FINAL
Site Inspection Quality Assurance Project Plan Addendum Fort Indiantown Gap, PA

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

May 2019

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Acronyms and Abbreviations

A	Analytical
AASF	Army Aviation Support Facility
ACSIM	Assistant Chief of Staff for Installation Management
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film forming foam
amsl	Above Mean Sea Level
AMIB	Aviation Maintenance Instruction Building
AOI	Area of Interest
APP	Accident Prevention Plan
ARNG	Army National Guard
ASTM	American Standard Test Method
A2LA	American Association for Laboratory Accreditation
bgs	below ground surface
BRAC	Base Realignment and Closure
˚C	Degrees Celsius
CA	Corrective Action
CACTF	Combined Arms Collective Training Facility
CAS	Chemical Abstracts Service
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chain of custody
CPR	Cardiopulmonary resuscitation
CSM	Conceptual site model
DASA ESOH	Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health
DL	Detection limit
DO	Dissolved Oxygen
DoD	Department of Defense
DPT	Direct Push Technology
DQI	Data Quality Indicators
DQO	Data Quality Objective
DUA	Data Usability Assessment
D422	Test Method for Particle Size Analysis
EDD	Electronic data deliverables
ELAP	Environmental Laboratory Accreditation Program
ELLE	Eurofins Lancaster Laboratories Environmental
EPA	Environmental Protection Agency
EQUIS	Environmental Quality Information System
°F	Fahrenheit
FRB	Field Reagent Blank
FTA	Fire Training Area

FTIG	Fort Indiantown Gap
GPS	Global Positioning System
HA	Health Advisory
HAZWOPER	Hazardous waste operations and emergency response
HDPE	High-density polyethylene
IED	Installations & Environment Division, Cleanup Branch
ICAL	Initial Calibration
IDQTF	Intergovernmental Data Quality Task Force
IDW	Investigation Derived Waste
LCMS	Liquid Chromatography/ Mass Spectrometry
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
LFD	Laboratory Fortified Blank
LOD	Limit of Detection
LOQ	Limit of Quantification
MAAF	Muir Army Airfield
MC	Munitions Constituents
MDL	Method Detection Limit
µg/kg	Micrograms Per Kilogram
µS/cm	microSiemens per centimeter
MPC	Measurement Performance Criteria
MS/MSD	Matrix spike/ matrix spike duplicate
NA	Not Applicable
ND	Non-detect
NELAP	National Environmental Laboratory Approval Program
ng/L	Nanograms Per Liter
ORA	Operational Range Assessment
ORP	Oxidative Reduction Potential
PA	Preliminary Assessment
PAARNG	Pennsylvania Army National Guard
PADEP	Pennsylvania Department of Environmental Protection
PADMVA	Pennsylvania Department of Military and Veterans Affairs
PAGS	Pennsylvania Geological Survey
PAL	Project Action Limit
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PFBA	Perfluorobutyrate
PFPeA	Perfluoro-n-pentanoic acid
pH	Potential of hydrogen
PID	Photoionization detector
PM	Project Manager
ppm	Parts per million
PQAPP	Programmatic UFP-QAPP

PSC	Project Screening Criteria
PT	Proficiency Testing
PVC	Poly-vinyl chloride
QA	Quality Assurance
QAM	Quality Assurance Manager
QAPP	Quality Assurance Project Plan
QC	Quality Control
QL	Quantitation Limit
QSM	Quality Systems Manual
RI	Remedial Investigation
RPD	Relative Percent Difference
RSL	Regional Screening Level
S	Sampling
SDG	Sample Delivery Group
SI	Site Inspection
SOP	Standard operating procedure
SPE	Solid Phase Extraction
SRM	Standard Reference Material
SSHP	Site Safety and Health Plan
S2bVEM	Stage 2b Validation, Electronic and Manual
S2bVM	Stage 2b Validation, Manual
TCRA	Time Critical Removal Action
TO	Task Order
TOC	Total Organic Carbon
TPP	Technical Project Planning
TSA	Technical System Audits
UFP	Uniform Federal Policy
U.S.	United States
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WWTP	Waste Water Treatment Plant
WI11514	Test Method for Particle Size Analysis

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1. Introduction

1.1 Project Authorization

This is the Installation-Specific Addendum to the Army National Guard (ARNG) Site Inspection (SI) Programmatic Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP). This SI UFP-QAPP Addendum addresses specific SI activities to be completed at Fort Indiantown Gap (FTIG), Annville, Pennsylvania.

Programmatically, the ARNG is assessing the potential environmental impacts primarily from aqueous film forming foam (AFFF) and similar chemical releases suspected at their properties under a task order titled *Preliminary Assessments and Site Inspections (PA/SI) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites, ARNG Installations, Nationwide*. Each SI will assess potential impacts to human health and the environment related to processes that used per- and polyfluoroalkyl substances (PFAS) (e.g., metal plating and water proofing) and adjacent off-site businesses or operations (not under the control of ARNG) that could potentially be responsible for a PFAS release. This project is being executed by AECOM Technical Services, Inc. (AECOM) under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017, and Modification 01 issued 30 September 2017 by the United States (U.S.) Army Corps of Engineers (USACE) Baltimore District on behalf of the ARNG-Installations & Environment Division, Cleanup Branch (IED).

The SI project elements will be performed in compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300), and in compliance with USACE requirements and guidance for field investigations including specific requirements for sampling for PFOA and PFOS, and the group of related compounds known in the industry as PFAS. The term PFAS will be used throughout this plan to encompass all PFAS chemicals being evaluated, including PFOS and PFOA, which are the key components of AFFF, and the other 16 related compounds listed in the task order. This UFP-QAPP Addendum focuses on the SI phase of work specific to FTIG.

1.2 SI Purpose

The main purpose of this SI effort is to determine the presence or absence of PFAS contamination at ARNG facilities and assess whether or not a complete pathway exists between the source and potential receptors.

As stated in the *Federal Facilities Remedial Site Inspection Summary Guide* (United States Environmental Protection Agency [USEPA] 2005), an SI has four goals:

1) Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
2) Determine the potential need for a removal action (i.e., time critical removal action [TCRA]).
3) Collect or develop data to evaluate the release.
4) Collect additional data to develop the conceptual site model in preparation for an effective Remedial Investigation (RI).

In addition to the USEPA identified goals of an SI, the ARNG SI effort will also aim to identify potential off-facility sources.

1.3 QAPP Addendum Organization

Elements of every ARNG PFAS SI are addressed in the SI Programmatic UFP-QAPP (PQAPP) (AECOM 2018a). The PQAPP is comprehensive and is consistent with the USEPA's intent that the UFP-QAPP be the primary planning document for an entire project (Intergovernmental Data Quality Task Force [IDQTF] 2005a-c). This QAPP Addendum, in combination with the PQAPP elements, meets the requirements set forth in the UFP for QAPPs (IDQTF 2005a-c) and USEPA Requirements for Quality Assurance Project Plans (USEPA, 2001).

This QAPP Addendum was prepared to include the detailed information specific to the FTIG SI. For ease of review, material from the PQAPP is included in this deliverable alongside the FTIG-specific worksheets. **Table 1-1** below describes the components that are covered under the PQAPP and those that are covered under this UFP-QAPP Addendum:

Table 1-1: Comparison of PQAPP to QAPP Addendum

QAPP Addendum Worksheets	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- Technical Project Planning Session Summary	**Site-Specific**
Worksheet #10- Conceptual Site Model	**Site-Specific**
Worksheet #11- Project/ Data Quality Objectives	**Site-Specific**
Worksheet #12- Measuring Performance Criteria	**Programmatic**
Worksheet #13- Secondary Data Uses and Limitations	**Programmatic**
Worksheets #14 and #16- Project Tasks and Schedule	**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 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 Quality Control and Corrective Actions	**Programmatic**

QAPP Addendum Worksheets	Applicable Document
Worksheet #29- Project Documents and Records	**Programmatic**
Worksheets #31, #32 and #33- Assessments and Corrective Action	**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	**Programmatic**

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QAPP Worksheets #1 & #2: Title and Approval Page and QAPP Identifying Information

Site Name/Project Name: Army National Guard / MAES Delivery Order 00014/ Preliminary Assessments (PA) and Site Inspections (SI) for Perfluorooctane-Sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites, ARNG Installations, Nationwide

Installation: FTIG, Annville, Pennsylvania

Contract Work Assignment Number: USACE Contract No. W912DR-12-D-0014; Delivery Order No. W912DR17F0192

Relevant Plans and Reports from Previous Investigations: Relevant plans and reports from previous investigations are identified in the references cited in the introductory text that precedes these worksheets and in subsequent worksheets, as appropriate.

Gwinn, Rosa — Digitally signed by Gwinn, Rosa DN: cn=Gwinn, Rosa, ou=USGRM2 Date: 2019.05.29 12:54:25 -04'00'

Investigative Organization Project Manager — Signature / Date
Printed Name / Organization — Rosa Gwinn / AECOM Project Manager

Gettier, Sarah — Digitally signed by Gettier, Sarah Date: 2019.05.29 14:02:22 -04'00'

Investigative Organization Quality Manager — Signature / Date
Printed Name / Organization — Sarah Gettier / AECOM Project Quality Manager

HESS.PAMELA.SUE.1146563313 — Digitally signed by HESS.PAMELA.SUE.1146563313 Date: 2019.06.05 12:03:27 -04'00'

Army National Guard — Signature / Date
Printed Name / Organization — CPT Pam Hess / ARNG Program Manager

Dreama R O'Neal 6 June 2019

Pennsylvania Army National Guard — Signature / Date
Printed Name / Organization — Dreama O'Neal / Acting Environmental Section Chief

PECK.TIMOTHY.JOSEPH.1252325553 — Digitally signed by PECK.TIMOTHY.JOSEPH.1252325553 Date: 2019.06.26 09:08:33 -04'00'

Contract Organization Project Manager — Signature / Date
Printed Name / Organization — Timothy Peck / USACE, Baltimore District

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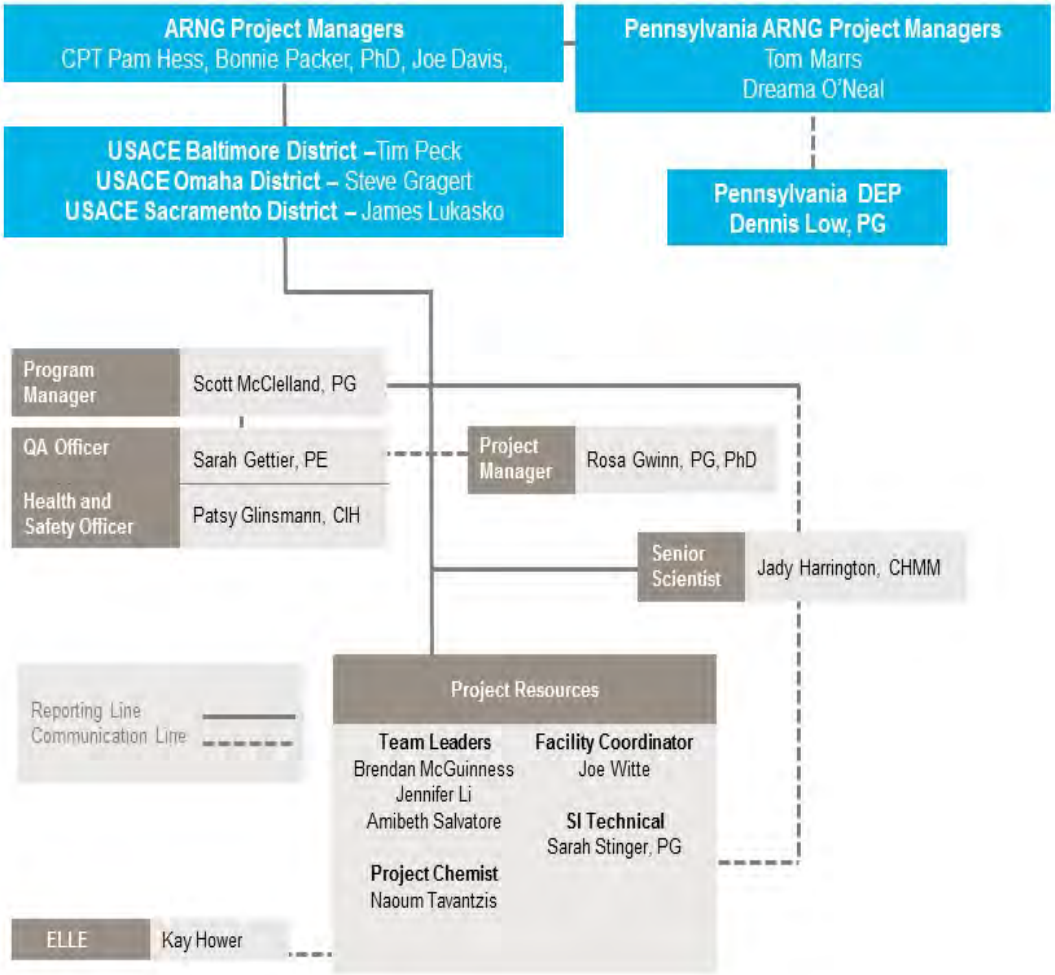
QAPP Worksheets #3 & #5: Project Organization and QAPP Distribution

The organization chart in **Figure WS #3/5-1** identifies key project personnel, as well as lines of authority and lines of communication among the ARNG, USACE, and prime contractor (AECOM). The QAPP will be distributed to all parties noted in the figure below. This organization chart is consistent with the PQAPP with the exception of the state ARNG and regulatory personnel.

Figure WS #3/5-1 Project Organizational Chart



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

This worksheet contains a list of the key project personnel who are identified as performing the tasks that are defined in this QAPP Addendum for FTIG and includes the personnel's organization, project role, education/experience, and specialized training/certifications. The personnel have signed and dated the worksheet to signify that they agree with the information in this QAPP and agree to implement it.

Name	Organization	Project Role	Education/Experience	Specialized Training / Certifications	Signature/Date
Scott McClelland, PG	Prime Contractor (AECOM)	Program Manager	Education: BA, Geology MS, Geology Experience. 30 years; executing and managing environmental investigation and remediation projects including program management of USACE Baltimore contracts.	Professional Geologist, KY AECOM Certified PM	
Rosa Gwinn, PG, PhD	AECOM	Project Manager	Education: BA, Geology MS, Geology PhD, Geology Experience: 33 years; managed 4 ORA Phase II TOs of similar scope, complexity, and duration for USACE and ARNG; experience with PFAS investigations.	Professional Geologist, WA, UT AECOM Certified PM 40hr HAZWOPER OSHA 8hr Refresher	
Jady Harrington, CHMM	AECOM	Senior Scientist	Education: BA, Biology Experience: 27 years; served as senior scientist for ORA Phase II TOs; MMRP RIs, experience with PFAS investigations.	CHMM AECOM Certified PM 40hr HAZWOPER OSHA 8hr Refresher 8hr OSHA Supervisor First Aid/CPR	

Name	Organization	Project Role	Education/Experience	Specialized Training / Certifications	Signature/Date
Sarah Gettier, PE	AECOM	QC Officer	Education: BS, Civil Engineering MS, Environmental / Environmental Health Engineering Experience: 15+ years direct experience developing QAPPs and other environmental planning documents	40hr HAZWOPER OSHA 8hr Refresher 8hr OSHA Supervisor First Aid/CPR	
Patsy Glinsmann, CIH	AECOM	Health and Safety Officer	Education: BS, Chemistry MS, Environmental Biology MHS, Occupational Safety and Health Experience: 25+ years; occupational health and safety.	Certified Industrial Hygienist	
Brendan McGuinness, PG	AECOM	SI Team Leader (FTIG SI Task Manager)	Education: BS, Geoscience Experience: 29+ years of environmental assessment and remediation experience including PFAS investigations for DoD clients.	Professional Geologist, TN AECOM Certified PM 40hr HAZWOPER OSHA 8hr Refresher First Aid/ CPR	
Robert Kennedy	AECOM	Senior Chemist	Education: BA, Chemistry Experience: 27 years; served as senior scientist for ORA Phase II TOs; experience with PFAS investigations.	Auditing/Data Review training	
Naoum Tavantzis	AECOM	Project Chemist	Education: BA, Environmental Science Masters of Business Administration Experience: 9+ years; project chemist for ORA Phase II TOs; PFAS investigations, data validation, laboratory coordination.	40hr HAZWOPER OSHA 8hr Refresher OSHA Supervisor training	
Michael Stankevich	AECOM	GIS Specialist	Education: BA, Geography – Environmental Track Experience: 9+ years; completed SDSFIE submittals for multiple ARNG installations		

Name	Organization	Project Role	Education/Experience	Specialized Training / Certifications	Signature/Date
Gretchen Welshofer	AECOM	Regulatory Specialist	Education: BA, Communication MS, Environmental Science Experience: 17+ years; performing human health risk assessments; expertise in evaluating potential risks and hazards to human health posed by MC emanating from small arms and large caliber ranges; expertise in evaluating contaminant fate and transport for validity of exposure pathways.		
Sarah Stinger, PG	AECOM	Technical/ Quality	Education: BS, Geology MS, Geology Experience: 33 years; performing CERCLA investigations; served as task leader and in QA role for ORA Phase II TOs at multiple ARNG installations.	Professional Geologist, VA, PA, LA AECOM Certified PM 40hr HAZWOPER OSHA 8hr Refresher	
Joe Witte	AECOM	Project Coordinator	Education: BS, Environmental Science and Policy Experience: 4+ years with 2 years direct experience working on ARNG and Army investigations under MMRP and ORA and developing QAPPs.	40hr HAZWOPER OSHA 8hr Refresher First Aid/CPR	
Kay Hower	Eurofins Lancaster Laboratories Environmental (ELLE)	Laboratory Project Manager	Education: BS, Animal Science Experience: 25 years		
Dorothy Love	ELLE	Laboratory Quality Assurance Director	Education: BS, Environmental Health Experience: 30 years		

Notes:
AECOM = AECOM Technical Services, Inc.
BA = Bachelor of Arts
BS = Bachelor of Science
CERCLA= Comprehensive Environmental Response, Compensation, and Liability Act
CHMM = Certified Hazardous Materials Manager
CIH = Certified Industrial Hygienist
PG = Professional Geologist
PhD = Doctor of Philosophy
PM = Project Manager
QAPP = Quality Assurance Project Plan
QC = quality control
RI = Remedial Investigation

CPR = cardiopulmonary resuscitation
DoD = Department of Defense
ELLE= Eurofins Lancaster Laboratories Environmental
FTIG = Fort Indiantown Gap
HAZWOPER = Hazardous Waste Operations and Emergency Response
hr = hour
KY = Kentucky
LA = Louisiana
ORA= Operational Range Assessments
MC = munitions constituents
MMRP = Military Munitions Response Program
MS = Master of Science
MO = Missouri
OSHA = Occupational Safety and Health Administration
PA = Pennsylvania
PE = Professional Engineer
PFAS = Per- and polyfluoroalkyl substances
SI = Site Inspection
TO = Task Order
USACE = United States Army Corps of Engineers
WA = Washington

QAPP Worksheet #6: Communication Pathways

Worksheet #6 documents the issues (communication drivers) that trigger the need to communicate with other project personnel or stakeholders. Its purpose is to ensure there are procedures in place for providing the appropriate notifications and generating the appropriate documentation when handling important communications, including those involving regulatory interfaces, unexpected events, emergencies, non-conformances, and stop-work orders.

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathway, Documentation)
Program Manager decisions and modification	USACE, Baltimore District Project Manager	Tim Peck	410-962-3416 timothy.j.peck@usace.army.mil	Initiate award of work and options. Track project progress through monthly reporting and daily field reporting. Stop work for quality or performance concerns.
	USACE, Omaha District, Project Manager	Steve Gragert	402-995-274353 steve.p.gragert@usace.army.mil	
	USACE, Sacramento District, Project Manager	James Lukasko	916-557-5392 james.j.lukasko@usace.army.mil	
ARNG Programmatic Management	ARNG	Captain Pamela Hess	703-601-6818 pamela.s.hess.mill@mail.mil	Communicate programmatic decisions and project implementation with USACE, Baltimore Project Manager and AECOM Project Manager.
		Bonnie Packer	703-607-7977 bonnie.m.packer.ctr@mail.mil	
Installation interface	PAARNG	Dreama O'Neal	717-861-2339 droneal@pa.gov	Communicate project scope/schedule and coordinate logistics between project team and installation personnel on an as-needed basis, documented via phone records and emails.
		Thomas Marrs	717-861-9414 tmarrs@pa.gov	

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathway, Documentation)
Regulatory agency interface (Pennsylvania Department of Environmental Protection)		John D. Fronko	717-861-8250 jfronko@pa.gov	Communicate technical approaches and decisions directly to regulatory agencies' representative(s) on an as-needed basis, documented via phone records and emails.
Community/ media interface				Communicate information directly to communities or media on an as-needed basis.
Manage all project phases Field progress reports Field modifications/QAPP changes	AECOM Project Manager (PM)	Rosa Gwinn	301-820-3131 rosa.gwinn@aecom.com	All materials and information about the project will be forwarded from the AECOM PM to ARNG/ USACE. Any field or laboratory changes will be coordinated with Steve Gragert (USACE), Bonnie Packer (ARNG), and Dreama O'Neal (PAARNG). The AECOM PM will obtain ARNG/ USACE approval/ concurrence for field modifications/QAPP changes as necessary. All approved modifications will be included in QAPP revisions (prior to field work) or non-conformance report(s) (during field work), and resolution / corrective action identified.
	AECOM SI Task Manager	Brendan McGuinness	703-682-1564 Brendan.mcguinness@aecom.com	Support AECOM PM in implementing SI tasks/procedures.
	AECOM QC Officer	Sarah Gettier		Oversees/conducts quality audits to assure field program performed in accordance with approved protocols. Supports AECOM PM, Technical Task Manager and Team Leaders to assure quality reviews are completed on project deliverables, including consistency and conformance with applicable regulatory and DoD guidance and with industry practices. Works with Project Chemist to resolve performance problems with contracted analytical laboratory.
Analytical laboratory modifications and performance problems	AECOM Project Chemist / Data Validator	Naoum Tavantzis	301-267-8761 naoum.tavantzis@aecom.com	Notify AECOM PM and QC Officer in a timely manner of performance problems encountered by the contracted analytical laboratory. PM will secure approval for modifications to the QAPP as necessary from ARNG/ USACE. All approved modifications will be included in non-conformance Reports.

Communication Driver	Organization	Name	Contact Information	Procedure (Timing, Pathway, Documentation)
Data verification issues (e.g., incomplete records) and data validation issues (e.g., non-compliance with procedures)				Verify/validate all analytical chemistry sample results from analytical laboratories with criteria developed in this QAPP and deliver to the PM and the Project QA Managers.
Data review corrective actions				Notify Laboratory PMs to identify resolution/corrective actions.
Sample receipt variances	Eurofins Lancaster Laboratories Environmental (ELLE)	Kay Hower	717-556-7364 KayHower@eurofinsus.com	Report all project non-conformances and problems to the AECOM Project Chemist.
Laboratory QC variances				Report all project non-conformances and problems to the AECOM Project Chemist.
Analytical corrective actions				Report all project non-conformances and problems to the AECOM Project Chemist.
Laboratory modifications and performance problems				Report all project non-conformances and problems to the ELLE PM. ELLE PM will report to AECOM Project Chemist.

Notes:
AECOM = AECOM Technical Services, Inc.
ARNG = Army National Guard
DoD = Department of Defense
ELLE = Eurofins Lancaster Laboratories Environmental
PAARNG = Pennsylvania Army National Guard
PM = project manager
QA = quality assurance
QAPP = Quality Assurance Project Plan
QC= Quality Control
SI = Site Inspection
USACE = United States Army Corps of Engineers

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QAPP Worksheet #9: Technical Project Planning Session Summary

This worksheet serves as a record of future Technical Project Planning (TPP) sessions. The intent is to provide a concise record of participants, key decisions or agreements reached, and action items. Minutes will be approved by all participants prior to being implemented into the QAPP.

AECOM will implement the TPP process as listed in EM 200-1-2 (USACE, 2016) including facility meetings in a professional and organized manner to obtain consensus on specific Data Quality Objectives (DQOs) for SI work. Three meetings will be held (in person and/ or teleconference) per the Performance Work Statement as described below:

- TPP Meeting 1 - Discuss DQOs (pre-work plan) and Conceptual Site Model (CSM)
- TPP Meeting 2 - Finalize work plan technical approach
- TPP Meeting 3 - Verify all data gaps have been filled and finalize SI Report

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QAPP Worksheet #10: Conceptual Site Model

The information presented in this section was gathered during the PA at FTIG. The PA process included the following tasks:

- Reviewed data resources to obtain information relevant to suspected PFAS releases
- Conducted a 2-day site visit on 13 and 14 December 2017
- Interviewed current and retired FTIG personnel during the site visit including Pennsylvania ARNG (PAARNG) environmental managers, the current PAARNG Fire Department Chief and PAARNG Assistant Chief, purchasing staff, Sustainable Range Program staff, and Muir Army Airfield (MAAF) hangar maintenance, safety, and operations staff
- Completed visual survey inspections at known or suspected PFAS release locations and documented with photographs
- Developed a CSM to outline the potential release and pathway of PFAS for the Areas of Interest (AOIs) and the facility

The findings of the PA as well as the CSM developed as part of the PA process are summarized in this worksheet. Additional details about FTIG can be found in the PA Report (AECOM, 2018b).

Facility Location and Description

FTIG is located in Lebanon and Dauphin Counties in south central Pennsylvania near Annville, approximately 26 miles northeast of Harrisburg (**Figure 10-1**). FTIG is an active National Guard Training Center and serves as headquarters for the Pennsylvania Department of Military and Veterans Affairs (PADMVA) and the PAARNG.

FTIG was originally developed by the Commonwealth of Pennsylvania as a military training facility in 1931 with annual training maneuvers starting in 1933. The land surrounding FTIG was gradually acquired from local farmers, with the exception of 17 privately-owned properties or “in-holdings” that were not purchased during the acquisition. In 1941, the Federal Government began leasing the property from the Commonwealth of Pennsylvania and used it as a training site for armored and infantry divisions.

In July 1995, the Base Realignment and Closure (BRAC) Commission recommended closing FTIG, except for minimum essential ranges, facilities, and training areas used by reserve components. The Commonwealth of Pennsylvania assumed control of the land from the Federal Government in 1998 and converted it back to a training site for ARNG and U.S. Army Reserve units. This arrangement transferred the management of FTIG to the PADMVA, the agency responsible for overseeing the operations of both the PAARNG and the Pennsylvania Air National Guard. Currently, separate leases for the U.S. Army (1990 to 2049) and the Air Force (1989 to 2049) exist.

The total facility is currently in excess of 18,000 acres and comprises a cantonment area, which includes the MAAF, heavy and light vehicle maintenance, army helicopter training and maintenance, bombing and strafing ranges, small arms ranges, and maneuver training.

Facility Environmental Setting

FTIG is located within the Appalachian Plateau at the junction of two sections of the Valley and Ridge Physiographic Province: the Appalachian Mountain Section and the Great Valley Section (Ogden, 2001a). The training corridor lies between Blue and Second Mountains within the Appalachian Mountain Section, while the cantonment area and the small arms ranges lie to the south in the Great Valley Section. The Appalachian Mountain Section is composed of ridges and valleys. The mountain ridges reach elevations of 1,200 to 1,440 feet above mean sea level (amsl).

The valley between Blue and Second mountains is approximately 600 to 700 feet amsl, and the cantonment area lies at 400 to 500 feet amsl.

Geology

The valley and ridge topography at FTIG is characteristic of folding and faulting of Paleozoic sedimentary rocks. The facility is underlain by an arm of one of the folds, resulting in a sequence of rock that becomes progressively younger from southeast (in the cantonment area) to northwest (in the training corridor) (Berg et al. 1980).

The cantonment area is primarily underlain by shale and siltstone of the Hamburg and Martinsburg sequences. The Tuscarora Formation quartzite and quartzitic sandstone forms the Blue Mountain ridgeline, while shales of the Clinton Group, Bloomsburg Formation, and Hamilton Group form the northern slope. The valley between Blue and Second Mountains is formed by the siltstones and mudstones of the Trimmers Rock Formation and the Irish Valley and Sherman Creek members of the Catskill Formation. The backbone of Second Mountain is supported by the sandstones in the Catskill Formation (the Clarks Ferry and Duncannon members) as well as the Spechty Kopf Formation and the Pocono Formation.

Bedrock is typically found within six feet of the ground surface, although it is often shallower (AMEC, 2006). Some of the bedrock units at the facility reportedly contain thin interbeds of limestone and other calcareous components (Greyer et al. 1958; Royer 1983); however, no karst features have been identified in the vicinity of FTIG.

Hydrogeology

Structural deformation has extensively impacted the bedrock formations in the FTIG area. The shale and sandstone bedrock formations have low permeability; therefore, the secondary permeability resulting from faulting and fracturing provide the conduit for groundwater infiltration and migration through these units (Ogden, 2001a). Productive aquifers are found in both the carbonate and sandstone formations, as evidenced by the number of public and private groundwater wells located near the southern facility boundary (Pennsylvania Geological Survey [PAGS], 2006) (**Figure 10-2**). The most productive aquifers are formed primarily in the carbonate rocks of the Martinsburg and Hamburg formations. However, there are a number of wells located to the northeast and southwest of the facility that are installed in the siltstone and mudstone units, which form the valley between Blue and Second Mountains. The average depth of drinking water wells in Lebanon and Dauphin counties ranges from 165 to 170 feet, with most wells installed at a depth of less than 200 feet (PADMVA, 2002).

The U.S. Geological Survey (USGS) has developed a highly generalized conceptual groundwater model based on several assumptions for the facility (USGS, 2010) that indicates shallow groundwater flow is in the direction of adjacent surface water bodies. Streams throughout the facility are gaining, even during dry periods, indicating there is a high degree of interaction between shallow groundwater and surface water over much of FTIG. Within the training corridor, topography and site conditions appear to also favor localized shallow groundwater flow with discharge to adjacent streams rather than a significant portion of recharge reaching the deeper groundwater flow system. However, due to the fractured nature of bedrock at FTIG, a fraction of infiltrating water may enter a deeper groundwater flow system, bypass the perennial streams, and continue underground.

Hydrology

Surface water resources at FTIG include streams, open water features, and wetlands (PADMVA 2016). All streams originate on Post property and are perennial, with the exception of the upper reaches of some smaller tributaries. Two named springs exist on FTIG: Russian Spring, located south of Blue Mountain, flows into Qureg Run and St. Joseph Spring, located north of Blue Mountain, flows into Indiantown Run. Several small, unnamed springs also exist, mostly on steep mountainsides. In addition, there are a total of 288 acres of wetlands within the boundaries of FTIG (PADMVA, 2002).

There are no natural ponds or lakes on-Post; however, there are two manmade lakes located on the non-operational, cantonment area of the facility. Marquette Lake is a 15-acre surface water impoundment of Indiantown Run located in the south-central portion of the facility, within the cantonment area. Shuey Lake, a 5.5-acre impoundment of Qureg Run, is located near the southeastern facility boundary.

Another surface water impoundment exists along Indiantown Run, Memorial Lake, located downstream from Marquette Lake. This 80-acre lake is contained within the 230-acre Memorial Lake State Park, an inholding at FTIG, and is adjacent to the southern post boundary (PADMVA, 2002). Memorial Lake is classified as a Warmwater Fishery by the State of Pennsylvania, and the portion of Indiantown Run from and including St. Joseph Springs to Memorial Lake is open for public fishing. Trout in Memorial Lake are raised from Pennsylvania Fish and Boat Commission provided fingerlings; therefore, they must be made available to the public upon release and any stocked water must be publicly fishable to return the commonwealth's investment. Shuey and Marquette Lakes are also stocked annually. There is no public boating on facility waters, but the FTIG Fish and Game Conservation Club is allowed to use some small un-motorized rowboats on Marquette Lake (PADMVA, 2016).

FTIG is located within the Susquehanna River and Swatara Creek drainage basins and is drained by the watersheds of Manada Creek, Bow Creek, Reeds Creek, and Swatara Creek (Ogden, 2001b). Approximately 6.5 stream miles of Manada Creek lie within FTIG boundaries and drain the western portion of the Post. Approximately 6 stream miles of Indiantown Run drain the central portion of FTIG, emptying first into Marquette Lake before flowing further downstream into Memorial Lake. After flowing from Memorial Lake, Indiantown Run is joined by 2 stream miles of Vesle Run, which drains the western edge of the cantonment area. Indiantown Run and Vesle Run drain the Bow Creek watershed. After Vesle Run joins, Indiantown Run flows approximately one mile before its confluence with Swatara Creek. Approximately 2 stream miles of Aires Run and Qureg Run drain the eastern portion of FTIG within the Reeds Run watershed, including most of the cantonment area. After they converge the stream continues 0.5 mile as Qureg Run to the FTIG boundary. Qureg Run confluences with Reeds Creek off-Post before joining Swatara Creek approximately 2 miles downstream. Unnamed tributaries of Trout Run and Forge Creek, each less than 0.5 mile long, drain small parcels of land at FTIG's easternmost boundaries. The entirety of FTIG drains into Swatara Creek, and a portion of Swatara Creek has been designated by the State of Pennsylvania as a Warmwater Fishery stream (AMEC, 2006).

FTIG obtains water from the City of Lebanon, although some wells exist on-Post as water supply points for small inaccesable structures. In 2017, six drinking water sources at FTIG were tested for PFAS, and all PFAS results were less than the USEPA Health Advisory (HA) of 70 parts per trillion. Lebanon Water Company serves approximately 57,000 customers, including FTIG, and draws water from Swatara Creek, downstream of Forge Creek (Ogden, 2001b). The Pennsylvania American Water Company also maintains a surface water intake located at the confluence of Swatara Creek and Manada Creek, approximately 10 miles downstream of the facility. Surface water features are presented on **Figure 10-3** and **Figure 10-4**.

Climate

The climate in the area where FTIG is located is moderate, with an average temperature of 53 degrees Fahrenheit (°F). Seasonally, temperatures vary from summer highs of 84.5 °F to winter lows of 21 °F (World Climate, 2018). Precipitation is relatively evenly distributed throughout the year, with an average of 42 inches of rain and 35 inches of snow. The prevailing wind is typically from the west at eight miles per hour, but topography influences the wind conditions (Ogden, 2000).

Current and Future Land Use

FTIG is an open facility with public roads; however, ranges have controlled access for safety reasons. As previously stated, 17 privately held residential properties exist within the facility boundary, some of which have private drinking water wells (**Figure 10-2**). Based on a 25-year development strategy, the FTIG Master Plan includes a comprehensive implementation plan to meet developing facility and training program needs in alignment with inevitable mission changes and growth. New facilities to house several additional Unmanned Aerial Systems platoons with expanded runways for the ARNG are being planned (PADMVA, 2016).

The southern, eastern, and western boundaries of FTIG are abutted by primarily conservation, rural residential, and agricultural land uses. The lands directly to the north of the facility are owned and operated by the Pennsylvania Game Commission and used for public recreation. Future land use around the facility is projected to remain conservation, rural residential, and agricultural with some parcels becoming commercial and industrial. A light, industrial park is located to the east of the facility in Union Township. The closest urban environments are located approximately 13 miles from the facility in Hershey to the southwest and Lebanon to the southeast, and the closest major city is Harrisburg, 26 miles to the southwest (PADMVA, 2016).

Summary of Potential Source Areas

The potential source areas identified in the PA (AECOM, 2018b) including Fire Training Areas (FTAs), non- FTAs, and Emergency Response Areas are described below.

Fire Training Areas

Five FTAs were identified at FTIG during the PA. These locations are presented on **Figure 10-5**.

Combined Arms Collective Training Facility

The Combined Arms Collective Training Facility (CACTF) is located northeast of the intersection of Cold Springs Road and Tomstown Road in the north-central portion of FTIG (**Figure 10-5**). The CACTF is in the training corridor, and access to the area is only with permission from Range Control. The geographic coordinates are 40°27'11.2"N and 76°37'21.2"W.

The CACTF is an active, 1-square-kilometer replicated urban environment with an assortment of mock facilities and buildings including residences, office buildings, church, gas station, store, streets, and sidewalks. The CACTF was constructed in 2009 and training exercises began in 2010. Range Facility Management Support System documents fire training activities at the CACTF by the PAARNG Fire Department in 2010, 2012, 2013, 2015, and 2016. According to the current PAARNG Assistant Fire Chief, water only was used during fire training activities at this location with the exception of the 2012 training event, described below.

In November 2012, AFFF was discharged by the PAARNG during fire training activities at the mock gas station in the southeast corner of the CACTF. AFFF fire training activities were conducted by the PAARNG on 18, 19, 26, and 29 November 2012, and, in total, involved the discharge of approximately 20 gallons of 3 percent AFFF concentrate. On the last day of the training event, AFFF accumulated at the mock gas station and breached the storm drain and sewer outlets, which outfall to an earthen, bermed retention pond on the southeast corner of the

CACTF lot. According to the current PAARNG Fire Chief and PAARNG Assistant Fire Chief, this location was used only once for AFFF training activities by the PAARNG. No remediation activities have occurred at this location.

Johnson Trail

The Johnson Trail FTA is located on the east side of Johnson Trail, to the south of Hartranft Road and just north of the wood chip area at the crest in the road (**Figure 10-5**). The geographic coordinates are 40°26'22.2"N and 76°33'35.1"W.

The Johnson Trail FTA is an earthen, bermed stockpile area for soil originating from projects at the FTIG facility. AFFF fire training activities were conducted by the PAARNG Fire Department on 30 and 31 March, and 1 and 6 April, in 2015. In total, the training involved the discharge of approximately 20 gallons of 1 percent AFFF concentrate, created by diluting 3 percent AFFF concentrate. According to the current PAARNG Fire Chief and PAARNG Assistant Fire Chief, this location was used only once for AFFF training activities by the PAARNG. No remediation activities have occurred at this location.

Fire Pit Area #19

Fire Pit Area #19 is located on the west side of First Street, north of B Street, but south of C Street (**Figure 10-5**). The geographic coordinates are 40°26'21.7"N and 76°33'08.7"W.

According to the BRAC 1997 Environmental Baseline Survey Report (Woodward-Clyde, 1997), Fire Pit Area #19 was constructed in 1975 by excavating an area 40 feet in diameter to a depth of approximately 1.5 feet and constructing a 1-foot high earthen berm around the perimeter of the pit. The fire pit was then lined with fire brick. The PAARNG Fire Department conducted coordinated fire training exercises with the U.S. Army Fire Department on an average of twice annually at this location from 1975 to 1986. According to the former PAARNG Fire Chief, fuel was ignited and the fire was extinguished with AFFF by both the PAARNG and the U.S. Army during these training exercises. No information was available on the concentration or amount of AFFF used during the training; however, approximately 3,000 gallons per year of used petroleum, oil, and lubricants generated in the Army Aviation Support Facility (AASF) were burned in the fire training pit.

The fire training pit was closed in 1990 and a limited SI was conducted. The results of the SI defined an area of soil contaminated with petroleum hydrocarbons (Weston, 1992). The PAARNG excavated the petroleum hydrocarbon-contaminated soil and disposed of it an unknown location (Woodward-Clyde, 1997). In 2003, a site specific remedial investigation was completed at Fire Pit Area #19, which identified volatile organic compound and semivolatile organic compound contamination below the non-residential statewide health standard and the site-specific standard. The Pennsylvania Department of Environmental Protection issued a Relief of Liability letter, dated 27 May, 2003, to the PAARNG. The Medical Battalion Training Site was constructed at this location in 2007.

Ramp Fire Pit Training Areas

During an interview with the former PAARNG Fire Chief, two additional fire pit training areas, reportedly used for coordinated exercises with the PAARNG and U.S. Army Fire Departments, were identified on either side of the MAAF ramp (**Figure 10-5**; east end and west end).

One fire training pit was located at the east end of the MAAF ramp (**Figure 10-5**). The geographic coordinates are 40°26'21.6"N and 76°33'58.1"W. At this location, a rotary-winged aircraft was ignited at least once annually from the late 1980s to the early 1990s using jet fuel and solvents and then extinguished with AFFF by the PAARNG and the U.S. Army Fire Departments. The area is currently a paved parking lot adjacent to the nearby Brigade Armory built in 1995. The terrain was once level with the MAAF, but the area was excavated and lowered with an embankment

during construction of the Brigade Armory parking lot. The soil from the excavation of the area may possibly still be on-Post; however, the exact fate of the soil could not be determined during the site visit.

A second fire training pit was located at the west end of the MAAF ramp (**Figure 10-5**). The geographic coordinates are 40°26'09.5"N and 76°34'27.5"W. At this location, a rotary-winged aircraft was ignited using jet fuel during a one-time event in the early 1990s and then extinguished with AFFF by the PAARNG and the U.S. Army Fire Departments. This area is collocated with the newly constructed Building 019-177 (EAATS hangar). The soil from the fire training pit location was scraped and hauled away prior to construction of Building 019-177. No information was available on the final disposition location of the excavated soil.

First Street

The First Street FTA is located to the east of First Street between East Tank Trail and Range Road (**Figure 10-5**). The geographic coordinates are 40°26'39.1"N and 76°33'08.6"W.

The First Street FTA consists of an open field with a rotary-winged aircraft encompassed by a circular drive. According to the current PAARNG Fire Chief and PAARNG Assistant Fire Chief, this area was used once for a fire training activity in March 2014, during which approximately 20 gallons of 3 percent AFFF concentrate was dispensed by the PAARNG. No remediation activities have occurred at this location.

Non-Fire Training Areas

Five non-FTAs were identified at FTIG during the PA. These locations are presented on **Figure 10-6**.

Building 019-101

Building 019-101 is the AASF hangar on the MAAF (**Figure 10-6**) and is operated by the PAARNG. The MAAF is bordered on the north by Range Road, on the east by Johnson Trail, on the south by Fisher Avenue, and on the west by Utility Road. The geographic coordinates are 40°26'18.0"N and 76°34'10.6"W.

Building 019-101 was constructed in 1973 and began operation in 1974. In 1988, the building was retrofitted with an AFFF fire suppression system, which is supplied by two 1,000-gallon tanks of 3 percent AFFF concentrate. Following installation, the west end of the hangar was separated from the east end by a temporary curtain and filled with AFFF to test the system. Once the test was complete, the majority of the AFFF was squeegeed out of the west end of the hangar and onto the MAAF ramp by the PAARNG and allowed to dissipate. A small amount of foam was contained in the hangar trench drain that flows to an oil-water separator and then to the Waste Water Treatment Plant. The former PAARNG Fire Chief and Air Traffic Control Tower Chief recall the foam persisting outdoors on the MAAF ramp and adjacent grass for about two days.

The former PAARNG Fire Chief also indicated that from 1988 until 2011, occasional, false alarms caused the fire suppression system to dispense approximately 5 to 10 gallons of AFFF per incident in the hangar. Per the facility maintenance manager, sensor interactions between a beam within the holding tank, temperature systems, and heat were the causes of the false alarms. These false alarm releases occurred approximately 20 times, most recently in 2011. Each time AFFF was dispensed during a false alarm, the pipes of Building 019-101 were flushed and the foam was squeegeed out on to the ramp, washed into the adjacent grass, and allowed to dissipate outdoors. In 2015, the AASF underwent an upgrade to retrofit the building with new sensors, lasers, and pipe liners. The existing AFFF was drained from the fire suppression system by Vector Fire Technology and disposed by Cycle Chem, Inc. at Modern Landfill in York, PA. There have been no accidental releases of AFFF since the building was retrofitted in 2015.

Building 019-101 Ramp

The Building 019-101 ramp lies between Building 019-101 and the runway and serves as an area for rotary-winged aircraft pre-flight activities (**Figure 10-6**). The geographic coordinates are 40°26'13.7"N and 76°34'08.8"W.

According to the former PAARNG Fire Chief, the ramp was "washed" repeatedly from approximately 1974 until 2011 with 3 percent AFFF concentrate by the PAARNG because AFFF acted as a detergent for spilled fuels. In addition, 3 percent AFFF concentrate that was dispensed intentionally or accidentally from the Building 019-101 hangar was squeegeed out of the hangar and onto the ramp. No remediation activities have occurred at this location.

The Air Traffic Control Tower Chief also recalled a potential PFAS release in the slingload area which is just north of the ramp and Building 019-135. No other interviewees recalled this potential PFAS release event. The geographic coordinates are 40°26'20.7"N and 76°34'06.9"W.

Former Crash Rescue Fire Station

The former Crash Rescue Fire Station was located on the MAAF immediately east of the air traffic control tower (**Figure 10-6**). The geographic coordinates are 40°26'17.3"N and 76°34'08.5"W.

The PAARNG Fire Department operated the former Crash Rescue Fire Station from 1974 until 1998 and responded to all emergencies on the MAAF. In addition, the PAARNG Fire Department supported the U.S. Army Fire Department, which operated out of the current Fire Station (Building 5-117) and responded to all other emergencies on-Post, as needed. Following BRAC in 1998, the former Crash Rescue Fire Station building was repurposed and the PAARNG Fire Department and U.S. Army Fire Department were combined. The PAARNG Fire Department now operates the current Fire Station (Building 5-117) on-Post (the former US Army Fire Station) and responds to emergencies of all types. No known fire training activities were conducted at the former Crash Rescue Fire Station, and no known leaks or spills of AFFF were identified; therefore, this area is not considered a potential release area.

Current Fire Station (Building 5-117)

The current Fire Station (Building 5-117) is located at the southwest corner of Fisher Avenue and Smathers Road, south of the MAAF (**Figure 10-6**). Based on historical aerial imagery, the Fire Station was built sometime between 1937 and 1948. The geographic coordinates are 40°25'58.3"N and 76°33'57.6"W.

Prior to BRAC, the current Fire Station was operated by the U.S. Army Fire Department. Following BRAC in 1998, the PAARNG Fire Department and U.S. Army Fire Department were combined. The PAARNG now operates the current Fire Station (Building 5-117) on-Post (the former U.S. Army Fire Station) and responds to fires of all types. The current fire staff consists of 12 state firefighters, 3 federal status technicians, and the federally-employed PAARNG Fire Chief.

AFFF is stored by the PAARNG Fire Department in two 250-gallon totes inside of the current Fire Station and is transferred to the fire trucks, as needed, via a pump. No known spills or leaks of AFFF were identified during the PA. However, the National Fire Protection Agency requires annual testing of the proportioning valves on the fire trucks and from 1998 until the present, the PAARNG Fire Department has tested the valves by discharging approximately 5 gallons of 3 percent AFFF concentrate onto the ground and testing the mixture using a hand-held refractometer. The valves have been tested in two locations: in the field immediately south of the current Fire Station behind a dumpster, and in the field on the north side of Fisher Avenue, immediately south of MAAF. The latter area was recently paved. No remediation activities have occurred at either potential release area. No information was available on the U.S. Army Fire Department's storage or use of AFFF at the current Fire Station.

Waste Water Treatment Plant

The WWTP is located at the southeast corner of the intersection of Biddle Road and Coulter Road (**Figure 10-6**). The geographic coordinates are 40°25'39.3"N and 76°33'04.5"W.

According to the Director of Environmental Management, the WWTP historically overflowed during rain events; however, the treatment plant was renovated from 2000 to 2005 to reduce the number of overflow incidences. The Installation Maintenance Manager recalled that around 2011, an accidental discharge of AFFF occurred in the Building 019-101 hangar as a result of a false alarm. The pipes of Building 019-101 were drained, and the WWTP approved the discharge of the AFFF from the hangar to the WWTP in small increments. Approximately 5 to 10 gallons of 3 percent AFFF concentrate were discharged to the WWTP before personnel were directed to stop because the AFFF concentrate killed all of the bacteria in the WWTP.

Prior to 2010, approximately 300,000 gallons of liquid sludge (3 percent solid) per quarter were transported from the WWTP by Kline's Services Inc., to Miller Environmental Inc., both of Lancaster, Pennsylvania, for conversion to sludge cake and composting. Following installation of a sludge press in spring 2010, approximately 11 dry tons per week of sludge cake (12 to 15 percent solid) were transported from the WWTP by Sattazahn's Inc., of Lebanon, Pennsylvania, to the Greater Lebanon Refuse Authority (local Lebanon Landfill). Since 2012, FTIG has been permitted to perform land application of biosolids from the WWTP on the southeastern boundary of Memorial Lake. Hay is grown in the biosolid land application area, then harvested and used for range and erosion control. There are no known potential releases of PFAS to areas that flow to the WWTP after 2011; however, upgrades to retrofit the sensors at Building 019-101, which were the cause of accidental AFFF releases, did not occur until 2015. The geographic coordinates of the land application area are 40°24'56.0"N 76°35'35.4"W. The community of Ono also pumps water up to the FTIG WWTP for treatment and return to Swatara Creek.

Building -19-177

Building 019-177 is the new Aviation Maintenance Instruction Building (AMIB) and EAATS hangar located at the west end of the Building 019-101 Ramp (**Figure 10-6**). The geographic coordinates are 40°26'09.5"N and 76°34'27.5"W.

Construction on the AMIB began in 2014, and the building was dedicated on 13 November 2017. The building is fitted with a fire suppression system containing high expansion foam.

The fire suppression system at the AMIB was tested on 6 September, 2017, by a contractor. The test lasted approximately 5 minutes and generated an estimated 12,000 gallons of water/foam solution. The foam was allowed to dissipate inside the hangar for approximately 24 hours. Then, the automatic valves connected to the floor drains were opened and the discharge of the oil-water separator was closed to prevent any discharge to the sanitary sewer (PADMVA, 2017). The foam was rinsed to the floor drains and was recovered by pumping the solution from the oil-water separator to a 21,000-gallon Baker tank. Approximately 20,000 gallons of non-hazardous foam solution were transported to a certified treatment, storage, and disposal facility for solidification and disposal as a non-hazardous waste in a landfill (PADMVA, 2017). All high expansion foam was recovered and transported off-Post; therefore, this area is not considered a potential release area.

Emergency Response Areas

Two emergency response areas were identified at FTIG during the PA. The locations are presented on **Figure 10-7**.

Crash Site

In the early 1990s, a rotary-winged aircraft clipped a tree during landing and crashed on the west end of MAAF, south of Runway 7 (**Figure 10-7**). The PAARNG Fire Department responded to the crash and extinguished the fire with AFFF. No information was available on the concentration or amount of AFFF used during the emergency response. This was the only crash site identified during the site visit. The approximate geographic coordinates are 40°25'58.7"N and 76°34'18.5"W.

Simulated Emergency Event

In 1991, the PAARNG Fire Department conducted a simulated emergency event using water at the western end of MAAF (**Figure 10-7**). The U.S. Army Fire Department, which was not aware of the scheduled simulated emergency event, responded to the event, dispensing AFFF. No information was available on the concentration or amount of AFFF dispensed by the U.S. Army Fire Department. The PAARNG Fire Department did not dispense AFFF during this event. The approximate geographic coordinates of the simulation event are 40°25'57.9"N and 76°34'28.3"W.

Adjacent Sources

No off-site PFAS sources adjacent to the FTIG facility were identified during the PA through interviews or the Environmental Data Resource Report.

Conceptual Site Model

Since the 1970s, PFAS has potentially been released to soil at several locations within the boundary of FTIG. Based on preliminary data and assumed groundwater flow directions, six different AOIs were identified. The AOIs have been established based on proximity of the potential source areas to one another and assumed groundwater flow direction. These AOIs are described below and presented on **Figure 10-8**.

- Area of Interest (AOI) 1- CACTF: Represents one potential source area (CACTF). Groundwater is assumed to be flowing to south, southeast.
- AOI 2- MAAF: Represents seven potential source areas (Ramp Fire Pit Training Areas, Building 019-101, Building 019-101 Ramp, Current Fire Station, Crash Site, Simulated Emergency Event, Accidental Tank Spill). Groundwater is assumed to be flowing south, southwest.
- AOI 3- Johnson Trail: Represents one potential source area (Johnson Trail). Groundwater is assumed to be flowing south, southeast.
- AOI 4- Fire Pit Area #19: Represents one potential source area (Fire Pit Area #19). Groundwater is assumed to be flowing south, southwest.
- AOI 5- First Street: Represents one potential source area (First Street). Groundwater is assumed to be flowing south, southwest.
- AOI 6- Biosolid Area: Represents one potential source area (Waste Water Treatment Plant). Groundwater is assumed to be flowing south, southwest.

Ground-disturbing activities at the AOIs could result in site worker, construction worker, and trespasser exposure to potential PFAS contamination via inhalation of dust or ingestion of surface soil. Ground-disturbing activities to subsurface soil could result in site and construction worker exposure.

In their anionic forms, PFAS are water soluble and can migrate readily from soil to groundwater or surface water via leaching and run-off. Given the length of time since the potential PFAS releases, the average precipitation at the facility, and high degree of soil permeability, potential PFAS contamination at the FTIG AOIs may have migrated with surface water and groundwater flow from the potential release areas to downgradient receptors.

The exposure pathway for groundwater via ingestion is potentially complete for site workers, construction workers, in-holding residents, and off-facility residents. Contamination in groundwater at the AOIs may flow downgradient to water supply well locations and receptors. Although FTIG is supplied drinking water by the City of Lebanon, water supply wells for small inaccessible structures, potential trespassers, and in-holding residential drinking water wells, are present at the facility. An in-holding residential well is located approximately 4,000 feet east and cross-gradient of AOI 1. Two FTIG water supply wells are located approximately 1,800 feet south of the AOI 1 and two more approximately 2,000 feet south of AOI 2. The closest off-facility groundwater supply wells are located beyond the southern installation border, approximately 5,500 to 7,000 feet south of the AOI 2 through AOI 5 area, and 2,500 feet south of AOI 6.

The exposure pathway for surface water and sediment via ingestion is potentially complete for site workers, construction workers, in-holding residents, trespassers, recreational users, and off-facility residents. PFAS releases in soil at potential source areas may migrate downgradient via surface water run-off to recreational areas used for fishing and swimming and potentially reach off-facility surface water intakes used for the drinking water supply. Surface water at AOI 1 drains to Indiantown Run, which drains the central portion of FTIG, emptying first into Marquette Lake before flowing further downstream into Memorial Lake. Marquette Lake is approximately 10,000 feet downstream of AOI 1. Memorial Lake is approximately 4,000 feet downstream of Marquette Lake. After flowing from Memorial Lake, Indiantown Run flows within 500 feet of up-gradient AOI 6 and is then joined by 2 stream miles of Vesle Run, which drains the western portion of AOI 2. After Vesle Run joins, Indiantown Run flows approximately one mile before its confluence with Swatara Creek. Approximately 2 stream miles of Aires Run and Qureg Run drain the eastern portion of FTIG, including the eastern portion of AOI 2, and the entire areas of AOI 3, AOI 4, and AOI 5. After Aires Run and Qureg Run converge, the stream continues as Qureg Run to the FTIG boundary. Qureg Run confluences with Reeds Creek Off-Post before joining Swatara Creek 2 miles downstream.

The Pennsylvania American Water Company surface water intakes are located approximately 10 miles downstream of FTIG, at the confluence of Manada Creek and Swatara Creek, and serves approximately 30,000 people (URS/Arcadis, 2013). Potential Contamination in groundwater at AOIs may flow downgradient to surface water supply locations and receptors.

QAPP Worksheet #11: Project/ Data Quality Objectives

DQOs specify the level of data required to support the decision making process for a project. Specific DQOs will be established for each site and will be described in this UFP-QAPP Addendum. These DQOs will follow the USEPA's seven-step iterative process for DQO development. DQOs are influenced by the ongoing project planning discussions with stakeholders and will be updated if new consensus decisions materialize.

The development of DQOs will follow the seven steps of USEPA's DQO process:

1. State the Problem

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 at both federal and state levels continues to evolve. The USEPA issued Drinking Water Health Advisories (HAs) for PFOA and PFOS in May 2016. In the absence of federal maximum contaminant levels, some states, have adopted their own promulgated drinking water standards for PFAS. The State of Pennsylvania currently uses the USEPA HAs for PFOA and PFOS.

The following quotes from Army policy documents form the basis for this project:

- "The Army will research and identify locations where PFOS and/or PFOA containing products, such as AFFF, are known or suspected to have been used. Installations shall coordinate with installation/facility fire response or training offices to identify AFFF use or storage locations. The Army will consider fire training areas, AFFF storage locations, hangars/buildings with AFFF suppression systems, fire equipment maintenance areas, and areas where emergency response operations required AFFF use as possible source areas. In addition, metal plating operations, which used certain PFOS-containing mist suppressants, shall be considered possible source areas."
- "Based on a review of site records…determine whether a CERCLA PA is appropriate for identifying PFOS/PFOA release sites. If the PA determines a PFOS/PFOA release may have occurred, a CERCLA SI shall be conducted to determine presence/absence of contamination."
- "Identify sites where perfluorinated compounds are known or suspected to have been released, with the priority being those sites within 20 miles of the public systems that tested above USEPA HA levels."

2. Identify the Goals of the Study

The goals of the SI include the following:

1) Determine the presence or absence of PFAS contamination at FTIG.
2) Develop information to potentially eliminate a release from further consideration because it is determined that it poses no significant threat to human health or the environment.
3) Determine the potential need for a TCRA. The primary actions that will be considered include provision of alternative water supplies or wellhead treatment.
4) Collect or develop data to evaluate the release.
5) Collect data to better characterize the release for more effective and rapid initiation of an RI.
6) Identify within 4 miles of the installation, other potential PFAS sources (fire stations, major manufacturers, other Department of Defense facilities), and receptors including

both groundwater and surface water receptors, in order to determine whether the ARNG is the likely source of PFAS or whether there is an off-facility source of PFAS responsible for installation detections of PFAS (USEPA, 2005).

3. Identify Information Inputs

Primary information inputs include:

- Preliminary Assessment for FTIG
- Analytical data collected during other environmental sampling efforts at FTIG
- Groundwater, surface water, soil and/or sediment sample data collected in accordance with this QAPP Addendum
- Field data collected including groundwater elevation and water quality parameters measured using a multi-parameter water quality meter

4. Define the Boundaries of the Study

The scope of the SI is bounded by the property limits of FTIG. Off-facility sampling is not included in the scope of this SI; however, if future off-facility sampling is required, the proper stakeholders will be notified, and necessary rights of entry will be obtained by ARNG with property owner(s).

5. Develop the Analytic Approach

All samples will be analyzed by a Department of Defense Environmental Laboratory Accreditation Program and National Environmental Laboratory Accreditation Program certified laboratory (i.e., Eurofins Lancaster Laboratories Environmental). Data will be compared to Project Screening Criteria and decision rules as defined in the PQAPP will be applied. Decision rules have been developed for groundwater and soil that will apply to all data collected. These rules will govern response actions based on the results of the SI sampling effort.

The decision rules described in the tables at the end of this section (**Tables WS11-1** and **WS11-2**) identify actions based on the following:

<u>Groundwater/Surface Water</u>:

1.) Is there a human receptor within 4-miles of the facility?

2.) What is the concentration of PFAS constituents at the potential source area?

3.) What is the concentration of PFAS constituents at the boundary?

4.) What does the conceptual site model suggest in terms of source, pathway and receptor?

<u>Soil/Sediment:</u>

1.) What is the concentration of PFAS constituents in shallow surface soil or sediment (0-2 feet below ground surface [bgs])?

2.) What is the concentration of PFAS constituents in deep soil (i.e., mid-point of boring and bedrock interface) (4-11 feet bgs)?

3.) What does the conceptual site model suggest in terms of source, pathway and receptor?

Soil, groundwater, and sediment samples will be collected from each of the potential source areas identified in the PA. Based on previous investigations, groundwater is expected to be encountered at the soil and bedrock interface located at approximately 11 feet bgs, and in weathered bedrock at 30 feet bgs. In 2017, groundwater sampling was performed by PAARNG at FTIG and PFAS were detected in groundwater at two locations at concentrations

less than the USEPA HA of 70 parts per trillion. Proposed SI sample locations and depths are defined in **Worksheet #18**.

6. Specify Performance/Acceptance Criteria

See **QAPP Worksheet #37**.

7. Develop the Detailed Plan for Obtaining Data

See **Worksheet #17** and **#18**.

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Table WS11-1: Groundwater Decision Rules				
Scenario	**Data Location (source/ boundary)**	**PFAS Concentration Range**	**Response Action (Off-facility human receptor within 4 miles)**	**Response Action (No off-facility human receptor within 4 miles)**
Scenario 1	AOI 1-6	ND	No further action required during SI phase.	No further action required during SI phase.
	Boundary	ND		
Scenario 2	AOI 1-6	> ND (any positive detection)	1.) Assess CSM including: - Data reliability and bias - Migration via groundwater flow (i.e., groundwater flow towards potential receptors) - Flow to surface water bodies, drinking water intakes - Distance from boundary to receptor - Aquifer where drinking water well(s) are screened - Estimated timeframe of release(s) 2.) Identify sentinel well(s) on-facility close to a receptor, slated for future groundwater monitoring. 3.) If all PFAS detections in sentinel wells are below promulgated values: (a) Monitor existing sentinel wells to revalidate results or (b) Install additional sentinel wells at the facility boundary and collect an additional round of samples or (c) Collect samples between a potential source (e.g., municipal airport or fire station) and facility boundary. (d) Based on sampling results, ARNG to update CSM and determine if additional evaluation is needed. 4.) If PFAS detections in sentinel wells are above PSC: (a) Proceed to Scenario 3, Step 2.	1.) Assess CSM as described. 2.) ARNG to consider future investigation.
	Boundary	< PSC		
Scenario 3	AOIs 1-6	> ND (any positive detection)	1.) Assess CSM as described above and: - Potential off-facility alternative sources	1.) Assess CSM as described.

Table WS11-1: Groundwater Decision Rules				
Scenario	**Data Location (source/ boundary)**	**PFAS Concentration Range**	**Response Action (Off-facility human receptor within 4 miles)**	**Response Action (No off-facility human receptor within 4 miles)**
	Boundary	> PCS	2.) If the assessment of the CSM implies unacceptable risk to human health, initiate off-facility sampling protocol: (a) ARNG to notify ACSIM and DASA ESOH with appropriate authorizing letter from The Adjutant General. (b) Request to sample private drinking water well(s) nearest to the facility boundary where the elevated concentration or exceedance(s) was observed. If access is not granted: (c) Request ROE to install a monitoring well adjacent to the residential property, screened in the same aquifer as the private drinking water well(s). 3.) If PFAS in off-facility samples are detected below the PSC: (a) Evaluate data for laboratory blank detections. If detection is not attributable to a laboratory blank detection, initiate a monitoring protocol at the private well. (b) Identify a 'sentinel well' on-facility close to a receptor, slated for future groundwater monitoring. 4.) If PFAS in off-facility samples are detected above the PSC: (a) Collect confirmation sample. (b) Initiate TCRA (i.e., provide alternative drinking water source to resident). 5.) Proceed to RI if: (1) If PSCs have been exceeded, (2) there is probable risk to human receptor and (3) ARNG is likely the responsible party. Otherwise, ARNG to consider future monitoring and/or investigation.	2.) ARNG to consider future investigation.

Table WS11-1: Groundwater Decision Rules				
Scenario	**Data Location (source/ boundary)**	**PFAS Concentration Range**	**Response Action (Off-facility human receptor within 4 miles)**	**Response Action (No off-facility human receptor within 4 miles)**
Scenario 4	AOIs 1-6	ND	1.) Assess potential off-facility sources	1.) Assess CSM as described.
	Boundary	> ND	2.) ARNG to consider future investigation	2.) ARNG to consider future investigation.

Notes:
ACSIM = Assistant Chief of Staff for Installation Management
AOI = area of interest
ARNG = Army National Guard
CSM = Conceptual Site Model
DASA ESOH = Deputy Assistant Secretary of the Army for Environment, Safety, and Occupational Health
ND = non-detect
PSC = Project Screening Criteria
PFAS = per- and polyfluoralkyl substances
SI = Site Inspection
RI = Remedial Investigation
ROE = Right of Entry
TCRA = Time Critical Removal Action

Table WS11-2: Soil Data Decision Rules			
Scenario	**Data Location (depth)**	**PFAS Concentration Range**	**Response Action**
Scenario 1	Surface/ Shallow	ND	No further action during SI Phase.
	Deep (mid-point of boring and bedrock interface)	ND	
Scenario 2	Surface/ Shallow	> ND (any positive detection)	1. Assess CSM including: - Potential for particulate runoff (i.e., transport via surface water) - Nearby receptors and land use at the source location (i.e., is anyone in direct contact?) - Depth to groundwater; distance to nearby surface water body - Comparison of soil concentrations to groundwater concentrations at the source or nearby surface water body - Data reliability and bias 2. ARNG to consider need for additional evaluation.
	Deep (mid-point of boring and bedrock interface)	ND	
Scenario 3	Surface/ Shallow	> PSC	1. Assess CSM as above and: - Comparison of soil concentrations to groundwater concentrations at the source and downgradient at the boundary - Comparison of soil concentrations to surface water concentrations at or near the source and downstream at the boundary 2. ARNG to assess need for a potential action for protection of receptors.
	Deep (mid-point of boring and bedrock interface)	> PSC	

Notes:
ARNG = Army National Guard
CSM = Conceptual Site Model
ND = non-detect
PFAS = per- and polyfluoroalkyl substances
PSC = Project Screening Criteria
SI = Site Inspection

Final PQAPP Worksheet #12: Measuring Performance Criteria

Matrix Groundwater & Surface Water
Analytical Group Per- and polyfluoroalkyl substances
Concentration Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Precision/ Accuracy/Bias	LCS/LCSD shall be spiked with all analytes. Analyte recovery limits 70-130%, RPD≤30%	LCS	A
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Accuracy/Bias	Absolute area must be -50% to +50% of the ICAL midpoint standard. On days when an ICAL is not performed the first CCV of the day is used.	Isotopically Labeled Injection Standards	A
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Accuracy/Bias	50-150% recovery	Isotopically Labeled Extraction Standards	A
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Accuracy/Bias	At least 5 points. S/N ratio ≥10:1 for all ions used for quantification. % RSD of the RFs for all analytes must be <20%. Linear or non-linear calibrations must have a r2 ≥0.99. Must use at least 6 points for a quadratic. Analytes must be within 70-130% of their true value for each calibration standard.	Initial calibration standards	A
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Accuracy/Lab Contamination	No analytes detected > 1/2 LOQ or >1/10 the amount measured in any sample	Method Blank	A
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Accuracy/Bias	MS/MSD shall be spiked with all analytes. Analyte recovery limits 70-130%. RPD≤30	MS/MSD	A
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Sensitivity	Detection limits ≤ to acceptance criteria	Detection Limits	A

Matrix Groundwater & Surface Water
Analytical Group Per- and polyfluoroalkyl substances
Concentration Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Completeness	Completeness criteria will be considered met if 100% of all planned sample data (as requested on COC in lab reports and EDD; including requested reanalyses) are collected	Reported Sample Data	S & A
Water sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	Comparability	Based on accuracy and media comparison	Use of standardized SOPs in field and laboratory	S & A

Groundwater and Surface Water Notes:
A= Analytical
COC = Chain of custody
EDD = Electronic data deliverable
EPA = Environmental Protection Agency
LCMS = Liquid chromatography / mass spectrometry
LCS/LCSD = Laboratory Control Sample/ Laboratory Control Sample Duplicate
LOQ = Limit of Quantitation
MS/MSD = Matrix spike/ matrix spike duplicate
PFBA =Perfluorobutyrate
PFOA = perfluorooctanoic acid
PFPeA = Perfluoro-n-pentanoic acid
QSM = Quality Systems Manual
QC = Quality Control
RPD = Relative percent difference
S = Sampling
SOP = Standard operating procedure
SRM = Standard Reference Material

Matrix Drinking Water
Analytical Group Per- and polyfluoroalkyl substances
Concentration Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Water sampling	EPA 537 Rev. 1.1, WI12017	Accuracy	Method limits, where applicable	Surrogate Spike	A
Water sampling	EPA 537 Rev. 1.1, WI12017	Accuracy/Bias/ Precision	Method limits, where applicable	Laboratory Fortified Blank (LFB)/Laboratory Fortified Sample Matrix (LFSM) and their Duplicates	S & A
Water sampling	EPA 537 Rev. 1.1, WI12017	Accuracy/Laboratory Contamination	No analytes detected at or above the MDL	Laboratory Reagent Blank (LRB)	A
Water sampling	EPA 537 Rev. 1.1, WI12017	Precision	RPD as set by project	Field Duplicate	S & A
Water sampling	EPA 537 Rev. 1.1, WI12017	Accuracy/Field Contamination	No detected target compounds	Field Blank	S & A
Water sampling	EPA 537 Rev. 1.1, WI12017	Completeness	As determined by the project	Reported Sample Data	S & A
Water sampling	EPA 537 Rev. 1.1, WI12017	Bias/Holding Time	≤14 days to extraction/≤28 days to analysis	Reported Sample Data	A
Water sampling	EPA 537 Rev. 1.1, WI12017	Sensitivity	Detection limits ≤ to PALs	Detection limits	S

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Water sampling	EPA 537 Rev. 1.1, WI12017	Comparability	Based on accuracy and media comparison	Use of standardized SOPs in field and laboratory	S & A

Drinking Water Notes:
A= Analytical
COC = Chain of custody
EDD = Electronic data deliverable
EPA = Environmental Protection Agency
LCMS = Liquid chromatography / mass spectrometry
LCS/LCSD = Laboratory Control Sample/ Laboratory Control Sample Duplicate
LOQ = Limit of Quantitation
MDL = Method Detection Limit
MS/MSD = Matrix spike/ matrix spike duplicate
PFBA =Perfluorobutyrate
PFOA = perfluorooctanoic acid
PFPeA = Perfluoro-n-pentanoic acid
QSM = Quality Systems Manual
QC = Quality Control
RPD = Relative percent difference
S = Sampling
SOP = Standard operating procedure
SRM = Standard Reference Material

Matrix Soil/ Sediment
Analytical Group Per- and polyfluoroalkyl substances
Concentration Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Precision/ Accuracy/Bias	LCS/LCSD shall be spiked with all analytes. Analyte recovery limits 70-130%, RPD≤30%	LCS	A
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Accuracy/Bias	Absolute area must be -50% to +50% of the ICAL midpoint standard. On days when an ICAL is not performed the first CCV of the day is used.	Isotopically Labeled Injection Standards	A
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Accuracy/Bias	50-150% recovery	Isotopically Labeled Extraction Standards	A
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Accuracy/Bias	At least 5 points. S/N ratio ≥10:1 for all ions used for quantification. % RSD of the RFs for all analytes must be <20%. Linear or non-linear calibrations must have a r2 ≥0.99. Must use at least 6 points for a quadratic. Analytes must be within 70-130% of their true value for each calibration standard.	Initial calibration standards	A
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Accuracy/Lab Contamination	No analytes detected > 1/2 LOQ or >1/10 the amount measured in any sample	Method Blank	A
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Accuracy/Bias	MS/MSD shall be spiked with all analytes. Analyte recovery limits 70-130%, RPD≤30	MS/MSD	A
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Sensitivity	Detection limits ≤ acceptance criteria	Detection Limits	A
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Completeness	Completeness criteria will be considered met if 100% of all planned sample data (as requested on COC in lab reports and EDD; including requested re-analyses) are collected	Reported Sample Data	S & A

Matrix Soil/ Sediment
Analytical Group Per- and polyfluoroalkyl substances
Concentration Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil/Sediment sampling	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	Comparability	Based on accuracy and media comparison	Use of standardized SOPs in field and laboratory	S & A

Soil/Sediment Notes:
A= Analytical
COC = Chain of custody
EDD = Electronic data deliverable
EPA = Environmental Protection Agency
LCMS = Liquid chromatography / mass spectrometry
LCS/LCSD = Laboratory Control Sample/ Laboratory Control Sample Duplicate
LOQ = Limit of Quantitation
MS/MSD = Matrix spike/ matrix spike duplicate
PFBA =Perfluorobutyrate
PFOA = perfluorooctanoic acid
PFPeA = Perfluoro-n-pentanoic acid
QSM = Quality Systems Manual
QC = Quality Control
RPD = Relative percent difference
S = Sampling
SOP = Standard operating procedure
SRM = Standard Reference Material

Matrix: Soil
Analytical Group: Total Organic Carbon
Concentration Level: Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Accuracy/Bias	Laboratory statistical limits	Laboratory Control Spike/Matrix Spike	A
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Accuracy/ Laboratory Contamination	No analytes detected > LOQ or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Method Blank	A
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Precision	Laboratory statistical RPD	Lab Duplicate	S & A
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Precision	RPD as set by project	Field Duplicate	S & A
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Accuracy/Field Contamination	No detected target compounds	Field Blank	S & A
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Completeness	As determined by the project	Reported Sample Data	S & A
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Bias/Holding Time	≤28 days	Reported Sample Data	A
Soil sampling	SM 5310B/415.1/SW-946 9060; WI11627	Sensitivity	Detection limits ≤ to PALs	Detection limits	S

Soil/Sediment Notes:
A= Analytical
PALs = Project Action Limits
QC = Quality Control
RPD = Relative percent difference
S = Sampling
SM = Standard Method
SOP = Standard operating procedure
SRM = Standard Reference Material
SW=Solid Waste

Matrix: Solids
Analytical Group: Grain Size
Concentration Level: Low

Sampling Procedure	Analytical Method/SOP	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
Soil sampling	ASTM D422; WI11514	Precision	Laboratory statistical RPD	Lab Duplicate	S & A
Soil sampling	ASTM D422; WI11514	Precision	RPD as set by project	Field Duplicate	S & A
Soil sampling	ASTM D422; WI11514	Completeness	As determined by the project	Reported Sample Data	S & A
Soil sampling	ASTM D422; WI11514	Bias/Holding Time	NA	Reported Sample Data	A

Soil/Sediment Notes:
A= Analytical
ASTM D422 = American Standard Test Method for Particle Size Analysis
QC = Quality Control
RPD = Relative percent difference
S = Sampling
WI11514 = Standard Test Method for Particle Size Analysis

Final PQAPP Worksheet #13: Secondary Data Uses and Limitations

Secondary data sources, uses and limitations are tabulated below. Original source documents were reviewed for uncertainty discussions that may identify additional or more subtle data limitations.

Data Type	Source	Data Uses Relative to Current Project	Factors Affecting Reliability of Data and Limitations on Data Use
Meteorological	National Weather Service	Estimates of seasonal fluctuations in precipitation.	Meteorological data is generally for a regional area. Actual site conditions may vary.
Topographic	United States Geological Survey	Inferred groundwater flow pathways based on local topography at each site. All groundwater flow maps will ultimately rely upon groundwater measurements from monitoring wells.	Topography of some sites may have been altered by building or grading activities.
Soil and groundwater chemistry, groundwater monitoring data, and data gaps identification	Historical site reports	Applicable to the evaluation of historical site conditions in soil and groundwater to supplement data being collected under this delivery order.	The data may not represent current conditions because of the age of some of the data. Reliability of second or third party data quality.
Historical site records (i.e., material inventories)	Purchase records, site inventories, onsite records, material safety data sheets	Applicable to the evaluation of potential constituents of concern and source areas.	Records may be incomplete or inaccurate.
Periodicals (i.e., news articles)	Local newspapers, magazines or other periodicals	Applicable to the evaluation of the use of potential constituents of concern at off-facility locations or mutual use/ aid agreements with local fire department or other entities.	Records may be incomplete or inaccurate.

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QAPP Worksheet #14 & #16: Project Tasks and Schedule

The following table describes the main tasks and schedule for the FTIG SI:

Task	Start Date	End Date
Pre-mobilization	January 2019	February 2019
Mobilization	May 2019	May 2019
Field Work	May 2019	June 2019
Demobilization	June 2019	June 2019
Data Review/ Validation	June 2019	June2019
Reporting	July 2019	July 2019

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Final PQAPP Worksheet #15: Screening Limits and Laboratory-Specific Detection/ Quantitation Limits

Matrix: Aqueous
Analyte Group: Perfluorinated Compounds EPA Method 537 Modified, QSM 5.1 Table B-15

Analyte	CAS Number	Laboratory Control Spike Lower Control Limit (%)	Laboratory Control Spike Upper Control Limit (%)	Achievable Laboratory Limits		
				DL (ng/L)	LOD (ng/L)	LOQ (ng/L)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	70	130	0.5	1.2	2.0
Perfluoroheptanoic acid (PFHpA)	375-85-9	70	130	0.4	1.2	2.0
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	70	130	0.4	1.2	2.0
Perfluorononanoic acid (PFNA)	375-95-1	70	130	0.4	1.2	2.0
Perfluorooctanoic acid (PFOA)	335-67-1	70	130	0.5	1.2	2.0
Perfluorobutanesulfonic acid (PFBS)	375-73-5	70	130	0.3	1.1	2.0
Perfluorobutanoic acid (PFBA)	375-22-4	70	130	2.0	4.8	6.0
Perfluoropentanoic acid (PFPA)	2706-90-3	70	130	2.0	4.8	6.0
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	70	130	1.0	2.4	3.0
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	70	130	1.0	2.4	3.0
Perfluorodecanoic acid (PFDA)	335-76-2	70	130	0.5	1.2	2.0
Perfluorotetradecanoic acid (PFTA)	376-06-7	70	130	0.5	1.2	2.0
Perfluorododecanoic acid (PFDoA)	307-55-1	70	130	0.5	1.2	2.0
Perfluorohexanoic acid (PFHxA)	307-24-4	70	130	0.5	1.2	2.0
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	70	130	0.6	1.2	2.0
Perfluoroundecanoic acid (PFUnA)	2058-94-8	70	130	0.5	1.2	2.0
6:2 Fluorotelomer sulfonate (6:2 FTS)	27619-97-2	70	130	1.0	2.0	3.0
8:2 Fluorotelomer sulfonate (8:2 FTS)	39108-34-4	70	130	1.0	2.0	3.0

CAS = Chemical Abstracts Service
DL= Detection Limit
EPA = Environmental Protection Agency
LOD = Limit of Detection
LOQ = Limit of Quantitation
ng/L = nanograms per liter
QSM =Quality Systems Manual

Matrix: Drinking Water
Analyte Group: Perfluorinated Compounds EPA Method 537 v 1.1

Analyte	CAS Number	Laboratory Control Spike Lower Control Limit (%)	Laboratory Control Spike Upper Control Limit (%)	Achievable Laboratory Limits		
				DL (ng/L)	LOD (ng/L)	LOQ (ng/L)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	70	130	0.5	1.4	2.0
Perfluoroheptanoic acid (PFHpA)	375-85-9	70	130	0.5	1.5	2.0
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	70	130	0.5	1.4	2.0
Perfluorononanoic acid (PFNA)	375-95-1	70	130	0.5	1.5	2.0
Perfluorooctanoic acid (PFOA)	335-67-1	70	130	0.5	1.5	2.0
Perfluorobutanesulfonic acid (PFBS)	375-73-5	70	130	0.5	1.3	2.0
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	70	130	0.5	1.5	2.0
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	70	130	0.5	1.5	2.0
Perfluorodecanoic acid (PFDA)	335-76-2	70	130	0.5	1.5	2.0
Perfluorotetradecanoic acid (PFTA)	376-06-7	70	130	0.5	1.5	2.0
Perfluorododecanoic acid (PFDoA)	307-55-1	70	130	0.5	1.5	2.0
Perfluorohexanoic acid (PFHxA)	307-24-4	70	130	0.5	1.5	2.0
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	70	130	0.5	1.5	2.0
Perfluoroundecanoic acid (PFUnA)	2058-94-8	70	130	0.5	1.5	2.0

CAS = Chemical Abstracts Service
DL= Detection Limit
EPA = Environmental Protection Agency
LOD = Limit of Detection
LOQ = Limit of Quantitation
ng/L = nanograms per liter

Groundwater/Drinking Water Project Screening Criteria

Analyte	CAS Number	USEPA PSC (ng/L)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	70[a]
Perfluoroheptanoic acid (PFHpA)	375-85-9	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	-
Perfluorononanoic acid (PFNA)	375-95-1	-
Perfluorooctanoic acid (PFOA)	335-67-1	70[a]
Perfluorobutanesulfonic acid (PFBS)	375-73-5	-
Perfluorobutanoic acid (PFBA)	375-22-4	-
Perfluoropentanoic acid (PFPA)	2706-90-3	-
N-ethyl perfluorooctanesulfonamidoacetic acid	2991-50-6	-
N-methyl perfluorooctanesulfonamidoacetic acid	2355-31-9	-
Perfluorodecanoic acid (PFDA)	335-76-2	-
Perfluorotetradecanoic acid (PFTA)	376-06-7	-
Perfluorododecanoic acid (PFDoA)	307-55-1	-
Perfluorohexanoic acid (PFHxA)	307-24-4	-
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	-
Perfluoroundecanoic acid (PFUnA)	2058-94-8	-
6:2 Fluorotelomer sulfonate (6:2 FTS)	27619-97-2	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	39108-34-4	-

Groundwater PSC Notes:

a. PSC is 70 ng/L for PFOS and PFOA, individually or combined (USEPA 2016).

CAS = Chemical Abstracts Service
ng/L = nanograms per liter
PSC = Project Screening Criteria
USEPA = United States Environmental Protection Agency

Groundwater/Drinking Water Project Screening Criteria

Analyte	CAS Number	USEPA PSC (ng/L)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	70[a]
Perfluoroheptanoic acid (PFHpA)	375-85-9	-
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	-
Perfluorononanoic acid (PFNA)	375-95-1	-
Perfluorooctanoic acid (PFOA)	335-67-1	70[a]
Perfluorobutanesulfonic acid (PFBS)	375-73-5	-
Perfluorobutanoic acid (PFBA)	375-22-4	-
Perfluoropentanoic acid (PFPA)	2706-90-3	-
N-ethyl perfluorooctanesulfonamidoacetic acid	2991-50-6	-
N-methyl perfluorooctanesulfonamidoacetic acid	2355-31-9	-
Perfluorodecanoic acid (PFDA)	335-76-2	-
Perfluorotetradecanoic acid (PFTA)	376-06-7	-
Perfluorododecanoic acid (PFDoA)	307-55-1	-
Perfluorohexanoic acid (PFHxA)	307-24-4	-
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	-
Perfluoroundecanoic acid (PFUnA)	2058-94-8	-
6:2 Fluorotelomer sulfonate (6:2 FTS)	27619-97-2	-
8:2 Fluorotelomer sulfonate (8:2 FTS)	39108-34-4	-

Groundwater PSC Notes:

a. PSC is 70 ng/L for PFOS and PFOA, individually or combined (USEPA 2016).

CAS = Chemical Abstracts Service
ng/L = nanograms per liter
PSC = Project Screening Criteria
USEPA = United States Environmental Protection Agency

Matrix: Soil/ Sediment
Analyte Group: Perfluorinated Compounds EPA Method 537 Modified, QSM 5.1 Table B-15

Analyte	CAS Number	Laboratory Control Spike Lower Control Limit (%)	Laboratory Control Spike Upper Control Limit (%)	Achievable Laboratory Limits		
				DL (µg/kg)	LOD (µg/kg)	LOQ (µg/kg)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	70	130	0.2	0.65	0.8
Perfluoroheptanoic acid (PFHpA)	375-85-9	70	130	0.2	0.68	0.8
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	70	130	0.2	0.64	0.8
Perfluorononanoic acid (PFNA)	375-95-1	70	130	0.2	0.68	0.8
Perfluorooctanoic acid (PFOA)	335-67-1	70	130	0.2	0.68	0.8
Perfluorobutanesulfonic acid (PFBS)	375-73-5	70	130	0.2	0.6	0.8
Perfluorobutanoic acid (PFBA)	375-22-4	70	130	0.6	1.2	2.0
Perfluoropentanoic acid (PFPA)	2706-90-3	70	130	0.2	0.68	0.8
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	70	130	0.5	2	3
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	70	130	0.5	2	3
Perfluorodecanoic acid (PFDA)	335-76-2	70	130	0.3	0.68	1
Perfluorotetradecanoic acid (PFTA)	376-06-7	70	130	0.2	0.68	0.8
Perfluorododecanoic acid (PFDoA)	307-55-1	70	130	0.2	0.68	0.8
Perfluorohexanoic acid (PFHxA)	307-24-4	70	130	0.2	0.68	0.8
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	70	130	0.2	0.68	0.8
Perfluoroundecanoic acid (PFUnA)	2058-94-8	70	130	0.2	0.68	0.8
6:2 Fluorotelomer sulfonate (6:2 FTS)	27619-97-2	70	130	0.6	1.9	2
8:2 Fluorotelomer sulfonate (8:2 FTS)	39108-34-4	70	130	0.5	1.9	2

CAS = Chemical Abstracts Service
DL= Detection Limit
EPA = Environmental Protection Agency
LOD = Limit of Detection
LOQ = Limit of Quantitation
µg/kg = micrograms per kilogram
QSM =Quality Systems Manual

Soil Impact to Groundwater: Project Screening Criteria

Analyte	CAS Number	USEPA PSC (µg/kg)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	0.378[a]
Perfluoroheptanoic acid (PFHpA)	375-85-9	--
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	--
Perfluorononanoic acid (PFNA)	375-95-1	--
Perfluorooctanoic acid (PFOA)	335-67-1	0. 172[a]
Perfluorobutanesulfonic acid (PFBS)	375-73-5	130[a]
Perfluorobutanoic acid (PFBA)	375-22-4	--
Perfluoropentanoic acid (PFPA)	2706-90-3	--
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	--
-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	--
Perfluorodecanoic acid (PFDA)	335-76-2	--
Perfluorotetradecanoic acid (PFTA)	376-06-7	--
Perfluorododecanoic acid (PFDoA)	307-55-1	--
Perfluorohexanoic acid (PFHxA)	307-24-4	--
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--
Perfluoroundecanoic acid (PFUnA)	2058-94-8	--
6:2 Fluorotelomer sulfonate (6:2 FTS)	27619-97-2	--
8:2 Fluorotelomer sulfonate (8:2 FTS)	39108-34-4	--

Soil Impact to Groundwater PSC Notes:

a.) Regional Screening Levels (RSL) for PFBS as presented in the USEPA Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1) November 2014 through May 2018. As of June 2018, values for PFOA and PFOS calculated by the USEPA RSL calculator using USEPA Office of Water (OW) Reference Dose (RfDs), HQ of 1, and residential exposure assumptions.

CAS = Chemical Abstracts Service
PSC = Project Screening Criteria
RSL = Regional Screening Level
µg/kg = micrograms per kilogram
USEPA = United States Environmental Protection Agency.

Soil: Human Health Screening Levels / Project Screening Criteria

Analyte	CAS Number	USEPA PSC (µg/kg)
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	1,260[a]
Perfluoroheptanoic acid (PFHpA)	375-85-9	--
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	--
Perfluorononanoic acid (PFNA)	375-95-1	--
Perfluorooctanoic acid (PFOA)	335-67-1	1,260[a]
Perfluorobutanesulfonic acid (PFBS)	375-73-5	1,260,000[a]
Perfluorobutanoic acid (PFBA)	375-22-4	--
Perfluoropentanoic acid (PFPA)	2706-90-3	--
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	2991-50-6	--
N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)	2355-31-9	--
Perfluorodecanoic acid (PFDA)	335-76-2	--
Perfluorotetradecanoic acid (PFTA)	376-06-7	--
Perfluorododecanoic acid (PFDoA)	307-55-1	--
Perfluorohexanoic acid (PFHxA)	307-24-4	--
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	--
Perfluoroundecanoic acid (PFUnA)	2058-94-8	--
6:2 Fluorotelomer sulfonate (6:2 FTS)	27619-97-2	--
8:2 Fluorotelomer sulfonate (8:2 FTS)	39108-34-4	--

Human Health Screening Levels PSC Notes:

a.) Regional Screening Levels (RSL) for PFBS as presented in the USEPA Regional Screening Level (RSL) Summary Table (TR=1E-06, HQ=1) November 2014 through May 2018. As of June 2018, values for PFOA and PFOS calculated by the USEPA RSL calculator using USEPA Office of Water (OW) Reference Dose (RfDs), HQ of 1, and residential exposure assumptions. Note: RSL users screening sites with multiple contaminants should consult the USEPA (2018) RSL User's Guide and USEPA (1989) Risk Assessment Guidance.

CAS = Chemical Abstracts Service
PSC = Project Screening Criteria
RSL = Regional Screening Level
µg/kg = micrograms per kilogram
USEPA = United States Environmental Protection Agency

Matrix: Soil
Analyte Group: Wet Chemistry

Analyte	Method	PSC (µg/kg)	PSC Reference	Laboratory Control Spike Lower Control Limit (%)	Laboratory Control Spike Upper Control Limit (%)	Achievable Laboratory Limits		
						DL (mg/kg)	LOD (mg/kg)	LOQ (mg/kg)
Total Organic Carbon	9060A	NA	NA	90	110	100	200	300
pH	9045D	NA	NA	90	110	NA	NA	NA

DL= Detection Limit
LOD = Limit of Detection
LOQ = Limit of Quantitation
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
NA = Not applicable
pH = Potential of hydrogen
PSC = Project Screening Criteria

QAPP Worksheet #17: Sampling Design and Rationale

Worksheet #17a-h describes the sampling design, basis for its selection and field investigation details. Filed activities will be completed per the Standard Operating Procedures (SOPs) in PQAPP Appendix C.

The objectives for the SI are to determine presence or absence of PFAS in soil, groundwater, surface water, or sediment (if present) at each AOI, and assess the potential for off-site human exposure if PFAS constituents are migrating off-facility by sampling groundwater at the installation boundary (Phase 1). If contamination is found in Phase 1, up to ten permanent wells will be installed downgradient of source areas where PFAS were detected between the potential source area and drinking water receptors (Phase 2).

The potential source areas were divided into six AOIs **(Figure 10-8**) in the PA. The AOIs were established based on proximity of the potential source areas to one another and assumed groundwater flow direction.

- AOI 1- CACTF: Represents one potential source area (CACTF). Groundwater is assumed to be flowing to south, southeast.
- AOI 2- MAAF: Represents seven potential source areas (Ramp Fire Pit Training Areas, Building 019-101, Building 019-101 Ramp, Current Fire Station, Crash Site, Simulated Emergency Event, Accidental Tank Spill). Groundwater is assumed to be flowing south, southwest.
- AOI 3- Johnson Trail: Represents one potential source area (Johnson Trail). Groundwater is assumed to be flowing south, southeast.
- AOI 4- Fire Pit Area #19: Represents one potential source area (Fire Pit Area #19). Groundwater is assumed to be flowing south, southwest.
- AOI 5- First Street: Represents one potential source area (First Street). Groundwater is assumed to be flowing south, southwest.
- AOI 6- Biosolid Area: Represents one potential source area (Waste Water Treatment Plant). Groundwater is assumed to be flowing south, southwest.

The investigation will be phased as described below:

Phase 1

Soil and groundwater samples will be collected at each AOI identified in the PA report, and downstream surface water and sediment samples collected from Indiantown Gap Run, Vesle Run, Aries Run, the former waste water treatment plant outfall, and NPDES storm water outfall 003. The media sample descriptions for the six AOIs are listed below and presented on **Figures 17-1** through **17-5**. One round of groundwater samples will be collected from the newly installed and existing monitoring wells scheduled to be sampled.

Table 17-1: Site Inspection Sample Count

AOI	Potential Source Area	# of Boring Locations	Approximate Depth (feet bgs)	Groundwater Samples	*DPT Soil Samples	Surface Water / Sediment
1	Combined Arms Collective Training Facility	5	3 to 1 1 to 15 1 to 30	2	6	4 (See Figure 17-1&WS17e)

AOI	Potential Source Area	# of Boring Locations	Approximate Depth (feet bgs)	Groundwater Samples	*DPT Soil Samples	Surface Water / Sediment
	Existing Monitoring Well Locations	N/A	TBD	2	N/A	N/A
2	Ramp Fire Pits	3	2 to 15 1 to 30	3	6	2 (See Figure 17-1&WS17e)
	019-101 Ramp	2	2 to 15	2	6	
	Accidental Tank Spill	2	2 to 1	N/A	2	
	Simulated Event	2	1 to 15 1 to 30	2	3	
	Crash Site	1	1 to 15	1	3	
	Current Fire Station	3	2 to 15 1 to 30	3	6	
	Existing Monitoring Well Locations	N/A	15	2	N/A	N/A
3	Johnson Trail	1	1 to 15	1	3	3 (See Figure 17-1&WS17e)
4	Fire Pit #19	1	1 to 15	1	3	
5	First Street	1	1 to 15	1	3	
6	Biosolid Area	1	1 to 15	1	3	1 (See Figure 17-1&WS17e)
7	FTIG Boundary	6	3 to 15 3 to 30	6	N/A	N/A
Various	NPDES Outfall 03, Former WWTP	N/A	N/A	N/A	N/A	2
Total (not including QC)				**27**	***44**	**12**

Notes:
# = number
AOI = Area of Interest
bgs = below ground surface
N/A= Not Applicable
QC = quality control
TBD = to be determined
* = Assumes soil not sampled at collocated deep temporary well

Phase 2

Based on the results of Phase 1 SI investigation, the location, depth and screen interval of Phase 2 permanent groundwater monitoring wells will be determined for each AOI. If contamination is found within the AOIs, up to ten wells will be installed in Phase 2. The wells will be divided amongst the various potential source areas where PFAS were detected during Phase 1 and at presumed downgradient direction between the source area and the facility boundary. The well locations and construction details will be reviewed and approved by stakeholders following the Phase 1 SI sampling and analysis. Groundwater samples will then be collected from the permanent groundwater monitoring wells.

Sampling Tasks

The field program will include tasks as detailed in the following Worksheet elements:

- Worksheet #17a- Mobilization
- Worksheet #17b- Direct Push Boring Installation and Soil Sampling
- Worksheet #17c- Phase 1 SI Temporary Groundwater Monitoring Well Installation and Grab Groundwater Samples
- Worksheet #17d- Phase 2 SI Permanent Groundwater Well Installation and Groundwater Sampling
- Worksheet #17e- Surface Water and Sediment Sampling
- Worksheet #17f- Water Level Measurements
- Worksheet #17g Surveying
- Worksheet #17h- Investigation-Derived Waste Management

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QAPP Worksheet #17a
Sampling Design and Rationale
Mobilization

Site Preparation

The site preparation activities for the SI field investigation operations include mobilization of field team personnel and equipment. No vegetation clearance is planned during field investigation activities. Traffic control measures may be required to complete investigations near some AOIs to ensure compliance with facility requirements.

PFAS Site Water Supply Sampling and Sampling Equipment Acceptability

A sample from the potable water source at FTIG will be collected prior to mobilization to confirm that it is PFAS free for use during field activities. If the water is not PFAS- free, totes of water will be brought onsite from another source determined to be PFAS-free.

All materials being purchased or rented for field work will be confirmed as acceptable for use in the PFAS sampling environment. A summary of acceptability of materials for use in the PFAS sampling environment is provided in PQAPP Appendix C, Table 1. As an additional layer of control, prior to the start of field work each day, a PFAS Sampling Checklist will be completed (PQAPP Appendix C, Table 2). The check list will serve as a reminder to each field team member regarding the allowable materials within the sampling environment an example of the checklist is provided below.

Example PFAS Daily Sampling Checklist

Team Members		
Yes	**No**	**Description**
		Has AECOM PFAS Sampling guidance been reviewed by all team members?
		Comments:
Yes	No	Has AECOM field sampling staff received needed training certification?
		Comments:
Yes	No	Was a briefing held for field sampling staff?
		Comments:
Yes	No	Were additional PFAS sampling instructions given to field sampling staff?
		Comments:
Yes	No	Have personal clothing and PPE requirements been followed by all field sampling staff?
		Comments:
Yes	No	Were lotions and sunscreen used for field sampling staff?
		Comment:
Sample Collection		
Yes	No	Has a PFAS-free water source been identified?
		Comment
		Source of PFAS-free water:
Yes	No	Have all sampling items, parts and equipment been inspected to be free of PFAS?
		Comment:
Yes	No	Has sampling location sequence been communicated to avoid cross-contaminations?
		Comment:
Yes	No	Have drilling fluids been evaluated and shown to be free of PFAS?
		Comment:
Yes	No	Use of PFAS-free decontamination solution?
		Brand name of decontamination solution:
Yes	No	Have all field logs, notebooks, pens, labels been inspected, and do they meet AECOM PFAS sampling guidance requirements?
		Comment:
Yes	No	Have all sample shipping materials (ice, Ziploc® bags) been inspected, and do they meet AECOM PFAS sampling guidance requirements?
		Comment:
Yes	No	Have all blanks arrived at the site and will they be collected to verify cross-contamination?
		Comment:
Document Control		
Yes	No	Have all variances from sampling guidance been documented?
		Comment:
Other Comments:		

Personnel Qualifications

All personnel mobilized to the site will meet applicable Occupational Safety and Health Administration training requirements including hazardous waste operations and emergency response (HAZWOPER) training and medical surveillance requirements as specified in the Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP) (**Appendix A**). Additionally, all AECOM employees that will be performing field work will take an internal PFAS sampling guidance training.

Permits and Notifications

Utility clearance will be conducted by PAARNG with input from the AECOM field team. AECOM or its drilling subcontractor will contact "PA1call.org" (800-242-1776) the local one-call utility location system. AECOM and the drilling subcontractor will participate in a FTIG orientation prior to initiating work if required. The determination of the orientation requirement will be made after final intrusive investigation locations are determined. AECOM will also contact the ARNG Environmental Manager at least five business days prior to the scheduled start of the field activities. A site walk will be scheduled with the appropriate ARNG personnel to mark out locations of the subsurface utilities. As a precaution, the first five feet of each boring will be advanced using air knifing methods. All field work will be coordinated with the ARNG Environmental Manager and/or his/her designee.

Health and Safety Requirements

Health and safety requirements for SI field activities are provided in the APP (**Appendix A**). Field personnel will wear PFAS-free Level D personal protective equipment. Detailed job hazard analyses identifying the physical, chemical, and biological hazards that may be encountered at the site and the associated mitigation methods are presented in the SSHP.

All onsite personnel who may be exposed to hazardous conditions will be required to meet training requirements identified in Federal Regulation 29 CFR 1910.120 (HAZWOPER). At least two personnel trained in first aid and cardiopulmonary resuscitation (CPR) will be onsite during field activities. Training certificates for personnel (HAZWOPER 40-hour training; current HAZWOPER 8-hour refresher training; and first aid/CPR) will be maintained onsite by the Field Manager.

Personnel and visitors who enter the site will be required to review the APP and SSHP and sign the acknowledgement form. Site workers will be required to sign the daily tailgate safety meeting form and fill out daily Task Hazard Assessment forms. Safety issues that arise during implementation of field activities will be addressed during tailgate safety meetings held daily before the workday and will be documented in the daily tailgate safety meeting form.

QAPP Worksheet #17b
Sampling Design and Rationale
Direct-Push Boring Installation and Soil Sampling

Soil samples will be collected via direct-push technology (DPT) (SOP 3-17). A GeoProbe® DT45 or DT60 dual-tube sampling system (or equivalent) will be used to collect continuous soil cores to the target depth. DPT will be used to collect one surface soil (0.5-1 feet depth), one subsurface soil sample at the soil bedrock interface, and one subsurface soil sample at the mid-point between the surface and the soil bedrock interface. If refusal is encountered before the desired depth of sample location, the GeoProbe® DT45 or DT60 will utilize an air hammer to reach the desired depth in bedrock. All drilling materials will be PFAS-free. The proposed sample locations are shown on **Figure WS17-1** and described in **Worksheet #18**. The target depths for the borings are provided in the table below.

Table 17-2: Target Depths for Soil Borings

Area of Interest	Number of Borings	Target Depth (feet bgs)
AOI-1	5	1, 15, and 30
AOI-2	13	1, 15 and 30
AOI-3	1	15
AOI-4	1	15
AOI-5	1	15
AOI-6	1	15
Facility Boundary	6	15 and 30

Notes:
bgs = below ground surface

The soil cores will be continuously logged for lithological descriptions by a field geologist using the Unified Soil Classification System (USCS) per SOP 3-20. A photo ionization detector (PID) will be used to screen the breathing zone during boring activities. Observations and measurements will be recorded on field forms and in a non-treated field logbook. Photographs will also be taken of the boring cores. At a minimum, depth interval, recovery thickness, PID concentrations, moisture, relative density, color (using a Munsell soil color chart), and texture (using the USCS) will be recorded. Additional observations to be recorded may include groundwater or perched water depth, organic material, or cultural debris.

If a clay layer is observed in a boring with a thickness in excess of three feet, the field geologist will select a representative clay sample from the clay layer and submit to the laboratory for grain size analysis by ASTM D-422 to document the clay content at the site. The soil boring will be completed to the scheduled total depth and sampled in accordance with the QAPP. The boring will be abandoned immediately after sampling using bentonite chips.

DPT borings will be abandoned using bentonite chips at completion of sampling activities unless they are being converted into monitoring wells. Borings in grass will be abandoned by backfilling with bentonite chips. Bentonite chips will be hydrated in place with PFAS free source water from FTIG. It is anticipated that all borings will be installed in the grass however, if they are required in asphalt, they will be abandoned by backfilling with bentonite chips to approximately 6 inches bgs, and the remainder of the borehole will be patched with asphalt cold patch. Borings into concrete are to be avoided if possible to minimize foreign object debris, which can severely damage aircraft. However, if borings are advanced into concrete, the borings will be restored similar to those in

asphalt except that concrete will be placed in the borehole to provide as flush a surface as possible.

Field duplicate samples will be collected at a rate of 10 percent and analyzed for the same parameters as the accompanying samples. Matrix spike and matrix spike duplicates will be collected at the rate of 5 percent and analyzed for the same parameters as the accompanying samples. Field Reagent Blanks will accompany each cooler containing samples for PFAS analysis and will be analyzed for select PFAS. Equipment blanks will not be prepared or analyzed unless a deviation from this plan requires sample handling using non-dedicated equipment. If non-dedicated sampling equipment is used, equipment blank(s) will be collected and will be analyzed for the same analytes as the groundwater samples. A temperature blank shall be placed in each cooler to ensure that samples are preserved at or below four degrees Celsius during shipment.

Each sample will be collected into laboratory-supplied bottleware and submitted to the laboratory for analysis of selected parameters. Samples will be analyzed for PFAS (EPA Method 537 Modified, total organic carbon (TOC) (EPA Method 9060A) and Potential of hydrogen (pH) (EPA Method 9045D). All sample containers will be PFAS free. The laboratory method detection limits for these analytes are presented in **PQAPP Worksheet #15**. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain-of-custody procedures to the laboratory (See SOP 3-04).

QAPP Worksheet #17c
Sampling Design and Rationale
Phase 1 Temporary Well Installation and Grab Groundwater Samples

Boreholes for temporary wells will be created using a Geoprobe® DT325 dual-tube sampling system (or air hammer in bedrock). Once the borehole has been advanced to the specified depth, the temporary wells will be constructed of a 5-ft section of 1-inch (.010 Slot) schedule 40 poly-vinyl chloride (PVC) screen with sufficient casing to reach ground surface. The well will be backfilled with at least 2 foot of sand above the screen interval (may be less if completed well depth is less than 10 ft). The remaining length of the borehole around the PVC riser will be backfilled with bentonite and hydrated. New PVC pipe will be used for each sampling location. Due to the small diameter of the temporary wells, development will be performed with a peristaltic pump. These wells may have limited water and may purge dry during development. However attempts will be made to remove fines from the well prior to sampling (see SOP 3-14). Groundwater samples will be collected in accordance with low-flow sampling protocols using a peristaltic pump with tubing that has been determined to be PFAS free (i.e. high-density polyethylene [HDPE] or other PFAS free material). If the peristaltic pump cannot generate enough hydraulic lift to bring the groundwater to the surface, groundwater samples will be collected using PFAS free 0.85 inch Geotech Bladder pump.

The target depth is specified for each AOC is described in **Table 17-3** below:

Table 17-3: Proposed Screen Interval by Area of Interest

Area of Interest	# Temporary wells	Target Screen Interval (feet bgs)
AOI 1	2	10-15 (1 Well) 25-30 (1 Well)
AOI 2	11	10-15 (8 wells) 25-30 (3 wells)
AOI 3	1	10-15
AOI 4	1	10-15
AOI 5	1	10-15
AOI 6	1	10-15
Facility Boundary	6 (co-located)	10-15 (3 wells) 25-30 (3 wells)

Notes:
bgs = below ground surface

The temporary well will be allowed to recharge for a minimum of 24 hours after installation. The well will be purged at a rate determined by the estimated recharge rate into the well in order to reduce turbidity in the groundwater prior to sampling.

Any non-dedicated sampling materials will be decontaminated between boring locations. Water quality parameters (e.g., temperature, specific conductance, pH, dissolved oxygen, oxidation–reduction potential) will be measured and recorded on the field sampling form after the grab sample has been collected. Water quality parameters will be measured using a water quality meter and flow-through cell. See SOP 3-14: Monitoring Well Sampling and SOP 3-24: Water Quality Parameter Testing for more details.

Each sample will be collected into laboratory-supplied bottleware and submitted to the laboratory for analysis of selected parameters (EPA Method 537 Compliant with Quality Systems Manual (QSM) 5.1 Table B-15). All sample containers will be PFAS free. The laboratory method detection limits for these analytes are presented in **PQAPP Worksheet #15**. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain-of-custody procedures to the laboratory (See SOP 3-04).

At the direction of FTIG, temporary monitoring wells in grass will be abandoned by removing the PVC pipe and backfilling the hole with bentonite chips. It is anticipated that all wells will be installed in the grass however, if they are required in asphalt, they will be abandoned by backfilling with bentonite chips to approximately 6 inches bgs, and the remainder will be patched with asphalt cold patch.

QAPP Worksheet #17d
Sampling Design and Rationale
Phase 2 Permanent Monitoring Well Installation and Groundwater Sampling

DPT rigs with the ability to spin augers will be used to install new, 2-inch diameter monitoring wells constructed with Schedule 40 PVC, flush-threaded 10-feet sections of riser, 0.010-inch slotted well screen, and a threaded bottom cap. The location and depth of the permanent wells will be determined based on the results of Phase 1 (direct push soil sampling and grab groundwater sampling).

If refusal is encountered before the desired depth of sample location, attempts will be made adjacent to the original location. A filter pack of 20/40 silica sand will be installed in the annulus around the well screen to a minimum of 2-feet above the well screen. A 2-foot thick bentonite seal will be placed above the filter sand and hydrated with distilled water. Bentonite grout will be placed in the well annulus from the top of the bentonite seal to ground surface. The bentonite grout will be allowed to set for a period of 24-hours prior to well completion (See SOP 3-12). Monitoring wells completed as "stick-ups" will include a metal protective casing. If a monitoring well is within 20 feet of a runway, it will be installed as a "flush-mount" well.

New monitoring wells will be developed no sooner than 24 hours following installation by pumping and surging using a variable speed submersible pump. Development of wells will be completed per the SOP in PQAPP Appendix C until field parameters have stabilized (See SOP 3-13).

Samples will be collected no sooner than 24 hours following development via low-flow sampling methods using a 1.75" QED Sample Pro® bladder pump (or equivalent) with disposable tubing (See SOP 3-14). Water levels will be measured to the nearest 0.01 inch and recorded. The pump tubing will be PFAS-free (i.e. HDPE or other PFAS-free material) and placed at the center of the well screen or at the mid-point of the water column, if groundwater is not at a higher elevation than the top of the screen. Groundwater sampling equipment will be decontaminated between boring locations, as warranted (See SOP 3-06).

Each sample will be collected into laboratory-supplied bottleware and submitted to the laboratory for analysis of selected parameters (EPA Method 537 Modified). All sample containers will be PFAS free. The laboratory method detection limits for these analytes are presented in **PQAPP Worksheet #15**. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain-of-custody procedures to the laboratory (See SOP 3-04).

Field duplicate samples will be collected at a rate of 10 percent and analyzed for the same parameters as the accompanying samples. Matrix spike and matrix spike duplicates will be collected at the rate of 5 percent and analyzed for the same parameters as the accompanying samples. Field Reagent Blanks will accompany each cooler containing samples for PFAS analysis and will be analyzed for select PFAS. Equipment blanks will not be prepared or analyzed unless a deviation from this plan requires sample handling using non-dedicated equipment. If non-dedicated sampling equipment is used, equipment blank will be collected and will be analyzed for the same analytes as the groundwater samples. A temperature blank shall be placed in each cooler to ensure that samples are preserved at or below four degrees Celsius during shipment.

QAPP Worksheet #17e
Sampling Design and Rationale
Surface Water and Sediment Sampling

Surface water and sediment samples (See SOP 3-10 and 3-22; respectively) will be collected from Indiantown Gap Run Vesle Run, Aries Run, the former waste water treatment plant outfall, and NPDES storm water outfall 003. The sample locations are further described below.

A sample will be collected at the former waste water treatment plant outfall and at NPDES storm water outfall 003, which drains the eastern portion of AOI 2. These outfalls may have been collection points for surface water containing PFAS from AOIs. Samples from Indiantown Gap Run will be taken: immediately up-stream and down-stream of AOI 1; and then up-stream of Marquette Lake; and up-stream of Memorial Lake. A sample will be collected from Indiantown Gap Run downstream of AOI 6, prior to leaving the installation boundary. A sample will be taken from Vesle Run downstream of the western surface water drainage area AOI 2. A sample will be taken from Aries Run, immediately upstream and down-stream of AOI 3, AOI 4, and AOI 5, and then furthest downstream prior to leaving the installation boundary. Surface water and sediment sampling in streams will be initiated at the most downstream end while moving upstream to the next sample location. Sediment samples will be co-located with surface water samples. The surface water sample will be collected prior to the collection of the sediment sample. A surface water grab sample will be collected from a single point in the waterbody using a dip sampler, approximately two-thirds up from the bottom of the water body. Sampling will be performed deliberately and methodically to minimize disturbance of bottom sediments, and as quickly as possible to ensure a representative sample is collected. The surface water sample will be transferred to appropriate sampling container. A sediment coring device will be used to collect the sediment sample from the first one foot of sediment. The sediment will be transferred to a stainless steel bowl where stones in excess of 1 centimeter will be removed. The ArcGIS Collector application will be used to collect Global Positioning System (GPS) coordinates for the sample location.

General water quality parameters will be collected at each sampling location (i.e., temperature, pH, conductivity, dissolved oxygen and Oxidative Reduction Potential) with a water quality meter. The surface water dipper, sediment coring device, and water quality probe will be stainless steel or another PFAS-free material.

Each surface water and sediment sample will be collected into laboratory-supplied bottleware and submitted to the laboratory for analysis of selected parameters (EPA Method 537 Compliant with QSM 5.1 Table B-15). The sediment samples will also be analyzed for TOC (EPA Method 9060A) and pH (EPA Method 9045D). All sample containers will be PFAS free. The laboratory method detection limits for these analytes are presented in **PQAPP Worksheet #15**. Samples will be packaged on ice and transported daily via overnight commercial carrier under standard chain-of-custody procedures to the laboratory (See SOP 3-03 and SOP 3-04).

QAPP Worksheet #17f
Sampling Design and Rationale
Synoptic Water Level Measurements

Groundwater levels will be used to monitor site-wide groundwater elevations and assess groundwater flow. Synoptic water level elevation measurements will be collected from all newly installed permanent monitoring wells and existing monitoring wells. The newly installed monitoring wells will be surveyed and the water level measurement will be taken from the survey mark on the northern side of the well casing. For existing monitoring wells, if a surveyed well casing measuring point is not referenced in available documents, the water level measurement will be taken from the northern side of the well casing.

QAPP Worksheet #17g
Sampling Design and Rationale
Surveying

A small notch will be cut on the northern side of the well casing which will be surveyed by a Pennsylvania-licensed surveyor (See SOP 3-07). All survey data will be collected in the Universal Transverse Mercator Zone 18N projection with WGS84 datum.

QAPP Worksheet #17h
Sampling Design and Rationale
Investigation Derived Waste Management

Currently, the disposal of PFAS investigation derived waste (IDW) is not regulated. PFAS IDW is considered a non-hazardous waste and will be managed in accordance with USEPA, *Management of Investigation Derived Waste* (2014), ARNG guidance, and applicable state regulations.

Non-hazardous solid IDW (i.e., soil cuttings) generated during SI activities will be left in place at the point of the source. The soil cuttings will be distributed evenly around the borehole, or if a temporary well or/and borehole location, placed back in the borehole after sample collection. This IDW will not be sampled and will assume the PFAS characteristics of the associated soil samples collected from that source location.

Soil IDW generated near high traffic areas, aprons, flightlines, or highly visible landscaped areas will be containerized in properly labeled 55-gallon drums (See SOP 3-05). In addition, any soil IDW generated which exhibits PID measurements above background will also be containerized in properly labeled 55-gallon drums. The IDW will be stored within the fenced boundary of FTIG at a location designated by PAARNG. AECOM will coordinate with ARNG for waste profiling, transportation, and disposal of the solid IDW.

Liquid IDW generated during SI activities (e.g., purge water and decontamination fluids) will be discharged directly to the ground surface slightly downgradient of the source. This IDW will not be sampled and will assume the PFAS characteristics of the associated groundwater samples collected from that source location. If direct ground discharge is not permitted liquid IDW will be managed in accordance with the Army Guidance for Addressing Releases of PFAS, Q18 (June 2018). The IDW will be containerized in properly labeled 55-gallon drums (See SOP 3-05). The IDW will be stored on the facility at a location designated by MTARNG. AECOM will coordinate with ARNG for waste profiling, transportation, and disposal of the liquid IDW.

In addition to leaving the soil and liquid IDW at the source of generation, AECOM will collect GPS points around (i.e., polygon) the location of the where the IDW was placed. The polygon will be included in the reporting phase for future use, if required.

Other solids such as spent personal protective equipment, plastic sheeting, tubing, rope, unused monitor well construction materials, and other environmental media generated during the field activities will be disposed of at a licensed solid waste landfill.

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QAPP Worksheet #18: Sampling Locations and Methods

The table below describes the samples that will be collected during the FTIG SI. Note: Sampling SOPs can be found in Appendix C of the PQAPP.

Phase 1						
AOI	**Sample Identifier**	**Matrix**	**Depth (feet bgs)**	**Type (Sampling Tool)**	**Analyte/ Analytical Group**	**Sampling SOP**
1	AOI1-SS1- [0.5-1] AOI1-SS2- [0.5-1] AOI1-SS3- [0.5-1] AOI1-SB1- [Depth] AOI1-SB1- [Depth] AOI1-SB1- [Depth]	Soil	0.5-1 ft bgs, mid-point of boring, and at the bedrock interface	Geoprobe Dual-tube Sampling System	PFAS (EPA Method 537 Compliant with QSM 5.1 Table B-15) TOC (Method 9060A) pH (Method 9045D)	3-21
2	AOI2-SB1-[Depth] AOI2-SB1-[Depth] AOI2-SB1-[Depth] AOI2-SB2-[Depth] AOI2-SB2-[Depth] AOI2-SB2-[Depth] AOI2-SB3-[Depth] AOI2-SB3-[Depth] AOI2-SB3-[Depth] AOI2-SB4-[Depth] AOI2-SB4-[Depth] AOI2-SB4-[Depth] AOI2-SB5-[Depth] AOI2-SB5-[Depth] AOI2-SB5-[Depth] AOI2-SB6-[Depth] AOI2-SB6-[Depth] AOI2-SB6-[Depth] AOI2-SB7-[Depth] AOI2-SB7-[Depth] AOI2-SB7-[Depth] AOI2-SB8-[Depth] AOI2-SB8-[Depth] AOI2-SB8-[Depth]	See Above	See Above	See Above	See Above	3-21

Phase 1						
AOI	**Sample Identifier**	**Matrix**	**Depth (feet bgs)**	**Type (Sampling Tool)**	**Analyte/ Analytical Group**	**Sampling SOP**
	AOI2-SB9-[Depth] AOI2-SB9-[Depth] AOI2-SB9-[Depth] AOI2-SB10-[Depth] AOI2-SB10-[Depth] AOI2-SB10-[Depth] AOI2-SB11-[Depth] AOI2-SB11-[Depth] AOI2-SB11-[Depth] AOI2-SB12- [0.5-1] AOI2-SB13- [0.5-1]					
3	AOI3-SB1-[Depth] AOI3-SB1-[Depth] AOI3-SB1-[Depth]	See Above	See Above	See Above	See Above	3-21
4	AOI4-SB1-[Depth] AOI4-SB1-[Depth] AOI4-SB1-[Depth]	See Above	See Above	See Above	See Above	3-21
5	AOI5-SB1-[Depth] AOI5-SB1-[Depth] AOI5-SB1-[Depth]	See Above	See Above	See Above	See Above	3-21
6	AOI6-SB1-[Depth] AOI6-SB1-[Depth] AOI6-SB1-[Depth]	See Above	See Above	See Above	See Above	3-21
All	FTIG-SD1-[Depth] FTIG-SD2-[Depth] FTIG-SD3-[Depth] FTIG-SD4-[Depth] FTIG-SD5-[Depth] FTIG-SD6-[Depth] FTIG-SD7-[Depth] FTIG-SD8-[Depth] FTIG-SD9-[Depth] FTIG-SD10-[Depth] FTIG-SD11-[Depth]	Sediment	0-1 ft bgs	Sediment Coring Device	See Above	3-22

Phase 1						
AOI	**Sample Identifier**	**Matrix**	**Depth (feet bgs)**	**Type (Sampling Tool)**	**Analyte/ Analytical Group**	**Sampling SOP**
	FTIG-SD12-[Depth]					
1	AOI1-GW1 AOI1-GW2 AOI1-Existing Well ID#1 AOI1-Existing Well ID#2	Groundwater	Mid-screen	Peristaltic Pump	Perfluorinated Compounds (EPA Method 537 Compliant with QSM 5.1 Table B-15)	3-14
2	AOI2-GW1 AOI2-GW2 AOI2-GW3 AOI2-GW4 AOI2-GW5 AOI2-GW6 AOI2-GW7 AOI2-GW8 AOI2-GW9 AOI2-GW10 AOI2-GW11 AOI2-Existing Well ID#1 AOI2-Existing Well ID#2	Groundwater	Mid-screen	See Above	See Above	3-14
3	AOI3-GW1	Groundwater	Mid-screen	See Above	See Above	3-14
4	AOI4-GW1	Groundwater	Mid-screen	See Above	See Above	3-14
5	AOI5-GW1	Groundwater	Mid-screen	See Above	See Above	3-14
6	AOI6-GW1	Groundwater	Mid-screen	See Above	See Above	3-14
7	FTIG-Boundary-GW1 FTIG-Boundary-GW2 FTIG-Boundary-GW3 FTIG-Boundary-GW4 FTIG-Boundary-GW5 FTIG-Boundary-GW6	Groundwater	Mid-screen	See Above	See Above	3-14
All	FTIG-SW1 FTIG-SW2 FTIG-SW3 FTIG-SW4 FTIG-SW5	Surface Water	Two-thirds from bottom of surface water body	Dip Sampler	See Above	3-10

Phase 1						
AOI	**Sample Identifier**	**Matrix**	**Depth (feet bgs)**	**Type (Sampling Tool)**	**Analyte/ Analytical Group**	**Sampling SOP**
	FTIG-SW6 FTIG-SW7 FTIG-SW8 FTIG-SW9 FTIG-SW10 FTIG-SW11 FTIG-SW12					

Notes:
AOI = Area of Interest
bgs = below ground surface
DD = day
EPA = Environmental Protection Agency
FTIG = Fort Indiantown Gap
GW = groundwater
MM = month
MW = monitoring well
QSM =Quality Systems Manual
SB = soil boring
SD = sediment
SW = surface water
SOP = Standard Operating Procedure
TBD = to be determined
TOC = Total Organic Carbon
YY = year

Phase 2						
AOI	**Sample Identifier**	**Matrix**	**Depth (feet bgs)**	**Type (Sampling Tool)**	**Analyte/ Analytical Group**	**Sampling SOP**
TBD	FTIG-MW1 FTIG-MW2 FTIG-MW3 FTIG-MW4 FTIG-MW5 FTIG-MW6 FTIG-MW7 FTIG-MW8 FTIG-MW9 FTIG-MW10	Groundwater	Mid-screen	Peristaltic Pump or Bladder Pump	Perfluorinated Compounds (EPA Method 537 Compliant with QSM 5.1 Table B-15)	3-14

Notes:
AOI = Area of Interest
bgs = below ground surface
DD = day
EPA = Environmental Protection Agency
FTIG = Fort Indiantown Gap
MM = month
MW = monitoring well
QSM =Quality Systems Manual
SOP = Standard Operating Procedure
TBD = to be determined
YY = year

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Final PQAPP Worksheet #19 & #30: Sample Containers, Preservation and Hold Times

Laboratory: Eurofins Lancaster Laboratories Environmental
List any required accreditations/certifications: DoD/ELAP, PADEP
Back-up Laboratory: NA
Sample Delivery Method: FedEx, Courier

Analyte/ Analyte Group	Matrix	Method/SOP	Accreditation Expiration Date	Container(s) (number, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround
PFAS	Aqueous	EPA 537 Modified, QSM 5.1 Table B-15/ WI22030	DoD ELAP 11/30/20; PA NELAP 1/30/20	HDPE w/ HDPE screw cap 2 x 250mL	Cool, 0-6°C	14 days from collection to extraction	28 days from extraction to analysis	28 days
PFAS	Drinking Water	EPA 537 v 1.1/ WI12017	DoD ELAP 11/30/20; PA NELAP 1/30/20	HDPE w/ HDPE screw cap 2 x 250mL	Cool, 0-6°C; Trizma if chlorinated source	14 days from collection to extraction	28 days from extraction to analysis	28 days
PFAS	Solid	EPA 537 Modified, QSM 5.1 Table B-15/ WI22283	DoD ELAP 11/30/20; PA NELAP 1/30/20	4.5 oz plastic bottle	Cool, 0-6°C	28 days from collection to extraction	28 days from extraction to analysis	28 days
Total Organic Carbon	Solid	EPA 9060A, SM 5310 B-2011/ WI11627	DoD ELAP 11/30/20; PA NELAP 1/30/20	Glass 1x4oz or 8 oz	Cool, 0-6°C,	NA	28 days	28 days
pH	Solid	EPA 9045D/ WI11518	DoD ELAP 11/30/20; PA NELAP 1/30/20	Glass 1x4oz or 8oz	Cool, 0-6°C,	NA	NA	28 days
Clay Content	Solid	ASTM D-422/ WI11514	DoD ELAP 11/30/20; PA NELAP 1/30/20	Polyethylene, Glass 1x500 grams	Cool, 0-6°C,	NA	NA	28 days

Notes:
1.) Total Organic Carbon and pH are important for evaluating transport through the soil medium.
2.) Trizma will be added to any groundwater samples collected from drinking water wells, even if the groundwater is not chlorinated.

°C = Degrees Celsius
DoD = Department of Defense
ELAP = Environmental Laboratory Accreditation Program
EPA = Environmental Protection Agency
HDPE = High-density polyethylene
LCMS = Liquid chromatography/ mass spectrometry
mL = milliliter
NA = Not Applicable
NELAP = National Environmental Laboratory Accreditation Program
oz = ounce
pH = potential of hydrogen
PFAS= Per and poly-fluoroalkyl Substances
QAPP = Quality Assurance Plan

QSM = Quality Systems Manual
SOP = Standard Operating Procedure

Final PQAPP Worksheet #20: Field QC Summary

Matrix	Analytical Group	Field Samples	Field Duplicates	Matrix Spikes	Matrix Spike Duplicates	Reagent Blanks	Equipment Blanks*	Field Trip Blanks	Total # Analyses**
Groundwater	PFAS	36	4	1	1	2	2	1	47
Surface Water	PFAS	12	1	1	1	1	1	1	18
Soil	PFAS	42	5	3	3	3	3	0	59
Sediment	PFAS	12	1	1	1	1	1	0	17
Potable Water	PFAS	1	NA	NA	NA	NA	NA	NA	1

Notes:
*Applies only if use of non-dedicated sampling equipment is necessary
NA = Not Applicable
**Phase 1

Measurement Performance Criteria Table — Field Quality Control Samples				
QC Sample	**Analytical Group**	**Frequency**	**Data Quality Indicators**	**MPC**
Matrix: Groundwater (Surface Water)				
Field Duplicate	PFAS	One per 10 field samples	Precision	Values > 5X LOQ: RPD must be ≤30% Values ≤ 5X LOQ: Absolute difference ≤ 2x the LOQ
Matrix Spike/Matrix Spike Duplicate	PFAS	One per 20 field samples[1]	Bias/Accuracy/Precision (lab)	RPD ≤ 30%; Refer to Worksheet #28 for recovery criteria
Equipment Rinsate Blank	PFAS	One per 20 field samples per type of reusable equipment used[2]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank. Laboratory-certified PFAS-free water will be used to collect equipment rinsate blanks.
Reagent Blank	PFAS	One per sampling event[3]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank
Cooler Temperature Blank	PFAS	One per cooler	Representativeness	Temperature must be above freezing and ≤ 6 °C

Measurement Performance Criteria Table — Field Quality Control Samples				
QC Sample	**Analytical Group**	**Frequency**	**Data Quality Indicators**	**MPC**
Matrix: Soils (Surface, Sub-Surface and Sediment)				
Field Duplicate	PFAS, TOC	One per 10 field samples	Precision	Values > 5X LOQ: RPD must be ≤30% Values ≤ 5X LOQ: Absolute difference ≤ 2x the LOQ
Matrix Spike/Matrix Spike Duplicate	PFAS, TOC	One per 20 field samples[1]	Bias/Accuracy/Precision (lab)	RPD ≤ 30%; Refer to Worksheet #28 for recovery criteria
Reagent Blank	PFAS	One per sampling event[3]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank
Equipment Rinsate Blank	PFAS, TOC	One per 20 field samples per type of reusable equipment used[2]	Accuracy/ Bias	No target analytes ≥ ½ LOQ, unless target analytes in field samples are > 10x those in rinsate blank
Cooler Temperature Blank	PFAS	One per cooler	Representativeness	Temperature must be above freezing and ≤ 6 °C

Measurement Performance Criteria Table Notes:

1.) Analyzed more frequently than one per twenty samples or per Sample Delivery Group

2.) Only for re-usable equipment, not for disposable equipment/ supplies.

3.) Regardless of matrix

4.) FRB - An aliquot of reagent water that is placed in a sample container in the laboratory and treated as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment

°C = Degrees Celsius

FRB = Field Reagent Blank

LOQ = Limit of Quantitation

MPC = Measurement Performance Criteria

PFAS = per- and polyfluoroalkyl substances

QC = Quality Control

RPD = Relative Percent Difference

TOC = Total Organic Carbon

Final PQAPP Worksheet #21: Field Standard Operating Procedures (SOPs)

A summary of SOPs is provided in the table below which can be found in Appendix C of the PQAPP. All field staff will be trained through AECOM's internal PFAS Sampling Training prior to performing any sampling activities. A summary of the acceptability of certain materials for use in the PFAS sampling environment is provided in PQAPP Appendix C, Table 1. A PFAS sampling checklist to be completed daily is provided as PQAPP Appendix C, Table 2.

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Modified for Project Work?	Comments
N/A	*Appendix C, Table 1: Summary of Acceptability of Material for Use in PFAS Sampling Environment* *Appendix C, Table 2: PFAS Daily Sampling Checklist*	AECOM	N	See PQAPP Appendix C, Table 1 and Table 2
3-01	*Utility Clearance*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-02	*Logbooks*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-03	*Recordkeeping, Sample Labeling and Chain-of-custody*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-04	*Sample Handling, Storage, and Shipping*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-05	*Investigation-Derived Waste Management*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-06	*Equipment Decontamination*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-07	*Land Surveying*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-10	*Surface Water and Liquid Sampling*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-12	*Monitoring Well Installation*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-13	*Monitoring Well Development*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-14	*Monitoring Well Sampling*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Modified for Project Work?	Comments
3-15	*Monitoring Well and Borehole Abandonment*	AECOM	N	See SOP for detailed procedures
3-16	*Soil and Rock Classification*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-17	*Direct Push Sampling Techniques*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-20	*Operation and Calibration of Photoionization Detector*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-21	*Surface and Subsurface Soil Sampling Procedures*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-22	*Sediment Sampling*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures
3-24	*Water Quality Parameter Testing for Groundwater Sampling*	AECOM	Y	Modified for PFAS sampling See SOP for detailed procedures

Notes:
N = No
PFAS = per- and polyfluoroalkyl substances
SOP = Standard operating procedure

Final PQAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing and Inspection

Field Equipment	Calibration Activity	Maintenance Activity	SOP Reference	Testing Activity	Inspection Activity	Title or Position of Responsible Person	Frequency	Calibration Acceptance Criteria	Corrective Action
Horiba U-52 Water Quality Standards (pH, ORP, DO, Conductivity, Temperature, Turbidity)	Calibrate with standard solutions	Per page 8 of SOP C24	Field Equipment SOP C24	Operational equipment check and calibration	Visually inspect for cleanliness and obvious defects (broken/ missing parts)	Field Technician Lead	Prior to use	pH: ± 0.01 pH units Conductivity: ± 0.01 µS/cm Turbidity: ± 0.01 NTU DO: ± 0.01 mg/l Temp: ± 0.01 °C	Minor: Repair Major: Replace instrument
MiniRAE 2000 (PID)	Calibrate with fresh air and isobutylene calibration gas	Per page 4 of SOP C20	Field Equipment SOP C20	Operational equipment check and calibration	Visually inspect for cleanliness and obvious defects (broken/ missing parts)	Field Technician Lead	Prior to use	0-99 ppm ± 0.1 ppm 100-1,999 ppm ± 1.0 ppm 2000-10,000 ppm ± 10 ppm	Minor: Repair Major: Replace instrument
QED MP10 Controller (Bladder Pump Controller Box)	NA	--	Field Equipment SOP C14	Operational equipment check	Visually inspect for cleanliness and obvious defects (broken/ missing parts)	Field Technician Lead	Prior to use	NA	Minor: Repair Major: Replace instrument
QED SamplePro (Stainless Steel Submersible Bladder Pump)	NA	Per page 7 of SOP C14	Field Equipment SOP C14	Operational equipment check	Visually inspect for cleanliness and obvious defects (broken/ missing parts)	Field Technician Lead	Prior to use	NA	Minor: Repair Major: Replace instrument

Field Equipment	Calibration Activity	Maintenance Activity	SOP Reference	Testing Activity	Inspection Activity	Title or Position of Responsible Person	Frequency	Calibration Acceptance Criteria	Corrective Action
Solinst 101 (Water Level Meter)	NA	Per page 5 of SOP C14	Field Equipment SOP C14	Operational equipment check	Visually inspect for cleanliness and obvious defects (broken/ missing parts)	Field Technician Lead	Prior to use	NA	Minor: Repair Major: Replace instrument

Notes:
N = No
DO = Dissolved Oxygen
NA = Not Applicable
NTU = nephelometric turbidity unit
µS/cm = microSiemens / centimeter
pH = potential for hydrogen
PID = photoionization detector
ppm = parts per million
ORP = Oxidative Reduction Potential
SOP = Standard Operating Procedure
Temp = Temperature

Final PQAPP Worksheet #23: Analytical Standard Operating Procedures (SOPs)

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
WI22030	Polyfluorinated Alkyl Substances (PFAS) in Aqueous Samples by Method 537 Revision 1.1 Modified QSM 5.1 Table B-15 Using LC/MS/MS, version 5, effective 03/15/19	Definitive	Water/PFAS	Triple Quad LC/MS/MS	ELLE	N
WI22283	Polyfluorinated Alkyl Substances (PFASs) in Solids by Method 537 Revision 1.1 Modified Using LC/MS/MS, version 9, effective 03/19/19	Definitive	Solid/PFAS		ELLE	N
WI12017	Perfluorinated Alkyl Substances (PFASs) in Drinking Water by Method 537 version 1.1, version 10, 03/07/19	Definitive	Drinking Water/PFAS	LC/MS/MS	ELLE	N
WI11627	Determination of TOC and TC in Solids and Sludges by Combustion by SM 5310B, EPA 415.1, SW-846 9060/9060A, 10/31/18, version 16	Definitive	Solid/TOC	TOC analyzer	ELLE	N
WI11518	pH by 9045D, 9045D, and Corrosivity by SW-846 Chap 7 of Solids, Soils, and Solvents using Electrometic Methods, 8/10/18, version 12	Definitive	Solid/pH	pH Meter	ELLE	N
WI11514	Particle Size Distribution of Soils and Solids/Grain Size Classification by ASTM D422-63 (reapproved 2007), 1/24/19, version 10	Definitive	Solid/Clay content	Hydrometer	ELLE	N

Notes:
ELLE = Eurofins Lancaster Laboratories Environmental
LC/MS/MS = liquid chromatography/tandem mass spectrometry
N = No
PFAS = per- and polyfluoroalkyl substances
pH = potential of hydrogen
SOP = Standard Operating Procedure
TOC = Total Organic Carbon

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Final PQAPP Worksheet #24: Analytical Instrument Calibrations

Instrument	Calibration Procedure/	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
LC/MS/MS PFAS Table B-15	Mass Calibration	Initially, annually, and after performing major maintenance	Per manufacturer specifications	NA	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	Tuning of LC/MS/MS	When masses fall outside ± 0.5 amu of true masses	Within 0.5 amu of true value	Retune and verify. If tuning fails acceptance criteria, perform a mass calibration and repeat the tune check.	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	Mass Spectral Acquisition Rate	Each analyte, labeled analyte, and injection internal standard	A minimum of 10 spectra scans are acquired across each chromatographic peak	NA	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	Initial calibration with a minimum 5 points	After continuing calibration fails	S/N ratio ≥10:1 for all ions used for quantification. % RSD of the RFs for all analytes must be <20%. Linear or non-linear calibrations must have a r2 ≥0.99. Must use at least 6 points for a quadratic. Analytes must be within 70-130% of their true value for each calibration standard.	Perform more aggressive instrument maintenance and recalibrate	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	MDL standard	After each initial calibration	All compounds must be detected	Repeat ICAL procedure prior to analyzing samples. Repeat maintenance if needed.	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	Instrument Sensitivity Check	Prior to analysis and every 12 hours using a standard with analyte concentrations at the LOQ	Recover within ±30% of their true value	Correct problem and rerun ISC. If problem persists, repeat ICAL	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	ICV Standard	Once with every ICAL	Within ±30% of their true value	Reanalyze the ICV and samples associated with the non-compliant ICV. If ICV fails again do system maintenance, recalibrate, and reanalyze samples.	ELLE analyst	WI22030 & WI22283

Instrument	Calibration Procedure/	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
LC/MS/MS PFAS Table B-15	LOD standard	Quarterly	All compound must be detected	Reprep and reanalyze LOD.	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	LOQ Verification	Quarterly	Within 50% of true value	Reprep and reanalyze LOQ.	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	CCV Standard	Every 10 samples and at the end of a sequence	Alterntate analyte concentrations range from the LOQ to the mid-level of the calibration curve. Recover within ±30% of their true value	Reanalyze CCV in duplicate immediately. If both pass, samples can be report. If either fails or if immediate reanalysis of CCV in duplicate cannot be performed all samples since acceptable CCV must be reanalyzed. If the CCV fails high any associated samples that are ND can be reported.	ELLE analyst	WI22030 & WI22283
LC/MS/MS PFAS Table B-15	Instrument Blanks	Immediately following the highest standard analyzed and daily at start of a sequence	Concentration of each analyte must be ≤1/2 LOQ	If criteria not met after highest calibration standard, must decrease that standard's concentration until criteria is met. If criteria not met for sample, run additional instrument blanks until criteria is met.	ELLE analyst	WI22030 & WI22283
TOC analyzer	Initial Calibration (ICAL) with min 4 points ranging from 0.3 mg to 6 mg	Monthly or after continuing calibration fails	The correlation coefficient must be 0.995 or greater	Correct problem; recalibrate instrument, new calibration verified	Analyst, Supervisor, QA Manager	WI11627
TOC analyzer	Independent Calibration Verification (ICV)	Immediately following the ICAL	±10% (90-110% of true value)	Instrument maintenance, reanalysis of ICV or initial calibration or re-preparation of the standards	Analyst, Supervisor, QA Manager	WI11627
TOC analyzer	Continuing Calibration Verification (CCV)	If instrument is idle > 4 hours, after every 10 field samples, and at the end of the sequence	±10 % (90-110% of true value)	Instrument maintenance, reanalysis of ICV or initial calibration or re-preparation of the standards	Analyst, Supervisor, QA Manager	WI11627

Instrument	Calibration Procedure/	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
TOC analyzer	Continuing Calibration Blank (CCB)	If instrument is idle > 4 hours, after every 10 field samples, and at the end of the sequence	Concentration must be less than the LOQ	Correct problem; recalibrate instrument	Analyst, Supervisor, QA Manager	WI11627
TOC Analyzer	LOD	Quarterly	Detection of compound	Reanalyze	Analyst, Supervisor, QA Manager	WI11627
pH Meter	Calibrate meter; 3 point – 4,7, 10 buffers	Continuing calibration per 10 samples	Continuing calibration verification (CCV) within ±10%.	Recalibrate meter	Analyst, Supervisor QA Manager	WI11518
LC/MS/MS PFC Compounds in Drinking Water by EPA Method 537 Version 1.1	Tuning of LC/MS/MS	When masses fall outside ± 0.5 amu of true masses	Within 0.5 amu of true value	Retune and recalibrate	ELLE analyst	WI12017
LC/MS/MS PFC Compounds in Drinking Water by EPA Method 537 Version 1.1	Initial calibration with a minimum 5 points	After continuing calibration fails	Back calculated concentrations for each analyte in each calibration level must be within 70% to 130% of its true value with the exception of the low calibration standard, CAL 1, where the back calculated concentration must be within 50% to 150% of its true value.	Recalibrate, perform instrument maintenance. If calibration does not meet method criteria, recalibrate.	ELLE analyst	WI12017
LC/MS/MS PFC Compounds in Drinking Water by EPA Method 537 Version 1.1	Peak Asymmetry Factor	After each initial calibration	The factor for the first two eluting peaks in the mid-level ICAL must fall in the range 0.8-1.5. The relative percent difference (RPD) between the high and low areas for each internal standard must be < 20%.	Recalibrate, perform instrument maintenance. If calibration does not meet method criteria, recalibrate.	ELLE analyst	WI12017
LC/MS/MS PFC Compounds in Drinking Water by EPA Method 537 Version 1.1	MDL standard	After each initial calibration	All compounds must be detected	Repeat tuning and ICAL procedure prior to analyzing samples. Repeat maintenance if needed.	ELLE analyst	WI12017

Instrument	Calibration Procedure/	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
LC/MS/MS PFC Compounds in Drinking Water by EPA Method 537 Version 1.1	ICV Standard	Once with every ICAL	Target compounds ≤30% drift.	Reanalyze the ICV. If ICV fails again do system maintenance and recalibrate.	ELLE analyst	WI12017
LC/MS/MS PFC Compounds in Drinking Water by EPA Method 537 Version 1.1	CCC Standard	Every 10 samples, at the beginning and at the end of a sequence	The absolute areas of the quantitation ions for the internal standards must be within 70%-140% of the areas measured in the most recent CCV and within 50%-150% of the average areas measured during the most recent ICAL. The calculated amount for each target analyte and surrogate must be within ±30% of the true value for all CCVs except the low concentration CCV. For the low concentration CCV, each target compound must be within ±50% of the true value and each surrogate must be within ±30% of the true value.	Samples that are not bracketed by acceptable CCV runs must be reanalyzed. If the CCV recoveries are running high indicating increased sensitivity, and no detections of target analytes are observed, the data may be reported with a comment.	ELLE analyst	WI12017

Notes:
Amu = Atomic Mass Unit
CCC/CCV = Continuing Calibration Check/Verification
ELLE = Eurofins Lancaster Laboratories Environmental
ICAL = Initial Calibration
ICV = Initial Calibration Verification
LC/MS/MS = liquid chromatography/tandem mass spectrometry
LOD = Limit of Detection
LOQ = Limit of Quantitation
N = No
NA = Not applicable
ND=Non-detect
MDL = Method Detection Limit
Mg = Milligram
PFAS = per- and polyfluoroalkyl substances
PFC = Perfluorinated Compounds
pH = potential of hydrogen
QA = Quality Assurance
RSD = Relative Standard Deviation
S/N = Signal to Noise Ratio
SOP = Standard Operating Procedure
TOC = Total Organic Carbon

Final PQAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing and Inspection

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
LC/MS/MS	Backflush of column, injection port and pre-columns, cleaning of ion spray cone, adjustment of collision energies, others as needed	Calibration Check	Visual	As Needed	Initial calibration or calibration verification passes method specifications	Perform additional maintenance prior to instrument calibration or calibration verification	ELLE Analysts	WI12019
TOC Analyzer	Change injection needle, change catalyst	TOC	Monitor instrument performance via Continuing Calibration Verification	As needed or replace as necessary, loss of sensitivity or failing resolutions, erratic response	No maintenance is required as long as instrument QC meets criteria	Perform instrument maintenance, clean injection needle, change catalyst	Analyst, Supervisor, QA Manager	
pH Meter	As needed replacement of components	pH	Visual inspection of components	As needed maintenance/calibration checks every 10 injectons	90-110% for calibration checks	Recalibration	ELLE Analyst	WI11518
Hydrometer	Visual inspection	Grain Size	Inspection for cracks or breaks	Each day of use	No cracks or breaks	Replace hydrometer	ELLE analyst	WI11514

Notes:
ELLE = Eurofins Lancaster Laboratories Environmental
LC/MS/MS = liquid chromatography/tandem mass spectrometry
pH = potential of hydrogen
QA = Quality Assurance
SOP = Standard Operating Procedure
TOC = Total Organic Carbon

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Final PQAPP Worksheet #26 & #27: Sample Handling, Custody, and Disposal

Sampling Organization: AECOM

Laboratory: ELLE

Method of sample delivery (shipper/carrier): FedEx

Number of days from reporting until sample disposal: 60 Days

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	AECOM	SOP 3-03 Recordkeeping, Sample Labeling and Chain-of-custody
Chain-of-custody form completion	AECOM	
Packaging	AECOM	SOP 3-04 Sample Handling, Storage, and Shipping
Shipping coordination	AECOM	
Sample receipt, inspection, & log-in	ELLE	WI10725 Environmental Sample Receipt and Unpacking; WI10723 Environmental Sample Entry
Sample custody and storage	ELLE	WI12042 Automated Storage, Retrieval, and Discarding of Samples; SOP11184 Laboratory Sample Analysis Record (LSAR) Documentation
Sample disposal	ELLE	WI12042 Automated Storage, Retrieval, and Discarding of Samples

Notes:
ELLE = Eurofins Lancaster Laboratories Environmental
SOP = Standard Operating Procedure

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Final PQAPP Worksheet #28: Analytical Quality Control and Corrective Actions

Matrix: Soil & Aqueous
Analytical Group: Perfluorinated Compounds
Analytical Method: EPA Method 537 Modified, QSM 5.1 Table B-15
SOP Reference: WI22030 & WI22283
Certification Status: DOD/ELAP & PADEP

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method blanks	1 per prep batch of up to 20 samples	No analytes detected > 1/2 LOQ or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Reanalyze to confirm detections. If detects confirm reextract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected > 1/2 LOQ or >1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater
MS/MSD	1 per prep batch of up to 20 samples	Laboratory statistical limits, if in-house limits do not exist use 70-130%; RPD ≤30%	Flag outliers	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits
LCS/LCSD	1 per prep batch of up to 20 samples	Laboratory statistical limits, if in-house limits do not exist use 70-130%; RPD ≤30%	Reanalyze LCS and associated samples. Analytes in the LCS that fail high and are ND in the samples can be reported. All others are re-extracted.	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits
Isotopically Labeled Extraction Standards	Per sample (including MS/MSD, LCS, and blanks) prior to preparation	Within 50% of true value [1]	If fails for QC sample, but the native compounds are within specification, report data. If fails for sample, reextract and reanalyze and/or consult a supervisor for course of action.	ELLE Analyst	Accuracy	Results within acceptance limits

QC Sample	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Isotopically Labeled Injection Standards	Per sample (including MS/MSD, LCS, and blanks) prior to preparation	Absolute area must be -50% to +50% of the ICAL midpoint standard. On days when an ICAL is not performed the first CCV of the day is used.	Analyze a second aliquot of the extract. If none remains, reanalyze first aliquot and/or consult a supervisor to determine course of action	ELLE Analyst	Accuracy	Results within acceptance limits
Post Spike Sample	Aqueous samples prepared by serial dilution instead of SPE that have reported values <LOQ	70-130% recovery	Reanalyze sample, sample duplicate and post spike sample at higher dilutions until criteria is met	ELLE Analyst	Accuracy	Results within acceptance limits

Notes:

CA = Corrective Action

CCV = Continuing Calibration Verification

DoD/ELAP = Department of Defense/Environmental Laboratory Accreditation Program

ELLE = Eurofins Lancaster Laboratories Environmental

ICAL = Initial Calibration

LC/MS/MS = liquid chromatography/tandem mass spectrometry

LCS/LCSD = Laboratory Control Spike/ Laboratory Control Spike Duplicate

LOQ = Limit of Quantitation

MS/MSD = Matrix Spike/Matrix Spike Duplicate

ND = Non-Detect

PADEP = Pennsylvania Department of Environmental Protection

QC = Quality Control

RPD = Relative Percent Difference

SOP = Standard Operating Procedure

SPE = Solid Phase Extraction

Matrix: Drinking Water
Analytical Group: Perfluorinated Compounds
Analytical Method: EPA Method 537
SOP Reference: WI12017
Certification Status: DOD/ELAP & PADEP

QC Sample	Frequency/Number	Method/SOP Acceptance Limits	Corrective Action	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Laboratory Reagent Blank	1 per prep batch of up to 20 samples	No analytes detected at or above the MDL	Reanalyze to confirm detections. If detects confirm reextract samples that are not ND or not >10x the blank value	ELLE Analyst	Accuracy/Laboratory Contamination	No analytes detected at or above the MDL
MS/MSD	1 per prep batch of up to 20 samples	70-130% for all except low fortified blank which is 50-150%; RPD ≤30%	Flag outliers	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits
LCS/LCSD	1 per prep batch of up to 20 samples	70-130% for all except low fortified blank which is 50-150%; RPD ≤30%	Reanalyze LFB and associated samples. Analytes in the LFB that fail high and are ND in the samples can be reported. All others are re-extracted.	ELLE Analyst	Accuracy/Bias/ Precision	Results within acceptance limits
Surrogates	Per sample (including QC Samples) prior to preparation	70-130%	If fails for QC sample, but the spiked compounds are within specification, report data. If fails for sample, reextract and reanalyze and/or consult a supervisor for course of action.	ELLE Analyst	Accuracy	Results within acceptance limits
Internal Standards	Per sample (including QC samples) prior to preparation	Internal standard responses within 70-140% of the response of the most recent calibration check and not more than 50% from the average area measured during the initial calibration	Analyze a second aliquot of the extract. If none remains, reanalyze first aliquot. If it meets acceptance criteria, report results. Otherwise consult supervisor for course of action.	ELLE Analyst	Accuracy	Results within acceptance limits

Notes:
CA = Corrective Action
DoD/ELAP = Department of Defense/Environmental Laboratory Accreditation Program
ELLE = Eurofins Lancaster Laboratories Environmental
LFB = Laboratory Fortified Blank

LCS/LCSD = Laboratory Control Spike/ Laboratory Control Spike Duplicate
MDL = Method Detection Limit
MS/MSD = Matrix Spike/Matrix Spike Duplicate
ND = Non-Detect
PADEP = Pennsylvania Department of Environmental Protection
QC = Quality Control
RPD = Relative Percent Difference
SOP = Standard Operating Procedure

Matrix: Soil
Analytical Group: Total Organic Carbon
Analytical Method: EPA 9060A
SOP Reference: WI11627 **Certification Status**: DOD/ELAP & PADEP

QC Sample	Frequency/Number	Method/SOP Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Method Blank	One per preparatory batch, maximum of 20 samples	Concentration shall not be > 1/2 the LOQ or 1/10 the amount of sample	The source of contamination should be investigated, and samples should be reanalyzed. If, additional sample is not available, report with narrative.	Analyst, Supervisor, QA Manager	Accuracy/Laboratory Contamination	As per method
LCS	One per preparatory batch, maximum of 20 samples	Laboratory statistical (47-143)	If LCS fails to meet lab criteria, the source of inaccuracy should be investigated, and samples reanalyzed. If additional sample is not available, report in a narrative.	Analyst, Supervisor, QA Manager	Accuracy/Bias/ Precision	As per method
MS	One pair per batch (assuming sufficient volume exists) or as specified by client request.	Laboratory statistical (47-143)	If recovery is outside control limits and a lab error suspected, repeat the MS determination. If the LCS is within control limits and the matrix interference is indicated, analyze a post digestion spike and report results with a narrative.	Analyst, Supervisor, QA Manager	Accuracy/Bias/ Precision	As per method
Duplicate/MSD	One pair per batch (assuming sufficient volume exists) or as specified by client request.	RPD should be ≤20	Investigate the source of the precision error. A source of precision error in the duplicate/MSD may be the homogenous nature of the sample. If lab error is suspected, repeat analysis. If matrix issue is indicated, report with a narrative.	Analyst, Supervisor, QA Manager	Accuracy/Bias/ Precision	As per method

Notes:
CA = Corrective Action
DoD/ELAP = Department of Defense/Environmental Laboratory Accreditation Program
LCS = Laboratory Control Spike
MS = Matrix Spike
PADEP = Pennsylvania Department of Environmental Protection
QA = Quality Assurance
QC = Quality Control
RPD = Relative Percent Difference
SOP = Standard Operating Procedure

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Matrix: Soil
Analytical Group: Clay Content
Analytical Method: ASTM D-422
SOP Reference: WI11514
Certification Status: DOD/ELAP & PADEP

QC Sample	Frequency/Number	Method/SOP Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator	Measurement Performance Criteria
Duplicate	One per batch, maximum of 20 samples	Laboratory statistical RPD	Repeat if sample volume allows or narrate results	Analyst, Supervisor, QA Manage	Accuracy/Bias/ Precision	As per method

Notes:
CA = Corrective Action
DoD/ELAP = Department of Defense/Environmental Laboratory Accreditation Program
PADEP = Pennsylvania Department of Environmental Protection
pH = potential of hydrogen
QA = Quality Assurance
QC = Quality Control
RPD = Relative Percent Difference
SOP = Standard Operating Procedure

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Matrix: Soil
Analytical Group: pH
Analytical Method: EPA 9045D
SOP Reference: WI11518
Certification Status: DOD/ELAP & PADEP

QC Sample	Frequency/Number	Method/SOP Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Standard	Before sample analysis, after every 20 samples and at the end of analysis	Within ±0.05 pH of true value	Do not analyze samples without a daily LCS which meets criteria.	Analyst, Supervisor, QA Manager	Accuracy/Bias/ Precision	As per method
Duplicate	One per batch, maximum of 20 samples	Within 0.1 pH unit	Repeat if sample volume allows or narrate results	Analyst, Supervisor, QA Manage	Accuracy/Bias/ Precision	As per method

Notes:
CA = Corrective Action
DoD/ELAP = Department of Defense/Environmental Laboratory Accreditation Program
PADEP = Pennsylvania Department of Environmental Protection
QA = Quality Assurance
QC = Quality Control
RPD = Relative Percent Difference
SOP = Standard Operating Procedure

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Final PQAPP Worksheet #29: Project Documents and Records

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Logbook	Field Logbook	Sample receipt, custody, and tracking records	Field sampling audit records	
Chain-of-Custody Records	Field Sampling Forms	Sample prep logs	Laboratory audit records	
Air Bills	Equipment Inspection Forms	Equipment calibration logs	Data validation reports	
Custody Seals	Boring Logs	Run logs	Data usability assessment reports	
Corrective Action Forms	Corrective Action Forms	Equipment maintenance test, and inspection logs	Corrective Action Forms	
Field Sampling Forms	Daily Tailgate Health &Safety Sign In Sheet	Corrective Action Forms		
Sample location and depth data	Accident Prevention Plan/Site Safety, & Health Plan Acknowledgement	Reported analytical results		
Field equipment calibration logs	Dig Permits	Data package completeness checklists		
		Sample disposal records		
		Extraction/cleanup records		
		Raw data		
		Right of Entry Agreements		
		Photographic Logs		

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Final PQAPP Worksheet #31, #32 & #33: Assessments and Corrective Action

This worksheet is used to document responsibilities for conducting project assessments, responding to assessment findings and implementing corrective action. Appropriately scheduled assessments allow management to implement corrective action in a timely manner, thereby correcting non-conformances and minimizing their impact on DQOs/Project Quality Objectives.

Assessments:

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Action	Person(s) Responsible for Monitoring Effectiveness of Corrective Action
Project Manager Review	Monthly (for field efforts that are longer than one month)	Internal	AECOM	Project Manager/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Project Manager/ AECOM
Review of Chain of Custody forms	Daily	Internal	AECOM	Project Chemist/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Project Chemist/ AECOM
Laboratory Data Assessment (validation)	Once	Internal	AECOM	Data Validator	Project Chemist/ AECOM	Data Validator	Project Chemist/ AECOM
Daily Quality Control Audits	Daily	Internal	AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Quality Assurance Officer/ AECOM
Field Technical System Audits	Daily	Internal	AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Quality Assurance Officer/ AECOM
Field Performance Audits	Weekly	Internal	AECOM	Project Manager/ AECOM or representative	Field Sampling Team Leader/ AECOM	Field Sampling Team Leader/ AECOM	Project Manager/ AECOM

Assessment Response and Corrective Action:

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Field Sampling Audit	Email	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily Quality Control Report/ Email	Project Quality Manager/ Project Manager	24 hours after notification
Project Manager Review	Email	Field Sampling Team Leader/ AECOM	Immediate	Daily Quality Control Report/ Email	AECOM Project Manager	24 hours after notification
Review of Chain of Custody forms	Email	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily Quality Control Report/ Email	Project Chemist	24 hours after notification
Laboratory Data Assessment (validation)	Written Audit Report	Laboratory QA Manager; AECOM Project Chemist	Within 24 hours after audit	Email	Data Validator	Up to 1 week after notification
Daily Quality Control Audits	Email/ Daily Quality Control Report	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily Quality Control Report/ Email	AECOM Project Manager	24 hours after notification
Field Technical System Audits	Email/ Daily Quality Control Report	Field Sampling Team Leader/AECOM Project Manager	Immediate	Daily Quality Control Report/ Email	AECOM Project Manager	24 hours after notification
Field Performance Audits	Email	Field Sampling Team Leader	Immediate	Daily Quality Control Report/ Email	AECOM Project Manager	24 hours after notification

Laboratory Assessments: ELLE

Assessment Type	Responsible Party & Organization	Number/Frequency	Estimated Dates	Assessment Deliverable	Deliverable Due Date
DoD/ELAP Accreditation	A2LA	Every Two Years	NA	Certification	NA
PT samples	Laboratory QAM	Accreditation	Per Accrediting Authority	Per Accrediting Authority	Per Accrediting Authority
Data Review	Naoum Tavantzis, AECOM	Once	45 days after receipt of data	Validation Report	45 days after receipt of data
External Laboratory Audit	A2LA	Bi-annually	NA	Written Audit Report	NA
Internal Laboratory Audit	ELLE	Annually	NA	Written Audit Report	NA

Notes:
A2LA= American Association for Laboratory Accreditation
COC = Chain of Custody
DoD = Department of Defense
ELAP = Environmental Laboratory Accreditation Program
ELLE = Eurofins Lancaster Laboratory Environmental
NA = Not applicable
PT = Proficiency Testing
QA = Quality Assurance
QAM = Quality Assurance Manager
QC = Quality Control

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Final PQAPP Worksheet #34: Data Verification and Validation Inputs

Item	Description	Verification (Completeness)	Validation (Conformance to Specifications)
Planning Documents/Records			
1	Approved Quality Assurance Project Plan	X	
2	Contract	X	
4	Field Standard Operating Procedures	X	
5	Laboratory Standard Operating Procedures	X	
Field Records			
6	Field logbooks	X	
7	Equipment calibration records	X	
8	Chain-of-Custody Forms	X	X
9	Sampling diagrams/surveys	X	
10	Drilling logs	X	
11	Relevant Correspondence	X	
12	Change orders/deviations	X	
13	Field audit reports	X	
14	Field corrective action reports	X	
Analytical Data Package			
16	Cover sheet (laboratory identifying information)	X	X
17	Case narrative	X	X
18	Internal laboratory chain of custody	X	X
19	Sample receipt records	X	X
20	Sample chronology (i.e., dates and times of receipt, preparation, and analysis)	X	X
21	Communication records	X	
22	Limit of Detection/Quantitation establishment and verification	X	
23	Standards Traceability	X	
24	Instrument calibration records	X	X
25	Definition of laboratory qualifiers	X	
26	Results reporting forms	X	X
27	Quality Control sample results	X	X
28	Corrective action reports	X	X
29	Raw data	X	X
30	Electronic data deliverable	X	X

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Final PQAPP Worksheet #35: Data Verification Procedure

This worksheet documents procedures that will be used to verify project data. It applies to both field and laboratory records. Data verification is a completeness check to confirm that all required activities were conducted, all specified records are present, and the contents of the records are complete. As illustrated in the following example, verification often is performed at more than one step by more than one person.

Records Reviewed	Requirement Documents	Process Description	Responsible Person, Organization
Chain of custody forms and shipping forms	Chain of Custody, Shipping Documents	Chain of custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain of custody should be initialled by the reviewer, a copy of the chain of custody retained in the site file, and the original and remaining copies taped inside the cooler for shipment.	Appropriate Field Sampling Team Leaders for the individual medias
Review of field logbooks	Field Logbooks	Review for completeness and accuracy.	Appropriate field Sampling Team Leaders
Field sampling TSAs	TSA Reports	Assessment of field sampling process prior to start of, or as close to the start of sampling as possible.	QA Manager or designee
Fixed laboratory analytical data review	Laboratory Data Package	Data controls are compared to this QAPP and DoD QSM v 5.1 (and PFAS analysis by Method 537, DoD QSM v5.1 Table B-15) Appendix A in a Three Tiered process using a minimum 100% peer review.	PM or QA Manager
Fixed laboratory TSAs	Laboratory Data Package	Environmental Laboratory Accreditation Program (ELAP) audit and internal quality audits.	QA Manager
Fixed laboratory data verification	Data Validation Reports	100% data verification/validation for water and soil.	AECOM Project Chemist
Fixed laboratory data validation	Data Validation Reports	Calculate and assess laboratory Data Quality Indicators.	QA Manager, or designee

Notes:
DoD = Department of Defense
ELAP = Environmental Laboratory Accreditation Program
PFAS = per- and polyfluoralkyl substances
PM = Project Manager
QA = Quality Assurance
QSM = Quality Services Manual
TSAs = Technical System Audit

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Final PQAPP Worksheet #36: Data Validation Procedures

Data Validator: AECOM

Analytical Group/Method	All Analytical Data
Analytical specifications	WS#24, WS #28 & Laboratory SOP
Measurement performance criteria	WS #12, WS#15, and WS#28
Percent of data packages to be validated	100%
Percent of raw data reviewed	100%
Percent of results to be recalculated	0%
Validation procedure and qualification	National Functional Guidelines for Organic Superfund Data Review (January 2017), DoD Data Validation Guidelines
Validation code	S2bVEM/S2bVM
Electronic validation program/version	EQUIS Data Validation Assistant

Notes:
DoD = Department of Defense
EQuIS = Environmental Quality Information System
S2bVEM = Stage 2b validation, Electronic and Manual
S2bVM = Stage 2b validation, Manual
SOP = Standard Operating Procedure

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Final PQAPP Worksheet #37: Data Usability Assessment

The Data Usability Assessment (DUA) is an evaluation at the conclusion of data collection activities that uses the results of both data verification and validation in the context of the overall project decisions or objectives. Using both quantitative and qualitative methods, the assessment will determine whether project execution and the resulting data the Data Quality Objectives (DQOs) established in **Worksheet #11**. Both sampling and analytical activities will be considered with the ultimate goal to assess whether the final, qualified results support the decisions to be made with the data.

The following personnel are responsible for participating in the data usability assessment:

- AECOM Project Manager: Rosa Gwinn
- AECOM Project Chemist: Naoum Tavantzis
- AECOM SI Task Manager: Brendan McGuinness

The DUA will be documented as a discussion within the SI report and refer to the Data Validation Report that will appear in an appendix of the SI reports. The Data Validation Report will follow the procedures given in **Worksheet #36**.

The following steps summarize the processes used to determine whether the collected data are of the right type, quality, and quantity to support the environmental decision-making for ARNG related to PFAS contamination at certain installations, and describes how data quality issues will be addressed and how limitations on the use of the data will be handled.

Step 1	**Review the project's objectives and sampling design.** The key components established in the DQOs (**Worksheet #11** will be reviewed to ensure that they are still applicable. Also, the sampling design and how it was implemented in the field will be reviewed for consistency with the stated objectives. For example, this step in the DUA will: • Reevaluate whether comparison criteria (i.e., Project Screening Criteria [PSC]; **Worksheet #15**) were updated since Programmatic UFP-QAPP generation and if laboratory quantitation limits (QLs) were sensitive enough for those changes (e.g., QLs remain lower than new criteria). It is important to note several states are in various stages of developing or finalizing limits for PFAS chemicals for different media; therefore, it is critical that PSC are regularly evaluated over the course of the project to ensure the PSC remain current. Additionally, project data must meet the measurement performance criteria for sensitivity and project QLs specified in **Worksheets #15 & 28**. • Discuss the limitations and impact on the use of project data if validation reports indicate that project specific sensitivity goals or QLs were not achieved for a specific sampling or laboratory group, data set or sample delivery group (SDG), matrix, analytical group, or concentration level.
Step 2	**Review the data verification and data validation outputs** All available Quality Assurance (QA) reports, including both field and laboratory generated forms, will be reviewed for deviations from planned activities identified in Step 1 (e.g., number and locations of samples, holding time exceedances, damaged samples, non-compliant proficiency testing (PT) sample results, and SOP deviations) and determine their impacts on the data usability. Validated data will be summarized and/or compiled to identify patterns, trends, and anomalies as they related to the Data Quality Indicators (DQIs) precision, accuracy/bias, representativeness, comparability, and completeness. Descriptions of each DQI and examples of how each may be incorporated into the usability report follows.

Step 2 (cont.)	**Precision** Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. Precision is usually expressed as standard deviation, variance, percent difference, or range, in either absolute or relative terms. QC measures for precision include field duplicates, laboratory duplicates, MSDs, analytical replicates, and surrogates. To meet the needs of the data users, SI project data must meet the measurement performance criteria for precision specified in **Worksheet #12** of this QAPP. Precision errors may be the result of one or more of the following: PFAS cross-contamination, field instrument variation, analytical measurement variation, poor sampling technique, sample transport problems, or spatial variation (heterogeneous sample matrices). To identify the cause of imprecision, the field sampling design rationale and sampling techniques will be evaluated by the reviewer, and both field and analytical duplicate/replicate sample results will be compared. For example, if poor precision is indicated in both the field and analytical duplicates/replicates, then the laboratory may be the source of error. If poor precision is limited to the field duplicate/replicate results, then the sampling technique, PFAS contamination, field instrument variation, sample transport, medium inhomogeneity, or spatial variability may be the source of error. If data validation reports indicate that analytical imprecision exists for a particular data set or SDG, then the impact of that imprecision on usability will be discussed in the usability report.
Step 2 (cont.)	**Accuracy/Bias** Accuracy is the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) due to sampling and analytical operations. Examples of QC measures for accuracy include Matrix Spikes, Laboratory Control Samples, and equipment blanks. A measurement is accurate when the reported value does not differ from the true value or known concentration of the spike or standard. To meet the needs of the data users, project data must meet the measurement performance criteria for accuracy/bias specified in **Worksheet #12** of this QAPP. The usability report for each installation will: • Discuss and compare data on contamination and accuracy/bias (when bias is observable) for each matrix, analytical group, and concentration level. • Describe the limitations on the use of project data if extensive contamination, inaccuracy, or bias exists or when inaccuracy is limited to a specific sampling or laboratory group, data set or SDG, matrix, or concentration level. • Discuss the impact of any qualitative and quantitative trends in bias on the sample data.
Step 2 (cont.)	**Representativeness** Representativeness is the measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition. It is achieved through a well-designed sampling program and by using standardized sampling strategies, techniques, and analytical procedures. To meet the needs of the data users, project data must meet the measurement performance criteria for sample representativeness specified in **Worksheet #12** of this QAPP. **Worksheet #28 & 35** discusses how the QA/QC activities (e.g., review of sampling design and SOPs, field sampling TSAs, analysis audits, etc.) and QC sample data will be reviewed to assess sample representativeness. For example, if field duplicate precision checks indicate potential spatial variability, additional scoping meetings and subsequent resampling may be needed to collect data that are more representative of a nonhomogeneous site. The usability report for each installation will: • Discuss the impact of field duplicate imprecision on site representativeness. For example, when data variability is high among field duplicate data sets (i.e., high relative standard deviation) calculation of the 95% upper confidence limit (UCL) of the population mean is more likely to overestimate the true mean and therefore achieve better statistical coverage. • Discuss the impact of laboratory and field sampling methods on sampling results and how they reflect site conditions. • Discuss the effect of site heterogeneity on sampling results in light of sampling methods used.

	• Describe the limitations on the use of project data when sampling results are non-representative for all data or for a specific sampling, group, data set or SDG, matrix, analytical group, or concentration level.
Step 2 (cont.)	**Comparability** Comparability is the degree to which different methods, data sets, and decisions agree or can be represented as similar. Comparability describes the confidence (expressed qualitatively or quantitatively) that two data sets can contribute to a common analysis and interpolation. The SI results will be used as benchmarks for determining comparability for data collected during any future sampling events at the various installations using the same or similar sampling and analytical SOPs. At this time, data will not be compared to other datasets or data using different sampling or analytical SOPs. To ensure future comparability of data generated for the installations, standard sample collection procedures and approved analytical methods will be used. Sample analyses will be performed by the laboratory using approved methods and procedures. Comparability criteria will be considered met for the project if, based on data reviewed, the sample collection and analytical procedures are determined to have been followed, or defined to show that variations did not affect the values reported. Deviations to sampling scope will be documented in sampling nonconformance reports which may contain some of the discussion of comparability. The usability reports will describe the limitations on the use of project data when project-required data comparability is not achieved for the overall project or is limited to a specific sampling or laboratory group, data set or SDG, matrix, analytical group, or concentration level.
Step 2 (cont.)	**Completeness** Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct, normal circumstances. To meet the needs of the data users, project data must meet the measurement performance criteria for data completeness. Completeness criteria will be considered met if 100% of all planned sample data are collected. As applicable, the usability report may also: • Describe how the amount of valid data will be determined as a percentage of the number of valid measurements for each matrix, analytical group, and concentration level. • Describe how critical data was assessed for completeness when certain sample locations or analytes and matrices are more critical than others in making project decisions. • Evaluate the impact of missing information. Ensure that enough information was obtained for the data to be usable to meet the DQOs (**Worksheet #11**).
Step 2 (cont.)	**Sensitivity** Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a detection limit (DL) study, and Limit of Detection (LOD)/Limit of Quantitation (LOQ) Verifications. To meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project QLs specified in Worksheets #15 & 28 of this QAPP. If appropriate, the usability report may also: • Discuss and compare sensitivity and DL/LOD/LOQ from the data sets collected for the project for each matrix, analytical group, and concentration level. • Discuss the impact of a lack of sensitivity or higher DL/LOD/LOQ on data usability, if validation reports indicate that sensitivity goals or DL/LOD/LOQ goals were not achieved. Describe the limitations on the use of project data if project-required sensitivity goals and DL/LOD/LOQ are not achieved for all project data, or when sensitivity is limited to a specific sampling or laboratory group, data set or SDG, matrix, analytical group, or concentration level.
Step 3	**Verify the assumptions of the selected statistical method** The use of statistical methods for data assessment for this project will be limited to estimating a 95% UCL (or mean as appropriate for the analyte) for the assessment of risks.
Step 4	**Implement the statistical method**

	Where statistical methods are used, the underlying assumptions will be assessed during the DUA. The consequences of selecting the incorrect alternative will be discussed and uncertainty tolerances will be considered.
Step 5	**Document data usability and draw conclusions** The DUA will determine and document whether the data can be used as intended given any deviations and corrective actions that may have occurred. Limitations on data use will be considered and discussed as appropriate and the performance of the sampling design assessed. Conclusions will be drawn taking any data limitations into consideration and documented in the SI report.

Notes:
ARNG = Army National Guard
DL = Detection Limit
DQO = Data Quality Objectives
DUA = Data Usability Assessment
LOD = Limit of Detection
LOQ = Limit of Quantiation
PFAS = Per- and Polyfluorinated Alkyl Substances
PSC = Project Screening Criteria
QAPP = Quality Assurance Project Plan
QA/QC = Quality Assurance/Quality Control
QL = Quantitation Limits
SDG = Sample Delivery Group
SI = Site Investigation
TSA = Technical Systems Audi

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Figures

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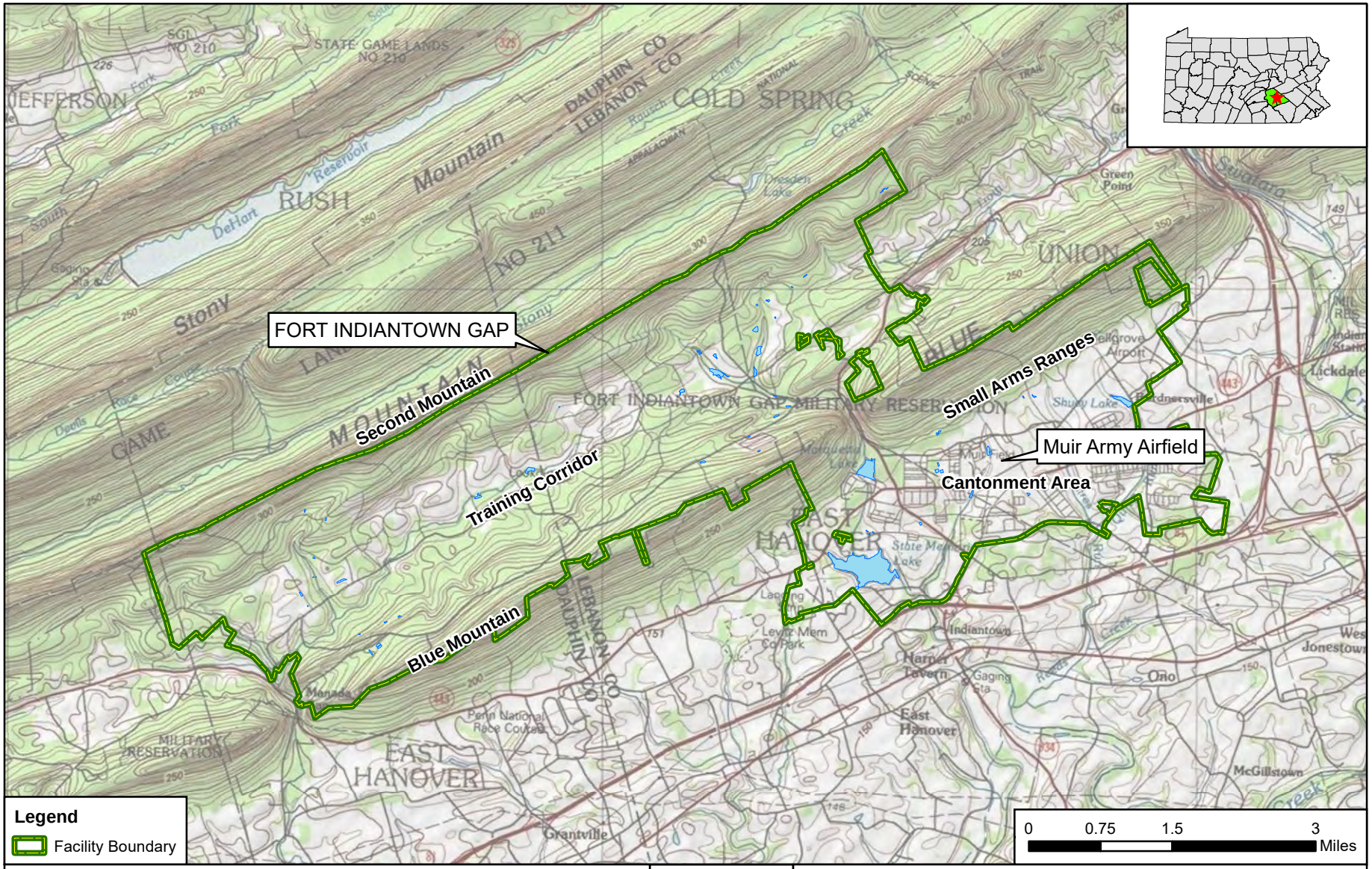

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Base Map: Copyright:© 2013 National Geographic Society, i-cubed		PM	RH	8/22/2018

N

TITLE

Facility Location

AECOM

12420 Milestone Center Drive
Germantown, MD 20876

Figure 10-1

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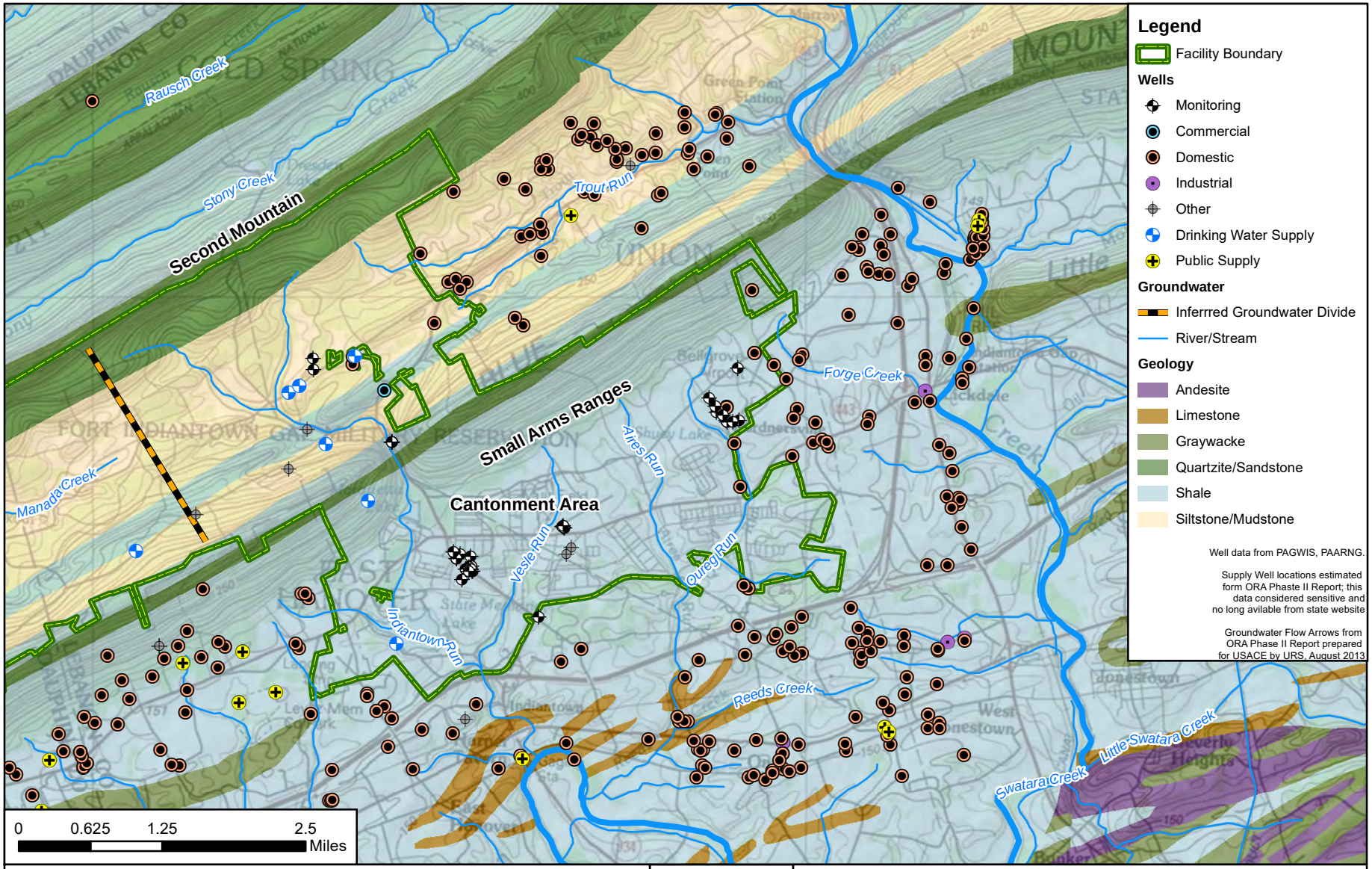

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Base Map: Copyright:© 2013 National Geographic Society, i-cubed Well data: PAGWIS, PAARNG		PM	RG	3/13/2019

TITLE

Groundwater Features

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Figure 10-2

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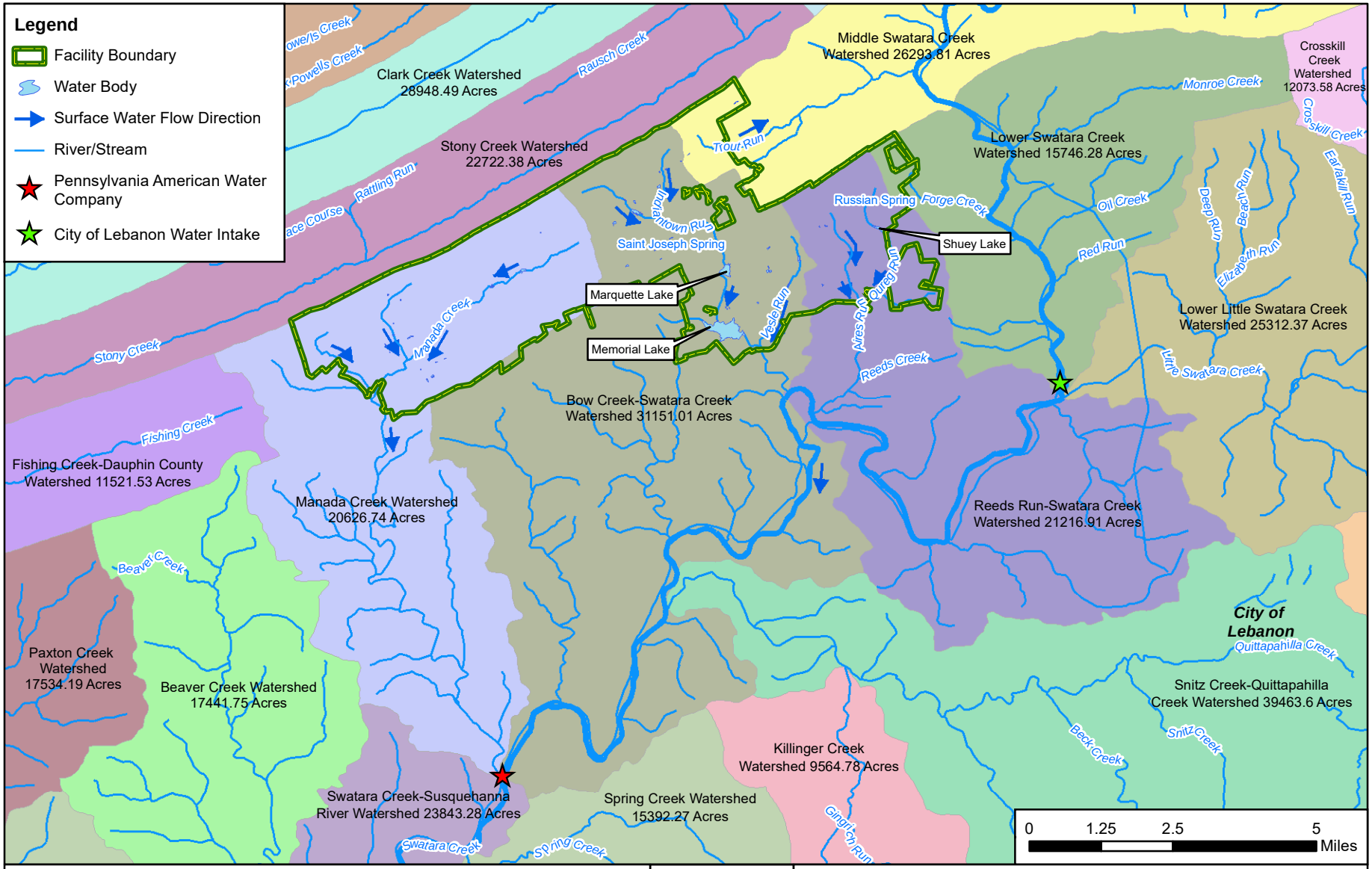

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		PM	RG	2/28/2019

TITLE

Regional Surface Water Features and Drainage Basins

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Figure 10-3

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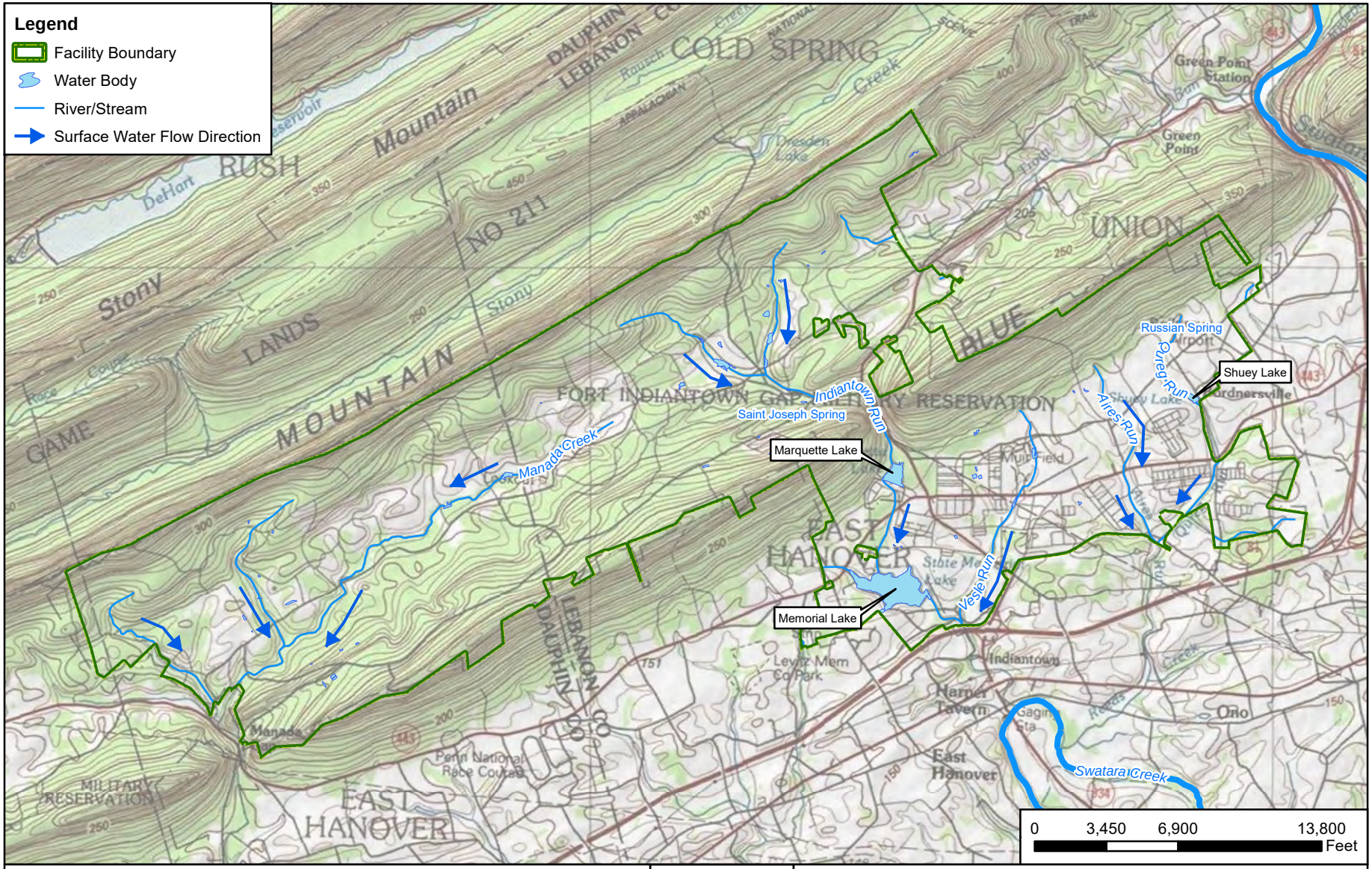

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Base Map: Copyright:© 2013 National Geographic Society, i-cubed		PM	RG	8/22/2018

N

TITLE

Facility Surface Water Features

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Figure 10-4

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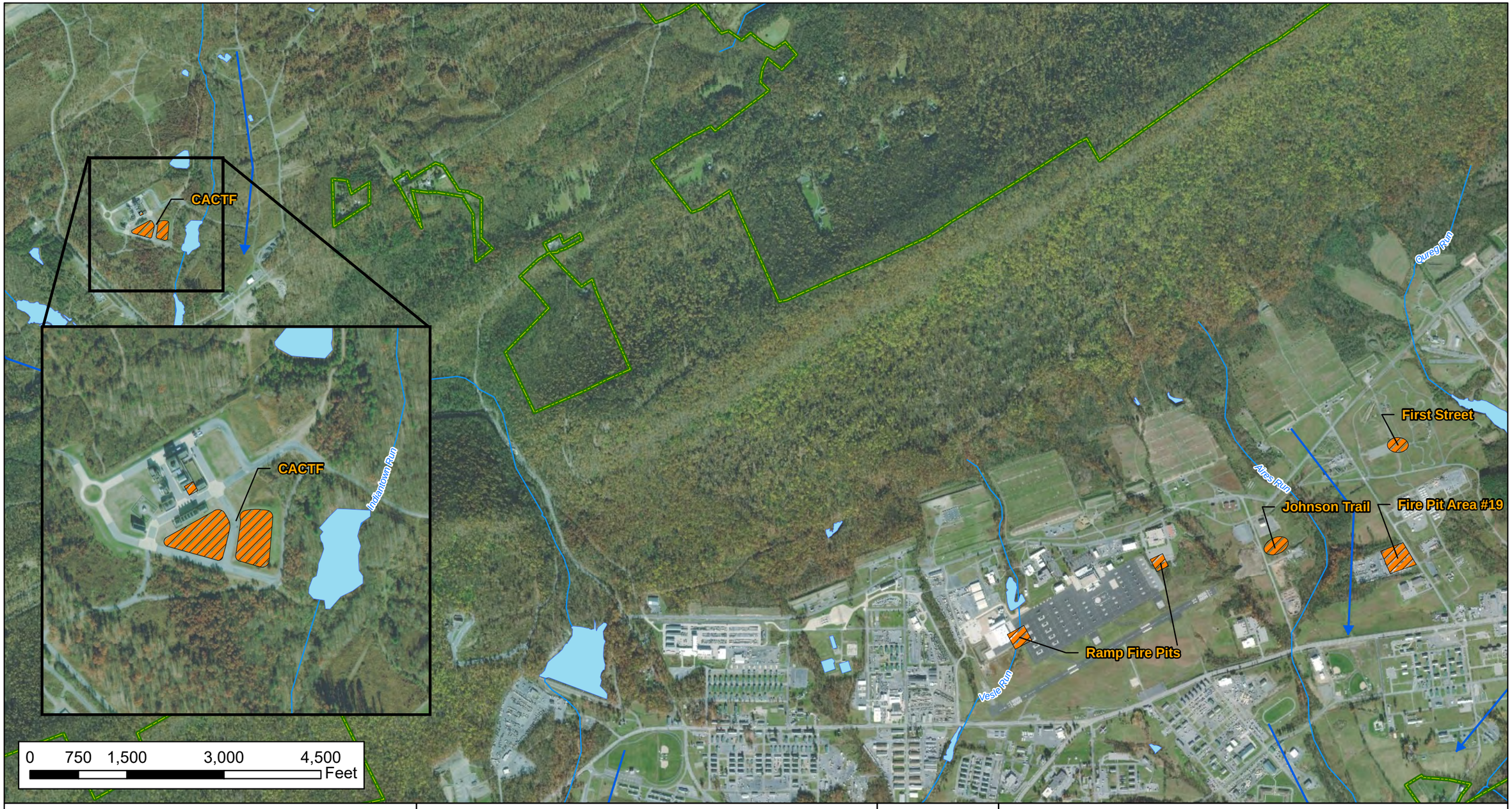

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	8/22/2018

Legend

- Potential PFAS Release
- Facility Boundary
- Water Body
- River/Stream
- Surface Water Flow Direction

N

Fire Training Areas

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Germantown, MD 20876

Figure 10-5

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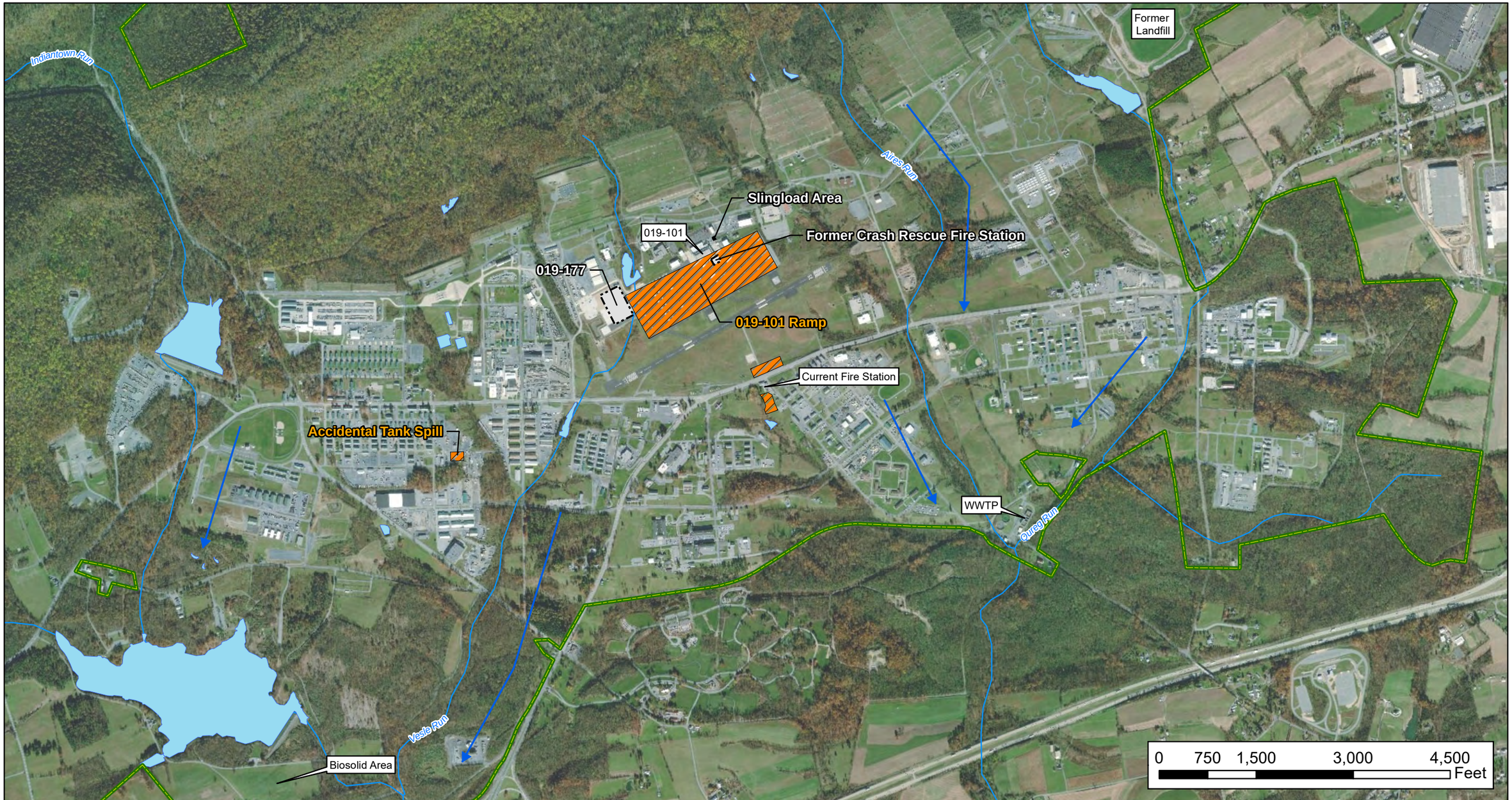

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	3/26/2019

Legend

- No Suspected Release
- Potential PFAS Release
- Facility Boundary
- Water Body
- River/Stream
- Surface Water Flow Direction

N

Non-Fire Training Areas

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Germantown, MD 20876

Figure 10-6

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	LS	8/22/2018

Legend

- Potential PFAS Release
- Facility Boundary
- Water Body
- River/Stream
- Surface Water Flow Direction

N

Emergency Response Areas

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Germantown, MD 20876

Figure 10-7

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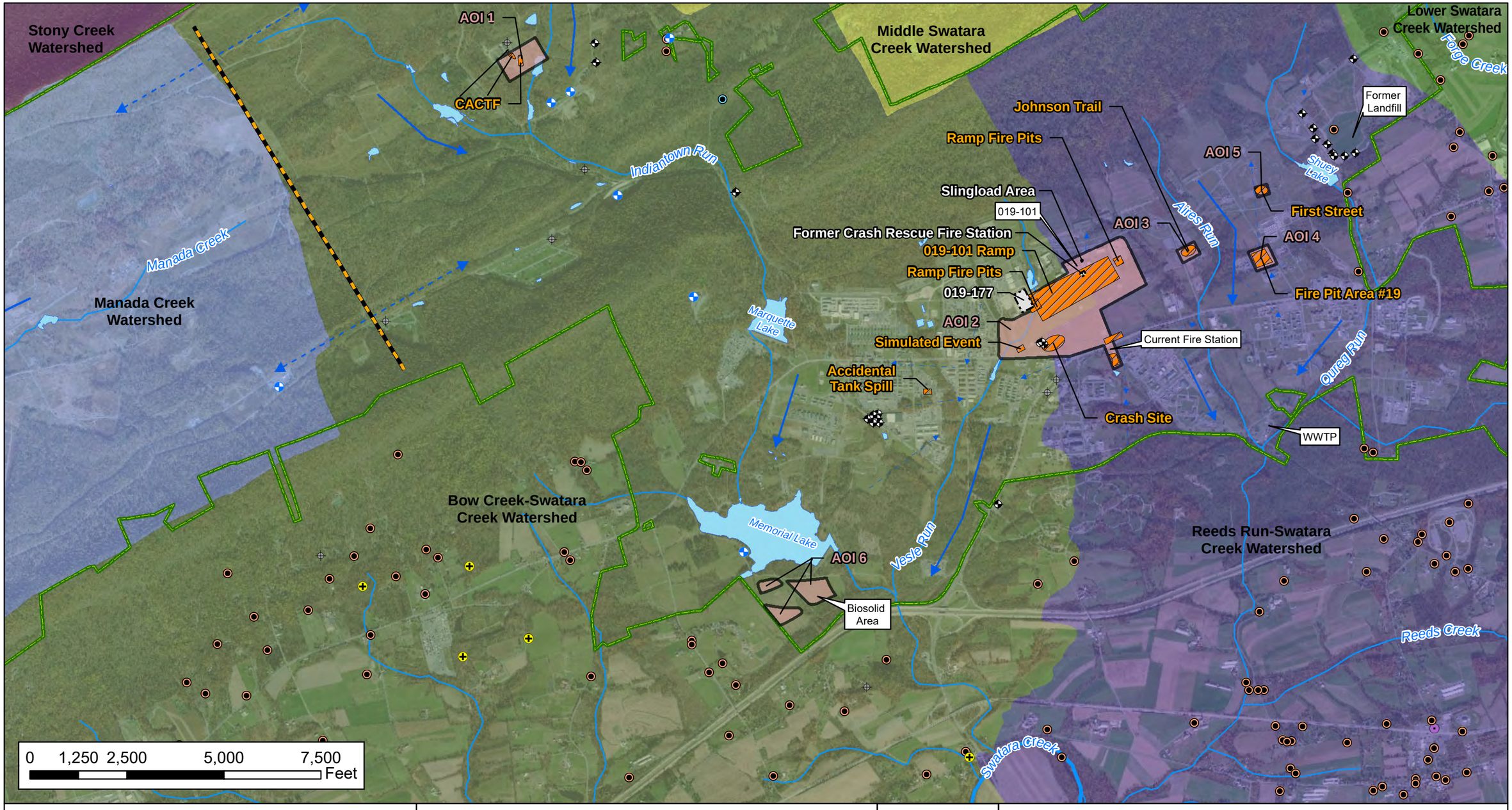

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	3/26/2019

- Area of Interest
- No Suspected Release
- Potential PFAS Release
- Facility Boundary
- Monitoring
- Drinking Water Supply
- Commercial
- Domestic
- Industrial
- Other
- Public Supply
- Water Body
- Inferrred Groundwater Divide
- River/Stream
- Surface Water Flow Direction
- Inferred Groundwater Flow Direction

N

Areas of Interest

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Germantown, MD 20876

Figure 10-8

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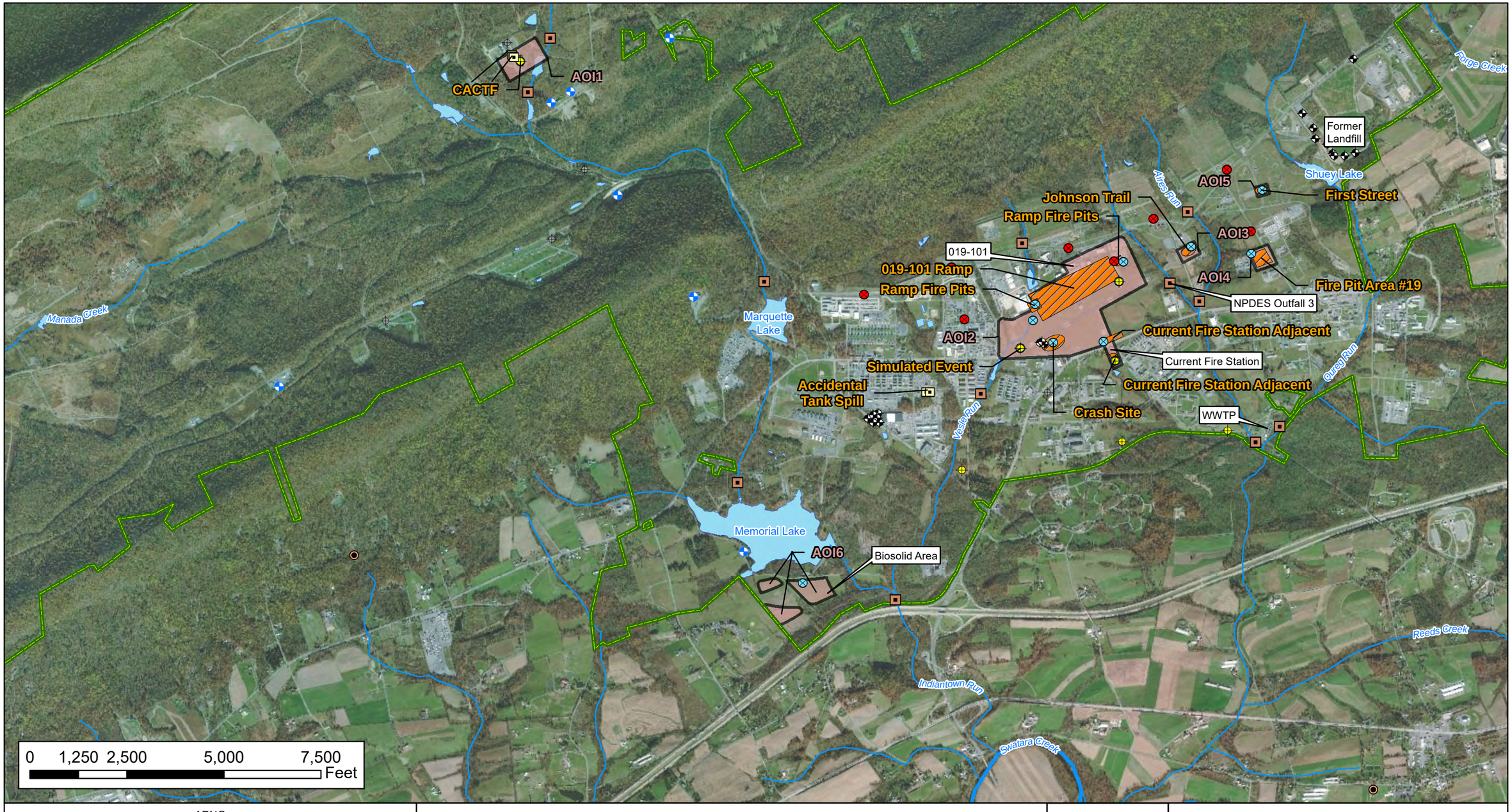

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Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	5/1/2019

- Area of Interest
- Potential PFAS Release
- Facility Boundary
- Water Body
- River/Stream
- SI Surface Soil Location
- SI Co-located Shallow & Deep Well
- Piezometer
- SI 15 ft DPT Boring/Temporary Well
- SI Surface Water Sediment Location
- Domestic Well
- Existing Monitoring Well
- Drinking Water Supply Well
- Other Well

N

Summary of Sampling Locations

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Figure 17-1

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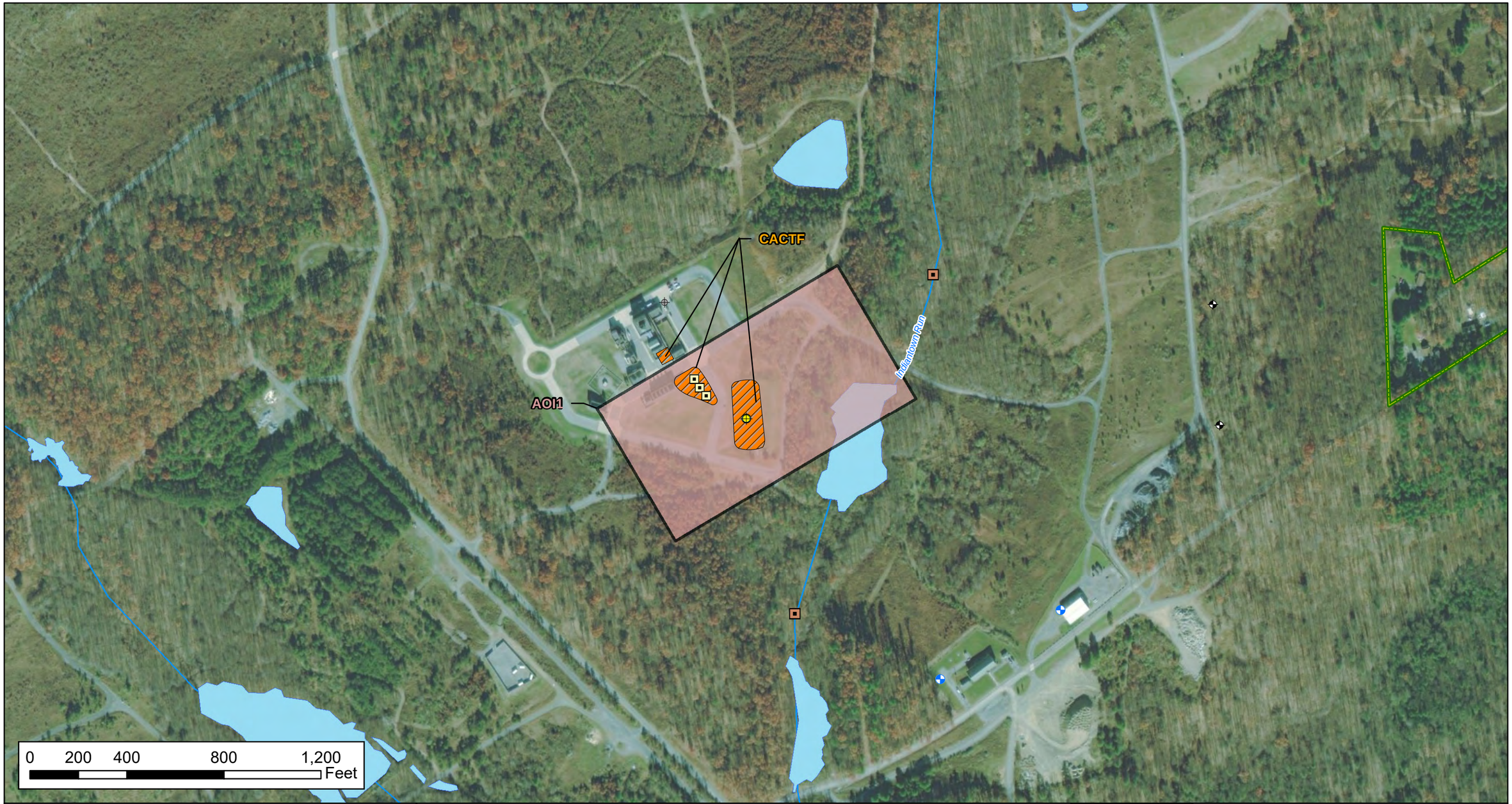

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- Area of Interest
- Potential PFAS Release
- Facility Boundary
- Water Body
- River/Stream
- SI Surface Soil Location
- SI Co-located Shallow & Deep Well
- SI 15 ft DPT Boring/Temporary Well
- SI Surface Water Sediment Location
- Existing Monitoring Well
- Drinking Water Supply Well
- Other Well

N

Proposed Site Inspection AOI 1 - Combined Arms Collective Training Facility

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 17-2

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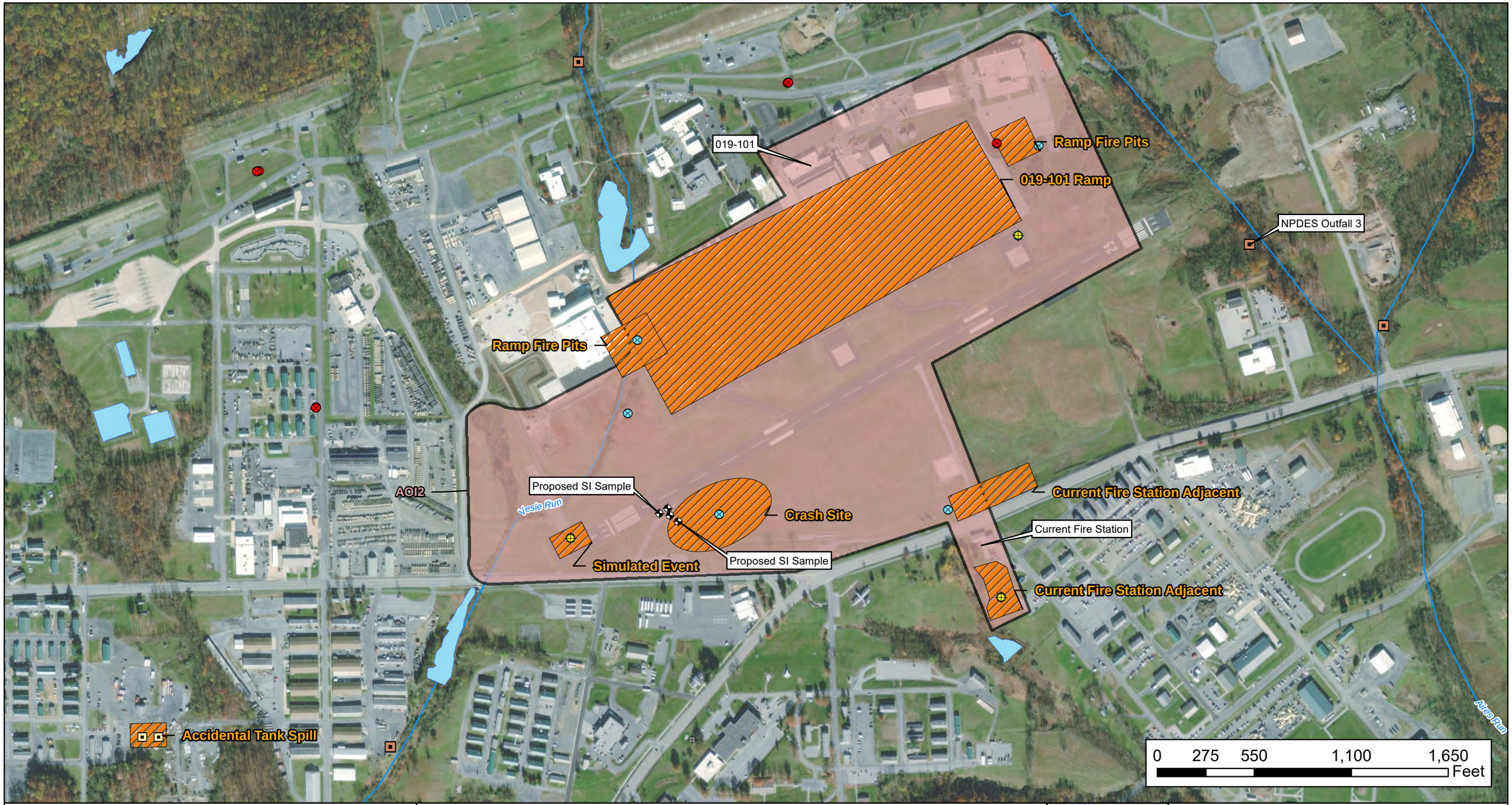

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- Area of Interest
- Potential PFAS Release
- Water Body
- River/Stream
- SI Surface Soil Location
- SI Co-located Shallow & Deep Well
- Piezometer
- SI 15 ft DPT Boring/Temporary Well
- SI Surface Water Sediment Location
- Existing Monitoring Well
- Other Well

N

Proposed Site Inspection AOI 2 - Muir Army Airfield

AECOM 12420 Milestone Center Drive Germantown, MD 20876

Figure 17-3

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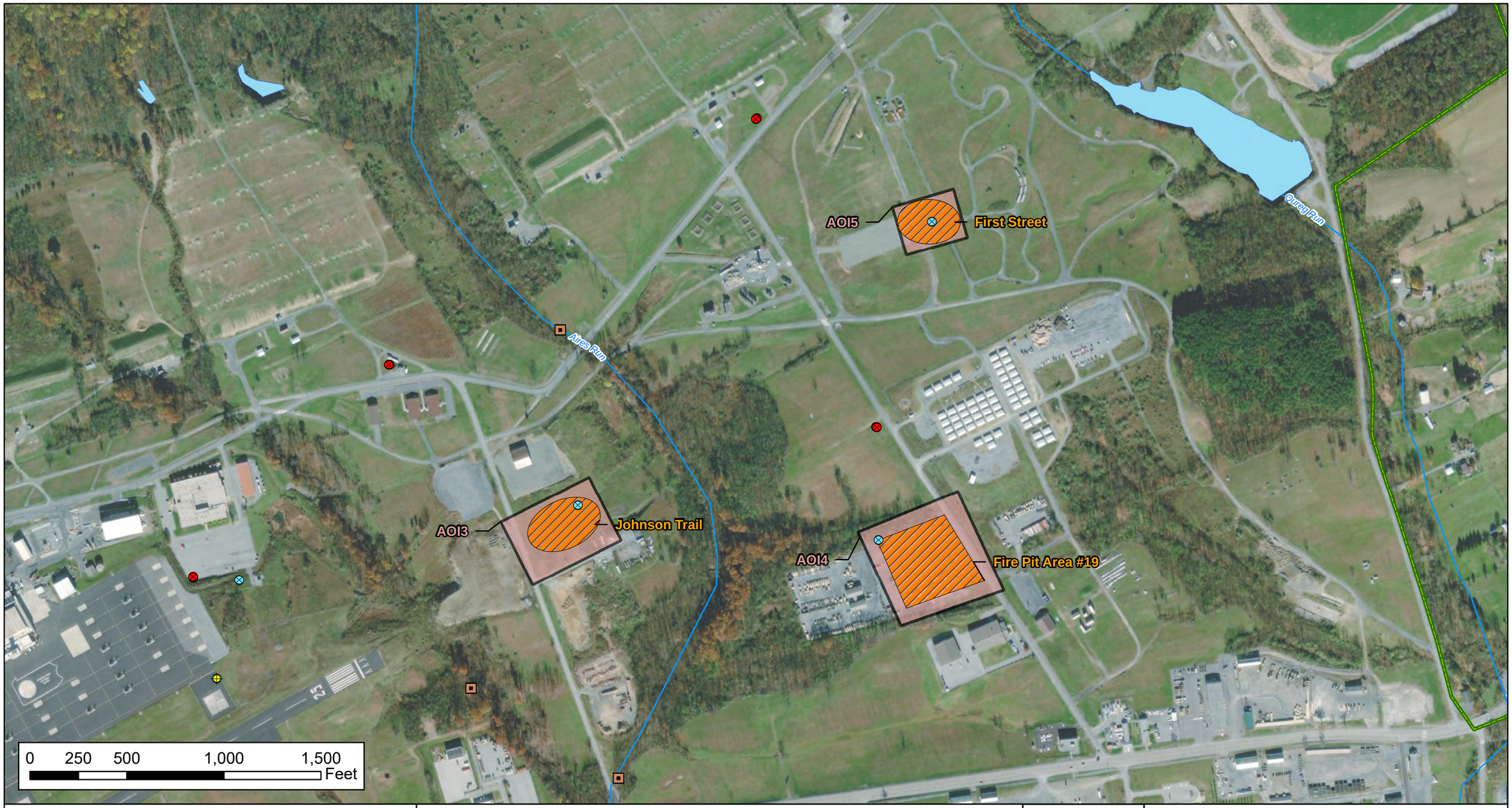

CLIENT	ARNG			
PROJECT	Site Investigation for PFAS at Fort Indiantown Gap, PA			
REVISED	5/1/2019	GIS BY	MS	5/1/2019
SCALE	1:6,000	CHK BY	BM	5/1/2019
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	5/1/2019

- Area of Interest
- Potential PFAS Release
- Facility Boundary
- Water Body
- River/Stream
- SI Co-located Shallow & Deep Well
- Piezometer
- SI 15 ft DPT Boring/Temporary Well
- SI Surface Water Sediment Location

N

Proposed Site Inspections AOI 3 - Johnson Trail, AOI 4 - Fire Pit Area #19, and AOI 5 - First Street

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 17-4

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CLIENT	ARNG			
PROJECT	Site Investigation for PFAS at Fort Indiantown Gap, PA			
REVISED	5/1/2019	GIS BY	MS	5/1/2019
SCALE	1:6,000	CHK BY	BM	5/1/2019
Base Map: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community		PM	RG	5/1/2019

- Area of Interest
- Facility Boundary
- Water Body
- River/Stream
- SI 15 ft DPT Boring/Temporary Well
- SI Surface Water Sediment Location

N

Proposed Site Investigation AOI 6 - Biosolid Area

AECOM
12420 Milestone Center Drive
Germantown, MD 20876

Figure 17-5

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Appendix A – Accident Prevention Plan (Internal)

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FINAL
Site Safety and Health Plan
Fort Indiantown Gap, Annville, Pennsylvania

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

May 2019

Prepared for:

U.S. Army Corps of Engineers, Baltimore District
2 Hopkins Plaza
Baltimore, MD 21201

Prepared by:

AECOM
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Appendix D SSHO Resume
Appendix E Training Certificates
Appendix F PA ARNG Work Notification Form

Acronyms and Abbreviations

°F	degrees Fahrenheit
AECOM	AECOM Technical Services, Inc.
AFFF	Aqueous film forming foam
AHA	Activity Hazard Analysis
amsl	above mean sea level
ANSI	American National Standards Institute
APP	Accident Prevention Plan
Argonne	Argonne National Laboratory
ARNG	Army National Guard
BRAC	Base Realignment and Closure
CACTF	Combined Arms Collective Training Facility
CDM	Camp, Dresser, and McKee
CFR	Code of Federal Regulations
CPR	Cardiopulmonary Resuscitation
ECP	Exposure control plan
EM	Engineer Manual
ERP	Emergency Response Plan
EZ	exclusion zone
FTIG	Fort Indiantown Gap
GPS	Global Positioning System
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSE	Health, Safety and Environment
HSER	Health, Safety and Environment Representative
IED	Installations & Environment Division, Cleanup Branch
kV	kilovolt
MAAF	Muir Army Airfield
MEC	Munitions and explosives of concern
OSHA	Occupational Safety and Health Administration
OVM	Organic vapor monitor
PA	Preliminary Assessment
PAARNG	Pennsylvania ARNG
PADMVA	Pennsylvania Department of Military and Veterans Affairs
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PID	Photoionization detector
PM	Project Manager
PPE	personnel protection equipment
PSHO	Project Safety and Health Officer
RMSF	Rocky Mountain Spotted Fever
SDS	Safety Data Sheets
SH&E	Safety, Health and Environment

SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SI	Site Inspection
THA	Task Hazard Analysis
TLV	Threshold Limit Value
U.S.	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WBGT	Wet Bulb Globe Thermometer

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0. Signature Sheet

a. Plan Reviewed by (Qualified Person, Competent Person, such as corporate safety staff person, QC):

Scott J. Dietz, CSP, STSC — Date: April 5, 2019

AECOM EBL, Safety, Health and Environment Manager
(240) 344 – 5892

b. Plan Approver (Company/corporate officer authorized to obligate the company):

Rosa Gwinn, PhD, PG — 09/18/2018 (Date)

AECOM Project Manager (Task Order Manager)
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c. Plan Concurrence (Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project):

Scott McClelland, PG — 09/18/2018 (Date)

AECOM, Vice President
(301) 820-3453

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1. Introduction

This Site Safety and Health Plan (SSHP) provides the basis for health and safety requirements, guidelines, and procedures that will be used during field activities performed at Fort Indiantown Gap (FTIG), Annville, Pennsylvania.

The Army National Guard (ARNG) is assessing the environmental impacts primarily from aqueous film forming foam (AFFF) and similar chemical releases suspected at their properties under a task order titled *Preliminary Assessments and Site Inspections (PA/SI) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites, ARNG Installations, Nationwide*. In addition, the SI will assess potential impacts to human health and the environment related to processes that use per- and polyfluoralkyl substances (PFAS) (e.g., metal plating and water proofing) and adjacent off-site businesses or operations (not under the control of ARNG) that could potentially be responsible for a PFAS release. This project is being executed by AECOM Technical Services, Inc. (AECOM) under Contract Number W912DR-12-D-0014, Task Order W912DR17F0192, issued 11 August 2017, and Modification 01 issued 30 September 2017 by the United States (U.S.) Army Corps of Engineers (USACE) Baltimore District on behalf of the ARNG-Installations & Environment Division, Cleanup Branch (IED).

The SI project elements will be performed in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act, as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations [CFR] Part 300), and in compliance with USACE Requirements and Guidance for field investigations including specific requirements for sampling for PFOA and PFOS, and the group of related compounds known in the industry as perfluorinated compounds or more commonly known as PFAS. The term PFAS will be used throughout this plan to encompass all PFAS chemicals being evaluated, including PFOS and PFOA, key components of the suspected AFFF releases being evaluated, and the other 16 related compounds listed in the task order.

The main purpose of the SI effort is to determine the presence or absence of PFAS contamination at ARNG facilities and assess whether or not a complete pathway exists between the source and potential receptors. The following field activities will be performed during SI field activities at FTIG:

- Mobilization/demobilization
- Hand auguring borings and grab soil sampling for chemical analysis
- Permanent groundwater monitoring well installation
- Low-flow groundwater sampling for chemical analysis
- Investigation Derived Waste management
- Surveying

This SSHP has been prepared for exclusive use for this program by employees of AECOM. A subcontractor will be needed to perform drilling activities. AECOM will not use this plan for work other than that described in this SSHP or the Programmatic Accident Prevention Plan (APP), nor will AECOM modify it or use it after the expiration date without written approval by the Project Manager (PM); Health, Safety, and Environment Representative (HSER); and Regional Health, Safety, and Environment Manager. This plan is not valid unless it is signed and dated by the PM and authorized Health, Safety, and Environment (HSE) staff.

This SSHP shall not be used by firms or persons not under contract to AECOM without written approval by AECOM's Chief Executive Officer. Any use of this SSHP by other parties, including,

without limitation, third party contractors on projects where AECOM is providing engineering, construction management, or similar services, without the express written permission of AECOM, will be at that party's sole risk, and AECOM shall have no responsibility. The existence and use of this SSHP by AECOM shall not be deemed an admission or evidence of any acceptance of any safety responsibility by AECOM for other parties, unless such responsibility is expressly assumed in writing by AECOM in a specific project contract. If this plan is to be used or modified by the USACE or their authorized representatives, the Project Identification page must be replaced by USACE or its authorized representatives, and neither AECOM nor its staff (past or present) will have any responsibility for the content or applicability of this document.

This SSHP shall be maintained on site at all times for reference by all personnel. This document includes plans required by USACE Engineer Manual (EM) 385-1-1, **Appendix A**.

2. Site Description

FTIG is located in Lebanon and Dauphin Counties in south central Pennsylvania near Annville, approximately 26 miles northeast of Harrisburg (**Figure 2-1**). FTIG is an active National Guard Training Center and serves as headquarters for the Pennsylvania Department of Military and Veterans Affairs (PADMVA) and the PAARNG.

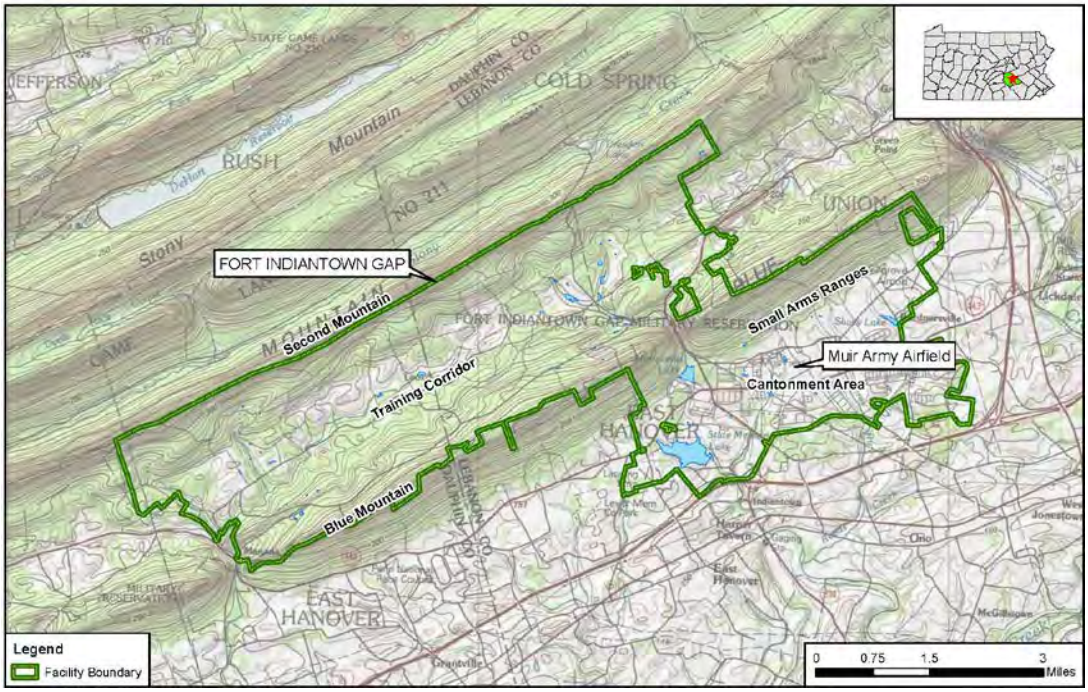
FTIG was originally developed by the Commonwealth of Pennsylvania as a military training facility in 1931 with annual training maneuvers starting in 1933. The land surrounding FTIG was gradually acquired from local farmers, with the exception of 17 privately-owned properties or "in-holdings" that were not purchased during the acquisition. In 1941, the Federal Government began leasing the property from the Commonwealth of Pennsylvania and used it as a training site for armored and infantry divisions.

In July 1995, the Base Realignment and Closure (BRAC) Commission recommended closing FTIG, except for minimum essential ranges, facilities, and training areas used by reserve components. The Commonwealth of Pennsylvania assumed control of the land from the Federal Government in 1998 and converted it back to a training site for ARNG and U.S. Army Reserve units. This arrangement transferred the management of FTIG to the PADMVA, the agency responsible for overseeing the operations of both the PAARNG and the Pennsylvania Air National Guard. Currently, separate leases for the U.S. Army (1990 to 2049) and the Air Force (1989 to 2049) exist.

The total facility is currently in excess of 18,000 acres and comprises a cantonment area, which includes the Muir Army Airfield (MAAF), bombing and strafing ranges, small arms ranges, and maneuver training.

FTIG is located within the Appalachian Plateau at the junction of two sections of the Valley and Ridge Physiographic Province: the Appalachian Mountain Section and the Great Valley Section (Ogden, 2001a). The training corridor lies between Blue and Second Mountains within the Appalachian Mountain Section, while the cantonment area and the small arms ranges lie to the south in the Great Valley Section. The Appalachian Mountain Section is composed of ridges and valleys. The mountain ridges reach elevations of 1,200 to 1,440 feet above mean sea level (amsl). The valley between Blue and Second mountains is approximately 600 to 700 feet amsl, and the cantonment area lies at 400 to 500 feet amsl.

Figure 2-1 Facility Location



3. Hazard Risk Analysis

3.1 Health Hazard Control Program

An objective of this SSHP is to ensure that all operations, materials, and equipment will be evaluated to determine the presence of hazardous environments or if hazardous or toxic agents could be released into the work environment.

The Activity Hazard Analysis (AHA) tables for the project work are presented in **Appendix A**. The AHAs identify all activities, substances and environments that present a hazard and recommend hazard control measures.

Key elements of the AHAs that are required for a Health Hazard Control Program are:

- The written procedures and AHAs are included in this SSHP as certification of the hazard/risk assessment process
- Each AHA identifies the workplace and activity evaluated
- The AHA identifies the name of the person who prepared the AHA and certifies that the evaluation has been performed
- The analysis identifies the date of the evaluation

AECOM requires hazard identification, risk evaluation, control measures, and written procedures to manage health, safety, and environment risks on the job. Hazard and risk assessments were completed and in concurrence with the Project Safety and Health Officer (PSHO), Scott Dietz, to ensure that all operations, materials, and equipment were evaluated and that the hazards and risks associated with the work will be communicated to personnel. The potential hazards associated with work on the site include chemical, physical and biological hazards.

The Site Safety and Health Officer (SSHO), Matt Ginalick, will manage the AHAs on site and with the help of the field crew, improve upon or add to existing analyses as new potential hazards are identified. The AHAs will be reviewed daily to confirm the tasks covered; however, each time a new phase is begun, the corresponding analyses will be read to review the potential safety concerns with each team member prior to each phase of work. The SSHO will conduct the required safety and health inspections.

3.2 Hazard Communication Program

Elements of the AECOM written Hazard Communication Program are presented below as responses to the requirements of USACE EM 385-1-1 06.B.01 (USACE, 2014).

Materials to be brought onsite will have a Safety Data Sheet (SDS) maintained in an accessible location for workers to review. Applicable SDSs are presented in **Appendix B**. Materials to be brought onsite will include:

- Diesel (for generators/drilling equipment)
- Gasoline (for vehicles)
- Alconox (for decontamination)
- Liquinox (for decontamination)

As part of the SSHO daily activities, an inventory of hazardous materials will be prepared with the quantities expected to be on site. The inventory will be updated if any additional materials are brought on site, and as frequently as necessary to reflect accurate quantities.

Unless each container has appropriate labeling, all chemical containers will be labeled with the following information:

- Product name and identity of the hazardous chemical(s)
- Appropriate hazard warnings
- Name and address of the chemical manufacturer, importer, or other responsible party

Labels on incoming containers of hazardous materials will not be removed or defaced. Labels are also required when a hazardous substance is transferred from a primary container to a secondary container. Labels on secondary containers must indicate the product name or the names of the hazardous substances contained therein, as well as related physical and health hazards and their associated target organs. Labels may incorporate words, pictures, symbols, or combinations thereof to ensure the appropriate information is provided to the end user.

Examples of acceptable labeling systems include the National Fire Protection Association Diamond, the Hazardous Materials Identification System, the Chemical Hazard Identification and Training system, or similar.

Employee requirements for reviewing SDSs for specific safety and health protection procedures are presented.

- AHAs will incorporate information contained in the SDSs.
- SDS information will be followed in the use and disposal of material and selection of hazard control and emergency response measures.
- The SSHO will obtain an SDS for each chemical before it is used. SDSs will generally be received by the person ordering the product. SDSs for products frequently used should be kept on file because additional copies may not be included in repeat shipments.
- The SSHO will review each SDS when it is received to evaluate whether the information is complete and to determine whether existing protective measures are adequate.
- The SSHO will maintain a collection of all applicable and relevant SDSs in an area that is accessible by all employees at all times. An electronic database is an acceptable method of maintaining the SDSs.
- The SSHO will replace SDSs when updated sheets are received and will communicate any significant changes to those who work with the chemical.
- SDSs are required for all hazardous materials brought on site by project personnel.

General household products to be used for their specific purpose, as well as food, drugs, and cosmetics brought into the workplace for employee use and consumption, are exempt, as are supplies in the first-aid kit, such as isopropyl alcohol and antibacterial wipes.

Employees bringing hazardous materials on to a site or project must submit SDSs to the SSHO. The SSHO may restrict the use of certain hazardous materials on a site or project due to occupational health risk, hazardous physical properties of the material, or potential employee sensitivity to odor or irritating properties of the material.

Other personnel working in the same area shall be provided with the following information on chemicals used by or provided to AECOM personnel:

- Names of hazardous chemicals to which they may be exposed while on the jobsite
- Precautions the employees may take to lessen the possibility of exposure by usage of appropriate protective measures, such as ventilation or isolation of the work. In some cases, as an administrative control measure, a task may be delayed to a time when a minimal number of employees are present in the area.
- Location of SDSs

As discussed in Section 6 of the APP, employees will be trained initially and periodically when use of hazardous or toxic agents is altered or modified to accommodate changing on-site work procedures. Training shall cover the following topics:

- Requirements and use of the hazard communications program on the project
- The location of all hazardous or toxic agents at the project
- Identification and recognition of hazardous or toxic agents on the project
- Physical and health hazards of the hazardous or toxic agents pertinent to project activities
- Protective measures employees can implement when working with project-specific hazardous or toxic agents

Periodically, employees are required to perform hazardous non-routine tasks. Prior to starting work on such projects, each employee must be provided with information about hazards to which they may be exposed, as follows:

- Specific chemical hazards associated with munitions (metals or explosives constituents in soil)
- Protective/safety measures that must be taken
- Measures that have been taken to lessen the hazards, including ventilation, respirators, presence of another employee, and emergency procedures

Provide training to all employees who have the potential to be exposed to hazardous materials: a) at the time of the initial task assignment; b) whenever new chemicals are introduced into the workplace, and c) more frequently where required by site-specific conditions or client-specific requirements. This training will include the following:

- Applicable regulatory requirements
- Location of the program, inventory, and SDS
- Site-specific chemicals used and their hazards (chemical, physical, and health), including the general characteristics of the chemicals and signs and symptoms of exposure
- How to detect the presence or release of chemicals including the location, types, and usage of any portable and fixed monitoring or detection equipment and their associated alarms, where applicable
- Safe work practices and methods employees can take to protect themselves from chemical hazards (metals or explosives constituents in soil)

- How to read an SDS
- Site- or project-specific information on hazard warnings and labels in use at the location, if applicable
- Site-specific evacuation and rescue procedures in the event of chemical release, including the location of staging areas and personnel accounting procedures

The following documentation will be maintained in the project file:

- Chemical inventory
- SDSs
- Training records

3.3 Hazard Assessment

The potential hazards associated with work on the site include chemical, physical, and biological hazards. AECOM policies require hazard identification, risk evaluation, control measures, and written procedures to manage health, safety, and environment risks on the job. Hazard and risk assessments were completed and reviewed by the PSHO to ensure that all operations, materials, and equipment were evaluated and that the hazards and risks associated with the work will be communicated to personnel.

Written procedures addressing each identified hazard and AHAs for each critical task were prepared (**Appendix A**). These procedures and AHAs are included in this section as certification of the hazard/risk assessment process.

Risk Assessment Codes were assigned using U.S. Army methods, taking into account the mitigation of risk by instituting the controls and procedures described herein. The SSHO will manage the AHAs on site and with the help of site personnel, improve upon or add to existing analyses as new potential hazards are noticed. The AHAs will be reviewed daily to confirm the tasks covered; however, each time a new phase is begun, the corresponding analyses will be read to review the potential safety concerns with each team member prior to each phase of work.

3.4 Chemical Hazards

3.4.1 Per- and Polyfluoroalkyl Substances

There is a risk of occupational exposure to PFAS at the site. In May 2016, the United States Environmental Protection Agency Lifetime Health Advisory established advisory of 70 parts per trillion for PFOA and PFOS, separately or combined for drinking water (United States Environmental Protection Agency [USEPA], 2016a, b).

Human exposure to PFAS is most common through ingestion. Most PFAS compounds are not considered to be volatile; therefore, inhalation and dermal contact have been considered to be relatively minor pathways (USEPA, 2016a, b). Consequently, using proper personal protection equipment (PPE) and following sampling standard operating procedures will minimize human exposure to PFAS during site activity. Protective gloves and safety goggles should be worn at all times during field work in areas where higher exposure to PFAS is anticipated.

3.5 Physical Hazards

There is a risk of injury from physical hazards at the site. Personnel should be aware of the fact that when protective equipment is worn, visibility, hearing, and manual dexterity are impaired. Slips, trips, and falls are the most common cause of on-site injuries.

3.5.1 Slip/Trip/Fall Hazards

As with any field project, uneven work surfaces and other slipping or tripping hazards may be present. Tripping is the most likely physical hazard that will be encountered. Personnel must use caution when walking on unstable or uneven terrain. In addition, proper site housekeeping, removal of trash, and orderly stacking and removal of materials will reduce slipping and tripping hazards. Proper site housekeeping will be the responsibility of all site personnel. The SSHO will conduct regular inspections assessing slip, trip and fall hazards.

3.5.2 Hand Tools and Portable Equipment (S3AM-305-PR1)

Field personnel may use hand tools (e.g., shovels, hand augers) and portable equipment during field activities. To prevent possible injury to the body, some general guidelines should be applied:

1. Keep hand and power tools in good repair and used only for the task for which they were designed.
2. Remove damaged or defective tools from service.
3. Keep surfaces and handles clean and free of excess oil to prevent slipping.
4. Do not carry sharp tools in pockets.
5. Clean tools and return to the toolbox or storage area upon completion of a job.
6. Wrenches must have a good bite before pressure is applied.
7. When working with tools overhead, place tools in a holding receptacle or secure when not in use.
8. Do not throw tools from place to place, from person to person, or drop from heights.
9. Use non-sparking tools in atmospheres with flammable or explosive characteristics.
10. Avoid use of flammable or explosive chemicals when a safer alternative is available.
11. Inspect all tools prior to start-up or use to identify any defects.
12. Powered hand tools should not be capable of being locked in the on position.
13. Require that all power-fastening devices be equipped with a safety interlock capable of activation only when in contact with the work surface.
14. Do not allow loose clothing, long hair, loose jewelry, rings, and chains to be worn while working with power tools.
15. Do not use cheater pipes.
16. Make provisions to prevent machines from automatically restarting upon restoration of power.

17. Equip power tools with designed guards.
18. Provide electrical power control on each power tool to make it possible for the operator to cut off the power without leaving the point of operation.
19. Piggy backing of electrical cords is prohibited.
20. Extension cords, constructed of metal junction boxes and flexible cords shall not be used.
21. Any generators used for power tools will be properly grounded in accordance with National Electric Code 250.34 unless all conditions specified for exemption have been met.
22. Ground Fault Circuit Interrupter protections will be in place for all generator receptacle outlets that provide temporary electrical power.

3.5.3 Hand Safety (S3AM-317-PR1)

Personnel are to perform work that could expose them to hand injury. All personnel are to wear protective gloves specific to their task at hand. If cold conditions exist, glove liners should be worn underneath all protective gloves. Physical protection gloves (i.e., leather) should be worn as necessary. Hands are to be kept clean to prevent slipping and contamination. Hand tools should be kept in good repair and sharp tools should be handled with extra care. All tools should be properly stored. The use of fixed open blades is prohibited. Nitrile gloves will be worn when contact with potentially contaminated soil is anticipated. If both chemical and physical protection are required, nitrile will be worn under the leather or work gloves.

3.5.4 Manual Lifting (S3AM-014-PR1)

Back injuries are among the leading occupational injuries reported by industrial workers. Back injuries such as pulls and disc impairments can be reduced by using proper manual lifting techniques. Leg muscles are stronger than back muscles, so workers should lift with their legs and not with their backs. If the load is too heavy, workers should not attempt to lift it alone. Lifting is always easier when performed with another person, and manual or mechanical assistance should always be used when it is available.

The following guidelines will be followed whenever lifting objects that are of odd size or shape, or that weigh over 50 pounds.

1. Get help when lifting heavy loads. Heavy loads (more than 50 pounds) will only be lifted using a two-person lift.
2. When moving heavy objects such as containers, use a dolly or other means of assistance.
3. Plan the lift. If lifting a heavy object, plan the route and where to place the object. In addition, plan communication signals to be used (i.e., “1, 2, 3, lift”).
4. Wear sturdy shoes that are in good condition and supply traction when performing lifts.
5. Keep your back straight and head aligned during the lift and use your legs to lift the load; do not twist or bend from the waist. Keep the load in front of you; do not lift or carry objects from the side. Keeping the heavy part of the load close to your body will help maintain your balance.

3.5.5 Utilities (S3AM-331-PR1)

Prior to starting work, the SSHO will obtain utility clearances. The SSHO is responsible for ensuring a safe work environment when working around overhead utilities. Pre-work

walkthroughs will be performed with personnel familiar with the facility to identify any overhead and in-work area utilities. These walkthroughs will minimize the chance for accidental contact with or damage to these utilities.

Although overhead utilities are not anticipated, overhead utilities will be treated as energized until determined to be de-energized by testing. The Project Manager (Rosa Gwinn or designated representative) will notify the USACE Contracting Officer's Representative (Tim Peck), ARNG Point-of-Contact (Bonnie Packer), and affected utility company(s) when working near or moving the drill rig or clearing/grubbing in close proximity to overhead utility lines. **Table 8-2** includes contact information.

Use of a direct push drill rigs or hollow stem auger drill rigs to install borings/ monitoring wells will not be conducted within 50 feet (15 meters) of overhead power lines without first contacting the utility company to determine the voltage of the system. No aspect of any piece of equipment is to be operated within 50 feet (15 meters) of overhead power lines until the operations are coordinated with the utility officials. Operations adjacent to overhead lines are prohibited unless one of the following conditions is satisfied:

- Power has been shut off and positive means (e.g., lockout/tagout) have been taken to prevent lines from being energized. Wherever possible, the SSHO will observe power shut off and place a lock and tag on the switch. In all cases, utility company personnel must certify in writing to the SSHO the deactivation of overhead utilities, and the SSHO must retain the certification in the project files.
- Equipment, or any part of the equipment, cannot come within the following minimum clearance from energized overhead electric lines (**Table 3-1**).

Table 3-1 Minimum Clearance from Energized Overhead Lines

Voltage (Nominal, kV, alternating current)	Minimum Rated Clearance
0-50	10 feet
51- 200	15 feet
201-350	20 feet
351-500	25 feet
501-650 651-800 801-950	30 feet 35 feet 40 feet
751-1,000	45 feet

kV = kilovolt

The SSHO will obtain all necessary permits and inspections required by local and Pennsylvania regulations (e.g., Pennsylvania One Call) and will coordinate with FTIG staff for the performance of activities with or around electrical utilities.

Major hazards involved with hitting an underground utility line include electric shock/ electrocution (electric utility line), fire/explosion (gas utility line), trench cave-in (water/sewer utility line), burns (high-pressure steam utility line), communication disruption (telephone line, fiber optic cable), and costs associated with repair and disruption of utility service. One of the most important elements of site preparation is the location of underground utilities.

The possibility of the presence of underground utilities, pipelines, or vessels containing material under pressure will be investigated prior to the start of any intrusive work (e.g., installing additional monitoring wells). AECOM will follow the health and safety requirements outlined in the S3AM-331-PR1 “Underground Utilities” Safety, Health and Environment (SH&E) Procedure (Attachment A, APP).

3.5.6 Heavy Equipment (S3AM-309-PR1)

Drill rigs will be used for soil borings, temporary well installation and permanent monitoring well installation for the work that will be performed at FTIG. Site workers entering and working on-site will be required to wear high visibility traffic safety vests when moving equipment/motor vehicles are in use. If high visibility vests are required when working on/near the drill rig, the vest must be of the break-away type.

The rig will be inspected by the operator for operability prior to setting up on-site. Any deficiencies will be recorded and corrected before direct push activities begin. Adequate site clearing and leveling will be performed to accommodate the rig and supplies, and provide a safe work area. Drilling activities will not start if tree limbs, unstable ground, or site obstructions result in unsafe working conditions.

Work areas will be regulated so that the public will be protected from injury or accident. Adequate danger signs, barriers, caution tape, etc., will be placed so that they will effectively warn the public of hazards and restrict access to danger areas.

The location of emergency response equipment and evacuation procedures will be established prior to the start of work. The drill rig will be equipped with a fire extinguisher (minimum rating of 10-B:C). Smaller rigs will be equipped with at least one easily accessible emergency power shut-off device, and large rigs will be equipped with at least two easily accessible emergency power shut-off devices, which must be within reach of the operator and helper. These devices will be clearly marked and site workers nearby the drill rig will be informed of the location.

Before moving the drill rig, the route of travel will be inspected for depressions, slumps, gullies, ruts, and similar obstacles. The rig will not be moved in reverse unless the driver has personally inspected the area behind the rig. Heavy equipment will be required to have a serviceable automatic back-up alarm. Loads will be tied down on the rig during transport.

After the drill rig has been moved to a new location, the brakes and/or locks will be set. When there is a steep grade, the wheels will be blocked and the rig platform stabilized by outriggers or adequate timbering. The operator will walk completely around the unit before raising the mast at locations where overhead power lines are nearby. The mast will not be raised if distance to power lines is less than 50 feet; refer to SSHP **Section 3.5.5** for guidance on minimum safe clearance distances.

General PPE requirements for drilling activities are briefly outlined below, and detailed information is provided in the AHA.

- *Head protection*: Site workers engaged in work activities where head injury hazards are present will wear approved head protection.
- *Hearing protection*: Hearing protection will be worn during drilling.
- *Foot protection*: Site workers near the rig will be required to wear steel- or composite-reinforced safety shoes or boots.

- *Restrictions*: Loose and frayed clothing, loose long hair, dangling jewelry (including dangling earrings, chains, and wrist watches) are not permitted to be worn while working near rotating / moving parts.

During air knifing activities:

- Refer to SSHP **Section 6.1** for real-time air monitoring requirements.
- The subcontractor operator will be responsible for performing daily inspections of the rig prior to starting work, including a check of hydraulic hoses, connections, and valves. Deficiencies will be corrected before starting equipment.
- The operator will shut off the rig engine before leaving the vicinity. The rig will also be shut down during repairs and maintenance.
- Good housekeeping practices will be followed in and around each work area. Pipe and rods will be stacked on solid level stills, and secured or blocked to prevent spreading or rolling. Scrap, waste material, used PPE, and other debris will be collected and stored in piles or containers for removal and disposal.
- Gears and moving parts will be shielded to prevent accidental contact by site to workers.
- Unattended boreholes must be adequately covered or otherwise protected to prevent site workers or the public from accidentally stepping into a hole.

3.5.7 Noise (S3AM-118-PR1)

During to drilling activities, the decibel ratings are expected to exceed 85 dBA. Therefore hearing protection is mandatory. Personnel will wash their hands with soap and water prior to inserting earplugs to avoid initiating ear infections. All on-site AECOM personnel are in the Medical Surveillance program, as required by Hazardous Waste Operations and Emergency Response (HAZWOPER) and have had baseline and, where appropriate, annual audiograms.

3.5.8 Temperature Extremes (S3AM-113-PR1 and S3AM-112-PR1)

Local weather conditions and the required use of PPE may produce an environment that requires restricted work schedules to protect employees from heat or cold stress. The SSHO will observe workers for any potential symptoms.

Heat Stress Monitoring Plan

If temperature/relative humidity levels are expected to present heat stress conditions, a Wet Bulb Globe Thermometer (WBGT) will be on site and used to measure heat stress parameters. Work-rest cycles will be determined and the appropriate measures taken to prevent heat stress as outlined in S3AM-113- PR1, Heat Stress.

Work-rest schedules will be established by the SSHO based on the screening criteria for Threshold Limit Value (TLV) and Action Limit for Heat Stress Exposure (**Table 3-2**) established by the American Conference of Governmental Industrial Hygienists (2014).

Table 3-2 Heat Stress Exposure TLV and Action Limits

Heat Stress Exposure TLV and Action Limits		
Work Cycle (per hour)	TLV (˚F)	Action Limit (˚F)

	Light	Moderate	Heavy	Light	Moderate	Heavy
75 to 100% Work	87.8	82.4	NR	82.4	77.0	NR
50 to 75% Work	87.8	84.2	81.5	83.3	78.8	75.2
25 to 50% Work	89.6	86.0	84.2	85.1	80.6	77.9
0 to 25% Work	90.5	88.7	86.9	86.0	84.2	82.4

NR = Not recommended
˚F = Fahrenheit

It is expected that workloads will fall into the moderate category (walking with moderate lifting or pushing, or carrying 50 pounds or less). If the WBGT reading exceeds 77.0 degrees Fahrenheit (°F) (for personnel wearing standard work clothing) a work-rest cycle will be established and the measures outlined in S3AM-113, Heat Stress, will be taken to prevent heat stress.

Heat Stress Controls

The best approach to avoiding heat-related illness is through preventive measures to manage heat stress. Preventative measures to be implemented for this project will include:

Rest Areas – A relatively cool, shaded area will be provided for breaks when ambient temperatures exceed 80˚F and workers are wearing regular work clothes. If shade is not available, a canopy will be constructed, or workers will have access to air-conditioned buildings or vehicles. Employees will have access to these rest areas at break times and at any other time a recovery period is needed.

Liquids – Water and electrolyte replacement drinks will be made available. Employees will have access to potable drinking water equivalent to one quart of water per employee per hour during the work shift. Workers should drink 16 ounces before starting work in the morning and after lunch, and 8 to 16 ounces at each break. Employees will be encouraged to avoid alcohol during non-work hours and caffeine during work hours when heat stress conditions are anticipated.

Acclimatization – When working in a heat stress environment, employees will need to adapt to the hot conditions. Workloads should start at 50% capacity and increase 10% each day to achieve 100% capacity. Acclimatization will start to decrease after 3-4 days, and will be gone after one week of not working in a hot environment.

Heat stress controls to be implemented include:

- Allow workers to become acclimatized to the heat (3 to 6 days)
- Provide shaded or air-conditioned break areas
- Provide PFAS-free sun screen to prevent sun burn
- Provide drinking water and electrolyte-replenishing fluids

The SSHO will assess conditions that may cause heat stress in site workers. All site workers will be familiar with the symptoms of heat stress illness described below and will report any symptoms to the SSHO immediately. Personnel should monitor themselves and each other for the development of symptoms such as sudden fatigue, nausea, dizziness, irritability, malaise, flu-like symptoms, and lightheadedness.

Conditions related to heat stress:

Heat Rash may result from continuous exposure to heat or humid air. It appears as red papules, usually in areas where the clothing is restrictive, and gives rise to a prickly sensation, particularly as sweating increases.

To prevent heat rash, shower after work, dry off thoroughly, and put on clean, dry clothes. Try to stay in a cool place after work. See a physician if the rash continues to develop.

Heat Cramps are caused by heavy sweating with inadequate electrolyte replacement. Symptoms include muscle spasms and pain in the hands, feet and abdomen.

First Aid for Heat Cramps: Leave the work area, and rest in a cool, shaded place. Drink beverages that contain salt or eat salty food. Taking adequate breaks and drinking electrolyte replacement drinks should prevent cramps from returning.

Heat Exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool, moist skin
- Heavy sweating
- Dizziness
- Nausea
- Fainting
- Headache
- Blurred vision
- Vomiting

The key here is that the victim is still sweating, so the cooling system is still working; it's just under severe stress. The body core temperature may be elevated, but not higher than 104ºF. It is important to recognize and treat these symptoms as soon as possible, as the transition from heat exhaustion to the very hazardous heat stroke can be quite rapid.

First Aid for Heat Exhaustion: Treatment involves replacing fluids (rehydration) and salts and removing the person from the hot environment. If symptoms are mild, sipping cool, slightly salty beverages every few minutes may be all that is needed. Removing or loosening clothing and applying a wet cloth or ice packs to the skin also aid cooling.

Heat Stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels, typically at or above 104ºF. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Signs and symptoms are:

- Red, hot, usually dry skin
- Lack of or reduced perspiration (lack of perspiration may be masked for those wearing chemical protective clothing since perspiration from earlier in the day will be present)
- Nausea
- Vomiting
- Dizziness and confusion

- Strong, rapid pulse
- Coma

First Aid for Heat Stroke - THIS IS A MEDICAL EMERGENCY! SUMMON MEDICAL ASSISTANCE IMMEDIATELY!

While awaiting transportation to the hospital, a person should be wrapped in cold, wet bedding or clothing; immersed in a lake, stream, or cool bathtub; or cooled with ice. At the hospital, body cooling is usually accomplished by removing the clothes and covering the exposed skin with water or ice. To speed evaporation and body cooling, a fan may be used to blow air on the body. Body temperature is measured frequently, often constantly. To avoid overcooling, cooling is stopped when the body temperature is reduced to about 102°F.

Cold Stress Monitoring Plan

Cold stress is a concern when field crews are working outdoors in damp and cool (below 50°F) conditions or anytime temperatures are below 32°F. The appropriate measures taken to prevent cold stress are outlined in S3AM-112, Cold Stress.

Personnel should monitor weather forecasts each day and schedule work for the warmer part of the day. While working, ambient temperature, wind speed, and precipitation should be monitored, and a warming regimen should be implemented to allow workers breaks from the cold. Shelter to escape cold, wind, and precipitation, and a source of heat (such as warm packs or portable heaters) should be provided at the worksite. Other cold stress prevention controls include:

- Changing clothes when work clothes become wet with sweat
- Avoiding caffeine (which has diuretic and circulatory effects)
- Ensuring workers drink warm, sweet drinks or soups to increase their caloric intake and reduce the possibility of cold weather dehydration

When site conditions are as described above, workers should wear at least three layers of clothing, with an inner layer of cotton or synthetic material, a middle layer of down, wool, or similar material to provide insulation, and an outer layer to break the wind and allow some ventilation. A hat or hardhat liner will help maintain body heat, and insulated boots and gloves will reduce the chance of frostbite. Workers should keep a change of dry clothing available in case work clothes become wet; drink plenty of warm liquids, avoiding caffeine and alcohol; eat high-calorie snacks to help maintain body metabolism; and work in pairs and watch for signs of cold stress.

Hypothermia: Hypothermia results when the body loses heat faster than it can be produced. When this situation first occurs, blood vessels in the skin constrict in an attempt to conserve vital internal heat. Hands and feet are first affected. If the body continues to lose heat, involuntary shivers begin. This is the body's way of attempting to produce more heat, and it is usually the first real warning sign of hypothermia. Further heat loss produces speech difficulty, confusion, loss of manual dexterity, collapse, and finally death. Wet clothes or immersion in cold water greatly increases the hypothermia risk. The progressive clinical presentation of hypothermia is described in **Table 3-3**.

Frostbite: Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite can be categorized into:

Frost Nip or Initial Frostbite: (1st degree frostbite) Characterized by blanching or whitening of skin.

Superficial Frostbite: (2nd degree frostbite) Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Blistering and peeling of the frozen skin will follow exposure.

Deep Frostbite: (3rd degree frostbite) Tissues are cold, pale, and solid; extremely serious injury with possible amputation of affected area.

Frostbite can occur without hypothermia when the extremities do not receive sufficient heat. The toes, fingers, cheeks, and ears are the most commonly affected. Frostbite occurs when there is freezing of the fluids around the cells of the affected tissues. The first symptom of frostbite is an uncomfortable sensation of coldness, followed by numbness. There may be tingling, stinging, or cramping. Contact by the skin with tools or other metal objects below 20°F (-7 degrees Celsius) may result in contact frostbite.

Table 3-3 Cold Stress Monitoring

Condition	Signs/Symptoms	Treatment
Hypothermia Mild Body temperature (98°-90°F)	• Shivering • Lack of coordination • Stumbling, fumbling hands • Slurred speech • Memory loss • Pale, cold skin	• Move to warm area • Stay active • Remove wet clothes and replace with dry clothes or blankets • Cover the head • Drink warm (not hot) sugary drink
Hypothermia Moderate Body temperature (90°-86°F)	• Shivering stops • Unable to walk or stand • Confused and irrational	• Move to warm area • Stay active • Remove wet clothes and replace with dry clothes or blankets • Cover the head • Drink warm (not hot) sugary drink • Call for an ambulance • Cover all extremities completely • Place very warm objects, such as hot packs, or water bottles on the victim's head, neck, chest and groin
Hypothermia Severe Body temperature (86°-78°F)	• Severe muscle stiffness • Very sleepy or unconscious • Ice cold skin death	• Call for an ambulance • Treat the victim very gently • Do not attempt to re-warm the victim. The victim should receive treatment in the hospital
Frostbite	• Cold, tingling, stinging or aching feeling in frostbitten area • Numbness • Skin color turns red, then purple, then white or very pale skin, cold to the touch • Blisters in severe cases	• Seek medical attention • Do not rub the area • Wrap in soft cloth • If help is delayed, immerse in warm, not hot, water
Trench Foot	• Tingling, itching or burning sensation	• Soak feet in warm water, then wrap with dry cloth bandages

	• Blisters	• Drink a warm, sugary drink

3.5.9 Other Weather-Related Hazards

Other weather-related hazards that may take place during the site activities include heavy rains, damaging winds, thunderstorms, tornados, floods, wildfires, and lightning. Weather forecasts will be checked prior to site work each day on the National Oceanic and Atmospheric Administration website and will be monitored throughout the day by cell phone. If threatening weather conditions are predicted, the SSHO will determine if work can continue without endangering the health and safety of site personnel by using the following guidelines:

- Potential for lightning strikes
- Potential for heat or cold stress
- Limited visibility
- Inclement weather-related working conditions
- Roads becoming impassable

Outside work will be suspended during severe weather, including electrical storms. The SSHO will monitor storms and activate a lighting safety plan at the count of 30 seconds from the flash to the bang (6 miles away) and activities will not resume for 30 minutes from the last observed strike. This is called the 30:30 Rule. Personnel will seek shelter in the vehicles or a nearby building, as designated during the morning safety briefing.

3.5.10 Flammable and Combustible Materials (S3AM-126-PR1)

All work areas shall be kept free of unnecessary debris. No flammable and combustible liquids will be brought on site other than the gasoline or diesel fuel for the field vehicles and equipment used to support field operations. During all on-site activities, the following practices will be used for fire prevention and protection:

1. Smoking on site is prohibited in designated work areas and other areas where smoking may create a fire hazard (e.g., dry vegetation).
2. A designated smoking area will be established when operations on site begin.
3. Fire extinguishers will be available at all work and support areas.
4. A fire extinguisher will be available onsite at all times (2A, 10B:C).
5. Fire extinguishers will be inspected monthly.
6. Defective firefighting equipment will be replaced immediately.
7. Fires or open flame devices are prohibited on site.
8. All employees will be trained in the use of fire extinguishers and the hazards involved in incipient stage firefighting before being allowed to work on the project site as per 29 CFR 1910.157(g)(1).
9. Only fires in the incipient stage will be addressed using portable fire extinguishers. Regardless of the size and nature of the fire, and the Team's ability to respond, all fires will be reported immediately to the local fire department.

For this project, fire extinguishers will be placed in each motor vehicle (2A, 10B:C) and one extinguisher will be available at the work site (2A, 20B:C) Only UL-listed extinguishers will be used.

The potential for fire will be low; if a fire should occur, it would be expected to fall into Class A, B, or C. These classifications are defined as follows:

- Class A – Fires in ordinary combustible materials such as wood, cloth, paper, trash, rubber, and plastic.
- Class B – Fires in flammable liquid, oil, grease, tar, oil-based paint, lacquer, and flammable gas.
- Class C – Fires involving energized electrical equipment or systems, resulting in the extinguishing media conducting electricity. When electrical equipment or systems are de-energized, extinguishers for Class A or B fires can be used safely.

Extinguishers are rated according to the classification and size of the fires against which they are effective. Extinguisher ratings are found on the extinguisher label. A rating consists of a letter indicating the classification of fire on which the extinguisher is effective and a rating number indicating the relative extinguishing effectiveness. The significance of the rating number varies with the classification of fire for which the extinguisher is rated. The following rating criteria are used:

- For extinguishers rated for Class A fires, the rating number indicates relative effectiveness, the higher the number, the more effective the extinguisher. The minimum recommended rating for extinguishers rated for Class A fires is 2A.
- For extinguishers rated for Class B fires, the rating number represents the average size (in square feet) of the fire the extinguisher could put out.
- No number is used for extinguishers rated for Class C fires, because Class C fires are essentially either Class A or B fires involving energized electrical wiring and equipment.

3.5.11 Vehicle Safety (S3AM-319-PR1)

Personnel must use caution when operating personal or company vehicles. The following field/site vehicle safety items should be followed:

1. All staff members operating a motor vehicle must possess a current, valid driver's license. AECOM authorized drivers have completed the AECOM vehicle safety training online or through one of the approved training resources.
2. All local speed limits and traffic regulations will be followed. Headlights will be used from sunset to sunrise, during fog, or other unfavorable conditions. All uncontrolled intersections (no traffic lights or traffic signs) will be treated as a four-way stop. The driver will exercise extreme caution at uncontrolled intersections.
3. **Cell phone use (even with a hands-free device) is prohibited when driving.** The use of any other portable headphones, earphones, or other listening devices is also prohibited. Operators will not eat, drink, or smoke, while the vehicle is in motion. Driving includes the time spent in traffic or while stopped at red lights or stop signs. If a Global Positioning System (GPS) is used, it must be mounted such that it does not interfere with the driver's range of vision. The GPS will not be programmed while driving. GPS units and GPS units on smart phones may only be used if factory installed or secured to the vehicle with a bracket that allows the driver to view the image without having to take their eyes off the road.

4. Rental vehicles are maintained by the rental company and inspected prior to release. Drivers are responsible for inspecting the vehicle prior to use. Basic safety checks include tire condition/pressure; lights; turn signals; a clean windshield and adequate window washer fluid; gauges/warning lights indicating normal condition; mirrors properly adjusted; and brakes with adequate pedal pressure for proper breaking. Form S3AM-005-FM2 will be used to document the inspection on a weekly basis.

5. Specific vehicle travel routes and parking areas will be identified at field sites. Traffic cones, or other markings, will be used as needed, to define roads and parking. If parking on the shoulder of an active road, employees will park as far off the road as possible. If work is required alongside an active road, park the vehicle behind the area of work to provide a barrier against out of-control vehicles.

6. The operator and all passengers shall use seat belts at all times when a motor vehicle is in motion. No employee may ride in the bed of a pickup truck unless seating and restraints are provided for this specific use. Articles, tools, equipment, etc. placed in vehicles will be stored so as not to interfere with vision or the proper operation of the vehicle in any way. All items in the vehicle must be secured to prevent them from flying about or out of the vehicle during sudden stops, turning, etc.

Trucks or vehicles with obstructed rearview mirrors must observe the following procedures when backing up: Position an employee to act as a spotter at the rear of the vehicles, in the driver's line of sight, to ensure that the area behind the truck is clear. If no other employee is present, then the driver must step out of the vehicle and check the area behind the vehicle before backing up. As an added precaution, avoid backing up whenever possible.

3.5.12 Illumination

It is expected that site activities will be conducted only during daylight hours.

3.6 Biological Hazards

Potential biological hazards include bloodborne pathogens, hantavirus, reptiles, invertebrates, large mammals, and plants. Employee awareness and knowledge of the potential biological hazards will help reduce the risks associated with these hazards. Biological agents that may cause health hazards are diverse; consequently, their health effects are also diverse.

3.6.1 Bloodborne Pathogens

During site activities, workers can potentially be exposed to bloodborne pathogens when rendering first aid or Cardiopulmonary Resuscitation (CPR). Avoiding contact with biological agents is the best way to prevent adverse health effects caused by them. Recognition of potential hazards is essential. As a general rule, employees will not come into contact with any item that may appear to result from medical waste disposal. When avoidance is impractical or impossible, such as when administering first aid, PPE and personal hygiene will be used to prevent adverse effects. Employees designated to perform tasks involving occupational exposure including designated first-aid providers, shall receive bloodborne pathogens training at the time of initial assignment to the job.

Employees are at risk of contracting infectious diseases each time they are exposed to bloodborne pathogens. Any exposure incident may result in infection and subsequent illness. Since it is possible to become infected from a single exposure incident, it is the practice of AECOM to prevent exposure incidents whenever possible.

To ensure employees are effectively informed concerning potential workplace health hazards, and in accordance with the requirements set forth in 29 CFR 1910.1030 and EM 385-1-1 Section 3, AECOM has established an exposure control plan (ECP) for bloodborne pathogens. The purpose of this plan is to identify those tasks and procedures for which occupational exposure to bloodborne pathogens may occur, to identify the positions whose duties include those tasks, and to implement controls that will significantly reduce the risk of infection by bloodborne pathogens. The site-specific ECP includes:

- Work practice controls: Provide adequate supplies for providing first aid and CPR, and treat all contact with human blood and bodily fluids as potentially infectious. Hand washing facilities/supplies shall be readily accessible for all employees.
- PPE: Provide PPE at no cost to the employee. Typical equipment includes, but is not limited to, gloves, face masks, eye protection, and CPR shield. PPE will be considered appropriate if it does not permit blood or other potentially infectious materials to reach or pass through clothes, skin, or mucous membranes of the eyes or mouth under normal conditions of use and for the duration of time the equipment will be used. PPE must be readily accessible and will be removed prior to leaving the work area.
- Housekeeping: Use universal precautions when cleaning or decontaminating any surface or equipment that may be contaminated. Appropriate PPE will be used for protection during decontamination.
- Post-exposure Activities:
  - Report all occupational bloodborne pathogen exposures to the Incident Hotline (800-348-5046) immediately after initial decontamination and first aid is accomplished. Following the report of an exposure incident, a confidential medical evaluation with an occupational physician will be arranged as soon as possible, ideally no later than 1-2 hours after the incident has occurred.
  - Report incident to SSHO, PM, and PSHO.
  - Make initial notification in IndustrySafe (https://www.industrysafe.com/AECOM/) within 24 hours.
  - Per EM 385 1-1, the PM will verbally notify the Government Designated Authority of an incident as soon as reasonably possible, but not more than 24 hours after the incident. A written report of the incident investigation findings and corrective actions will be submitted as soon as possible but no later than five working days after the incident.

3.6.2 Hantavirus

Wild rodents (rats and mice) can be infected with hantavirus and pass it in their droppings, urine, or saliva. The primary mode of transmission is via inhalation of aerosolized material from bodily wastes. Avoid direct contact with or disturbing places where these animals have nested or are suspected to nest. Acute illness may be characterized by the abrupt onset of fever, myalgias, headache, and cough, followed by the rapid development of respiratory failure. Anyone with a potential exposure who develops a rapidly progressing, severe viral illness or unexplained adult respiratory distress syndrome should be evaluated for possible hantavirus infection.

3.6.3 Venomous Snakes

The timber rattlesnake, the eastern Massasauga rattlesnake, and the copperhead are the three types of venomous snake native to Pennsylvania. These rattlesnakes avoid confrontation with humans and prefer to leave the area when disturbed, but will defend themselves when threatened or injured. A bite should receive prompt professional medical attention. If bitten, contact 911 or contact your medical care provider or emergency room for further direction.

Timber Rattlesnake • • Head is large, flat and triangular, pupils are elliptical • Two different color phases: black and yellow. Both phases have dark bands on the back, no markings on the head, and a dark tail. • Segmented rattles on the end of its tail • Adult length is 3 to 5 feet • Prefer habitat in wooded hillsides and rocky outcrops	
Northern Copperhead • Head is large, flat, and triangular, pupils are elliptical • Tan or light brown in color, with a tinge of pink, with dark or reddish brown blotches on its back, which are narrow in the middle like an hourglass. Often with small, dark spots between the blotches. The head is a copper color with no markings. Scales are weakly keeled. • Adult length is 2 to 3 feet • Prefer habitat near rocks, ledges, and rock slides in deciduous forests and fields	
Eastern Massasauga Rattlesnake • Thick-bodied and stocky with 9 enlarged scales on top of its head • A row of dark blotches runs down the middle of the back, with rows of smaller blotches along each side. Scales are deeply keeled • Rattle is somewhat small • Adult length averages less than 2 feet • Prefer habitat in wetland areas with dry fields/meadows nearby	

3.6.4 Invertebrates

A large variety of invertebrates may be encountered, including ticks, bees, hornets, wasps, mosquitoes, and spiders.

Ticks

Ticks typically have a three stage life cycle, larvae, nymphs, and adults. Ticks are most active in spring and early summer and are most common in open forests. At each stage of life the tick climbs to the top of grasses or shrubs (behavior known as questing). The tick extends its front legs, grabs hold of a passing animal and immediately starts looking for a place to attach. The tick will then attach with barb-like mouth parts and begin sucking blood. After one to two days of feeding the ticks drop off, molt and move to the next life stage.

The primary biological hazard associated with tick bites in Pennsylvania is the possibility of contracting Lyme disease. Ticks can also transmit Tularemia, Anaplasmosis, Ehrlichiosis or Rocky Mountain Spotted Fever, and Babesiosis (Michigan Emerging Disease Issues, 2018).

Lyme disease is caused by bacteria called *Borrelia burgdorferi*. This bacterium inhabits the digestive tracts of Black-Legged Ticks, commonly known as a “deer tick.” When ticks bite humans, the bacteria can be transmitted to the people. It typically takes 24 hours or more before the Lyme disease bacteria will enter the host, therefore prompt tick identification and removal is important to the prevention of contacting Lyme disease from a tick.

Typical short-term symptoms of Lyme disease include headache, fever, fatigue, and muscle pain that can be characteristic of the flu. A key diagnosis point is a distinctive “bulls-eye” rash, where the redness assumes a ring-shaped pattern that appears a day to a month after the tick bite. If personnel observe the rash, the SSHO will take the site worker to get medical observation and treatment. At this initial stage Lyme disease is easily treated with a several week regimen of antibiotics. If left untreated, Lyme disease can spread to the heart, nervous system, and joints. Long term Lyme disease sufferers can have a huge list of varied symptoms including meningitis, brain inflammation, muscle twitching, chronic joint pain, arthritis, and even memory loss. Long term Lyme disease can be misdiagnosed as multiple sclerosis or even Type II diabetes.

Personnel should use the following prevention tactics when working outside:

1. Dress in light-colored clothing to make adhering ticks more visible. Wear long-sleeved shirts and tuck pants into socks and/or use brand name duct tape to seal the gap between pants and boots.
2. Use an insect/tick repellant containing 100% natural ingredient, such as Repel Lemon Eucalyptus.
3. Perform self-searches routinely when in the field to check for ticks.
4. Check body areas where ticks are commonly found: behind the knees, between the fingers and toes, under the arms, in and behind the ears, and on the neck, hairline, and top of the head. Check places where clothing presses on skin.
5. After work, place clothing in hot dryer to kill any loose ticks.
6. Shower and perform a careful whole body search for ticks.
7. If any ticks are found attached, remove using fine tweezers or a “tick tool”.
8. Report tick bites and attached ticks to the Occupational Health Nurse (WorkCare) for follow-up.

If a tick is observed on the skin with the head burrowed, remove the tick by firmly grasping the tick's mouthparts at the skin with tweezers, and pulling straight out. Try to avoid squishing the body as this could force infected fluid from the tick into the host, increasing the chance of infection. Any tick that has been removed should be placed in a dry jar or ziplock bag and preserved it in the freezer for later identification if needed. Ticks may be difficult and painful to remove. The SSHO or another First Aid trained coworker may need to assist in this removal. Wash the bite site with soap and treat the bite with an antiseptic. If any symptoms of RMSF are present, inform the SSHO and seek medical care.

Bees, Hornets, and Wasps

Stings from bees, hornets, and wasps cause more deaths than bites and stings from all other insects and spiders. Death is usually a result of an allergic reaction. Many stinging insects can sting repeatedly; honeybees are the only stinging insects that leave a stinger in the wound. If stung by any insect, check the wound to see if the stinger is still there. The stinger will be clearly visible. If the stinger is still there, scrape or flick it out with something stiff like a credit card. Do not try to pull the stinger out as squeezing injects more venom into the wound. Typical symptoms include a burning pain and swelling.

Unusual symptoms can signal the onset of an allergic reaction. There are two types of allergic reactions. In the first type, the bite or sting site becomes excessively swollen and the patient may experience nausea, vomiting, dizziness, and headache.

The second type of allergic reaction can be life-threatening. A severe reaction can cause body-wide skin itching, hives, or puffiness of the eyes, nose, lips, tongue, and throat. Abdominal pain and vomiting may develop. Breathing difficulties are common. The patient may collapse and go into shock. This kind of reaction represents a medical emergency.

Allergic reactions usually do not develop after the first sting. After a second or third sting, a reaction can develop. It is difficult to predict whether a person will have a life-threatening allergic reaction. If you or family members are very allergic or have asthma, you are more likely to be allergic to stings and should be careful around stinging insects.

If difficulties in breathing or swallowing, and/or body-wide itching develop, the patient may be having a severe allergic reaction and should receive medical attention. If the reaction is not severe, wash the bite or sting area well with soap and water to help prevent infection. If stung or bitten on fingers or hand, remove any rings or jewelry in case of swelling. Your local pharmacist can help you select the best over-the-counter medications to help treat stings.

To prevent bee and wasp stings, the following precautions will be taken during field activities:

1. Be aware of the presence of bees and wasps while you are working especially in the vicinity of flowers and fallen logs or debris piles. Bees and wasps tend to sting if they feel threatened or are disturbed.

2. Avoid wearing floral patterns or using floral scents, which will attract bees.

3. Do not leave food, drinks, or garbage out and uncovered.

4. Personnel that are sensitive to bees must make the SSHO aware of this and should carry a bee sting kit with them. Wear a Medic-Alert bracelet if extremely allergic to bee or wasp stings.

5. If you are allergic, ask your physician about prescribing an emergency epinephrine kit have on hand.

6. If bees or wasps get trapped inside your vehicle while you are driving, pull over to the shoulder and let the creature escape before you continue driving.
7. Only strike a wasp or bee if you are sure to kill it. If you strike or kill a wasp or bee you will set off its defense pheromone, which will trigger a defense response in any nearby nest mates.
8. In the event of a mass sting attack, try to stay calm, cover your head if possible, and run steadily to safety. Get into anything that is sealed in such a way as not to allow insect entry, such as a vehicle.
9. All bee stings include an alarm pheromone, which incites the colony to attack, so step one is to get away from a nest/hive quickly. Scrape out stingers as soon as possible. A honeybee sting has a pump attached that continues to introduce venom for 1 minute after stinging. A wasp does not leave its stinger.
10. Apply an ice pack to minimize pain and swelling. Lift limb to heart level to reduce swelling. If the victim has been stung multiple times, is young or old, or is one of the 1% that is super sensitive to stings, watch for signs of systemic allergies. These may include:
    - Headaches
    - Fever
    - Nausea
    - Vomiting
    - Swelling of the tongue or throat
    - Difficulty in breathing
    - Cramps
    - Drowsiness
    - Unconsciousness

Personnel with known sensitivity to stings should have an epinephrine kit and have it administered, followed by an ice pack and a visit to a hospital. Co-workers should know where the kit is located and how to administer it in an emergency. All employees will be made aware of the symptoms of anaphylactic shock, so that they can recognize it in themselves and co-workers and act accordingly.

Venomous Spiders

Spiders can be found in derelict buildings, sheltered areas, basements, storage areas, wellheads and even on open ground. According to the Penn State College, only one species of venomous spider is found in Pennsylvania: the black widow (*Latrodectus hesperus*). The brown recluse is not yet known to inhabit Pennsylvania.

The black widow prefers moist, dark conditions. Black widow bites feel like a minor pinprick, but dull pains will soon develop in the area of the bite. The affected area will generally begin to cramp and other symptoms such as sweating, nausea and vomiting may occur. Other spiders native to the area possess venom, but they are not harmful to humans.

Black widows • Females: shiny black with red hourglass on the bottom of abdomen • Males: more vibrant pattern on abdomen consisting of many red and white spots • Males are rarely encountered and are not known to bite humans • Cobweb spiders; spend most of their time in their webs • Make webs in undisturbed, uncluttered areas on porches and in sheds	

3.6.5 Mammals

Personnel working on the project site have the potential for contact with mammals such as white tailed deer, squirrels, mice, rats and other mammals. Some of these animals have been known to harbor fleas carrying bubonic plague. Their bites can also transmit rabies and other infections. Some animals pose a special problem because people tend to try to feed them or pet them; the increased contact brings a greater possibility of danger. Avoid wildlife when possible. Identify an evacuation route and shelter when working in areas where wildlife may be encountered.

3.6.6 Poisonous Plants

Poisonous Plants contain the oil urushiol, which produces a rash, can lead to dermatitis and infections. Exposure to urushiol produces a rash that can be irritating and cause the exposed employee to scratch the affected area, increasing susceptibility for an infection. It should be noted that each time an employee is exposed to urushiol the severity of the reaction increases. In cases that involve severe rashes, medical treatment may be necessary to control the rash.

Personnel suspecting they have been exposed to poison ivy should immediately and carefully remove contaminated clothing with disposable gloves and store clothing in a labeled plastic bag to be washed. Wash any exposed skin with soap and water. Employees shall report the exposure immediately to the SSHO, PSHO, and PM. Wash contaminated clothing and tools with strong soap and water prior to reuse; plant oils may remain active for a period of months.

Poison Ivy • Grows in East, West, Midwest, Texas • Several forms – vine, trailing shrub, or shrub • Three leaflets (can vary 3-9) • Leaves green in summer, red in fall • Yellow or green flowers • White berries		

<table>
<tr>
<td>Poison Oak
Grows in the East (NJ to Texas), Pacific Coast
6-foot tall shrubs or long vines
Oak-like leaves, clusters of three
Yellow berries</td>
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<tr>
<td>Poison Sumac
Grows in boggy areas, especially in the Southwest and Northern states
Shrub up to 15 feet tall
Seven to 13 smooth-edged leaflets
Glossy pale yellow or cream-colored berries
Red stem (rachis) on compound leaf</td>
<td> </td>
</tr>
<tr>
<td>Giant Hogweed
White flowers with 50-150 flower rays clustered into an umbrella shaped flower up to 2.5 feet across
Between 7-14 feet tall
Huge leaves, incised and deeply lobed up to 5 feet across
Stems are green with extensive purple splotches and prominent coarse white hairs. Stems are also hollow, ridged, 2-4 inches in diameter, and have a thick circle of hairs at base of leaf stalk
Seeds are dry, flattened, and oval. Approximately 3/8 inch long and tan with brown lines (oil tubes) extending 3/4 of the seed length that widen at ends</td>
<td> </td>
</tr>
</table>

3.7 Activity Hazard Analyses

The AHAs are provided in **Appendix A**. These forms list potential hazards associated with each phase of project field work, and associated actions to eliminate or minimize the hazards.

4. Staff Organization, Qualifications, and Responsibilities

Roles and responsibilities for key safety personnel are provided in **Table 4-1**. Copies of resumes for safety personnel are presented in **Appendix D**.

Table 4-1 Roles and Responsibilities of Key Safety Personnel

Position	Description of Key Responsibilities
SSHO Team Lead Matt Ginalick	• Is present during operations to implement the SSHP • Inspects site activities to identify safety and occupational health deficiencies and corrects them • Coordinates changes/modifications to the SSHP with the PSHO, PM, and contracting officer • Conducts project-specific training • Has stop work responsibility related to safety and health concerns • Implements and enforces the APP/SSHP, along with safety concerns contained in the SH&E procedures, and reports violations to the PSHO and PM • Controls access to established work zones and exclusion zones (EZs), if any • Provides overall safety oversight during disposal operations • Secures the site until emergency response personnel assume control in the event of an accident or an emergency • Assists in the investigation of accidents/incidents and “near misses” • Notifies and coordinates off-site emergency and medical response agencies • Enforces the “buddy system” • Conducts visitor orientations, on-site safety training, and maintains the visitor log • Coordinates with health and safety professionals to identify personnel on site for whom special PPE, exposure monitoring, or work restrictions may be required • Conducts daily field site inspections, including materials, tools and equipment, and safety briefing • Provides ongoing review of the protection level needs as project work is performed, and informs the PSHO of the need to upgrade/downgrade protection levels as appropriate • Maintains qualification/certification records for site personnel on electronic and hard copy
PSHO Scott Dietz	• Develops, maintains, and oversees implementation of the SSHP • Visits the project site, as needed, to audit the effectiveness of the SSHP • Remains available for project emergencies • Develops modifications to the SSHP, as needed • Evaluates occupational exposure monitoring/air sampling data and adjusting SSHP requirements, as necessary • Serves as a quality control staff member • Approves the SSHP by signature • Determines the need for periodic audits of the operation to evaluate compliance with this plan

Position	Description of Key Responsibilities
	• Provides health and safety support as requested by the SSHO and PM • Develops, maintains, and implements this SSHP • Responds, as appropriate, to project emergencies
Regional Safety, Health, and Environment (SH&E) Manager Alberto Munuera	• Oversees health and safety program and personnel, establishing policies and standards, and providing guidance • Reviews and concurs with the APP and SSHP • Reviews work plans and deliverables • Verifies APP and SSHP implementation and compliance • Verifies compliance with USACE documents, as well as local, state, and federal statutes and codes

4.1 Site Telephone Numbers/ Contact Information

FTIG PFAS Manager:
Tom Marrs
PA ARNG Bureau of Environmental Management
717-861-9414
tmarrs@pa.gov

4.2 Site-Specific Training Requirements

Project-specific training requirements are discussed in Section 6 of the APP. All Contractors must receive site-specific safety training for the both MAAF and Combined Arms Collective Training Facility (CACTF). At the CACTF, safety training will be required to enter the area, and check in and check out of all Contractor team members will be required.

4.3 Site-Specific Medical Surveillance Requirements

All personnel must comply with the medical surveillance requirements required by Occupational Safety and Health Administration (OSHA) (29 CFR 1910.120). The AECOM medical surveillance program meets all OSHA and USACE criteria for hazardous waste investigations. Personnel must have passed the AECOM medical surveillance examination (or equivalent) within the time frame established (annual or biennial schedule). The PM will verify that all AECOM personnel meet applicable OSHA medical surveillance requirements prior to the start of site work. Copies of Training Certificates are provided in **Appendix E**.

4.4 Prevention of Alcohol and Drug Abuse

Employees who use drugs or alcohol in an improper or illegal manner increase the risk of injury to themselves and fellow employees as well as to property. For this reason, AECOM regards any misuse of drugs or alcohol by employees to be an unacceptable practice. AECOM has an established Substance Abuse Prevention Policy and Procedure, S3AM-019-PR1, meeting the requirements of the Drug Free Workplace Act of 1988. This policy defines the procedures necessary to create and ensure a drug- and alcohol-free workplace, inform and educate employees of those procedures, and comply with Federal and State law and client requirements related to the documentation and dissemination of those procedures. Employees must comply with the requirements contained in this Policy and Procedure as a condition of employment.

Failure to comply with these requirements will be grounds for disciplinary action, including termination of employment.

AECOM maintains an Employee Assistance Program that provides initial behavioral health services and guidance for obtaining longer-term treatment. In conjunction with the Employee Assistance Program, the Company promotes a drug-free awareness program to inform employees about:

- The dangers of substance abuse in the workplace
- Available counseling, rehabilitation, and employee assistance programs (both for self-referral and supervisory referral)
- The penalties that may be imposed for substance abuse violations
- The Company's commitment to maintaining a drug-free workplace

All employees are expected to report to work fit for duty and free from the effects of illegal drugs and other controlled substances. Employees must disclose any relevant work duty restrictions to their supervisor, and if taking a prescribed medication, must carry it in the original packaging labeled by a licensed pharmacist. Employees shall not be under the influence of, consume, possess, sell, or distribute alcoholic beverages on any customer- or AECOM-controlled property. This specifically applies when an employee is on duty and when meals and break periods are taken during on-duty periods. All employees must sign a Substance Abuse Prevention Policy Acknowledgment and Consent Form. Compliance with the Policy and Procedure is a condition of initial and continued employment.

Drug and Alcohol testing is required under the following circumstances:

- Pre-employment
- Reasonable suspicion (observation of apparent drug or alcohol use)
- Post-accident (probable cause)

Human Resources administers this Substance Abuse Prevention Policy and Procedure. Managers and supervisors are to observe and document employee behavior which appears to violate this Policy and Procedure, and are responsible for referring employees for drug/alcohol testing as required. All employees must commit to a safe and drug-free workplace by complying with this Policy and Procedure and understanding their responsibilities.

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5. Personal Protective Equipment

Based on the hazard assessment presented in **Section 3.0**, Level D PPE was determined as the initial level of protection required, as defined in **Section 5.1**. The decision to require the use of optional items (hearing protection, waders, hard hats, and reflective vests) will be made by the SSHO, based on the hazard and risk analysis in the field. The SSHO may also make the decision to upgrade to Modified Level D, as defined in **Section 5.2**, if site conditions warrant. The level of protection worn by site personnel will be enforced by the SSHO.

Any recommended changes in the level of protection that involve the use of protective equipment not covered under this APP/SSHP (e.g., respirators) will be documented, and a revised hazard assessment will be prepared by the PSHO and submitted to USACE for review prior to use in the field.

Due to the nature of the work to be performed and site conditions, dusty conditions are not anticipated to be encountered during site activities; therefore, PPE upgrades to include the use of respiratory protection are not expected.

All site workers will have current HAZWOPER training. Training includes the identification of PPE necessary for various tasks; how to don, doff, adjust, and wear PPE; limitations of PPE; and proper care, inspection, testing, maintenance, useful life, storage, and disposal of the PPE. PPE will be inspected on a regular basis in accordance with Personal Protective Equipment Policy and Procedure, S3AM-208-PR1.

If there is reason to believe that any affected employee who has been trained does not have the understanding and skill required to use the assigned PPE, that employee will be removed from the job site until additional training can be completed. AECOM uses a combination of classroom instruction, on-line modules, and hands-on experience for PPE training.

5.1 Level D Protection

Level D PPE provides minimal protection against potential chemical hazards such as metals or explosive constituents in soil, and should not be worn in any area with respiratory or skin hazards. Level D PPE for this work effort includes:

- Cotton coveralls or long pants and a shirt with sleeves
- Safety glasses with side shields (or impact-resistant goggles)
- Steel- or composite-reinforced safety shoes or boots
- Leather work gloves for materials handling
- Hearing protection (as required)
- American National Standards Institute (ANSI) Class 2 retro-reflective vest (Class 3 during periods of limited visibility), when working near vehicular traffic or heavy equipment
- Hardhat during direct push technology/drilling activities and when overhead hazards exist

Level D PPE will be adequate for the majority of tasks conducted during this project, due to the type of activities planned.

5.2 Modified Level D Protection

- Cotton coveralls or long pants and a shirt with sleeves

- Safety glasses with side shields (or impact-resistant goggles)
- Steel- or composite-reinforced safety shoes or boots
- Chemical-resistant boot covers, TAP (M2A1) (as required)
- Leather work gloves for materials handling
- Nitrile gloves (when sampling)
- Hearing protection (as required)
- American National Standards Institute (ANSI) Class 2 retro-reflective vest (Class 3 during periods of limited visibility), when working near vehicular traffic or heavy equipment
- Hardhat during direct push technology/drilling activities and when overhead hazards exist
- Tychem® or Tyvek F
- Respiratory protection, North 54501(slung). If used, the level of protection will change to Level C

5.3 Level A, B and C Protection

The tasks scheduled for this project should not require the use of Level A, B, or C PPE, and their use is not covered by the APP or this SSHP.

6. Exposure Monitoring

Air monitoring will be conducted during all intrusive activities performed under this SSHP. No volatile are anticipated to be encountered during intrusive activities.

6.1 Real-Time Monitoring for Volatile Organic Compounds

Real-time monitoring for volatile organic compounds will be conducted using an organic vapor meter- photo ionization detector (OVM–PID). The OVM-PID will be used to monitor employee breathing zones during subsurface soil sampling, installation of temporary and permanent groundwater monitoring wells, and during groundwater sampling. Monitoring the employee's breathing zone will be conducted at least every 15 minutes until the SSHO determines a more applicable schedule. Organic vapors will be monitored using an OVM-PID with a 10.6 electron volt lamp or higher and a detection limit of 0.1 part per million (ppm) as isobutylene. Refer to **Table 6-1** for site-specific OVM-PID Action Levels. OVM-PID calibration results and monitoring results will be recorded in the SSHO's logbook. The logbook will be maintained at the site and will be available for review upon request.

Table 6-1 Site-Specific OVM-PID Action Levels

Meter Response	Action / Respiratory Protection Required
OVM-PID response[1]: < 10 ppm sustained above background in breathing zone	Level D (i.e., no respiratory protection required).
OVM-PID response[1]: > 10 ppm sustained above background in breathing zone	Retreat from work area; allow to vent to below 10 ppm. Consult with SSHO, and evaluate the need for changes in work practices, adding mechanical ventilation, conducting chemical-specific industrial hygiene monitoring.

[1] OVM-PID readings will be considered to be sustained (i.e., non-transient) if reading is sustained for more than 1 minute.

6.2 Calibration of Real-Time Monitoring Equipment

Monitoring and calibration protocols will be performed in accordance with the manufacturer's guidelines. Calibration will be performed, at a minimum, prior to each day's use. A copy of the instrument's manual will be kept in the Support Zone. The OVM-PID will be calibrated using either a 100 ppm or a 250 ppm isobutylene span gas concentration.

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7. Site Control

AECOM personnel will keep staff informed of work activities as well as report any suspicious activities noticed during field operations.

7.1 Exclusion Zones

The SSHO will coordinate on-site access control which will be set up based on a modified site zonation system to control the potential spread of contamination. The EZ and Contamination Reduction Zone will be identified prior to the start of each task. These zones will be removed once the task is complete. Site control will be maintained by communication and the following:

- Work/monitoring operations will cease if nonessential personnel are present within the EZ.
- A Site Control Log will be maintained to ensure accountability of all personnel on-site.
- Authorized visitors will sign a Site Visitors Log and wear proper PPE.
- Authorized visitors will be escorted at all times by the Site Supervisor, SSHO or their designee.
- A safety briefing will be provided by the SSHO to all personnel or visitors to inform them on the potential hazards. All personnel and visitors must acknowledge this briefing via signature.
- Designated safety areas (muster locations) will be established in case of an emergency.

7.2 Site Communication, Hand Signals and Emergency Communications

Site communication will be established before field activities start. Site communication will consist of cell telephones and radios. Additionally, cellular telephones will be available on-site for emergency. Emergency telephone numbers will be provided to site workers and will be available at all times workers are on-site; refer to **Table 8-2**.

7.2.1 Emergency Signals

Emergency signals are critical for alerting workers of danger and to maintain site control during an emergency. In addition to cell telephones, air horns can be used for emergency communications. All field personnel will be trained to recognize the emergency communications and signals described in **Table 7-1**.

Table 7-1 Emergency Contact Signals

Signal	Meaning
One long sound/blast of the emergency alarm signal, air horn, siren, whistle	Emergency situation, face safety watch and watch or listen for directions
Pause; followed by a number of short sounds, 1, 2, 3, or 4	Evacuate to the predesignated emergency meeting place indicated by the number of sounds
Two long blasts of the emergency alarm signal, air	All clear

Signal	Meaning
horn, siren, whistle	
Point one arm in direction of evacuation, make a large circling motion with the other arm in direction of evacuation	Evacuate the area
Point index finger toward self	I; me
Point index finger toward object	It; them
Point index finger toward person	You; them
Circle index finger at group	We; us; all of us
Pointed finger on extended arm	Look in that direction
Beckon with index finger	Come here
Point with thumb in a particular direction	Move this way; go this way
Hold index finger up near head	Wait
Slowly ease palm face down	Relax; slow down
Put palm over brow	Scout it out; check it out
Move hand far away from body	Stay away
Hands on top of head	Need assistance
Grip partner's wrist or place both hands around partner's arm	Leave area immediately
Thumbs up	OK; I'm all right
Thumbs down	No; negative; bad; not OK
Hand gripping throat	Cannot breathe; out of air
Wave hands over head from side-to-side	Attention; stand-by for the next signal
Swing hand from direction of person receiving signal to directly overhead and through in circle	Come here
Clenched fist of extended arm	Stop motion/hold position
Draw index finger across front of throat	Shut off engine; cut off power; quit
Place palm face down and rotate from side to side	Unsure; can't decide
Form a circle with thumb and index finer	OK; I understand; agree
Military salute	I understand and will comply

8. Emergency Response and Contingency Procedures

When an emergency occurs, decisive action is required. Decisions must often be made immediately and personnel must be ready to respond immediately to an emergency. For this purpose, pre-emergency planning is an essential part of each project's Emergency Response Plan (ERP). Pre-emergency planning tasks will be developed and established prior to the start of site work. Pre-emergency planning for the site includes the following tasks:

- Development and approval of this ERP in accordance with S3AM-010-PR1, Emergency Response Planning
- Coordination of the ERP with local health and emergency response agencies
- Training of site personnel in appropriate emergency procedures
- Maintaining emergency response equipment on site, such as fire extinguishers, first aid supplies, and spill response equipment
- Conducting an emergency response practice drill during site mobilization and before site activities begin
- Modification of the ERP, if necessary, as work progresses

8.1 Response Priorities

Only if it is safe to do so, AECOM personnel may choose to provide only minimal or first line response to all emergencies.

First Priority: Prevent further injury or illness by:

- Protecting response personnel
- Isolating the scene to authorized personnel only
- Notifying emergency response personnel
- If possible, rescuing any injured parties

Second Priority: Provide first aid to persons with life-threatening injuries or illnesses.

Third Priority: Alleviate the immediate hazards by:

- Extinguishing incipient-stage fire
- Reducing chemical releases, and/or
- Containing any spill

8.2 Evacuation Routes and Procedures

In a severe emergency such as a large fire, site evacuation may become necessary. **Table 8-1** provides the procedures for site evacuation. The SSHO will be responsible for informing site personnel of the anticipated routes of evacuation during the morning safety briefings. The evacuation route and assembly area will correlate to the wind direction, topography, and the nature of the incident. Personnel will be advised to move to an upwind location at least 100

yards from any fires and/or releases, and will be advised to continually monitor wind direction for changes.

If moving upwind is not possible without encountering the incident, personnel will be advised to move crosswind or downwind to a distance out of the path of vapor releases, smoke, odors, or spills. In the event that a site evacuation becomes necessary, the procedures listed in the table below will be used.

Table 8-1 Site Evacuation Procedures

Step	Procedures
1	Site personnel will be notified of an emergency evacuation via horn signal or verbal command. All site personnel will immediately stop work.
2	All site personnel will evacuate the work area as quickly as possible and assemble at a location at least 100 yards upwind of the incident, or as instructed during the morning safety briefing.
3	The SSHO will be responsible for roll call.
4	The SSHO will contact emergency response personnel as all site personnel are being accounted for during roll call.
5	The SSHO will ensure that emergency response personnel have adequate site access.
6	The SSHO will ensure that all combustion equipment has been shut down.
7	All site personnel assembled at the designated safe evacuation area will wait for further instructions from emergency response personnel.

8.3 Injury/Illness Treatment

At a minimum, two site personnel will maintain current First Aid/CPR certifications. Their numbers will be included in the emergency telephone number list in **Table 8-2**: Emergency Telephone Numbers. In the event of any illness or injury, the following steps will be taken:

- Evaluate the extent of injuries or seriousness of illness.
- When employees require urgent medical attention, transport to the hospital or call for emergency assistance. First aid should be administered while awaiting an ambulance or paramedics. All emergency medical treatment, other than first aid, will be administered by the local paramedics. **Table 8-2** in the SSHP lists site emergency telephone numbers. In all cases, critical injuries must be immediately referred for professional medical attention.
- All first aid will be administered by on-site personnel trained and certified in CPR and first aid. During the daily tailgate safety meeting at least two workers with current CPR and first aid training will be identified and their names and cell phone numbers will be shared among all field personnel.
- All vehicles used to transport injured persons to the off-site medical facility will be provided with directions and a map to the medical facility. Medical Data Sheets (completed during the initial site-specific safety training) will be referenced in an emergency to assist with the treatment of the victim. The SSHO or designee will accompany the victim to the hospital.

- For a non-critical injury/illness, provide first-aid treatment and evaluate the need for further treatment.
  - AECOM personnel will utilize the services of AECOM safety staff or the AECOM Triage Nurse by calling the AECOM Incident Hotline to make this evaluation and approve treatment.
  - If further treatment is approved, the AECOM Triage nurse will provide the appropriate forms to the occupational medicine clinic. AECOM personnel should seek treatment from an occupational medicine clinic approved by the workers' compensation insurance carrier. AECOM safety staff and the AECOM Triage nurse will assist employees and managers as needed to identify clinics.
  - Subcontractor personnel will follow their company procedures for medical treatment and case management.

Table 8-2 Emergency Telephone Numbers

Emergency Fire, Police, Medical	911
FTIG Police (Non-emergency): FTIG Security Control Center 7-5 Wiley Road Annville, PA 17003	(717) 861-2727
Medical Services (Non-emergency): WellSpan Good Samaritan Hospital 252 S. 4th St Lebanon, PA 17042	(717) 270-7500
National Poison Control	(800) 222-1222
National Weather Service Forecast Office	https://forecast.weather.gov/
Federal OSHA Hotline	(800) 3321-6742
FTIG Emergency Phone Number	911
FTIG POC: Tom Marrs	717-861-9414
USACE POC: Tim Peck Steve Gragert	(410) 962-3416 (402) 995-2743; (402) 237-2085
ARNG POC: Bonnie Packer	(703) 607-7977
AECOM PM: Rosa Gwinn	(301) 820-3131 (301) 585-1586
AECOM PSHO: Scott Dietz	(240) 344-5892
AECOM SSHO: Matt Ginalick	(301) 820-3162
AECOM SH&E Manager: John Malonee	(301) 512-3395

First Aid/CPR Certified Staff: Paul Oliver, Mark Love, Tyler Beach	(267) 566-6310 , (717) 790-3424, (717) 790-3445
AECOM Incident Reporting Hotline	(800) 348-5046

8.4 Chemical Exposure

In the event of a chemical exposure, the guidelines presented in **Table 8-3** will be followed. Refer to Table 8-3 for emergency response personnel contact information.

Table 8-3 First Aid for Chemical Exposure

Type of Over Exposure	First-Aid-Guidelines
Skin Contact	Skin: Wash/rinse the affected area thoroughly with copious amounts of soap and water.
	Eyes: Eyes should be rinsed for at least 15 minutes following chemical contamination.
	Contact emergency response personnel if required, or transport victim to the hospital.
Ingestion	Contact Poison Control Center.
	Contact emergency response personnel, or transport victim to the hospital.

8.5 Decontamination During a Medical Emergency

As previously indicated, few site operations will trigger contamination of any type. For minor medical problems or injuries, regular decontamination procedures will be followed. If emergency, life-saving first aid and/or medical treatment are required, regular decontamination procedures may need to be abbreviated or omitted:

- If the victim has been contaminated with acid, other chemicals, or contaminated groundwater/soil/sediment, immediately wash or rinse the victim with water to rinse off the material.
- Outer garments can be removed if it does not cause a delay, interfere with treatment, or aggravate the problem.
- PPE can be cut away.
- If contaminated clothing cannot be safely removed, then the victim should be wrapped in a blanket or plastic sheeting to prevent the contamination of the inside of the ambulance and/or emergency response personnel.

The SSHO will advise the medical staff of the type of contamination.

8.6 Emergency Response Plan (Fires)

8.6.1 Small Incident/Fire

A small fire is defined as a fire that can be extinguished with a portable fire extinguisher. An incipient fire is a fire that is small because it has just started. In the event of a small or incipient fire, the following minimum actions will be taken:

- Evacuate nearby personnel from the area, if possible, to an upwind location, or to an area not affected by smoke or hazardous decomposition products if an upwind location is not feasible.
- Attempt to extinguish fire using portable fire extinguisher or by smothering.
- Contact emergency response personnel, as needed, for any injuries or exposures to hazardous decomposition products.
- After the fire has been extinguished, or emergency response personnel have been contacted, notify the AECOM PM, the AECOM PSHO, AECOM Regional or Area SH&E Manager, ARNG authorized representative, and USACE authorized representative.

8.6.2 Large Fire/Explosion

An explosion, large fire, or a small fire that cannot be extinguished is beyond the first line response capabilities of AECOM personnel. Professional emergency response personnel would be needed to provide emergency assistance for these types of incidents. In the event of a large fire, explosion, or a small fire that cannot be extinguished, the following minimum actions will be taken:

- Evacuate all personnel from the site, if possible, to an upwind location, or to an area not affected by smoke or hazardous decomposition products if an upwind location is not feasible.
- Perform a quick roll call to account for all site personnel.
- Contact the fire department.
- Contact emergency response personnel, as needed, for any injuries or exposures to hazardous decomposition products.
- After emergency response personnel have been contacted, notify the AECOM PM and PSHO, USACE, ARNG POC, and local ARNG POC.

8.6.3 Fires Involving Explosives

If a fire occurs in an area containing explosive materials, the SSHO will immediately direct site personnel to an upwind location. The SSHO must make notifications to the appropriate agencies.

8.7 Hazardous Substance Spill Release

It is not expected that any spills of hazardous materials will occur from AECOM activities on site. In the event that a hazardous substance spill or release occurs, the following steps will be taken:

- Evacuate site personnel, if necessary. Follow the evacuation sequence outlined in **Section 8.2** and **Table 8-1**.
- Follow the procedures in the corresponding SDS for spills or releases.
- Attempt to determine the source of leak or release, the contaminants involved, and the approximate volume of the leaked or released substance.
- After the spill/release has been contained, or emergency response personnel have been contacted, notify the PM, who will notify the USACE authorized representative.
- A spill or release of a hazardous substance at or above its reportable quantity will require reporting to the National Spill Response Center at (800) 424-8802.

8.8 Emergency Equipment and First Aid Requirements

First aid/CPR support will be provided by trained AECOM personnel. In the event that specialized or elevated care is necessary, Emergency Medical Technician/ambulance service will transport the injured person to the appropriate medical facility.

A supply of emergency and first aid PPE and equipment will be maintained in sufficient quantities to ensure an adequate supply for response. All emergency equipment will be fully stocked and readily accessible. American Red Cross First Aid and CPR Instruction Manuals will readily accessible. The following supplies will be available:

- Bloodborne pathogens PPE kit (minimum requirements are nitrile gloves [2 pairs] and CPR shield)
- Allergy response kit
- Portable, plastic or metal, water-resistant first-aid kit, with handle and manual
- Industrial first-aid kit (one 16-unit kit that complies with ANSI Z308A for every 25 persons or fewer) with the following supplies:
  - Flashlight/batteries
  - Bandage scissors
  - Red bag for biohazard waste disposal
  - Individually wrapped items
  - Compress bandages - minimum of six in sizes ranging from 2" to 4"
  - Assorted adhesive bandages (at least 16)
  - Sterile gauze compress pads 4" x 4"
  - Sterile nonstick gauze pads 3" x 3", minimum of 4 packages
  - Paper tape (hypoallergenic), at least 5 yards of 3/8" wide
  - Water-soluble burn dressing with gel pad (for minor burns, use after cold water soak), at least 6
  - Antiseptic (alcohol prep pads, towelette, or swab), at least 10 individual-use packages (must meet Food and Drug Administration CFR 333 requirements)
  - Iodine prep pads (if not allergic to iodine, use after soap and water wash for bloodborne exposure)

- Ice pack or cold pack
- Gauze roller bandages: two 2" x 6 yards and one 4" x 6 yards
- Butterfly strips (wound closure)
- Tweezers (one use, disposable)
- Temperature strips
- Triangular bandage: 40" x 40" x 56"
- Sterile normal saline eye wash, 4-ounce bottle
- Eye covering, at least 2
- Antibiotic - individual use packages only, at least 6
- Insect sting relief wipes or spray
- Instant cold packs

o Fire extinguishers placed in the following locations:

- In each motor vehicle (10B:C)
- On site (2A:20B:C)

o Spill control/absorption supplies

o Soap or waterless hand cleaner and towels

o Technu or alternative poison ivy wash or wipes

8.9 Discovery of Potential Munitions and Explosives of Concern

Munitions and explosives of concern (MEC) are not expected to be encountered; however, site workers must be familiar with and able to recognize MEC and then notify the ARNG POC and local ARNG POC of a potential hazardous condition. Do not touch, handle, pick-up, or step on any unfamiliar or unrecognizable objects. Site workers will follow the 3R's (Recognize, Retreat and Report) upon discovering / recognizing an unfamiliar item, unrecognizable object, or potential MEC item:

o Site workers will immediately stop work and notify the SSHO.

o All site workers will carefully retreat from the potential MEC hazard item by retracing their steps (going out the way you came in) to an upwind location. Follow the evacuation sequence outlined in SSHP **Section 8.2**. Site workers assembled at the evacuation point will wait for further instructions from the SSHO.

o The SSHO will non-intrusively mark the location of the item with caution hazard tape (tied to a nearby landscape feature) or survey flags (laid on the ground).

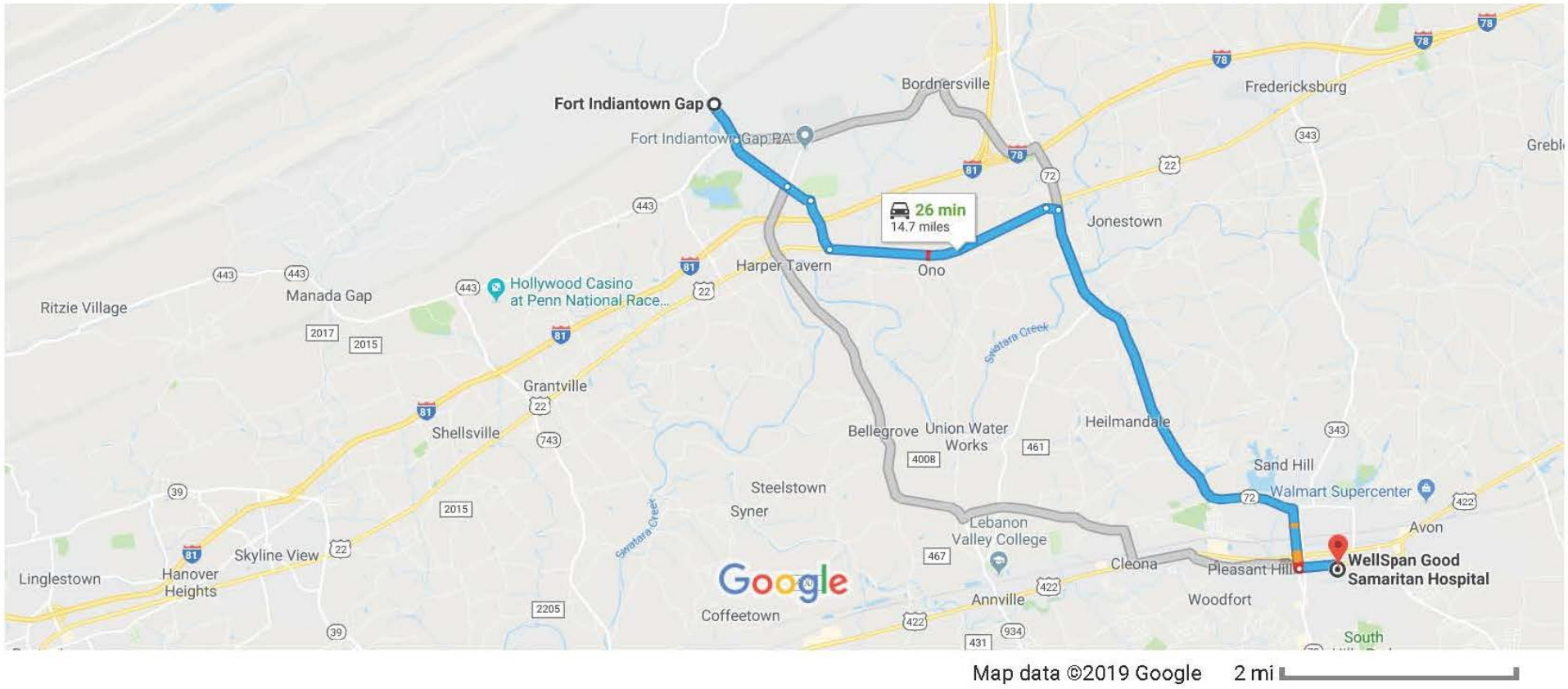
o The SSHO will report to the Task Order Manager who will report to the ARNG POC and local ARNG POC.

o Site workers will not return to the immediate work area until given an all clear by the ARNG POC/local ARNG POC.

8.10 Emergency Response Contact Information

SSHP **Table 8-2** includes local emergency response contact information. WellSpan Good Samaritan Hospital is the closest hospital with an emergency department. The distance from FTIG to the WellSpan Good Samaritan Hospital is approximately 15 miles, and the estimated driving time is approximately 26 minutes. Directions and map to the WellSpan Good Samaritan Hospital is provided on **Figure 8-1**.

Figure 8-1 Hospital Directions



Driving Directions

From: FTIG, Annville, PA

14.7 Miles / 26 Minutes

To: Wellspan Good Samaritan Hospital
252 S. 4th St 4th and, Walnut St, Lebanon, PA 17042

1. Head south on Asher Miner Rd toward Lake Rd
1 min (0.7 mi)

Follow Asher Miner Rd and Indiantown Gap Rd to US-22 E
5 min (2.3 mi)

2. Continue straight to stay on Asher Miner Rd
1.1 mi

3. Continue onto Indiantown Gap Rd
0.4 mi

4. Turn right to stay on Indiantown Gap Rd
0.8 mi

Follow US-22 E and PA-72 S to S 4th St in Lebanon
20 min (11.6 mi)

5. Turn left at the 1st cross street onto US-22 E
3.5 mi

6. Take the PA-72 S exit toward Lebanon
0.2 mi

7. Turn right onto PA-72 S
7.4 mi

8. Turn left onto Walnut St
0.5 mi

Continue on S 4th St to your destination
1 min (0.1 mi)

9. Turn right onto S 4th St
390 ft

10. Turn left
207 ft

11. Turn left
62 ft

12. Turn left
Destination will be on the right
3 ft

WellSpan Good Samaritan Hospital
252 S. 4th St 4th and, Walnut St, Lebanon, PA 17042

9. General Plan

9.1 General Site Rules

- All site personnel will wear PPE as required by the task.
- The buddy system will be observed at all times.
- Site personnel who wear corrective lenses will provide their own prescription safety glasses.
- Horseplay will not be tolerated.
- Proper site housekeeping (including removal of trash and orderly stacking and removal of materials to reduce slipping, tripping, and fire hazards) will be the responsibility of all site personnel on a daily basis.
- If any unusual site conditions are noted (odors, presence of unknown liquids, suspect biohazards) or any symptoms are experienced, work will be stopped until site hazards can be evaluated.

9.2 Sanitation

Employees will not be required to perform work under unsanitary conditions. AECOM will establish and maintain hygienic sanitation provisions including the following:

- Drinking/potable water (bottled water) will be kept onsite during field activities. This will be replenished, as necessary, to provide adequate supplies of potable water. Soap and water will also be available at the jobsite for washing body parts.
- Containers used for drinking water will be clearly marked and not used for any other purpose.
- Cups must not be shared by employees.
- Outlets for non-potable water (i.e., firefighting purposes) are not to be used by employees for drinking, washing, or cooking purposes.
- A portable toilet or other bathroom facility will be available for employees.
- Disposable PPE will eliminate the need for a Personnel Decontamination Station. Used PPE and refuse generated during field activities will be collected in trash bags and disposed of at an approved location.

9.3 Contamination Prevention

Exposure to chemical contamination is limited to PFAS exposure during this project. If this changes and there is a potential of contamination, personnel should be alert and follow good work practices during the use of hazardous chemicals, such as:

- Do not walk through areas of suspected contamination.
- Do not handle or touch materials suspected to be contaminated.
- Make sure all PPE is free of cuts or tears prior to donning.

- Particular care should be taken to protect any skin injuries. If open wounds exist on hands or forearms, handling of chemicals should be restricted or eliminated.
- Do not carry cigarettes, gum, chewing tobacco, cosmetics into work areas.

9.4 Personal Decontamination

If any personnel will be handling hazardous chemicals, they will pass through a decontamination station where conditions necessitate. To reduce the volume of water generated through decontamination, protective clothing will be discarded instead of cleaned and reused. The generation of decontamination water should be minimized whenever possible.

Following equipment decontamination, employees may be required to follow the proper personal decontamination procedures above.

Personnel decontamination should consist of the following glove removal procedure:

1. Grasp the cuff of the dominant hand and pull glove over the bulk of the hand, leaving the fingers inside the glove.
2. Use the dominant hand to grasp the cuff of the non-dominant hand and pull the glove completely off (inside-out) and place inside of the dominant hand glove.
3. Once removed, employee should only touch the inside material of the dominant hand glove.
4. Thoroughly wash hands.

9.5 Equipment Decontamination

A separate equipment decontamination pad will be set up as needed adjacent to the EZ. All equipment and tools will be cleaned prior to site entry to remove grease, oil, dirt, or any other off-site materials. The drilling subcontractor will establish a separate decontamination area outside of the exclusion zone to decontaminate large equipment between sampling locations as well as upon entry and exiting the site.

The SSHO will inspect the equipment prior to approving the items for use on site. The SSHO will also be responsible for inspecting all items for adequacy of decontamination prior to removal off site. The inspection will be noted in the SSHO's logbook. Other site materials will be disposed of as normal trash.

The steps in **Table 9-1** will be taken when decontaminating small equipment:

Table 9-1 Small Equipment Decontamination Procedure

Step	Description
1	Wrap small equipment such as shovels, picks, chisels, hammers, and drill augers in plastic sheeting.
2	Transport the small equipment from the EZ to the decontamination pad.
3	Wash small equipment with water spray.
4	Scrub small equipment with soapy water using brushes and a phosphate-free soap.
5	Rinse small equipment with potable water.

6	Place small equipment on clean plastic sheeting and allow it to dry.

9.6 Disposal of Decontamination Waste

Disposable PPE will eliminate the need for a Personnel Decontamination Station. The used PPE will be collected in plastic trash bags and disposed of as regular trash.

9.7 Layout Plan

Due to the short duration of field activities, AECOM will not bring temporary facilities (e.g., site trailer) on-site. Installation of fencing is not anticipated since no construction hazard will be present at these sites. Existing facilities and field vehicles will be used for equipment staging and storage during field activities.

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10. Required Documentation

The following documentation must be kept on site or readily accessible:

- Current HAZWOPER training certificates (including 8-hour refresher and site supervisor training)
- Current First Aid/CPR Certification
- SDSs for all hazardous chemicals brought on site by AECOM and its subcontractors
- OSHA-required medical surveillance examination clearance records
- Field logbook
- Copies of any Incident Reports such as:
  - AECOM Health and Safety Incident Report
  - USACE Accident Investigation Form
- Signed copies of the APP/SSHP Compliance Agreement
- Site Safety Briefing Form
- Deficiency Tracking Log
- Completed AHA/THA forms
- Any other permits, training records, or documentation

10.1 Training Logs

Training logs should include initial site-specific safety training, daily safety briefings, weekly "toolbox" topic training, and visitor training. A record of the training will be documented on a training log, which will include the following information:

- Date
- Employee's name
- Time allocation in training session
- Training topic(s)
- Trainer(s) signature

10.2 Field Log Books

The SSHO will maintain a logbook on site in accordance with standard AECOM procedures. Complete and detailed documentation of site activities will be very important. The following information will be recorded on a daily basis:

- Site conditions (e.g., weather)
- Activities being performed
- Log of photographs (if taken)

- Personnel on site
- Site visitors
- Incidents, accident, and near misses
- Violations of health and safety procedures
- Other significant events

10.3 Incident Reports

Incident reports will be completed and submitted as described in Section 8 of the APP.

10.4 PA ARNG Work Notification and Access Permit

The Work Notification and Access Permit is completed prior to field work and must be countersigned by a FTIG environmental member, (e.g. Thomas Marrs P.G., PA DEM). It needs to be carried by each field crew at FTIG. It demonstrates that the FTIG environmental department is aware of the field activity and gives the field crews documentation to show post security that they are allowed at the location.

11. References

AECOM. 2018. *Final Preliminary Assessment Report, Fort Indiantown Gap, Annville Pennsylvania, Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites ARNG Installations, Nationwide Contract No. W912DR-12-D-0014/W912DR17F0192*.

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Ogden, 2001a. Final Geologic and Topographic Condition Study, National Guard Training Center Fort Indiantown Gap, Annville, Pennsylvania.

United States Army Corps of Engineers (USACE). 2014. Safety and Health Requirements Manual, EM 385-1-1. 30 November.

United States Environmental Protection Agency (USEPA). 2016a. Drinking Water Health Advisory for PFOA – May 2016. https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final_508.pdf.

USEPA. 2016b. Drinking Water Health Advisory for PFOS – May 2016. https://www.epa.gov/sites/production/files/2016-05/documents/pfos_health_advisory_final_508.pdf.

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Appendix A – Activity Hazard Analysis (Programmatic)

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Activity Hazard Analysis (AHA)

Activity/Work Task:	Mobilization/Demobilization
Project Location:	TBD
Contract Number:	60552172
Date Prepared:	6/7/2018
Prepared by (Name/Title):	Joe Witte/Env. Scientist
Reviewed by (Name/Title):	Alberto Munuera/PSHO

Notes: (Field Notes, Review Comments, etc.)

Required Site Personal Protective Equipment:
Hard Hat
Safety Glasses ANSI Z87.1
Safety Toed Boots ASTM 24 12-05, 13-05
High Visibility Vest with reflective strips
Hearing Protection
Dust Mask (Respirator) – Based on exposure.

Overall Risk Assessment Code (RAC) (Use highest code): **L**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
Loading/Unloading vehiclse	Lifting injury/back strain	• Use a partner while lifting heavy or large objects. • Use proper lifting techniques	L
	Pinch Points	• Locate potential pinch points and guard as needed. • Warn others prior to closing doors and tailgates	L
	Struck by	• Stage equipment on an even surface. • Tall objects should be tipped onto side to prevent tipping	L
	Shifting loads	• Secure loads with a cargo net, straps, or other mechanical device. • Do not store unsecured items on passenger seats.	L
Driving to/from/on Site	Vehicular Incident • -Injury • -Property Damage • -Vehicle Damage	• Complete a pre-use visual inspection. • No hand-held electronic devices • Be aware of road conditions and drive only to your comfort level. • Slowly exit from parking spaces; Seek eye contact with other drivers or pedestrians. • Before changing lanes, signal well in advance, check mirrors and over shoulder • Maintain safe distances behind vehicles and stay out of other	L

		vehicles' blind spots. • DRIVE DEFENSIVELY. Move eyes and scan mirrors at least every 2 seconds. • Back into parking spaces (or "pull through") when appropriate • Use a spotter when backing-up or maneuvering around objects or other vehicles • Be familiar with the handling and operation of company or rental vehicles • Assure tires are properly inflated and there is sufficient tread (including spare).	
	Fatigue	• Take turns driving • Frequent breaks.	L
Set up work area	Traffic	• Wear high visibility safety vest. Use buddy system while placing traffic cones/barricades. Work facing traffic pattern.	L
	Overhead hazards	Observe overhead conditions and avoid staging near overhead utilities, trees, etc.	L
	Public	• Setup exclusion zone.	L
Site clean up	Public entering exclusion zone	• Secure work area from public entrance.	L
	Injury due to end of day rush	• Work methodically at end of day. Do not rush or take short cuts.	L
	Fatigue	• Rotation of shifts. • Frequent breaks.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Hand Tools (list all): None	**Required Training:** None	None
Power Tools (list all): None	None	None
Equipment (list all): AECOM-owned or rental vehicle	Defensive driving OSHA HAZWOPER 40-Hour Valid driver's license	As described in S3NA-005-PR Vehicle and Driver Safety Program
Personal Protective Equipment (PPE): Hardhat Safety Glasses High Visibility Vests Safety toed Boots Hearing Protection Gloves	None	None

Printed Name	Signature	Date

By signing below, I affirm that I have read this Activity Hazard Analysis (AHA) and understand the risks associated with the above stated construction activity for the referenced project.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

Activity Hazard Analysis (AHA)

Activity/Work Task:	Direct Push Oversight and Soil Sampling	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location:	TBD		
Contract Number:	60552172		
Date Prepared:	6/7/2018		
Prepared by (Name/Title):	Joe Witte/Env. Scientist		
Reviewed by (Name/Title):	Alberto Munuera/PSHO		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

Required Site Personal Protective Equipment:
Hard Hat
Safety Glasses ANSI Z87.1
Safety Toed Boots ASTM 24 12-05, 13-05
High Visibility Vest with reflective strips
Hearing Protection
Dust Mask (Respirator) – Based on exposure.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
Mobilization/Site Set Up	Driving	• Complete a pre-use visual inspection. No hand-held electronic devices. Be aware of road conditions and drive only to your comfort level. • Use spotter when driving on-site or around equipment	L
	Fatigue (long hours, repetitive tasks)	• Buddy system. Rotation of shifts. Frequent breaks.	L
	Inclement weather	• Evaluate weather conditions prior to beginning the travel to determine if travel should proceed. Verify your vehicle is equipped to travel in poor weather. Have supplies on hand in the event that you become stranded, including a communication device to call for help.	L
Boring Process	Cuts	• Wear appropriate work gloves to prevent cuts, lacerations.	M
	Underground utilities	• Clear area for all underground utilities in accordance with the facilities dig permitting process. • Hand auger the first 5 feet of any boring location.	

	Dermal Contact	• Wear appropriate protective clothing to avoid dermal or personal clothing contact with sampled material.	**M**
	Slips/Trips/Falls	• Clear trees, roots, weeds, limbs and other ground hazards from the drilling location. Practice good housekeeping to keep the ground around the drilling site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.	**M**
	Proximity to Rig	• Stay clear of drilling rig when operating • Wear hard hat, safety glasses, safety vest and ear protection	**M**
General Physical Hazards	Slip/Trip/Fall	• Take inventory of your surroundings noting any conditions which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. • Make any corrective actions to eliminate hazards, erect barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out. • Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards. • Watch your step and ensure proper footing. • Maintain 3 points of contact when climbing into vehicle	**L**
	Cold/Heat Stress	• Provide drinking water and first aid kit. • Wear appropriate clothing for weather conditions. • Buddy system; heat stress monitoring; heat stress control plan (including shelters, work rotation, methods of cooling)	**L**
	Biological Hazards	• Assess work area for poisonous plants and animals and communicate observations to avoid them. • If hazardous insects or plants such as ticks, poison oaks are identified or suspected in a work area, controls including the use of disposable (Tyvek) coveralls, insect repellent (23.8% DEET or similar), light colored clothing, barrier creams, frequent tick checks should be implemented. • Additionally, all field clothing and equipment should be thoroughly cleaned, removed and/or segregated from clean clothing, equipment and supplies to avoid transfer of hazardous plants/insects. • All employees should bath immediately following fieldwork and use soaps/cleansers designed to remove oils associated with poison	**M**

	Cuts/Scrapes/Bruises	• Level D PPE required. • Wear appropriate work gloves for task	L
	Manual Lifting	• Wear appropriate work gloves for task • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance) • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. Use appropriate lifting techniques if required to manually lift an object. Seek assistance when needed.	
	Adverse Weather	• Be aware of changing weather condition and provide appropriate weather gear. • When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)	L
Sample collection and packaging	Chemical exposure potential	• Follow proper decontamination procedures	L
	Cuts/scrapes	• Inspect glassware for breakage and avoid sharp edges and wear gloves (nitrile and cut resistant leather or Kevlar). • Wear gloves when managing sharp acetate liners.	L
	Manual lifting of equipment	• Use proper lifting techniques and do not over-extend • Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials.	L
IDW Handling- Containerizing soil cuttings	Chemical Exposure	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Use respiratory protection, depending on measurements. • Have portable eyewash on site	L
	Manual Lifting	• Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Minimize body strain by taking stretching breaks • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. • Pour water from buckets into drums/containers as soon as practicable.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Hand Tools (list all): None	**Required Training:** None	None
Power Tools (list all): None	None	None
Equipment (list all): AECOM-owned or rental vehicle Pump	Defensive driving OSHA HAZWOPER 40-Hour Valid driver's license	As described in S3NA-005-PR Vehicle and Driver Safety Program
Personal Protective Equipment (PPE): Hardhat Safety Glasses High Visibility Vests Safety toed Boots Hearing Protection Gloves	None	None

Printed Name	Signature	Date

By signing below, I affirm that I have read this Activity Hazard Analysis (AHA) and understand the risks associated with the above stated construction activity for the referenced project.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

Activity Hazard Analysis (AHA)

Activity/Work Task:	Soil Sampling- Hand Auger
Project Location:	TBD
Contract Number:	60552172
Date Prepared:	7/12/2018
Prepared by (Name/Title):	Claire Mitchell/ SI Task Manager
Reviewed by (Name/Title):	Alberto Munuera/PSHO

Notes: (Field Notes, Review Comments, etc.)

Required Site Personal Protective Equipment:
Hard Hat
Safety Glasses ANSI Z87.1
Safety Toed Boots ASTM 24 12-05, 13-05
High Visibility Vest with reflective strips
Hearing Protection
Dust Mask (Respirator) – Based on exposure.

Overall Risk Assessment Code (RAC) (Use highest code): **M**

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
Travel	Driving	• Complete a pre-use visual inspection. No hand-held electronic devises. Be aware of road conditions and drive only to your comfort level. • Use spotter when driving on-site or around equipment	L
	Fatigue (long hours, repetitive tasks)	• Buddy system. Rotation of shifts. Frequent breaks.	L
	Inclement weather	• Evaluate weather conditions prior to beginning the travel to determine if travel should proceed. Verify your vehicle is equipped to travel in poor weather. Have supplies on hand in the event that you become stranded, including a communication device to call for help.	L
General Physical Hazards	Slip/Trip/Fall	• Take inventory of your surroundings noting any conditions which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. • Make any corrective actions to eliminate hazards, erect barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out.	L

General Physical Hazards (continued)		• Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards. • Watch your step and ensure proper footing. • Maintain 3 points of contact when climbing into vehicle	
	Cold/Heat Stress	• Provide drinking water and first aid kit. • Wear appropriate clothing for weather conditions. • Buddy system; heat stress monitoring; heat stress control plan (including shelters, work rotation, methods of cooling)	**L**
	Biological Hazards	• Assess work area for poisonous plants and animals and communicate observations to avoid them. • If hazardous insects or plants such as ticks, poison oaks are identified or suspected in a work area, controls including the use of disposable (Tyvek) coveralls, insect repellent (23.8% DEET or similar), light colored clothing, barrier creams, frequent tick checks should be implemented. • Additionally, all field clothing and equipment should be thoroughly cleaned, removed and/or segregated from clean clothing, equipment and supplies to avoid transfer of hazardous plants/insects. • All employees should bath immediately following fieldwork and use soaps/cleansers designed to remove oils associated with poison	**M**
	Cuts/Scrapes/Bruises	• Level D PPE required. • Wear appropriate work gloves for task	**L**
	Manual Lifting	• Wear appropriate work gloves for task • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance) • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. Use appropriate lifting techniques if required to manually lift an object. Seek assistance when needed.	**L**
	Adverse Weather	• Be aware of changing weather condition and provide appropriate weather gear. • When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)	**L**
Sediment/ Soil Sampling	Subsurface structures	• Watch for changes in soil types or other indications of backfill or non-native soil. • Stop of unanticipated items are noted (i.e., hard objects)	**M**

	Muscle Strain	• Use proper lifting techniques and tools. • When possible, use the buddy system when adding or removing t-handle on auger, section of the shaft, or the auger tip. • Do not attempt excessive force if the auger does not turn.	**M**
	Exposure potential	• Use respiratory protection, depending on measurements. • Wear modified Level D PPE, when necessary (Tyvek and face shields or dust masks).	**M**
	Manual lifting	• Items over 49 pounds need two people to lift. Life with legs, not with the back. • Minimize body strain by taking stretching breaks, especially when soil logging. • Use dollies, carts, come-alongs or rollers whenever possible rather than physically moving materials.	**M**
Decontamination	Chemical exposure potential	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Have portable eyewash on site	**L**
	Cuts/scrapes	• Use appropriate cutting devices for tubing boxes and proper tools for pump repairs/maintenance. • Wear appropriate work gloves for task	**L**
	Manual lifting of equipment	• Pour water from buckets into drums/containers as soon as practicable and lifting with legs. • Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Minimize body strain by taking stretching breaks.	**L**
Sample Packaging	Cuts/scrapes	• Inspect glassware for breakage and avoid sharp edges and wear gloves (nitrile and cut resistant leather or Kevlar)	**L**
	Manual lifting	• Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Minimize body strain by taking stretching breaks, especially when soil logging. • Use dollies, carts, come-alongs or rollers whenever possible rather than physically moving materials.	**L**

IDW Handling	Chemical Exposure	• Wear modified level D PPE when necessary (Tyvek or dust masks) • Use respiratory protection, depending on measurements.	**L**
	Manual Lifting	• Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Minimize body strain by taking stretching breaks • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Hand Tools (list all): None	**Required Training:** None	None
Power Tools (list all): None	None	None
Equipment (list all): AECOM-owned or rental vehicle Hand Auger	Defensive driving OSHA HAZWOPER 40-Hour Valid driver's license	As described in S3NA-005-PR Vehicle and Driver Safety Program
Personal Protective Equipment (PPE): Hardhat Safety Glasses High Visibility Vests Safety toed Boots Hearing Protection Gloves	None	None

Printed Name	Signature	Date

By signing below, I affirm that I have read this Activity Hazard Analysis (AHA) and understand the risks associated with the above stated construction activity for the referenced project.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

Activity Hazard Analysis (AHA)

Activity/Work Task:	Well Installation Oversight and Well Development	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location:	TBD		
Contract Number:	60552172		
Date Prepared:	6/7/2018		
Prepared by (Name/Title):	Joe Witte/Env. Scientist		
Reviewed by (Name/Title):	Alberto Munuera/PSHO		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

Required Site Personal Protective Equipment:
Hard Hat
Safety Glasses ANSI Z87.1
Safety Toed Boots ASTM 24 12-05, 13-05
High Visibility Vest with reflective strips
Hearing Protection
Dust Mask (Respirator) – Based on exposure.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps	Hazards	Controls	RAC
Mobilization/Site Set Up	Driving	• Complete a pre-use visual inspection. No hand-held electronic devices. Be aware of road conditions and drive only to your comfort level. • Use spotter when driving on-site or around equipment	L
	Fatigue (long hours, repetitive tasks)	• Buddy system. Rotation of shifts. Frequent breaks.	L
	Inclement weather	• Evaluate weather conditions prior to beginning the travel to determine if travel should proceed. Verify your vehicle is equipped to travel in poor weather. Have supplies on hand in the event that you become stranded, including a communication device to call for help.	L
Monitoring Well Installation Oversight	Cuts	• Wear appropriate work gloves to prevent cuts, lacerations.	M
	Underground utilities	• Clear area for all underground utilities in accordance with the facilities dig permitting process. • Subcontractor to hand auger the first 5 feet of any boring location.	M

	Dermal Contact	• Wear appropriate protective clothing to avoid dermal or personal clothing contact with sampled material.	**M**
	Slips/Trips/Falls	• Clear trees, roots, weeds, limbs and other ground hazards from the drilling location. Practice good housekeeping to keep the ground around the drilling site clear of obstructions, equipment and other tripping hazards. Wear appropriate foot protection to prevent slips and trips. Use caution when working on uneven and wet ground surfaces.	**M**
	Proximity to Rig	• Stay clear of drilling rig when operating • Wear hard hat, safety glasses, safety vest and hearing protection	**M**
General Physical Hazards	Slip/Trip/Fall	• Take inventory of your surroundings noting any conditions which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. • Make any corrective actions to eliminate hazards, erect barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out. • Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards. • Watch your step and ensure proper footing. • Maintain 3 points of contact when climbing into vehicle	**L**
	Cold/Heat Stress	• Provide drinking water and first aid kit. • Wear appropriate clothing for weather conditions. • Buddy system; heat stress monitoring; heat stress control plan (including shelters, work rotation, methods of cooling)	**L**
	Biological Hazards	• Assess work area for poisonous plants and animals and communicate observations to avoid them. • If hazardous insects or plants such as ticks, poison oaks are identified or suspected in a work area, controls including the use of disposable (Tyvek) coveralls, insect repellent (23.8% DEET or similar), light colored clothing, barrier creams, frequent tick checks should be implemented. • Additionally, all field clothing and equipment should be thoroughly cleaned, removed and/or segregated from clean clothing, equipment and supplies to avoid transfer of hazardous plants/insects. • All employees should bath immediately following fieldwork and use soaps/cleansers designed to remove oils associated with poison	**M**

	Cuts/Scrapes/Bruises	• Level D PPE required. • Wear appropriate work gloves for task	**L**
	Manual Lifting	• Wear appropriate work gloves for task • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance) • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. Use appropriate lifting techniques if required to manually lift an object. Seek assistance when needed.	
	Adverse Weather	• Be aware of changing weather condition and provide appropriate weather gear. • When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)	**L**
Well Development	Chemical exposure potential	• Follow proper decontamination procedures	**L**
	Manual lifting of equipment and buckets	• Use proper lifting techniques and do not over-extend • Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials.	**L**
IDW Handling- transferring purge water from 5-gallon buckets to 55-gallon drums staged in central location.	Chemical Exposure	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Use respiratory protection, depending on measurements. • Have portable eyewash on site	**L**
	Manual Lifting	• Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Minimize body strain by taking stretching breaks • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. • Pour water from buckets into drums/containers as soon as practicable.	**L**
	Splash Hazard	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Inspect Drums/Containers prior to use for integrity and contaminants • Pour water from buckets into drums/containers as soon as	**L**

		practicable.	
	Spills	• Inspect Drums/Containers prior to use for integrity and contaminants • Pour water from buckets into drums/containers as soon as practicable. • Place used PPE and disposable sampling equipment in garbage bags to be disposed of properly.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Hand Tools (list all): None	**Required Training:** None	None
Power Tools (list all): None	None	None
Equipment (list all): AECOM-owned or rental vehicle Water quality meter 55-gallon drums 5-gallon buckets with lids Monsoon Pump	Defensive driving OSHA HAZWOPER 40-Hour Valid driver's license	As described in S3NA-005-PR Vehicle and Driver Safety Program
Personal Protective Equipment (PPE): Hardhat Safety Glasses High Visibility Vests Safety toed Boots Hearing Protection Gloves	None	None

Printed Name	Signature	Date

By signing below, I affirm that I have read this Activity Hazard Analysis (AHA) and understand the risks associated with the above stated construction activity for the referenced project.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

Activity Hazard Analysis (AHA)

Activity/Work Task:	Groundwater and Surface Water Sampling	Overall Risk Assessment Code (RAC) (Use highest code)	**M**
Project Location:	TBD		
Contract Number:	60552172		
Date Prepared:	7/19/2018		
Prepared by (Name/Title):	Joe Witte/Env. Scientist		
Reviewed by (Name/Title):	Alberto Munuera/PSHO		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

Required Site Personal Protective Equipment:
Hard Hat
Safety Glasses ANSI Z87.1
Safety Toed Boots ASTM 24 12-05, 13-05
High Visibility Vest with reflective strips
Hearing Protection
Dust Mask (Respirator) – Based on exposure.

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Job Steps	Hazards	Controls	RAC
Travel	Driving	• Complete a pre-use visual inspection. No hand-held electronic devises. Be aware of road conditions and drive only to your comfort level. • Use spotter when driving on-site or around equipment	L
	Fatigue (long hours, repetitive tasks)	• Buddy system. Rotation of shifts. Frequent breaks.	L
	Inclement weather	• Evaluate weather conditions prior to beginning the travel to determine if travel should proceed. Verify your vehicle is equipped to travel in poor weather. Have supplies on hand in the event that you become stranded, including a communication device to call for help.	L
General Physical Hazards	Slip/Trip/Fall	• Take inventory of your surroundings noting any conditions which may pose a slip, trip or fall hazard. Clear and walk your pathway prior to work beginning. • Make any corrective actions to eliminate hazards, erect barricades or place warning signs and cones to raise awareness to hazards that can't be engineered out.	L

		• Maintain strong housekeeping habits. Keep worksites clean and free from debris, spills or other slip/trip hazards. • Watch your step and ensure proper footing. • Maintain 3 points of contact when climbing into vehicle	
	Cold/Heat Stress	• Provide drinking water and first aid kit. • Wear appropriate clothing for weather conditions. • Buddy system; heat stress monitoring; heat stress control plan (including shelters, work rotation, methods of cooling)	**L**
	Biological Hazards	• Assess work area for poisonous plants and animals and communicate observations to avoid them. • If hazardous insects or plants such as ticks, poison oaks are identified or suspected in a work area, controls including the use of disposable (Tyvek) coveralls, insect repellent (23.8% DEET or similar), light colored clothing, barrier creams, frequent tick checks should be implemented. • Additionally, all field clothing and equipment should be thoroughly cleaned, removed and/or segregated from clean clothing, equipment and supplies to avoid transfer of hazardous plants/insects. • All employees should bath immediately following fieldwork and use soaps/cleansers designed to remove oils associated with poison	**M**
	Cuts/Scrapes/Bruises	• Level D PPE required. • Wear appropriate work gloves for task	**L**
	Manual Lifting	• Wear appropriate work gloves for task • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance) • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. Use appropriate lifting techniques if required to manually lift an object. Seek assistance when needed.	
	Adverse Weather	• Be aware of changing weather condition and provide appropriate weather gear. • When work is halted due to inclement weather, personnel are to seek shelter in vehicles or building designated Shelter in Place (SIP)	**L**
Equipment Calibration	Chemical	• Appropriate ventilation in calibration area when using calibration gases (perform calibration outside). • Wear appropriate PPE (Level D).	**L**

(Groundwater Sampling) Establish EZ around well sampling location and unload/set-up equipment	Traffic in roadways and parking lots	• Use combination of vehicles, cones, traffic barriers and caution tape. • A traffic plan may be necessary depending on location.	**L**
	Cuts/scrapes	• Wear leather gloves.	**L**
	Stacking heights	• Avoid stacking equipment and boxes.	**L**
(Surface water sampling) Establish EZ around surface water sample location and collect sample.	Slips/ trips/ falls	• Investigate planned approach for rocks, branches, debris and other slip/trip/fall hazards. • Evaluate angle of approach and minimize as best as possible. • Have a buddy system in place. • Use a pack to secure tools, sample jars, etc. to have hands free. • Wear proper non-slip foot ware (waterproof foot ware not recommended for PFAS sampling).	**L**
	Biological Hazards	• Inspect area for snakes, insects, and small animals.	**L**
	Exposure/drowning from falling into water	• Use the buddy system. • Stay back from the water's edge as far as possible. • Wear a PFD if within 6' of water 3' deep or deeper. Maintain awareness of surroundings and maintain communication between team members; identify potential hazards prior to entering area and avoid, when possible.	**M**
Open well and take water level measurement.	Cuts/scrapes	• Wear leather gloves.	**L**
	Biological Hazards	• Look for spiders, scorpions, etc. in the well head.	**L**
	Exposure potential	• Use ventilation procedures on each well, monitoring at well head and breathing zone. • Use respiratory protection, depending on measurements. • Wear nitrile gloves to remove plug and taking measurement.	**L**
Sample/develop purge using a bailer or pump (well will be purged	Exposure potential	• Wear nitrile gloves while taking flow rates • Monitor breathing zone continuously during sampling event.	**L**

prior to sampling)	Cuts/scrapes	• Use appropriate cutting devices for tubing boxes and proper tools for pump repairs/maintenance. • Wear appropriate work gloves for task	**L**
	Electrical	• Ensure employees are properly trained in the use of the compressors, e.g., use correct contacts for 12 volt batteries and avoid arcing situations	**L**
	Compressed gas calibration gas	• Gas canisters are not to be used unless they have standardized markings showing that they have been tested as required by regulations. • All cylinders shall be stored upright, with caps in place; and secured • Inspect cylinders prior to use.	**L**
	Manual lifting	• Wear appropriate work gloves for task • Use proper lifting techniques by bending and lifting with legs and not back, and do not over extend or twist (Do not lift over 49lb. without assistance) • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. Use appropriate lifting techniques if required to manually lift an object. Seek assistance when needed.	**L**
IDW Handling	Chemical Exposure	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Use respiratory protection, depending on measurements. • Have portable eyewash on site	**L**
	Manual Lifting	• Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Minimize body strain by taking stretching breaks • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials. • Pour water from buckets into drums/containers as soon as practicable.	**L**
	Splash Hazard	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Inspect Drums/Containers prior to use for integrity and contaminants • Pour water from buckets into drums/containers as soon as practicable.	**L**

	Spills	• Inspect Drums/Containers prior to use for integrity and contaminants • Pour water from buckets into drums/containers as soon as practicable. • Place used PPE and disposable sampling equipment in garbage bags to be disposed of properly.	**L**
Sample collection and packaging	Chemical exposure potential	• Follow proper decontamination procedures	**L**
	Cuts/scrapes	• Inspect glassware for breakage and avoid sharp edges and wear gloves (nitrile and cut resistant leather or Kevlar)	**L**
	Manual lifting of equipment	• Use proper lifting techniques and do not over-extend • Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Use dollies, carts, come-alongs, or rollers whenever possible rather than the employee physically moving materials.	**L**
Decontamination	Chemical exposure potential	• Wear modified level D PPE when necessary (Tyvek and face shields or dust masks) • Have portable eyewash on site	**L**
	Cuts/scrapes	• Use appropriate cutting devices for tubing boxes and proper tools for pump repairs/maintenance. • Wear appropriate work gloves for task	**L**
	Manual lifting of equipment	• Pour water from buckets into drums/containers as soon as practicable and lifting with legs. • Items over 49 pounds need two people to lift. Lift with legs, not with the back. • Minimize body strain by taking stretching breaks.	**L**

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Hand Tools (list all): Screwdriver Ratchet	**Required Training:** None	None
Power Tools (list all): None	None	None
Equipment (list all): AECOM-owned or rental vehicle 55-gallon steel drum 5-gallon buckets with lids Pump	Defensive driving OSHA HAZWOPER 40-Hour Valid driver's license	As described in S3NA-005-PR Vehicle and Driver Safety Program
Personal Protective Equipment (PPE): Hardhat Safety Glasses High Visibility Vests Safety toed Boots Hearing Protection Gloves	None	None

Printed Name	Signature	Date

By signing below, I affirm that I have read this Activity Hazard Analysis (AHA) and understand the risks associated with the above stated construction activity for the referenced project.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

Activity Hazard Analysis (AHA) - Example

Activity/Work Task:	Surveying Oversight	Overall Risk Assessment Code (RAC) (Use highest code)	**L**
Project Location:	TBD		
Contract Number:	W912DR-12-D-0014		
Date Prepared:	July 12, 2018		
Prepared by (Name/Title):	Claire Mitchell/ SI Task Manager		
Reviewed by (Name/Title):	Alberto Munuera, Area SHE Manager		

Risk Assessment Code (RAC) Matrix

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Notes: (Field Notes, Review Comments, etc.)

Required Site Personal Protective Equipment:
Hard Hat
Safety Glasses ANSI Z87.1
Safety Toed Boots ASTM 24 12-05, 13-05
High Visibility Vest with reflective strips
Hearing Protection

Step 1: Review each **"Hazard"** with identified safety **"Controls"** and determine RAC (See above)

"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.

"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible

Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.

RAC Chart

- **E = Extremely High Risk**
- **H = High Risk**
- **M = Moderate Risk**
- **L = Low Risk**

Job Steps		Hazards	Controls	RAC
1	Driving to and from site	Vehicular accident	• Plan route; be alert to traffic and weather conditions; allow extra time as needed. • Inspect vehicle to ensure proper operation. • Obey traffic rules when driving on and off base • Avoid distractions; the use of portable electronic devices while driving is prohibited. • Wear seat belts • Use spotter when backing up	L
3	Surveying Oversight	Injury from slips, trips, falls	• Wear sturdy shoes with adequate tread. • Be alert to uneven terrain, obstructions in walkway, and foliage covered slopes • Be aware of slippery surfaces • Be prepared for inclement weather and resulting conditions • Move slowly and follow the leader; focus on safe footing before shifting weight	L
		Struck by vehicles	• Wear Class 2 retro-reflective vests when walking near roadways • Walk facing traffic • Check for oncoming traffic before crossing roadway	L

		Eye injury	• Wear safety glasses with side shields	L
		Bites, stings from insects, bees, ticks, mosquitoes	• Wear long sleeves and long pants • Tuck pant lets into socks and tape around • Avoid walking through brush or rubbing against bushes and trees. • Spray repellent containing 100% DEET around ankles, wrists, and head covering; spray repellent containing 30% DEET on exposed skin. • Check for ticks during field activities; shower and conduct a complete body check after work	L
		Snake, spider bites	• Be able to identify poisonous species • Be aware of spider, snake habitats • Do not place hands or feet into areas that cannot be seen.	L
		Poisonous plants	• Be able to identify poisonous plants and avoid contact • If contact occurs, wash exposed skin and tools with soap and water or a product such as Technu • Wash clothing in soap and hot water to remove oils; do not reuse clothing	L
		Munitions or explosives	• Do not touch suspect items; retreat to a safe location and report to installation personnel	L
		Contaminated soil or water	• Avoid contact with standing water exhibiting oily sheens or other evidence of contamination • Avoid contact with soil and vegetation with visible contamination • Withdraw from area if odors are present, or irritation of skin or eyes is noted.	L

Equipment to be Used	Training Requirements	Inspection Requirements
None	AECOM Field Safety First Aid/CPR Vehicle Safety Personal protective equipment	Vehicle Inspections before use. Personal Protective Equipment inspection prior to use.

By signing below, I affirm that I have read this Activity Hazard Analysis (AHA) and understand the risks associated with the above stated construction activity for the referenced project.

Printed Name	Signature	Date

The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified persons

Appendix B – Safety Data Sheets

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Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer
Alconox, Inc.
30 Glenn Street
White Plains, NY 10603
1-914-948-4040

Supplier
Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.

Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.

Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.

Remove contact lens(es) if able to do so during rinsing.

Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.

Seek medical attention if irritation, discomfort, or vomiting persists.

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4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

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8 Exposure controls/personal protection

8.1 Control parameters :

7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:

Not needed under normal conditions.

Protection of skin:

Select glove material impermeable and resistant to the substance.

Eye protection:

Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:

Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower:** **Explosion limit upper:**	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C:**	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density:**	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density:**	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities:**	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water):**	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature:**	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature:**	Not determined or not available.

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Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

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12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number: None
ADR, ADN, DOT, IMDG, IATA

14.2 UN Proper shipping name: None
ADR, ADN, DOT, IMDG, IATA

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

Non Bulk:
RQ (if applicable): None
Proper shipping Name: None
Hazard Class: None
Packing Group: None
Marine Pollutant (if applicable): No additional information.

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	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable

Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

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Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

HMIS: 1-0-0

MATERIAL SAFETY DATA SHEET

LIQUINOX®

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Union REACH Regulations

ALCONOX

SECTION 1 - PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:	**LIQUINOX®**
CHEMICAL FAMILY NAME:	Detergent.
PRODUCT USE:	Critical-cleaning detergent for laboratory, healthcare and industrial applications
U.N. NUMBER:	Not Applicable
U.N. DANGEROUS GOODS CLASS:	Non-Regulated Material
SUPPLIER/MANUFACTURER'S NAME:	Alconox, Inc.
ADDRESS:	30 Glenn St., Suite 309, White Plains, NY 10603. USA
EMERGENCY PHONE:	**TOLL-FREE in USA/Canada** 800-255-3924
	International calls 813-248-0585
BUSINESS PHONE:	914-948-4040
DATE OF PREPARATION:	May 2011
DATE OF LAST REVISION:	February 2008

SECTION 2 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: This product is a pale yellow liquid no odor. Exposure can be irritating to eyes, respiratory system and skin. It is a non-flammable liquid. The Environmental effects of this product have not been investigated.

US DOT SYMBOLS	CANADA (WHMIS) SYMBOLS	EUROPEAN and (GHS) Hazard Symbols
Non-Regulated	Not Controlled	None
		Signal Word: **Caution!**

EU LABELING AND CLASSIFICATION:

Classification of the substance or mixture according to Regulation (EC) No1272/2008 Annex 1
EC# 231-791-2 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 268-356-1 This substance is not classified in the Annex I of Directive 67/548/EEC
CAS# 84133-50-6 Not Listed in EU Chemical Inventory
EC# 232-483-0 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 215-090-9 This substance is not classified in the Annex I of Directive 67/548/EEC
EC# 241-543-5 This substance is not classified in the Annex I of Directive 67/548/EEC

GHS Hazard Classification(s):
None

Hazard Statement(s):
None

Precautionary Statement(s):
P264: Wash hands thoroughly after handling
P271: Use only in well ventilated area.

Hazard Symbol(s):
Not Classified

Risk Phrases:
None

Safety Phrases:
S24/25: Avoid contact with skin and eyes

HEALTH HAZARDS OR RISKS FROM EXPOSURE:

ACUTE: Exposure to this product may cause irritation of the eyes, respiratory system and skin. Ingestion may cause gastrointestinal irritation including pain, vomiting or diarrhea.

CHRONIC: This product contains an ingredient which may be corrosive.

TARGET ORGANS: ACUTE: Eye, respiratory System, Skin CHRONIC: None Known

SECTION 3 - COMPOSITION and INFORMATION ON INGREDIENTS

HAZARDOUS INGREDIENTS:	CAS #	EINECS #	ICSC #	WT %	HAZARD CLASSIFICATION; RISK PHRASES
Water	7732-18-5	231-791-2	Not Listed	40 – 60%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	268-356-1	Not Listed	10 – 20%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Alcohol Ethoxylate	84133-50-6	Not Listed	Not Listed	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Coconut Diethanolamide	8051-30-7	232-483-0	Not Listed	1 – 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Sodium Xylene Sulfonate	1300-72-7	215-090-9	1514	2 – 7%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Tripotassium EDTA	17572-97-3	241-543-5	Not Listed	1 - 5%	HAZARD CLASSIFICATION: None RISK PHRASES: None
Balance of other ingredients are non-hazardous or less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

SECTION 4 - FIRST-AID MEASURES

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: Wash skin thoroughly after handling. Seek medical attention if irritation develops and persists. Remove contaminated clothing. Launder before re-use.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention if breathing dificulty continues.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or MSDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Pre-existing skin, or eye problems may be aggravated by prolonged contact.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and reduce over-exposure.

SECTION 5 - FIRE-FIGHTING MEASURES

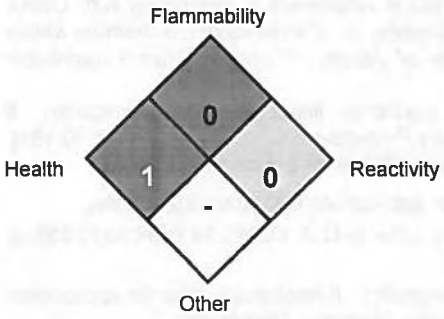
FLASH POINT: Not Flammable
AUTOIGNITION TEMPERATURE: Not Applicable
FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): NA Upper (UEL): NA
FIRE EXTINGUISHING MATERIALS: As appropriate for surrounding fire. Carbon dioxide, foam, dry chemical, halon, or water spray.

UNUSUAL FIRE AND EXPLOSION HAZARDS: This product is non-flammable, however containers may rupture if exposed to heat or fire.

Explosion Sensitivity to Mechanical Impact: Not Sensitive.
Explosion Sensitivity to Static Discharge: Not Sensitive

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

SECTION 6 - ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Personnel should be trained for spill response operations.
SPILLS: Contain spill if safe to do so. Prevent entry into drains, sewers, and other waterways. Soak up with an absorbent material and place in an appropriate container for disposal. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations).

SECTION 7 - HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts generated by this product. Use in a well-ventilated location. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: Containers of this product must be properly labeled. Store containers in a cool, dry location. Keep container tightly closed when not in use. Store away from strong acids or oxidizers.

SECTION 8 - EXPOSURE CONTROLS - PERSONAL PROTECTION

EXPOSURE LIMITS/GUIDELINES:

Chemical Name	CAS#	ACGIH TWA	OSHA TWA	SWA
Water	7732-18-5	Not Listed	Not Listed	Not Listed
Sodium (C10 – C16) Alkylbenzene Sulfonate	68081-81-2	Not Listed	Not Listed	Not Listed
Alcohol Ethoxylate	84133-50-6	Not Listed	Not Listed	Not Listed
Coconut Diethanolamide	8051-30-7	Not Listed	Not Listed	Not Listed
Sodium Xylene Sulfonate	1300-72-7	Not Listed	Not Listed	Not Listed
Tripotassium EDTA	17572-97-3	Not Listed	Not Listed	Not Listed

Currently, International exposure limits are not established for the components of this product. Please check with competent authority in each country for the most recent limits in place.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below. Use local exhaust ventilation to control airborne dust. Ensure eyewash/safety shower stations are available near areas where this product is used.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed above, if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION: Safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133 or appropriate Canadian Standards.

HAND PROTECTION: Use chemical resistant gloves to prevent skin contact.. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada.

BODY PROTECTION: Use body protection appropriate to prevent contact (e.g. lab coat, overalls). If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

SECTION 9 - PHYSICAL and CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
APPEARANCE & ODOR:	Pale yellow liquid with no odor.
ODOR THRESHOLD (PPM):	Not Available
VAPOR PRESSURE (mmHg):	17 @ 20°C (68°F)
VAPOR DENSITY (AIR=1):	>1
BY WEIGHT:	Not Available
EVAPORATION RATE (nBuAc = 1):	<1
BOILING POINT (C°):	100°C (212°F)
FREEZING POINT (C°):	Not Available
pH:	8.5
SPECIFIC GRAVITY 20°C: (WATER =1)	1.083
SOLUBILITY IN WATER (%)	Complete
COEFFICIENT OF WATER/OIL DIST.:	Not Available
VOC:	None
CHEMICAL FAMILY:	Detergent

SECTION 10 - STABILITY and REACTIVITY

STABILITY: Product is stable
DECOMPOSITION PRODUCTS: When heated to decomposition this product produces Oxides of carbon (COx), and Hydrocarbons
MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids and strong oxidizing agents.
HAZARDOUS POLYMERIZATION: Will not occur.
CONDITIONS TO AVOID: Contact with incompatible materials.

SECTION 11 - TOXICOLOGICAL INFORMATION

TOXICITY DATA: Toxicity data is not available for mixture.

SUSPECTED CANCER AGENT: None of the ingredients are found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, IARC and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies.
IRRITANCY OF PRODUCT: Contact with this product can be irritating to exposed skin, eyes and respiratory system.
SENSITIZATION OF PRODUCT: This product is not considered a sensitizer.
REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SECTION 12 - ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.
ENVIRONMENTAL STABILITY: No Data available at this time.
EFFECT OF MATERIAL ON PLANTS or ANIMALS: No evidence is currently available on this product's effects on plants or animals.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on this product's effects on aquatic life.

SECTION 13 - DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

SECTION 14 - TRANSPORTATION INFORMATION

US DOT; IATA; IMO; ADR:
THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.
PROPER SHIPPING NAME: Non-Regulated Material
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
PACKING GROUP: Not Applicable.
DOT LABEL(S) REQUIRED: Not Applicable
NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: None of the ingredients are classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B)

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS:
This product is not classified as dangerous goods, per U.S. DOT regulations, under 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:
This product is not classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA):
This product is not classified as Dangerous Goods, by rules of IATA:

INTERNATIONAL MARITIME ORGANIZATION (IMO) DESIGNATION:
This product is not classified as Dangerous Goods by the International Maritime Organization.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):
This product is not classified by the United Nations Economic Commission for Europe to be dangerous goods.

SECTION 15 - REGULATORY INFORMATION

UNITED STATES REGULATIONS
SARA REPORTING REQUIREMENTS: This product is not subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act., as follows: None
TSCA: All components in this product are listed on the US Toxic Substances Control Act (TSCA) inventory of chemicals.
SARA 311/312:

Acute Health:	Yes	Chronic Health:	No	Fire:	No	Reactivity:	No

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) may apply, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None
CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the ingredients are on the California Proposition 65 lists.

CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All of the components of this product are on the DSL Inventory

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: No component of this product is on the CEPA First Priorities Substance Lists.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is categorized as a Not Controlled Product, as per the Controlled Product Regulations

EUROPEAN ECONOMIC COMMUNITY INFORMATION:

EU LABELING AND CLASSIFICATION:

Classification of the mixture according to Regulation (EC) No1272/2008. See section 2 for details.

AUSTRALIAN INFORMATION FOR PRODUCT:

AUSTRALIAN INVENTORY OF CHEMICAL SUBSTANCES (AICS) STATUS: All components of this product are listed on the AICS.

STANDARD FOR THE UNIFORM SCHEDULING OF DRUGS AND POISONS: Not applicable.

JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS: The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:

Asia-Pac:	Listed
Australian Inventory of Chemical Substances (AICS):	Listed
Korean Existing Chemicals List (ECL):	Listed
Japanese Existing National Inventory of Chemical Substances (ENCS):	Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS):	Listed
Swiss Giftliste List of Toxic Substances:	Listed
U.S. TSCA:	Listed

SECTION 16 - OTHER INFORMATION

PREPARED BY: Paul Eigbrett Global Safety Management, 10006 Cross Creek Blvd. Suite 440, Tampa, FL 33647

Disclaimer: To the best of Alconox, Inc. knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness is not guaranteed and no warranties of any type either express or implied are provided. The information contained herein relates only to this specific product.

ANNEX:

IDENTIFIED USES OF LIQUINOX® AND DIRECTIONS FOR USE

Used to clean: Healthcare instruments, laboratory ware, vacuum equipment, tissue culture ware, personal protective equipment, sampling apparatus, catheters, tubing, disk drives, clean rooms, medical devices, optical parts, electronic components, pharmaceutical apparatus, cosmetics manufacturing equipment, metal castings, forgings and stampings, industrial parts, pipes, tanks and reactors. Authorized by USDA for use in federally inspected meat and poultry plants. Passes inhibitory residue test for water analysis. Used for phosphate sensitive analysis ware. FDAcertified. Used to remove: Soil, grit, grime, slime, grease, oils, blood, tissue, particulates, deposits, chemical and solvents.

Surfaces cleaned: Corrosion inhibited formulation recommended for glass, metal, stainless steel, porcelain, ceramic, plastic, cement and fiberglass. Can be used on soft metals such as copper, aluminum, zinc and magnesium if rinsed promptly. Used for art restoration. Corrosion testing may be advisable.

Cleaning method: Soak, brush, sponge, cloth, ultrasonic, flow through clean-inplace. Will foam—not for spray or machine use.

Directions: Make a fresh 1% solution (2 1/2 Tbsp. per gal., 1 1/4 oz. per gal. or 10 ml per liter) in cold, warm or hot

water. If available, use warm water. Use cold water for blood stains. For difficult soils, raise water temperature and use more detergent. Clean by soak, circulate, wipe or ultrasonic method. Not for spray machines, will foam. RINSE THOROUGHLY—preferably with running water. For critical cleaning, do final or all rinsing in distilled, deionized or purified water. For food contact surfaces, rinse with potable water. Used on a wide range of glass, ceramic, plastic and metal surfaces. Corrosion testing may be advisable.

SAFETY DATA SHEET

1. Identification

Product identifier	**DIESEL FUELS**
Other means of identification	
SDS number	102-GHS
Synonyms	Diesel Fuels All Grades, Diesel Fuel No.2, Fuel Oil No.2, High Sulfur Diesel Fuel, Low Sulfur Diesel Fuel, Ultra Low Sulfur Diesel Fuel, CARB (California Air Resource Board) Diesel Fuel, Off-Road Diesel Fuel, Dyed Diesel Fuel, X Grade Diesel Fuel, X-1 Diesel Fuel, R5 ULSD, B5 ULS D See section 16 for complete information.
Recommended use	Motor Fuel Refinery feedstock.
Recommended restrictions	None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer/Supplier	Valero Marketing & Supply Company and Affiliates One Valero Way San Antonio, TX 78269-6000
General Assistance	210-345-4593
E-Mail	CorpHSE@valero.com
Contact Person	Industrial Hygienist
Emergency Telephone	24 Hour Emergency 866-565-5220 1-800-424-9300 (CHEMTREC USA)

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 3
Health hazards	Acute toxicity, inhalation	Category 4
	Skin corrosion/irritation	Category 2
	Carcinogenicity	Category 2
	Reproductive toxicity	Category 2
	Specific target organ toxicity, repeated exposure	Category 2
	Aspiration hazard	Category 1
Environmental hazards	Hazardous to the aquatic environment, long-term hazard	Category 2

OSHA defined hazards Not classified.

Label elements

Signal word	Danger
Hazard statement	Flammable liquid and vapor. Harmful if inhaled. Causes skin irritation. Suspected of causing cancer. Suspected of damaging fertility or the unborn child. May cause damage to organs (blood, thymus, liver) through prolonged or repeated exposure. May be fatal if swallowed and enters airways.
Precautionary statement	
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharges. Do not breathe mist/vapors/spray. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area.

Response	If skin irritation occurs: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If exposed or concerned: Get medical advice/attention. If swallowed: Immediately call a poison center/doctor. Take off contaminated clothing and wash before reuse. In case of fire: Use foam, carbon dioxide, dry powder or water fog for extinction.
Storage	Store locked up. Store in a well-ventilated place. Keep cool.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Fuels, diesel, no. 2	68476-34-6	85 - 100
Biodiesel - Fatty acid methyl esters	67762-38-3	0 - 10
Fuels, diesel, C9-18-alkane branched and linear	1159170-26-9	0 - 5
n-Nonane	111-84-2	1 - 3
Octane (All isomers)	111-65-9	1 - 2
Hexane (Other isomers)	96-14-0	0 - 1
Naphthalene	91-20-3	0 - 1
n-Heptane	142-82-5	0 - 1
n-Hexane	110-54-3	0 - 1

4. First-aid measures

Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin contact	Remove contaminated clothing and shoes. Wash off immediately with soap and plenty of water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes. If high pressure injection under the skin occurs, always seek medical attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.
Ingestion	Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Do not give mouth-to-mouth resuscitation. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical attention immediately.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash. The toxicological properties of this product have not been thoroughly investigated. Use appropriate precautions. Hydrogen sulfide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulfide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odor does not provide a reliable indicator of the presence of hazardous levels in the atmosphere.
Indication of immediate medical attention and special treatment needed	In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed. The toxicological properties of this material have not been fully investigated.
General information	If exposed or concerned: get medical attention/advice. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire-fighting measures

Suitable extinguishing media	Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards arising from the chemical	The product is flammable, and heating may generate vapors which may form explosive vapor/air mixtures. Thermal decomposition or combustion may liberate toxic gases or fumes.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire-fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tanks due to fire. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Cool containers exposed to flames with water until well after the fire is out. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Water runoff can cause environmental damage. Use compatible foam to minimize vapor generation as needed.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Local authorities should be advised if significant spills cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the SDS for Personal Protective Equipment.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Local authorities should be advised if significant spillages cannot be contained. Stop leak if you can do so without risk. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas. Use non-sparking tools and explosion-proof equipment. Small Spills: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste. Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment. Clean up in accordance with all applicable regulations.
Environmental precautions	If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Flammable. Review Firefighting Measures, Section 5, before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g. by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Use compatible foam to minimize vapor generation as needed. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 1-800-424-8802. For highway or railways spills, contact Chemtrec at 1-800-424-9300.

7. Handling and storage

Precautions for safe handling	Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Wear personal protective equipment. Avoid breathing mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. The product is combustible, and heating may generate vapors which may form explosive vapor/air mixtures. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities	Flammable liquid storage. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. The pressure in sealed containers can increase under the influence of heat. Keep container tightly closed in a cool, well-ventilated place. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Naphthalene (CAS 91-20-3)	PEL	50 mg/m3
		10 ppm
n-Heptane (CAS 142-82-5)	PEL	2000 mg/m3
		500 ppm
n-Hexane (CAS 110-54-3)	PEL	1800 mg/m3
		500 ppm
Octane (All isomers) (CAS 111-65-9)	PEL	2350 mg/m3
		500 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Fuels, diesel, no. 2 (CAS 68476-34-6)	TWA	100 mg/m3	Inhalable fraction and vapor.
Hexane (Other isomers) (CAS 96-14-0)	STEL	1000 ppm	
	TWA	500 ppm	
Naphthalene (CAS 91-20-3)	STEL	15 ppm	
	TWA	10 ppm	
n-Heptane (CAS 142-82-5)	STEL	500 ppm	
	TWA	400 ppm	
n-Hexane (CAS 110-54-3)	TWA	50 ppm	
n-Nonane (CAS 111-84-2)	TWA	200 ppm	
Octane (All isomers) (CAS 111-65-9)	TWA	300 ppm	

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Hexane (Other isomers) (CAS 96-14-0)	Ceiling	1800 mg/m3
		510 ppm
	TWA	350 mg/m3
		100 ppm
Naphthalene (CAS 91-20-3)	STEL	75 mg/m3
		15 ppm
	TWA	50 mg/m3
		10 ppm
n-Heptane (CAS 142-82-5)	Ceiling	1800 mg/m3
		440 ppm
	TWA	350 mg/m3
		85 ppm
n-Hexane (CAS 110-54-3)	TWA	180 mg/m3
		50 ppm
n-Nonane (CAS 111-84-2)	TWA	1050 mg/m3
		200 ppm
Octane (All isomers) (CAS 111-65-9)	Ceiling	1800 mg/m3
		385 ppm
	TWA	350 mg/m3
		75 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
n-Hexane (CAS 110-54-3)	0.4 mg/l	2,5-Hexanedion, without hydrolysis	Urine	*
	0.4 mg/l	2,5-Hexanedi - on, without hydrolysis		*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

n-Hexane (CAS 110-54-3) Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Fuels, diesel, no. 2 (CAS 68476-34-6) Can be absorbed through the skin.
Naphthalene (CAS 91-20-3) Can be absorbed through the skin.
n-Hexane (CAS 110-54-3) Can be absorbed through the skin.

Appropriate engineering controls Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection Wear safety glasses. If splash potential exists, wear full face shield or chemical goggles.

Skin protection

Hand protection Wear chemical-resistant, impervious gloves. Suitable gloves can be recommended by the glove supplier. Be aware that the liquid may penetrate the gloves. Frequent change is advisable.

Other Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.

Respiratory protection Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.

Thermal hazards Wear appropriate thermal protective clothing, when necessary.

General hygiene considerations Consult supervisor for special handling instructions. Avoid contact with eyes. Avoid contact with skin. Keep away from food and drink. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance Liquid (may be dyed red).

Physical state Liquid.

Form Liquid.

Color Clear. Straw.

Odor Kerosene (strong).

Odor threshold Not available.

pH Not available.

Melting point/freezing point -60.07 °F (-51.15 °C) Estimated

Initial boiling point and boiling range 325 - 700 °F (162.78 - 371.11 °C)

Flash point > 100.0 °F (> 37.8 °C) Closed Cup

Evaporation rate 0.02

Flammability (solid, gas) Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)	0.4 %
Flammability limit - upper (%)	8 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	< 1 mm Hg (20°C)
Vapor density	3 (Air = 1)
Relative density	0.82 - 0.87
Relative density temperature	60 °F (15.56 °C)
Solubility(ies)	
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	494.96 °F (257.2 °C)
Decomposition temperature	Not available.
Viscosity	2 - 4.5 mm²/s

10. Stability and reactivity

Reactivity	Stable at normal conditions.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	May be fatal if swallowed and enters airways.
Inhalation	Harmful if inhaled. In high concentrations, vapors and spray mists are narcotic and may cause headache, fatigue, dizziness and nausea.
Skin contact	Causes skin irritation.
Eye contact	May cause eye irritation.
Symptoms related to the physical, chemical and toxicological characteristics	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash. The toxicological properties of this product have not been thoroughly investigated. Use appropriate precautions.

Information on toxicological effects

Acute toxicity	Harmful if inhaled. Harmful: may cause lung damage if swallowed. The toxicological properties of this material have not been fully investigated.

Components	Species	Test Results
Fuels, diesel, no. 2 (CAS 68476-34-6)		
Acute		
Inhalation		
LC50	Rat	4.1 mg/l, 4 hours

Components	Species	Test Results
Naphthalene (CAS 91-20-3)		
Acute		
Dermal		
LD50	Rabbit	> 2 g/kg
Oral		
LD50	Rat	490 mg/kg
n-Heptane (CAS 142-82-5)		
Acute		
Inhalation		
LC50	Rat	103 mg/l, 4 Hours
n-Hexane (CAS 110-54-3)		
Acute		
Oral		
LD50	Rat	28710 mg/kg
n-Nonane (CAS 111-84-2)		
Acute		
Inhalation		
LC50	Rat	3200 mg/l, 4 Hours
Octane (All isomers) (CAS 111-65-9)		
Acute		
Inhalation		
LC50	Rat	118 mg/l, 4 Hours

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Based on available data, the classification criteria are not met.

Respiratory or skin sensitization

Respiratory sensitization Based on available data, the classification criteria are not met.

Skin sensitization Based on available data, the classification criteria are not met.

Germ cell mutagenicity Based on available data, the classification criteria are not met.

Carcinogenicity Suspected of causing cancer.
International Agency for Research on Cancer (IARC): Whole diesel engine exhaust – IARC Group 1. Exposure may cause lung cancer and also noted a positive association with an increased risk of bladder cancer.
Diesel exhaust has been reported to be an occupational hazard due to NIOSH-reported potential carcinogenic properties.

IARC Monographs. Overall Evaluation of Carcinogenicity

Fuels, diesel, no. 2 (CAS 68476-34-6)	3 Not classifiable as to carcinogenicity to humans.
Naphthalene (CAS 91-20-3)	2B Possibly carcinogenic to humans.

NTP Report on Carcinogens

Naphthalene (CAS 91-20-3)	Reasonably Anticipated to be a Human Carcinogen.

Reproductive toxicity Suspected of damaging fertility or the unborn child.
Napthalene interferes with embryo development in experimental animals at dose levels that cause maternal toxicity. In humans, excessive exposure to this agent may cause hemolytic anemia in the mother and fetus.

Specific target organ toxicity - single exposure Based on available data, the classification criteria are not met.

Specific target organ toxicity - repeated exposure May cause damage to the following organs through prolonged or repeated exposure: Blood. Liver. Thymus.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Contains organic solvents which in case of overexposure may depress the central nervous system causing dizziness and intoxication. Repeated exposure to naphthalene may cause cataracts, allergic skin rashes, destruction of red blood cells, and anemia, jaundice, kidney and liver damage. Danger of serious damage to health by prolonged exposure. Prolonged or repeated overexposure may cause central nervous system, kidney, liver, and lung damage.

Further information Symptoms may be delayed. Hydrogen sulfide, a highly toxic gas, may be present. Signs and symptoms of overexposure to hydrogen sulfide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odor does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. Toxicological properties of this material have not been fully investigated.

12. Ecological information

Ecotoxicity Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Components		Species	Test Results
Fuels, diesel, no. 2 (CAS 68476-34-6)			
Aquatic			
Acute			
Crustacea	EL50	Daphnia magna	68 mg/l, 48 hours
Fish	LL50	Oncorhynchus mykiss	65 mg/l, 96 hours
Naphthalene (CAS 91-20-3)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	1.09 - 3.4 mg/l, 48 hours
Fish	LC50	Pink salmon (Oncorhynchus gorbuscha)	0.95 - 1.62 mg/l, 96 hours
n-Heptane (CAS 142-82-5)			
Aquatic			
Fish	LC50	Western mosquitofish (Gambusia affinis)	4924 mg/l, 96 hours
n-Hexane (CAS 110-54-3)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	2.101 - 2.981 mg/l, 96 hours

Persistence and degradability Not available.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

Hexane (Other isomers) (CAS 96-14-0)	3.6
Octane (All isomers) (CAS 111-65-9)	5.18
n-Heptane (CAS 142-82-5)	4.66
n-Hexane (CAS 110-54-3)	3.9
n-Nonane (CAS 111-84-2)	5.46

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste. Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Hazardous waste code D001: Waste Flammable material with a flash point <140 °F

US RCRA Hazardous Waste U List: Reference

Naphthalene (CAS 91-20-3)	U165

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities.

14. Transport information

DOT

UN number UN1202

UN proper shipping name Diesel fuel

Transport hazard class(es)

Class Combustible Liquid

Subsidiary risk -

Packing group III

Environmental hazards

Marine pollutant	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	144, B1, IB3, T2, TP1
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242

IATA

UN number	UN1202
UN proper shipping name	Diesel fuel
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	III
Environmental hazards	Yes
ERG Code	3L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1202
UN proper shipping name	DIESEL FUEL
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	III
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	Not applicable. However, this product is a liquid and if transported in bulk covered under MARPOL 73/78, Annex I.

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

n-Nonane (CAS 111-84-2)	1.0 % One-Time Export Notification only.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

CERCLA Hazardous Substance List (40 CFR 302.4)

Hexane (Other isomers) (CAS 96-14-0)	LISTED
Naphthalene (CAS 91-20-3)	LISTED
n-Heptane (CAS 142-82-5)	LISTED
n-Hexane (CAS 110-54-3)	LISTED
n-Nonane (CAS 111-84-2)	LISTED
Octane (All isomers) (CAS 111-65-9)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical	Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Naphthalene	91-20-3	0 - 1

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Naphthalene (CAS 91-20-3)
n-Hexane (CAS 110-54-3)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

Hexane (Other isomers) (CAS 96-14-0)
Naphthalene (CAS 91-20-3)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
n-Nonane (CAS 111-84-2)
Octane (All isomers) (CAS 111-65-9)

US. New Jersey Worker and Community Right-to-Know Act

Fuels, diesel, no. 2 (CAS 68476-34-6)
Naphthalene (CAS 91-20-3)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
n-Nonane (CAS 111-84-2)
Octane (All isomers) (CAS 111-65-9)

US. Pennsylvania Worker and Community Right-to-Know Law

Fuels, diesel, no. 2 (CAS 68476-34-6)
Hexane (Other isomers) (CAS 96-14-0)
Naphthalene (CAS 91-20-3)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
n-Nonane (CAS 111-84-2)
Octane (All isomers) (CAS 111-65-9)

US. Rhode Island RTK

Naphthalene (CAS 91-20-3)
n-Hexane (CAS 110-54-3)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Benzene (CAS 71-43-2)
Toluene (CAS 108-88-3)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No

Country(s) or region	Inventory name	On inventory (yes/no)*
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

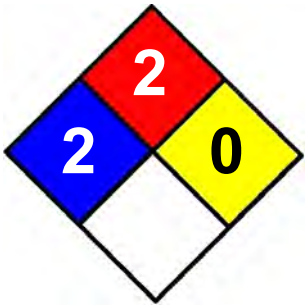
Issue date 13-May-2013

Revision date 23-May-2014

Version # 04

Further information HMIS® is a registered trade and service mark of the NPCA.

NFPA Ratings



Disclaimer This material Safety Data Sheet (SDS) was prepared in accordance with 29 CFR 1910.1200 by Valero Marketing & Supply Co., ("VALERO"). VALERO does not assume any liability arising out of product use by others. The information, recommendations, and suggestions presented in this SDS are based upon test results and data believed to be reliable. The end user of the product has the responsibility for evaluating the adequacy of the data under the conditions of use, determining the safety, toxicity and suitability of the product under these conditions, and obtaining additional or clarifying information where uncertainty exists. No guarantee expressed or implied is made as to the effects of such use , the results to be obtained, or the safety and toxicity of the product in any specific application. Furthermore, the information herein is not represented as absolutely complete, since it is not practicable to provide all the scientific and study information in the format of this document, plus additional information may be necessary under exceptional conditions of use, or because of applicable laws or government regulations.

SAFETY DATA SHEET

1. Identification

Product identifier **UNLEADED GASOLINE**

Other means of identification

SDS number 002-GHS

Synonyms Regular/Premium/Midgrade - Unleaded Gasoline, RFG - Reformulated Unleaded Gasoline, Conventional Unleaded Gasoline, Oxygenated Unleaded Gasoline, Non-Oxygenated Unleaded Gasoline, CARB (California Air Resource Board) Unleaded Gasoline, RBOB - Reformulated Blendstock for Oxygenate Blending, CBOB - Conventional Blendstock for Oxygenate Blending, Petrol, Motor Fuel.
See section 16 for complete information.

Recommended use Motor Fuel
Motor fuels.

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer/Supplier Valero Marketing & Supply Company and Affiliates
One Valero Way
San Antonio, TX 78269-6000

General Assistance 210-345-4593

E-Mail CorpHSE@valero.com

Contact Person Industrial Hygienist

Emergency Telephone 24 Hour Emergency 866-565-5220
1-800-424-9300 (CHEMTREC USA)

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 1
Health hazards	Skin corrosion/irritation	Category 2
	Germ cell mutagenicity	Category 1B
	Carcinogenicity	Category 1B
	Reproductive toxicity	Category 2
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Specific target organ toxicity, repeated exposure	Category 2
	Aspiration hazard	Category 1
Environmental hazards	Hazardous to the aquatic environment, long-term hazard	Category 2

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Extremely flammable liquid and vapor. Causes skin irritation. May cause genetic defects. May cause cancer. Suspected of damaging fertility or the unborn child. May cause drowsiness or dizziness. May cause damage to organs (blood, liver, kidney) through prolonged or repeated exposure. May be fatal if swallowed and enters airways. Toxic to aquatic life with long lasting effects.

Precautionary statement

Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting// equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe gas/mist/vapors/spray. Wash thoroughly after handling. Wear protective gloves/protective clothing/eye protection/face protection. Use only outdoors or in a well-ventilated area. Avoid release to the environment.
Response	If exposed or concerned: Get medical advice/attention. If inhaled: Remove person to fresh air and keep comfortable for breathing. If swallowed: Immediately call a poison center/doctor. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. In case of fire: Use alcohol-resistant foam, carbon dioxide, dry powder or water fog for extinction. Collect spillage.
Storage	Store locked up. Store in a well-ventilated place. Keep container tightly closed. Keep cool.
Disposal	Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazard(s) not otherwise classified (HNOC)	None known.

3. Composition/information on ingredients

Mixtures

Chemical name	CAS number	%
Gasoline	86290-81-5	80-100
Toluene	108-88-3	0-30
Hexane (Other Isomers)	96-14-0	5-25
Xylene (o, m, p isomers)	1330-20-7	0-25
Octane (All isomers)	111-65-9	0-18.5
Ethanol	64-17-5	0-10
1,2,4, Trimethylbenzene	95-63-6	0-6
n-Heptane	142-82-5	1-5
Pentane	109-66-0	1-5
Cumene	98-82-8	0-5
Ethylbenzene	100-41-4	0-5
Benzene	71-43-2	0-4.9
n-Hexane	110-54-3	0-3
Cyclohexane	110-82-7	0-3

4. First-aid measures

Inhalation	Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
Skin contact	Remove contaminated clothing and shoes. Wash off immediately with soap and plenty of water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse. Destroy or thoroughly clean contaminated shoes. If high pressure injection under the skin occurs, always seek medical attention.
Eye contact	Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention.
Ingestion	Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Do not give mouth-to-mouth resuscitation. If vomiting occurs, keep head low so that stomach content does not get into the lungs. Never give anything by mouth to a victim who is unconscious or is having convulsions. Get medical attention immediately.
Most important symptoms/effects, acute and delayed	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Cyanosis (blue tissue condition, nails, lips, and/or skin). Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash.

Indication of immediate medical attention and special treatment needed	In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed.
General information	If exposed or concerned: get medical attention/advice. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance. Wash contaminated clothing before re-use.

5. Fire-fighting measures

Suitable extinguishing media	Water spray. Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).
Unsuitable extinguishing media	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards arising from the chemical	Vapor may cause flash fire. Vapors can flow along surfaces to distant ignition source and flash back. Sensitive to static discharge.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire-fighting equipment/instructions	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Withdraw immediately in case of rising sound from venting safety devices or any discoloration of tanks due to fire. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Cool containers exposed to flames with water until well after the fire is out. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. Vapors may form explosive air mixtures even at room temperature. Prevent buildup of vapors or gases to explosive concentrations. Some of these materials, if spilled, may evaporate leaving a flammable residue. Water runoff can cause environmental damage. Use compatible foam to minimize vapor generation as needed.
Specific methods	Use water spray to cool unopened containers.
General fire hazards	Extremely flammable liquid and vapor. Containers may explode when heated.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Local authorities should be advised if significant spills cannot be contained. Keep upwind. Keep out of low areas. Ventilate closed spaces before entering. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. See Section 8 of the SDS for Personal Protective Equipment.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Stop leak if you can do so without risk. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas. Use non-sparking tools and explosion-proof equipment. Small Spills: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. This material and its container must be disposed of as hazardous waste. Large Spills: Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent product from entering drains. Do not allow material to contaminate ground water system. Should not be released into the environment.
Environmental precautions	Gasoline may contain oxygenated blend products (Ethanol, etc.) that are soluble in water and therefore precautions should be taken to protect surface and groundwater sources from contamination. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Firefighting Measures, Section 5, before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g. by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Use compatible foam to minimize vapor generation as needed. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 1-800-424-8802.

7. Handling and storage

Precautions for safe handling

Eliminate sources of ignition. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity.
Wear personal protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Avoid contact with eyes, skin, and clothing. Do not taste or swallow. Avoid prolonged exposure. Use only with adequate ventilation. Wash thoroughly after handling. The product is extremely flammable, and explosive vapor/air mixtures may be formed even at normal room temperatures. DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. When using, do not eat, drink or smoke. Avoid release to the environment.

Conditions for safe storage, including any incompatibilities

Flammable liquid storage. Do not handle or store near an open flame, heat or other sources of ignition. This material can accumulate static charge which may cause spark and become an ignition source. The pressure in sealed containers can increase under the influence of heat. Keep container tightly closed in a cool, well-ventilated place. Keep away from food, drink and animal feedingstuffs. Keep out of the reach of children.

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
Benzene (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Cumene (CAS 98-82-8)	PEL	245 mg/m3
		50 ppm
Cyclohexane (CAS 110-82-7)	PEL	1050 mg/m3
		300 ppm
Ethanol (CAS 64-17-5)	PEL	1900 mg/m3
		1000 ppm
Ethylbenzene (CAS 100-41-4)	PEL	435 mg/m3
		100 ppm
n-Heptane (CAS 142-82-5)	PEL	2000 mg/m3
		500 ppm
n-Hexane (CAS 110-54-3)	PEL	1800 mg/m3
		500 ppm
Octane (All isomers) (CAS 111-65-9)	PEL	2350 mg/m3
		500 ppm
Pentane (CAS 109-66-0)	PEL	2950 mg/m3
		1000 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	PEL	435 mg/m3
		100 ppm

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value
Benzene (CAS 71-43-2)	Ceiling	25 ppm
	TWA	10 ppm
Toluene (CAS 108-88-3)	Ceiling	300 ppm
	TWA	200 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
1,2,4, Trimethylbenzene (CAS 95-63-6)	TWA	25 ppm
Benzene (CAS 71-43-2)	STEL	2.5 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
	TWA	0.5 ppm
Cumene (CAS 98-82-8)	TWA	50 ppm
Cyclohexane (CAS 110-82-7)	TWA	100 ppm
Ethanol (CAS 64-17-5)	STEL	1000 ppm
Ethylbenzene (CAS 100-41-4)	TWA	20 ppm
Gasoline (CAS 86290-81-5)	STEL	500 ppm
	TWA	300 ppm
Hexane (Other Isomers) (CAS 96-14-0)	STEL	1000 ppm
	TWA	500 ppm
n-Heptane (CAS 142-82-5)	STEL	500 ppm
	TWA	400 ppm
n-Hexane (CAS 110-54-3)	TWA	50 ppm
Octane (All isomers) (CAS 111-65-9)	TWA	300 ppm
Pentane (CAS 109-66-0)	TWA	600 ppm
Toluene (CAS 108-88-3)	TWA	20 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
1,2,4, Trimethylbenzene (CAS 95-63-6)	TWA	125 mg/m3
		25 ppm
Benzene (CAS 71-43-2)	STEL	1 ppm
	TWA	0.1 ppm
Cumene (CAS 98-82-8)	TWA	245 mg/m3
		50 ppm
Cyclohexane (CAS 110-82-7)	TWA	1050 mg/m3
		300 ppm
Ethanol (CAS 64-17-5)	TWA	1900 mg/m3
		1000 ppm
Ethylbenzene (CAS 100-41-4)	STEL	545 mg/m3
		125 ppm
	TWA	435 mg/m3
		100 ppm
Hexane (Other Isomers) (CAS 96-14-0)	Ceiling	1800 mg/m3
		510 ppm
	TWA	350 mg/m3
		100 ppm
n-Heptane (CAS 142-82-5)	Ceiling	1800 mg/m3
		440 ppm
	TWA	350 mg/m3
		85 ppm
n-Hexane (CAS 110-54-3)	TWA	180 mg/m3
		50 ppm
Octane (All isomers) (CAS 111-65-9)	Ceiling	1800 mg/m3
		385 ppm
	TWA	350 mg/m3
		75 ppm
Pentane (CAS 109-66-0)	Ceiling	1800 mg/m3

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
		610 ppm
	TWA	350 mg/m3
		120 ppm
Toluene (CAS 108-88-3)	STEL	560 mg/m3
		150 ppm
	TWA	375 mg/m3
		100 ppm
Xylene (o, m, p isomers) (CAS 1330-20-7)	STEL	655 mg/m3
		150 ppm
	TWA	435 mg/m3
		100 ppm

Biological limit values

ACGIH Biological Exposure Indices

Components	Value	Determinant	Specimen	Sampling Time
Benzene (CAS 71-43-2)	25 µg/g	S-Phenylmercapturic acid	Creatinine in urine	*
Ethylbenzene (CAS 100-41-4)	0.7 g/g	Sum of mandelic acid and phenylglyoxylic acid	Creatinine in urine	*
n-Hexane (CAS 110-54-3)	0.4 mg/l	2,5-Hexanedi - on, without hydrolysis		*
	0.4 mg/l	2,5-Hexanedion, without hydrolysis	Urine	*
Toluene (CAS 108-88-3)	0.3 mg/g	o-Cresol, with hydrolysis	Creatinine in urine	*
	0.03 mg/l	Toluene	Urine	*
	0.02 mg/l	Toluene	Blood	*
Xylene (o, m, p isomers) (CAS 1330-20-7)	1.5 g/g	Methylhippuric acids	Creatinine in urine	*

* - For sampling details, please see the source document.

Exposure guidelines

US - California OELs: Skin designation

Benzene (CAS 71-43-2)	Can be absorbed through the skin.
Cumene (CAS 98-82-8)	Can be absorbed through the skin.
n-Hexane (CAS 110-54-3)	Can be absorbed through the skin.
Toluene (CAS 108-88-3)	Can be absorbed through the skin.

US - Minnesota Haz Subs: Skin designation applies

Cumene (CAS 98-82-8)	Skin designation applies.
Toluene (CAS 108-88-3)	Skin designation applies.

US - Tennesse OELs: Skin designation

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

Benzene (CAS 71-43-2)	Can be absorbed through the skin.
n-Hexane (CAS 110-54-3)	Can be absorbed through the skin.

US. NIOSH: Pocket Guide to Chemical Hazards

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Cumene (CAS 98-82-8)	Can be absorbed through the skin.

Appropriate engineering controls

Provide adequate general and local exhaust ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Use explosion-proof equipment.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses. If splash potential exists, wear full face shield or chemical goggles.
Skin protection	
Hand protection	Avoid exposure - obtain special instructions before use. Wear protective gloves. Be aware that the liquid may penetrate the gloves. Frequent change is advisable. Suitable gloves can be recommended by the glove supplier.
Other	Wear chemical-resistant, impervious gloves. Full body suit and boots are recommended when handling large volumes or in emergency situations. Flame retardant protective clothing is recommended.
Respiratory protection	Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Consult supervisor for special handling instructions. Avoid contact with eyes. Avoid contact with skin. Keep away from food and drink. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Appearance	Light straw to red clear liquid with characteristic strong odor of gasoline.
Physical state	Liquid.
Form	Liquid.
Color	Light straw to red clear.
Odor	Characteristic Gasoline Odor (Strong).
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	44.01 °F (6.67 °C) May start to solidify at this temperature. This is based on data for the following ingredient: Cyclohexane. Weighted average: -91.9 deg C (-133.4 deg F)
Initial boiling point and boiling range	80.06 - 440.06 °F (26.7 - 226.7 °C)
Flash point	-40.0 °F (-40.0 °C) (closed cup)
Evaporation rate	10 - 11 BuAc
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	1.3 %
Flammability limit - upper (%)	7.1 %
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	60.8 - 101.3 kPa (20°C)
Vapor density	3 - 4 (Air=1)
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Very slightly soluble.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	> 500 °F (> 260 °C)
Decomposition temperature	Not available.
Viscosity	Not available.

Other information

Flash point class	Flammable IA
VOC (Weight %)	100 %

10. Stability and reactivity

Reactivity	None known.
Chemical stability	Stable under normal temperature conditions and recommended use.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Heat, flames and sparks. Ignition sources. Contact with incompatible materials. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, flame, sparks, static electricity, or other sources of ignition; they may explode and cause injury or death.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Ingestion	Swallowing or vomiting of the liquid may result in aspiration into the lungs.
Inhalation	In high concentrations, mists/vapors may irritate throat and respiratory system and cause coughing. May cause drowsiness or dizziness.
Skin contact	Causes skin irritation. Prolonged contact may cause dryness of the skin.
Eye contact	May cause eye irritation.
Symptoms related to the physical, chemical and toxicological characteristics	Irritation of nose and throat. Irritation of eyes and mucous membranes. Skin irritation. Unconsciousness. Corneal damage. Narcosis. Cyanosis (blue tissue condition, nails, lips, and/or skin). Decrease in motor functions. Behavioral changes. Edema. Liver enlargement. Jaundice. Conjunctivitis. Proteinuria. Defatting of the skin. Rash.

Information on toxicological effects

Acute toxicity Based on available data, the classification criteria are not met.

Components	Species	Test Results
1,2,4, Trimethylbenzene (CAS 95-63-6)		
Acute		
Dermal		
LD50	Rabbit	> 3160 mg/kg
Inhalation		
LC50	Rat	> 2000 mg/l, 48 Hours
Oral		
LD50	Rat	6 g/kg
Benzene (CAS 71-43-2)		
Acute		
Oral		
LD50	Rat	3306 mg/kg
Cumene (CAS 98-82-8)		
Acute		
Inhalation		
LC50	Mouse	2000 mg/l, 7 Hours
	Rat	8000 mg/l, 4 Hours
Oral		
LD50	Rat	1400 mg/kg
Cyclohexane (CAS 110-82-7)		
Acute		
Oral		
LD50	Rat	12705 mg/kg

Components	Species	Test Results
Ethanol (CAS 64-17-5)		
Acute		
Inhalation		
LC50	Rat	30000 mg/m3
Ethylbenzene (CAS 100-41-4)		
Acute		
Dermal		
LD50	Rabbit	> 5000 mg/kg
Oral		
LD50	Rat	5.46 g/kg
n-Heptane (CAS 142-82-5)		
Acute		
Inhalation		
LC50	Rat	103 mg/l, 4 Hours
n-Hexane (CAS 110-54-3)		
Acute		
Oral		
LD50	Rat	28710 mg/kg
Octane (All isomers) (CAS 111-65-9)		
Acute		
Inhalation		
LC50	Rat	118 mg/l, 4 Hours
Pentane (CAS 109-66-0)		
Acute		
Inhalation		
LC50	Rat	364 mg/l, 4 Hours
Toluene (CAS 108-88-3)		
Acute		
Dermal		
LD50	Rabbit	14.1 ml/kg
Inhalation		
LC50	Rat	8000 mg/l, 4 Hours
Oral		
LD50	Rat	2.6 g/kg
Xylene (o, m, p isomers) (CAS 1330-20-7)		
Acute		
Oral		
LD50	Rat	4300 mg/kg

Skin corrosion/irritation Causes skin irritation.

Serious eye damage/eye irritation Based on available data, the classification criteria are not met.

Respiratory or skin sensitization

Respiratory sensitization Based on available data, the classification criteria are not met.

Skin sensitization Based on available data, the classification criteria are not met.
This substance may have a potential for sensitization which may provoke an allergic reaction among sensitive individuals.

Germ cell mutagenicity May cause genetic defects.
In in-vitro experiments, neither benzene, toluene nor xylene changed the number of sister-chromatid exchanges (SCEs) or the number of chromosomal aberrations in human lymphocytes. However, toluene and xylene caused a significant cell growth inhibition which was not observed with benzene in the same concentrations. In in-vivo experiments, toluene changed the number of sister-chromatid exchanges (SCEs) in human lymphocytes. Toluene may cause heritable genetic damage.

Carcinogenicity May cause cancer.

IARC Monographs. Overall Evaluation of Carcinogenicity

Benzene (CAS 71-43-2)	1 Carcinogenic to humans.
Cumene (CAS 98-82-8)	2B Possibly carcinogenic to humans.
Ethylbenzene (CAS 100-41-4)	2B Possibly carcinogenic to humans.
Gasoline (CAS 86290-81-5)	2B Possibly carcinogenic to humans.
Toluene (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.
Xylene (o, m, p isomers) (CAS 1330-20-7)	3 Not classifiable as to carcinogenicity to humans.

NTP Report on Carcinogens

Benzene (CAS 71-43-2)	Known To Be Human Carcinogen.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	Cancer

Reproductive toxicity Suspected of damaging fertility or the unborn child.
Benzene, xylene and toluene have demonstrated animal effects of reproductive toxicity. Animal studies of benzene have shown testicular effects, alterations in reproductive cycles, chromosomal aberrations and embryo/fetotoxicity. Ethanol has demonstrated human effects of reproductive toxicity. Can cause adverse reproductive effects - such as birth defects, miscarriages, or infertility. Avoid exposure to women during early pregnancy. Avoid contact during pregnancy/while nursing.

Specific target organ toxicity - single exposure May cause drowsiness or dizziness.

Specific target organ toxicity - repeated exposure May cause damage to the following organs through prolonged or repeated exposure: Blood. Kidneys. Liver.

Aspiration hazard May be fatal if swallowed and enters airways.

Chronic effects Repeated exposure of laboratory animals to high concentrations of gasoline vapors has caused kidney damage and cancer in rats and cancer in mice. Gasoline was evaluated for genetic activity in assays using microbial cells, cultured mammalian cells and rat bone marrow cells. The results were all negative so gasoline was considered nonmutagenic under these conditions. Overexposure to this product or its components has been suggested as a cause of liver abnormalities in laboratory animals and humans. Lifetime studies by the American Petroleum Institute have shown that kidney damage and kidney cancer can occur in male rats after prolonged inhalation exposures at elevated concentrations of total gasoline. Kidneys of mice and female rats were unaffected. The U.S. EPA Risk Assessment Forum has concluded that the male rat kidney tumor results are not relevant for humans. Total gasoline exposure also produced liver tumors in female mice only. The implication of these data for humans has not been determined.

Further information Symptoms may be delayed.

12. Ecological information

Ecotoxicity Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Components		Species	Test Results
1,2,4, Trimethylbenzene (CAS 95-63-6)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	7.19 - 8.28 mg/l, 96 hours
Benzene (CAS 71-43-2)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	8.76 - 15.6 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	7.2 - 11.7 mg/l, 96 hours
Cumene (CAS 98-82-8)			
Aquatic			
Crustacea	EC50	Brine shrimp (Artemia sp.)	3.55 - 11.29 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	2.7 mg/l, 96 hours
Cyclohexane (CAS 110-82-7)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	3.961 - 5.181 mg/l, 96 hours
		Striped bass (Morone saxatilis)	8.3 mg/l, 96 hours

Components		Species	Test Results
Ethanol (CAS 64-17-5)			
Aquatic			
Algae	EC50	Freshwater algae	275 mg/l, 72 Hours
		Marine water algae	1970 mg/l
Fish	LC50	Fathead minnow (Pimephales promelas)	> 100 mg/l, 96 hours
		Freshwater fish	11200 mg/l, 96 Hours
Invertebrate	EC50	Freshwater invertebrate	5012 mg/l, 48 Hours
		Marine water invertebrate	857 mg/l, 48 Hours
Ethylbenzene (CAS 100-41-4)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	1 - 4 mg/l, 48 hours
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	4 mg/l, 96 hours
n-Heptane (CAS 142-82-5)			
Aquatic			
Fish	LC50	Western mosquitofish (Gambusia affinis)	4924 mg/l, 96 hours
n-Hexane (CAS 110-54-3)			
Aquatic			
Fish	LC50	Fathead minnow (Pimephales promelas)	2.101 - 2.981 mg/l, 96 hours
Toluene (CAS 108-88-3)			
Aquatic			
Crustacea	EC50	Water flea (Daphnia magna)	5.46 - 9.83 mg/l, 48 hours
Fish	LC50	Pink salmon (Oncorhynchus gorbuscha)	6.86 - 8.48 mg/l, 96 hours
Xylene (o, m, p isomers) (CAS 1330-20-7)			
Aquatic			
Fish	LC50	Rainbow trout,donaldson trout (Oncorhynchus mykiss)	8 mg/l, 96 Hours

Persistence and degradability Not available.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

Benzene (CAS 71-43-2)	2.13
Cumene (CAS 98-82-8)	3.66
Cyclohexane (CAS 110-82-7)	3.44
Ethanol (CAS 64-17-5)	-0.31
Ethylbenzene (CAS 100-41-4)	3.15
Hexane (Other Isomers) (CAS 96-14-0)	3.6
Octane (All isomers) (CAS 111-65-9)	5.18
Pentane (CAS 109-66-0)	3.39
Toluene (CAS 108-88-3)	2.73
Xylene (o, m, p isomers) (CAS 1330-20-7)	3.2
n-Heptane (CAS 142-82-5)	4.66
n-Hexane (CAS 110-54-3)	3.9

Mobility in soil Not available.

Other adverse effects Not available.

13. Disposal considerations

Disposal instructions Dispose in accordance with all applicable regulations. This material and its container must be disposed of as hazardous waste. Dispose of this material and its container to hazardous or special waste collection point. Incinerate the material under controlled conditions in an approved incinerator. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

Hazardous waste code D001: Waste Flammable material with a flash point <140 °F
D018: Waste Benzene

US RCRA Hazardous Waste U List: Reference

Benzene (CAS 71-43-2)	U019
Cumene (CAS 98-82-8)	U055
Cyclohexane (CAS 110-82-7)	U056
Toluene (CAS 108-88-3)	U220
Xylene (o, m, p isomers) (CAS 1330-20-7)	U239

Waste from residues / unused products Dispose of in accordance with local regulations.

Contaminated packaging Offer rinsed packaging material to local recycling facilities.

14. Transport information

DOT

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	II
Environmental hazards	
Marine pollutant	Yes
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Special provisions	139, B33, B101, T8
Packaging exceptions	150
Packaging non bulk	202
Packaging bulk	242

IATA

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	Yes
ERG Code	3H
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

IMDG

UN number	UN1203
UN proper shipping name	Gasoline
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Label(s)	3
Packing group	II
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-E
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable. However, this product is a liquid and if transported in bulk covered under MARPOL 73/78, Annex I.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Benzene (CAS 71-43-2)	Cancer

Central nervous system
Blood
Aspiration
Skin
Eye
Respiratory tract irritation
Flammability

CERCLA Hazardous Substance List (40 CFR 302.4)

Benzene (CAS 71-43-2)	LISTED
Cumene (CAS 98-82-8)	LISTED
Cyclohexane (CAS 110-82-7)	LISTED
Ethanol (CAS 64-17-5)	LISTED
Ethylbenzene (CAS 100-41-4)	LISTED
Gasoline (CAS 86290-81-5)	LISTED
Hexane (Other Isomers) (CAS 96-14-0)	LISTED
n-Heptane (CAS 142-82-5)	LISTED
n-Hexane (CAS 110-54-3)	LISTED
Octane (All isomers) (CAS 111-65-9)	LISTED
Pentane (CAS 109-66-0)	LISTED
Toluene (CAS 108-88-3)	LISTED
Xylene (o, m, p isomers) (CAS 1330-20-7)	LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - No
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
Toluene	108-88-3	0-30
Xylene (o, m, p isomers)	1330-20-7	0-25
1,2,4, Trimethylbenzene	95-63-6	0-6
Cumene	98-82-8	0-5
Ethylbenzene	100-41-4	0-5
Benzene	71-43-2	0-4.9
n-Hexane	110-54-3	0-3
Cyclohexane	110-82-7	0-3

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Ethylbenzene (CAS 100-41-4)
n-Hexane (CAS 110-54-3)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Pentane (CAS 109-66-0)

Safe Drinking Water Act (SDWA) Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Toluene (CAS 108-88-3) 6594

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Toluene (CAS 108-88-3) 35 % weight/volumn

DEA Exempt Chemical Mixtures Code Number

Toluene (CAS 108-88-3) 594

US state regulations

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

US. Massachusetts RTK - Substance List

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
Hexane (Other Isomers) (CAS 96-14-0)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. New Jersey Worker and Community Right-to-Know Act

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. Pennsylvania Worker and Community Right-to-Know Law

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethanol (CAS 64-17-5)
Ethylbenzene (CAS 100-41-4)
Gasoline (CAS 86290-81-5)
Hexane (Other Isomers) (CAS 96-14-0)
n-Heptane (CAS 142-82-5)
n-Hexane (CAS 110-54-3)
Octane (All isomers) (CAS 111-65-9)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. Rhode Island RTK

1,2,4, Trimethylbenzene (CAS 95-63-6)
Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Cyclohexane (CAS 110-82-7)
Ethylbenzene (CAS 100-41-4)
n-Hexane (CAS 110-54-3)
Pentane (CAS 109-66-0)
Toluene (CAS 108-88-3)
Xylene (o, m, p isomers) (CAS 1330-20-7)

US. California Proposition 65

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

Benzene (CAS 71-43-2)
Cumene (CAS 98-82-8)
Ethylbenzene (CAS 100-41-4)
Toluene (CAS 108-88-3)

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

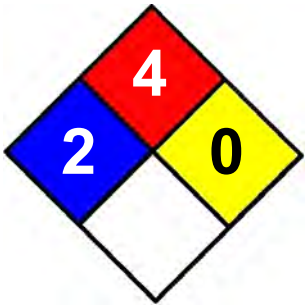
Issue date 13-May-2013

Revision date 23-May-2014

Version # 03

Further information HMIS® is a registered trade and service mark of the NPCA.

NFPA Ratings



References

ACGIH
EPA: AQUIRE database
NLM: Hazardous Substances Data Base
US. IARC Monographs on Occupational Exposures to Chemical Agents
HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluation of Carcinogenicity
National Toxicology Program (NTP) Report on Carcinogens
ACGIH Documentation of the Threshold Limit Values and Biological Exposure Indices

Disclaimer

This material Safety Data Sheet (SDS) was prepared in accordance with 29 CFR 1910.1200 by Valero Marketing & Supply Co., ("VALERO"). VALERO does not assume any liability arising out of product use by others. The information, recommendations, and suggestions presented in this SDS are based upon test results and data believed to be reliable. The end user of the product has the responsibility for evaluating the adequacy of the data under the conditions of use, determining the safety, toxicity and suitability of the product under these conditions, and obtaining additional or clarifying information where uncertainty exists. No guarantee expressed or implied is made as to the effects of such use , the results to be obtained, or the safety and toxicity of the product in any specific application. Furthermore, the information herein is not represented as absolutely complete, since it is not practicable to provide all the scientific and study information in the format of this document, plus additional information may be necessary under exceptional conditions of use, or because of applicable laws or government regulations.

Appendix C – Task Hazard Analysis Form

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Americas

Task Hazard Assessment

S3AM-209-FM6

Date:	**Project Name / Location:**
Permit / Job Number:	**Project Number:**
Description of Task:	

Do you have a pre-job hazard assessment (JHA) specific to this task in your hands?

- ○ **Yes** – review the steps, hazards, and precautions. Attach and reference JHA in the form below. Add any additional steps, hazards, and precautions to this form otherwise unidentified on JHA.
- ○ **No** – list all steps, hazards, and precautions associated with the task in the form below.

Basic Task Steps (explain in order how the task will be carried out)	**Hazards** (identify all hazards & potential hazards of each step)	**Risk** (before)	**Control Measures / Precautions** (describe how that hazard will be controlled)	**Risk** (after)	**Revised?** (yes – record time)
			Highest Risk Index		

The Task Hazard Assessment is to be completed at the worksite by the individual(s) who is intended to conduct the task immediately prior to initiating the associated task. Number and attach additional pages if necessary.

Worker/Visitor acknowledgement and review of this content on back of this document. Originator to also sign Worker acknowledgement section.

Originator _____ (Print Name) _____ (Signature)

Supervisor _____ (Print Name) _____ (Signature)

Risk Matrix on Reverse

THIS FORM IS TO BE KEPT ON JOB SITE.

AECOM

WORKER SIGN ON

NAME (Please Print) TIME SIGNATURE

I participated in the development and understand the content of this Task Hazard Assessment.

Task Hazard Assessment Follow-Up/Review

Initials/Time	Initials/Time	Initials/Time

Instructions:
Identify basic steps of the task and associated hazards. Calculate the initial risk rating. Identify control measure to eliminate or reduce the hazard's risk and calculate the residual risk rating. If the risk rating (after controls are implemented) cannot be reduced to 4 or lower, additional approvals are needed before the activity can begin.

Employees shall monitor the activities for compliance with this document. Workers should **STOP WORK** on a task if conditions change from the planned and agreed approach to the work.

This document should be updated to reflect new conditions or changes in task methods.

VISITOR SIGN ON

I have read and understand the content of this Task Hazard Assessment.

Emergency Meeting / Assembly Area

Emergency Contact #

Method of Communication

Risk Rating Matrix

Probability	Severity				
	5 - Catastrophic	4 – Critical	3 – Major	2 – Moderate	1 - Minor
5 – Frequent	25	20	15	10	5
4 – Probable	20	16	12	8	4
3 – Occasional	15	12	9	6	3
2 – Remote	10	8	6	4	2
1 - Improbable	5	4	3	2	1

Risk Rating (Probability x Severity)	Risk Acceptance Authority
1 to 4 (Low)	Risk is tolerable, manage at local level
5 to 9 (Medium)	Risk requires approval by Operations Lead/Supervisor & SH&E Manager
10 to 25 (High)	Risk requires the approval of the Operations Manager & SH&E Director

Severity – Potential Consequences				
	People	Property Damage	Environmental Impact	Public Image/Reputation
Catastrophic	Fatality, Multiple Major Incidents	>$1M USD, Structural collapse	Offsite impact requiring remediation	Government intervention
Critical	Permanent impairment, Long term injury/illness	>$250K to $1M USD	Onsite impact requiring remediation	Media intervention
Major	Lost/Restricted Work	> $10K to $250K USD	Release at/above reportable limit	Owner intervention
Moderate	Medical Treatment	> $1K to $10K USD	Release below reportable limit	Community or local attention
Minor	First Aid	</=$1K USD	Small chemical release contained onsite	Individual complaint

Probability		
Frequent	Expected to occur during task/activity	9/10
Probable	Likely to occur during task/activity	1/10
Occasional	May occur during the task/activity	1/100
Remote	Unlikely to occur during task/activity	1/1,000
Improbable	Highly unlikely to occur, but possible during task/activity	1/10,000

Appendix D –SSHO Resume Training

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AECOM

Matthew Ginalick, III, CHST

Health and Safety Professional

Areas of Expertise

- Health & Safety
- Remedial System Design Installation, Operation and Maintenance
- Site Management
- Bioremediation
- Hazard Assessments
- Confined Space Entry
- Fall Protection

Years of Experience

With AECOM: 20 Years
With Other Firms: 0 Years

Hire Date with AECOM

July 1998

Registration/Certification

2010/Construction Health and Safety Technician (CHST) - Board of Certified Safety Professionals

Overview

Mr. Ginalick has 20 years of experience in the environmental and construction management fields. He excels in health and safety, site supervision, remedial design, system installation, and operation and maintenance. He has received two AECOM National Capital Area Office awards; the Health, Safety, & Environment Award (2005), and Team Award (2007) for his outstanding performance and commitment to excellence. He has also received the National Geospatial-Intelligence Agency Star Partner Award for safety (2009, 2010) and the North Atlantic Division USACE Command General's Safety Award (2008).

Mr. Ginalick has been responsible for managing, implementing and enforcing AECOM' Safety and Health Program at various sites and projects. Mr. Ginalick has the training and experience to conduct exposure monitoring/air sampling, and select/adjust personal protective equipment use. As AECOM' onsite health and safety representative, Mr. Ginalick has performed personal air monitoring and maintained safety and air monitoring equipment on site. Inspected ongoing site activities, fall protection systems, scaffolding, ensured compliance with the Health and Safety Plan, corrected any health or safety deficiencies in the field, and reported the outcome to the PM and senior health and safety personnel. Interfaced with senior health and safety personnel about onsite implementation of the Health and Safety Plan. Reported any accidents, incidents, and near misses to the PM and senior health and safety personnel. Oversaw the health and safety of the subcontractor work crew when working on site. Ensured the provision of emergency care, including first aid and cardiopulmonary resuscitation (CPR), in cases of injury or illness.

As a Safety and Occupational Health Manager, I plan, direct, control, and evaluate a complex program involving a broad range of high safety risk construction and environmental activities. I work closely with construction supervisors in studying and developing improvements concerning work schedules, safe work techniques, resource requirements, standards, improvements, and or modernization of equipment, facility layout and workflow. Duties include overseeing and enforcing Contractor Safety Programs. I inspect blueprints, schematics, building plans, construction methods and processes for adherence to safety codes and standards. I also prepare accurate and complete technical reports of survey findings and provide recommendations on how to correct hazardous conditions. I perform pre-inspection assessments to ensure regulatory compliance and represent company in government regulatory inspections. Other duties include analysis of written programs and inspection of worksites to determine the consistency of safe work practices and documentation for safety program policies, standards, directives, and interpretations related to those requirements.

Other duties Mr. Ginalick would perform as AECOM' onsite Safety

and Health representative include approval of personnel working on a project in accordance with the qualifications of 29 Code of Federal Regulations (CFR) 1910.120 and the Health and Safety Plan. Maintain site records for project personnel. Review the hazard analysis prior to beginning each field work task. Conduct daily housekeeping inspections. Inspect the Field First Aid Kit daily against the first aid supply list. Assess potential hazards at each location of field activities. Inspect PPE prior to beginning field work each day and as needed and document the inspection. Conduct daily site safety briefings (i.e., tailgate meetings) for all personnel on site prior to the start of the work shift and document the meeting. Identify and correct deficiencies. Prior to initiating any intrusive activities, obtain utility clearances, as needed. Ensure that all safety equipment is in proper condition and is properly used. Observe workers for any potential symptoms of heat or cold stress.

Project Specific Experience

Construction Manager/Health and Safety Officer, Lockheed Martin, Martin State Airport Groundwater Remediation Project, Middle River, MD. Mr. Ginalick is serving as the full-time on-site construction manager and senior SSHO responsible for directing all aspects of health and safety associated with construction of large groundwater remediation system. The Major elements include construction of a 170-foot by 60-foot treatment building, drilling 16 extraction wells, installing underground well conveyance piping and electrical and control wiring, paving an existing gravel road, and extending 13.6 KV electrical service 1,500 feet along the roadway to reach the treatment building site along with a new water main and fire hydrants. The treatment system included installation of 10 fiberglass tanks varying sizes (1,200 -11,000 gallons), four chemical tanks (400-1600 gallons), multimedia filters, liquid and vapor phase carbon systems, a UV system with 6 30kw fixed lamps, and an air stripper. Mr. Ginalick supervises a team of staff and coordinates works with AECOM's project manager, technical specialists, and subcontractor managers to ensure site safety. Supervises the project team in tailgate safety meetings, task hazard analysis, air monitoring as detailed in the health and safety plan, sampling of waste streams including soil, sediment, surface water, drilling fluids, groundwater from aquifer testing, and other materials as necessary for classification as either non-hazardous or hazardous waste.

☒AECOM Project

Year Completed: 2018 (professional services)
Project Cost: $ 20.5 M

Navy, Construction Manager, Non-Time-Critical Removal Action A950 Spoils Pile and A22 Drainage Ditch, Boca Chica Field, Naval Air Station Key West, Florida (July 2015-September 2015). AECOM was conducting a munitions response action to complete the removal of Munitions and Explosives of Concern/ Material Potentially Presenting an Explosive Hazard (MEC/MPPEH)

(including Small Arms Ammunition (SAA)) from sediments at the A950 Spoils Pile and A22 Drainage Ditch sites. Removal of MEC/MPPEH (including SAA) from sediments at these sites will support the achievement of future goals by the Navy, which include completing the stormwater improvement construction project at the A22 Drainage Ditch, and reusing the spoils pile and drainage ditch sediments as backfill material at the installation. The activities include the mechanical screening of
the 6,400 cubic yards of A950 Spoils Pile sediments to remove MEC/MPPEH which may potentially contain high explosives and SAA. Concurrent with the spoils pile screening, the 110 cubic yards of A22 Drainage Ditch sediments will be excavated from the ditch, deposited on the adjacent ground surface in lifts, then mag & flag and manual excavation procedures implemented to remove MEC/MPPEH. After MEC/MPPEH removal, the drainage ditch sediments will be run through the screening plant to remove any residual SAA. After screening operations, munitions constituents (MC) sampling of screened sediments will be conducted to aid in determining the usability of this material for backfill at the installation.

☒AECOM Project ☐Other Firm Project

Year Completed: 2015 (professional services)

USACE, Health & Safety Officer , Phase II Environmental Site Assessment, Bethesda, MD (May 2015-July 2015). AECOM conducted a Phase 2 investigation to confirm and quantify the presence of hazardous materials or other agents in the environment identified in the Phase 1 ESA report for the National Institute of Health(NIH). Building and research-related materials were evaluated within the NIH Building 29 complex, and only research-related materials or those building materials impacted by research activities had been evaluated in the Nicholson Land Research Center (NLRC). Building-related hazardous or regulated materials are expected to include asbestos, lead in paint, mercury, PCBs, ODS, low level radioactive materials, acid neutralization tanks, and mold. Research-related equipment (i.e., fume hoods, sample refrigerators, and walk-in coolers) and research-introduced hazards were evaluated for the presence of asbestos in fume hoods; lead objects, sheeting, and shielding; reactive compounds (e.g., azides, picrates, and perchlorates) in sinks, fume hoods, and ducts; mercury in sinks, vacuum systems, floors, and cabinets; and ethidium bromide on surfaces. Intrusive sampling activities included bulk ACM sampling, limited paint chip sampling, and concrete core sampling for PCBs in Building 29 and 29A mechanical rooms. Physical sampling and laboratory analyses were performed for acid neutralization tanks (liquid and wipe samples), lead sheeting/shielding (wipes), sink traps (swab samples), and vacuum system (liquids). Field instrumentation were used to identify lead in paint (XRF), perchlorate (methylene blue indicator with lab analysis), mercury vapors (portable spectrophotometer), and ethidium bromide (UV light).

☒AECOM Project ☐Other Firm Project

Year Completed: 2015 (professional services)

USACE, Health & Safety Officer , Fort Meade Preliminary Assessment/Site Investigation, Ft. Meade, MD (April 2011 – December 2013, May 2014 – December 2014). AECOM has been managing a PA/SI study of 127 sites at Ft. Meade, MD. Duties included preparing work plans, obtaining dig permits, coordinate with Army DPW environmental office, coordination with miss utility sub-contractors and drilling sub-contractors, coordinating with tenants on Post in order to get access to collect samples and install wells, coordinating with State Highway Administration to get access to drive soil borings on State Highway right-of-way, employing Unexploded ordnance (UXO) avoidance on some sites, collecting surface soil, subsurface soil, groundwater, surface water, and sediment samples for chemical analysis, data validation on all samples, preparing reports.

☒AECOM Project ☐Other Firm Project

Year Completed: Ongoing (professional services)
Project Cost: $ 4.1 Million (Design/ Study Fee)

US Coast Guard, Health & Safety Officer, US Coast Guard Station Sandy Hook, Sandy Hook, NJ (April 2014). Provide engineering services to collect representative samples of dredge material and analyze according to select requirements of the New Jersey Dredge Material Management Technical Guidance. Helped develop a Sampling Plan that addressed sample locations, depths, and compositing in accordance with the technical guidance. Sediment cores were collected using a pontoon boat equipped with a VibraCore sampler.

☒AECOM Project

Year Completed: Ongoing (professional services)
Project Cost: $ 60K (Design/ Study Fee)

US Coast Guard, Health & Safety Officer, US Coast Guard Station Indian River, Rehoboth, DE (January 2014 –March 2014, January 2015). AECOM conducted a limited hydrogeologic investigation at USCG Station Indian River Inlet to delineate the lateral extent of liquid, adsorbed, and dissolved phase petroleum contamination from a heating fuel oil release at the site. Helped prepared a Work Plan and Health and Safety Plan, conduct the field investigation, and prepared an Above Ground Storage Tank (AST) Release Investigation Report for the site. The investigation methods were performed and the report was prepared in accordance with the requirements for a Tier 1 assessment as described in the State of Delaware Department of Natural Resources and Environmental Control (DNREC) Tank Management Section (TMS) guidance document titled Delaware Risk-Based Corrective Action Program (DERBCAP) Guide for Underground Storage Tank (UST) Sites (DNREC 2000).

☒AECOM Project

Year Completed: Ongoing (professional services)

Project Cost: $ 80K (Design/ Study Fee)

USACE, Safety Engineer for NGA Integrated Program Office, Ft. Belvoir, VA (Jan. 2008- Mar. 2011). Manage safety and health programs for major U.S. Army Corps of Engineers construction projects. Lead Safety Manager for a $2.1 billion dollar BRAC initiative, construction of the new facility for the National Geospatial-Intelligence Agency on the Ft. Belvoir North Campus. Develop, implement and re-engineer policy, training, quality control, inspection techniques, and standards oversight programs. Establish safety program standards according to state and federal safety and occupational health regulations. Lead site coordinator for the Baltimore District's first site participating in OSHA's Voluntary Protection Program. Performed quantitative and qualitative safety assessments for the five general contractors, who, at the peak of the project, had over 2,500 workers onsite. Duties included health and safety enforcement, record keeping, monthly reporting, documentation, contractor oversight and on-site activity management, preventing exposure to hazardous materials, implementing safe work practices, use of HAZMAT training, fall protection training, confined space entries, MEC avoidance/ awareness, light studies, noise surveys, fire extinguisher training, emergency preparedness training, fire drills, hot work training, plan reviews, use of scaffolding, use of fall protection. The NGA Campus East project is the single largest USACE military construction project since the Pentagon in 1943. Construction included a 2.2 million-square-foot office building, a 150,000-square-foot technology center, a 95,000-square-foot central utility plant, a 5,100-space parking garage, 15,000 emergency service center, and a site package that included utilities, significant roads and bridges. NGA Campus East achieved LEED Gold certification.

☒AECOM Project ☐Other Firm Project

Year Completed: 2011
Project Cost: $ 2.1 Billion (Design/ Study Fee)

Fedders Corporation, Health & Safety Officer, Sub-Slab Vapor Recovery System, Fedders Corporation, MD (Dec 2006-May 2007). Supervised installation of a sub-slab vapor recovery system to mitigate TCE vapor intrusion issues in a 200,000 square foot building. Activities included design assistance, proposal assistance, procurement of subcontractors, site supervision, health & safety, and system startup and testing. Duties included site health and safety enforcement, record keeping, monthly reporting, schedule review, documentation, exposure monitoring, preventing exposure to hazardous materials, implementing safe work practices, daily tailgate safety meetings, training for heavy equipment, air sampling throughout the project, PPE guidance for work crews, hot work training, soil sampling, PID monitoring of personal work space and soils, ground water sampling, fall protection training, use and implementation of fall protection systems, erection and use of scaffolding, crane inspections, roof work, and concrete

work. Project had some unique challenges with unknown site conditions that required quick resolution in the field due the site completion constraints.

☒AECOM Project ☐Other Firm Project

Year Completed: 2007
Project Cost: $ 600K (Design/ Study Fee)

USACE, Manor View Dump, Ft. Meade, MD (June 2005- June 2006). Supervised the field investigation of soil gas of a landfill of soil waste, construction debris, and burned material. The dump was discovered when excavation was occurring from new construction of housing units. Methane was discovered in high levels around the new buildings as well as an elementary school nearby. This led to an indoor air quality investigation, and follow up monitoring of the site. Main activities were soil gas sampling, indoor air quality sampling, as well as sub-slab vapor sampling. Additional duties included daily tailgate safety meetings, soil sampling, PID monitoring of personal work space and soils, and ground water sampling.

☒AECOM Project ☐Other Firm Project

Year Completed: 2006
Project Cost: $ 300K (Design/ Study Fee)

USACE, Site Health and Safety Officer, Excavation and Removal of Contaminated Soil, Ft. McNair, DC (Sept 2006-Feb 2007). Responsible for managing the H&S issues associated with the excavation and removal of 12,000 tons of contaminated soils. Main activities included monitoring of site excavation, heavy equipment safety, and of dust levels in air to evaluate worker exposures and off-site emissions. Additional tasks were manifesting of waste to be removed from site, daily tailgate safety meetings, and coordination with the general contractor for the site and AECOM, soil sampling, monitoring soil with PID and other field instruments. Other site activities included site clearing and tree removal, working with the District of Columbia permit office to expedite permits, installing and maintaining sediment and erosion controls, and coordinating with subcontractors.

☒AECOM Project ☐Other Firm Project

Year Completed: 2007
Project Cost: $ 1.2 Million (Design/ Study Fee)

Oak Ridge National Laboratories, Site Supervisor/ Collateral H&S Officer, Bioremediation of Chlorinated Solvent Plumes, Dover AFB, DE (Oct 2005-Sept 2006). Supervised the installation of multiple bioremediation systems to remediate 8 chlorinated solvents source areas and downgradient groundwater plumes, which extended up to a mile in length. Duties included safety enforcement and compliance, daily tailgate safety meetings, training for heavy equipment, air sampling throughout the project, PPE guidance for work crews, soil sampling, PID monitoring of personal work space and soils, ground water sampling, fall protection training, and concrete work. The project

involved coordinating field crews from multiple AECOM offices and subcontractors with Base personnel and the client. Ensured utilities were properly located and marked prior to construction activities and coordinated work such that it would not interfere with Base activities. Up to 3 drilling rigs, 5 direct push rigs, and two injection trucks were active at the Base at one time. Project was completed on time, within budget, and ahead of schedule with no injuries. Completion of the project resulted in Dover AFB achieving "construction complete" status with the USEPA. Dover AFB also received the Department of Defense Environmental Restoration Award, which recognizes Dover AFB as the installation with the best environmental restoration program throughout the DoD.

☒AECOM Project ☐Other Firm Project

Year Completed: 2006
Project Cost: $ 2.3 Million

USACE, Site Health and Safety Officer and Site Supervisor, Landfill Cap Repair, Ft. Eustis, VA (Mar 2004-Oct 2004).
Responsible for H&S oversight on a 26 acre landfill cap repair project. The landfill had subsided in several areas, which could have compromised the liner. Over 9 acres had to be excavated down to the liner, the liner cut, the landfill raised to design height, the liner reinstalled, and the entire 26 acre cap regraded. Activities included heavy equipment inspections, review of safe operating procedures, daily H&S briefings, and coordination of subcontractors, material needs, and schedules.

☒AECOM Project ☐Other Firm Project

Year Completed: 2004
Project Cost: $ 1.2 Million

United States Postal Service, Site Supervisor / Collateral H&S Officer, United States Postal Service (Oct 2001-May 2002).
Supervision of a bio-terrorism hazmat team, responsible for containment and decontamination of postal facilities. Duties included were daily tailgate safety meetings, training for heavy equipment, air sampling throughout the project, PPE guidance for work crews, surface and bulk sampling methods used, site health and safety enforcement, record keeping, monthly reporting, documentation, contractor oversight and on-site activity management. Site safety duties also included preventing exposure to hazardous materials, implementing safe work practices, use of HAZMAT training, implementing safe and thorough decontamination practices, exposure monitoring, ensuring proper respirator use and exposure time limits.

☒AECOM Project ☐Other Firm Project

Year Completed: 2002
Project Cost: $ 3 Million (Design/ Study Fee)

Exelon Corporation, Site Supervisor/Collateral Health & Safety Officer , *Exelon Site, Crofton, MD (Jan 2004- Feb 2014)* AECOM designed, built, and operated a pump and treat system to provided groundwater hydraulic control at a coal ash landfill in Crofton,

Maryland for a large public utility. The five well pumping system to prevent the offsite migration of groundwater containing elevated sulfate and metal concentrations. The detailed design included five 6-inch diameter recovery wells and associated well vaults, over 3500 feet of underground high-density polyethylene (HDPE) piping, a treatment building, building foundation, electrical layout, and control panel. After the system was operational, served as a technical advisor for the project.

☒AECOM Project ☐Other Firm Project

Year Completed: 2014 (professional services)
Project Cost: $ XX Million (Design/ Study Fee)

Albertsons,Technical Advisor/Collateral Health & Safety Officer, Former Dry Cleaner, New Fairfield, Connecticut (Dec 2005 to Mar 2007)
Technical advisor for a former dry cleaning site in New Fairfield, Connecticut. Advisor the project team on potential system upgrades to reduce migration, increase extraction efficiency, and improve protection of human health/environment with a focus on reduction of the long-term client obligations at the site. Supervised those minor modifications to the treatment system and recovery wells.

☒AECOM Project ☐Other Firm Project

Year Completed: 2010 (professional services)
Project Cost: $ XX Million (Design/ Study Fee)

Dow Chemical, Site Manager/Collateral H&S Officer, Dow Chemical / Allyn's Point (Nov. 1999 – Aug 2001 full time and ongoing activities 2001, Current). Operations and Maintenance of a one of a kind regeneration resign soil vapor extraction system, and overall site management. Activities include complying with Dow Chemical's rigorous health and safety policies, supervising on-site personnel, and maintaining and troubleshooting the system which has been in place for 14 years. Duties included were daily tailgate safety meetings, training for heavy equipment, air sampling throughout the project, PPE guidance for work crews, soil sampling, PID monitoring of personal work space and soils, ground water sampling, fall protection training, and concrete work, steel erection, LOTO processes, RCRA waste handling, and manifesting waste.

☒AECOM Project ☐Other Firm Project

Year Completed: Ongoing
Project Cost: $4.5 Million

Dow Chemical, Site Supervisor / Collateral H&S Officer, Dow Chemical, Latex Compost Area Cap (Aug 2000-Nov 2000). Project involved capping of a biodegradable latex site; responsibilities included overall site management, and H&S officer for the 5 acre cap. Duties included coordination of subcontractors, scheduling, daily tailgate safety meetings, training for heavy equipment, PPE guidance for work crews, PID monitoring of personal work space and soils.

☒AECOM Project ☐Other Firm Project

Year Completed: 2000
Project Cost: $ 200K (Design/ Study Fee)

Specialized Training

Overview for TSDF Operators
Asbestos Awareness
Lead Awareness
Confined Space Entry and Rescue
System Scaffolding Erector
Sectional Scaffolding Erector
Scaffolding User
HAZWASTE Management
OSHA 30-Hour Construction Industry Outreach Training Program
OSHA #500 Train the Trainer in OSHA Standards for Construction Safety
OSHA 40-Hour Hazardous Waste Operations Site Worker
OSHA 8-Hour Hazardous Waste Operations Supervisor
OSHA 8-Hour Annual Hazardous Waste Operations Refresher OSHA 8-Hour Hazardous Waste Generator
USACE 8-Hour Engineers Radiation Safety
Unexploded Ordnance Safety
First Aid
CPR w/ AED

Chronology

07/98 - Present: AECOM Corporation, Gaithersburg, MD, Senior Environmental Scientist

Contact Information

Company:	AECOM Corporation
Address:	12420 Milestone Center Drive, Suite 150 Germantown, MD 20876
Tel:	301.820.3000
Direct:	301.820.3162
Fax:	301.820.3009
Email address:	matt.ginalick@AECOM.com

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Appendix E – Training

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HAZMAT

TRAINING ▲ INFORMATION ▲ SERVICES

A Division of All American Environmental Services, Inc.

CERTIFICATE OF COMPLETION

This is to certify that

MATTHEW GINALICK, III

has successfully completed

HAZARDOUS MATERIALS SITE WORKER COURSE (40-HOUR)
SATISFYING 29 CFR 1910.120 (3)(e)(i) REQUIREMENTS

at

HAZMAT T.I.S.I.; COLUMBIA, MARYLAND

July 27-31, 1998
40S-9807B

Chief Executive Officer

EXIBIT PAGE 001

AECOM University

Certificate of Completion

AECOM
Built to deliver a better world

Certificate of Completion

8 Hour HAZWOPER Refresher

This certifies that

Matthew Ginalick

Has completed eight hours of annual refresher training for hazardous waste/materials workers under OSHA 29 CFR 1910.120.

Completed on 5/14/2018

Mike de Bettencourt, Director

Safety, Health and Environment Training and Development

ALL AMERICAN ENVIRONMENTAL SERVICES, INC.

This is to certify that

MATT GINALICK, III

has successfully completed

"8-HOUR OSHA HAZARDOUS SITE WORKER SUPERVISOR"

at

ALL AMERICAN ENVIRONMENTAL SERVICES, INC.
SCHOOL OF OCCUPATIONAL SAFETY AND HEALTH
COLUMBIA, MARYLAND

June 15, 2001
MGT-0106

Manuel C. Cusick

School Director

HEARTSAVER

Heartsaver® CPR AED

American Heart Association®

Matt Ginalick

has successfully completed the cognitive and skills evaluations in accordance with the curriculum of the American Heart Association Heartsaver® CPR AED Program.

Optional modules completed:

First Aid, Child CPR AED,Infant CPR

Issue Date
11/6/2017

Recommended Renewal Date
11/2019

Training Center Name
Summit Health - Chambersburg Hospital

Instructor Name
Mark Clem

Training Center ID
PA05008

Instructor ID
07120110269

Training Center Address
112 N 7th St
Chambersburg PA 17201-1720 USA

eCard Code
186201371590

Training Center Phone Number
(717) 267-3000

QR Code

To view or verify authenticity, students and employers should scan this QR code with their mobile device or go to www.heart.org/cpr/mycards.

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OSHA Occupational Safety and Health Administration

15-600545738

This card acknowledges that the recipient has successfully completed a 30-hour Occupational Safety and Health Training Course in

Construction Safety and Health

MATT GENALICK

MICHAEL MILLSAP
(Trainer name – print or type)

9/15/2008
(Course end date)

AECOM University

Certificate of Completion

AECOM
Built to deliver a better world

Certificate of Completion

8 Hour HAZWOPER Refresher

This certifies that

Mark Love

Has completed eight hours of annual refresher training for hazardous waste/materials workers under OSHA 29 CFR 1910.120.

Completed on 2/25/2019

Mike de Bettencourt, Director

Safety, Health and Environment Training and Development

Mark Love

Has completed training in the discipline of:

Certification ID: 78716

Expires: 8/5/2012

Completed: 8/5/2011

Hazardous Waste Operations & Emergency Response Site Worker

OSHA Gen Ind. Subpart H OSHA Const. Subpart D

Mandatory Hrs 40

James Jacono, GSP

James F. Jacono, GSP

Manager of Safety and Training

Eichelbergers Inc.

James Jacono, GSP

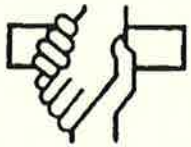
Jim Jacono GSP

Safety Consultant

Lead Instructor

Trainee signature (required on MSHA certifications)

Eichelbergers Inc. training certification summary printed: ***Thursday, October 5, 2017***



Certificate of Completion

this is to certify that

Paul W. Oliver

has successfully completed the

Professional Safety Training Services

Safety Training Program on the

40-Hour Hazardous Site Worker Course

(In Accordance With OSHA 29 CFR 1910.120)

on this 15th day of November, 2012

Calvin C. Williams, Sr.

Instructor

Refresher Due Annually

*PSTS Certificate #:**7720-1***

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LITHO IN U.S.A.

AECOM University

Certificate of Completion

AECOM
Built to deliver a better world

Certificate of Completion

8 Hour HAZWOPER Refresher

This certifies that

Tyler Beach

Has completed eight hours of annual refresher training for hazardous waste/materials workers under OSHA 29 CFR 1910.120.

Completed on 2/8/2019

Mike de Bettencourt, Director

Safety, Health and Environment Training and Development

CERTIFICATE OF COMPLETION

This certificate is awarded to

Tyler Beach

in recognition for completion of 29 CFR 1910.120 requirements for

40-HOUR HAZWOPER TRAINING

Dated September 17-20, 2012

Manager, Regulatory Affairs

ECS & R

3237 US Highway 19 • Cochranton, PA 16314

AECOM University

Certificate of Completion

AECOM
Built to deliver a better world

This is to certify that

Michael Glinski

Has completed:

OSHA 30: Construction Outreach Training Course v3 (CEU=3.0)

11/26/2016

Conferred by:

STL PRECISION

CERTIFIES THAT

MICHAEL GLINSKI

HAS SUCCESSFULLY MET CERTIFICATE REQUIREMENTS FOR THE COURSE ENTITLED

40 HOUR HAZMAT/HEALTH & SAFETY TRAINING

IN ACCORDANCE WITH: OSHA 29CFR1910.120(e)(3)(i)
AND IN EVIDENCE THEREOF IS AWARDED THIS

CERTIFICATE OF COMPLETION

on the twenty-eighth day of August, 2000

Trained to Level B

CERTIFICATE NO.
6010

Expires one year from date of issue

Robert W. Pope, Corporate Environmental Health Officer

Training Provided By:

STL Precision, 10200 USA Today Way, Miramar, Florida 33025, 954-431-4550

AECOM University

Certificate of Completion

AECOM
Built to deliver a better world

Certificate of Completion

8 Hour HAZWOPER Refresher

This certifies that

Michael Glinski

Has completed eight hours of annual refresher training for hazardous waste/materials workers under OSHA 29 CFR 1910.120.

Completed on 3/19/2019

Mike de Bettencourt, Director

Safety, Health and Environment Training and Development

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Appendix F – PA ARNG Work Notification and Access Permit

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Pennsylvania Army National Guard Contractor Work Notification and Access Permit

COMPLETION IS REQUIRED BEFORE CONTRACTOR INITIATION OF ANY TYPE OF ONSITE ACTIVITY WHERE THE PAARNG IS A STAKEHOLDER. A SIGNED AND COMPLETED COPY MUST BE AVAILABLE ONSITE WHILE WORKING.

A. SITE DESCRIPTION- WHERE WILL CONTRACTOR BE WORKING??

Fort Indiantown Gap - basewide

B. WHEN IS THE WORK PLANNED TO BEGIN??

May 2019

C. SCOPE OF WORK- WHAT WILL CONTRACTOR BE DOING??

Site walks, drilling oversight, environmental media sampling (soil, groundwater, surface water, sediment), surveying oversight

D. ON-SITE ORGANIZATION AND COORDINATION

The following personnel are designated to carry out the stated job functions on site. (Note: One person may carry out more than one job function.) Name/Phone

1. Point of Contact: Matt Ginalick 301-820-3162

2. Project Manager/Task Manager: Rosa Gwin 301-820-3131/

Brendan McGuinness 703-682-1564

3. Site Health & Safety: Matt Ginalick 301-820-3162

4. Subcontractors: Eichelbergers Drilling

E. ON-SITE CONTROL AND SECURITY

Entry into any area will not be made until designated "Safe" by the Site Safety Officer. Enclosed Areas (Warehouses, storage buildings, industrial structures, etc.) If the integrity of the walls or roof of any structure do not appear to be sound, entry will not occur.

At no time shall any personnel enter an excavation pit unless it is stable rock or is less than three feet deep and has been examined by a competent person, i.e., the Site Safety Officer, to indicate there is no potential for a cave-in 29 CFR 1926.652(a)(l).

At no time shall any person enter an area meeting the criteria of a Confined Space as defined in 29 CFR1910.146.

F. COMMUNICATION EQUIPMENT & PROCEDURES

Cell phone will be present at the site for offsite communication. Confirm cell service is available at each work location.

The PAARNG Environmental Contact that signs off on this work shall be notified for any of the issues below:

- All and any releases of fuel or chemicals to the environment. (A spill report Form 100 must be completed.)
- All and any injuries to contractor or subcontractor.

Emergency Phone Numbers (provide alternate numbers if appropriate)

FOR ALL 911 CALLS- NOTIFY COUNTY EMS THAT YOU ARE AT FORT INDIANTOWN GAP AND THE 911 OPERATOR WILL TRANSFER YOU TO ON SITE EMERGENCY SERVICES

On-site cell phone(s): _____

Ambulance:	911
Fire:	911
Police:	911
State Police:	911
County EMS:	911

Access Permit Completed By: [contractor name-print/sign/date]

Brendan McGuinness, AECOM

Reviewed By: [environmental representative name-print/sign/date]

Special Concerns/Issues/Notifications/ Requirements

Appendix B – Technical Project Planning Meeting Minutes (TPP1 and TPP2)

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Meeting Minutes
Fort Indiantown Gap (FTIG) – Site Inspection
Technical Project Planning (TPP) – Meeting 1& 2
Preliminary Assessments and Site Inspections (PA/SIs) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanic Acid (PFOA) Impacted Sites
Contract No. W912DR-12-D-0014, DO W912DR17F0192
Wednesday, 20 March 2019
0900 to 1430

Participants			
Name	**Affiliation***	**Phone**	**E-Mail**
Pamela Hess	ARNG IED	703-601-6818	pamela.s.hess.mil@mail.mil
Bonnie Packer	ARNG IED	703-607-7977	bonnie.m.packer.ctr@mail.mil
Tim Peck	USACE	410-962-3416	timothy.j.peck@usace.army.mil
Brian Shedd	USACE	443-472-1912	brian.p.shedd@usace.army.mil
John Fronco	PA ARNG BEM	717-861-8250	jfronko@pa.gov
Dreama O'Neal	PA ARNG BEM	717-861-2339	droneal@pa.gov
Tom Marrs	PA ARNG BEM	717-861-9414	tmarrs@pa.gov
Maj. Nathaniel Lantz	FTIG TC	717-644-8846	nathaniel.r.lantz.mil@mail.mil
Jeremy Magee	FTIG AASF #1	717-861-2254	jeremy.r.magee.civ@mail.mil
CW5 Joe Sandbakken	FTIG KMUI Safety	717-861-2306	joseph.w.sandbakken.mil@mail.mil
Donald Wilson	FTIG Fire Marshal	717-861-2349	donald.l.wilson14.civ@mail.mil
Keith Hickox	PA ARNG PAO	717-861-6254	keith.w.hickox.mil@mail.mil
Chris Botzum	Horsham AGS PA	215-323-7177	chris.botzum.mil@mail.mil
Jacqueline Siciliano	Horsham AGS ENV	215-323-8387	jacqueline.siciliano.mil@mail.mil
Ryan Kostival	PA DEP	717-787-1915	rkostival@pa.gov
Richard Kaiser	PA DEP	717-705-4851	rkaiser@pa.gov
Brendan McGuinness	AECOM	703-682-1564	brendan.mcguinness@aecom.com
Bill Eaton	AECOM	301-820-3454	bill.eaton@aecom.com

**ARNG IED-Army National Guard Installations & Environment Division, Cleanup Branch; PA ARNG BEM-Pennsylvania Army National Guard, Bureau of Environmental Management; FTIG TC-Fort Indiantown Gap Training Center; FTIG AASF #1-Fort Indiantown Gap Army Aviation Support Facility #1; FTIG KMUI Safety-Muir Army Air Field Safety; PA ARNG PAO- Pennsylvania Army National Guard, Public Affairs Office; PA DEP-Pennsylvania Department of Environmental Protection; Horsham AGS PA-Horsham Army Guard Station, Public Affairs; Horsham AGS ENV-Horsham Army Guard Station, Environmental; USACE-United States Army Corps of Engineers; and AECOM-AECOM Technical Services, Inc.*

John Fronco (FTIG BEM) welcomed participants and began the meeting with a role call and introductions. The sign-in sheet is included as **Attachment A** to these meeting minutes. The briefing slides are included as **Attachment B** to these meeting minutes. The meeting focused on perfluoroalkyl and polyfluoroalkyl substances (PFAS) releases at Fort Indiantown Gap and the proposed sampling approach. After the presentation the meeting included a windshield tour of the areas of interest (AOIs) and the proposed SI sampling locations. Dr. Bonnie Packer (ARNG IED) continued the meeting by providing a programmatic overview of the technical project planning (TPP) process and its overall goal of effective communication and coordination between the various stakeholders.

Programmatic Discussion:

- The TPP process is a USACE established planning process with the main goal of engaging stakeholders in project planning and reporting. The ARNG has embraced a Comprehensive

Environmental Response, Compensation, and Liability Act (CERCLA) model for the PFAS PA/SIs nationwide.

- The present TPP1&2 meeting provides an opportunity for stakeholders to discuss the SI Work Plan, focused on potential release areas identified in the Preliminary Assessment (PA). Regulatory stakeholders will be afforded the opportunity to formally comment on the Draft Final SI Work Plan previously provided to them for review, and all comments will be considered prior to finalization of the plan.
- A future TPP3 meeting will present the SI Report findings to all stakeholders; again, regulatory review and comment of the document will occur.
- The ARNG PFAS program is centrally contracted through USACE Baltimore District and managed by ARNG. Every ARNG facility nationwide responded to a questionnaire on potential PFAS releases. ARNG Facilities were prioritized by the likelihood of release and proximity to drinking water sources. FTIG was identified as a high priority site because of the proximity of residential wells to FTIG.
- There are nearly 200 facilities on the ARNG's nationwide PA list.

ARNG FTIG Program Overview and PA Findings:

- Bonnie Packer (ARNG IED) provided an overview of the PA findings by referring attendees to presentation slide # 11 which is a map showing the locations of the AOIs identified in the PA which are recommend for an SI. Tom Marrs (FTIG BEM) noted that although the PA Report was submitted in September 2018, the PA will not be final until ARNG Operations and Security and Public Affairs Office review is complete.
- Bonnie Packer (ARNG IED) reminded attendees that the purpose of the SI is to determine the presence or absence of PFAS in the environmental samples. Presence indicates a PFAS release has occurred. She indicated that if SI results indicated PFAS presence in groundwater near a down gradient FTIG boundary, then a decision to conduct off site residential drinking water sampling may be made, involving rights-of-entry (ROE) documentation prior to sampling. John Fronco asked Horsham AGS representatives how far out from impacted wells Horsham conducts residential sampling. Chris Botzum (Horsham AGS PA) indicated one mile is typically used and responded that a PFAS limit of 40 parts per trillion (ppt) is used as a screening level in decision-making. Bonnie Packer (ARNG IED) responded that a risk screening level below 70 ppt is not currently supported by Army guidance. Further offline discussion was requested by Dr. Packer.
- Bonnie Packer (ARNG IED) also emphasized that there is flexibility associated with the planned SI sampling locations to be discussed by Brendan McGuinness (AECOM), thus allowing adjustment of sampling locations as may be appropriate to avoid impacting the FTIG mission, particularly at AOI 2 which encompasses Muir Army Airfield.
- Maj. Lantz (FTIG TC) suggested that conducting the SI during range maintenance activities at the end of April might simplify logistics. Bonnie Packer (ARNG IED) responded that field activities occurring in early May 2019 was a more likely timeframe.
- Bonnie Packer (ARNG IED) pointed out that past excavation of soil at sites conducted during previous remedial activities, such as at the AOI 2 Ramp Fire Pit 19, does not mean that all PFAS was removed. Prior to turning the presentation over to Brendan McGuinness (AECOM) she asked if there were any questions regarding the PFAS PA and SI Program.
- Maj. Lantz (FTIG TC) asked several questions relating to possible impacts from coring through the ramp area and potential impacts to flight operations. Brendan McGuinness (AECOM) described the process for repairing and core holes, including use of high strength runway-grade concrete during repairs and that boreholes will be moved to non-paved areas where possible. Regarding duration of SI activities at the Muir Army Airfield, a general time of about one week was described, from initiation of activities through repair of the borehole. Bonnie Packer (ARNG IED) and Brendan McGuinness (AECOM) committed to carefully coordinate to minimize impacts to a level acceptable to FTIG. Jeremy Magee (AASF # 1) stated that the contractor [AECOM] needs to

coordinate with CWS Joe Sandbakken (Airfield Safety) to receive airfield safety training prior to conducting SI activities at the Muir Army Airfield. Jeremy Magee (AASF # 1) indicated that the airfield conducts scheduling on Thursdays; therefore, AECOM should communicate on the prior day (Wednesday) the planned activities at the airfield. Thus, the AECOM communications can be considered during scheduling.

- Bonnie Packer (ARNG IED) invited Brendan McGuinness to continue with the technical presentation.

Fort Indiantown Gap SI Description:

- Brendan McGuinness (AECOM) began his presentation with a safety moment by stating that the SI will conform to requirements in USACE Engineering Manual 385-1-1. Site-specific safety procedures will be planned for and followed during SI field work, including establishing controlled work zones during field activities.
- Brendan McGuinness (AECOM) began his portion of the presentation with slide # 10, a map of all the AOIs to be discussed. During the subsequent discussion of slide # 15, which showed Hanger 019-101 and the airfield ramp, Tim Peck (USACE) pointed out that the white material on the ground in the site photograph was snow [not Aqueous Film Forming Foam (AFFF)].
- Several of the presentation slides mention "3% AFFF concentrate", leading some to think that concentrate was released. Donald Wilson (FTIG FD) indicated that it is very unlikely that concentrate was ever released. He indicated that the phrase probably means the diluted solution where only 3% of the diluted solution was concentrate. Brendan McGuinness (AECOM) stated that Donald Wilson's interpretation was correct. Ryan Kostival (PA DEP) asked that if an AFFF were to occur today would it involve Mil-Spec concentrate [i.e., high amounts of PFOS and PFOA]. Donald Wilson (FTIG FD) responded in the affirmative, until a mil-spec replacement is available. CWS Joe Sandbakken (Airfield Safety) asked if oil water separators (OWS) mentioned during the presentation remove PFOA and PFOS. John Fronco (FTIG BEM) responded "no" and stated: (1) effluent form the OWS would still contain PFOA and PFOS and that the effluent ultimately is received at the FTIG sewage treatment plant, (2) and that biosolids from the treatment works are land farmed at FTIG and that these application sites will be investigated during the SI, and (3) this landfarming didn't begin until 2012 so he feels it is unlikely the biosolids contained PFOS and PFOA.
- John Fronco (FTIG BEM) mentioned an AFFF spill location not prior identified. A fire truck was inadvertently charged with AFFF solution. The unwanted AFFF solution was removed from the truck and placed into a temporary above ground, unused storage tank. The storage tank was observed to leak AFFF and the leak was sealed; however, some AFFF solution was released to the ground near the tank [this "accidental tank spill site" will be addressed in the SI, as summarized below in the minutes of the visual reconnaissance conducted after the formal presentation].
- During presentation of Slide # 25 Tom Marrs (FTIG BEM) approached the projection to emphasis the absence of fire training areas (FTAs) southwest of the primary FTIG groundwater divide; rather the FTAs are located east to southeast of this divide.
- During presentation of Slide # 27 Ryan Kostival (PA DEP) mentioned that a new PFAS analytical method (EPA SW846 8327 & 8328) are being developed and asked if the ARNG program would switch to these methods [rather than Method 537 Rev1, Modified]. Bonnie Packer (ARNG IED) responded in the affirmative and reminded all that the PFAS situation is dynamic and evolving and that ARNG procedures will evolve along with the state of the science.
- Brendan McGuinness (AECOM) completed the presentation and, after a short break, attendees were invited to participate in visual reconnaissance of the SI sites.

Visual Reconnaissance:

- Transportation (van) was provided by FTIG DEP. PA DEP representatives (Ryan Kostival and Richard Kaiser) were able to participate.

- Proposed MW and soil sample locations were visually inspected to ensure proper placement to confirm presence or absence of PFAS.
- Based on the reconnaissance, the following sample location adjustments were agreed to:
    - Accidental Tank Spill Site – Two surface soil samples will be collected. AECOM is identifying the Accidental Tank Spill Site as a non-fire training area associated with AOI-2 on all relevant figures.
    - CACTF – AECOM is revising relevant figures to show 3 surface soil samples at the upgradient release area and delete the 1 soil boring at that location. We will keep the co-located shallow and deep soil boings/temporary wells in the lower retention basin. The retention basin as-built will be obtained from PA ARNG and reviewed to check for infrastructure and potential liner material (clay, geotextile, rip-rap, etc.) and borings adjusted as necessary.
    - AECOM is revising the soil boring locations at individual AOIs to be more downgradient of suspected release locations to account for any uncertainty in the specific location of the release area as discussed during the TPP site reconnaissance.
    - AOI 6 – AECOM is revising the location of AOI 6 (Biosolids Area) and the 1 soil boring/temporary well location on all relevant figures.

The meeting ended at 1430.

Action Items:

- AECOM will revise the SI UFP-QAPP Addendum figures as required by the visual reconnaissance findings described above.
- AECOM will provide the revised figures for distribution early next week (week of March 25) for review.
- Approved revised figures will be incorporated into the Final SI UFP-QAPP Addendum and associated text and tables will also be updated to be consistent with the figures.
- PA DEP will provide comments on the Draft Final SI UFP-QAPP currently under their review. PA DEP comments on the Draft Final SI-QAPP will also be considered during preparation of the Final SI UFP-QAPP.

Notes and Recommendations on Conduct of Field Investigation from Tom Marrs (FTIG DEP):

- All vehicles must have proof of insurance.
- All contractors must have a visual ID Badge (e.g. driver license).
- Traffic control at FTIG is strictly enforced (i.e. no speeding, full stop at stop signs, etc.,).
- 1 Team Field Leader for communication and co-ordination for of all contractors is required. The Team Field Leader will be knowledgeable of the schedule and location of all members at FTIG.
- Cell phone service is good at FTIG. Cell service is available at @ 90 percent of FTIG area.
- FTIG has a full time Police Department. In an emergency, call 911. The 911 dispatcher will connect the caller to the FTIG emergency response. Contractors should know what numbered area and building # they are working near as sometimes one's actual location can be confusing.
- All Contractors must receive both MUIR Air Field and CATCF safety training. It is recommended and more efficient that the Contractors not be switched out during field work activities, requiring new team members to be trained. In the event crew members must be switched, lead time is required to have new members trained. AECOM will make all efforts to maintain the same Contractor team members during the field effort.
- At the CACTF, safety training will be required to enter the area, and check in and check out of all Contractor team members will be required.

SIGN-IN SHEET
Fort Indiantown Gap - Site Inspection
Pennsylvania Army National Guard
Technical Project Planning (TPP) Meeting 1 and 2
March 20, 2019

Name	Organization	Phone	Email
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Richard Kaiser	PA DEP	717-705-4851	rkaiser@pa.gov
Bill Eaton	AECOM	301-820-3454	bill.eaton@aecom.com
Drama O'Neal	PAARNG-ENV	717-861-2339	droneal@pa.gov
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Tim Peck	USACE - Baltimore	410-962-3416	timothy.j.peck@usace.army.mil
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Bonnie Packer	ARNG ILE	703-607-7977	bonnie.m.packer.ctr@mail.mil

Attachment B- TPP1 Briefing Slides

Fort Indiantown Gap - Site Inspection
Pennsylvania Army National Guard

Technical Project Planning (TPP) Meeting 1 and 2
Fort Indiantown Gap

Preliminary Assessments and Site Inspections (PA/SI) for Perfluorooctanesulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA) Impacted Sites

March 2019

Agenda

- Introductions
- Safety Moment
- TPP Meeting Goals
- Army National Guard (ARNG) PA/SI Overview
- Fort Indiantown Gap PA Findings
- Fort Indiantown Gap SI Overview
- Stakeholder Involvement
- Sample Location Refinement
- Questions and Open Discussion

Introductions

- ARNG-Installation and Environment Directorate (IED), Cleanup & Restoration Branch
  - Captain Pamela Hess, Toxic Release Program Manager
  - Bonnie Packer, Nationwide Project Manager
  - David Connolly, Project Manager
- United States Army Corps of Engineers (USACE)
  - Tim Peck, Program Manager (Baltimore District)
  - Brian Shedd, Geologist (Baltimore District)
- Pennsylvania Army National Guard (PAARNG)
  - Dreama O'Neal, PAARNG
  - Thomas Marrs, P.G. PAARNG
  - John Fronko, PAARNG
- Pennsylvania Department of Environmental Protection (PADEP)
  - To Be Determined
- Pennsylvania Department of Health (PADOH)
  - To Be Determined
- AECOM Technical Services, Inc.
  - Brendan McGuinness, SI Task Manager
  - Bill Eaton, SI Technical Advisor

Safety Moment

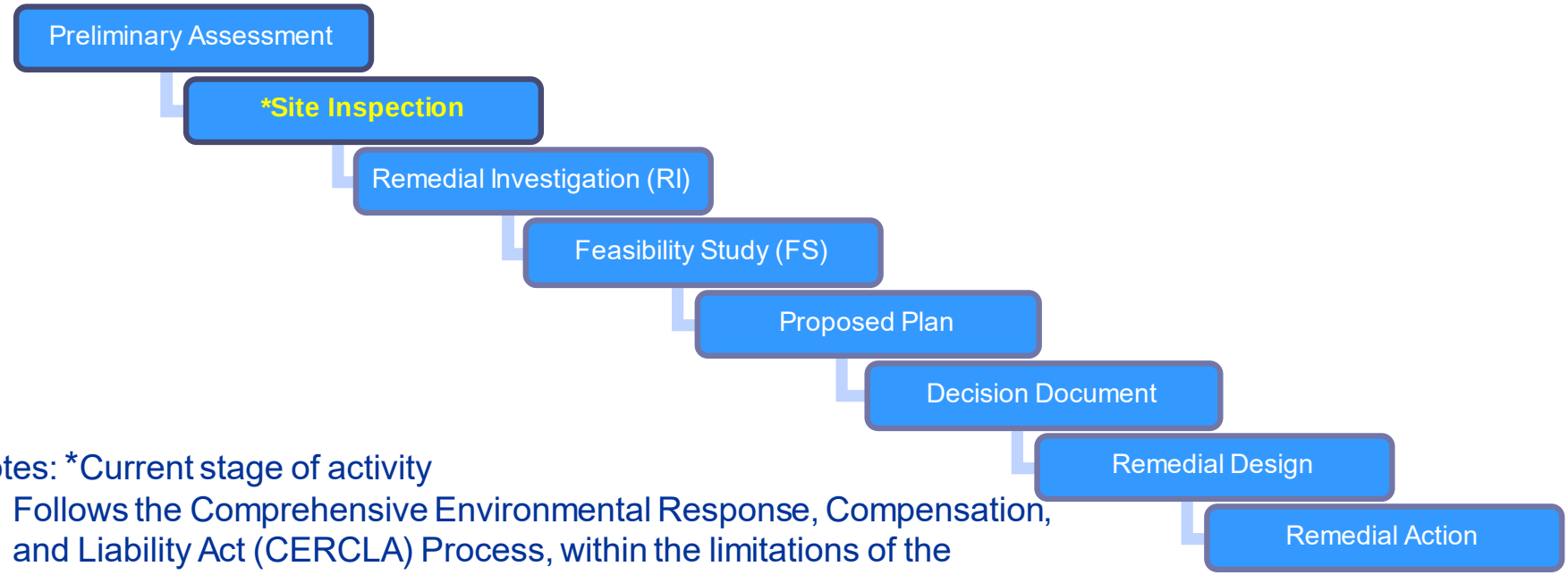
- SI will follow USACE Engineering Manual (EM) 385-1-1 requirements:
  - AECOM and subcontractors will participate in FTIG orientation
  - Accident Prevention Plan addresses all component plans for EM 385-1-1, including Construction Support during drilling operations
  - Site Specific Health and Safety Plan addresses project participants, training, and hazard identification and mitigation
- Planning documents were prepared during SI Work Plan phase

TPP Meeting Goals

- TPP1: Discuss ARNG PA/SI Program
  - Provide an overview of the ARNG PA/SI Program
  - Define objectives for SI data collection
  - Encourage stakeholder involvement
  - Review project schedule
- TPP2: Discuss proposed SI approach
  - Provide an overview of PA findings
  - Present Conceptual Site Model (CSM) and Data Quality Objectives (DQOs)
  - Present SI approach
- TPP3: Discuss SI findings
- Participants:
  - TPP1 and 2: ARNG, USACE, PAARNG, PADEP, PADOH
  - TPP3: ARNG, USACE, PAARNG, PADEP, PADOH, other local stakeholders

ARNG PA/SI Overview

Work Phases



Notes: *Current stage of activity

- Follows the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Process, within the limitations of the evolving regulatory standards
- An interim removal action can be conducted or a No Further Action determination can be made at any phase
- Restoration Advisory Board is typically solicited at RI/FS Phase

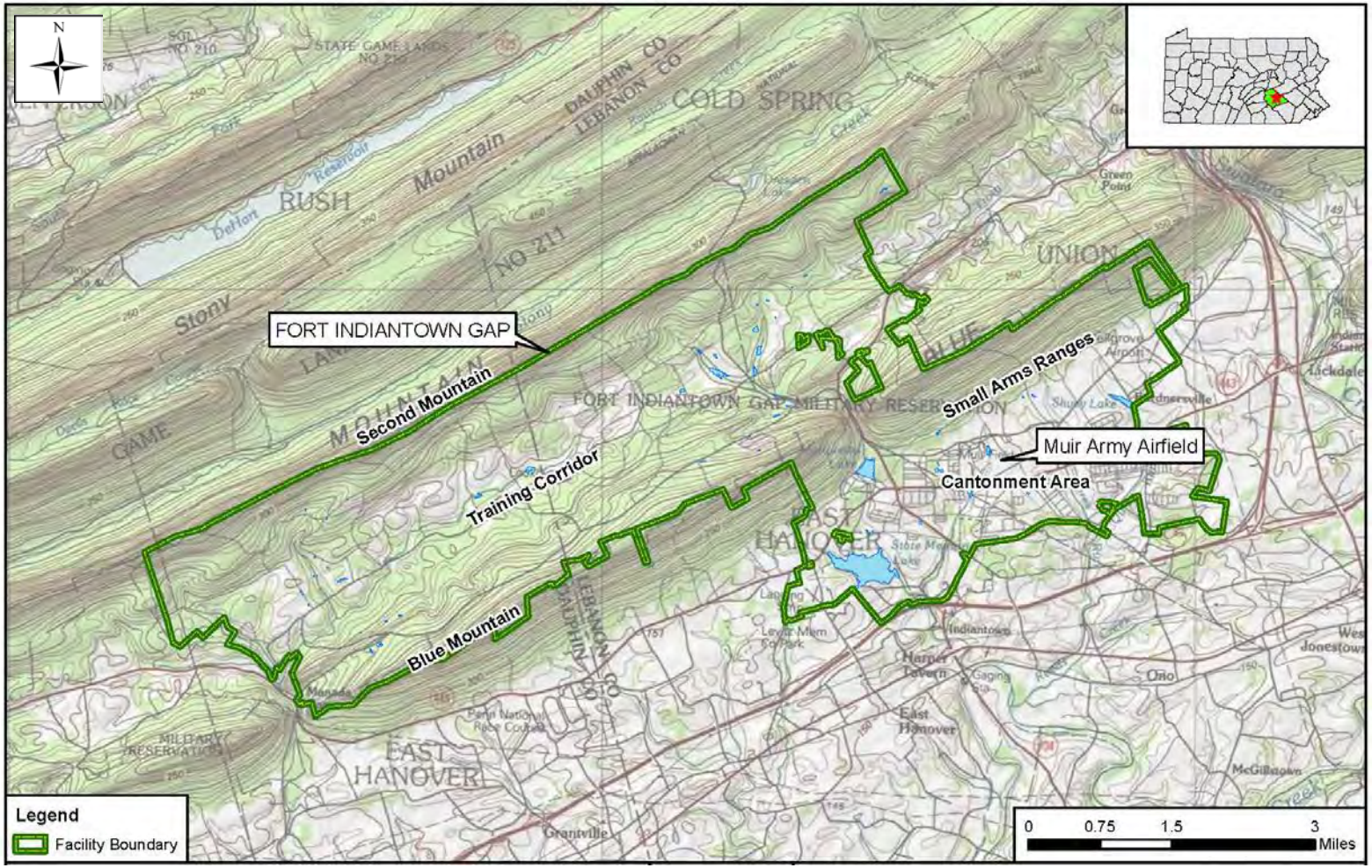
ARNG PA/SI Overview
ARNG Program

- Activities centrally contracted through USACE and managed by ARNG-IED
  - USACE Baltimore manages the contract, with project support from Sacramento and Omaha Districts
  - Project support: chemistry, geology, risk assessment
- PA ranking (~200 facilities) - state ARNG input
  - Likelihood of release
  - Complete pathway to drinking water receptor
- Priority assigned to facilities with highest likelihood of release near drinking water intake
- PA – facility-wide; SI – areas of interest (AOIs)

ARNG PA/SI Overview
Roles in PA/SI

- State ARNG Role for the Preliminary Assessment
  - Identify potential per- and polyfluorinated alkyl substances (PFAS) release locations
  - Provide ARNG personnel and facility access
  - Gather and provide appropriate documents
  - Identify/schedule personnel to interview
  - State ARNG provides final PA to the regulatory agencies
- SI Regulatory Involvement
  - CERCLA SI conducted in conjunction with the appropriate regulatory agency

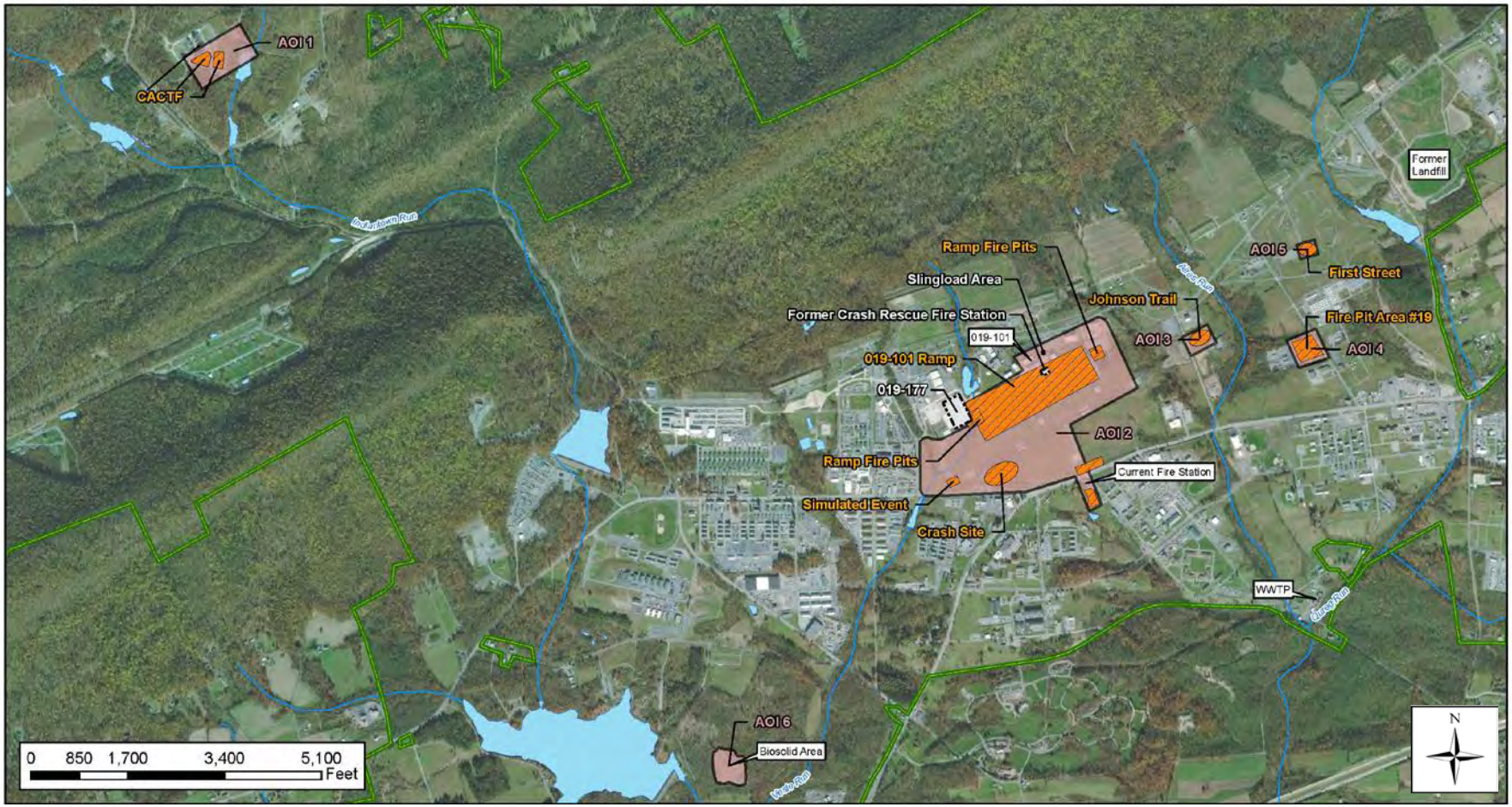
Fort Indiantown Gap PA Findings



Fort Indiantown Gap PA Findings

- Reviewed data resources to obtain information relevant to suspected PFAS releases
- Conducted a 2-day site visit that included visual site inspections at known PFAS locations on 13 and 14 December 2017, and documented with photographs
- Interviewed current Fort Indiantown Gap personnel during the site visit including the PAARNG environmental managers, the current PAARNG Fire Department Chief and PAARNG Assistant Chief, purchasing staff, Sustainable Range Program staff, and Muir Army Airfield (MAAF) hangar maintenance, safety, and operations staff

Fort Indiantown Gap PA Findings



Fort Indiantown Gap PA Findings
Combined Arms Collective Training Facility

- Active 1 km^2 replicated urban environment for training
  - PAARNG Fire Department conducted fire training activities in 2010, 2013, 2015, 2016 using water only
  - 2012 fire training activities used ~20 gallons of 3% AFFF concentrate
  - AFFF accumulated at mock gas station: breached storm drain & sewer outlets
    - Outfall to retention pond

Fort Indiantown Gap PA Findings
Muir Army Airfield

- Current Fire Station – Building 5-117
  - AFFF stored in two 250-gallon totes, transferred to fire trucks via pump
  - No known spills or leaks of AFFF
  - 1998 – 2017: Annual testing of proportioning valves on fire trucks
    - ~5 gallons of 3% AFFF concentrate in field south of current fire station & field north of Fisher Ave (recently paved)

Fort Indiantown Gap PA Findings
Muir Army Airfield

- East End & West End of MAAF: Potential PFAS releases 1980s-1990s via coordinated fire training activities & emergency response events
  - East End Fire Pit: Rotary-winged aircraft ignited ~1x/year from late 1980s – early 1990s using jet fuel & solvents, extinguished with AFFF
  - West End Fire Pit: Rotary-winged aircraft ignited during one-time event in early 1990s using jet fuel, extinguished with AFFF

Fort Indiantown Gap PA Findings
Muir Army Airfield (cont.)

- Building 019-101: Accidental PFAS release early 1990's from fire suppression system
  - 1988-2011 ~ 20 false alarms caused FSS to dispense 5-10 gallons of AFFF per incident
- Building 019-101 Ramp:
  - Ramp occasionally "washed" from 1974 – 2011 with 3% AFFF concentrate
  - AFFF releases from Building 019-101 squeegeed from hangar onto ramp

1,000-gallon tanks of AFFF located at Building 019-101

East end of Building 019-101

Fort Indiantown Gap PA Findings
Muir Army Airfield (cont.)

- Crash Site
  - Rotary-wing aircraft crash on west end of MAAF in early 1990s
  - Fire at crash site extinguished with unknown concentration/quantity of AFFF
- Simulated Emergency Event
  - 1991 PAARNG Fire Department (FD) simulated an emergency event using water at west end of MAAF; U.S. Army FD unaware, responded to event and dispensed unknown concentration/quantity of AFFF

Fort Indiantown Gap PA Findings
Johnson Trail

- FTA – earthen, bermed stockpile soil area
- AFFF fire training activities conducted by PAARNG FD 30-31 March & 1, 6 April 2015
  - Discharge ~20 gallons 1% AFFF concentrate (diluted 3% AFFF concentrate)
  - No remediation activities at this location

Fort Indiantown Gap PA Findings
Fire Pit Area #19

- Constructed 1975 PAARNG FD conducted fire training with U.S. Army FD ~2x/year between 1975-1986
  - Fuel ignited, fire extinguished using unknown concentration/quantity AFFF
- ~3000 gallons/year of used petroleum, oil, lubricants burned
- Closed 1990 – limited SI identified petroleum hydrocarbon contaminated soil
  - Contaminated soil excavated & disposed
- 2003 site specific RI identified VOCs and SVOCs below non-residential statewide health standard & site-specific standard – PADEP issued Relief of Liability Letter May 2003

Fort Indiantown Gap PA Findings
First Street

- Open field with a rotary-winged aircraft encompassed by a circular drive
- Used for fire training activity in March 2014
  - ~20 gallons of 3% AFFF concentrate dispensed by PAARNG
  - No remediation activities have occurred

Fort Indiantown Gap PA Findings
Biosolid Area

- Waste Water Treatment Plant (WWTP) renovated 2000 – 2005 to reduce overflow incidences. Liquid sludge from WWTP transported offsite prior to 2010
- 2010 – sludge press installed, dry sludge cake transported offsite
- 2011 - Accidental discharge of AFFF occurred in Building 019-101 hangar due to faulty sensors
  - Pipes drained ~5-10 gallons 3% concentrate AFFF discharged from the hangar to the WWTP
  - Sensors upgraded in 2015
- Beginning in 2012, land application of biosolids from WWTP
  - No known potential releases to WWTP after 2011

Fort Indiantown Gap PA Findings Not Recommended for SI

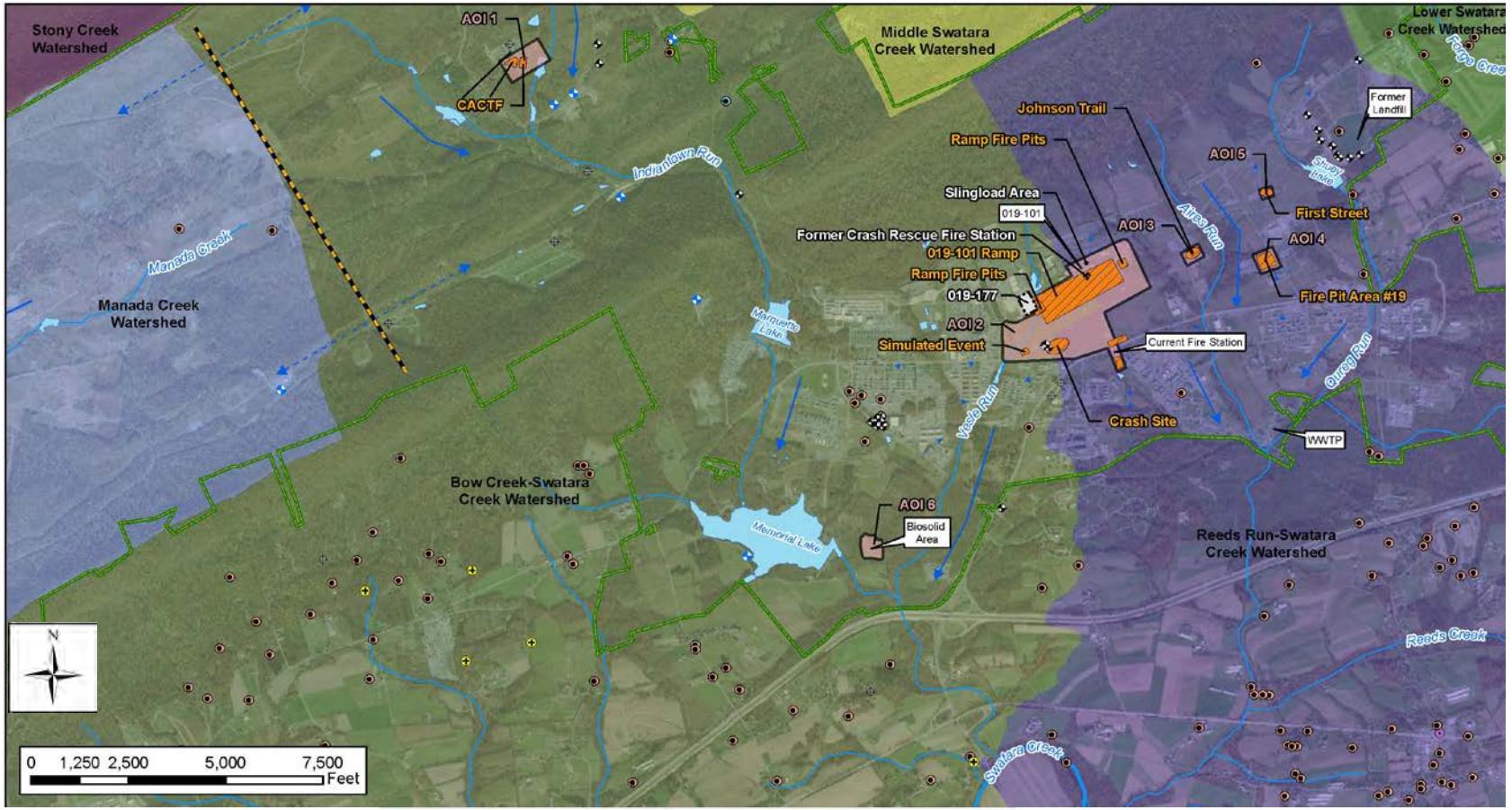
- Former Crash Rescue Fire Station
  - PAARNG FD operated from 1974-1998 and responded to emergencies on MAAF
  - No known fire training activities conducted, no known leaks or spills of AFFF were identified
- Building 19-177
  - Construction began 2014; building dedicated 2017
  - Fitted FSS is high expansion foam
  - FSS tested in 2017, ~ 12,000 gallons water/foam solution generated, discharged to open floor drains, drained to oil-water separator, recovered and disposed off-Post

Fort Indiantown Gap PA Findings
Adjacent Sources

- Off-site adjacent sources not identified during PA interviews or review of the Environmental Data Resource Report

Fort Indiantown Gap PA Findings

Summary of Findings and AOIs

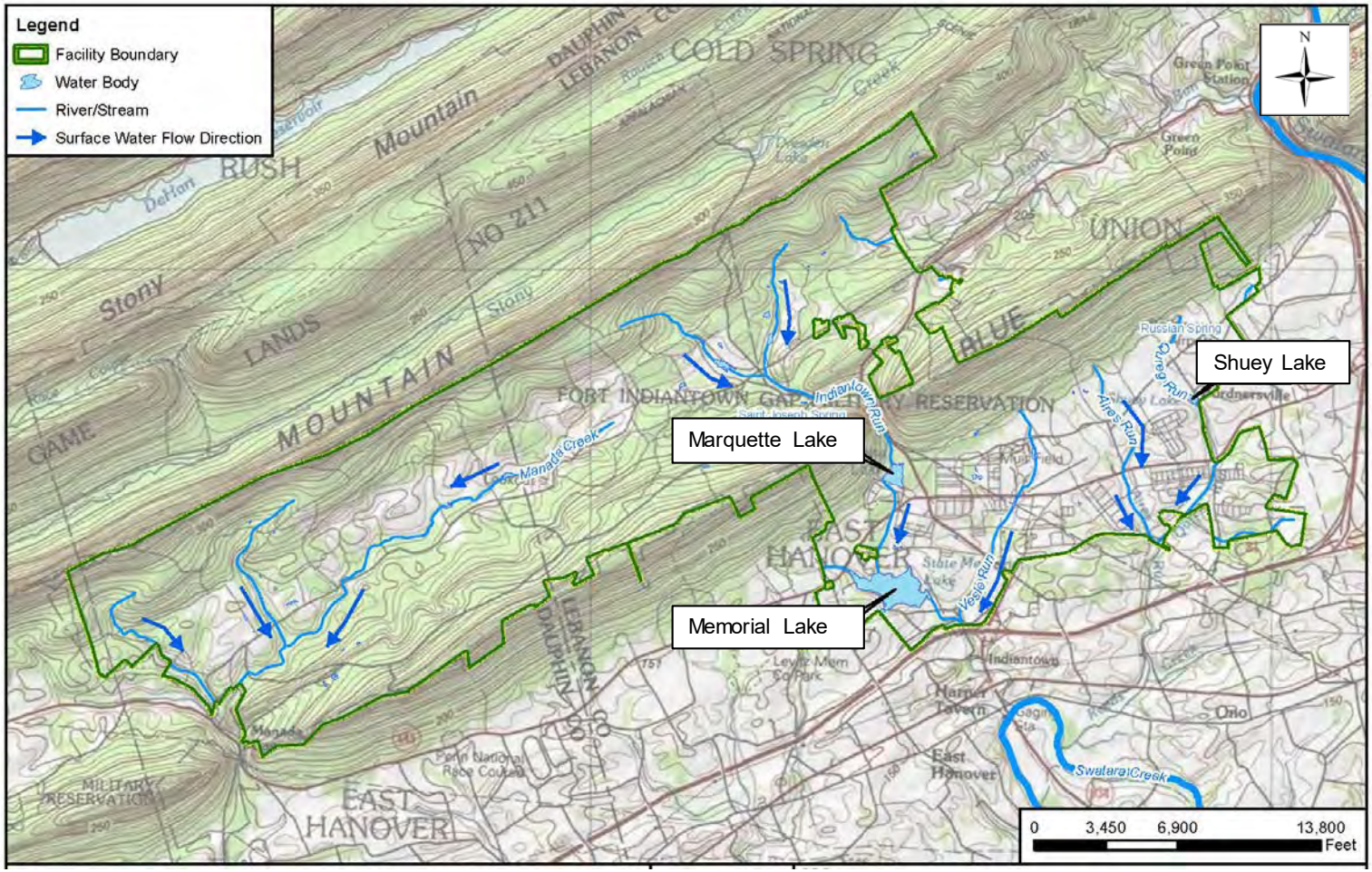


Fort Indiantown Gap SI Overview
Data Quality Objectives

- Primary SI DQOs
  - Determine the presence / absence of a release
  - Gather data for conceptual site model:
    - Source-Pathway-Receptor relationships
- Enhanced SI DQOs
  - Check for the presence/ absence at facility boundary
  - Check for alternate sources, up- or downgradient

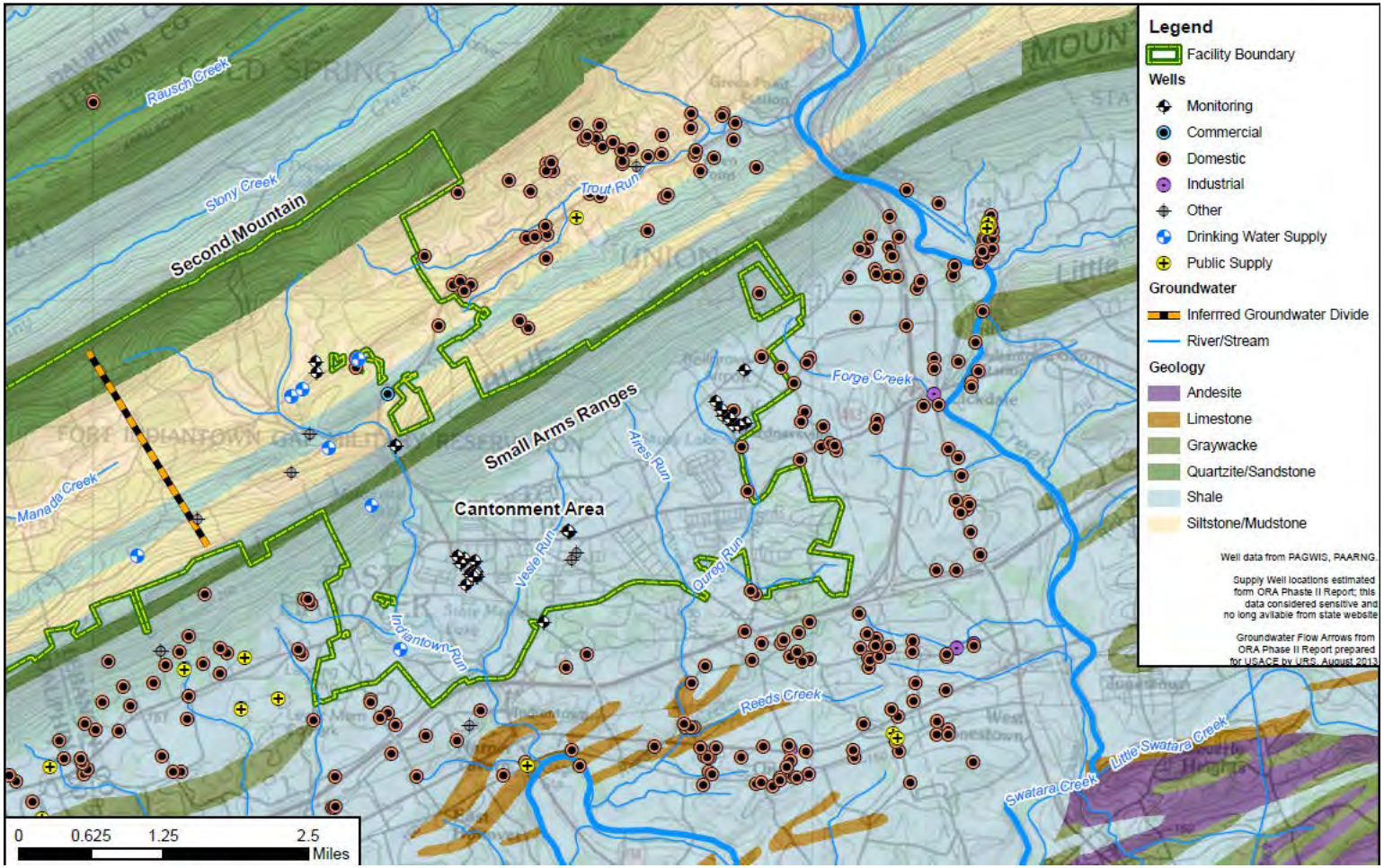
Fort Indiantown Gap SI Overview

Conceptual Site Model - Surface Water Features



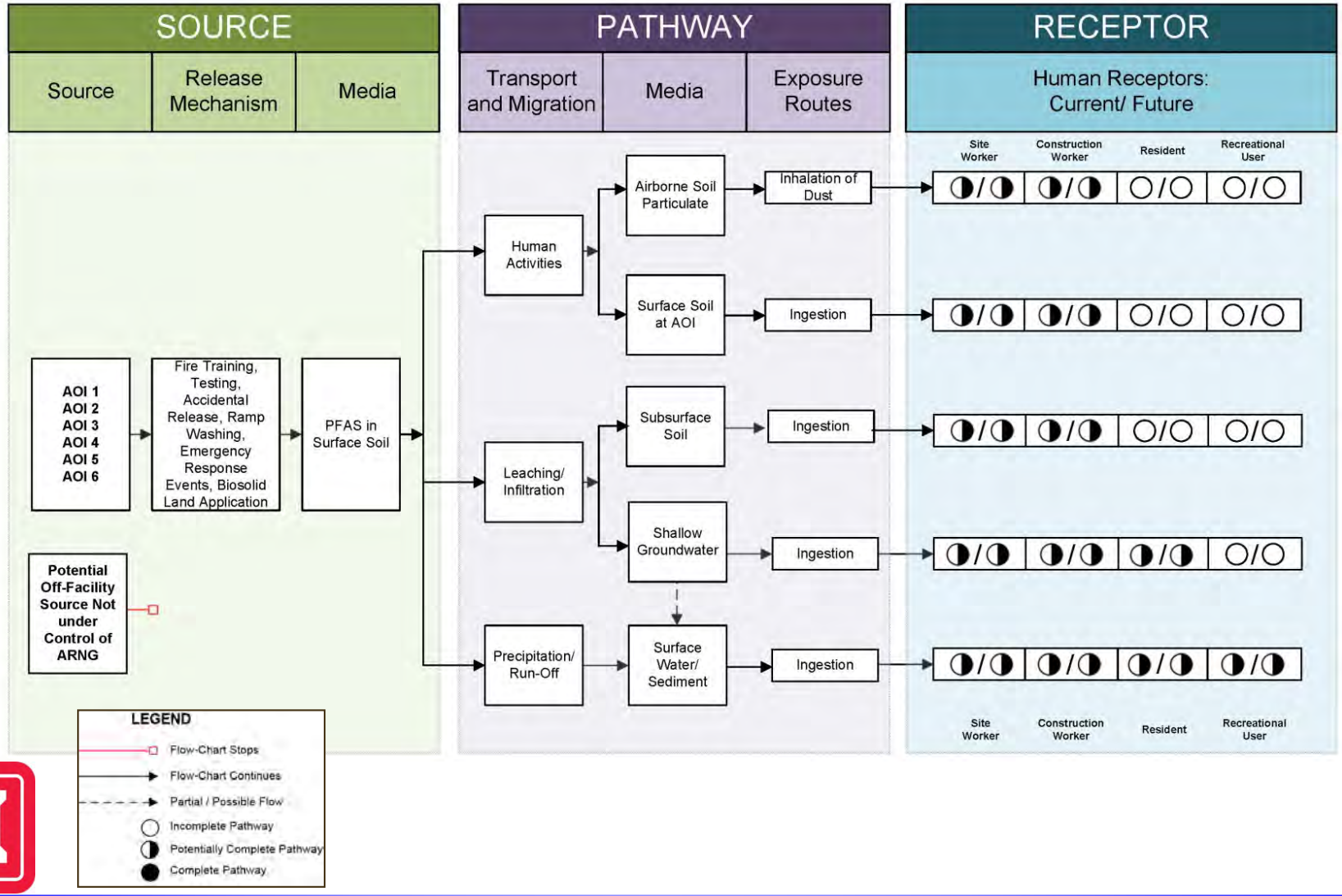
Fort Indiantown Gap SI Overview

Conceptual Site Model - Groundwater Features



Fort Indiantown Gap SI Overview

Conceptual Site Model



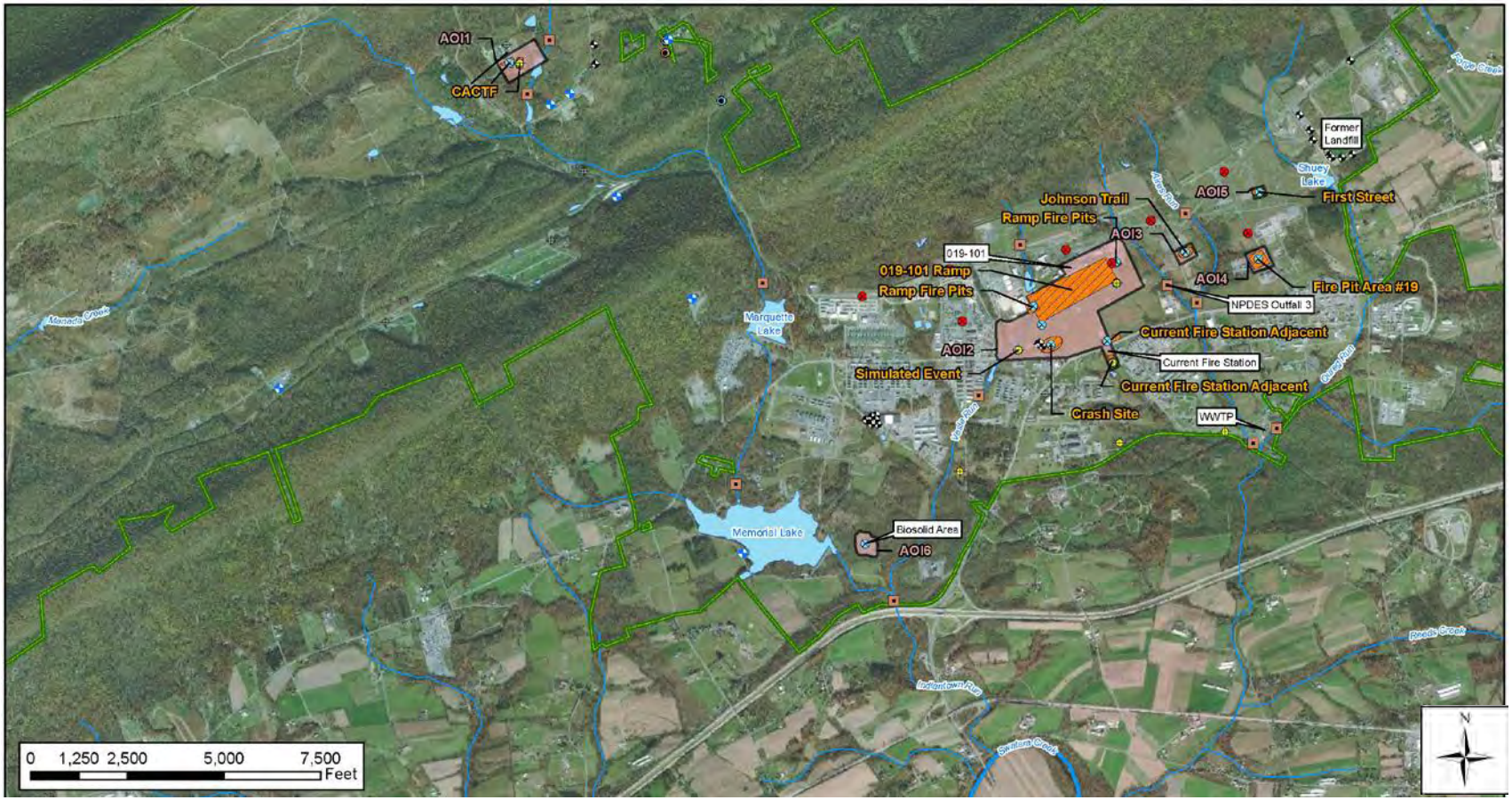
Fort Indiantown Gap SI Overview

Planning and Sampling

- Finalize Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) Addendum
- Install temporary monitoring wells downgradient of potential source areas and/or at the facility boundary
- Continuous soil cores to target depth (soil samples collected at surface, mid point, above water table)
- Collect possible surface water and sediment samples in Indiantown Gap Run, Vesle Run, Aires Run, the former WWTP outfall, and NPDES Stormwater Outfall 003

Fort Indiantown Gap SI Approach

Proposed Sampling Locations



Fort Indiantown Gap SI Overview

Planning and Sampling

AOI	# of Boring Locations	Target Depth(s) for Borings	Soil Samples	Target Interval(s) for GW samples	Grab Groundwater Samples	Surface Water Samples	Sediment Samples
1	3	15 ft – 2 30 ft – 1	6	10-15 ft – 2 25-30 ft – 1	New – 3 Existing – 2	4	4
2	11	15 ft – 8 30 ft – 3	24	10-15 ft – 8 25-30 ft – 3	New – 9 Existing – 2	2	2
3	1	15 ft – 1	3	10-15 ft	New – 1	3	3
4	1	15 ft – 1	3	10-15 ft	New – 1		
5	1	15 ft – 1	3	10-15 ft	New – 1		
6	1	15 ft – 1	3	10-15 ft	New – 1	1	1
Various (NPDES Outfall 03, Former WWTP)	N/A	N/A	N/A	N/A	N/A	2	2
FTIG Boundary	6	15 ft – 3 30 ft – 3	9	10-15 ft – 3 25-30 ft – 3	New – 6	0	0

Fort Indiantown Gap SI Overview

Analytical Parameters

Perfluorooctanesulfonic acid (PFOS)	Perfluoroheptanoic acid (PFHpA)
Perfluorohexanesulfonic acid (PFHxS)	Perfluorononanoic acid (PFNA)
Perfluorooctanoic acid (PFOA)	Perfluorobutanesulfonic acid (PFBS)
Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPA)
N-ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA)
Perfluorodecanoic acid (PFDA)	Perfluorotetradecanoic acid (PFTA)
Perfluorododecanoic acid (PFDoA)	Perfluorohexanoic acid (PFHxA)
Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)

- All data will undergo Level IV data validation
- EPA Method 537 Modified

Stakeholder Involvement

- Use TPPs and open communication to encourage involvement
- Key involvement topics
  - Proposed approaches
  - Document review time for PADEP and other stakeholders
- Schedule:
  - UFP-QAPP Addendum: Draft-Final for regulatory review in March 2019
  - Field Investigation: April 2019

Sample Location Refinement

- Visual reconnaissance of sample locations
- Confirm placement is accessible and will meet DQOs
- Relocate if required, with ARNG, PAARNG, and PADEP concurrence

Questions and Open Discussion

- Coordination
  - Data transfer
  - Report distribution (paper, electronic, portable document format)
- Schedule
  - Revision and finalization of UFP-QAPP (March 2019)
  - Field execution (April 2019)
  - SI Report preparation and review
  - TPP 3: discussion of field results with stakeholders

Acronyms

- AFFF – aqueous film forming foam
- AOI – area of interest
- ARNG – Army National Guard
- ARNG-IED – ARNG Compliance & Cleanup Branch
- CACTF – Combined Arms Collective Training Facility
- CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act
- CSM – Conceptual Site Model
- DQO – Data Quality Objective
- EM – Engineering Manual
- FD – Fire Department
- FTIG – Fort Indiantown Gap
- FSS – Fire Suppression System
- MAAF- Muir Army Airfield
- NPDES – National Pollutant Discharge Elimination System
- PA – Preliminary Assessment
- PAARNG – Pennsylvania ARNG
- PADEP – Pennsylvania Department of Environmental Protection
- PADOH – Pennsylvania Department of Health
- PFAS – Per- and Polyfluorinated Alkyl Substances
- PFOS – Perfluorooctanesulfonic Acid
- PFOA – Perfluorooctanoic Acid
- SI – Site Inspection
- TPP – Technical Project Planning
- UFP-QAPP – Uniform Federal Policy Quality Assurance Project Plan
- USACE – United States Army Corps of Engineers
- WWTP – Waste Water Treatment Plant