.
- **Eurofins Environmental Testing America (Lancaster)**: Primary laboratory for analysis of geotechnical and waste characterization samples.
- **Pace Analytical Mobile Services:** Mobile PFAS laboratory for screening-level, expedited on-site analysis of environmental samples.
- **Laboratory Data Consultants (LDC):** Data validation of laboratory analytical results.
- **Clean Harbors:** Disposal of Investigative Derived Waste (IDW) generated during RI.

The following subcontractors are to be finalized to support the PFAS RI at Truax Field:

- Surveyor to perform surveying of MWs and locations of environmental samples.

5.2 SCOPE OF WORK

A subcontractor specific SOW has been defined for each of the following activities conducted as part of the PFAS RIs:

Survey SOW:

Using Real Time Kinematic Global Positioning System and a Continuously Operating Reference Station for localization, the surveyor shall complete a survey documenting the soil boring locations and newly installed MWs at Truax Field. The survey data will be provided in electronic file format; include the point number, northing, easting, elevation, and point description; and be provided to EA with a Survey Summary Report signed and stamped by a state-licensed surveyor. The surveyor shall use State Plane Coordinates in survey feet: horizontal reference using North American Datum of 1983 (NAD 1983) and the vertical reference using North American Vertical Datum of 1988 (NAVD 1988).

Direct-push SOW (soil):

In compliance with *USACE PFAS Chemistry Instructions for Scope and Services*, direct-push soil sampling will be used to obtain surface and subsurface soil lithologic information, and for collection of discrete soil samples for chemical analysis. A truck-mounted or track-mounted hydraulic direct-push system will be used to advance borings to a final depth of approximately 10 to 30 feet (ft) below grade. Subsurface, representative soil samples will be collected by EA personnel at 5-ft intervals beginning at approximately 1 to 5 ft below grade. Following collection of soil samples, remaining soil cuttings will be containerized for offsite disposal by another subcontractor. Soil borings will be filled and sealed as required by state regulations by filling the borehole with grout to within 3 ft of the surface (grout seal will be placed over the borehole, and the remainder backfilled with native topsoil material mounded for settling). An alternative to the above grouting and sealing procedures may be proposed if found to be in conformance with appropriate state regulations. The direct-push work shall be performed in accordance with applicable Wisconsin regulations, and by a Wisconsin-licensed driller.

Subsurface Sonic Drilling SOW:

Subsurface drilling to install approximately 2 MWs at 11 sites associated with Truax Field will be performed using a sonic drilling rig. Borings will be of sufficient diameter to permit at least two inches of annular space between the boring wall and all sides of the 2-inch well riser and screen. The well borings, once the well screen interval is determined, may be backfilled with clean silica sand from the bottom of the borehole to the bottom of the well screen prior to well construction. All liquid generated during decontamination activities will be containerized for disposal, separate from the soil cuttings, by another subcontractor. Each of the drilling and/or boring locations will be restored to original conditions as close as possible. To complete Boring Logs and State well reports, the subcontractor will provide lithological descriptions, in accordance with the Unified Soil Classification System, of each recovered soil interval and other pertinent lithological information which will be recorded on a standard drilling log form by EA personnel.

Mobile PFAS Screening-level Lab SOW:

On-site screening of soil and groundwater samples will be conducted using a Mobile Lab Service (MLS) via accelerated Liquid chromatography tandem mass spectroscopy (LC/MS/MS) method. The accelerated method follows the PFAS analyses by LC/MS/MS with isotope dilution and in-line solid phase extraction. The MLS can screen an average of 30 soil a water samples per day and will be set up to identify and quantitate perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutane sulfonate (PFBS). Turnaround times for draft screening data are expected to be same day for a selected number of prioritized samples and next for all other samples. Contingencies for managing delays associated with difficult matrices and other unforeseen items that might impact data quality and productivity will be outlined in the lab’s quality assurance plan and work plan.

Fixed Laboratory Analytical SOW:

A fixed, offsite laboratory will perform definitive analytical analysis of groundwater, surface water, soil, and sediment samples for PFAS by LC/MS/MS in accordance with DoD Quality Systems Manual [QSM (version 5.3 or most current)] Table B-15. The laboratory will report the 24 PFAS analytes requested, provide Level IV data packages, and support preparation of Environmental Resources Program Information Management System (ERPIMS) deliverables.

Investigative Derived Waste Disposal SOW:

The subcontractor will complete transportation and disposal of soil IDW from well installation soil borings and direct push investigation activities in accordance with Federal, State, and Local laws and regulations. Soil from IDW will be containerized and analyzed for PFAS contamination. EA will provide the subcontractor with analytical results of waste characterization samples. Copies of manifests will be provided by the contractor to EA designated personnel prior to departure of the site and following receipt at the facility.

5.3 SUBCONTRACTOR SAFETY INFORMATION

Subcontractor safety information necessary for compliance with the Programmatic and Truax Field AAPs/SSHPs will be added to this plan following identification and selection of subcontractors.

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6. TRAINING

6.1 INSTALLATION SPECIFIC TRAINING AND CERTIFICATION

EA will coordinate with the Installation RPM to determine required safety training prior to onsite work activities.

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7. SUPPLEMENTAL PLANS

7.1 EMERGENCY RESPONSE PLAN

An emergency is defined as a situation that requires calling outside help onto a job site. Field personnel will immediately stop work and report to the Task Manager/SSHO under the following situations:

- Medical emergency
- Fire emergency
- Spill emergency
- Discovery of unanticipated hazards (e.g., drums, heavily contaminated materials, etc.)
- Heavy equipment accident
- Overexposure of personnel to onsite contaminants requiring emergency medical support
- Heat/cold-related injury or heat/cold stress requiring emergency medical support.

7.1.1 Posting of Emergency Telephone Numbers

Emergency telephone numbers will be distributed to site personnel by the SSHO. These copies will be kept in the site support vehicles. The SSHO will always have this emergency numbers on his or her person. Emergency contact numbers are presented in **Table 6-1**.

7.1.2 Medical Support

The local Emergency Medical Services will be notified immediately if needed. Emergency contact numbers are presented in **Table 6-1**. Personnel will not transport victims to emergency medical facilities unless the injury does not pose immediate threat to life, and transport to the emergency medical facility can be accomplished without the risk of further injury. Directions and route to the nearest hospital are presented on **Figure 6-1**.

First aid equipment will be available in company vehicles. Accident reporting will be performed in accordance with Section 8 of the Programmatic UFP-QAPP (EA 2020).

Table 6-1. Emergency Contact Numbers

Name	Name	Number to Call
Major Emergency		911
Police/Fire/Ambulance/Spills (Emergencies)		911
Emergency Room	Meriter Hospital	608-417-6000
Off base Urgent Care	Union Corners Clinic – Urgent Care Clinic	608-242-6855
Poison Control		800-222-1222

Name	Name	Number to Call
National Response Center		800-424-8802
EA Medical Services	AllOne Health Resources	800-350-4511

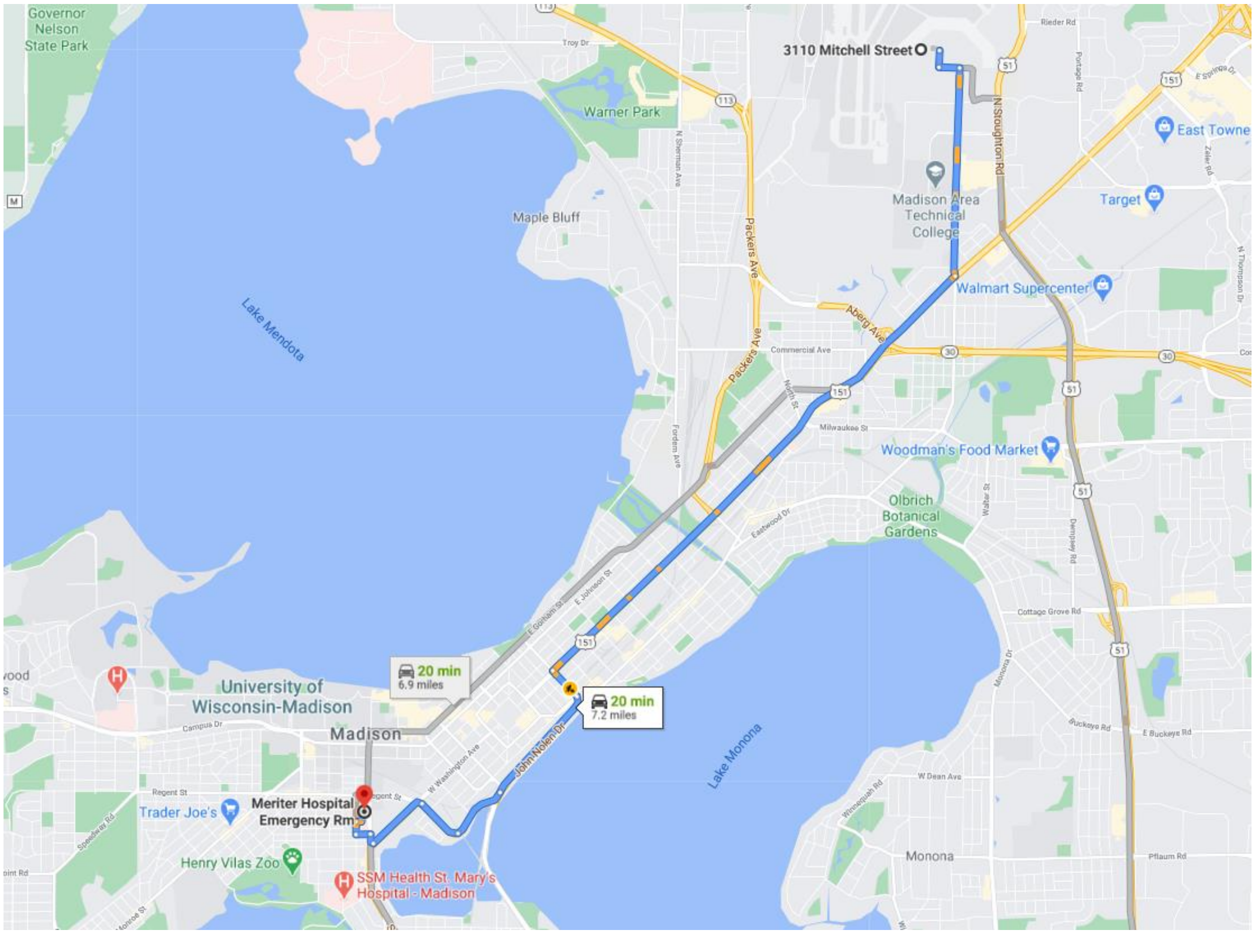

Figure 6-1. Directions to the Emergency Room

<u>From Truax Field to Meriter Hospital Emergency Room, Madison, WI</u>

Take Wright St to E Washington Ave
Turn right onto E Washington Ave and follow approximately 3.5 miles
Use the left two lanes to turn left onto S Blair St
S. Blair St turns slightly right and becomes John Nolen Dr
Turn right onto N Shore Dr and continue onto Proudfit St
Turn left onto W Washington Ave
Take sharp right onto S Park St
Turn left onto Chandler St
Turn right at the 1st cross street onto S Brooks St
Turn right at the 1st cross street onto Mound St and follow hospital signs to the Emergency Room.

7.2 INSTALLATION SPECIFIC SITE SAFETY AND HEALTH PLAN

The installation specific information provided in this section shall supplement the SSHP provided as an attachment to the Programmatic UFP-QAPP (EA 2020).

7.2.1 Site Description

Truax Field is located at the Dane County Regional Airport in south-central Wisconsin adjacent to the city of Madison. The Base is the home of the 115th Fighter Wing. Originally constructed in 1942, the base occupied 2,050 acres and served through the end of World War II. The base was reactivated in 1951 and occupied by the USAF through 1968, when it was deactivated and taken over by the Wisconsin Air National Guard (WIANG). In 1981, the WIANG installation at Truax Field became the 128th Tactical Fighter Wing, and later the 128th Fighter Wing. In October 1995, the unit at Truax Field was re-designated the 115th Fighter Wing with no change in mission or aircraft. Since 1942, aircraft housed at Truax Field have varied but have predominantly been fighter/attack aircraft.

7.2.2 Project Tasks

The following tasks are possible as part of the project:

- Oversee Subcontractor completing DPT.
- Installation and development of new MWs.
- Collect soil, groundwater, surface water and sediment samples.
- Disposal of IDW.
- Perform aquifer testing (i.e., slug testing) on all new MWs to assess hydraulic conductivities.
- Installation of lysimeters in known source areas based on soil and groundwater sampling results.
- Semiannual groundwater monitoring.

Further detail regarding the tasks and technical approach are provided in the associated project planning documents.

7.2.3 Installation Specific Biological Hazards

The following biological hazards have been identified as common hazards in Wisconsin that may be encountered at Truax Field. A biological photograph log is provided as Appendix G to the APP.

Wildlife:

Wisconsin is home to several species of snakes. Two venomous snakes found in the project region are the Eastern Massasauga rattlesnake and the Timber rattlesnake which, depending on the time of year. may be present among brush and other isolated locations or items that provide good habitat. Rattlesnakes have a potentially deadly venom which affects the circulatory system. Use caution when moving or disturbing such areas or items. If a snake is encountered, do not attempt to touch or catch it. The field team should keep a safe distance, use caution, and not disturb the animal allowing it to pass. If the snake refuses to move, back away slowly and come back at a later time. If bitten, immediately seek medical attention at the nearest hospital. If possible, identify key characteristics of the snake to assist with the doctor's medical evaluation and treatment.

Spiders such as the Brown Recluse Spider and Black Widow Spiders have been spotted in Wisconsin. The Brown Recluse spider bites get increasingly painful over time with a potentially deadly venom. If you're bitten, contact a doctor immediately for proper treatment. Black Widow female spider bites can cause permanent damage and even death (though death is now rare thanks to modern treatment). You can easily recognize them thanks to their red markings. Watch out for these spiders in dark, secluded areas, and see a doctor if you think one has bitten you.

Ticks are external parasites of reptiles, birds, and mammals. Most drop off their host after feeding. They molt and then wait on the tips of leaves, forelegs outstretched, ready to attach to any animal brushing past. The bites of some soft-bodied ticks may cause mild paralysis. Ticks transmit many diseases, most importantly Rocky Mountain Spotted Fever and Lyme Disease. Ticks attach themselves to the host only with their mouth parts and feed on blood. In removing a tick, take care not to leave mouth parts behind. Ticks are best removed by pulling them off with steady, gentle pressure. The pull must be light enough to not injure the tick. After tick is removed, wash area thoroughly with soap and water, gently scrubbing the area of the tick bite.

Large predatory mammals such as gray wolves, coyotes, and Black bears are found in areas of Wisconsin, but rarely near urban areas. If a wolf or coyote is encountered, make noise, make yourself look as big as possible, and slowly create distance between you and the animal. If attacked, seek medical attention at the nearest hospital.

Plants:

Poison Hemlock are branching perennials that can reach heights of six feet in moist meadows. Ingesting a single mouthful can be deadly. The poison is mainly in the roots, but the entire plant should be avoided, as convulsions, fever, delirium, and death will shortly follow. If encountered, seek medical attention at the nearest hospital.

Poison Ivy, Oak, Sumac, Wild parsnip, and Stinging nettle are plants that contain an irritating, oily sap called urushiol. Urushiol triggers an allergic reaction upon contact with skin, resulting in an itchy rash, which can appear within hours of exposure or up to several days later. A person can be exposed to urushiol directly or by touching objects that have come into contact with the sap of one of the poisonous plants. If encountered, use a cold compress, calamine lotion, nonprescription hydrocortisone cream, or an antihistamine to ease itching. If the rash is near eyes or covers large parts of the body, seek medical attention at the nearest hospital.

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8. RISK MANAGEMENT PROCESSES

Major activities to be performed are covered in the AHAs (Appendix A to the APP [Appendix D] of the Programmatic UFP-QAPP) (EA 2021). No additional hazards for the work at Truax Field have been identified.

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ATTACHMENT 1

Truax Field

Training Certificates for Key Personnel

(Not Included in this Submittal)