# FINAL SITE INSPECTION REPORT PATRICK AIR FORCE BASE, FL

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide



December 2017

**Contract FA8903-16-D-0027 Task Order 0004** 

Prepared for:

Air Force Civil Engineer Center JBSA Lackland, Texas



#### **FINAL**

#### **SITE INSPECTION REPORT**

## SITE INSPECTION OF AQUEOUS FILM FORMING FOAM (AFFF) RELEASE AREAS ENVIRONMENTAL PROGRAMS WORLDWIDE

### PATRICK AIR FORCE BASE BREVARD COUNTY, FLORIDA

Project No. RPMO20167118

Prepared for:
Air Force Civil Engineer Center
Joint Base San Antonio – Lackland, Texas

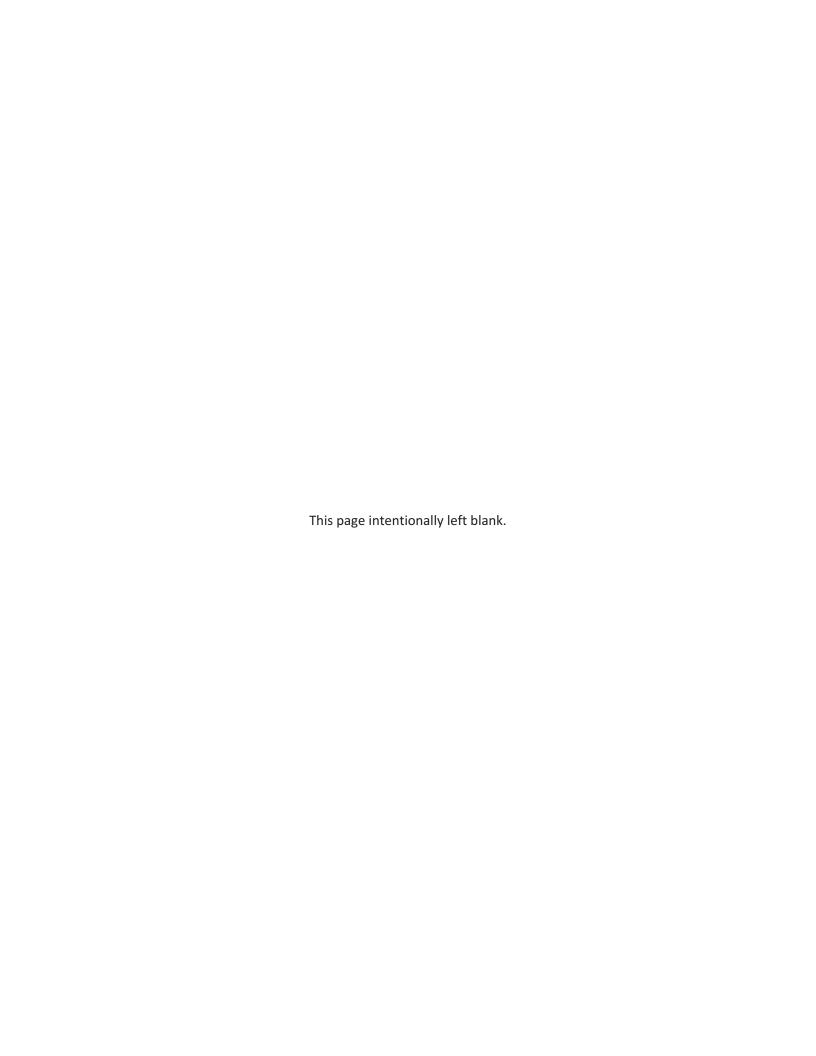


Prepared by:

Amec Foster Wheeler Environment & Infrastructure, Inc.

Contract FA8903-16-D-0027 Task Order 0004

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#### **TABLE OF CONTENTS**

ACRO	NYMS			vi		
EXECU	JTIVE SU	JMMARY	,	viii		
1.0	INTRODUCTION					
	1.1 PER- AND POLY-FLUORINATED ALKYL SUBSTANCES OVERVIEW					
	1.2	PROJE	PROJECT OBJECTIVES			
	1.3	PROJE	PROJECT SCOPE			
2.0	AFFF RELEASE AREA BACKGROUND					
	2.1	SITE LOCATION AND SETTING				
	2.2					
	2.3	PREVI	OUS INVESTIGATIONS	5		
3.0	FIELD	FIELD ACTIVITIES AND ANALYTICAL PROTOCOL				
	3.1	AFFF F	RELEASE AREA 1: FORMER FTA 2			
		3.1.1	Sample Location and Methodologies			
		3.1.2	Analytical Results	14		
		3.1.3	Conclusions			
	3.2	AFFF F	AFFF RELEASE AREA 2: FIRE TRUCK ROLLOVER AREA			
		3.2.1	Sample Location and Methodologies			
		3.2.2	Analytical Results	17		
		3.2.3	Conclusions			
	3.3	AFFF F	RELEASE AREA 3: NORTHERN SEWAGE TREATMENT PLANT	20		
		3.3.1	Sample Location and Methodologies			
		3.3.2	Analytical Results	21		
		3.3.3	Conclusions	21		
4.0	MIGRATION/EXPOSURE PATHWAYS AND TARGETS					
	4.1	SOIL (S	SOIL (SURFACE AND SUBSURFACE) EXPOSURE PATHWAY			
		4.1.1	Local Geologic Setting	23		
		4.1.2	Soil Exposure Pathways and Targets	23		
		4.1.3	Soil Exposure Conclusions	23		
	4.2	GROU	GROUNDWATER MIGRATION PATHWAY			
		4.2.1	Local Hydrogeologic Setting	24		
		4.2.2	Groundwater Exposure Pathways and Targets	24		
		4.2.3	Groundwater Migration Pathway Conclusions	24		
	4.3	SEDIMENT MIGRATION PATHWAY				
		4.2.1	Sediment Exposure Pathways and Targets	25		
		4.2.2	Sediment Migration Pathway Conclusions	25		
5.0	SUMI	SUMMARY AND CONCLUSIONS				
6.0	REFEI	REFERENCES				

#### **FIGURES**

Figure 2.1-1	Installation Location Map				
Figure 2.3.1	AFFF Release Areas for SI in the PA				
Figure 3.0-1	AFFF Release Areas				
Figure 3.0-2	Basev	vide Cross-Section A – A'			
Figure 3.0-3	Basev	vide Cross-Section B – B'			
Figure 3.0-4	Basewide Groundwater Elevations (May 2017)				
Figure 3.1-1	Sampling Locations and Groundwater Elevations, Former FTA 2, AFFF Release Area 1				
Figure 3.1-2	PFAS in Soil, Former FTA 2, AFFF Release Area 1				
Figure 3.1-3	PFAS in Groundwater, Former FTA 2, AFFF Release Area 1				
Figure 3.2-1	Sampling Locations and Groundwater Elevations, Fire truck Rollover Area, AFFF Release Area 2				
Figure 3.2-2	PFAS in Soil, Fire Truck Rollover Area, AFFF Release Area 2				
Figure 3.2-3	PFAS in Groundwater, Fire Truck Rollover Area, AFFF Release Area 2				
Figure 3.3-1	-	ling Locations and Groundwater Elevations, Northern Sewag se Area 3	ge Treatment Plant, AFFF		
Figure 3.3-2	PFAS	in Soil, Northern Sewage Treatment Plant, AFFF Release Are	ea 3		
Figure 3.3-3	PFAS	in Groundwater, Northern Sewage Treatment Plant, AFFF R	elease Area 3		
		TABLES			
Table 1.1-1	Regula	tory Screening Values	(Page 2 in Report)		
Table 3.0-1	Monito	oring Well Construction Details	(Tables Section)		
Table 3.0-2			(Tables Section)		
Table 3.1-1			(Tables Section)		
Table 3.1-2	Summ	ary of Soil General Chemistry Analytical Testing Results	(Tables Section)		
Table 3.1-3	Summ	ary of Groundwater Analytical Testing Results	(Tables Section)		
Table 4.0-1	Conce	otual Site Model: Installation-Wide Summary	(Tables Section)		
Table 5.0-1	Summ	ary of Screening Level Exceedances	(Page 27 in Report)		
		APPENDICES			
Appendix A	SCF S	te Investigation Report (2014) Data Tables and Figures			
Appendix B	Photograph Logs				
Appendix C	Field Forms				
	C-1	Field Activity Daily Logs			
	C-2	Daily PFAS Protocol Checklists			
	C3	Tailgate Safety Meeting Reports			
	C-4	Soil Boring/Monitoring Well Records			

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Final Site Inspection Report, Patrick Air Force Base
December 2017
Page v

Soil Sample Collection Logs

C-6 Screened Well Construction Forms

C-7 Well Development Logs

C-8 Water Quality Sampling Instrument Calibration Forms

C-9 Groundwater Sampling Logs

Appendix D Laboratory Analytical Reports (DVD)

Appendix E Data Validation Report

C-5

Appendix F IDW Non-hazardous Waste Manifest

AFB Air Force Base

AFCEC Air Force Civil Engineer Center
AFFF Aqueous Film Forming Foam

**ACRONYMS** 

bgs below ground surface

BRAC Base Realignment and Closure

CCAFS Cape Canaveral Air Force Station

CoC Chain-of-Custody

DL detection limit

DoD Department of Defense
DPT direct push technology
DQO data quality objectives

ESMC Eastern Space and Missile Center

FDEP Florida Department of Environmental Protection

FTA fire training area

FTS fluorotelomer sulfonate

HA Health Advisory

HDPE high-density polyethylene

HGL HydroGeoLogic

IDWInvestigation-Derived WasteIRPInstallation Restoration ProgramISWPInstallation-Specific Work Plan

LC-MS-MS Liquid Chromatography and Tandem Mass Spectrometry

LOQ Limit of Quantification

μg/L micrograms per liter
μg/kg micrograms per kilogram
mg/kg milligrams per kilogram

NEtFOSAA N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA)

NFA No Further Action

NMeFOSAA N-Methyl perfluorooctanesulfonamidoacetic acid

PA Preliminary Assessment

PFAS per- and polyfluorinated alkyl substances

PFBS perfluorobutanesulfonic acid

PFC perfluorinated compound PFDA Perfluorodecanoic acid PFDoA Perfluorododecanoic acid perfluoroheptanoic acid **PFHpA PFHxA** Perfluorohexanoic acid **PFHxS** perfluorohexanesulfonic acid PFNA perfluorononanoic acid **PFOA** perfluorooctanoic acid **PFOS** perfluorooctanesulfonic acid PFTA Perfluorotetradecanoic acid Perfluorotridecanoic acid **PFTrDA PFUnA** Perfluoroundecanoic acid PPE personal protective equipment

PVC polyvinyl chloride

QPP Quality Program Plan

RSL Regional Screening Level

SI Site Investigation

SIR Site Investigation Report
SOP Standard Operating Procedure

S.U. Standard Unit

SWMU Solid Waste Management Unit

USACE United States Army Corps of Engineers

USAF United States Air Force

USEPA United States Environmental Protection Agency

#### **EXECUTIVE SUMMARY**

This Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc. and affiliate Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of SI activities conducted at three aqueous film forming foam (AFFF) release areas located at Patrick Air Force Base (AFB). The purpose of the SI was to determine, through environmental media sampling, if a release of per- and polyfluorinated alkyl substances (PFAS) has occurred at potential AFFF release areas identified during a Preliminary Assessment (PA) conducted by HydroGeologic Inc. (HGL) (2015), or from the installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016. The data presented in this SIR were collected and evaluated in accordance with the Final Installation-Specific Work Plan (ISWP) (Amec Foster Wheeler, 2017a) and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2017b).

PFAS are a class of synthetic organofluorine compounds that possess a chemical structure that gives them unique properties, including thermal stability and the ability to repel both water and oil. These chemical properties make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams such as AFFF. AFFF concentrate contains fluorocarbon surfactants to meet required performance standards for fire extinguishing agents (Department of Defense [DoD] Military Specification MIL-F-24385F [SH], Amendment 1, 5 August 1984). The United States Air Force (USAF) began purchasing and using AFFF containing PFAS (perfluorooctanesulfonic acid [PFOS] and/or perfluorooctanoic acid [PFOA]) for extinguishing petroleum fires and during firefighting training activities in 1970. AFFF was primarily used on USAF installations at fire training areas (FTAs), but may have also been used, stored or released from hangar fire suppression systems, at firefighting equipment testing and maintenance areas, and during emergency response actions for fuel spills and/or aircraft mishaps.

The United States Environmental Protection Agency (USEPA) Office of Water issued lifetime drinking water Health Advisory (HA) values for PFOS and PFOA in May 2016 that replaced the 2009 Preliminary HA values. The HA values for PFOS and PFOA are 0.07 micrograms per liter (µg/L) for each constituent; however, when these two chemicals co-occur in a drinking water source, a conservative and health-protective approach is recommended that compares the sum of the concentrations (PFOS + PFOA) to the HA value (0.07 µg/L). HA values are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available (USEPA, 2016a and 2016b). Although the USEPA has not established HA values for PFAS in soil, the USAF calculated a residential screening level of 1.26 milligrams per kilogram (mg/kg) for PFOS and PFOA in soil using the USEPA Regional Screening Level (RSL) calculator (<a href="https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\_search">https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\_search</a>).

While PFOS and PFOA are the focus of the HA and provide specific targets for the USAF to address in the SI, USEPA has also derived RSL values for perfluorobutanesulfonic acid (PFBS) for which there is a Tier 2 toxicity value (Provisional Peer Review Toxicity Value) (USEPA, 2017a). Concentrations of PFBS detected in groundwater and soil were compared to the RSLs of 400 µg/L and 1,300 mg/kg, respectively.

Neither the USEPA nor the Florida Department of Environmental Protection (FDEP) have issued HA values or promulgated standards for any other PFAS constituents to date.

Patrick AFB is located along the east-central Florida coastline, between the communities of Satellite Beach and Cocoa Beach in Brevard County, Florida, and encompasses approximately 2,324 acres. The installation is located on a barrier island bordered by the Atlantic Ocean to the east and the Banana River to the west (HGL, 2015).

Patrick AFB was established in 1940 by the U.S. Navy as the Banana River Naval Air Station, and served as an active base for antisubmarine sea-patrol planes during World War II. The installation was deactivated in 1947, transferred to the USAF in 1948, and renamed Patrick AFB in 1950, in honor of Major General Mason M. Patrick, the Chief of the United States Army Air Service from 1921 to 1927. The USAF began development of the Eastern Test Range in 1950. From 1950 to present, the 45th Space Wing (45 SW), formerly the Eastern Space and Missile Center (ESMC), has been headquartered at Patrick AFB and is responsible for launch, test and support operations associated with the cruise missile program, ballistic missiles, the Apollo and Space Shuttle programs, and the Delta, Atlas, Titan, and other commercial launch programs (SpaceX, Athena, etc.) (45th Civil Engineer Squadron, Installation Management Flight, Environmental Conservation Element [45 CES/CEIE], 2015).

Patrick AFB is the center of administrative activities that support 45 SW Headquarters, Cape Canaveral Air Force Station (CCAFS) where space launch activities occur, and downrange tracking and support facilities at Jonathon Dickinson Missile Tracking Annex, Malabar Annex, and Ascension Island. The mission of Patrick AFB includes the responsibility of safety, planning, engineering, support services, scheduling, test operations, launch and range operation, directing or supporting operations, and test results evaluation for the 45 SW (45 CES/CEIE, 2015).

Nine AFFF release areas were recommended for SI at Patrick AFB based on research conducted during a PA by HGL (2015), and one additional AFFF release area was included during the installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016. The following three AFFF release areas were included in this SI since they had not been previously investigated for PFAS:

- AFFF Release Area 1: Former FTA 2.
- AFFF Release Area 2: Fire Truck Rollover Area.
- AFFF Release Area 3: Northern Sewage Treatment Plant.

The following seven AFFF release areas were not included in this SI since PFAS were identified at concentrations above regulatory screening levels during a previous investigation (SES Construction and Fuel Services LLC [SCF], 2014):

- AFFF Release Area 4: Hangar 630.
- AFFF Release Area 5: Hangar 647.
- AFFF Release Area 6: Building 705 Pump House.
- AFFF Release Area 7: Hangar 750.

- AFFF Release Area 8: Fire Station, Building 810 (Solid Waste Management Unit [SWMU] P186, Installation Restoration Program [IRP] Site ID TA058).
- AFFF Release Area 9: Outfall 21 to Banana River.
- AFFF Release Area 10: Building 313, Former Plating Shop (SWMU P041, IRP Site ID OT030).

The specific objectives of the SI were as follows:

- Determine if PFAS are present in soil, groundwater, sediment, and/or surface water at AFFF release areas selected for SI or investigated previously by others;
- Determine if PFOS and PFOA concentrations in soil exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario, and PFBS concentrations in soil exceed the USEPA RSL of 1,300 mg/kg, based on a residential exposure scenario;
- Determine if concentrations of PFOS, PFOA, or the sum of PFOS and PFOA, in groundwater and surface water exceed the USEPA HA value of 0.07 μg/L, and if PFBS concentrations in groundwater exceed the USEPA Tap Water RSL of 400 μg/L;
- Determine if concentrations of PFOS or PFOA in sediment exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the USEPA HA value, or PFBS above the USEPA Tap Water RSL).

#### **PFAS Analytical Results**

Analytical results indicated the presence of PFAS in groundwater at Patrick AFB in excess of the applicable USEPA HA values. PFOS, PFOA, and/or PFOS+PFOA in groundwater exceeded the USEPA HA values at AFFF Release Areas 1 through 8 and 10. PFAS were detected in soil at AFFF Release Areas 1 through 8, but were below the RSL for PFOS, PFOA, and PFBS. PFAS were detected in sediment at AFFF Release Areas 4 and 9, but were below the calculated RSLs for PFOS and PFOA, based on a residential exposure scenario. PFAS concentrations in surface water at AFFF Release Area 9 exceeded the USEPA HA values for PFOS, PFOA, and PFOS+PFOA.

Potential human health pathways were identified during this SI. The potential receptors and targets vary by AFFF release area and are summarized below.

#### Surface and Subsurface Soil Receptors

The highest potential for exposure to PFAS from soil is to on-site workers, specifically those involved with excavation or drilling activities. PFOS, PFOA, and/or PFBS were detected in soil at AFFF Release Areas 1 through 8; however, all detections were below applicable RSLs, based on a residential exposure scenario.

#### **Groundwater Receptors**

PFAS in groundwater exceeded the USEPA HA value of 0.07  $\mu$ g/L for PFOS, PFOA, and/or PFOS+PFOA at AFFF Release Areas 1 through 8 and 10. Human groundwater receptors via the ingestion pathway are not present for any AFFF release area at or downgradient of Patrick AFB since the installation utilizes drinking

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Final Site Inspection Report, Patrick Air Force Base
December 2017

Page xi

water supplied by the City of Cocoa (HGL, 2015). In addition, human groundwater receptors via the ingestion pathway are not present downgradient of Patrick AFB since the primary groundwater exposure points downgradient of the installation are the Banana River to the west or the Atlantic Ocean to the east, which are not used as drinking water sources for the area. As a result, there is currently no potential receptor pathway with immediate impacts to human health at or downgradient of Patrick AFB.

#### <u>Sediment Receptors</u>

PFOS and PFOA were detected in sediments at concentrations below the calculated RSL from the drainage channel and Outfall 21 to Banana River (AFFF Release Area 9) during the previous site investigation by SCF (2014). Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with sediment within the drainage channel and at Outfall 21 to Banana River.

#### Surface Water Receptors

PFOS and PFOA were detected in surface water samples collected at the headwaters of the drainage channel and at Outfall 21 to the Banana River (AFFF Release Area 9) at concentrations exceeding the USEPA HA value of  $0.07~\mu g/L$  during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to drinking water sources, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Final Site Inspection Report, Patrick Air Force Base December 2017 Page xii

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#### 1.0 INTRODUCTION

This Site Inspection (SI) Report (SIR) was prepared by Amec Foster Wheeler Programs, Inc. and affiliate Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) under Contract No. FA8903-16-D-0027, Task Order 0004, to document the results of SI activities conducted at seven aqueous film forming foam (AFFF) release areas located at Patrick Air Force Base (AFB). The purpose of the SI was to determine, through environmental media sampling, if a release of per- and polyfluorinated alkyl substances (PFAS) has occurred at potential AFFF release areas identified by others during a Preliminary Assessment (PA) (HydroGeologic Inc. [HGL], 2015) or installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016.

The data presented in this SIR were collected and evaluated in accordance with the Final Installation-Specific Work Plan (ISWP) (Amec Foster Wheeler, 2017a), and the General Quality Program Plan (QPP) (Amec Foster Wheeler, 2017b).

#### 1.1 PER- AND POLY-FLUORINATED ALKYL SUBSTANCES OVERVIEW

PFAS are a class of synthetic organofluorine compounds that possess a chemical structure that gives them unique properties, including thermal stability and the ability to repel both water and oil. These chemical properties make them useful components in a wide variety of consumer and industrial products, including non-stick cookware, food packaging, waterproof clothing, fabric stain protectors, lubricants, paints, and firefighting foams such as AFFF. AFFF concentrate contains fluorocarbon surfactants to meet required performance standards for fire extinguishing agents (Department of Defense [DoD] Military Specification MIL-F-24385F [SH], Amendment 1, 5 August 1984). The United States Air Force (USAF) began purchasing and using AFFF containing PFAS (perfluorooctanesulfonic acid [PFOS] and/or perfluorooctanoic acid [PFOA]) for extinguishing petroleum fires and during firefighting training activities in 1970, as confirmed by the following federal government documents:

- Military Specification for AFFF (MIL-F-24385), formally issued in 1969;
- General Accounting Office determination on sole source award protest to provide AFFF to the Navy in December 1969; and,
- A History of USAF Fire Protection Training at Chanute Air Force Base, 1964-1976 (Coates, 1977).

AFFF was primarily used on USAF installations at fire training areas (FTAs), but may have also been used, stored or released from hangar fire suppression systems, at firefighting equipment testing and maintenance areas, and during emergency response actions for fuel spills and/or aircraft mishaps.

The United States Environmental Protection Agency (USEPA) Office of Water issued lifetime drinking water Health Advisory (HA) values for PFOS and PFOA in May 2016 that replaced the 2009 Preliminary HA values. The HA values for PFOS and PFOA are 0.07 micrograms per liter ( $\mu$ g/L) for each constituent; however, when these two chemicals co-occur in a drinking water source, a conservative and health-protective approach is recommended that compares the sum of the concentrations (PFOS + PFOA) to the HA value (0.07  $\mu$ g/L). The HA values are non-regulatory concentrations of drinking water contaminants

at or below which adverse health effects are not anticipated to occur over specific exposure durations (e.g., 1 day, 10 days, and a lifetime). They serve as informal technical guidance to assist federal, state, and local officials, and managers of public or community water systems in protecting public health when emergency spills or other contamination situations occur. A HA document provides information on the environmental properties, health effects, analytical methodology, and treatment technologies for removing drinking water contaminants. HA values are not to be construed as legally enforceable federal standards and are subject to change as new information becomes available (USEPA, 2016a and 2016b).

The USEPA has not published Regional Screening Levels (RSLs) for PFOS or PFOA for soil or sediment; however; for this project, a screening level of 1.26 milligrams per kilogram (mg/kg) for soil and sediment was calculated using the USEPA RSL calculator (<a href="https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\_search">https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\_search</a>). The toxicity value input for the calculator is the Tier 3 value reference dose of 0.00002 mg/kg per day derived by the USEPA in their Drinking Water HA values for both PFOS and PFOA (USEPA, 2016a and 2016b).

While PFOS and PFOA are the focus of the HA and provide specific targets for the USAF to address in the SI, USEPA has also derived RSL values for perfluorobutanesulfonic acid (PFBS) for which there is a Tier 2 toxicity value (Provisional Peer Review Toxicity Value) (USEPA, 2017a). PFBS concentrations detected in groundwater and soil were compared to the RSLs of 400  $\mu$ g/L and 1,300 mg/kg, respectively.

**Table 1.1-1** below presents the screening values for comparing analytical results for PFOS, PFOA, and PFBS. Neither the USEPA nor the Florida Department of Environmental Protection (FDEP) have issued HA values or promulgated standards for any other PFAS constituents to date.

**USEPA Health** Calculated RSL **USEPA Regional Screening Advisory for Drinking** for Soils and **Level Table Water (Surface Water** Chemical **Sediments**<sup>b</sup> or Groundwater) (June 2017)<sup>a</sup> **Parameter Abstract** (µg/kg) (µg/L)<sup>c</sup> Number **Residential Soil Tap Water**  $(\mu g/L)$ (µg/kg) 1763-23-1 NL**PFOS** NL1,260  $0.07^{d}$ **PFOA** 335-67-1 NL NL1,260 **PFBS** 375-73-5 1.3E+6 400 NLNL

Table 1.1-1. Regulatory Screening Values.

#### Notes:

- a USEPA Regional Screening Levels (June, 2017a) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017].
- b Screening levels, based on residential exposure, calculated using the USEPA Regional Screening Level calculator (<a href="https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\_search">https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\_search</a>).
- c USEPA, May 2016a. "Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)" and USEPA, May 2016b. "Drinking Water Health Advisory for Perfluorooctanoic Acid (PFOA)."
- d When both PFOA and PFOS are both present, the combined concentrations of PFOA and PFOS should be compared with the  $0.07 \mu g/L$  health advisory level.

μg/kg - micrograms per kilogram μg/L - micrograms per liter

NL - not listed

PFBS - perfluorobutanesulfonic acid

PFOA - perfluorooctanoic acid PFOS - perfluorooctanesulfonic acid RSL - Regional Screening Level

USEPA - United States Environmental Protection Agency

#### 1.2 PROJECT OBJECTIVES

In accordance with DoD Instruction 4715.18, "Emerging Contaminants (ECs)" (DoD, 2009), the *Interim AF Guidance on Sampling and Response Actions for Perfluorinated Compounds at Active and Base Realignment and Closure (BRAC) Installations* (USAF, 2012), and the *SAF/IE Policy on Perfluorinated Compounds of Concern* (USAF, 2016) the USAF will:

- 1) Identify locations where there is a reasonable expectation that there may have been a release of PFAS (defined below) associated with USAF actions;
- Determine if there is unacceptable risk to human health and the environment; and,
- 3) Address releases that pose an unacceptable risk, including offsite migration.

The primary objectives of this SI were to:

- Determine if PFOS, PFOA, or PFBS are present in soil, groundwater, sediment, and/or surface water at AFFF release areas selected for SI or investigated previously by others;
- Determine if PFOS and PFOA concentrations in soil exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario, and if PFBS concentrations in soil exceed the USEPA RSL of 1,300 mg/kg, based on a residential exposure scenario;
- Determine if PFOS, PFOA, or sum of PFOS and PFOA concentrations in groundwater and surface water exceed the USEPA HA value of 0.07  $\mu$ g/L, and if PFBS concentrations in groundwater exceed the USEPA Tap Water RSL of 400  $\mu$ g/L;
- Determine if concentrations of PFOS or PFOA in sediment exceed the calculated RSL of 1.26 mg/kg; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the USEPA HA value, or PFBS above the USEPA Tap Water RSL).

#### 1.3 PROJECT SCOPE

Nine AFFF release areas were recommended for SI at Patrick AFB based on research conducted during a PA by HGL (2015), and one additional AFFF release area was included during the installation scoping visit conducted by Amec Foster Wheeler on 15 November 2016. The following three AFFF release areas were included in this SI since they had not been previously investigated for PFAS:

- AFFF Release Area 1: Former FTA 2.
- AFFF Release Area 2: Fire Truck Rollover Area.
- AFFF Release Area 3: Northern Sewage Treatment Plant.

The following seven AFFF release areas were not included in this SI since PFAS was identified at concentrations above regulatory screening levels during a previous investigation (SES Construction and Fuel Services LLC [SCF], 2014):

- AFFF Release Area 4: Hangar 630.
- AFFF Release Area 5: Hangar 647.
- AFFF Release Area 6: Building 705 Pump House.
- AFFF Release Area 7: Hangar 750.
- AFFF Release Area 8: Fire Station, Building 810 (Solid Waste Management Unit [SWMU] P186, Installation Restoration Program [IRP] Site ID TA058).
- AFFF Release Area 9: Outfall 21 to Banana River.
- AFFF Release Area 10: Building 313, Former Plating Shop (SWMU P041, IRP Site ID OT030).

Media evaluated at each area included surface and subsurface (vadose zone) soil and groundwater collected from temporary and existing monitoring wells at AFFF Release Areas 1 through 3. Surface and subsurface (vadose zone) soil, groundwater, sediment, and surface water analytical data were also evaluated from AFFF Release Areas 4 through 10, as reported in the site investigation by SCF (2014).

This SIR discusses and provides a comparison of the analytical results to screening values for PFOS, PFOA, and PFBS in soil, groundwater, sediment, and surface water. The remaining PFAS do not have screening values. As a result, only the results of PFOS, PFOA, and PFBS from AFFF Release Areas 1 through 3 are discussed in detail and presented in figures in the SIR; however, all data are presented in the soil, groundwater, sediment, and surface water analytical tables. Figures and tables from the previous site investigation report completed by SCF (2014) are included as an appendix in this SIR that document the detected PFAS results from AFFF Release Areas 4 through 10.

#### Page 5

#### 2.0 AFFF RELEASE AREA BACKGROUND

#### 2.1 SITE LOCATION AND SETTING

Patrick AFB is located along the east-central Florida coastline, between the communities of Satellite Beach and Cocoa Beach in Brevard County, Florida, and encompasses approximately 2,324 acres (**Figure 2.1.1**). The installation is located on a barrier island bordered by the Atlantic Ocean to the east and the Banana River to the west (HGL, 2015).

#### 2.2 SITE HISTORY

Patrick AFB was established in 1940 by the U.S. Navy as the Banana River Naval Air Station, and served as an active base for antisubmarine sea-patrol planes during World War II. The installation was deactivated in 1947, transferred to the USAF in 1948, and renamed Patrick AFB in 1950, in honor of Major General Mason M. Patrick, the Chief of the United States Army Air Service from 1921 to 1927. The USAF began development of the Eastern Test Range in 1950. From 1950 to present, the 45th Space Wing (45 SW), formerly the Eastern Space and Missile Center (ESMC), has been headquartered at Patrick AFB and is responsible for launch, test and support operations associated with the cruise missile program, ballistic missiles, the Apollo and Space Shuttle programs, and the Delta, Atlas, Titan, and other commercial launch programs (SpaceX, Athena, etc.) (45th Civil Engineer Squadron, Installation Management Flight, Environmental Conservation Element [45 CES/CEIE], 2015).

Patrick AFB is the center of administrative activities that support 45 SW Headquarters, Cape Canaveral Air Force Station (CCAFS) where space launch activities occur, and downrange tracking and support facilities at Jonathon Dickinson Missile Tracking Annex, Malabar Annex, and Ascension Island. Major tenants at Patrick AFB include: Air Force Reserve Command (920th Rescue Wing); 301st, 39th, and 308th Rescue Squadrons; 17th Test Squadron, Detachment 3; Air Combat Command Program Project Management Squadron/QA; Air Force Office of Special Investigations (8th Field Investigative Region, Detachment 802); United States Army Corps of Engineers; Defense Equal Opportunity Management Institute; Department of State/Air Wing; Air Force Technical Applications Center; National Geospatial Intelligence Agency; Joint Stars Joint Test Force; and, the Florida Air National Guard - 114th Combat Communications. The 920th Rescue Wing is the primary user of the Patrick AFB airfield. The mission of Patrick AFB includes the responsibility of safety, planning, engineering, support services, scheduling, test operations, launch and range operation, directing or supporting operations, and test results evaluation for the 45 SW (45 CES/CEIE, 2015).

#### 2.3 PREVIOUS INVESTIGATIONS

HGL was contracted by the Air Force Civil Engineer Center (AFCEC) to prepare a PA of FTA and non-FTA sites at Patrick AFB to identify locations where PFAS may have been used and released into the environment, and to provide an initial assessment of possible migration pathways and receptors of potential contamination (HGL, 2015). Fifteen potential AFFF release areas were identified during the PA research, with the following nine potential AFFF release areas recommended for SI (**Figure 2.3-1**):

- 1) Former FTA 2: Fire training exercises were performed in two burn pits potentially using an unknown amount of AFFF. Burn Pit 1 was unlined and was used for fire training activities from 1970 to 1985, while Burn Pit 2 was concrete-lined and used for fire training activities from 1985 to 2001, with AFFF potentially released outside the concrete-lined area.
- 2) Fire Truck Rollover Area: A fire truck rolled over in 1997 when turning from Taxiway E onto Taxiway B and released an unknown quantity of AFFF onto the taxiway and surrounding grass.
- 3) Northern Sewage Treatment Plant: This facility received wastewater, potentially containing AFFF, from releases at various hangars and buildings from 1968 to 1995. An unknown amount of AFFF was observed at the plant in 1994 that discharged onto the surrounding grounds.
- 4) Hangar 630: The hangar AFFF fire suppression system was activated in 1999 and 2004, and AFFF discharged onto grassy areas and into storm sewer inlets north and south of the hangar.
- 5) Hangar 647: The hangar AFFF fire suppression system was activated during a hurricane in 2004, and AFFF discharged onto a grassy area and into storm sewer inlets north of the hangar.
- 6) Building 705 Pump House: Approximately 800 to 1,000 gallons of AFFF were released from leaks in underground piping to Hangars 750 and 751 from 2007 to 2011.
- 7) Hangar 750: AFFF from system activations was contained by a 30,000-gallon Underground Storage Collection Tank located south of the hangar, and periodically pumped out onto the adjacent grassy areas.
- 8) Fire Station, Building 810 (SWMU P186, IRP Site ID TA058): Daily operational checks and periodic flushing of hoses with AFFF occurred at the 800 airfield ramp and in adjacent grassy areas surrounding the building.
- 9) Outfall 21 to Banana River: AFFF releases from Hangars 630 and 647 drained into the storm sewer inlets and discharged through Outfall 21 into a drainage canal that led to the Banana River.

Building 313, Former Plating Shop (SWMU P041, IRP Site ID OT030; **Figure 2.3-1**), was omitted from the PA; however, it was determined during a 2009 USEPA-Region 5 PFOS chromium receptor study that PFOS-containing compounds were sometimes used for mist suppression during the plating process (SCF, 2014). As such, this potential AFFF release area was also recommended for SI.

As referenced in the PA (HGL, 2015), SCF previously conducted a site investigation of firefighting foam (AFFF) usage at Patrick AFB to determine the presence or absence of PFAS at select sites and whether further investigation is required based on the presence of PFAS and their relative concentrations (SFC, 2014). Surface and subsurface soil, groundwater, sediment, and/or surface water samples were collected from seven areas where AFFF may have been potentially released. These seven AFFF release previously investigated are listed below, along with a description of the sampled media that contained PFAS concentrations in excess of the current regulatory screening values. Since PFOS and/or PFOA in groundwater were detected at these areas above criteria, these areas were not proposed for further action under this SI. Pertinent data tables and figures from the SCF site investigation report are provided in Appendix A.

- Page 7
- Hangar 630: PFOS concentrations in groundwater exceeded the current USEPA HA value.
- Hangar 647: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA
  value.
- Building 705 Pump House: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value.
- Hangar 750: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA
  value.
- Building 313, Former Plating Shop: PFOS concentrations in groundwater exceeded the current USEPA HA value.
- Fire Station, Building 810: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value.
- Outfall to Banana River: PFOS and PFOA concentrations in surface water exceeded the current USEPA HA value for surface water used as drinking water; however, surface water at the installation is not used as a drinking water source.

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Final Site Inspection Report, Patrick Air Force Base
December 2017
Page 8

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Page 9

#### 3.0 FIELD ACTIVITIES AND ANALYTICAL PROTOCOL

SI activities were conducted at Patrick AFB from 22 to 25 May 2017 at the three AFFF release areas identified during the PA (HGL, 2015), but not previously investigated by others (**Figure 3.0-1**). Sample locations were determined following discussions between Amec Foster Wheeler, Patrick AFB, and AFCEC personnel, and were documented in the Final ISWP (Amec Foster Wheeler, 2017a). Media sampled during the SI included surface soil, subsurface soil, and groundwater collected from temporary and permanent (existing) monitoring wells.

Photographic documentation of the SI activities is provided in **Appendix B** and field documentation is provided in **Appendix C**. Inspection activities were recorded by field personnel on field activity daily logs (**Appendix C-1**), and daily PFAS protocol checklists were completed to ensure PFAS were not introduced by Amec Foster Wheeler employees or subcontractors (**Appendix C-2**). A tailgate safety meeting was conducted each morning prior to beginning work, with the tailgate safety meeting reports provided in **Appendix C-3**.

#### **Soil Boring Advancement and Soil Sample Collection**

Ten soil borings were advanced for the collection of soil samples and temporary monitoring well installation, while an eleventh boring was advanced for temporary monitoring well installation, by a Florida-licensed driller, Amdrill, Inc. of Brooksville, Florida. Soil borings were initially cleared to a depth of five feet below ground surface (bgs) with a hand auger and completed using direct push technology (DPT) drilling methods. Soil samples were continuously collected from ground surface to first-encountered groundwater using a hand auger and decontaminated 5-foot Macro-Core® samplers with acetate liners, in accordance with Standard Operating Procedure (SOP) AFW-02 (PFAS)—Soil Sampling and DEP-SOP-001/01, FS 3000, Soil. The samples were also field-screened with a photoionization detector equipped with a 10.6 electron volt lamp for volatile organic vapors, and logged by a qualified geoscientist in accordance with the Unified Soil Classification System. The resulting soil boring information, photoionization detector readings, lithologic data, and soil sample locations are included on soil boring/monitoring well records provided in Appendix C-4, while the soil sample data (sample ID numbers, date/time collected, and depths) are included on soil sample collection logs in Appendix C-5. Cross-sections illustrating lithologic data are presented on Figures 3.0-2 and 3.0-3.

Samples for laboratory analysis were extracted from the hand auger bucket or acetate liners with a decontaminated stainless steel spoon and transferred directly into laboratory-provided high-density polyethylene (HDPE) containers. Sample containers were sealed, labeled, packed into ice-filled coolers, and delivered under chain-of-custody (CoC) to SGS Accutest in Orlando, Florida for PFAS analysis or CT Laboratories in Baraboo, Wisconsin for physiochemical properties analysis.

#### **Monitoring Well Installation and Development**

Eleven temporary monitoring wells were installed during the SI through 3.75-inch outside-diameter rods using DPT. Monitoring well construction was based on observed depth to water at the time of drilling and

Page 10

geologic conditions encountered. All new monitoring wells were constructed in accordance with the ISWP, SOP AFW-04 (PFAS)-*Monitoring Well Installation*, and the FDEP's Monitoring Well Design and Construction Guidance Manual (FDEP, 2008), to effectively bracket the water table. The temporary monitoring wells were constructed of two-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing and a threaded 10-foot section of 0.010-inch slotted two-inch-diameter Schedule 40 PVC pre-pack well screen wrapped with a stainless steel wire mesh containing a 0.25-inch-thick filter pack and end cap. Well construction details for the 11 temporary monitoring wells are provided on well construction forms in **Appendix C-6**, while **Table 3.0-1** provides a summary of the well construction details for the temporary monitoring wells.

The monitoring wells were developed with a peristaltic pump outfitted with disposable HDPE tubing, in accordance with SOP AFW-05 (PFAS)—Well Development and the FDEP's Monitoring Well Design and Construction Guidance Manual (FDEP, 2008). Water quality parameters (pH, specific conductance, temperature, oxidation-reduction potential [ORP], dissolved oxygen [DO], and turbidity) of the development water were measured with water quality meters and recorded on Well Development Logs (Appendix C-7). A minimum of three saturated casing volumes of water were purged from each new well during development, and continued until the field water quality parameters stabilized. The aforementioned instrumentation was field calibrated as per DEP-SOP-001/01, FT 1000, General Field Testing and Measurement, and the results included on water quality sampling instrument calibration forms (Appendix C-8).

#### **Groundwater Elevations**

Depth to water measurements were recorded from each temporary and permanent monitoring well prior to groundwater purging and sampling, and groundwater elevations were calculated relative to top-of-casing elevations surveyed by a professionally licensed Florida surveyor. Depth to groundwater ranged from 4.28 to 7.65 feet below top of casing, and the calculated groundwater elevations ranged from -0.93 to 1.01 feet above mean sea level, in May 2017 (**Table 3.0-2**). Groundwater flow was generally to the west-northwest towards the Banana River in the central and western portions of the installation (near AFFF Release Areas 1 and 3, and the western portion of AFFF Release Area 2) at an average hydraulic gradient of 0.0004 feet/feet. However, groundwater flow is to the southeast towards the Atlantic Ocean in the southeastern portion of the installation (the eastern portion of AFFF Release Area 2) at an average hydraulic gradient of 0.01 feet/feet (**Figure 3.0-4**).

#### **Groundwater Sampling**

The groundwater sampling program included the collection of groundwater samples for laboratory chemical analysis of PFAS from 11 new temporary monitoring wells and one existing permanent monitoring well. Samples were collected using low-flow groundwater sampling methods with a peristaltic pump. The HDPE tubing was connected to a flow-through cell whereby recovered groundwater was monitored for pH, temperature, specific conductivity, DO, and ORP. Turbidity was measured with a

separate turbidity meter. Groundwater sampling equipment was calibrated on a daily basis prior to use, with the resulting data recorded on water quality sampling instrument calibration forms contained in **Appendix C-8**. Depth to water measurements and field parameters were monitored until groundwater indicator parameters reached stabilization criteria in accordance with SOP AFW-03 (PFAS)-*Groundwater Sampling* and DEP-SOP-001/01, FS 2200, Groundwater Sampling. The flow-through cell was then removed and groundwater samples were collected directly into laboratory-provided HDPE containers from the discharge tubing. The sample containers were sealed, labeled, packed on ice in an insulated cooler, and delivered to SGS Accutest under CoC protocol. Groundwater sampling activities were documented on groundwater sampling records provided in **Appendix C-9**.

#### **Soil Boring Abandonment**

The casings and screens from the 11 temporary monitoring wells were initially removed from the ground subsequent to groundwater sampling, steam cleaned, and disposed of in a dumpster at the installation. The 11 temporary monitoring well boreholes were abandoned with neat Portland cement on 24 and 25 May 2017 as per SOP AFW-06 (PFAS), *Borehole Abandonment*, the St. John's River Water Management District, Chapter 40C-3, Florida Administrative Code, and the FDEP's Monitoring Well Design and Construction Guidance Manual (FDEP, 2008).

#### **Total Sample Counts**

The following total sample counts for each media (including field duplicate samples) during SI initial and follow-on SI activities at Patrick AFB are listed below:

- 27 soil samples were collected at 10 soil boring locations during the SI; and,
- 16 groundwater samples were collected from 11 temporary monitoring wells and one existing monitoring well during the SI.

Samples collected during the SI were analyzed for the following 16 PFAS compounds:

- PFOS;
- PFOA;
- PFBS;
- Perfluoroheptanoic acid (PFHpA);
- Perfluorohexanesulfonic acid (PFHxS);
- Perfluorononanoic acid (PFNA);
- N-Ethyl perfluorooctanesulfonamidoacetic acid (NEtFOSAA);
- N-Methyl perfluorooctanesulfonamidoacetic acid (NMeFOSAA);
- Perfluorodecanoic acid (PFDA);
- Perfluorotetradecanoic acid (PFTA);
- Perfluorododecanoic acid (PFDoA);
- Perfluorohexanoic acid (PFHxA);

Page 12

- Perfluorotridecanoic acid (PFTrDA);
- Perfluoroundecanoic acid (PFUnA);
- 6:2 fluorotelomer sulfonate (FTS); and,
- 8:2 FTS.

Soil and groundwater samples were analyzed by SGS Accutest in Orlando, Florida, a DoD Environmental Laboratory Accreditation Program accredited laboratory. Samples were analyzed by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry (LC-MS-MS). The LC-MS-MS method provides acceptable detection limits to confirm the presence of PFAS listed above. The laboratory analytical reports for the PFAS samples collected during the SI are included in **Appendix D**.

Analytical results for PFOS, PFOA, and PFBS are discussed in the following sections, while the analytical results for the remaining PFAS constituents are provided in tables at the conclusion of this SIR.

Co-occurrence of PFOS and PFOA (PFOS+PFOA) in aqueous samples was reported using the following guidelines:

- 1. If PFOS and PFOA are both detected in concentrations at or above the laboratory detection limit (DL) in groundwater, then the reported concentration for PFOA was added to the reported concentration for PFOS.
- 2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported.
- 3. If neither PFOA nor PFOS are detected at concentrations at or above the DL, then co-occurrence was reported as *Not Detected*.

One composite surface soil sample and one composite subsurface soil sample were also collected at each AFFF release area and submitted to CT Laboratories in Baraboo, Wisconsin for laboratory analysis of physiochemical properties, including soil pH (USEPA Method 9045B), particle size analysis (ASTM International [ASTM] D422), and total organic carbon (TOC) content (Lloyd Kahn 9060A Method). The particle size analysis was subcontracted to Mi-Tech Services, Inc. in Weston, Wisconsin. The laboratory analytical reports for the physiochemical properties samples collected during the SI are included in **Appendix D**.

#### **Data Validation and Usability Assessment**

Laboratory analytical data from soil and groundwater samples analyzed for PFAS were validated in June 2017. Amec Foster Wheeler evaluated a total of 576 data records from field samples during the validation process and J or UJ qualified 133 records (23%) as estimated values because of field duplicate imprecision, low LCS recoveries, high or low surrogate recoveries, and/or analyte concentrations between the DL and the Limit of Quantification (LOQ). During validation, Amec Foster Wheeler J qualified two PFBS results and one PFOA result as estimated concentrations because the concentrations were between the DL and the LOQ. All of these results were at least one order of magnitude lower than the applicable screening

Page 13

criteria of PFBS (400  $\mu$ g/L) and PFOA (0.07  $\mu$ g/L), and the uncertainty in the analytical results is not interpreted to adversely affect overall data usability. Amec Foster Wheeler also J qualified four PFOS results as being estimated concentrations because of high surrogate recoveries and/or field duplicate imprecision. All of these results are at least one order of magnitude greater than the screening criteria of 0.07  $\mu$ g/L. The analytical uncertainty due to the potential high bias and/or imprecision is insufficient to indicate that the reported results are not representative of true screening criteria exceedances. All PFOA, PFOS, and PFBS results from soil samples that were qualified during validation were orders of magnitude lower than their respective screening criteria, and uncertainty in the analytical results is not interpreted to affect overall data usability. For the AFFF release areas sampled in this SI, the decision to advance each of the areas for further investigation was based on non-qualified data. A description of the data validation scope, procedures, observations and actions is presented in the Data Validation Reports provided in Appendix D.

#### Surveying

Soil borings, temporary monitoring wells, and existing permanent monitoring well were surveyed by a Florida Licensed Professional Surveyor (Amec Foster Wheeler, Orlando, Florida) for horizontal coordinates and groundwater surface and/or top-of-casing elevations (**Table 3.0-1**). Horizontal coordinates were surveyed based on Florida State Plane Coordinate System, East Zone, United States Survey Feet, North American Datum of 1983. Groundwater surface and top-of-casing elevations were collected based on North American Vertical Datum of 1988.

#### **Investigation-Derived Waste**

Investigation-Derived Waste (IDW) consisted of soil cuttings from soil boring advancement, well development water, groundwater sampling purge water, equipment decontamination water, disposable personal protective equipment (PPE), and other miscellaneous refuse. Used PPE and other miscellaneous refuse was placed in plastic bags and discarded into an on-site sanitary trash container for disposal at a sanitary landfill. Soil and liquid IDW was containerized in Department of Transportation-approved 55-gallon steel drums. Composite grab samples were collected on 25 May 2017 from the one drum of soil IDW and seven drums of liquid IDW generated during the SI. The samples were laboratory analyzed by SGS Accutest in Orlando, Florida for laboratory analysis of PFAS, volatile organic compounds, semi-volatile organic compounds, pesticides, herbicides, and metals, polychlorinated biphenyls, total petroleum hydrocarbons (gasoline range organics and diesel range organics), flashpoint, pH, sulfide, and cyanide, to determine the applicable disposal options (Appendix D). The eight drums of IDW were transported from the installation by Evergreen Waste LLC on 20 October 2017 for incineration at the Covanta Environmental Solutions facility in Augusta, Georgia. The non-hazardous waste manifest for the one drum of solid IDW and seven drums of liquid IDW are found in Appendix F.

A detailed description of sampling locations and results at each AFFF release area is provided in the following sections.

#### 3.1 AFFF RELEASE AREA 1: FORMER FTA 2

Fire training exercises were performed in two burn pits potentially using an unknown amount of AFFF. Burn Pit 1 was unlined and was used for fire training activities from 1970 to 1985, while Burn Pit 2 was concrete-lined and used for fire training activities from 1985 to 2001, with AFFF potentially released outside the concrete-lined area (HGL, 2015).

#### 3.1.1 Sample Location and Methodologies

#### 3.1.1.1 Soil Samples

Soil borings MW01001, MW01002, and MW01003 were advanced at the former location of Burn Pit 1 and soil borings MW01004, MW01005, and MW01006 were advanced around the concrete-lined former Burn Pit 2 on 23 and 24 May 2017 (**Figure 3.1-1**). Surface soil samples were collected from soil borings MW01001, MW01002, MW01004, MW01005, and MW01006 at 0 to 0.5 feet bgs, and subsurface soil samples were collected at 2 to 3 feet bgs, for PFAS analysis. Composite soil samples were collected from all soil borings at 0 to 1 foot bgs and 2 to 3 feet bgs for TOC, pH, and particle size analysis. Groundwater was encountered at approximately 4 to 5 feet bgs during boring advancement.

#### 3.1.1.2 Groundwater Samples MW01003

Temporary monitoring wells were installed in soil borings MW01001, MW01002, MW01003, MW01004, MW01005, and MW01006 on 23 and 24 May 2017 to assess PFAS concentrations at the former burn pits (**Figure 3.1-1**). The temporary monitoring wells were developed on 23 and 24 May 2017 and sampled on 25 May 2017. Analytical Results

#### 3.1.2.1 Soil Results

Five surface soil samples and five subsurface soil samples were collected from borings MW01001, MW01002, MW01004, MW01005, and MW01006 on 23 and 24 May 2017. PFAS results are provided in **Table 3.1-1**, illustrated on **Figure 3.1-2**, and summarized below.

#### MW01001:

- PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.474 mg/kg (0 to 0.5 feet bgs).
- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.0239 mg/kg (2 to 3 feet bgs).
- PFBS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00126 mg/kg (2 to 3 feet bgs).

#### MW01002:

 PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.292 mg/kg (2 to 3 foot bgs).

- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.00487 mg/kg (2 to 3 foot bgs).
- PFBS was not detected at either interval.

#### MW01004:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.115 mg/kg (2 to 3 foot bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

#### MW01005:

- PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.344 mg/kg (0 to 0.5 foot bgs).
- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.0294 mg/kg (2 to 3 foot bgs).
- PFBS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.004 mg/kg (0 to 0.5 foot bgs).

#### MW01006:

- PFOS was detected below the RSL at the two sampling intervals at a maximum concentration of 1.18 mg/kg (0 to 0.5 foot bgs).
- PFOA was detected below the RSL at the two sampling intervals at a maximum concentration of 0.0233 mg/kg (2 to 3 foot bgs).
- PFBS was detected below the RSL at the two sampling intervals at a maximum concentration of 0.00463 mg/kg (0 to 0.5 foot bgs).

The composite TOC concentrations ranged from 6,610 mg/kg (0 to 1 foot bgs) to 10,100 mg/kg (2 to 3 feet bgs), while the composite pH concentrations ranged from 8.13 Standard Unit (S.U.) (2 to 3 feet bgs) to 8.53 S.U. (0 to 1 foot bgs) (**Table 3.1-2**). The particle size analytical results for the 0 to 1 foot bgs sample was 5.7% fines (silt and clay), 88.7% sand (fine to coarse), and 5.6% gravel (fine), while the 2 to 3 feet bgs sample was 4.5% fines (silt and clay), 86.2% sand (fine to coarse), and 9.3% gravel (fine to coarse). The material description for the 0 to 1 foot bgs sample was a pale brown, poorly graded fine to medium sand, while the 2 to 3 feet bgs sample was described as light brownish gray silty sand.

#### 3.1.2.2 Groundwater Results

Seven groundwater samples (six normal and one field duplicate) were collected from temporary monitoring wells MW01001, MW01002, MW01003, MW01004, MW01005, and MW01006. PFAS results are provided in **Table 3.1-3**, illustrated in **Figure 3.1-3**, and summarized below.

#### MW01001:

- PFOS was detected above the USEPA HA value at a concentration of 0.195  $\mu$ g/L.
- PFOA was detected below the USEPA HA value at a concentration of 0.0311 μg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 0.2261 μg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.0245 µg/L.

#### MW01002:

- PFOS was detected above the USEPA HA value at a concentration of 0.926 μg/L.
- PFOA was detected above the USEPA HA value at a concentration of 0.0817 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 1.0077 μg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.0376 µg/L.

#### MW01003:

- PFOS was detected above the USEPA HA value at a concentration of 1.32 μg/L.
- PFOA was detected above USEPA HA value at a concentration of 0.236 μg/L.
- PFOS+PFOA was detected above USEPA HA value at a concentration of 1.556 µg/L.
- PFBS was below the USEPA Tap Water RSL at a concentration of 0.064 μg/L.

#### MW01004:

- PFOS was detected above the USEPA HA value at a concentration of 152  $\mu$ g/L.
- PFOA was detected above the USEPA HA value at a concentration of 6.06 μg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 158.06 μg/L.
- PFBS was not detected.

#### MW01005:

- PFOS was detected above the USEPA HA value at a concentration of 11.9 μg/L.
- PFOA was detected above USEPA HA value at a concentration of 0.0768 μg/L.
- PFOS+PFOA was detected above USEPA HA value at a concentration of 11.9768  $\mu$ g/L.
- PFBS was below the USEPA Tap Water RSL at a concentration of 0.0342 µg/L.

#### MW01006:

- PFOS was detected above the USEPA HA value at a concentration of 159 μg/L.
- PFOA was detected above USEPA HA value at a concentration of 4.99 μg/L.
- PFOS+PFOA was detected above USEPA HA value at a concentration of 163.99 µg/L.
- PFBS was below the USEPA Tap Water RSL at an approximate concentration of 2.37 μg/L.

#### 3.1.2 Conclusions

PFOS, PFOA, and PFBS were detected in soil at AFFF Release Area 1 at concentrations below the USEPA RSLs. The highest concentrations of PFAS constituents were identified in surface soils at MW01006,

located on the south side of Burn Pit 2. PFOS and PFOS+PFOA concentrations exceeded the USEPA HA values in each temporary monitoring well, while PFOA concentrations exceeded the USEPA HA value at locations MW01002 through MW01006. PFBS was detected at concentrations below the USEPA Tap Water RSL from temporary monitoring wells MW01001, MW01002, MW01003, MW01005, and MW01006, and was not detected at MW01004.

#### 3.2 AFFF RELEASE AREA 2: FIRE TRUCK ROLLOVER AREA

AFFF Release Area 2 is the location where a fire truck rolled over in 1997 when turning from Taxiway E onto Taxiway B and released an unknown quantity of AFFF onto the taxiway and surrounding grass.

#### 3.2.1 Sample Location and Methodologies

#### 3.2.1.1 Soil Samples

Three soil borings (MW02001, MW02002 and MW02003) were advanced northwest, southwest, and southeast, respectively, of the intersection of Taxiways B and E on 23 May 2017 (Figure 3.2-1). Surface soil samples were collected from 0 to 0.5 feet bgs and subsurface soil samples were collected from 2 to 3 feet bgs for PFAS analysis. Composite soil samples were also collected from each soil boring from 0 to 1 foot bgs and 2 to 3 feet bgs for TOC, pH, and particle size analysis. Groundwater was encountered at approximately 4 feet bgs during boring advancement.

#### 3.2.1.2 Groundwater Samples

Three temporary monitoring wells were installed in soil borings MW02001, MW02002, and MW02003 on 23 May 2017 to assess PFAS concentrations northwest, southwest, and southeast, respectively, of the intersection of Taxiways B and E (**Figure 3.2-1**). The temporary monitoring wells were developed and sampled on 23 May 2017.

#### 3.2.2 Analytical Results

#### 3.2.2.1 Soil Results

Three surface soil samples and four subsurface soil samples (three regular and one field duplicate) were collected from soil borings MW02001, MW02002, and MW02003 on 23 May 2017. PFAS results are provided in **Table 3.1-1**, illustrated in **Figure 3.2-2**, and summarized below.

#### MW02001:

- PFOS was detected below the RSL at the surface (0 to 0.5 feet bgs) interval at an approximate concentration of 0.000593 mg/kg, and was not detected at the subsurface (2 to 3 feet bgs) interval.
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

#### MW02002:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00144 mg/kg (0 to 0.5 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

#### MW02003:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00381 mg/kg (2 to 3 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

The composite TOC concentrations ranged from 6,920 mg/kg (0 to 1 foot bgs) to 16,000 mg/kg (2 to 3 feet bgs), while the composite pH concentrations ranged from 8.20 S.U. (0 to 1 foot bgs) to 8.32 S.U. (2 to 3 feet bgs) (**Table 3.1-2**). The particle size analytical results for the 0 to 1 foot bgs sample was 2.5% fines (silt and clay), 78.7% sand (fine to coarse), and 18.8% gravel (fine to coarse), while the 2 to 3 feet bgs sample was 2.2% fines (silt and clay), 92.6% sand (fine to coarse), and 5.2% gravel (fine). The material description for the 0 to 1 foot bgs sample was a pale brown, poorly graded medium to fine sand with trace organics, while the 2 to 3 feet bgs sample was described as a light brownish gray silty sand.

#### 3.2.2.2 Groundwater Results

Four groundwater samples (three normal and one field duplicate) were collected from MW02001, MW02002, and MW02003 on 23 May 2017. PFAS results are provided in **Table 3.1-3**, illustrated in **Figure 3.2-3**, and summarized below.

#### MW02001:

- PFOS was detected above the USEPA HA value at a concentration of 0.0743  $\mu g/L$ .
- $\bullet$  PFOA was detected below the USEPA HA value at an approximate concentration of 0.00968 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 0.08398 µg/L.
- PFBS was not detected.

#### MW02002:

- PFOS was detected above the USEPA HA value at an approximate concentration of 1.17  $\mu$ g/L (field duplicate).
- PFOA was detected below the USEPA HA value at a concentration of 0.0482 µg/L.
- PFOS+PFOA was detected above the USEPA HA value at an approximate concentration of 1.2181 μg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.0248  $\mu$ g/L (field duplicate).

#### MW02003:

- PFOS was detected above the USEPA HA value at an approximate concentration of 1.33 μg/L.
- PFOA was detected below the USEPA HA value at a concentration of 0.0179 μg/L.
- PFOS+PFOA was detected above the USEPA HA value at an approximate concentration of  $1.3479 \, \mu g/L$ .
- PFBS was detected below the USEPA Tap Water RSL at an approximate concentration of 0.0127 µg/L.

#### 3.2.3 Conclusions

PFOS was detected in soil at AFFF Release Area 2 at concentrations below the RSLs. The highest concentrations of PFOS were observed in surface soil (0 to 0.5 foot bgs) at sample location MW02003. PFOA and PFBS were not detected in any of the soil samples. PFOS and PFOS+PFOA concentrations exceeded the USEPA HA values in the three temporary monitoring wells, while PFOA concentrations were detected below the USEPA HA value in all three temporary monitoring wells. PFBS was detected at concentrations below the USEPA Tap Water RSL in temporary monitoring wells MW02002 and MW02003.

#### 3.3 AFFF RELEASE AREA 3: NORTHERN SEWAGE TREATMENT PLANT

AFFF Release Area 3 received wastewater, and potentially AFFF from releases at various hangars and buildings, from 1968 to 1995. The areas surrounding the main treatment tank/structure (Building 652) were primarily grass.

#### 3.3.1 Sample Location and Methodologies

#### **3.3.1.1** Soil Samples

Two soil borings (MW03001 and MW03002) were advanced west and east, respectively, of Building 652 on 22 and 23 May 2017 (**Figure 3.3-1**). Surface soil samples were collected from 0 to 0.5 feet bgs, and subsurface soil samples were collected from 2 to 3 feet bgs, for PFAS analysis. Composite soil samples were also collected from each soil boring from 0 to 1 foot bgs and 2 to 3 feet bgs for TOC, pH, and particle size analysis. Groundwater was encountered at approximately 4 feet bgs during boring advancement.

#### **3.3.1.2** Groundwater Samples

Two temporary monitoring wells were installed in soil borings MW03001 and MW03002 on 22 and 23 May 2017 to assess PFAS concentrations adjacent to Building 652 (**Figure 3.3-1**). The temporary monitoring wells were developed on 22 and 23 May 2017 and sampled on 24 May 2017. An existing monitoring well, 610-MW17, was also sampled on 24 May 2017.

#### 3.3.2 Analytical Results

#### 3.3.2.1 Soil Results

Two surface and subsurface soil samples were collected for PFAS analysis, with the results provided in **Table 3.1-1**, illustrated in **Figure 3.3-2**, and summarized below.

#### MW03001:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00181 mg/kg (0 to 0.5 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

#### MW03002:

- PFOS was detected below the RSL at the two sampling intervals at an approximate maximum concentration of 0.00797 mg/kg (2 to 3 feet bgs).
- PFOA was not detected at either interval.
- PFBS was not detected at either interval.

The composite TOC concentrations ranged from 4,800 mg/kg (2 to 3 feet bgs) to 5,920 mg/kg (0 to 1 foot bgs), while the composite pH concentrations ranged from 8.86 S.U. (0 to 1 foot bgs) to 9.17 S.U. (2 to 3 feet bgs) (**Table 3.1-2**). The particle size analytical results for the 0 to 1 foot bgs sample was 3.4% fines (silt and clay), 70.7% sand (fine to coarse), and 25.9% gravel (fine to coarse), while the 2 to 3 feet bgs sample was 2.3% fines (silt and clay), 69.4% sand (fine to coarse), and 28.3% gravel (fine to coarse). The material description for the 0 to 1 foot bgs sample was a pale brown, fine to medium poorly graded sand with trace organics, while the 2 to 3 feet bgs sample was described as a light brownish gray silty sand.

#### 3.3.2.2 Groundwater Results

Four groundwater samples (three normal and one field duplicate) were collected for PFAS analysis, with the results provided in **Table 3.1-3**, illustrated in **Figure 3.3-3**, and summarized below.

#### MW03001:

- PFOS was detected above the USEPA HA value at a concentration of 12.2  $\mu g/L$ .
- PFOA was detected above the USEPA HA value at a concentration of 0.937 μg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 13.137 μg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 2.58 μg/L.

#### MW03002:

- PFOS was detected above the USEPA HA value at an approximate concentration of 3.07 µg/L.
- PFOA was detected above the USEPA HA value at a concentration of 0.155 μg/L.

- 1 480 21
- PFOS+PFOA was detected above the USEPA HA value at an approximate concentration of 3.225  $\mu$ g/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.396 μg/L.

#### 610-MW17:

- PFOS was detected above the USEPA HA value at a concentration of 1.28 μg/L.
- PFOA was detected below the USEPA HA value at a concentration of 0.068 μg/L.
- PFOS+PFOA was detected above the USEPA HA value at a concentration of 1.348 μg/L.
- PFBS was detected below the USEPA Tap Water RSL at a concentration of 0.193.

#### 3.3.3 Conclusions

PFOS in soil was detected at concentrations below the USEPA RSLs, while PFOA and PFBS were not detected. PFOS and PFOS+PFOA in groundwater exceeded the USEPA HA values in each of the three monitoring wells. PFOA in groundwater exceeded the USEPA HA values in locations MW03001 and MW03002 and was detected at concentrations below the USEPA HA value in 610-MW17. PFBS was detected at concentrations below the USEPA Tap Water RSL in all three wells.

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Final Site Inspection Report, Patrick Air Force Base
December 2017
Page 22

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#### 4.0 MIGRATION/EXPOSURE PATHWAYS AND TARGETS

An updated base-wide conceptual site model table is provided as **Table 4.0-1**. The table provides an overview of the facility, physical, release, land use, exposure, and ecological profiles at Patrick AFB. The table has been updated to include information collected during this SI, as well as the information collected during the previous site investigation conducted by SCF (2014). A more detailed description of source area conditions and exposure pathways is described in the following sections.

#### 4.1 SOIL (SURFACE AND SUBSURFACE) EXPOSURE PATHWAY

#### 4.1.1 Local Geologic Setting

The principle soil types at Patrick AFB include the Canaveral Complex, Urban Land, and Galveston-Urban Land Complex that generally consist of highly permeable, fine-grained beach sands (CH2M Hill, 2000). Surficial sediments consist of approximately 100 feet of undifferentiated Pleistocene and Holocene beach deposits underlain by coquina and sandy clay of the Anastasia Formation, the Caloosahatchee Marl Formation, and limestone of the Tamiami Formation (CH2M Hill, 2000). The underlying Miocene Age Hawthorn Group is composed predominantly of clays, silts, and marls (CH2M Hill, 2000). Basewide geologic cross sections developed from the SI well installation activities are provided in **Figures 3.0-2 and 3.0-3**.

#### 4.1.2 Soil Exposure Pathways and Targets

PFOS, PFOA, and/or PFBS were detected in soil at AFFF Release Areas 1 through 8 and 10; however, all of the detections in soil were below the calculated and USEPA RSLs.

Surface soil at Patrick AFB is potentially accessible by on-site workers, site visitors, and/or trespassers. Subsurface soil is primarily accessible by on-site construction workers involved with excavating, drilling, or any activity that exposes them to subsurface soil. Access to source area soil is not expected to change in the future.

Potential exposure routes for soil include inhalation of impacted surface soil dust particles and dermal contact of contaminants in soil.

#### 4.1.3 Soil Exposure Conclusions

Exposure to soil with PFAS concentrations exceeding the RSLs would not occur based on the soil analytical results from this SI and the previous site investigation by SCF (2014). Potential exposure receptors for PFAS detections below RSLs include Patrick AFB personnel, on-site workers, visitors, and trespassers that may come into contact with surface and/or subsurface soil at the respective AFFF release areas via inhalation or dermal contact. The highest potential of exposure to PFAS from soil is to on-site workers that may be involved with excavation or drilling activities.

#### 4.2 GROUNDWATER MIGRATION PATHWAY

## 4.2.1 Local Hydrogeologic Setting

The surficial aquifer system near Patrick AFB is contained in undifferentiated Late Miocene, Pliocene, and Recent Pleistocene deposits composed primarily of medium to coarse quartz sands and coquina under unconfined conditions. Groundwater is typically encountered at an average depth of five feet below land surface and generally flows to the west. The Floridan Aquifer is comprised of a series of highly permeable limestone formations of the Eocene Age Ocala Group and Avon Park Limestone that is separated from the surficial aquifer by the Hawthorn Group, which acts as an aquitard (CH2M Hill, 2000).

### 4.2.2 Groundwater Exposure Pathways and Targets

PFAS, once in groundwater, are highly mobile and will migrate near the same velocity as groundwater due to their high solubility and low partition coefficient value. PFAS are chemically and biologically stable in the environment and resist typical environmental degradation processes. As a result, these chemicals are extremely persistent in the environment, with a half-life greater than 41 years for PFOS and greater than 92 years for PFOA (USEPA, 2014). PFBS is generally less toxic and less bioaccumulative in wildlife and humans (USEPA, 2017b).

PFOS, PFOA, and/or PFBS were detected in groundwater at AFFF Release Areas 1 through 8 and 10. PFOS and/or PFOA also exceeded the USEPA HA value of 0.07  $\mu$ g/L at AFFF Release Areas 1 through 8 and 10, and are therefore considered release areas for pathway analysis.

Groundwater flow from these areas is towards either the Banana River (AFFF Release Areas 1 and 3) or the Atlantic Ocean (AFFF Release Area 2) (**Figure 3.0-4**). Groundwater flow from AFFF Release Areas 4 through 7, 9, and 10 is anticipated to be to the west, while groundwater flow from AFFF Release Area 8 is anticipated to be to the east. No primary human groundwater receptors were identified at or downgradient of Patrick AFB from PFAS-impacted AFFF release areas since the drinking water supply to Patrick AFB is provided by the City of Cocoa (HGL, 2015). No primary human groundwater receptors were identified downgradient of Patrick AFB since the primary groundwater exposure points at Patrick AFB are the Banana River located along the western installation boundary and the Atlantic Ocean located along the eastern installation boundary.

## 4.2.3 Groundwater Migration Pathway Conclusions

PFOS and PFOA in groundwater exceeded the USEPA HA value of 0.07  $\mu$ g/L for PFOS, PFOA, and/or the sum of PFOS/PFOA, at AFFF Release Areas 1 through 8 and 10. Receptors are not present on Patrick AFB since the installation utilizes drinking water supplied by the City of Cocoa. Groundwater from these area is towards either the Banana River (AFFF Release Areas 1 and 3) or the Atlantic Ocean (AFFF Release Area 2), and human receptors were not identified in the Preliminary Assessment (HGL, 2015).

## 4.3 SEDIMENT EXPOSURE PATHWAY

### 4.3.1 Sediment Exposure Pathways and Targets

PFOS and PFOA were detected in sediments from AFFF Release Area 9 at concentrations below the calculated RSL. Sediment at Patrick AFB is potentially accessible by USAF personnel, on-site workers, visitors, and trespassers. Potential exposure routes for sediment include dermal contact with submerged and/or exposed sediment during work activities such as maintenance of drainage ditches and canals that contain PFAS-impacted sediment.

#### 4.3.2 Sediment Exposure Conclusions

PFOS and PFOA were detected in sediments at concentrations below the calculated RSL from AFFF Release Area 9 during the previous site investigation by SCF (2014). Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with sediment within the drainage channel and Outfall 21 to the Banana River.

#### 4.4 SURFACE WATER EXPOSURE PATHWAY

#### 4.4.1 Surface Water Exposure Pathways and Targets

PFOS and PFOA were detected in surface water samples collected at the headwaters of the drainage channel and at Outfall 21 to the Banana River (AFFF Release Area 9) at concentrations exceeding the USEPA HA value of 0.07  $\mu$ g/L during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to surface water used as a drinking water source, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

#### 4.4.2 Surface Water Exposure Conclusions

PFOS and PFOA were detected in surface water at concentrations above the USEPA HA value from AFFF Release Area 9 during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to drinking water sources, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Final Site Inspection Report, Patrick Air Force Base
December 2017
Page 26

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#### **5.0 SUMMARY AND CONCLUSIONS**

As stated in the introduction, the objectives of this study were to:

- Determine if PFOS, PFOA, or PFBS are present in soil, groundwater, sediment, and/or surface water at AFFF release areas selected for SI or investigated previously by others;
- Determine if PFOS and PFOA concentrations in soil exceed the calculated RSL of 1.26 mg/kg, based on a residential exposure scenario, and if PFBS concentrations in soil exceed the USEPA RSL of 1,300 mg/kg, based on a residential exposure scenario;
- Determine if PFOS, PFOA, or sum of PFOS and PFOA concentrations in groundwater and surface water exceed the USEPA HA value of 0.07  $\mu$ g/L, and if PFBS concentrations in groundwater exceed the USEPA Tap Water RSL of 400  $\mu$ g/L;
- Determine if concentrations of PFOS or PFOA in sediment exceed the calculated RSL of 1.26 mg/kg; and,
- Identify potential receptor pathways with immediate impacts to human health (immediate impact to human health is considered consumption of drinking water with PFOS/PFOA above the USEPA HA value, or PFBS above the USEPA Tap Water RSL).

Section 3 of this SI detailed the analytical results for PFAS at AFFF Release Areas 1, 2, and 3 included in this SI, while figures and tables from the previous site investigation report completed by SCF (2014) are included in Appendix A of this SIR that document the detected PFAS results from AFFF Release Areas 4 through 10. In addition, Section 4 includes an assessment of exposure/migration pathways and targets for media impacted with PFAS at all 10 AFFF release areas. A summary table (**Table 5.0-1**) is also provided below which lists specific exceedances by area and media, fulfilling the objectives of the SI.

Table 5.0-1. Summary of Analytical Results and Screening Level Exceedances.

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level				
	Surface Soil (0	to 0.5 feet)								
	PFOS	1.18	1.26	mg/kg	5/0	No				
	PFOA	0.0129 J	1.26	mg/kg	5/0	No				
	PFBS	0.00463	1,300	mg/kg	5/0	No				
	Subsurface Soil (2 to 3 feet)									
AFFF Release Area 1	PFOS	0.312	1.26	mg/kg	5/0	No				
Former FTA 2	PFOA	0.0294	1.26	mg/kg	5/0	No				
Torrier FTA 2	PFBS	0.00223	1,300	mg/kg	5/0	No				
	Groundwater									
	PFOS	159	0.07	μg/L	6/6	Yes				
	PFOA	6.06	0.07	μg/L	6/5	Yes				
	PFOS+PFOA	163.99	0.07	μg/L	6/6	Yes				
	PFBS	2.37 J	400	μg/L	6/0	No				

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level					
	Surface Soil (0	to 0.5 feet)									
	PFOS	0.0023	1.26	mg/kg	3/0	No					
	PFOA	ND	1.26	mg/kg	3/0	No					
	PFBS	ND	1,300	mg/kg	3/0	No					
	Subsurface Soil (2 to 3 feet)										
AFFF Release Area 2	PFOS	0.00381 J	1.26	mg/kg	3/1	No					
Fire Truck Rollover	PFOA	ND	1.26	mg/kg	3/0	No					
Area	PFBS	ND	1,300	mg/kg	3/0	No					
	Groundwater										
	PFOS	1.33 J	0.07	μg/L	3/3	Yes					
	PFOA	0.0482	0.07	μg/L	3/0	No					
	PFOS+PFOA	1.3479 J	0.07	μg/L	3/3	Yes					
	PFBS	0.0248	400	μg/L	3/0	No					
	Surface Soil (0	to 0.5 feet)									
	PFOS	0.00426	1.26	mg/kg	2/0	No					
	PFOA	ND	1.26	mg/kg	2/0	No					
	PFBS	ND	1,300	mg/kg	2/0	No					
	Subsurface Soil (2 to 3 feet)										
AFFF Release Area 3	PFOS	0.00797 J	1.26	mg/kg	2/0	No					
Northern Sewage	PFOA	ND	1.26	mg/kg	2/0	No					
Treatment Plant	PFBS	ND	1,300	mg/kg	2/0	No					
	Groundwater		,								
	PFOS	12.2	0.07	μg/L	3/3	Yes					
	PFOA	0.937	0.07	μg/L	3/2	Yes					
	PFOS+PFOA	13.137	0.07	μg/L	3/3	Yes					
	PFBS	2.58	400	μg/L	3/0	No					
	Surface Soil (0			1 1 37	,						
	PFOS	0.0065	1.26	mg/kg	2/0	No					
	PFOA	0.00055 J	1.26	mg/kg	2/0	No					
	PFBS	ND	1,300	mg/kg	2/0	No					
	Subsurface Soi	l (4 to 5 feet)	,	<u> </u>	,						
AFFF Release Area 4	PFOS	0.0069	1.26	mg/kg	8/0	No					
Hangar 630	PFOA	0.00092	1.26	mg/kg		No					
Haligai USU	PFBS	ND	1,300	mg/kg	8/0	No					
	Sediment										
	PFOS	0.022	1.26	mg/kg	2/0	No					
	PFOA	0.0019	1.26	mg/kg	2/0	No					

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level					
	Groundwater										
	PFOS	3. 8 J	0.07	μg/L	7/7	Yes					
	PFOA	1.7	0.07	μg/L	7/3	Yes					
	PFOS+PFOA	5.5 J	0.07	μg/L	7/7	Yes					
	PFBS	0.058	400	μg/L	7/0	No					
	Subsurface Soil (3 to 5 feet)										
	PFOS	0.0091	1.26	mg/kg	4/0	No					
	PFOA	0.0059	1.26	mg/kg	4/0	No					
	PFBS	ND	1,300	mg/kg	4/0	No					
AFFF Release Area 5	Groundwater										
Hangar 647	PFOS	1.1	0.07	μg/L	3/3	Yes					
	PFOA	6.3 J	0.07	μg/L	3/3	Yes					
	PFOS+PFOA	6.47 J	0.07	μg/L	3/3	Yes					
	PFBS	0.017 J	400	μg/L	3/0	No					
	Surface Soil (0										
	PFOS	0.160 J	1.26	mg/kg	2/0	No					
	PFOA	0.0022 J	1.26	mg/kg	2/0	No					
	PFBS	0.0059 J	1,300	mg/kg	2/0	No					
	Subsurface Soil (4 to 5 feet)										
AFFF Release Area 6	PFOS	0.660 J	1.26	mg/kg	4/0	No					
Building 705 Pump	PFOA	0.110 J	1.26	mg/kg	4/0	No					
House	PFBS	0.029 J	1,300	mg/kg	4/0	No					
	Groundwater			•							
	PFOS	4,300 J	0.07	μg/L	4/4	Yes					
	PFOA	100 J	0.07	μg/L	4/4	Yes					
	PFOS+PFOA	4,338 J	0.07	μg/L	4/4	Yes					
	PFBS	110 J	400	μg/L	4/0	No					
	Surface Soil (0	to 0.5 feet)									
	PFOS	0.0031	1.26	mg/kg	2/0	No					
	PFOA	0.0035	1.26	mg/kg	2/0	No					
	PFBS	ND	1,300	mg/kg	2/0	No					
AFFF Release Area 7	Subsurface Soi	l (3 to 5 feet)									
Hangar 750	PFOS	0.00067 J	1.26	mg/kg	4/0	No					
Tiurigai 750	PFOA	0.0006 J	1.26	mg/kg	4/0	No					
	PFBS	ND	1,300	mg/kg	4/0	No					
	Groundwater										
	PFOS	7.6 J	0.07	μg/L	4/4	Yes					
	PFOA	0.17 J	0.07	μg/L	4/4	Yes					

AFFF Release Area	Parameter	Maximum Detected Concentration	Screening Value	Units	Number of Samples*/ Number of Exceedances	Exceeds Screening Level		
AFFF Release Area 7	PFOS+PFOA	7.77 J	0.07	μg/L	4/4	Yes		
Hangar 750	PFBS	0.063 J	400	μg/L	4/0	No		
	Surface Soil (0	to 0.5 feet)						
	PFOS	0.180	1.26	mg/kg	2/0	No		
	PFOA	0.0096	1.26	mg/kg	2/0	No		
	PFBS	0.0019	1,300	mg/kg	2/0	No		
	Subsurface Soi	l (2 to 5 feet)						
AFFF Release Area 8	PFOS	0.190	1.26	mg/kg	4/0	No		
Fire Station, Building	PFOA	0.011	1.26	mg/kg	4/0	No		
810	PFBS	0.0014	1,300	mg/kg	4/0	No		
	Groundwater							
	PFOS	930 J	0.07	μg/L	4/4	Yes		
	PFOA	13.0 J	0.07	μg/L	4/4	Yes		
	PFOS+PFOA	940 J	0.07	μg/L	4/4	Yes		
	PFBS	21.0 J	400	μg/L	4/0	No		
	Sediment							
	PFOS	0.022 J	1.26	mg/kg	3/0	No		
	PFOA	0.0013 J	1.26	mg/kg	3/0	No		
AFFF Release Area 9	PFBS	0.000015 J	1,300	mg/kg	3/0	No		
Outfall 21 to Banana	Surface Water							
River	PFOS	1.4	0.07	μg/L	2/2	Yes		
	PFOA	0.17	0.07	μg/L	2/2	Yes		
	PFOS+PFOA	1.476	0.07	μg/L	2/2	Yes		
	PFBS	0.022	400	μg/L	2/0	No		
	Groundwater							
AFFF Release Area 10	PFOS	0.61 J	0.07	μg/L	4/4	Yes		
Building 313, Former	PFOA	0.033 J	0.07	μg/L	4/0	No		
Plating Shop	PFOS+PFOA	0.637 J	0.07	μg/L	4/4	Yes		
	PFBS	ND	400	μg/L	4/0	No		

AFFF – aqueous film forming foam

μg/L - micrograms per liter mg/kg - milligrams per kilogram

ND – not detected

<sup>\*</sup> normal samples (count does not include QC samples)

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Final Site Inspection Report, Patrick Air Force Base December 2017

Page 31

Potential human health pathways were identified and detailed in Section 4 of this SIR. The potential receptors and targets vary by AFFF release area. Media-specific pathways and receptors are discussed below.

#### Surface and Subsurface Soil Receptors

The highest potential for exposure to PFAS from soil is to on-site workers, specifically those involved with excavation or drilling activities. PFOS, PFOA, and/or PFBS were detected in soil at AFFF Release Areas 1 through 8; however, all detections were below applicable RSLs, based on a residential exposure scenario.

## **Groundwater Receptors**

PFAS in groundwater exceeded the USEPA HA value of 0.07  $\mu$ g/L for PFOS, PFOA, and/or PFOS+PFOA, at AFFF Release Areas 1 through 8 and 10. Human groundwater receptors via the ingestion pathway are not present for any AFFF release area at or downgradient of Patrick AFB since the installation utilizes drinking water supplied by the City of Cocoa (HGL, 2015). In addition, human groundwater receptors via the ingestion pathway are not present downgradient of Patrick AFB since the primary groundwater exposure points downgradient of the installation are the Banana River to the west or the Atlantic Ocean to the east, which are not used as drinking water sources for the area. As a result, there is currently no potential receptor pathway with immediate impacts to human health at Patrick AFB.

#### **Sediment Receptors**

PFOS and PFOA were detected in sediments at concentrations below the calculated RSL from AFFF Release Area 9 (the drainage channel and Outfall 21 to Banana River) during the previous site investigation by SCF (2014). Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with sediment within the drainage channel and at Outfall 21 to Banana River.

#### <u>Surface Water Receptors</u>

PFOS and PFOA were detected in surface water samples collected at the headwaters of the drainage channel and at Outfall 21 to the Banana River (AFFF Release Area 9) at concentrations exceeding the USEPA HA value of 0.07  $\mu$ g/L during the previous site investigation by SCF (2014). However, the USEPA HA value for PFOS and PFOA is only applicable to drinking water sources, and the Banana River is not currently used as a drinking water source for Patrick AFB or the surrounding community. Potential exposure receptors include USAF personnel, on-site workers, visitors, and trespassers that may come into contact with surface water within the drainage channel and at Outfall 21 to the Banana River.

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Final Site Inspection Report, Patrick Air Force Base
December 2017
Page 32

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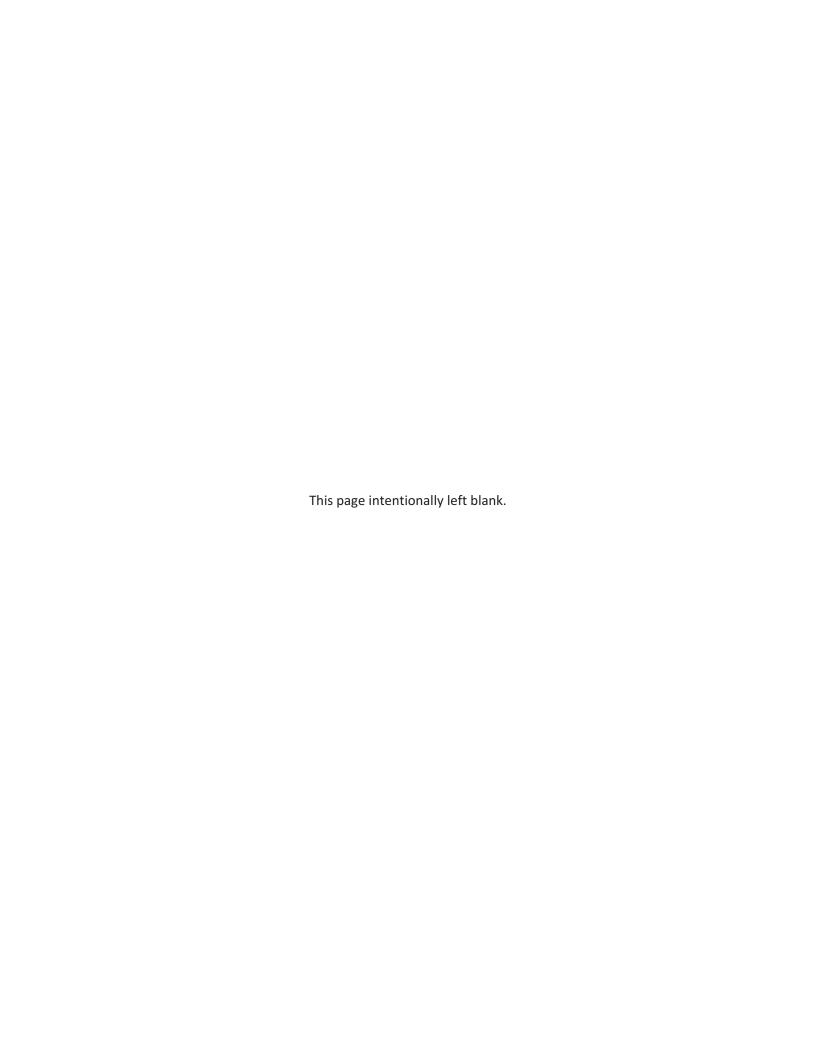
## **6.0 REFERENCES**

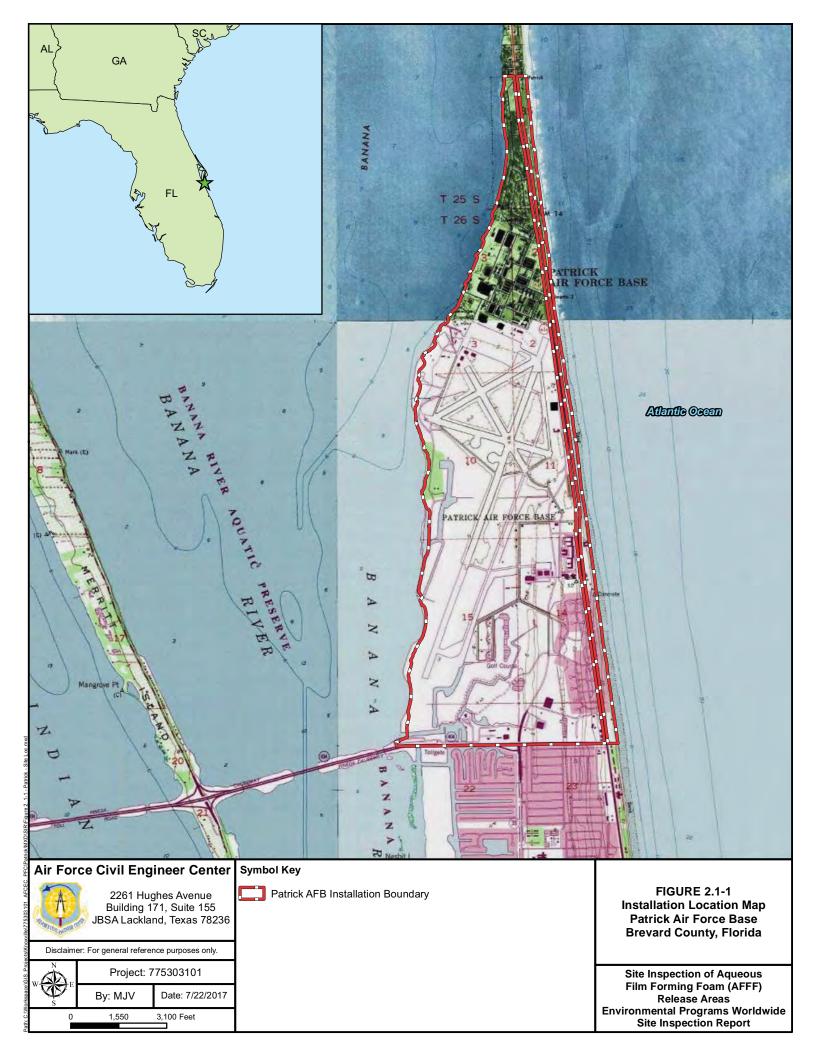
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Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Final Site Inspection Report, Patrick Air Force Base
December 2017
Page 34

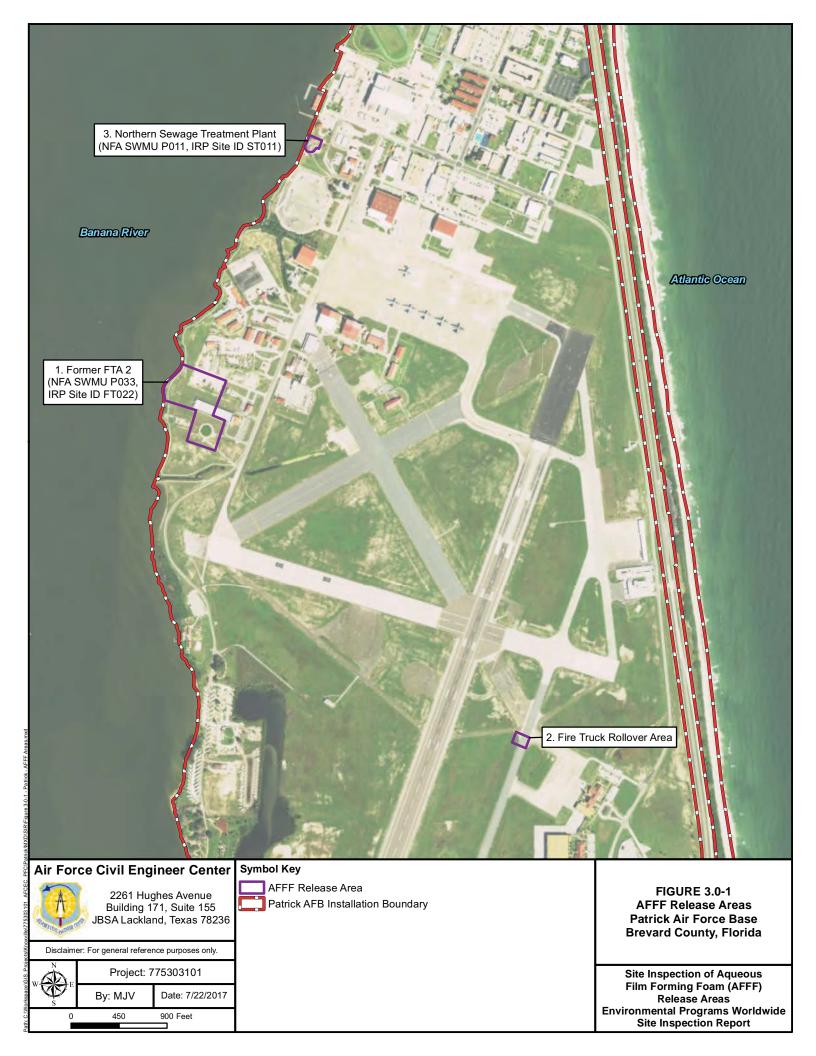
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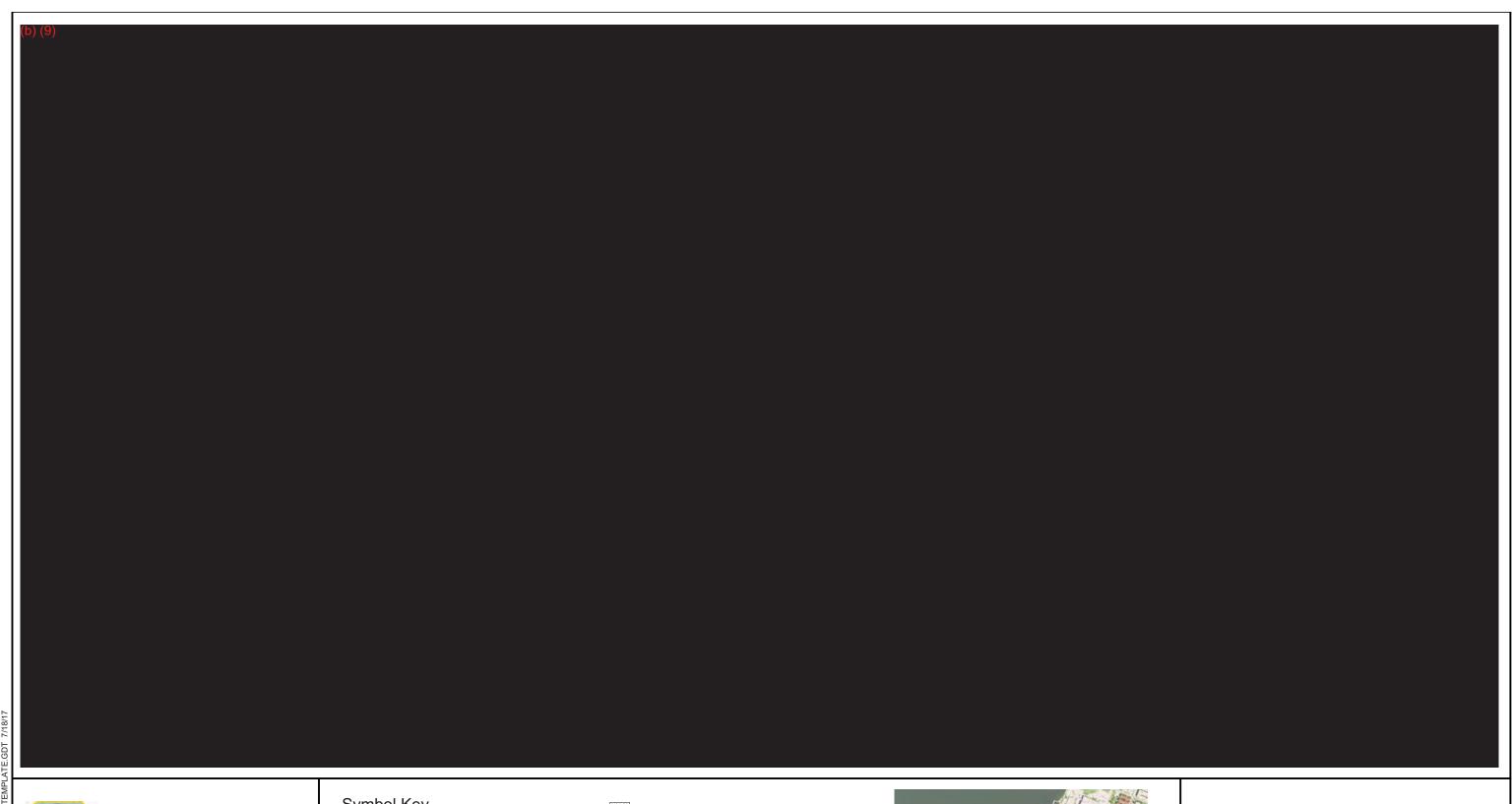














Air Force Civil Engineer Center

2261 Hughes Avenue Building 171, Suite 155 JBSA Lackland, Texas 78236



Project: 775303101

By: A. Yorke

Date: 07/18/2017

amec foster wheeler





Temporary Monitoring Well



Water Level (May 2017) Approximate Ground Level



Approximate Water Table



Inferred Extent

Disclaimer: For general reference purposes only.



Screen

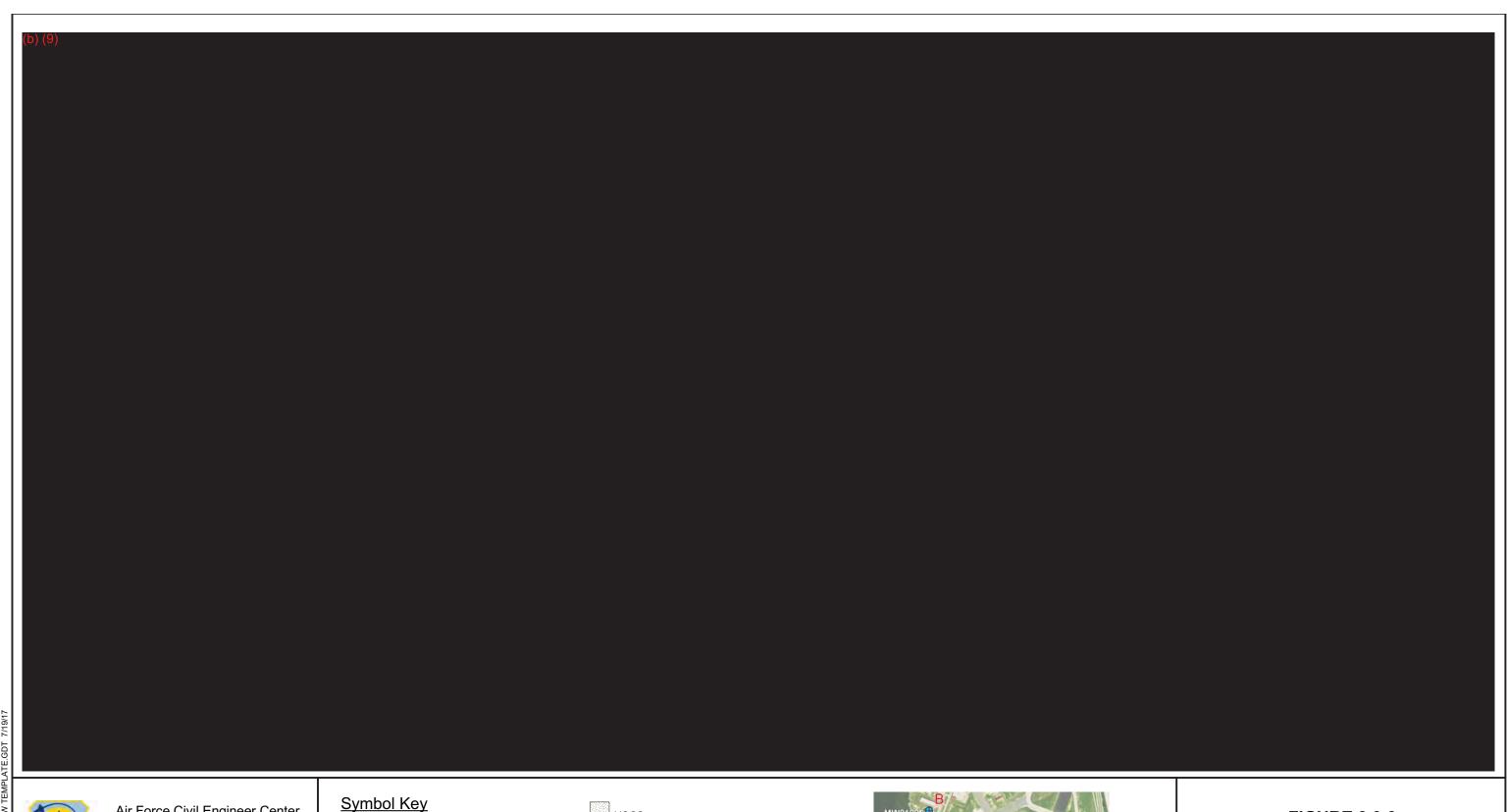


amsl = above mean sea level



**FIGURE 3.0-2 Base Cross-Section A-A' Patrick Air Force Base Brevard County, FL** 

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide Site Inspection Report





Air Force Civil Engineer Center 2261 Hughes Avenue

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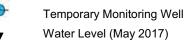


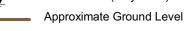
Project: 775303101

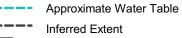
By: A. Yorke

Date: 07/19/2017

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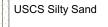






Screen

USCS Poorly-graded Sand



amsl = above mean sea level

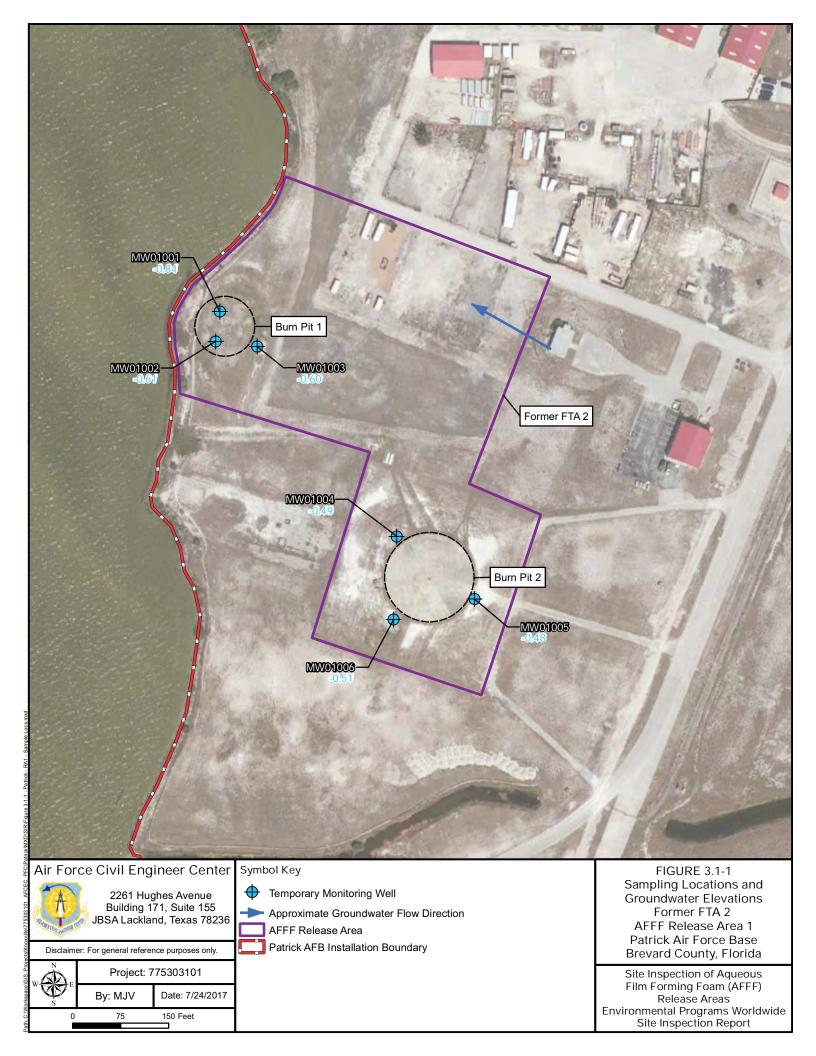
Disclaimer: For general reference purposes only.

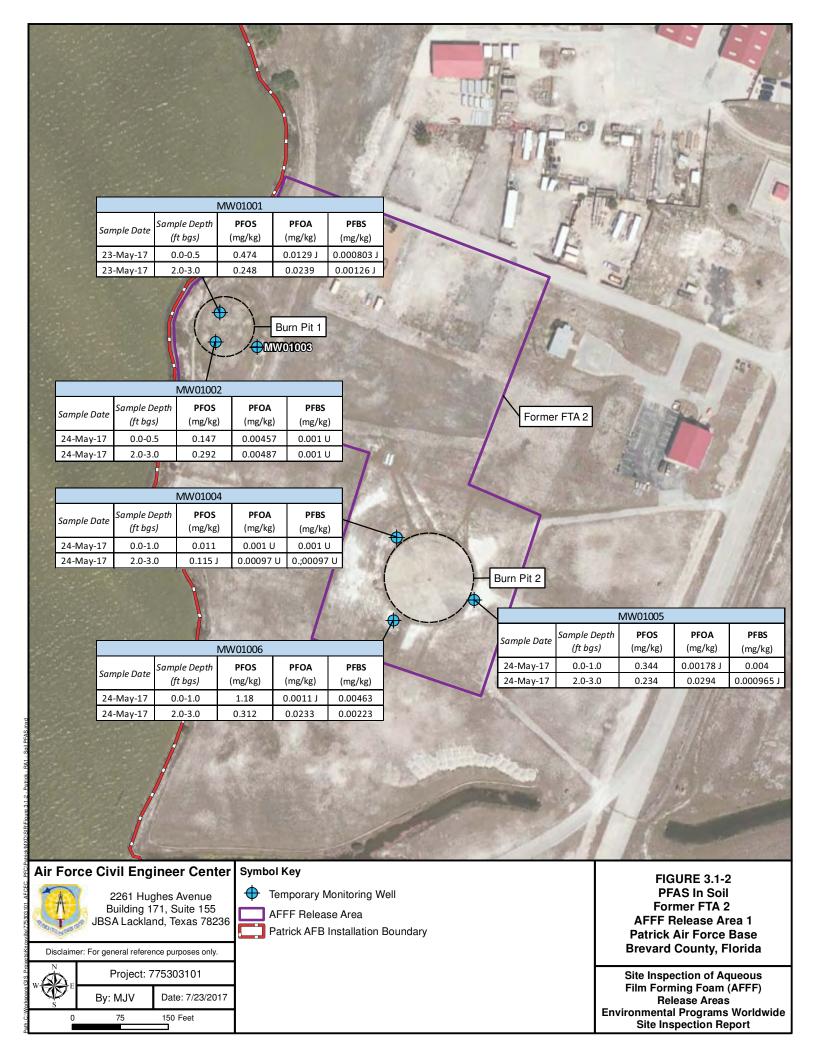


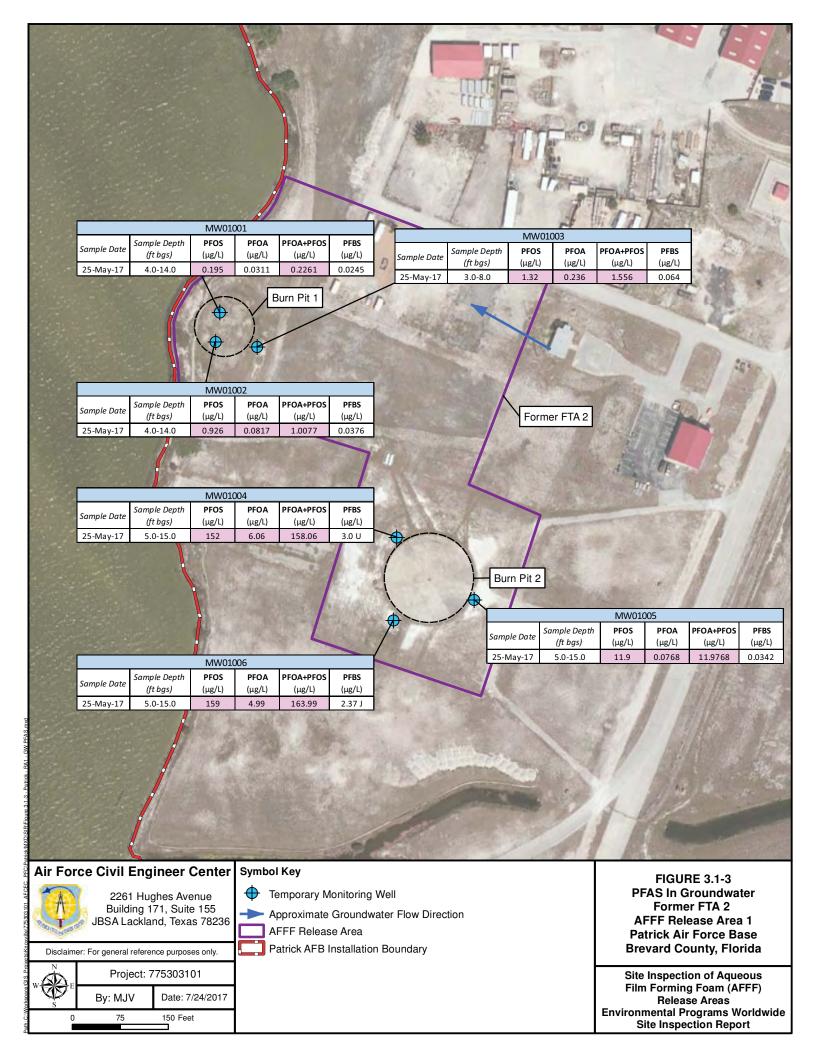
FIGURE 3.0-3
Base Cross-Section B-B'
Patrick Air Force Base
Brevard County, FL

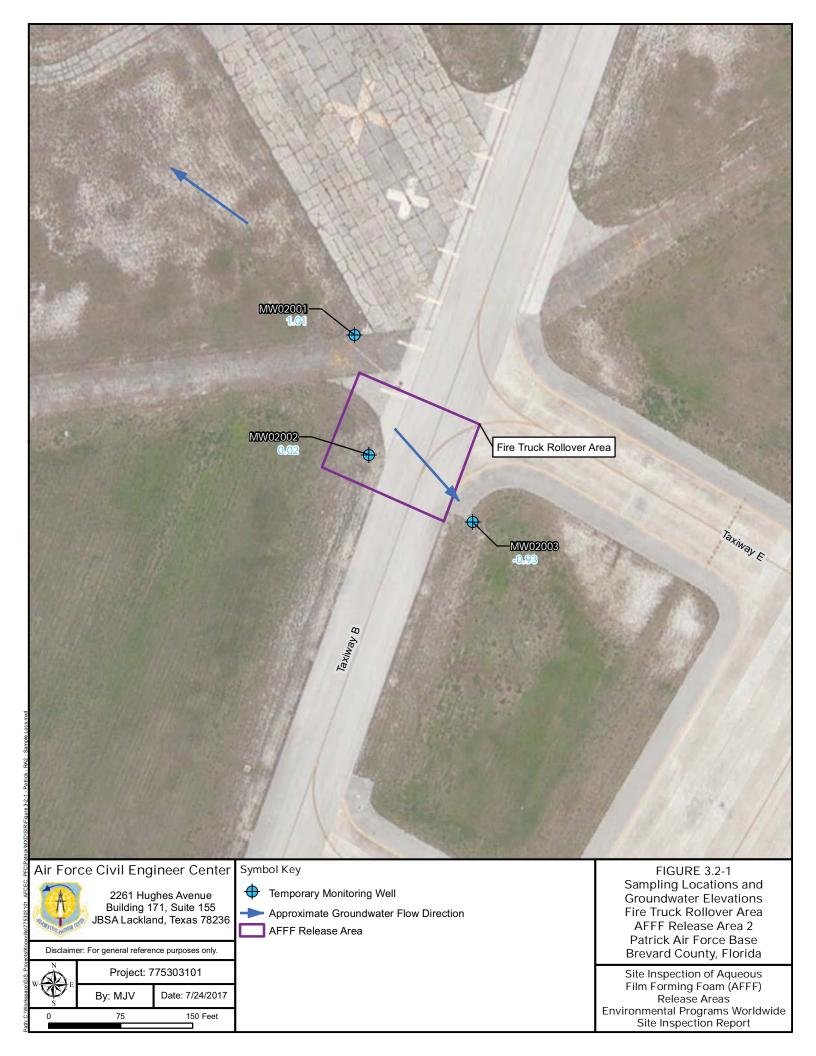
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide Site Inspection Report

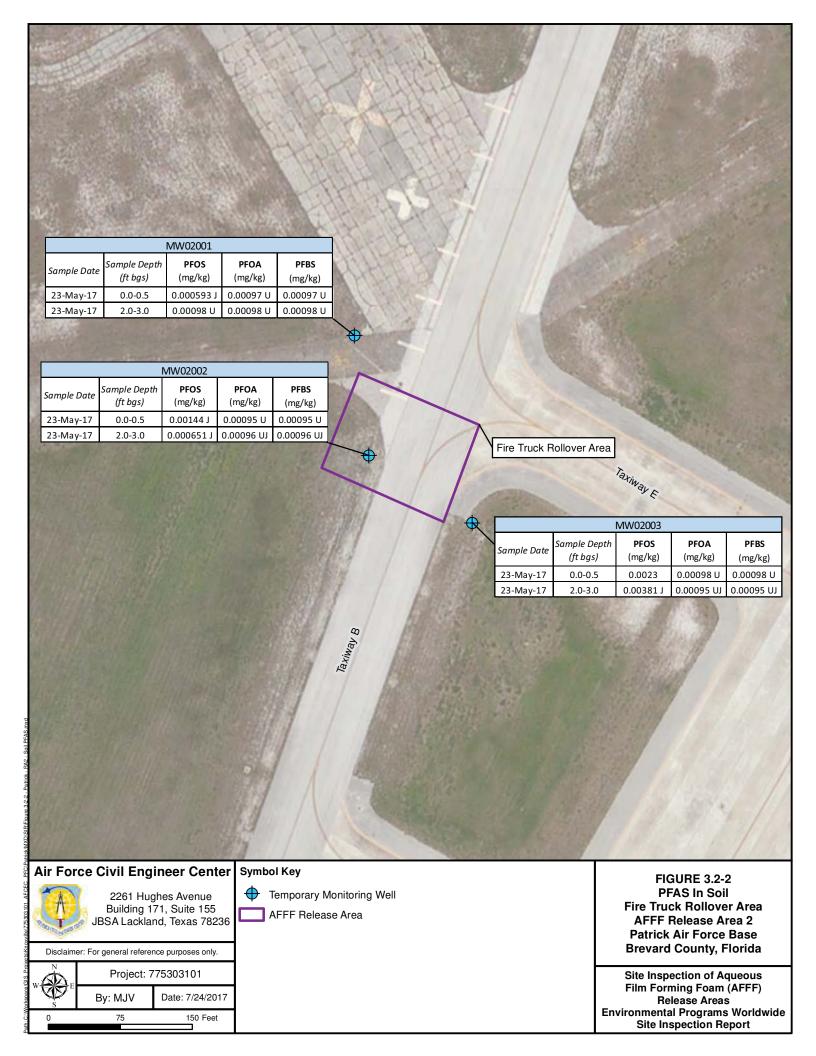


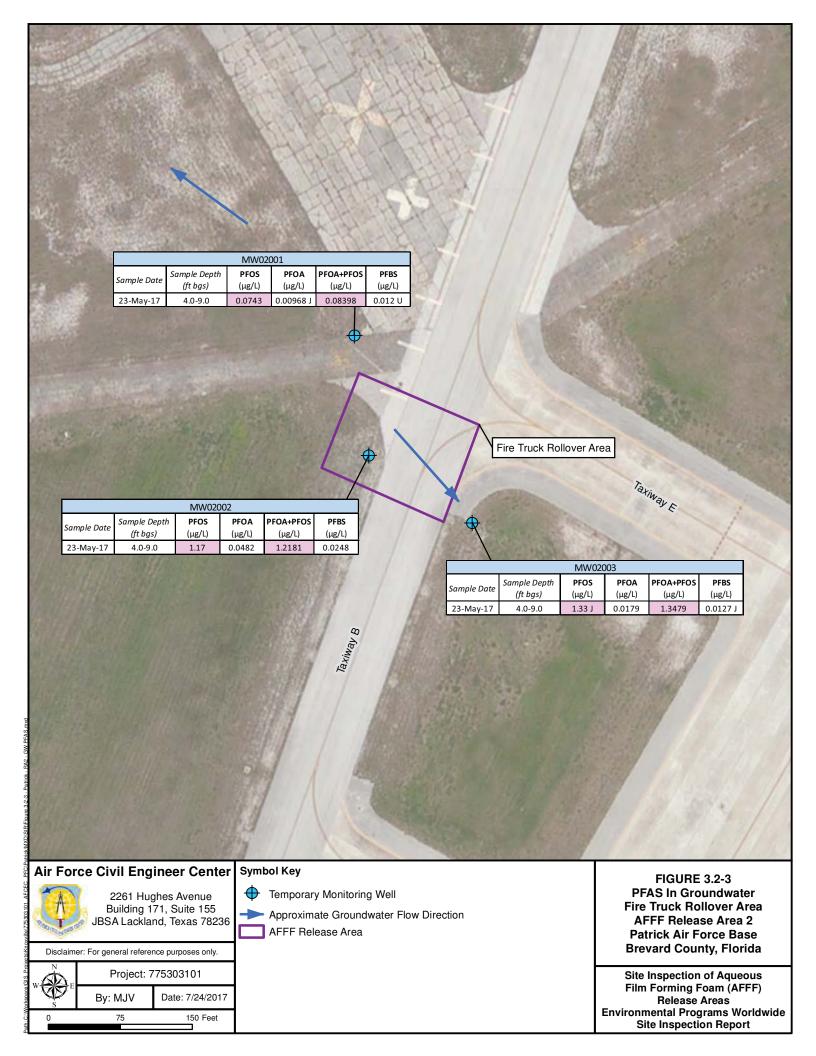




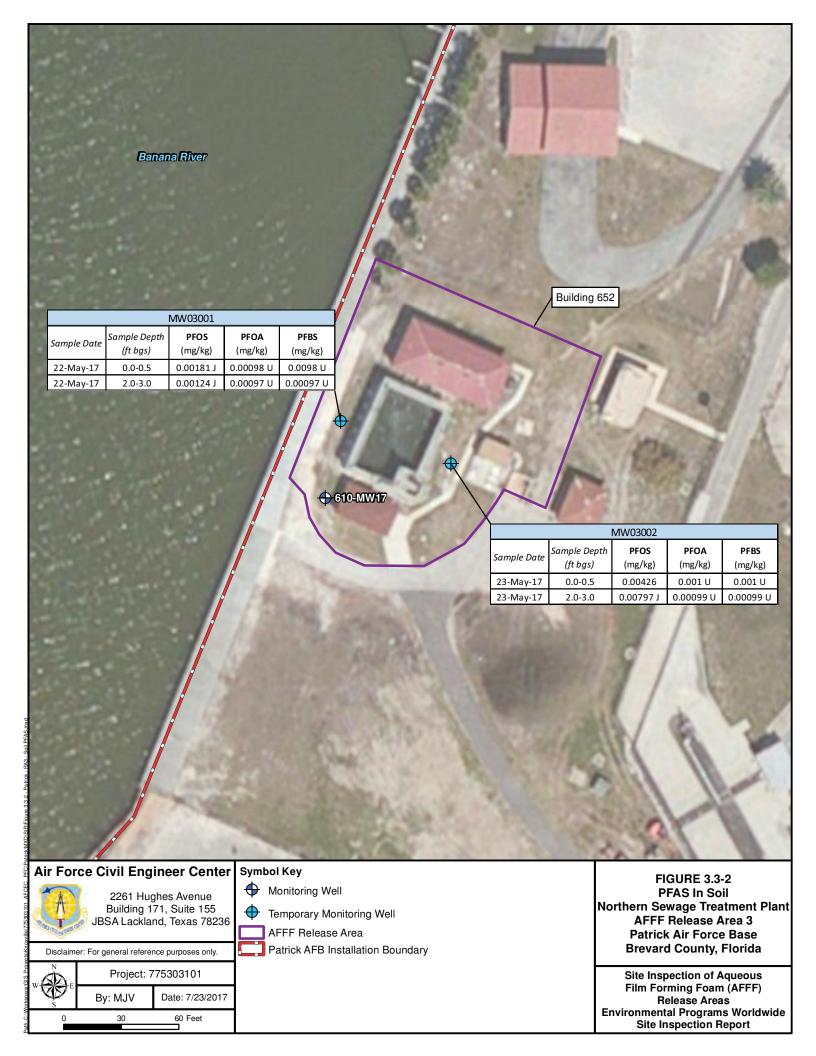




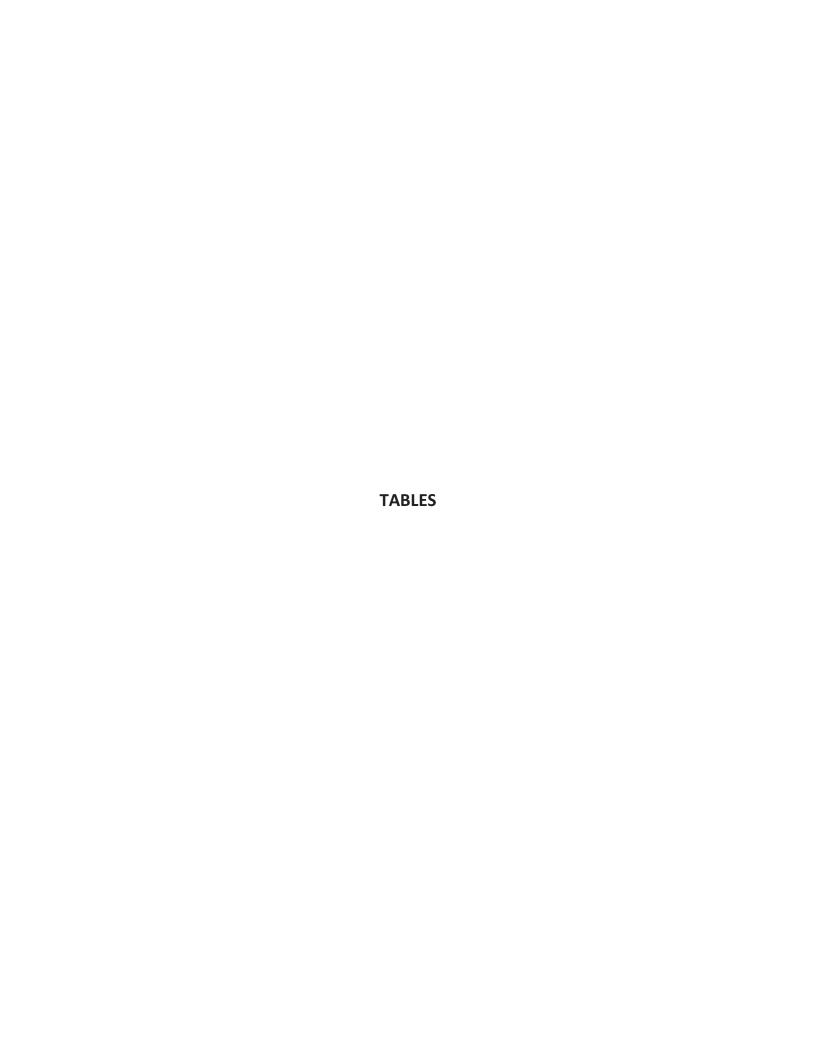












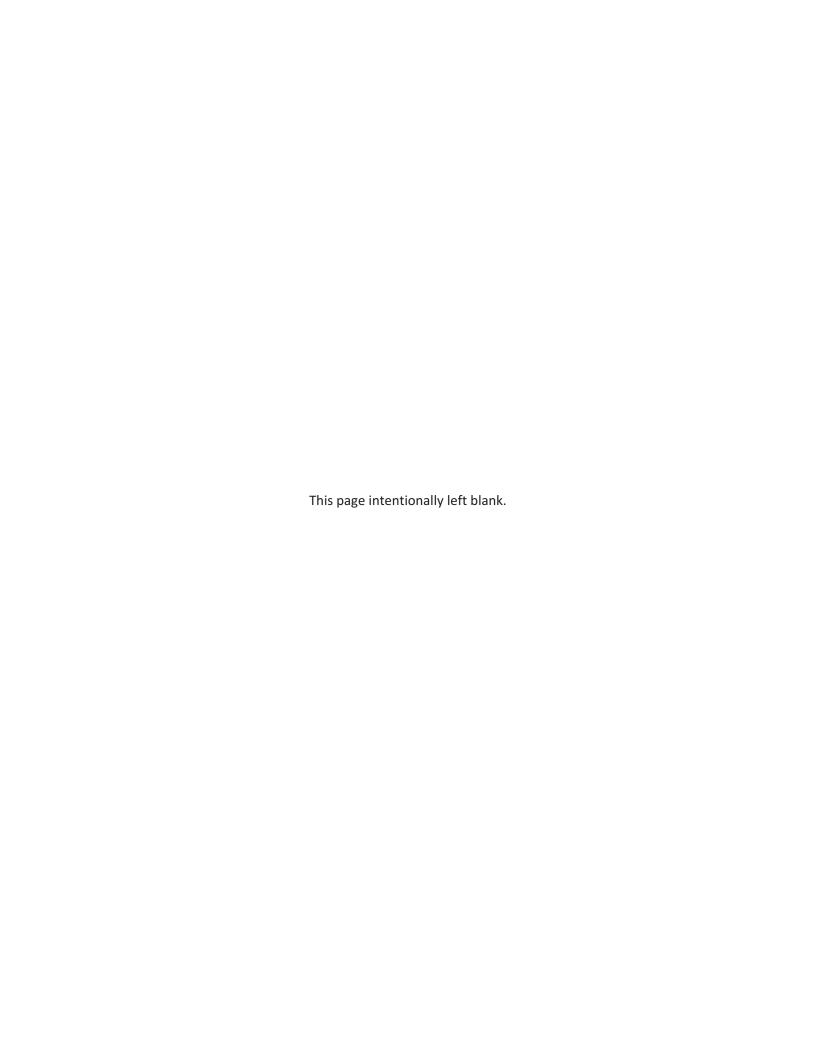


Table 3.0-1

Monitoring Well Construction Details

Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas

Site Inspection Report, Patrick AFB, Florida

AFFF Release Area	Location ID	Installation Date	Well Material	Northing	Easting	Ground Elevation (ft amsl)	TOC Elevation (ft amsl)	Well Depth (ft bgs)	Well Diameter (in)	Screen Length (ft)	Screen Size (in)	Screen Interval (ft bgs)
	MW01001	5/23/2017	PVC	1,422,262.48	779,695.76	4.2	4.69	14.7	2	10	0.01	4.5-14.5
	MW01002	5/24/2017	PVC	1,422,215.61	779,688.90	4.1	4.70	14.6	2	10	0.01	4.4-14.4
1	MW01003	5/24/2017	PVC	1,422,207.81	779,754.07	2.4	4.82	7.8	2	5	0.01	2.6-7.6
	MW01004	5/24/2017	PVC	1,421,911.45	779,972.12	3.5	4.86	13.8	2	10	0.01	3.6-13.6
	MW01005	5/24/2017	PVC	1,421,813.11	780,093.55	4.8	5.04	15.0	2	10	0.01	4.8-14.8
	MW01006	5/24/2017	PVC	1,421,781.11	779,967.08	4.5	4.91	14.8	2	10	0.01	4.6-14.6
	MW02001	5/23/2017	PVC	1,419,067.35	782,924.48	5.4	7.70	7.9	2	5	0.01	2.7-7.7
2	MW02002	5/23/2017	PVC	1,418,942.39	782,939.44	5.2	7.20	8.2	2	5	0.01	3-8
	MW02003	5/23/2017	PVC	1,418,872.37	783,047.43	5.2	6.72	8.7	2	5	0.01	3.5-8.5
	MW03001	5/22/2017	PVC	1,424,539.24	780,970.68	3.9	4.90	14.2	2	10	0.01	4-14
3	MW03002	5/23/2017	PVC	1,424,516.90	781,028.18	4.1	4.68	14.6	2	10	0.01	4.4-14.4
	610-MW17	Unknown	PVC	1,424,499.00	780,962.69	4.5	4.25	13.0	2	10	NA	3-13

amsl - above mean sea level

bgs - below ground surface

ft - feet

in - inches

NA - not available

PVC - Polyvinyl Chloride

TOC - top of casing

Table 3.0-2
Groundwater Elevations
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick AFB, Florida

AFFF Release Area	Location ID	Well Depth (ft bgs)	Ground Surface Elevation (ft amsl)	TOC Elevation (ft amsl)	Date Measured	Depth to Groundwater (ft btoc)	Groundwater Elevation (ft amsl)
	MW01001	14.5	4.2	4.69	5/25/2017	5.53	-0.84
	MW01002	14.4	4.1	4.70	5/25/2017	5.31	-0.61
1	MW01003	7.6	2.4	4.82	5/25/2017	5.42	-0.60
	MW01004	13.6	3.5	4.86	5/25/2017	5.35	-0.49
	MW01005	14.8	4.8	5.04	5/25/2017	5.52	-0.48
	MW01006	14.6	4.5	4.91	5/25/2017	5.42	-0.51
	MW02001	7.7	5.4	7.70	5/23/2017	6.69	1.01
2	MW02002	8.0	5.2	7.20	5/23/2017	7.18	0.02
	MW02003	8.5	5.2	6.72	5/23/2017	7.65	-0.93
	MW03001	14.0	3.9	4.90	5/24/2017	5.56	-0.66
3	MW03002	14.4	4.1	4.68	5/24/2017	5.25	-0.57
	610-MW17	13.0	4.5	4.25	5/24/2017	4.28	-0.03

amsl - above mean sea level

bgs - below ground surface

btoc - below top of casing

ft - feet

TOC - top of casing

**Table 3.1-1** 

# Summary of Soil Analytical Testing Results Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Site Inspection Report, Patrick Air Force Base, Florida

				Scraan	Analyte:	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	Perfluorobutanesulfonic acid (PFBS)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl  Perfluorooctanesulfonamido acetic acid (NETFOSAA)	N-Methyl  perfluorooctanesulfonamido acetic acid (NMEFOSAA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
AFFF Release Area	Location ID	Sample ID	Sample Date	Sample Depth (ft)	Sample Type	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	MW01001	PTRK01-SO-001	23-May-17	0.0-0.5	N	0.474	0.0129 J	0.000803 J	0.00294 J	0.0179	0.004 U	0.004 U	0.00524	0.00119 J	0.0016 J	0.0473 J	0.00462 J	0.00211	0.001 U	0.001 U	0.00179 J
	WWOIOOI	PTRK01-SO-002	23-May-17	2.0-3.0	N	0.248	0.0239	0.00126 J	0.00699	0.0118	0.004 U	0.004 U	0.000976 J	0.001 U	0.00246	0.0562	0.00653	0.0019 J	0.001 U	0.001 U	0.000732 J
		PTRK01-SO-003	24-May-17	0.0-0.5	N	0.147	0.00457	0.001 U	0.00741	0.0396	0.004 U	0.00371 J	0.00149 J	0.0117	0.00191 J	0.0164	0.00316	0.00099 J	0.001 U	0.001 U	0.00654
	MW01002	PTRK-FD-SO-001	23-May-17	0.0-0.5	FD	0.00097 UJ	0.00097 UJ	0.00097 UJ	0.0039 UJ	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 UJ	0.00097 UJ	0.00097 UJ	0.00097 U	0.00097 U	0.00097 U	0.00097 U
		PTRK01-SO-004	24-May-17	2.0-3.0	N	0.292	0.00487	0.001 U	0.00393 J	0.0356	0.0041 U	0.0041 U	0.00319	0.001 U	0.00154 J	0.0181	0.00145 J	0.00256	0.001 U	0.001 U	0.00224
1	MW01004	PTRK01-SO-005	24-May-17	0.0-1.0	N	0.011	0.001 U	0.001 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.000672 J	0.001 U	0.001 U	0.0012 J	0.000742 J	0.001 U	0.001 U	0.001 U	0.001 U
		PTRK01-SO-006	24-May-17	2.0-3.0	N	0.115 J	0.00097 U	0.00097 U	0.0039 U	0.0226	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 U	0.000707 J	0.000336 J	0.00097 U	0.00097 U	0.00097 U	0.00097 ∪
	MW01005	PTRK01-SO-007	24-May-17	0.0-1.0	N	0.344	0.00178 J	0.004	0.0514	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.000609 J	0.0313	0.00718	0.000645 J	0.00097 U	0.00097 U	0.00097 ∪
		PTRK01-SO-008	24-May-17	2.0-3.0	N	0.234	0.0294	0.000965 J	0.828	0.04 U	0.004 U	0.004 U	0.001 U	0.001 U	0.00229	0.232	0.00527	0.000961 J	0.001 U	0.001 U	0.001 U
	MW01006	PTRK01-SO-009	24-May-17	0.0-1.0	N	1.18	0.0011 J	0.00463	0.0261	0.0331	0.0039 U	0.0039 U	0.000555 J	0.00098 U	0.00117 J	0.0272	0.0114	0.00185 J	0.00098 U	0.00098 U	0.00098 U
		PTRK01-SO-010	24-May-17	2.0-3.0	N	0.312	0.0233	0.00223	0.752	0.041 U	0.0041 U	0.0041 U	0.001 U	0.001 U	0.00195 J	0.0816	0.00862	0.00221	0.001 U	0.001 U	0.001 U
	MW02001	PTRK02-SO-001	23-May-17	0.0-0.5	N	0.000593 J	0.00097 U	0.00097 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U
		PTRK02-SO-002	23-May-17	2.0-3.0	N	0.00098 U	0.00098 U	0.00098 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U
2	MW02002	PTRK02-SO-003	23-May-17	0.0-0.5	N	0.00144 J	0.00095 U	0.00095 U	0.0038 U	0.0038 U	0.0038 U	0.0038 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U	0.00095 U
		PTRK02-SO-004	23-May-17	2.0-3.0	N	0.000651 J	0.00096 UJ	0.00096 UJ	0.0038 UJ	0.0038 U	0.0038 U	0.0038 U	0.00096 U	0.00096 U	0.00096 UJ	0.00096 UJ	0.00096 UJ	0.00096 U	0.00096 U	0.00096 U	0.00096 ∪
	MW02003	PTRK02-SO-005	23-May-17	0.0-0.5	N	0.0023	0.00098 U	0.00098 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.00098 ∪
		PTRK02-SO-006	23-May-17	2.0-3.0	N	0.00381 J	0.00095 UJ	0.00095 UJ	0.0038 UJ	0.0038 U	0.0038 U	0.0038 U	0.00095 U	0.00095 U	0.00095 UJ	0.00095 UJ	0.00095 UJ	0.00095 U	0.00095 U	0.00095 U	0.00095 U
	MW03001	PTRK03-SO-001	22-May-17	0.0-0.5	N	0.00181 J	0.00098 U	0.00098 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00098 U	0.00098 U	0.00098 U	0.00098 U	0.000341 J	0.00098 U	0.00098 U	0.00098 U	0.00098 U
		PTRK03-SO-002	22-May-17	2.0-3.0	N	0.00124 J	0.00097 U	0.00097 U	0.0039 U	0.0039 U	0.0039 U	0.0039 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U	0.00097 U
3		PTRK03-SO-003	23-May-17	0.0-0.5	N	0.00426	0.001 U	0.001 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
	MW03002	PTRK03-SO-004	23-May-17	2.0-3.0	N	0.00797 J	0.00099 U	0.00099 U	0.004 U	0.004 U	0.004 U	0.004 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U	0.00099 U
		PTRK-FD-SO-002	23-May-17	2.0-3.0	FD	0.00439 J	0.001 U	0.001 U	0.004 U	0.004 U	0.004 U	0.004 U	0.001 U	0.001 U	0.001 U	0.001 U	0.000292 J	0.001 U	0.001 U	0.001 U	0.001 U

#### Notes:

PFAS analysis by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry

¹Screening levels calculated using the EPA Regional Screening Level calculator [https://epa-prgs.ornl.gov/cgi-bin/chemicals/csl\_search]

<sup>2</sup>USEPA Residential Screening Levels (June 2017) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017]

Highlighted cells indicate concentrations exceeding the Screening Level.

FD - field duplicate sample

ft - feet

ID - identification

J - The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.

mg/kg - milligrams per kilogram

N - normal field sample

NA - not applicable

U - The analyte was analyzed for but was not detected above the reporting limit of detection (LOD).

UJ - The reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

Table 3.1-2
Summary of Soil General Chemistry Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick Air Force Base, Florida

					Analyte:	Нф	TOC
AFFF Release Area	Location ID	Sample ID	Sample Date	Sample Depth (ft)	Sample Type	S. U.	mg/kg
1	PTRCK01	PTRCK01-(0-1)	25-May-17	0.0-1.0	N	8.53	6610
1	FINCKOI	PTRCK01-(2-3)	25-May-17	2.0-3.0	N	8.13	10100
2	PTRCK02	PTRCK01-(0-1)	25-May-17	0.0-1.0	N	8.2	6920
2	FINCKUZ	PTRCK01-(2-3)	25-May-17	2.0-3.0	N	8.32	16000
3	PTRCK03	PTRCK01-(0-1)	25-May-17	0.0-1.0	N	8.86	5920
3	FINCKUS	PTRCK01-(2-3)	25-May-17	2.0-3.0	N	9.17	4800

ft - feet

ID - identification

N - normal field sample

mg/kg - milligrams per kilogram

S.U. - standard units

TOC - Total Organic Carbon

Table 3.1-3
Summary of Groundwater Analytical Testing Results
Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas
Site Inspection Report, Patrick Air Force Base, Florida

					Analyte:	Perfluorooctanesulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	PFOS+PFOA	Perfluorobutanesulfonic acid (PFBS)	6:2 Fluorotelomer sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonate (8:2 FTS)	N-Ethyl perfluorooctanesulfonamidoacetic acid (NETFOSAA)	N-Methyl perfluorooctanesulfonamidoacetic acid (NMEFOSAA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluoroheptanoic acid (PFHpA)	Perfluorohexanesulfonic acid (PFHxS)	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnA)
				EPA Health	,	0.07	0.07	0.07	NA 400	NA NA	NA	NA	NA	NA	NA	NA	NA	NA NA	NA NA	NA	NA	NA
AFFF Releas Area	Location ID	Sample ID	Sample Date	SEPA Tap Was Sample Depth (ft)	Sample Type	NA μg/L	NA μg/L	NA μg/L	400 μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L	NA μg/L
	MW01001	PTRK01-GW-001	25-May-17	4.5-14.5	N	0.195	0.0311	0.2261	0.0245	0.0254 J	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.042	0.126	0.0383	0.00806 J	0.012 UJ	0.012 UJ	0.012 U
	MW01002	PTRK01-GW-002	25-May-17	4.4-14.4	N	0.926	0.0817	1.0077	0.0376	0.0752	0.489 J	0.031 U	0.031 U	0.012 U	0.012 UJ	0.155	0.248	0.141	0.0271 J	0.012 UJ	0.012 UJ	0.012 U
1	MW01003	PTRK01-GW-003	25-May-17	2.6-7.6	N	1.32	0.236	1.556	0.064	0.0996	0.26	0.032 UJ	0.032 UJ	0.0101 J	0.012 U	0.442	0.655	0.456	0.0557	0.012 UJ	0.012 UJ	0.012 U
1	MW01004	PTRK01-GW-004	25-May-17	3.6-13.6	N	152	6.06	158.06	3 U	97.9	17.1	8 U	8 U	3 U	3 U	3 U	20.6	5.87	2.81 J	3 UJ	3 UJ	3 U
	MW01005	PTRK01-GW-005	25-May-17		N	11.9	0.0768	11.9768	0.0342	0.592	4.6	0.032 U	0.032 U	0.0298	0.012 U	0.0971	0.573	0.173	0.0357	0.012 UJ	0.012 UJ	0.012 U
	MW01006	PTRK01-GW-006	25-May-17	4.6-14.6	N	159	4.99	163.99	2.37 J	129	25.3	7.7 U	7.7 U	2.9 U	2.9 U	2.44 J	25.4	10.5	1.18 J	2.9 UJ	2.9 UJ	2.9 U
	MW02001	PTRK02-GW-001	23-May-17	2.7-7.7	N	0.0743	0.00968 J	0.08398 J	0.012 U	0.031 U	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.00859 J	0.0754	0.0099 J	0.00449 J	0.012 UJ	0.012 UJ	0.012 U
2	MW02002	PTRK02-GW-002	23-May-17	3-8	N	0.95	0.0482	0.9982	0.0245	0.031 U	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.0776	0.618	0.0996	0.0253	0.012 UJ	0.012 UJ	0.012 U
	141402022	PTRK-FD-GW-001	23-May-17	3-8	FD	1.17 J	0.0481	1.2181 J	0.0248	0.031 U	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.0771	0.637	0.0969	0.0269 J	0.012 UJ	0.012 UJ	0.012 U
	MW02003	PTRK02-GW-003	23-May-17	3.5-8.5	N	1.33 J	0.0179	1.3479 J	0.0127 J	0.032 U	0.032 U	0.032 U	0.032 U	0.012 U	0.012 UJ	0.0121 J	0.346	0.0348	0.0133 J	0.012 UJ	0.012 UJ	0.012 U
	MW03001	PTRK03-GW-001	24-May-17	4-14	N	12.2	0.937	13.137	2.58	1.34	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.372	7.93	2.08	0.0195 J	0.012 UJ	0.012 UJ	0.012 U
3	MW03002	PTRK03-GW-002 PTRK-FD-GW-002	24-May-17	4.4-14.4	N	3.07 J	0.155	3.225 J	0.396	0.03 J	0.031 U	0.031 U	0.031 U	0.012 U	0.012 UJ	0.0707	1.91 J	0.279	0.0115 J	0.012 UJ	0.012 UJ	0.012 U 0.012 U
	610-MW17	PTRK03-GW-610-MW17	24-May-17 24-May-17	4.4-14.4 3-13	FD N	1.84 J 1.28	0.151	1.991 J 1.348	0.411 0.193	0.0289 J 0.032 U	0.032 U 0.032 U	0.032 UJ 0.0161 J	0.032 UJ 0.032 U	0.012 U 0.012 U	0.012 U 0.012 U	0.0825 0.0718	1.14 J 0.207	0.324 0.075	0.00984 J 0.0308	0.012 UJ 0.012 UJ	0.012 UJ 0.012 UJ	0.012 U

PFAS analysis by Modified USEPA Method 537 using Liquid Chromatography and Tandem Mass Spectrometry

Highlighted cells indicate concentrations exceeding USEPA Health Advisory

PFOS+PFOA = Co-occurrence of PFOA and PFOS (PFOA+PFOS) in aqueous samples is reported using the following guidelines

- 1. If both PFOA and PFOS are detected at or above the detection limit (DL), then the sum of PFOA+PFOS is reported
- 2. If only PFOS or only PFOA is detected at or above the DL in groundwater, then the concentration of the detected analyte only is reported
- 3. If neither PFOA nor PFOS is detected at or above the DL, then PFOA + PFOS is reported as "ND" representing Not Detected
- FD field duplicate sample
- ft feet
- ID identification
- J The analyte was positively identified and the associated numerical value is the approximate concentration of the analyte in the sample.
- μg/L micrograms per liter
- N normal field sample
- NA not applicable
- U The analyte was analyzed for but was not detected above the reporting limit of detection (LOD).
- UJ The reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

<sup>&</sup>lt;sup>1</sup>Health Advisory from USEPA Office of Water, 2016a and 2016b, Health Advisories (HAs) for drinking water.

<sup>&</sup>lt;sup>2</sup>USEPA Residential Screening Levels (June 2017a) [https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-june-2017]

## **Table 4.0-1**

# Conceptual Site Model: Installation-Wide Summary Site Inspection Report of Aqueous Film Forming Foam (AFFF) Release Areas Site Inspection Report, Patrick Air Force Base, Florida

Facility Profile	Physical Profile	Release Profile	Land Use and Exposure Profile	Ecological Profile
Installation Description/History:  • Years of operation: 1940 to present.  • Size: Approximately 2, 324 acres.  • Location: East-central Florida coast between the communities of Satellite Beach and Cocoa Beach, in Brevard County, Florida.  • Layout: Patrick AFB is comprised of one primary runway and several smaller transecting runways in the central portion; maintenance, support, and operational facilities north of the runways/flightline; and, residential and commercial facilities in the southeastern portion.  • History: Patrick AFB was established in 1940 by the U.S. Navy as the Banana River Naval Air Station, and served as an active base for antisubmarine sea-patrol planes during World War II. The installation was transferred to the USAF in 1948 and renamed Patrick AFB in 1950. The USAF began development of the Eastern Test Range in 1950. From 1950 to present, the 45 SW has been headquartered at Patrick AFB and is responsible for launch, test and support operations associated with the cruise missile program, ballistic missiles, the Apollo and Space Shuttle programs, and the Delta, Atlas, Titan, and other commercial launch programs (SpaceX, Athena, etc.) (45 CES/CEIE).  • Current Mission: The responsibility of safety, planning, engineering, support services, scheduling, test operations, launch and range operation, directing or supporting operations, and test results evaluation for the 45 SW (45 CES/CEIE).  • AFFF Containing PFAS was used for firefighting training activities, testing of firefighting equipment, extinguishing petroleum fires, and in fire suppression systems at several buildings/hangars.  • Based on the research conducted during the PA as well as information collected during a site scoping visit conducted by Amec Foster Wheeler on 15 November 2016, the following three potential AFFF release areas were identified as requiring further action:  • AFFF Release Area 2 - Fire Truck Rollover Area.  • AFFF Release Area 3 - Northern Sewage Treatment Plant.	<ul> <li>Topography:</li> <li>Patrick AFB lies within the within the Atlantic Barrier Chain Physiographic Province at elevations less than 20 feet above mean sea level (amsl), with dunal formations immediately inland of the Atlantic Ocean beach forming the highest ridges (10 to 15 feet amsl) that slope gently to the west (CH2M Hill, 2000).</li> <li>Vegetation:</li> <li>The installation is primarily developed; however, limited natural vegetation consists of salt-tolerant plants including sea oats, saw palmetto, sea grapes, coco-plum, wax myrtle, lantana, and bay cedar (Reynolds, Smith and Hills Inc., 1984).</li> <li>Surface Water:</li> <li>The surface water features at Patrick AFB consists of manmade ditches, culverts, and drainage canals that collect and divert rainwater westward into the Banana River (CH2M Hill, 2000).</li> <li>Soils:</li> <li>The principle soil types at Patrick AFB include the Canaveral Complex, Urban Land, and Galveston-Urban Land Complex that generally consist of highly permeable, fine-grained beach sands (CH2M Hill, 2000). Silty sands were encountered at 2 to 3 feet bgs during this investigation.</li> <li>Geology:</li> <li>Surficial sediments consist of approximately 100 feet of undifferentiated Pleistocene and Holocene beach deposits underlain by coquina and sandy clay of the Ansatsais Formation, the Caloosahatchee Marl Formation, and limestone of the Tamiami Formation (CH2M Hill, 2000).</li> <li>The underlying Miocene Age Hawthorn Group is composed predominantly of clays, silts, and marls (CH2M Hill, 2000).</li> <li>Hydrogeology:</li> <li>The surficial aquifer system is contained in undifferentiated Late Miocene, Pliocene, and Recent Pleistocene deposits composed primarily of medium to coarse quartz sands and coquina under unconfined conditions (CH2M Hill, 2000).</li> <li>Hydrogeology:</li> <li>The Floridian Aquifer is comprised of a series of highly permeable limestone formations of the Eocene Age Ocala Group and Avon Park Limestone that is separated from the surficial aquifer by the Ha</li></ul>	<ul> <li>Contaminants of Potential Concern:</li> <li>PFAS are the contaminants of potential concern during this investigation.</li> <li>Petroleum-related compounds, chlorinated solvents, metals and PFAS are historical site contaminants.</li> <li>Media of Potential Concern:</li> <li>Soil and groundwater.</li> <li>Confirmed AFFF Releases:</li> <li>Former FTA 2: Fire training exercises were performed in two burn pits potentially using an unknown amount of AFFF. Burn Pit 1 was unlined and used from 1970 to 1985. Burn Pit 2 was concrete-lined and used from 1985 to 2001, with AFFF potentially released outside the concrete-lined area.</li> <li>Fire Truck Rollover Area: A fire truck rolled over when turning from Taxiway E onto Taxiway B and released an unknown quantity of AFFF onto the taxiway and surrounding grass.</li> <li>Northern Sewage Treatment Plant: This facility received wastewater, potentially containing AFFF, from releases at various hangars and buildings from 1968 to 1995. An unknown amount of AFFF was observed at the plant in 1994 that discharged onto the surrounding grounds.</li> <li>Hangar 630: PFOS concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).</li> <li>Hangar 647: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).</li> <li>Hangar 705: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).</li> <li>Hangar 750: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).</li> <li>Hangar 750: PFOS and PFOA concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).</li> <li>Building 313, Former Plating Shop): PFOS concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).</li> <li>Building 313, Former Plating Shop): PFOS concentrations in groundwater exceeded the current USEPA HA value in May 2014 (SCF, 2014).</li> </ul>	Current Land Use:  Occupied by Patrick AFB. Future Land Use:  Land use is not expected to change in the future. Potential Receptors:  Potential receptors associated with current and future land use include USAF personnel and residents, grounds maintenance workers, utility workers, construction workers, and trespassers.	Potential Ecological Receptors (HGL, 2015):  Inland and aquatic plant species, reptiles, birds, and mammals that inhabit or migrate through or adjacent to the installation.  Banana River.  Multiple wetlands on and adjacent to the installation. Threatened and Endangered Species (United States Fish and Wildlife Service, 2017):  Threatened species that were identified in Brevard County and may exist at Patrick AFB include the following:  Wood stork - Bird (Mycteria americana).  Audubon's crested caracara - Bird (Polyborus plancas audubonii)  Florida scrub-jay - Bird (Aphelocoma coerulescens).  Southeastern beach mouse - Mammal (Peromyscus polionotus niveiventris)  Loggerhead sea turtle - Reptile (Caretta caretta)  Atlantic salt marsh snake (Nerodia clarkia taeniata).  Eastern Indigo Snake - Reptile (Drymarchon corais couperi)  Endangered species that were identified in Brevard County and may exist at Patrick AFB include the following:  Everglade snail kite - Bird (Rostrhamus sociabilis plumbeus).  West Indian Manatee - mammal (Trichechus manatus)

Fire Station, Building 810): PFOS and	Hawksbill sea turtle –
PFOA concentrations in groundwater	Reptile ( <i>Eretmochelys</i>
exceeded the current USEPA HA value in	imbricata)
May 2014 (SCF, 2014).	<ul> <li>Leatherneck sea turtle –</li> </ul>
Outfall 21 to Banana River: PFOS and	Reptile ( <i>Dermochelys</i>
PFOA concentrations in surface water	coriacea)
exceeded the current USEPA HA value in	
May 2014 (SCF, 2014).	
Primary Release Pathways:	
Release or application of AFFF to the	
ground at potential source areas.	
Infiltration of PFAS deeper into the soil	
column over time reaching groundwater.	
AFFF washed into drainage, storm water,	
and sewer systems.	
Secondary Release Pathways:	
None	

## **APPENDIX A**

SCF SITE INVESTIGATION REPORT (2014)
DATA TABLES AND FIGURES

(ug/L)

PFB01-GW-001-000

PFB01-GW-002-000

Feet

Figure 4 Site 1 Hangar 750 Locations and Detection Summary

1006 Floyd Culler Court Oak Ridge, Tennessee 37830

10/15/14

Florid

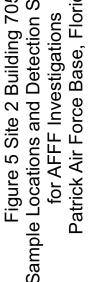
for AFFF Investigations Patrick Air Force Base, Flor

Locations

Sample

PFB01-SB-002-001

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Perfluorooctanoic acid (PFOA)

Perfluoropentanoic acid (PFPA)

Perfluorotridecanoic Acid (PFTriA)

0.26J

0.59J

0.46J

Q1062.0007

Note: **BOLD** values exceed screening levels.

150

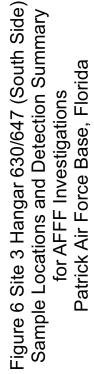
ug/L = micrograms per liter

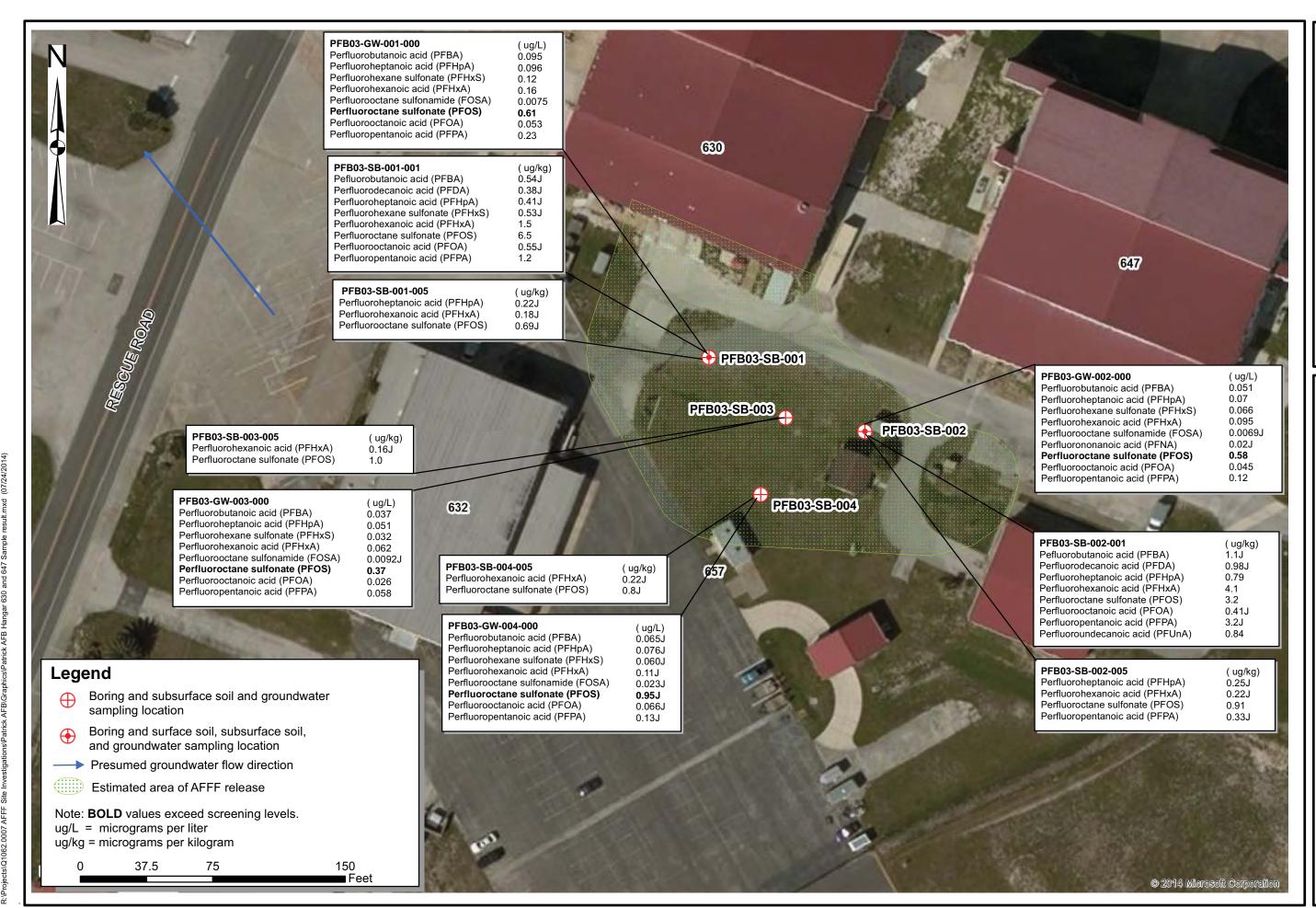
ug/kg = micrograms per kilogram

10/15/14

751

© 2014 Microsoft Corporatio

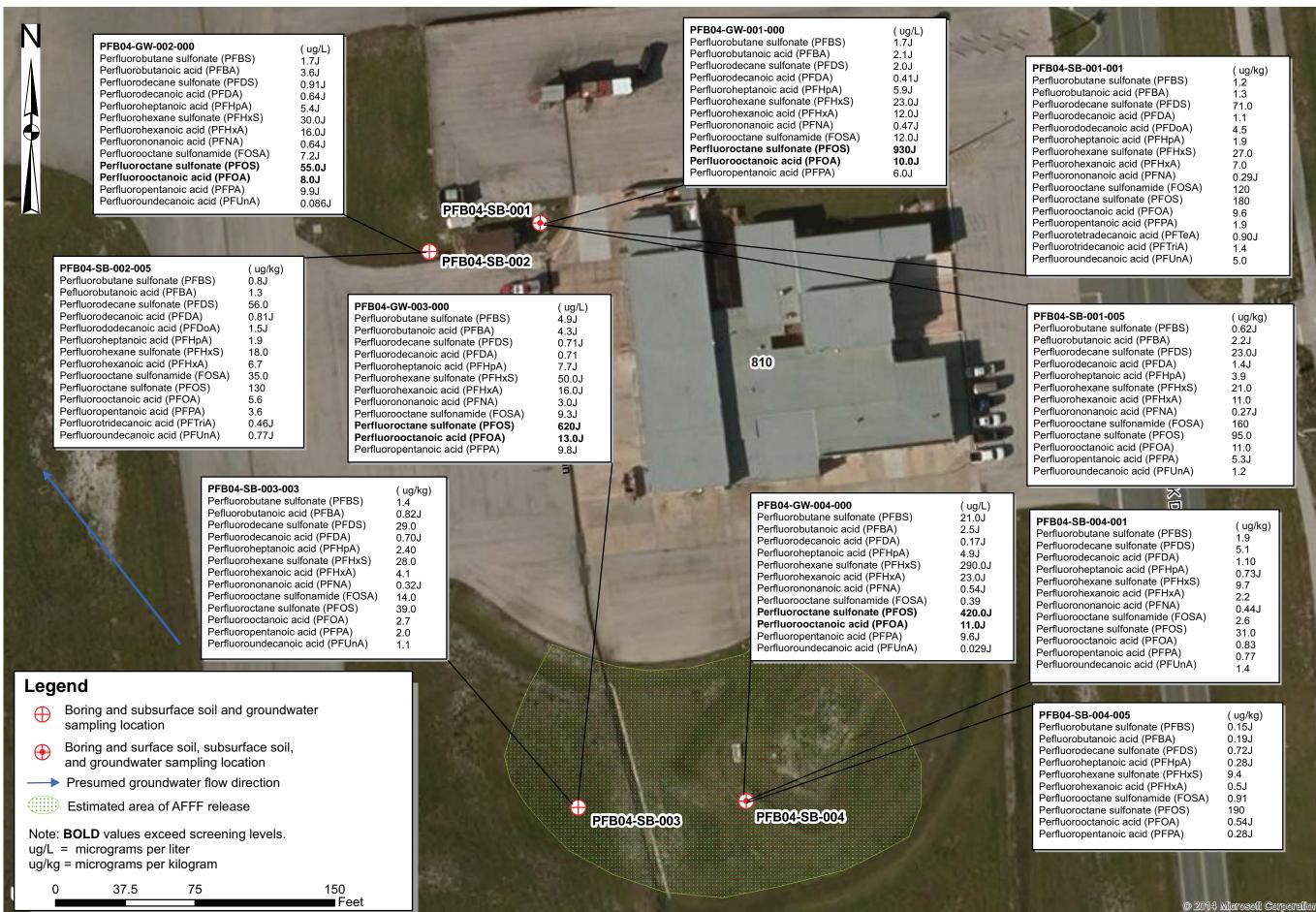




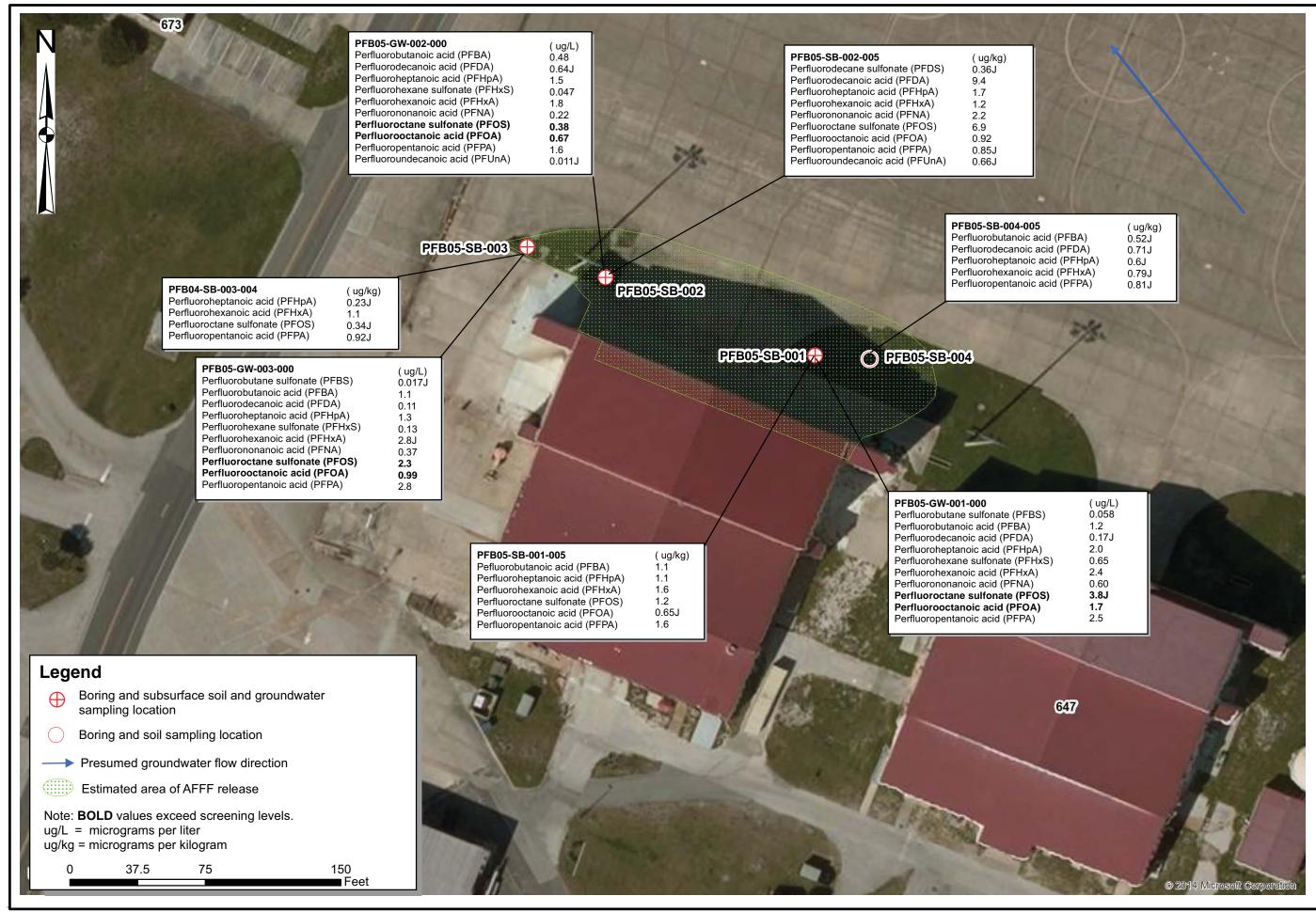


Summary Locations

igure , c...ocations and Detention, c...for AFFF Investigations 4 Building 810 Patrick Air Force Site Figure Sample







∞ర 9 Sites 5 8 Sample Lo

Figure Channel S

Perfluoroctane sulfonate (PFOS) 1.4 664 Perfluorononanoic acid (PFNA) 0.045J Perfluorooctanoic acid (PFOA) 0.076 Perfluoroctane sulfonate (PFOS) 1.3J 641 Perfluoropentanoic acid (PFPA) 0.11 Perfluorooctanoic acid (PFOA) 0.17 Perfluoropentanoic acid (PFPA) 0.27 667 642 PFB05-SW-001-900 (Field Duplicate) PFB06-SD/SW-001 Perfluorobutane sulfonate (PFBS) 0.022 Perfluorobutanoic acid (PFBA) 0.084 Perfluorodecanoic acid (PFDA) 0.04J Perfluoroheptanoic acid (PFHpA) 0.22 Perfluorohexane sulfonate (PFHxS) PFB06-SD-001-001 0.26 (ug/kg) Perfluorohexanoic acid (PFHxA) Perfluorodecane sulfonate (PFDS) 0.33 Perfluorononanoic acid (PFNA) Perfluorotridecanoic acid (PFTriA) 0.036J Perfluoroctane sulfonate (PFOS) 1.3J Perfluorooctanoic acid (PFOA) 0.17 Perfluoropentanoic acid (PFPA) PFB06-SD-002 688 PFB06-SD-002-001 (ug/kg) PFB05-SD-001-001 (ug/kg) Perfluorodecane sulfonate (PFDS) 0.3J Perfluorobutanoic acid (PFBA) 1.7J Perfluorotridecanoic acid (PFTriA) Perfluorodecane sulfonate (PFDS) 2.1 Perfluorododecanoic acid (PFDoA) 3.4J Perfluoroheptanoic acid (PFHpA) 0.48J Perfluorohexane sulfonate (PFHxS) 1.3J Perfluorohexanoic acid (PFHxA) 6.7J Perfluoroctane sulfonate (PFOS) 22.0J Perfluorooctanoic acid (PFOA) 1.3J Perfluoropentanoic acid (PFPA) 0.62J Perfluorotridecanoic acid (PFTriA) 0.99J Perfluoroundecanoic acid (PFUnA) 0.78J PFB05-SD-001-901 (Field Duplicate) Perfluoroctane sulfonate (PFOS) 3.3 PFB06-SD/SW-002 PFB05-SD-002-001 (ug/kg) PAV9 Perfluorobutanoic acid (PFBA) 1.2 Perfluorodecanoic acid (PFDA) 0.29J Perfluoroheptanoic acid (PFHpA) 1.2 Perfluorohexanoic acid (PFHxA) 14.0 PFB05-SD-002 W JH NEW 674 Perfluorooctane sulfonate (PFOS) 0.39J Perfluorooctanoic acid (PFOA) 1.9 Legend Perfluoropentanoic acid (PFPA) 1.7 Surface water and sediment sampling point Sediment sampling point 630 Presumed groundwater flow direction Note: **BOLD** values exceed screening levels. 647 ug/L = micrograms per liter ug/kg = micrograms per kilogram 500 632 624 PAV8

663

671

(ug/L)

0.019J

0.077

0.05J

0.22J

750

0.24

0.35

A-9

PFB05-SW-001-000

666

669

Perfluorobutane sulfonate (PFBS)

Perfluoroheptanoic acid (PFHpA)

Perfluorohexanoic acid (PFHxA)

Perfluorohexane sulfonate (PFHxS)

Perfluorobutanoic acid (PFBA)

Perfluorodecanoic acid (PFDA)

PFB06-SW-001-000

Perfluorobutane sulfonate (PFBS)

Perfluorobutanoic acid (PFBA)

Perfluorodecanoic acid (PFDA)

Perfluoroheptanoic acid (PFHpA)

Perfluorohexanoic acid (PFHxA)

Perfluorononanoic acid (PFNA)

Perfluorohexane sulfonate (PFHxS)

( ug/L) 0.015J

0.042

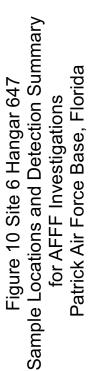
0.08

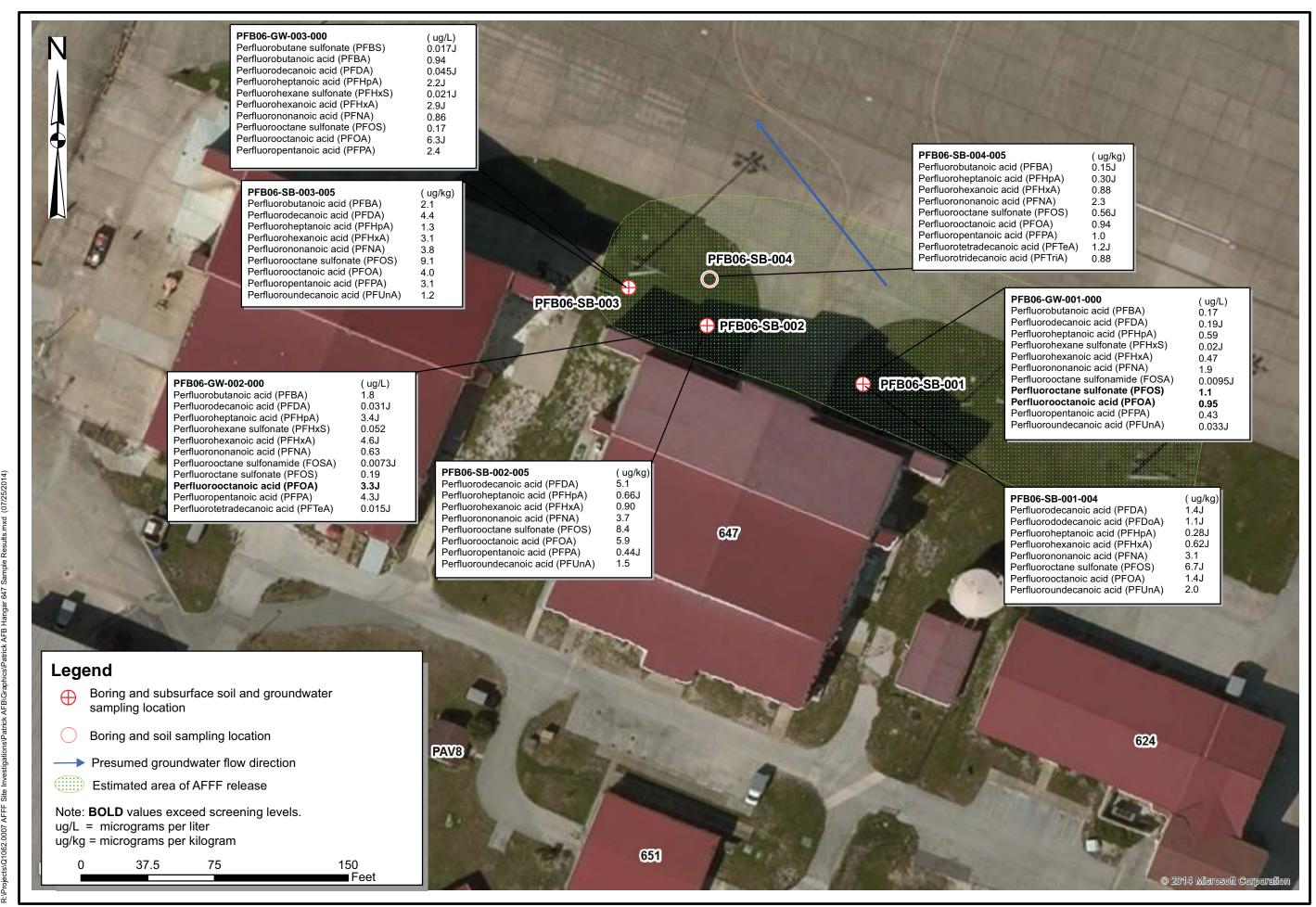
0.24

0.19

0.022J

0.0085J





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Us Air Force Bases
Inited States
Patrick AFB GIS

Lucit Index States

Lucit Index State

Figure 11 Site 7 Building 313
Sample Locations and Detection Summary
for AFFF Investigations
Patrick Air Force Base, Florida

Q1062.0007

10/15/14

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB01-GW-001-000/ PFB01-GW-001-900 (Field Duplicate)	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the east side of the collection tank.
PFB01-GW-002-000	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the north side of the collection tank.
PFB01-GW-003-000	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the west side of the collection tank.
PFB01-GW-004-000	Groundwater	4-5	Determine if PFCs are present in the shallow groundwater. Sample collected from temporary well point on the east side of the site in the surface drainage path from Hangar 750.
PFB01-SB-001-001/ PFB01-SB-001-901 (Field Duplicate)	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil on the east side of the collection tank.
PFB01-SB-001-005/ PFB01-SB-001-905 (Field Duplicate)	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the collection tank.
PFB01-SB-002-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at location situated on the north side of the collection tank.
PFB01-SB-002-004	Soil	3-4	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the north side of the collection tank.
PFB01-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the collection tank.
PFB01-SB-004-004	Soil	3-4	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the east side of the site in the drainage path from Hangar 750.

bgs = below ground surface

PFC = perfluorinated compound

Table 2 Perfluorinated Chemicals Detected in Groundwater Samples at Hangar 750 (Site 1)

Sample	Number		PFB01-G		PFB01-GW (Field Du		PFB01-G		PFB01-G		PFB01-G' 000	
Analyte	CAS Number	EPA PHA (μg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)
Perfluorobutane Sulfonate (PFBS)	29420- 43-3	NL	0.063 J	0.0097	0.037 J	0.0097	0.022 J	0.0091	0.023 J	0.010	0.044 J	0.0086
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.089 J	0.012	0.053 J	0.012	0.14 J	0.011	0.13 J	0.012	0.12 J	0.010
Perfluorodecane sulfonate (PFDS)	67906- 42-7	NL	0.014 J	0.011	0.012 U	0.011	0.071	0.010	0.012 U	0.011	0.010 U	0.0096
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.011 J	0.0092	0.0092 J	0.0092	0.024 J	0.0086	0.012 J	0.0096	0.024 J	0.0082
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.042	0.016	0.030 J	0.016	0.27	0.015	0.16	0.016	0.12	0.014
Perfluorohexane Sulfonate (PFHxS)	108427- 53-8	NL	0.44 J	0.0082	0.28 J	0.0082	0.22 J	0.0077	0.12 J	0.0085	0.50 J	0.0073
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.32 J	0.0034	0.22	0.0034	0.34	0.0032	0.25	0.0036	0.43	0.0030
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.023 U	0.020	0.024 U	0.020	0.13	0.019	0.044 J	0.021	0.046	0.018
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	0.018 J	0.0063	0.011 J	0.0069	0.012 J	0.0061	0.016 J	0.0064	0.0077 J	0.0063
Perfluorooctane Sulfonate (PFOS)	1763-23- 1	0.2	4.6 J	0.016	3.2 J	0.016	3.6 J	0.015	1.2 J	0.016	7.6 J	0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.085 J	0.011	0.054 J	0.012	0.15 J	0.011	0.071 J	0.012	0.17 J	0.010
Perfluoropentanoic acid (PFPA)	2706-90- 3	NL	0.11 J	0.013	0.071	0.013	0.38	0.012	0.22	0.013	0.28	0.011

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed the corresponding screening value.

 $\mu g/L = micrograms per liter$ 

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = not listed. An EPA PHA value has not been established for this analyte.

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

U = Analyte not detected at the method detection limit

Table 3 Perfluorinated Chemicals Detected in Surface Soil at Hangar 750 (Site 1)

	Samp	ole Number	PFB-01-S	B-001-001		SB-001-901 Ouplicate)	PFB01-SB-002-001		
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	0.64 U	0.32	0.64 U	0.32	4.2	0.33	
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.3	0.29	1.3	0.29	0.70 J	0.30	
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	0.64 U	0.61	0.64 U	0.61	1.2 J	0.62	
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	10.0 J	0.13	13.0	0.13	0.70 J	0.13	
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	0.71 J	0.30	0.94	0.30	0.66 U	0.31	
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	11.0	0.16	14.0	0.16	0.89	0.16	
Perfluorononanoic acid (PFNA)	375-95-1	NL	3.5	0.23	2.9	0.24	1.3	0.24	
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	0.64 U	0.10	0.64 U	0.10	0.20 J	0.11	
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	3.1	0.15	2.6	0.15	0.75 J	0.15	
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	3.5	0.25	4.0	0.25	0.69 J	0.25	
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	5.4	0.26	6.1 J	0.26	0.44 J	0.26	
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	1.5 U	0.74	1.5 U	0.74	0.78 J	0.76	
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	0.64 U	0.34	0.64 U	0.34	0.67 J	0.35	
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.64 U	0.34	0.53 J	0.34	1.1	0.35	

Note: Shaded values indicate analyte not detected at the method detection limit.

μg/kg = micrograms per kilogram

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = not listed. An EPA Residential Soil Screening Level has not been established for this analyte.

RSSL = Regional Soil Screening Level. EPA Memorandum, November 2009.

U = Analyte not detected at the method detection limit

Table 4 Perfluorinated Chemicals Detected in Subsurface Soil at Hangar 750 (Site 1)

	Sample	e Number	PFB01-SE	B-001-005		B-001-905 ouplicate)	PFB01-S	B-002-004	PFB01-S	5B-003-005	PFB01-	SB-004-004
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)								
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.66 U	0.13	0.62 U	0.12	0.71 U	0.14	0.17 J	0.12	0.57 U	0.11
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	0.66 U	0.33	0.35 J	0.31	12.0	0.35	0.59 U	0.30	0.57 U	0.29
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.41 J	0.13	0.34 J	0.12	0.43 J	0.14	0.32 J	0.12	0.57 U	0.11
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.74 J	0.16	0.70 J	0.15	0.33 J	0.18	0.58 J	0.15	0.24 J	0.14
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	0.42 Ј	0.15	0.59 J	0.14	0.50 J	0.17	0.67 J	0.14	1.0	0.13
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	0.60 J	0.25	0.49 J	0.24	0.71 U	0.27	0.59 U	0.23	0.57 U	0.22
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.31 J	0.26	0.50 J	0.25	0.71 U	0.28	0.59 U	0.24	0.57 U	0.23
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	0.66 U	0.35	0.52 J	0.33	0.71 U	0.38	0.59 U	0.32	0.57 U	0.31
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.66 U	0.35	0.62 U	0.33	0.68 J	0.38	0.59 U	0.32	0.57 U	0.31

Note: Shaded values indicate analyte not detected at the method detection limit.

 $\mu g/kg = micrograms$  per kilogram EPA = United States Environmental Protection Agency NL = Not listed. An EPA RSSL value has not been established for this analyte U = Analyte not detected at the method detection limit

CAS = Chemical Abstract Service

J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors. RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

Q1062.0007 11/6/14

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB02-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the southeast side of the mixing tanks.
PFB02-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point between the pump house and mixing tanks.
PFB02-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the southwest side of the pump house.
PFB02-GW-004-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point between the pump house and mixing tanks on the north side.
PFB02-SB-001-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at the southeast side of the mixing tanks.
PFB02-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring at the southeast side of the mixing tanks.
PFB02-SB-002-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at between the pump house and mixing tanks.
PFB01-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the north side of the collection tank.
PFB01-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring at the southwest side of the pump house.
PFB01-SB-004-006	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring between the pump house and mixing tanks on the north side.

bgs = below ground surface

PFC = perfluorinated chemical or compound

Table 6 Perfluorinated Chemicals Detected in Groundwater Samples at Building 705 (Site 2)

	Sample	Number	PFB02-GW	V-001-000	PFB02-GV	V-002-000	PFB02-GV	V-003-000	PFB02-GW-004-000		
Analyte	CAS Number	EPA PHA (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	
Perfluorobutane sulfonate (PFBS)	29420- 43-3	NL	28.0 J	0.0082	21.0 J	0.0092	110 J	0.0084	1.6 J	0.0086	
Perfluorobutanoic acid (PFBA)	375-22-4	NL	32.0 J	0.0098	7.2 J	0.011	23.0 J	0.010	0.48 J	0.010	
Perfluorodecane sulfonate (PFDS)	67906- 42-7	NL	0.01 UJ	0.0091	0.011 UJ	0.010	0.010 UJ	0.0094	0.14 J	0.0096	
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.018 J	0.0078	0.022 Ј	0.0088	0.13 J	0.0080	0.0091 J	0.0082	
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	16.0 J	0.013	5.5 J	0.015	15.0 J	0.014	0.32	0.014	
Perfluorohexane Sulfonate (PFHxS)	108427- 53-8	NL	170 J	0.0069	63.0 J	0.0078	250 J	0.0071	6.8 J	0.0073	
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	56.0 J	0.0029	36.0 J	0.0033	77.0 J	0.0030	2.1	0.0030	
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.02 UJ	0.017	0.085 J	0.020	0.29 J	0.018	0.021 UJ	0.018	
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	1.3	0.0064	0.10	0.0062	4.8	0.0058	0.67	0.0064	
Perfluorooctane sulfonate (PFOS)	1763-23- 1	0.2	2,500 J	0.013	150 J	0.015	4,300 J	0.014	110 J	0.014	
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	100 J	0.0097	11.0 J	0.011	38.0 J	0.010	1.6 J	0.010	
Perfluoropentanoic acid (PFPA)	2706-90- 3	NL	20.0 J	0.011	17.0 J	0.012	43.0 J	0.011	0.91	0.011	
Perfluoroundecanoic acid (PFUnA)	2058-94- 8	NL	0.01 U	0.0069	0.011 U	0.0077	0.033	0.0071	0.010 U	0.0072	

Note: Shaded values indicate analyte not detected at the method detection limit. BOLD values exceed EPA PHA.

 $\mu$ g/L = micrograms per liter

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors.

NL = Not listed. An EPA PHA value has not been established for this analyte.

U =Analyte not detected at the method detection limit.

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 7 Perfluorinated Chemicals Detected in Soil at Building 705 (Site 2)

	Sample	Number	PFB02-S	B-001-001	PFB02-S	B-001-005	PFB02-SI	B-002-001	PFB02-S	B-002-005	PFB02-SB-003-005		PFB02-SB-004-006	
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)										
Perfluorobutane Sulfonate (PFBS)	29420-43-3	NL	5.9 J	0.14	2.2	0.15	1.5	0.14	0.28 J	0.14	29 J	0.14	0.81 J	0.14
Perfluorobutanoic acid (PFBA)	375-22-4	NL	2.2 J	0.12	1.2	0.13	1.0	0.12	0.18 J	0.12	13 J	0.12	0.40 J	0.12
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	1.9 J	0.3	5.8	0.31	0.66 J	0.29	0.61 U	0.31	0.59 UJ	0.30	0.62 U	0.31
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.4 J	0.27	0.34 J	0.28	0.59 U	0.27	0.61 U	0.27	0.86 J	0.27	0.62 U	0.28
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	4.4	0.12	3.0	0.13	0.39 J	0.12	0.38 J	0.12	17 J	0.12	0.99	0.12
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	34	0.28	25	0.29	5.7	0.28	4.8	0.28	340 J	0.28	4.3	0.29
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	3.9	0.15	7.5	0.16	2.2	0.15	0.97	0.15	100 J	0.15	3.0	0.15
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.23 J	0.22	0.63 U	0.23	0.59 U	0.22	0.61 U	0.22	0.59 UJ	0.22	0.62 U	0.23
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	1.5 J	0.1	13	0.10	1.2	0.096	0.47 J	0.10	36 J	0.097	0.62 U	0.10
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	160 J	0.14	660 J	0.15	35	0.14	140	0.14	0.59 UJ	0.14	7.5	0.14
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	2.2 J	0.23	3.9	0.24	0.29 J	0.23	0.26 J	0.23	110 J	0.23	0.62 U	0.24
Perfluoropentanoic acid (PFPA)	2706-90-3		6.4 J	0.24	4.8	0.25	1.8	0.24	0.59 J	0.24	38 J	0.24	2.0	0.25
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	0.61 U	0.32	0.63 U	0.34	0.59 U	0.31	0.46 J	0.33	0.59 U	0.32	0.53 J	0.33
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.61 U	0.32	0.63 U	0.34	0.59 U	0.31	0.61 U	0.33	0.46 J	0.32	0.62 U	0.33

Note: Shaded values indicate analyte not detected at the method detection limit.

µg/kg = micrograms per kilogram

EPA = United States Environmental Protection Agency

NL = not listed. An EPA RSSL value has not been established for this analyte

U = Analyte not detected at the method detection limit

CAS = Chemical Abstract Service

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors. RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

Table 8 Environmental Samples Collected South of Hangars 630 and 647 (Site 3)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB03-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the northwest corner of the site in surface drainage from Hangar 630.
PFB03-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point at the northeast corner of the site in surface drainage from Hangar 647.
PFB03-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the north side of the site between Hangars 630 and 647.
PFB03-GW-004-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the south side of the site between Hangars 630 and 647.
PFB03-SB-001-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at the northwest corner of the site in surface drainage from Hangar 630.
PFB03-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring at the northwest corner of the site in surface drainage from Hangar 630.
PFB03-SB-002-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil on the northeast side of the site in surface drainage from Hangar 647.
PFB03-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring situated at the northeast corner of site in the drainage from Hangar 647.
PFB03-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water saturated zone in a soil boring on the north side of the site between Hangars 630 and 647.
PFB03-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the south side of the site between Hangars 630 and 647.

bgs = below ground surface

PFC = perfluorinated chemical or compound

Table 9 Perfluorinated Chemicals Detected in Groundwater South of Hangars 630 & 647 (Site 3)

	Sample	Number	PFB03-GV	V-001-000	PFB03-GV	V-002-000	PFB03-GV	W-003-000	PFB03-GW-004-000		
Analyte	CAS Number	EPA PHA (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.095	0.01	0.051	0.011	0.037	0.01	0.065 J	0.01	
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.096	0.014	0.07	0.015	0.051	0.014	0.076 J	0.014	
Perfluorohexane sulfonate (PFHxS)	108427- 53-8	NL	0.12	0.0072	0.066	0.0077	0.032	0.0072	0.06 J	0.0073	
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.16	0.003	0.095	0.0032	0.062	0.003	0.11 J	0.003	
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.021 U	0.018	0.02 J	0.019	0.021 U	0.018	0.021 UJ	0.018	
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	0.0075 J	0.0058	0.0069 J	0.0059	0.0092 J	0.006	0.023 J	0.0062	
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	0.61	0.014	0.58	0.015	0.37	0.014	0.95 J	0.014	
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.053	0.01	0.045	0.011	0.026	0.01	0.066 J	0.01	
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.23	0.011	0.12	0.012	0.058	0.011	0.13 J	0.011	

 $\mu$ g/L = micrograms per liter

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = Not listed. An EPA PHA value has not been established for this analyte.

U = Analyte not detected at the method detection limit

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 10 Perfluorinated Chemicals Detected in Soil from South Side of Hangars 630 & 647 (Site 3)

	Sam	ple Number	PFB03-SB-001-001		PFB03-SB-001-005		PFB03-SB-002-001		PFB03-SB-002-005		PFB03-SB-003-005		PFB03-SB-004-005	
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/L)	Result (µg/kg)	Reporting Limit (µg/kg)
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.54 J	0.12	0.62 U	0.12	1.1 J	0.11	0.65 U	0.13	0.62 U	0.12	0.69 U	0.14
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.38 J	0.27	0.62 U	0.28	0.98 J	0.26	0.65 U	0.29	0.62 U	0.28	0.69 UJ	0.31
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.41 J	0.12	0.22 J	0.12	0.79	0.11	0.25 J	0.13	0.16 J	0.12	0.69 U	0.14
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	0.53 J	0.28	0.62 U	0.29	0.57 U	0.27	0.65 UJ	0.3	0.62 U	0.29	0.69 U	0.32
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	1.5	0.15	0.18 J	0.16	4.1	0.14	0.22 J	0.16	0.62 U	0.15	0.22 J	0.17
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	6.5	0.14	0.69 J	0.15	3.2	0.13	0.91	0.15	1	0.14	0.8 J	0.16
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	0.55 J	0.23	0.62 U	0.24	0.41 J	0.22	0.65 U	0.25	0.62 U	0.24	0.69 U	0.26
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	1.2	0.24	0.62 U	0.25	3.2 J	0.23	0.33 J	0.26	0.62 U	0.25	0.69 U	0.28
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.61 U	0.32	0.62 U	0.33	0.84	0.3	0.65 U	0.35	0.62 U	0.33	0.69 UJ	0.37

Note: Shaded values indicate analyte not detected at the method detection limit.

µg/kg = micrograms per kilogram

EPA = United States Environmental Protection Agency

NL = not listed. An EPA RSSL value has not been established for this analyte

U = Analyte not detected at the method detection limit

CAS = Chemical Abstract Service

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors. RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

Table 11 Environmental Samples Collected at Building 810 (Site 4)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB04-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the east side of the storage building.
PFB04-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the storage building.
PFB04-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point in the west portion of the south grassy area.
PFB04-GW-004-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point in the east portion of the south grassy area.
PFB04-SB-001-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil at location on the east side of the storage building.
PFB04-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the storage building.
PFB04-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the west side of the storage building.
PFB04-SB-003-003	Soil	2-3	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring in the west portion of the south grassy area.
PFB04-SB-004-001	Soil	0-0.5	Determine if PFCs remain in the surface soil. Sample collected from surface soil in the east portion of the south grassy area.
PFB04-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring in the east portion of the south grassy area.

bgs = below ground surface PFC = perfluorinated chemical or compound

Table 12 Perfluorinated Chemicals Detected in Groundwater at Building 810 (Site 4)

	Samp	ole Number	PFB04-G	W-001-000	PFB04-G	W-002-000	PFB04-G	W-003-000	PFB04-GV	V-004-000
Analyte	CAS Number	EPA PHA (μg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)
Perfluorobutane sulfonate (PFBS)	29420- 43-3	NL	1.7 J	0.0083	1.7 J	0.0084	4.9 J	0.0083	21.0 J	0.008
Perfluorobutanoic acid (PFBA)	375-22-4	NL	2.1 J	0.0099	3.6 J	0.01	4.3 J	0.0098	2.5 J	0.0095
Perfluorodecane sulfonate (PFDS)	67906- 42-7	NL	2.0 J	0.0092	0.91 J	0.0093	0.71 J	0.0092	0.0097 UJ	0.0088
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.41 J	0.0079	0.64 J	0.008	0.71	0.0079	0.17 J	0.0076
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	5.9 J	0.013	5.4 J	0.013	7.7 J	0.013	4.9 J	0.013
Perfluorohexane sulfonate (PFHxS)	108427- 53-8	NL	23.0 J	0.007	30.0 J	0.0071	50.0 J	0.007	290 Ј	0.0067
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	12.0 J	0.0029	16.0 J	0.003	16.0 J	0.0029	23.0 J	0.0028
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.47 J	0.018	0.64 J	0.018	3.0 J	0.017	0.54 J	0.017
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	12.0 J	0.0059	7.2 J	0.0056	9.3 J	0.0057	0.39	0.0055
Perfluorooctane sulfonate (PFOS)	1763-23- 1	0.2	930 J	0.013	55.0 J	0.014	620 J	0.013	420 J	0.013
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	10.0 J	0.0098	8.0 J	0.01	13.0 J	0.0098	11.0 J	0.0095
Perfluoropentanoic acid (PFPA)	2706-90- 3	NL	6.0 J	0.011	9.9 J	0.011	9.8 J	0.011	9.6 J	0.011
Perfluoroundecanoic acid (PFUnA)	2058-94- 8	NL	0.01 U	0.0069	0.08 6 J	0.007	0.010 U	0.0069	0.029 J	0.0067

 $\mu g/L = micrograms per liter$ 

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency
J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = not listed. An EPA PHA value has not been established for this analyte.

U = Analyte not detected at the method detection limit

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 13 Perfluorinated Chemicals Detected in Soil at Building 810 (Site 4)

	Sam	ple Number	PFB04-S	B-001-001	PFB04-SI	B-001-005	PFB04-S	PFB04-SB-002-005		-003-003	PFB04-SB-004-001		PFB04-SB-004-003	
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)										
Perfluorobutane Sulfonate (PFBS)	29420-43-3	NL	1.2	0.13	0.62 J	0.17	0.8 J	0.17	1.4	0.17	1.9	0.13	0.15 J	0.15
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.3	0.11	2.2 J	0.14	1.3	0.15	0.82 J	0.14	0.57 U	0.11	0.19 J	0.13
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	71	0.29	23 J	0.36	56	0.37	29	0.36	5.1	0.28	0.72 J	0.33
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.1	0.26	1.4 J	0.32	0.81 J	0.33	0.7 J	0.33	1.1	0.26	0.66 U	0.29
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	4.5	0.54	0.72 U	0.68	1.5 J	0.7	0.72 U	0.69	0.57 U	0.54	0.66 U	0.62
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	1.9	0.11	3.9	0.14	1.9	0.15	2.4	0.14	0.73 J	0.11	0.28 J	0.13
Perfluorohexane Sulfonate (PFHxS)	108427-53-8	NL	27	0.27	21	0.34	18	0.34	28	0.34	9.7	0.27	9.4	0.31
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	7	0.14	11	0.18	6.7	0.18	4.1	0.18	2.2	0.14	0.5 J	0.16
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.29 J	0.21	0.27 J	0.26	0.73 U	0.27	0.32 J	0.27	0.44 J	0.21	0.66 U	0.24
Perfluorooctane Sulfonamide (FOSA)	754-91-6	NL	120	0.093	160	0.12	35	0.12	14	0.12	2.6	0.093	0.91	0.11
Perfluorooctane Sulfonate (PFOS)	1763-23-1	6,000	180	0.13	95	0.17	130	0.17	39	0.17	31	0.13	190	0.15
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	9.6	0.22	11	0.28	5.6	0.28	2.7	0.28	0.83	0.22	0.54 J	0.25
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	1.9	0.23	5.3 J	0.29	3.6	0.29	2	0.29	0.77	0.23	0.28 J	0.26
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	0.9 J	0.66	1.7 UJ	0.83	1.7 UJ	0.83	1.7 U	0.83	1.3 U	0.65	1.5 U	0.75
Perfluorotridecanoic Acid (PFTriA)	72629-94-8	NL	1.4	0.31	0.72 U	0.38	0.46 J	0.39	0.72 U	0.39	0.57 U	0.3	0.66 U	0.35
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	5	0.31	1.2	0.38	0.77 J	0.39	1.1	0.39	1.4	0.3	0.66 U	0.35

Note: Shaded values indicate analyte not detected at the method detection limit.

μg/kg =micrograms per kilogram
EPA = United States Environmental Protection Agency
NL = Not listed. An EPA RSSL value has not been established for this analyte

U = Analyte not detected at the method detection limit

CAS = Chemical Abstract Service

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors. RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

Table 14 Environmental Samples Collected at Hangar 630, North Side (Site 5)

Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB05-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the east side of the hangar ramp.
PFB05-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the hangar ramp.
PFB05-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the site at the collection point for the surface water drainage.
PFB05-SB-001-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the hangar ramp.
PFB05-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the west side of the hangar ramp.
PFB05-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the site at the collection point for the surface water drainage.
PFB05-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring in the east side of the site at the tarmac, in the surface drainage path from the hangar.
PFB05-SD-001-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected from the pond west of the hangar area at the head wall of the drainage culvert. Sample co-located with surface water sample.
PFB05-SW-001-000	Surface Water	NA	Determine if PFCs are in the surface water downstream of the hangar area. Sample collected from the collection pond west of the hangar area at the head wall of the drainage culvert. Sample co-located with sediment sample.
PFB05-SD-002-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected at the inlet to the surface water drainage culvert west of the hangar.

bgs = below ground surface
PFC = perfluorinated chemical or compound

Table 15 Perfluorinated Chemicals Detected in Groundwater at Hangar 630, North Side (Site 5)

	Samı	ole Number	PFB05-G	W-001-000	PFB05-GW	-002-000	PFB05-GV	V-003-000
Analyte	CAS Number	EPA PHA (μg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.058	0.0087	0.0096 U	0.0088	0.017 J	0.0089
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.2	0.01	0.48	0.01	1.1	0.011
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.17 J	0.0083	0.64 J	0.0083	0.11	0.0085
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	2.0	0.014	1.5	0.014	1.3	0.014
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.65	0.0074	0.047	0.0074	0.13	0.0075
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	2.4	0.0031	1.8	0.0031	2.8 J	0.0031
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.6	0.018	0.22	0.018	0.37	0.019
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	3.8 J	0.014	0.38	0.014	2.3	0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	1.7	0.01	0.67	0.010	0.99	0.011
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	2.5	0.012	1.6	0.012	2.8	0.012
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.011 U	0.0073	0.011 J	0.0073	0.011 U	0.0075

 $\mu g/L = micrograms per liter$ 

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors.

NL = not listed. An EPA PHA value has not been established for this analyte.

U = Analyte not detected at the method detection limit

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 16 Perfluorinated Chemicals Detected in Soil at Hangar 630, North Side (Site 5)

	Sample	Number	PFB05-S	B-001-005	PFB05-SI	B-002-005	PFB05-S	B-003-004	PFB05-S	B-004-005
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.1	0.13	0.66 U	0.13	0.77 U	0.15	0.52 J	0.14
Perfluorodecane sulfonate (PFDS)	67906- 42-7	NL	0.65 U	0.32	0.36 Ј	0.33	0.77 U	0.38	0.71 U	0.36
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.65 U	0.29	9.4	0.3	0.77 U	0.35	0.71 J	0.32
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	1.1	0.13	1.7	0.13	0.23 Ј	0.15	0.6 J	0.14
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	1.6	0.16	1.2	0.17	1.1	0.19	0.79 J	0.18
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.65 U	0.24	2.2	0.24	0.77 U	0.28	0.71 U	0.26
Perfluorooctane Sulfonate (PFOS)	1763-23- 1	6,000	1.2	0.15	6.9	0.15	0.34 Ј	0.18	0.71 U	0.17
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	0.65 J	0.25	0.92	0.25	0.77 U	0.3	0.71 U	0.27
Perfluoropentanoic acid (PFPA)	2706-90- 3	NL	1.6	0.26	0.85 J	0.26	0.92 J	0.31	0.81 J	0.28
Perfluoroundecanoic acid (PFUnA)	2058-94- 8	NL	0.65 U	0.34	0.66 J	0.35	0.77 U	0.41	0.71 U	0.38

Note: Shaded values indicate analyte not detected at the method detection limit.

μg/kg = micrograms per kilogram

CAS = Chemical Abstract Service

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = Not listed. An EPA RSSL value has not been established for this analyte

RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

U = Analyte not detected at the method detection limit

EPA = United States Environmental Protection Agency

11/6

Table 17 Perfluorinated Chemicals Detected in Surface Water at Hangar 630, North Side (Site 5)

	Sample	Number	PFB05-S	W-001-000	PFB05-SW-001-900 (Field Duplicate)		
Analyte	CAS Number	EPA PHA (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reportin g Limit (µg/L)	
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.019 J	0.0082	0.022	0.0081	
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.077	0.0097	0.084	0.0097	
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.05 J	0.0078	0.04 J	0.0077	
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.22 J	0.013	0.22	0.013	
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.24	0.0069	0.26	0.0069	
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.35	0.0029	0.33	0.0029	
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.045 J	0.017	0.036 J	0.017	
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	1.3 J	0.013	1.3	0.013	
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.17	0.0097	0.17	0.0097	
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.27	0.011	0.27	0.011	

 $\mu g/L = micrograms per liter$ 

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = Not listed. An EPA PHA value has not been established for this analyte.

U = Analyte not detected at the method detection limit

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 18 Perfluorinated Chemicals Detected in Sediment at Hangar 630, North Side (Site 5)

	Sample	Number	PFB05-SI	D-001-001	PFB05-SI (Field D	0-001-901 uplicate)	PFB05-SD-002-001		
Analyte	CAS Number	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	
Perfluorobutanoic acid (PFBA)	375-22-4	NL	1.7 J	0.2	0.72 U	0.14	1.2	0.12	
Perfluorodecane sulfonate (PFDS)	67906-42-7	NL	2.1 J	0.51	0.72 U	0.36	0.62 U	0.31	
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.0 UJ	0.46	0.72 U	0.33	0.29 J	0.28	
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	3.4 J	0.96	0.72 U	0.69	0.62 U	0.59	
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.48 J	0.2	0.72 U	0.14	1.2	0.12	
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	1.3 J	0.47	0.72 U	0.34	0.62 U	0.29	
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	6.7 J	0.25	0.72 U	0.18	14.0	0.16	
Perfluorooctane sulfonate (PFOS)	1763-23-1	6,000	22.0 J	0.24	3.3	0.17	0.39 J	0.14	
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	1.3 J	0.39	0.72 U	0.28	1.9	0.24	
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.62 J	0.41	0.72 U	0.29	1.7	0.25	
Perfluorotridecanoic acid (PFTriA)	72629-94-8	NL	0.99 J	0.54	0.72 U	0.39	0.62 U	0.33	
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.78 J	0.54	0.72 U	0.39	0.62 U	0.33	

Note: Shaded values indicate analyte not detected at the method detection limit.

μg/kg = micrograms per kilogram

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = Not listed. An EPA RSSL value has not been established for this analyte

RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

U = Analyte not detected at the method detection limit

Table 19 Environmental Samples Collected at Hangar 647, North Side (Site 6)

			ital Samples Conected at Hangar 047, North Side (Site 0)
Sample Identifier	Matrix	Sample Interval (feet/bgs)	Purpose/Location
PFB06-GW-001-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the east side of the hangar ramp.
PFB06-GW-002-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the hangar ramp.
PFB06-GW-003-000	Groundwater	4-5	Determine if PFCs are in the shallow groundwater. Sample collected from temporary well point on the west side of the site between Hangars 647 and 630.
PFB06-SB-001-004	Soil	3-4	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the east side of the hangar ramp.
PFB06-SB-002-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in the soil boring on the west side of the hangar ramp.
PFB06-SB-003-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the site between Hangars 647 and 630.
PFB06-SB-004-005	Soil	4-5	Determine if PFCs remain in the subsurface soil above the vadose zone. Sample collected from just above the first water-saturated zone in a soil boring on the west side of the site at the tarmac, in the surface drainage path from the hangar.
PFB06-SD-001-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected from the drainage canal west of the hangar area at the outfall to the Banana River. Sample co-located with surface water sample.
PFB06-SW-001-000	Surface Water	NA	Determine if PFCs are in the surface water downstream of the hangar area. Sample collected from the drainage canal west of the hangar area at the outfall to the Banana River. Sample collocated with sediment sample.
PFB06-SD-002-001	Sediment	0-1	Determine if PFCs are in the sediment of the surface drainage system. Sample collected in the drainage canal west of the hangar area.

bgs = below ground surface

PFC = perfluorinated chemical or compound

Table 20 Perfluorinated Chemicals Detected in Groundwater at Hangar 647, North Side (Site 6)

	Sample	Number	PFB06-	GW-001-00	0	PFB(	6-GV	V-002-000	PFB	06-GV	V-003-000
Analyte	CAS Number	EPA PHA (µg/L)	Result (µg/L)	Lim	Reporting Limit (µg/L)		ı <b>lt</b> L)	Reporting Limit (µg/L)	Res (µg/		Reporting Limit (µg/L)
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.0098 L	0.009	90	0.0095	U	0.0087	0.017	J	0.0089
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.17	0.01	1	1.8		0.010	0.94		0.011
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.19 J	0.008	35	0.031	J	0.0082	0.045	J	0.0085
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.59	0.01	4	3.4	J	0.014	2.2	J	0.014
Perfluorohexane sulfonate (PFHxS)	108427-53- 8	NL	0.020 J	0.007	76	0.052		0.0073	0.021	J	0.0075
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.47	0.003	32	4.6	J	0.0031	2.9	J	0.0031
Perfluorononanoic acid (PFNA)	375-95-1	NL	1.9	0.01	9	0.63		0.018	0.86		0.019
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	0.0095 J	0.005	58	0.0073	J	0.0059	0.015	U	0.0058
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	1.1	0.01	4	0.19		0.014	0.17		0.014
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.95	0.01	1	3.3	J	0.010	6.3	J	0.011
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.43	0.01	2	4.3	J	0.011	2.4		0.012
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	0.022 L	IJ 0.01	6	0.015	J	0.015	0.022	UJ	0.016
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	0.033 J	0.007	75	0.011	UJ	0.0072	0.011	UJ	0.0074

μg/L = micrograms per Liter

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = Not listed. An EPA PHA value has not been established for this analyte.

U = Analyte not detected at the method detection limit

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 21 Perfluorinated Chemicals Detected in Soil at Hangar 647, North Side (Site 6)

	Sample	Number	PFB06-SI	B-001-004	PFB06-SI	B-002-005	PFB06-SI	B-003-005	PFB06-SB-004-005		
Analyte	CAS	EPA RSSL (µg/kg)	Result (µg/kg)	Reportin g Limit (µg/kg)							
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.66 U	0.13	0.65 U	0.13	2.1	0.13	0.1 5 J	0.13	
Perfluorodecanoic acid (PFDA)	335-76-2	NL	1.4 J	0.30	5.1	0.29	4.4	0.29	0.6 3 U	0.28	
Perfluorododecanoic acid (PFDoA)	307-55-1	NL	1.1 J	0.63	0.65 U	0.61	0.65 U	0.62	0.6 3 U	0.59	
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.28 J	0.13	0.66 J	0.13	1.3	0.13	0.3 0 J	0.13	
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.62 J	0.16	0.90	0.16	3.1	0.16	0.8 8	0.16	
Perfluorononanoic acid (PFNA)	375-95-1	NL	3.1	0.24	3.7	0.24	3.8	0.24	2.3	0.23	
Perfluorooctane sulfonate (PFOS)	1763-23-1	6,000	6.7 J	0.15	8.4	0.15	9.1	0.15	0.5 6 J	0.15	
Perfluorooctanoic acid (PFOA)	335-67-1	16,000	1.4 J	0.25	5.9	0.25	4.0	0.25	0.9 4	0.24	
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.66 U	0.26	0.44 J	0.26	3.1	0.26	1.0	0.25	
Perfluorotetradecanoic acid (PFTeA)	376-06-7	NL	1.5 U	0.76	1.5 U	0.74	1.5 U	0.75	1.2 J	0.72	
Perfluorotridecanoic acid (PFTriA)	72629-94-8	NL	0.66 U	0.35	0.65 U	0.34	0.65 U	0.35	0.8	0.33	
Perfluoroundecanoic acid (PFUnA)	2058-94-8	NL	2.0	0.35	1.5	0.34	1.2	0.35	0.6 3 U	0.33	

Note: Shaded values indicate analyte not detected at the method detection limit.

μg/kg = micrograms per kilogram

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = Not listed. An EPA RSSL value has not been established for this analyte

RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

U = Analyte not detected at the method detection limit

Table 22 Perfluorinated Chemicals Detected in Surface Water at Hangar 647, North Side (Site 6)

	Sample	Number	PFB06-SW	V-001-000
Analyte	CAS Number	EPA PHA (µg/L)	Result (µg/L)	Reporting Limit (µg/L)
Perfluorobutane sulfonate (PFBS)	29420-43-3	NL	0.015 J	0.0083
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.042	0.0099
Perfluorodecanoic acid (PFDA)	335-76-2	NL	0.0085 J	0.0079
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.080	0.013
Perfluorohexane sulfonate (PFHxS)	108427-53-8	NL	0.24	0.0071
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.19	0.0029
Perfluorononanoic acid (PFNA)	375-95-1	NL	0.022 J	0.018
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	1.4	0.013
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.076	0.0099
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.11	0.011

 $\mu g/L = micrograms per liter$ 

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate because of quantification factors.

NL = Not listed. An EPA PHA value has not been established for this analyte.

U = Analyte not detected at the method detection limit

PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

Table 23 Perfluorinated Chemicals Detected in Sediment at Hangar 647, North Side (Site 6)

	Sample	e Number	PFB06-S	D-001-001	PFB06-SD-002-001		
Analyte	CAS	EPA RSSL (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	Result (µg/kg)	Reporting Limit (µg/kg)	
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.72 U	0.18	0.30 J	0.18	
Perfluorooctane sulfonate (PFOS)	1763-23-1	6,000	0.96	0.17	2.8	0.17	
Perfluorotridecanoic acid (PFTriA)	72629-94-8	NL	0.98	0.38	0.73 U	0.39	

Note: Shaded values indicate analyte not detected at the method detection limit.

μg/kg = Micrograms per kilogram

CAS = Chemical Abstract Service

EPA = United States Environmental Protection Agency

J = Estimated value. The analyte was positively identified, but the value is an estimate due to quantification factors.

NL = Not listed. An EPA RSSL value has not been established for this analyte

RSSL = Residential Soil Screening Level. EPA Memorandum, November 2009.

U = Analyte not detected at the method detection limit

Table 24 Perfluorinated Chemicals Detected in Groundwater at Building 313 (Site 7)

Sample Number			PFB07-GW-S03-000		PFB07-GW-S03-900 (Field Duplicate)		PFB07-GW-S04-000		PFB07-GW-S11-000		PFB07-GW-S17-000	
Analyte	CAS Number	EPA PHA (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)	Result (µg/L)	Reporting Limit (µg/L)
Perfluorobutanoic acid (PFBA)	375-22-4	NL	0.011 J	0.0096	0.011 J	0.0094	0.0098 U	0.0096	0.0096 U	0.0094	0.010 J	0.0097
Perfluoroheptanoic acid (PFHpA)	375-85-9	NL	0.019 J	0.013	0.016 J	0.013	0.019 J	0.013	0.019 U	0.013	0.021 J	0.013
Perfluorohexane sulfonate (PFHxS)	108427- 53-8	NL	0.024 J	0.0069	0.023 J	0.0067	0.039 J	0.0068	0.021 J	0.0067	0.035 J	0.0069
Perfluorohexanoic acid (PFHxA)	307-24-4	NL	0.016 J	0.0029	0.019	0.0028	0.021	0.0029	0.0075 J	0.0028	0.019 J	0.0029
Perfluorooctane sulfonamide (FOSA)	754-91-6	NL	0.015 U	0.0057	0.015 U	0.0057	0.015 U	0.0058	0.014 J	0.0058	0.016 J	0.0057
Perfluorooctane sulfonate (PFOS)	1763-23-1	0.2	0.13 J	0.013	0.11 J	0.013	0.61 J	0.013	0.13 J	0.013	0.21 J	0.013
Perfluorooctanoic acid (PFOA)	335-67-1	0.4	0.027 J	0.0096	0.025 J	0.0094	0.027 J	0.0096	0.016 J	0.0094	0.033 J	0.0097
Perfluoropentanoic acid (PFPA)	2706-90-3	NL	0.012 J	0.011	0.015 J	0.010	0.020 J	0.011	0.0096 U	0.010	0.012 J	0.011

 $\mu g/L = micrograms \ per \ liter \\ EPA = United \ States \ Environmental \ Protection \ Agency$ 

NL = Not listed. An EPA PHA value has not been established for this analyte.

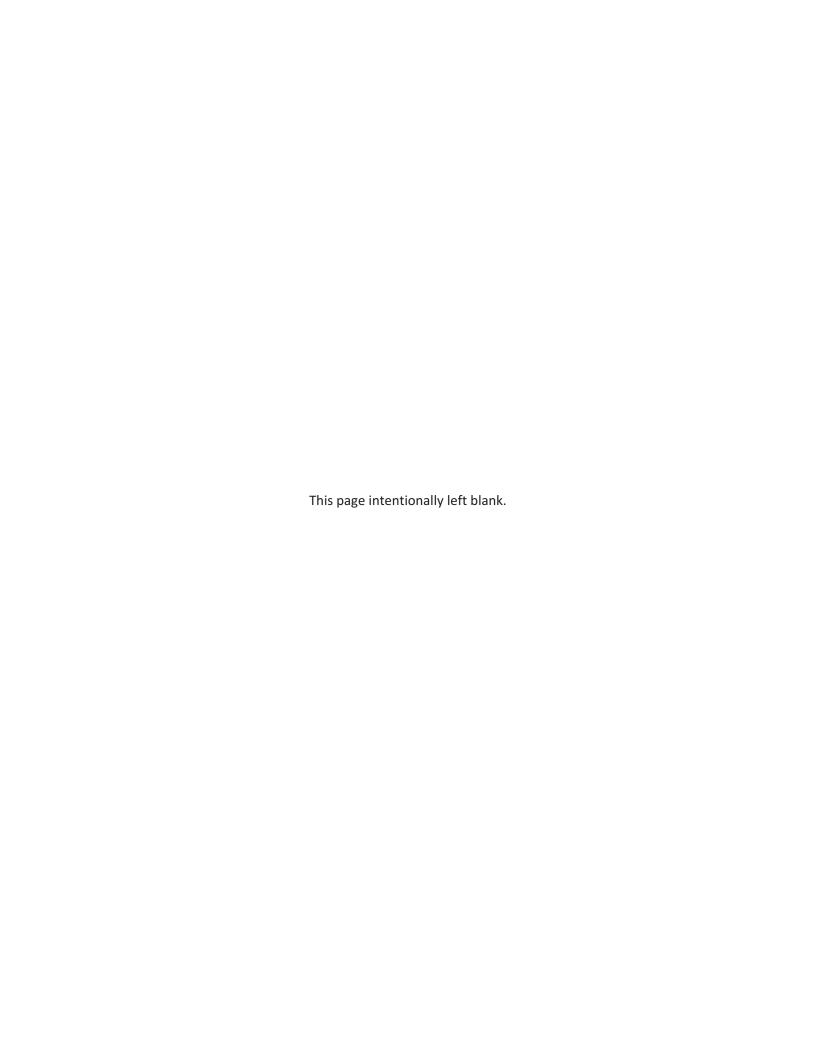
PHA = Provisional Health Advisory. EPA Memorandum, October 2009.

 $CAS = Chemical \ Abstract \ Service \\ J = Estimated \ value. \ The \ analyte \ was \ positively \ identified, \ but \ the \ value \ is \ an \ estimate \ because \ of \ quantification \ factors.$ 

U = Analyte not detected at the method detection limit

B-23 Q1062.0007 11/7/2014

## APPENDIX B PHOTOGRAPH LOGS







22 May 2017 1821

## Photo 1:

AFFF Release Area 3 (Northern Sewage Treatment Plant); DPT drilling at MW03001

Direction of Photo: North



23 May 2017 0900

## Photo 2:

AFFF Release Area 2 (Fire Truck Rollover); Hand auger installation of MW02001

Direction of Photo: Northwest





23 May 2017 0845

Photo 3: AFFF Release Area 2 (Fire Truck Rollover); Well development of MW02002

Direction of Photo: North



23 May 2017 1035

Photo 4: AFFF Release Area 2 (Fire Truck Rollover); Groundwater sampling at MW02002

Direction of Photo: North





24 May 2017 9:21

#### Photo 5:

AFFF Release Area 1 (Former FTA 2); DPT drilling at MW01006

Direction of Photo: Southwest



## 24 May 2017 10:19

#### Photo 6:

FTA No. 1 Burn Pit 2; well drilling equipment decontamination

Direction of Photo: South





25 May 2017 1126

#### Photo 7:

AFFF Release Area 3 (Northern Sewage Treatment Plant); ground surface after temporary monitoring well abandonment at MW03002

Direction of Photo: West



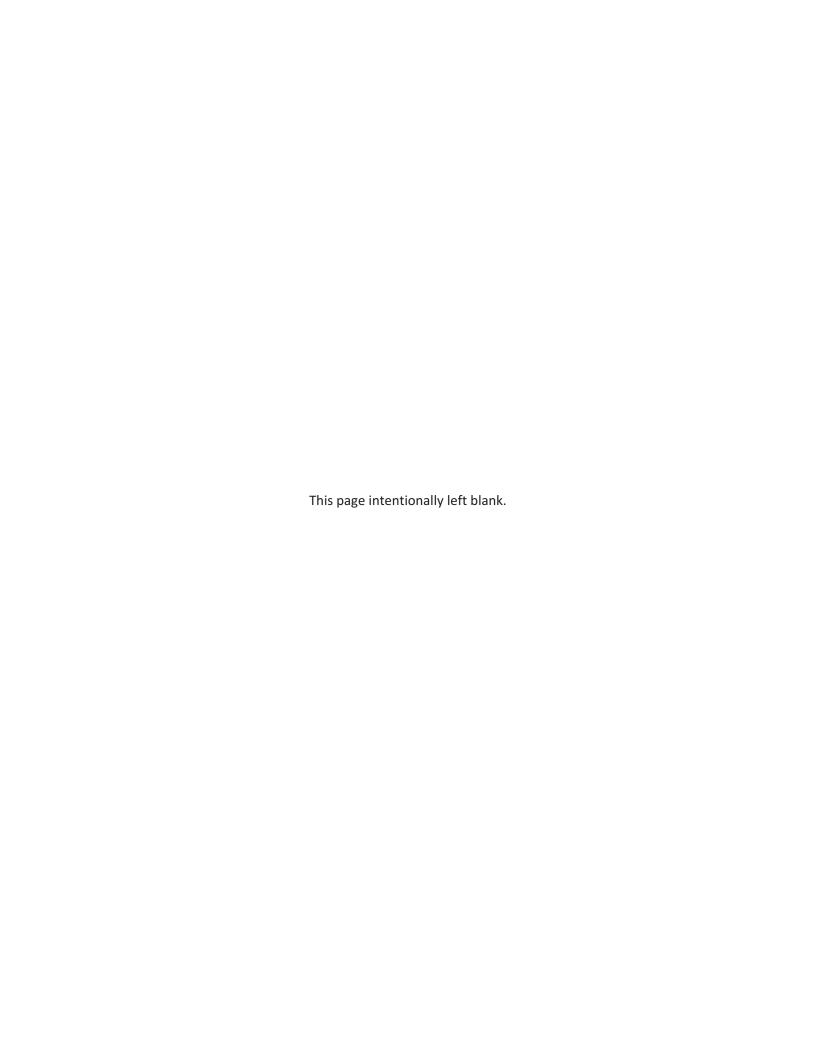
25 May 2017 1515

#### Photo 8:

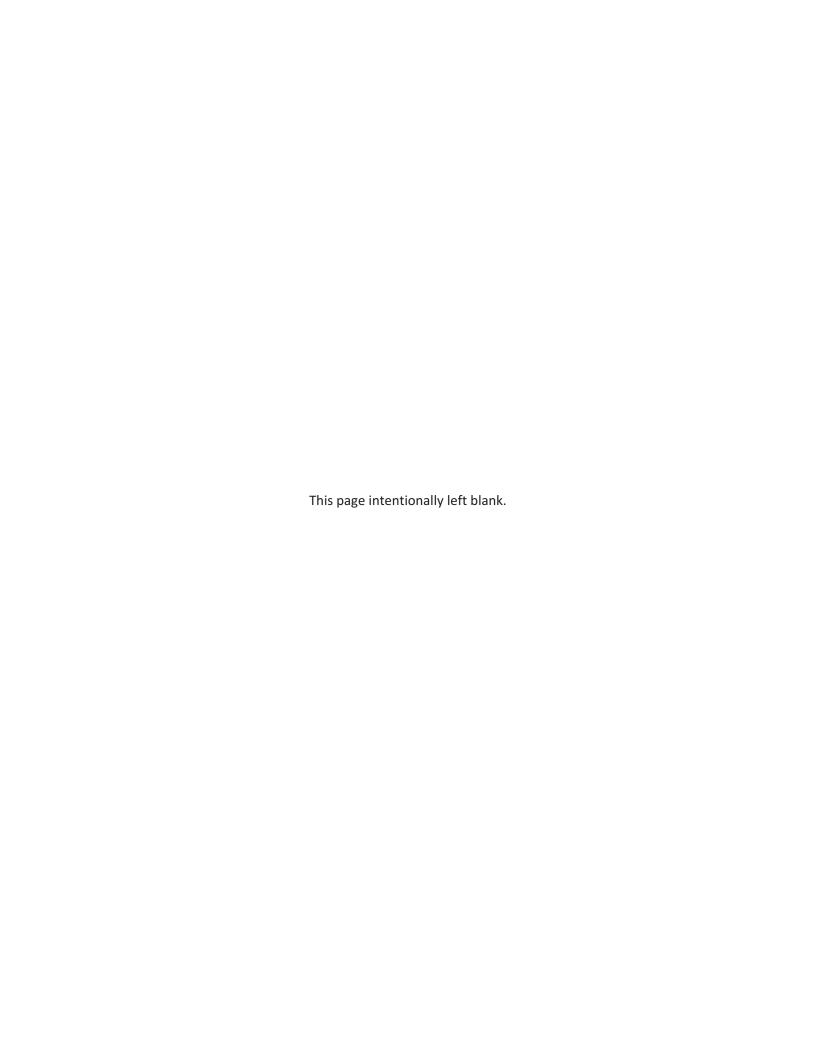
IDW drum storage area

Direction of Photo: Northwest **APPENDIX C** 

**FIELD FORMS** 



# APPENDIX C-1 FIELD ACTIVITY DAILY LOGS





QA/QC'd by:	Thomas W. Hensel		QA/Q	C Date:	6/14/2017
					Jason Hayes
					Name (print):
	None		None		
visitors on Site:		important 1	elephone Galis / Photos Take	:11 <b>.</b>	ioignature:
Visitors on Site:		Important T	elephone Calls / Photos Take	n.	Signature:
		N	one		
Deviation from Pla	ans:				
Davidation for a Di					
	Р	TRCK03-SO-001	, PTRCK03-SO-002		
List Samples Coll	ectea:				
Lint Committee C. "	anto di				
	ппопед демеюрите	o. mivv 0300 f.,	1000 dii porodrinerieri site idi tile t	awy.	
	rick AFB and traveled to AFFF Area 3., 17 0-001, 1800-took sample PTRCK03-SO-( finished development	002, 1830-comple		ell. AmDrill	
4000 1 1 1 5					
Describtion of Da	ny Activities and Events:				
Technician(s):	ily Activities and Events:		Jason Hayes, Jason Drizd		
Weather:	Cloudy, 10-15 mph winds,	upper 80s	Date and Time:		05/22/17 2249
Installation:	Patrick AFB (PTRC	CK)	Investigation Area:		AFFF Release Area 3
Contract:	FA8903-16-D-002	27	Task Order:		0004
Project Name:	Site Inspection of AFFF Rel Environmental Programs V		Project Number:		775303101.0025
					wheeler
					JOSECI



				wheeler
Project Name:	Site Inspection of AFFF Release Environmental Programs World	Project Nilmber:		775303101.0025
Contract:	FA8903-16-D-0027	Task Order:		0004
Installation:	Patrick AFB (PTRCK)	Investigation Area:	AFFF	Release Areas 1, 2, and 3
Weather:	Partly cloudy, 5-10 mph, uppe	Pr 80s Date and Time:		05/23/17 20:37
Technician(s):		Jason Hayes, Jason Drizd		
Description of Daily	/ Activities and Events:			
checklist., 0850-survey 2., 0900-started hand SO-001, 0920-complet 0930-took sample P MW02002. Starte development of MW0 sample PTRCK02-GW of MW02003. Had to r 1230-off airfield with d rest of the AmecFW p PTRCK03-SO-004, equipment to mobilize started hand augering the groundwater	yors left for Cape Canaveral to survey in augering at MW02002, 0905-took sampleted installation of MW02002. Set up to de TRCK02-SO-006, 0945-completed develoed hand augering at MW02001., 1000-to 12003. Started development of MW02001/-002 and PTRCK-FD-GW-001, 1110-compobilize out of the area for a plane landir diffilers., 1400-Gary Kihn and surveyors with personnel and AmDrill mobilized to MW0300, 1445-completed installation of MW0300 to to the next area., 1530-all activities on that MW01001. Encountered a liner mate table, due to some hydrocarbon contame 20-took sample PTRCK01-SO-001, 1725-	age area., 0845-conducted tailgate safety mewells installed yesterday., 0855-AmDrill and e PTRCK02-SO-003, 0910-took sample PTI evelop the well. Started hand augering at Moopment of MW02002. Started development ob sample PTRCK02-SO-001, 1005-took sa., 1040-completed development of MW0200 mpleted sampling of MW02002. Started saring., 1150-started setup for sampling at MW0 ent back to airfield to survey. AmDrill came of 8002 and started hand augering., 1420-took 2. Setup to develop well., 1515-finished de he airfield were completed, surveyors left for itial at about 1 foot. Soils collected below the ination. Highest PID reading was 345 ppm. Atook sample PTRCK01-SO-002, 1745-Com and took sample PTRCK-EB-001., 1830-lef	AmecFW pers RCK02-SO-004 W02003., 0925 of MW02003., Imple PTRCK0 D1. Started sar mpling of MW0 2001., 1214-cc over afterward verlopment of M r the day., 1545 e liner had PID John Langett v pleted well inst	onnel escorted out to AFFF Area 1, 0915-took sample PTRCK-FD-took sample PTRCK-SD-005, 0950-completed installation of 2-SO-002, 1015-completed mpling of MW02002., 1103-took 2003., 1135-completed sampling of MW02001., to abandon the wells., 1405-The K03-SO-003, 1425-took sample MW03002. Started loading up 5-mobilized to MW01001., 1620-reading increasing all the way to was notified of the possible callation at MW01001., 1800-
List Samples Collec				,
		TRCK02-SO-005, PTRCK02-SO-006, PTRC GW-003, PTRCK02-GW-001, PTRCK03-SC		
Deviation from Plan	ns:			
		None		
Visitors on Site:		Important Telephone Calls / Photos	Taken:	Signature:
	John Langett	None		Name (print):  Jason Hayes
QA/QC'd by:	Thomas W. Hensel	QA	QC Date:	6/14/2017

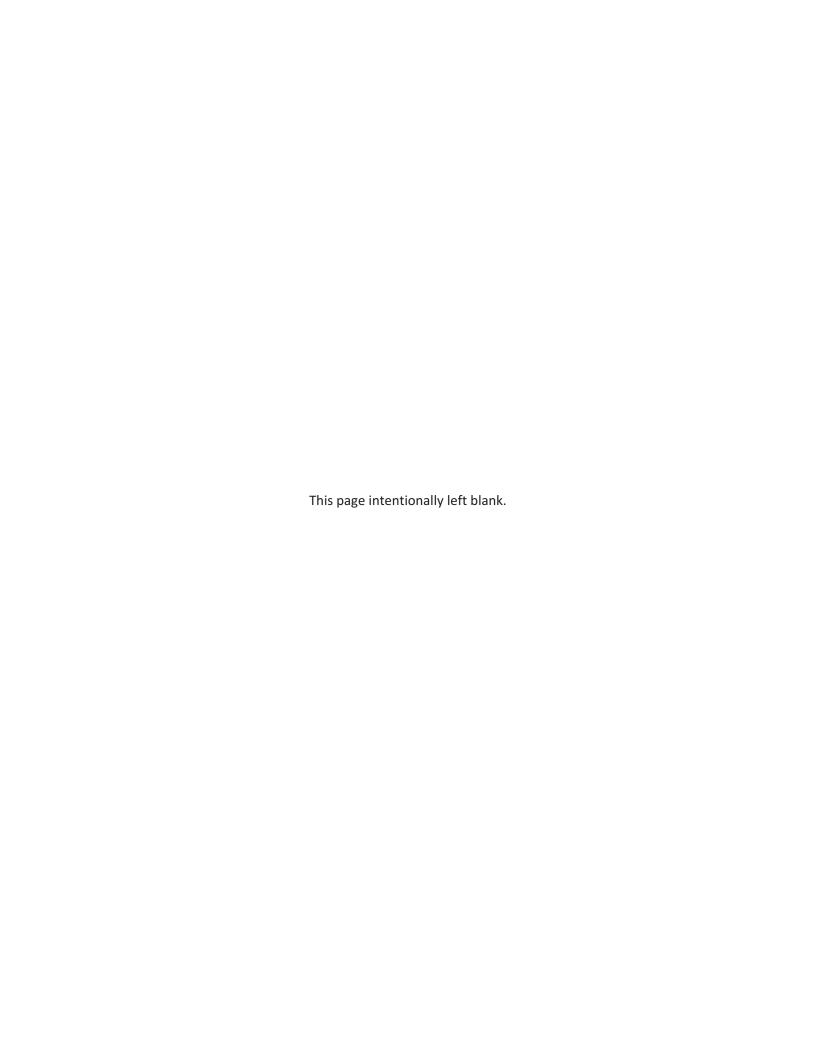


Project Name:	775303101.0025		
Contract:	FA8903-16-D-0027	Task Order:	0004
Installation:	Patrick AFB (PTRCK)	Investigation Area:	AFFF Release Areas 1, 2, and 3
Weather:	Cloudy, windy, upper 80s	Date and Time:	05/24/17 1828
Technician(s):		Jason Hayes, Jason Drizd	
Description of Da	nily Activities and Events:		
the rest of the Am finalized installation installation of MW0 this location., 0935 006., 1005-finalized finalized installation Patrick AFB., 1450 existing well 610 MW01003., 1551-J	ecFW personnel and AmDrill went to MW01 nof MW01002. Mobilized to MW01003. MW 1003. Mobilized to MW01006., 0905-took sal-finalized installation of MW01006. Mobilized installation of MW01004. Mobilized to MW0 of MW01004. Mobilized back to Cape Canal-JD completed groundwater sampling at MW-MW17., 1520- AmecFW and AmDrill starte D completed groundwater sampling at existing elopment of MW01004. Mobilized to MW010104. Mobilized to MW010106.	overal AFS to start abandonment of temporary 1/03002. A FD was taken at this location with development at MW01002., 1545-completed well 610-MW17., 1605-completed develop	715-took sample PTRCK01-SO-004, 0815-nologic logging per the ISWP., 0900-finalized PTRCK01-SO-010. A MS/MSD was taken at -SO-005., 0945-took sample PTRCK01-SO-1015-took sample PTRCK01-SO-008., 1050-wells installed on 5/22., 1400-Arrived back at sample id PTRCK-FD-SO-002. Mobilized to d development of MW01002. Mobilized to
PTRCK01-SO-003,		CK01-SO-010, PTRCK01-SO-005, PTRCK0 <sup>-</sup> -002, PTRCK03-GW-610-MW17, PTRCK-EB	
Deviation from P	ans:		
		None	
Visitors on Site:		Important Telephone Calls / Photos Ta	aken: Signature:
	John Langett	None	
			Name (print):
			Jason Hayes
QA/QC'd by:	Thomas W. Hensel	QA/QC	Date: 6/14/2017



			WITCH
Project Name:	Site Inspection of AFFF Release Environmental Programs Worl	Project Nilmber.	775303101.0025
Contract:	FA8903-16-D-0027	Task Order:	0004
Installation:	Patrick AFB (PTRCK)	Investigation Area:	AFFF Release Area 1
Weather:	Clear calm, mid 80s	Date and Time:	05/25/17 1746
Technician(s):		Jason Hayes, Jason Drizd	
Drizd (JD) setup on MW surveying each well., 084 MW01002, setup on MW1 Patrick AFB (PTRCK-Solin 1220-left MW01004, setup Canaveral to get base completion., 1410-Gary Hemp wells. All well have IDW sample from Patric containment storage comwater., 1630-left Patrick	all AmecFW and AmDrill personnel., 0/01001 to start groundwater sampling. 40-took sample PTRCK01-GW-001, 0 01003., 1026-took sample PTRCK01-0 on MW01005., 1316-took sample PT specific labels for IDW., 1330-survey. (ihn left site to travel back home. Jase e been abandoned with cement grout rick AFB (PTRCK-Liquid IDW), 1615-ventainers. A total of 8 drums of IDW were AFB. AmDrill left site to travel back hiperly with base specific labels. A total purge water and deconting	0800-conducted tailgate safety meeting and co AmDrill started abandonment of wells at AFF 845-left MW01001, setup on MW01002, 0932- GW-003, 1030-left MW01006, setup on MW01 GW-006, 1125-left MW01006, setup on MW01 RCK01-GW-005, 1320-left MW01005., 1330- ors started to get points in AFFF Area 1, will drien Hayes (JH) traveled back to Patrick AFB., 1 mix., 1530-finalized mobilization of IDW to stagnified all drums were labeled properly with base re left at Patrick AFB, 1 was drill cuttings, 7 we some. JH and JD traveled to cape canaveral to of 4 drums of IDW were left at Patrick AFB, 1 water., 1720-both JD and JH left site to travel h	FF Area 3 after AmecFW surveyors finished 2-took sample PTRCK01-GW-002., 0935-left 1006., 1045-collected Solid IDW sample from 1004., 1216-took sample PTRCK01-GW-004, 1-Gary Kihn and Jason Hayes traveled to cape rillers abandoning the location after survey 1430-surveyors have completed survey of all aging area at Patrick., 1545-collected Liquid as especific labels and covered in secondary ere liquid waste from purge water and deconto take liquid IDW sample., 1715-verified all 1 was drill cuttings, 3 were liquid waste from
PTRCK01-GW-001, PTR	CK01-GW-002, PTRCK01-GW-003, F	PTRCK01-GW-006, PTRCK01-GW-004, PTRC Liquid IDW	CK01-GW-005, PTRCK-Solid IDW, PTRCK-
Deviation from Plans:	:		
		None	
Visitors on Site:		Important Telephone Calls / Photos T	Faken: Signature:
	None	None	No. 7 10
			Name (print):  Jason Hayes
QA/QC'd by:	homas W. Hensel	QA/Q0	C Date: 6/16/2017

# APPENDIX C-2 DAILY PFAS PROTOCOL CHECKLISTS





						wneeler		
Proj	ect Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	Proje	ect Number:		775303101.0025		
Cont	tract:	FA8903-16-D-0027	Task Order:			0004		
Insta	allation:	Patrick AFB (PTRCK)	Wea	ther	Claudu 1	0.45		
Site	/Area Name:	AFFF Release Area 3	(temp./precipitation):		Cloudy, 1	0-15 mph winds, upper 90s		
Field	l Manager:	Jason Hayes	Date	and Time:		05/22/17 1740		
Fie	eld Clothing and	PPE (as applicable):	Sai	mple Containers:				
J	Field crew in co	ompliance with Tables 1 and 2, SOP AFW-01	1	All sample containe	rs made of HDPE	or polypropylene. Samples are		
J	Field crew has	not used fabric softener on clothing	4	not stored in containers made of LDPE				
Field crew has not used cosmetics, moisturizers, hand cream, or other related products or exposed body parts this morning		J	Caps are lined or unlined and made of HDPE or polypropylene					
Field crew has not applied unacceptable sunscreen or insect repellant		Wet Weather (as applicable):						
Field Equipment:  No Teflon® containing materials on-site			V		ather gear made o	amples and/or sampling of Vinyl, polyurethane, PVC,		
All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene			Equipment Decontamination:					
No waterproof field books on-site other than Rite-in-the-Rain® Products		"PFAS-free" water on-site for decontamination of sample equipmen						
J	No plastic clipt	poards, binders, or spiral hard cover notebooks	Alconox and Liquinox to be used as decontamination materials  Food Considerations:					
7	No adhesives (	Post-it® Notes) on-site	No feed on drively an eigenvish according of heaters and any					
7		vith regular ice only. No chemical (blue) ice	No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area					
	compliance issues	boxes cannot be checked, the Field Manager shall desc prior to commencement of that day's work. Corrective site until in compliance. Repeated failure to comply wi invest	e actior	n shall include removal S sample protocols will	of noncompliance i	tems from the investigation area or		
	Describe the no	ncompliance issues (include personnel not in compliand	ce) and	action/outcome of no	oncompliance:	Signature:		
		None				Name (print):		
						Jason Hayes		
QA/	QC'd by:	Thomas W. Hensel			QA/QC Date:	6/14/2017		



				Miliporo	
Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	Project Number:		775303101.0025	
– Contract:	FA8903-16-D-0027 Task Order:			0004	
Installation:	Patrick AFB (PTRCK)	Weather	D. d. J.	1.540 1.11 00	
Site/Area Name:	AFFF Release Area 2	(temp./precipitation):	Partiy clou	ıdy, 5-10 mph winds, upper 80s	
Field Manager:	Jason Hayes	Date and Time:		05/23/17 0856	
Field Clothing and	PPE (as applicable):	Sample Containers:			
Field crew in co	mpliance with Tables 1 and 2, SOP AFW-01	All sample containe	ers made of HDPE	or polypropylene. Samples are	
✓ Field crew has n	not used fabric softener on clothing	not stored in conta	iners made of LD	PE	
	not used cosmetics, moisturizers, hand cream, products or exposed body parts this morning	✓ Caps are lined or ur	nlined and made	of HDPE or polypropylene	
Field crew has n	not applied unacceptable sunscreen or insect	Wet Weather (as applicable):			
Field Equipment:	ntaining materials on-site		ather gear made	samples and/or sampling of Vinyl, polyurethane, PVC, y	
_	erials made from stainless steel, HDPE, acetate,	Equipment Decontamination:			
No waterproof field books on-site other than Rite-in-the-Rain® Products		"PFAS-free" water on-site for decontamination of sample equipment			
No plastic clipbo	oards, binders, or spiral hard cover notebooks	Alconox and Liquinox to be used as decontamination materials Food Considerations:			
✓ No adhesives (P	Post-it® Notes) on-site				
	ith regular ice only. No chemical (blue) ice	No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area			
noncompliance issues p	poxes cannot be checked, the Field Manager shall des prior to commencement of that day's work. Correctiv ite until in compliance. Repeated failure to comply w inves	e action shall include removal	of noncompliance	items from the investigation area or	
Describe the non	compliance issues (include personnel not in compliar	nce) and action/outcome of nc	oncompliance:	Signature:	
	None			Name (print):	
				Jason Hayes	
QA/QC'd by:	Thomas W. Hensel		QA/QC Date:	6/14/2017	

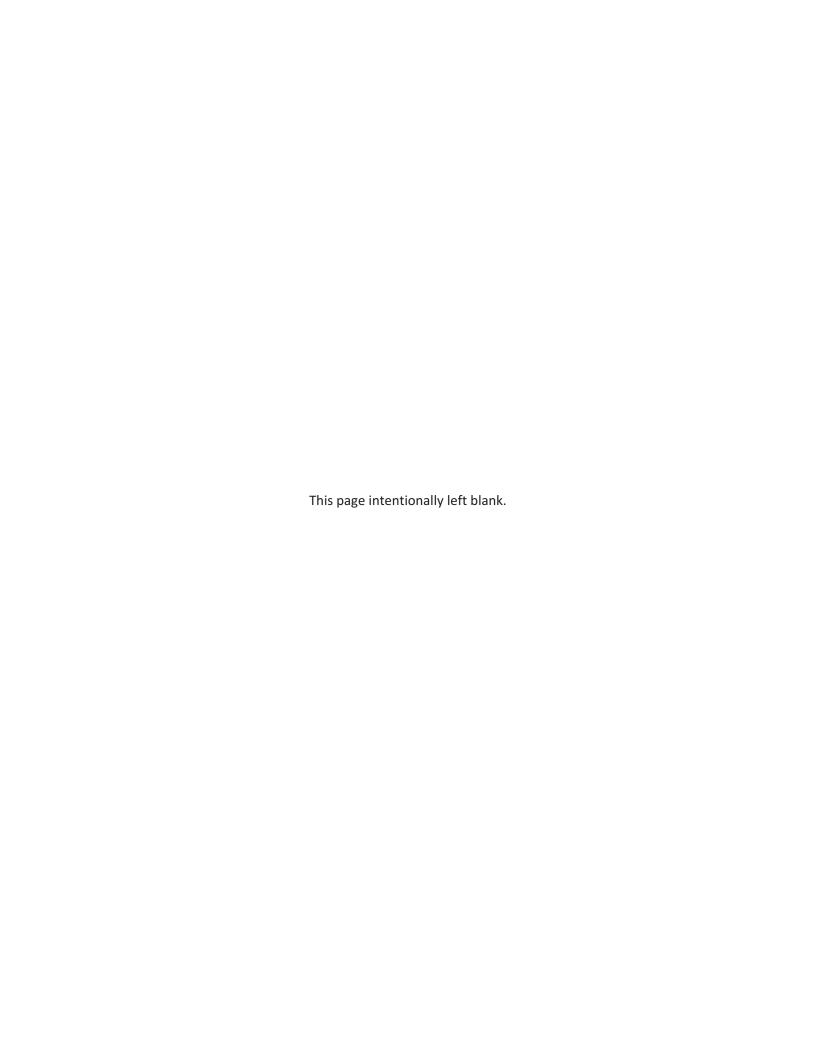


Proje	ect Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	Pro	ject Number:		775303101.0025			
Cont	ract:	FA8903-16-D-0027	Tas	k Order:		0004			
Insta	ıllation:	Patrick AFB (PTRCK)	We	ather					
Site/	Area Name:	AFFF Release Area 1	(temp./precipitation):		Cloudy, windy, m	id 80s, chance of rain in the afternoon			
Field	l Manager:	Jason Hayes	Dat	e and Time:		05/24/17 0700			
Fie	ld Clothing and	l PPE (as applicable):	Sc	ample Containers:					
1	Field crew in c	ompliance with Tables 1 and 2, SOP AFW-01	1	All sample containe	rs made of HDPE	or polypropylene. Samples are			
4	Field crew has	not used fabric softener on clothing	-	not stored in contain	iers made of LDPE				
	Field crew has not used cosmetics, moisturizers, hand cream, or other related products or exposed body parts this morning			Caps are lined or unlined and made of HDPE or polypropylene					
4	Field crew has not applied unacceptable sunscreen or insect repellant			/et Weather (as appli	icable):				
Fie	ld Equipment:		J	equipment, wet we	ather gear made	samples and/or sampling of Vinyl, polyurethane, PVC,			
	No Teflon® co	ntaining materials on-site	latex or rubl			-coated materials only			
All sample materials made from stainless steel, HDPE, acetate, silicon, or polypropylene			_	quipment Decontami					
7	No waterproof field books on-site other than Rite-in-the-Rain® Products		<b>√</b>	"PFAS-free" water o	amination of sample equipment				
J	No plastic clipk	poards, binders, or spiral hard cover notebooks	Alconox and Liquinox to be used as decontamination materials  Food Considerations:						
7		Post-it® Notes) on-site	FC	ooa Considerations:					
7		vith regular ice only. No chemical (blue) ice	No food or drink on-site with exception of bottled water and/or hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area						
	ompliance issues	boxes cannot be checked, the Field Manager shall desc prior to commencement of that day's work. Corrective site until in compliance. Repeated failure to comply wi invest	e action	on shall include removal	of noncompliance	items from the investigation area of			
	Describe the no	ncompliance issues (include personnel not in complian	ce) an	d action/outcome of no	oncompliance:	Signature:			
		None				Name (print):  Jason Hayes			
QA/0	QC'd by:	Thomas W. Hensel			QA/QC Date:	6/15/2017			



				wheeler		
Project Name:	Site Inspection of AFFF Release Areas Environmental Programs Worldwide	Project Number:		775303101.0025		
Contract:	FA8903-16-D-0027	Task Order:		0004		
Installation:	Patrick AFB (PTRCK)	Weather		Noudy calm mid 90s		
Site/Area Name:	AFFF Release Area 1	(temp./precipitation):		Cloudy calm mid 80s		
Field Manager:	Jason Hayes	Date and Time:		05/25/17 0800		
Field Clothing an	d PPE (as applicable):	Sample Containers:				
Field crew in o	compliance with Tables 1 and 2, SOP AFW-01	All sample containe	rs made of HDPE	or polypropylene. Samples are		
✓ Field crew has	s not used fabric softener on clothing	not stored in contai	ners made of LDP	E		
	s not used cosmetics, moisturizers, hand cream, ed products or exposed body parts this morning	☑ Caps are lined or un	lined and made o	of HDPE or polypropylene		
Field crew has	s not applied unacceptable sunscreen or insect	Wet Weather (as appli	cable):			
		:		amples and/or sampling		
Field Equipment:		equipment, wet we latex or rubber-coat		r gear made of Vinyl, polyurethane, PVC, naterials only		
No Teflon® containing materials on-site		,				
All sample ma	sterials made from stainless steel, HDPE, acetate,	Equipment Decontami	nation:			
, ,		"PFAS-free" water of	n-site for decont	amination of sample equipment		
No waterproo	of field books on-site other than Rite-in-the-Rain®					
		Alconox and Liquinox to be used as decontamination materials				
No plastic clip on-site	boards, binders, or spiral hard cover notebooks	Food Good double on				
_	(Pact it® Notes) on site	Food Considerations:				
	(Post-it® Notes) on-site		-	on of bottled water and/or		
Coolers filled packs in posse	with regular ice only. No chemical (blue) ice ession	hydration drinks (i.e., Gatorade and Powerade) that is available for consumption only in the staging area				
noncompliance issue	e boxes cannot be checked, the Field Manager shall des s prior to commencement of that day's work. Correctiv ffsite until in compliance. Repeated failure to comply w inves	e action shall include removal	of noncompliance	items from the investigation area or		
Describe the no	oncompliance issues (include personnel not in complian	ice) and action/outcome of no	ncompliance:	Signature:		
	None			Name (print):		
				Jason Hayes		
QA/QC'd by:	Thomas W. Hensel		QA/QC Date:	6/15/2017		

# APPENDIX C-3 TAILGATE SAFETY MEETING REPORTS





Project Name: Site Inspection of AFFF Release Areas Environmental Programs Worldwide			Pro	ject Number:			775303101.0025	
Con	tract:	FA8903-16-E	G-D-0027 Task Order:			-	0004	
Inst	allation:	Patrick AFB (F			e and Time:			05/22/17 1735
	d Manager Name:	Jason Ha	yes		Health and Safety Office	•	O):	Jason Hayes
Sate	ety Meeting Type:		Oudou		al Kickoff Tailgate Safety Meet	ting		
	Tonics Discussed (char	ok all that apply).	Order	OT B	usiness			
	communications)  Discussion of previous "	es equirements eeping on id Frequency and Personal Monitoring sedures ess, buddy system, work zones near misses" including work co			Physical Hazards and Cor Decontamination Procedu General Emergency Proce indicate) Site/Regional Emergency etc.) Medical Emergency Respo location of first aid kit, etc. Hazardous Materials Spill Applicable SOPs (e.g., He Injury/Illness Reporting Pro Route to Hospital and Medical Procedure 1 and Medical Procedure 2 an	procedures  Procedures  Procedures  Procedures  Procedures  Procedures  Procedures  Procedures  Procedures  Procedures	e.g., overhead utilit Personnel and Eq (e.g., locations of a dures (e.g. earthquer rocedures (e.g., ex dures Conservation Progres are Provider Visit C	uipment air horns and what 1 or 2 blasts ake response, typhoon response, xposure control precautions, ram, Safe Driving, etc.)
<b>√</b>	Engineering Controls	avoid similar occurrences		✓	hazards and effects)	ios onc	aged in the activity	y (EM-385 1-1, para 01.A.13.b)
				~				y (EIVI-000 I-1, para 01.A.13.D)
Safety suggestions by site workers:					Watch wor			
Action taken on previous suggestions: Injuries/accidents/personnel changes since previous		Communicate with drillers before approaching rig  NA						
meeting:					.,	-		
Observations of unsafe work practices/conditions that have developed since previous meeting:				No	one			
Location of (or changes in the locations of) evacuation routes/safe refuge areas:				Equipment la	ay-dow	n yard		
Othe	er Safety Topics Discussed:	-	None					
Addi	tional comments:		None					
	Attendee sign	natures below indicate acknowle	dgment of the information and willingness to abide by the procedures discussed during this safety meeting.					
	Attendee Name (print)	Company	Signature	_	Attendee Name (print)		Company	Signature
	Jason Hayes	Amec FW						
	Jason Drizd	Amec FW						
	Gary Kihn	Amec FW						
	Todd Ives	AmDrill, Inc.						
	Keith Anderson	AmDrill, Inc.						
				_[				
				T				
	Meeting Condu	cted By (print):	Co	mpan	y and Title			Signature
	Jason I	Hayes	Amec	FW -	Field Manager			
QA/QC'd by: Thomas W. Hensel							QA/QC Date:	6/14/2017



							wneelei	
Project Name:	Site Inspection of AFF Environmental Progr		Pro	ject Number:			775303101.0025	
Contract:	FA8903-16-I	D-0027	– Tas	sk Order:		-	0004	
Installation:	Patrick AFB (		_	e and Time:			05/23/17 0845	
Field Manager Name:	Jason Ha		Site	e Health and Safety Office	er (HS	SO):	Jason Hayes	
Safety Meeting Type:			Reg	ular/Daily Tailgate Safety Meet	ting			
		Ord	er of E	Business				
Topics Discussed (che	eck all that apply):		_	•				
✓ Site History/Site Layou	t		4					
Scope of Work			4		0.	•		
Personnel Responsibili			J		,	0 .	• '	
Medical Surveillance R	•		J				•	
<ul><li>Training Requirements</li><li>Safe Work Practices</li></ul>			1	General Emergency Proce indicate)	dures	(e.g., locations of	air horns and what 1 or 2 blasts	
	kaanina			,	7=	dunas (a a a authau	aka raananaa tumbaan raananaa	
<ul><li>✓ Logs, Reports, Record</li><li>✓ Sanitation and Illumina</li></ul>	. •		J	etc.)	rocec	ures (e.g. earinqu	ake response, typhoon response,	
Air Surveillance Type a			_	,	nea P	Procedures (e.a. e)	xposure control precautions,	
Monitoring Instruments	and Personal Monitoring		1	location of first aid kit, etc.)		100000100 (0.g., 0.	special definition procedurents,	
Monitoring Instruments Action Levels	g		J			dures		
	ocedures		J	·			ram, Safe Driving, etc.)	
	cess, buddy system, work zone	s, security,	1	Injury/Illness Reporting Pro	cedur	es		
communications)			1	Route to Hospital and Med	ical C	are Provider Visit (	Guidelines	
Discussion of previous	"near misses" including work c	rew suggestions to	4	Hazard Analysis of Work T	asks (	(chemical, physical	, biological and energy health	
correct work practices	to avoid similar occurrences		-	hazards and effects)				
Engineering Controls			4	Review AHAs with all partic	es enç	gaged in the activity	y (EM-385 1-1, para 01.A.13.b)	
Safety suggestions by site wor	kers:			Airfield wo	rker sa	afety		
Action taken on previous sugg	estions:			Coordinate with escort	t before	e all movement.		
Injuries/accidents/personnel changes since previous meeting:		None						
Observations of unsafe work practices/conditions that have developed since previous meeting:				No	ne			
Location of (or changes in the locations of) evacuation routes/safe refuge areas:				Equipment la	ay-dow	n yard		
Other Safety Topics Discussed	d:	None						
Additional comments:				No	ne			
Attendee sig	gnatures below indicate acknowle	dgment of the information	on and w	rillingness to abide by the proce	edures	discussed during the	nis safety meeting.	
Attendee Name (print)	Company	Signature		Attendee Name (print)		Company	Signature	
Jason Hayes	Amec FW							
Jason Drizd	Amec FW							
Gary Kihn	Amec FW							
Todd Ives	AmDrill, Inc.							
Keith Anderson	AmDrill, Inc.							
Meeting Cond	ucted By (print):		Compa	ny and Title			Signature	
- Jasor	n Hayes	Am	nec FW -	- Field Manager				
QA/QC'd by: Thomas W.	. Hensel				ļ	QA/QC Date:	6/14/2017	
i de la companya de								

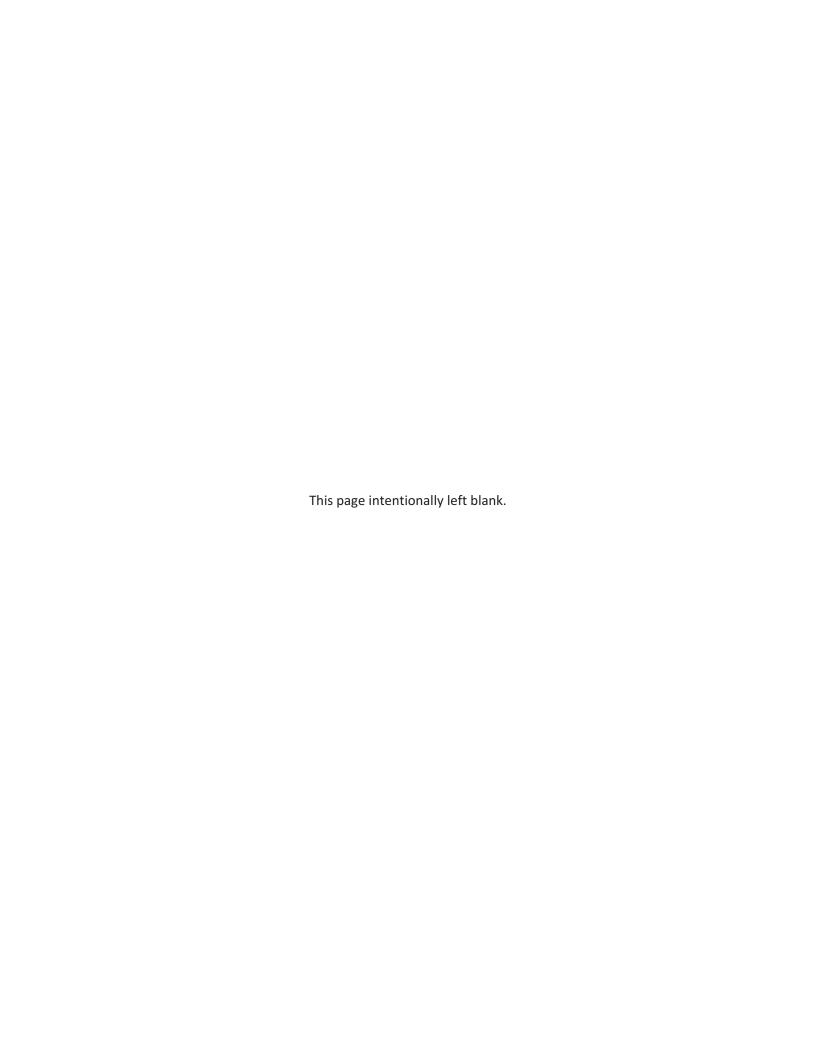


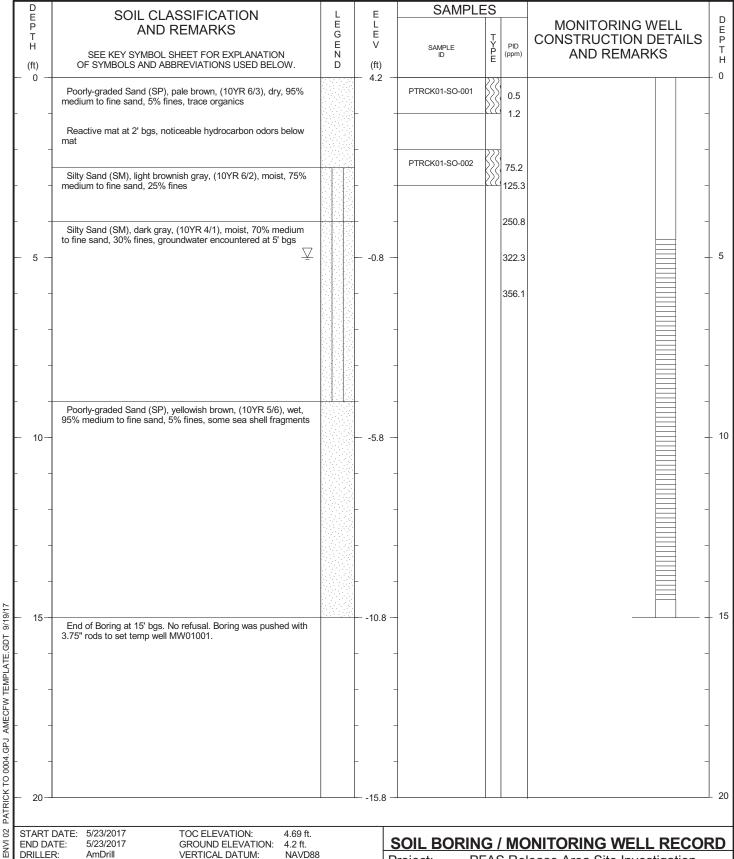
								wileetei
Pro	ject Name:	Site Inspection of AFF Environmental Progra		Pro	ject Number:			775303101.0025
Cor	ntract:	FA8903-16-E	0-0027	– Tas	sk Order:			0004
	allation:	Patrick AFB (I				-	05/24/17 0700	
_	d Manager Name:	Jason Ha		_	Health and Safety Offic	er (HS	SO):	Jason Hayes
	ety Meeting Type:		,	_	ular/Daily Tailgate Safety Mee	•		
-	ory mooning Type.		Orde	_	Business	9		
	Tanina Disaussed (shee	ok all that apply).	Old	C. O. D	,u3111033			
	Topics Discussed (chec	:K all that apply):		4	DDC Dogwinod/DDC Hood			
4	Site History/Site Layout					Do	ffing Dragaduras	
4	Scope of Work			J				9 P \
J	Personnel Responsibiliti			J	*	,	-	• •
4	Medical Surveillance Re	equirements		1				
1	Training Requirements			4		edures	(e.g., locations of	air horns and what 1 or 2 blasts
J	Safe Work Practices				indicate)			
√ √	Logs, Reports, Records	eeping		J		Proced	dures (e.g. earthqu	uake response, typhoon response,
4	Sanitation and Illumination	on			etc.)			
4	Air Surveillance Type ar	nd Frequency		4	Medical Emergency Response	onse P	rocedures (e.g., e	xposure control precautions,
J	Monitoring Instruments a	and Personal Monitoring		~	location of first aid kit, etc.	)		
J	Action Levels			J	Hazardous Materials Spill	Proced	dures	
4	Accident Reporting Prod	cedures		4	Applicable SOPs (e.g., He	aring (	Conservation Prog	ram, Safe Driving, etc.)
	Site Control (visitor acce	ess, buddy system, work zones	s. security.	4				
4	communications)	, , , , , , , , , , , , , , , , , , , ,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	J	Route to Hospital and Med			Guidelines
_	Discussion of provious "	near misses" including work o	row suggestions to					
J	·	near misses" including work co avoid similar occurrences	ow suggestions to	J	hazards and effects)	asks (	onennoai, priysica	I, biological and energy health
	·	avoid siirillai occuirences			,			(=1.00= / / 0.00
4	Engineering Controls			J	Review AHAs with all part	ies eng	gaged in the activit	y (EM-385 1-1, para 01.A.13.b)
Safe	ety suggestions by site work	ers:			Bad weather ma	ay be ir	n the area	
Action taken on previous suggestions:				Listen for warning	calls fr	om the base		
Injuries/accidents/personnel changes since previous meeting:					No	one		
	Observations of unsafe work practices/conditions that have developed since previous meeting:				No	one		
	Location of (or changes in the locations of) evacuation routes/safe refuge areas:				Equipment la	ay-dow	n yard	
	Other Safety Topics Discussed:		None					
Add	itional comments:				No	one		
	Attondoo sign	naturas halaw indicata acknowla	dament of the information	on and w	illingnoss to abido by the proc	oduros	discussed during t	his safety moeting
			edgment of the information and willingness to abide by the procedures discussed during this safety meeting.				· · ·	
	Attendee Name (print)	Company	Signature		Attendee Name (print)		Company	Signature
	Jason Hayes	Amec FW						
	Jason Drizd	Amec FW						
	Gary Kihn	Amec FW						
	Todd Ives	AmDrill, Inc.						
	Keith Anderson	AmDrill, Inc.						
				$\dashv$				
				$\dashv$				
				$\dashv$				
	Meeting Condu	cted By (print):		Compar	ny and Title			Signature
	•			•	-			
	Jason	Hayes	Am	nec FW -	Field Manager			
QA	QC'd by: Thomas W.	Hensel					QA/QC Date:	6/15/2017



Pro	ject Name:	Site Inspection of AFFI Environmental Progra		Proj	ject Number:			775303101.0025
Cor	tract:	FA8903-16-E	0-0027	_ Tas	k Order:		0004	
Inst	allation:	Patrick AFB (F	PTRCK)	Date	e and Time:			05/25/17 0800
	d Manager Name:	Jason Ha	yes	_	Health and Safety Offic	•	0):	Jason Hayes
Sate	ety Meeting Type:		01		ular/Daily Tailgate Safety Mee	eting		
	Tanias Dissussed (shee	ok all that apply).	Ord	er of B	usiness			
<b>V</b>	Topics Discussed (chec Site History/Site Layout	:K all that apply):		<b>√</b>	PPE Required/PPE Used			
<b>√</b>	Scope of Work				Define PPE Levels, Donn		ffing Procedures	
<b>√</b>	Personnel Responsibiliti	es		✓		-	-	/ lines)
~	Medical Surveillance Re	equirements		✓	Decontamination Procedu	ures for	Personnel and Equ	ipment
✓	Training Requirements			<b>√</b>	General Emergency Proc	edures	(e.g., locations of a	ir horns and what 1 or 2 blasts
~	Safe Work Practices				indicate)			
$\leq$	Logs, Reports, Records			✓		Proced	dures (e.g. earthqua	ake response, typhoon response,
뇓	Sanitation and Illumination			_	etc.)	D		
	Air Surveillance Type an Monitoring Instruments a			✓	location of first aid kit, etc.		rocedures (e.g., ex	posure control precautions,
>>>>>>>>>	Action Levels	and r croonar wormoning		<b>√</b>	Hazardous Materials Spill	,	dures	
~	Accident Reporting Prod	cedures			Applicable SOPs (e.g., He			am, Safe Driving, etc.)
<b>✓</b>		ess, buddy system, work zones	s, security,	✓	Injury/Illness Reporting Pr	ocedur	es	
	communications)			✓	Route to Hospital and Me	dical Ca	are Provider Visit G	uidelines
<b>√</b>		near misses" including work c	ew suggestions to	<b>√</b>		Tasks (	chemical, physical,	biological and energy health
l	·	avoid similar occurrences		_	hazards and effects)			
✓	Engineering Controls			✓	Review AHAs with all part	ties eng	gaged in the activity	(EM-385 1-1, para 01.A.13.b)
Safe	ty suggestions by site work	ers:			Be aware	of haza	ards	
Action taken on previous suggestions:		-			Notify all personnel of pote	ential ha	azards noticed onsite	
Injuries/accidents/personnel changes since previous meeting:				N	lone			
Observations of unsafe work practices/conditions that have developed since previous meeting:				N	lone			
Location of (or changes in the locations of) evacuation routes/safe refuge areas:				Equipment	lay-dow	n yard		
Othe	Other Safety Topics Discussed:		None					
Addi	tional comments:				N	lone		
	Attendee sign	natures below indicate acknowle	Igment of the information and willingness to abide by the procedures discussed during this safety meeting.					
	Attendee Name (print)	Company	Signature		Attendee Name (print)		Company	Signature
	Jason Hayes	Amec FW						
	Jason Drizd	Amec FW						
	Gary Kihn	Amec FW						
	Todd Ives	AmDrill, Inc.						
	Keith Anderson	AmDrill, Inc.						
	Meeting Condu	cted By (print):		Compan	y and Title	<del>'</del>		Signature
					•			<u> </u>
	Jason	Hayes	An	nec FW -	Field Manager			
QA/	QC'd by: Thomas W. I	Hensel					QA/QC Date:	6/15/2017

# APPENDIX C-4 SOIL BORING/MONITORING WELL RECORDS





START DATE: 5/23/2017 5/23/2017 END DATE: DRILLER: AmDrill Geoprobe 6625CPT **EQUIPMENT:** Geoprobe Direct Push EASTING: METHOD: HOLE DIA.: 4-inch

J. Hayes

Patrick AFB Area 1

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

**GROUND ELEVATION:** VERTICAL DATUM: NORTHING:

4.69 ft. 4.2 ft. NAVD88 1422262.48 ft. 779695.76 ft. HORIZONTAL DATUM: FL State Plane

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA

#### SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

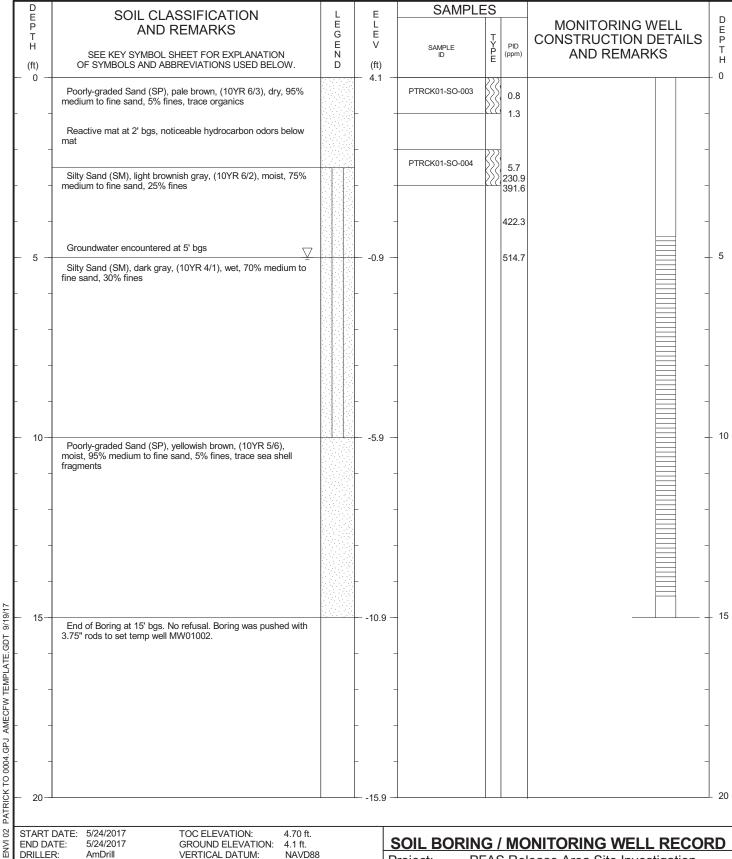
Project No: 775303101.0025.0400

Checked By: T. Hensel Well No. MW01001





2030 Falling Waters Road Suite 300 Knoxville, TN 37922



START DATE: 5/24/2017 5/24/2017 END DATE: DRILLER: AmDrill Geoprobe 6625CPT EQUIPMENT: METHOD: HOLE DIA.: 4-inch

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

NORTHING: Geoprobe Direct Push EASTING:

Patrick AFB Area 1

J. Hayes

TOC ELEVATION: 4.70 ft. **GROUND ELEVATION:** 4.1 ft. VERTICAL DATUM: NAVD88 HORIZONTAL DATUM: FL State Plane

1422215.61 ft. 779688.9 ft.

SOIL BORING / MONITORING WELL RECORD Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

Checked By: T. Hensel Well No. MW01002

amec foster wheeler



2030 Falling Waters Road Suite 300 Knoxville, TN 37922

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA

D E	SOIL CLASSIFICATION	L	Е	SAMPLE	S			
P T H	AND REMARKS	E G E	E V	SAMPLE	T Y P E	PID	MONITORING WELL CONSTRUCTION DETAILS	[
(ft) 0	SEE KEY SYMBOL SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS USED BELOW.	N D	(ft) 2.4	ID	E	(ppm)	AND REMARKS	1
	Poorly-graded Sand (SP), pale brown, (10YR 6/3), dry, 95% medium to fine sand, 5% fines, trace organics			No soil samples collected; sample of		3.6 7.2		
	Silty Sand (SM), light brownish gray, (10YR 6/2), moist, 75%			surface soil and sample of soil above the groundwater table collected to create		128.9		
_	mediun to fine sand, 25% fines		-	<ul> <li>composite samples for pH, TOC, and partical size analysis</li> </ul>		278.0 390.1	-	
-			-	-		600.9	-	
_	Groundwater encountered at 4' bgs		<u> </u>  -  -	-		1323.6	-	
5 —	Silty Sand (SM), dark gray, (10YR 4/1), wet, 70% medium to		-2.6	-			-	
-	fine sand, 30% fines		-	-			-	
-				-			-	
-	Poorly-graded Sand (SP), yellowish brown, (10YR 5/6), wet,			-			-	
_	95% medium to fine sand, 5% fines		- -				_	
10-			-7.6					
.0	End of Boring at 10' bgs. No refusal. Boring was pushed with 3.75" rods to set temp well MW01003.							
							-	
			-				-	
-			_				-	
15—			12.6	_			-	1
_			_	-			-	
_			-	-			-	
_			-	-			-	
-			-	-			-	_
20			-17.6					
START I	DATE: 5/24/2017 TOC ELEVATION: 4.82 ft.		Т					_
ND DA	TE: 5/24/2017 GROUND ELEVATION: 2.4 ft.	i					NITORING WELL RECOR	<u> </u>

START DATE: END DATE: DRILLER: EQUIPMENT: METHOD: HOLE DIA .:

SOIL-ROCK-MWELL

SITE:

5/24/2017 5/24/2017 AmDrill Geoprobe 6625CPT Geoprobe Direct Push EASTING: 4-inch

Patrick AFB Area 1

TOC ELEVATION: **GROUND ELEVATION:** VERTICAL DATUM: NORTHING: HORIZONTAL DATUM: FL State Plane

4.82 ft. 2.4 ft. NAVD88 1422207.81 ft. 779754.07 ft.

Project:

# **SOIL BORING / MONITORING WELL RECORD**

PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

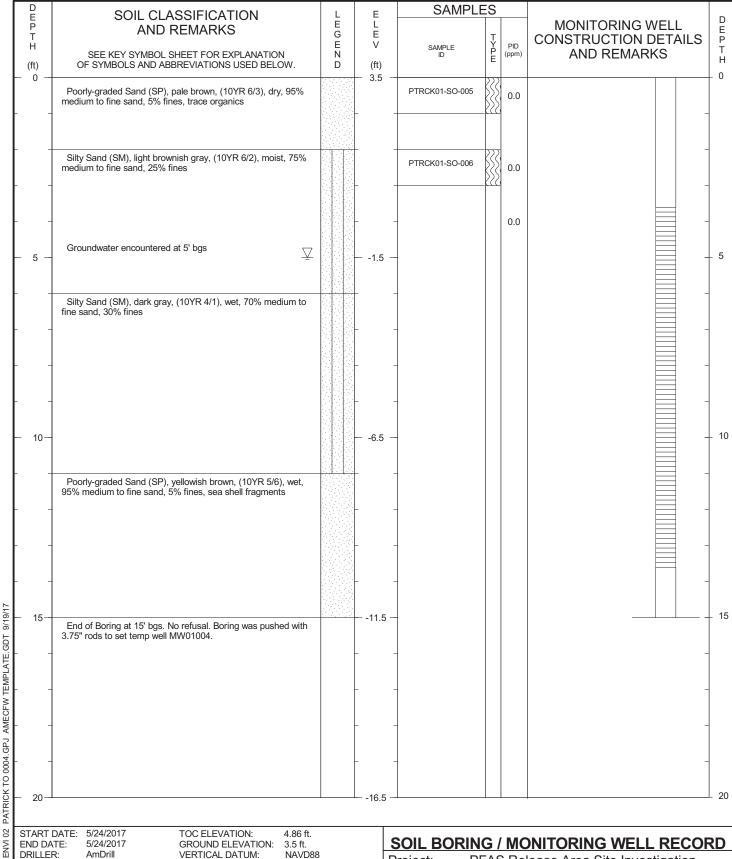
Checked By: T. Hensel Well No. MW01003

amec foster wheeler



2030 Falling Waters Road Suite 300 Knoxville, TN 37922

LOGGED BY: J. Hayes THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA



START DATE: 5/24/2017 5/24/2017 END DATE: DRILLER: AmDrill **EQUIPMENT:** METHOD: HOLE DIA.:

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

Geoprobe 6625CPT Geoprobe Direct Push EASTING: 4-inch Patrick AFB Area 1

J. Hayes

TOC ELEVATION: **GROUND ELEVATION:** VERTICAL DATUM: NORTHING:

4.86 ft. 3.5 ft. NAVD88 1421911.45 ft. 779972.12 ft. HORIZONTAL DATUM: FL State Plane

Checked By: T. Hensel

#### SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

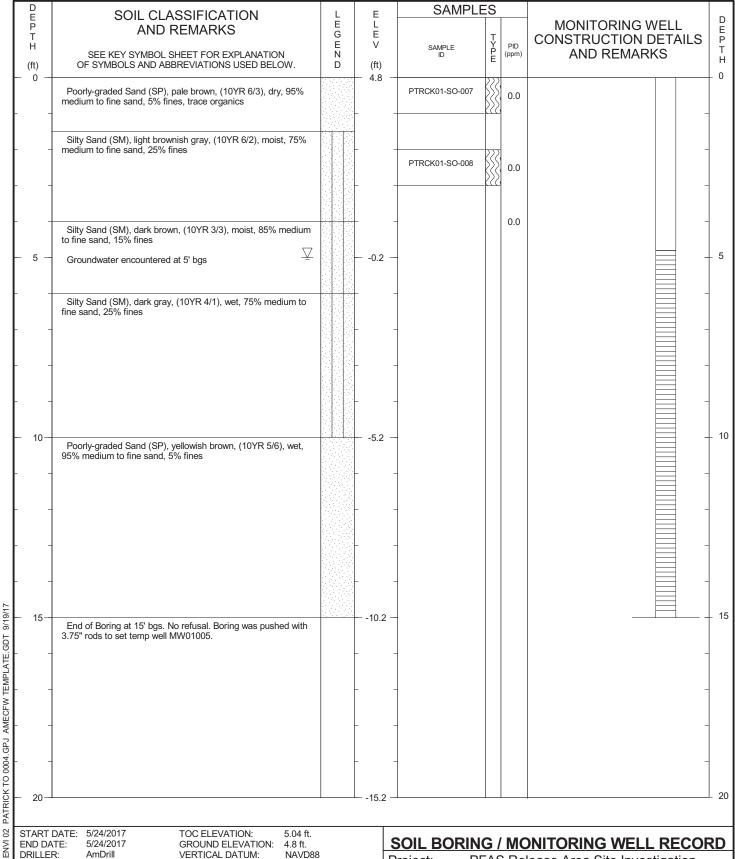
Well No. MW01004

amec foster wheeler



2030 Falling Waters Road Suite 300 Knoxville, TN 37922

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA



START DATE: 5/24/2017 5/24/2017 END DATE: DRILLER: AmDrill Geoprobe 6625CPT EQUIPMENT: Geoprobe Direct Push EASTING: METHOD: HOLE DIA.: 4-inch

SOIL-ROCK-MWELL

SITE:

**GROUND ELEVATION:** VERTICAL DATUM: NORTHING: HORIZONTAL DATUM:

5.04 ft. 4.8 ft. NAVD88

1421813.11 ft. 780093.55 ft. FL State Plane

amec foster wheeler

Checked By: T. Hensel

Project No: 775303101.0025.0400

Project:



SOIL BORING / MONITORING WELL RECORD

PFAS Release Area Site Investigation

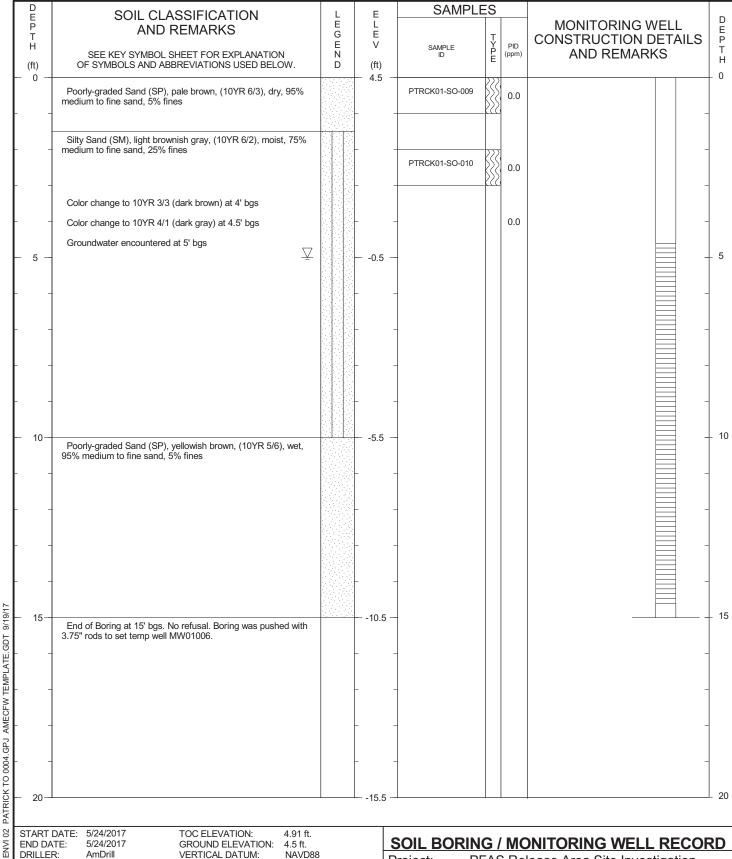
2030 Falling Waters Road Suite 300 Knoxville, TN 37922

Well No. MW01005

LOGGED BY: J. Hayes THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE

Patrick AFB Area 1

EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA



START DATE: 5/24/2017 5/24/2017 END DATE: DRILLER: AmDrill Geoprobe 6625CPT EQUIPMENT: METHOD: HOLE DIA.: 4-inch

SOIL-ROCK-MWELL

SITE:

TOC ELEVATION: **GROUND ELEVATION:** VERTICAL DATUM: NORTHING: Geoprobe Direct Push EASTING:

4.91 ft. 4.5 ft. NAVD88 779967.08 ft. HORIZONTAL DATUM:

1421781.11 ft. FL State Plane

LOGGED BY: J. Hayes

Patrick AFB Area 1

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA

#### SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

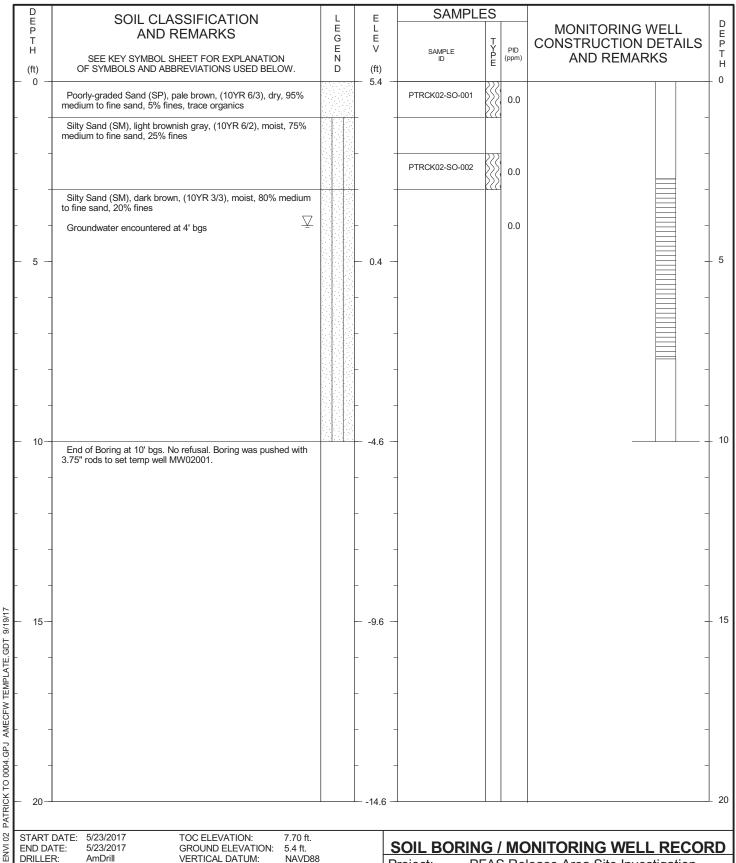
Project No: 775303101.0025.0400

Checked By: T. Hensel Well No. MW01006





2030 Falling Waters Road Suite 300 Knoxville, TN 37922



START DATE: END DATE: DRILLER: EQUIPMENT: METHOD: HOLE DIA .: 4-inch

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

5/23/2017 5/23/2017 AmDrill Geoprobe 6625CPT Geoprobe Direct Push EASTING:

Patrick AFB Area 2

J. Hayes

TOC ELEVATION: 7.70 ft. **GROUND ELEVATION:** 5.4 ft. VERTICAL DATUM: NAVD88 NORTHING: HORIZONTAL DATUM: FL State Plane

1419067.35 ft. 782924.48 ft.

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

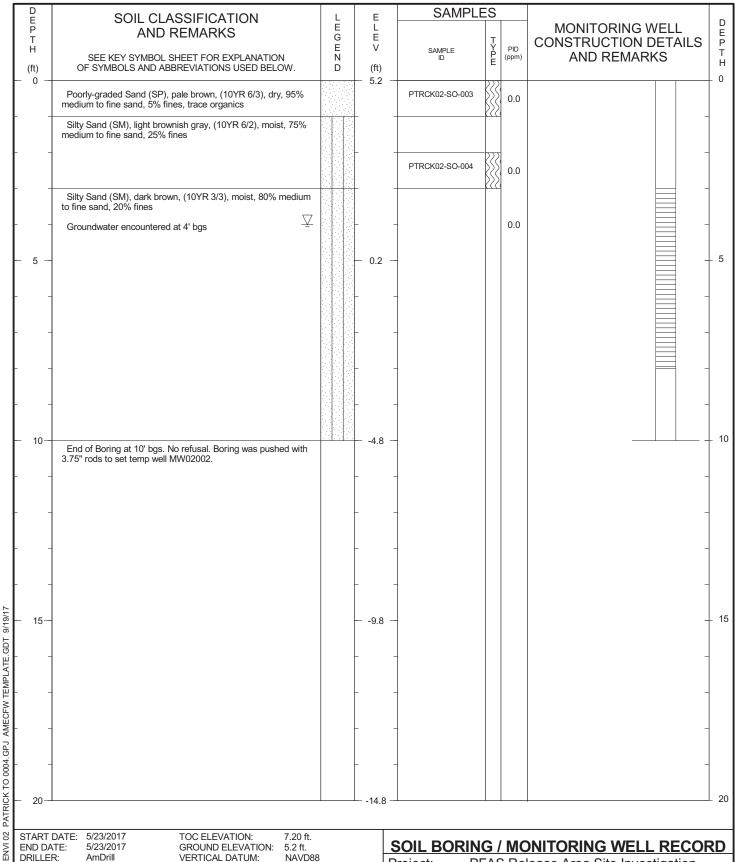
Checked By: T. Hensel Well No. MW02001

amec foster wheeler



2030 Falling Waters Road Suite 300 Knoxville, TN 37922

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA



START DATE: END DATE: DRILLER: EQUIPMENT: METHOD: HOLE DIA .:

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

5/23/2017 5/23/2017 AmDrill Geoprobe 6625CPT Geoprobe Direct Push EASTING: 4-inch

Patrick AFB Area 2

J. Hayes

TOC ELEVATION: **GROUND ELEVATION:** VERTICAL DATUM: NORTHING: HORIZONTAL DATUM: FL State Plane

7.20 ft. 5.2 ft. NAVD88 1418942.39 ft. 782939.44 ft.

Project:

SOIL BORING / MONITORING WELL RECORD PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

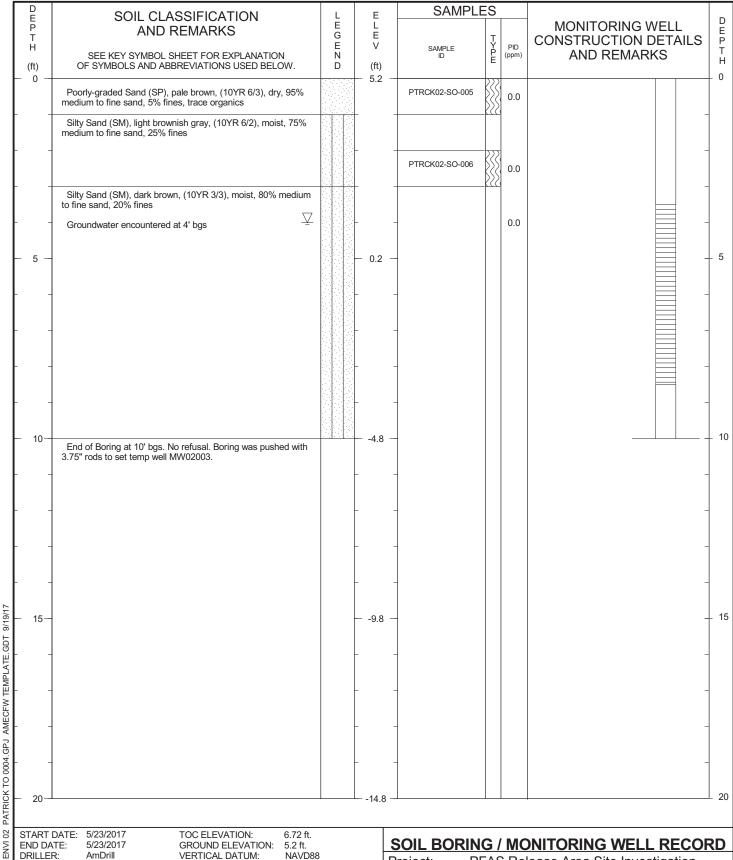
Checked By: T. Hensel Well No. MW02002

amec foster wheeler



2030 Falling Waters Road Suite 300 Knoxville, TN 37922

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA



START DATE: 5/23/2017 5/23/2017 END DATE: AmDrill DRILLER: EQUIPMENT: METHOD: HOLE DIA .:

J. Hayes

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

Geoprobe 6625CPT Geoprobe Direct Push EASTING: 4-inch Patrick AFB Area 2

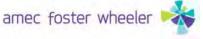
TOC ELEVATION: 6.72 ft. **GROUND ELEVATION:** 5.2 ft. VERTICAL DATUM: NAVD88 NORTHING: HORIZONTAL DATUM: FL State Plane

1418872.37 ft. 783047.43 ft.

Checked By: T. Hensel

Project No: 775303101.0025.0400

Project:

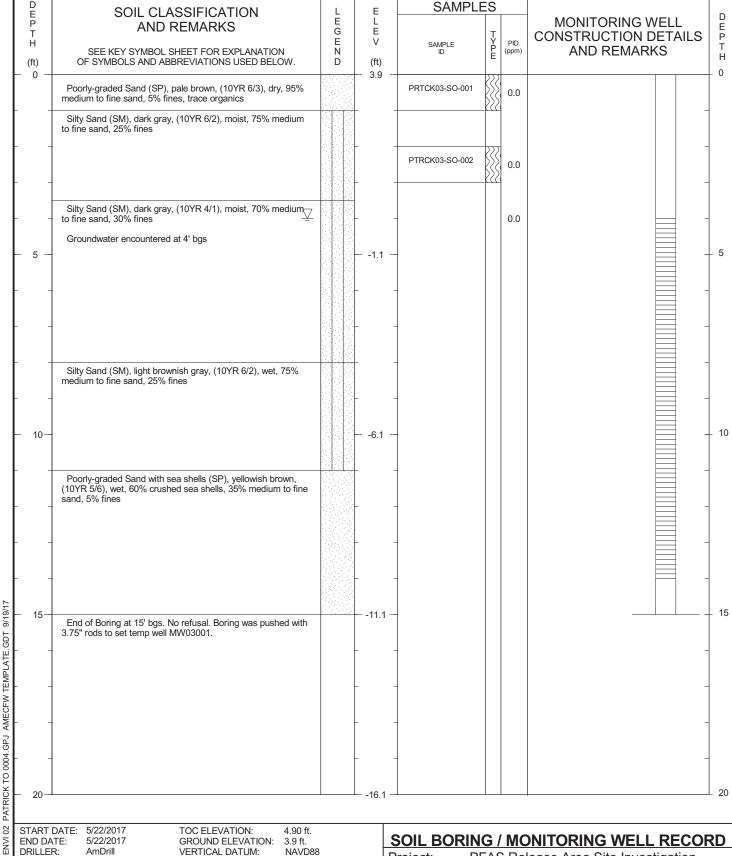


PFAS Release Area Site Investigation

SOIL BORING / MONITORING WELL RECORD

2030 Falling Waters Road Suite 300 Knoxville, TN 37922

Well No. MW02003



END DATE: 5/22/2017 DRILLER: AmDrill **EQUIPMENT:** METHOD: HOLE DIA.:

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

Geoprobe 6625CPT Geoprobe Direct Push EASTING: 4-inch Patrick AFB Area 3

J. Hayes

**GROUND ELEVATION:** VERTICAL DATUM: NORTHING: HORIZONTAL DATUM:

4.90 ft. 3.9 ft. NAVD88 1424539.24 ft. 780970.68 ft. FL State Plane

## SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation

Project No: 775303101.0025.0400

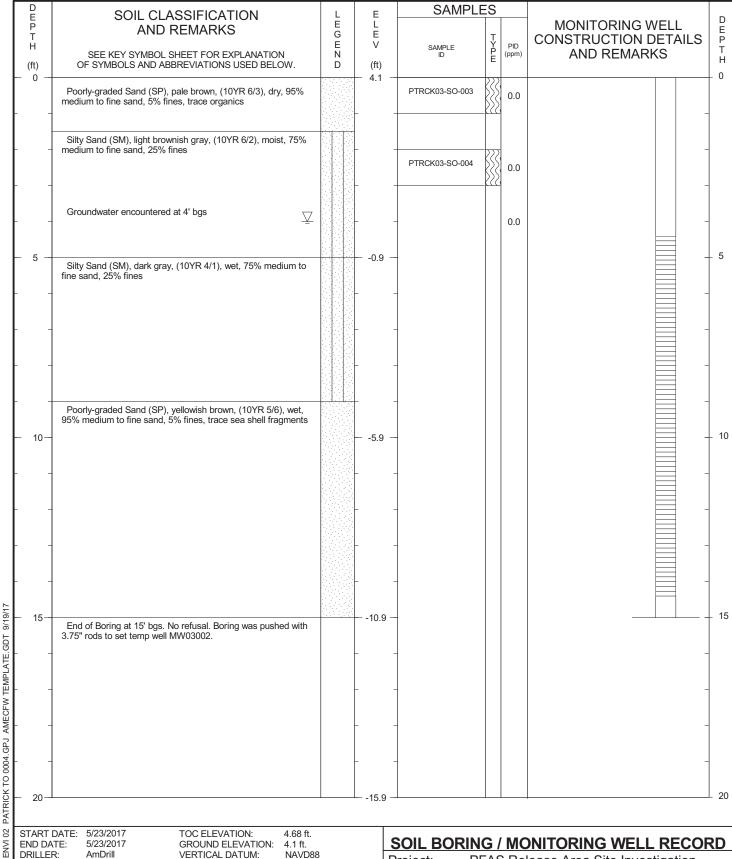
Checked By: T. Hensel Well No. MW03001

amec foster wheeler



2030 Falling Waters Road Suite 300 Knoxville, TN 37922

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA



START DATE: END DATE: DRILLER: EQUIPMENT: METHOD: HOLE DIA.: 4-inch

SOIL-ROCK-MWELL

SITE:

LOGGED BY:

5/23/2017 5/23/2017 AmDrill Geoprobe 6625CPT Geoprobe Direct Push EASTING:

Patrick AFB Area 3

J. Hayes

TOC ELEVATION: **GROUND ELEVATION:** VERTICAL DATUM: NORTHING: HORIZONTAL DATUM:

4.68 ft. 4.1 ft. NAVD88 1424516.9 ft. 781028.18 ft. FL State Plane

SOIL BORING / MONITORING WELL RECORD

Project: PFAS Release Area Site Investigation Project No: 775303101.0025.0400

Checked By: T. Hensel Well No. MW03002

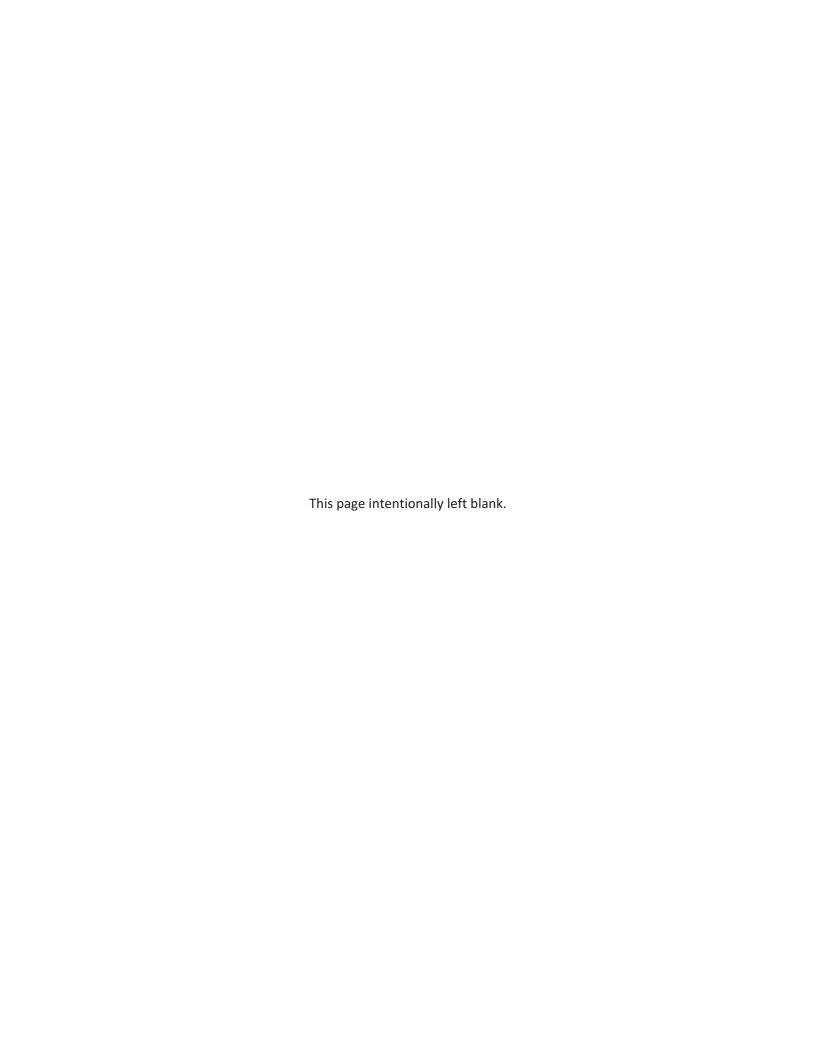
amec foster wheeler



2030 Falling Waters Road Suite 300 Knoxville, TN 37922

THIS RECORD IS A REASONABLE INTERPRETATION OF SUBSURFACE CONDITIONS AT THE EXPLORATION LOCATION. SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND AT OTHER TIMES MAY DIFFER. INTERFACES BETWEEN STRATA ARE APPROXIMATE. TRANSITIONS BETWEEN STRATA

# APPENDIX C-5 SOIL SAMPLE COLLECTION LOGS





Project Name:	Site Er	e Inspection of AFFF Release Are nvironmental Programs Worldwid	as e	Project N	umber:		775303101.0025
Contract:		FA8903-16-D-0027		Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)		Start Date	::		05/23/17
Location ID:		MW01001		End Date:			05/23/17
Technician(s):				Jason Hayes	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations
PTRCK01-SO-0	001	05/23/17 1720	0 - 1	SP			None
PTRCK01-SO-0	002	05/23/17 1725	2 - 3	SM			None
Sample Collection Method:	: 	Grab		Analysis/l	Wethod(s):	PFC	s (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservat	ive(s):		Ice (4 °C)
Associated Blank Sampl	es:						Signature:
		None					
Notes:							Name (print):
Strong hydrocarbon odor from 1 ft bgs to water table at about 5 ft bgs.						Jason Hayes	
QA/QC'd by: Thomas W. Hensel QA/QC Date:							6/14/2017



Project Name:	Site En	Inspection of AFFF Release Are vironmental Programs Worldwid	as e	Project Number:		775303101.0025		
Contract:		FA8903-16-D-0027		Task Orde	er:		0004	
Installation:		Patrick AFB (PTRCK)		Start Date	:	05/24/17		
Location ID:		MW01002		End Date:	-		05/24/17	
Technician(s):				Jason Hayes	, Jason Drizd			
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations	
PTRCK01-SO-0	03	05/24/17 0710	0 - 1	SP			None	
PTRCK01-SO-0	04	05/24/17 0715	2 - 3	SM			None	
Sample Collection Method:		Grab		Analysis/N	Method(s):	PFC	s (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)	
Sample Container Type(s):		4 oz HDPE		Preservati	ive(s):		Ice (4 °C)	
Associated Blank Sample	es:						Signature:	
		None						
Notes:							Name (print):	
Strong hydrocarbon odor present at 1-5 ft bgs.						Jason Hayes		
QA/QC'd by:	Thomas W. Hensel				Q	A/QC Date:	6/15/2017	



Project Name:	Site En	Inspection of AFFF Release Are vironmental Programs Worldwid	as e	Project No	umber:		775303101.0025
Contract:		FA8903-16-D-0027		Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)		Start Date	: ::		05/24/17
Location ID:		MW01004		End Date:	<del>-</del>		05/24/17
Technician(s):				Jason Hayes	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations
PTRCK01-SO-0	107	05/24/17 0940	0 - 1	SP			None
PTRCK01-SO-0	008	05/24/17 0945	2 - 3	SM			None
Sample Collection Method:		Grab		Analysis/I	Wethod(s):	PFC	s (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservat	ive(s):		Ice (4 °C)
Associated Blank Sample	es:						Signature:
		None					
Notes:							Name (print):
		None					Jason Hayes
QA/QC'd by:	Thomas W. Hensel				Q	A/QC Date:	6/15/2017



Project Name:	Site En	Site Inspection of AFFF Release Areas Environmental Programs Worldwide		Project Number:			775303101.0025
Contract:		FA8903-16-D-0027		Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)	_	Start Date	:		05/24/17
Location ID:		MW01005	_	End Date:	-		05/24/17
Technician(s):				Jason Hayes	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations
PTRCK01-SO-0	009	05/24/17 1010	0 - 1	SP			None
PTRCK01-SO-0	010	05/24/17 1015	2 - 3	SM			None
Sample Collection Method:		Grab		Analysis/N	Method(s):	PFC	s (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservati	ive(s):		Ice (4 °C)
Associated Blank Sample	es:						Signature:
		None					
Notes:							Name (print):
		None					Jason Hayes
QA/QC'd by:	Thomas W. Hensel				Q/	VQC Date:	6/15/2017



Project Name:		Site Inspection of AFFF Release Areas Environmental Programs Worldwide		Project Number:		775303101.0025	
Contract:		FA8903-16-D-0027	_	Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)	_	Start Date	:		05/24/17
Location ID:		MW01006	_	End Date:	•		05/24/17
Technician(s):				Jason Hayes	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations
PTRCK01-SO-0	011	05/24/17 0905	0 - 1	SP			None
PTRCK01-SO-0	012	05/24/17 0910	2 - 3	SM			None
Sample Collection Method:	-	Grab		Analysis/I	Method(s):	PFC	s (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservat	ive(s):		Ice (4 °C)
Associated Blank Sampl	es:	MS/MSD					Signature:
Notes:							Name (print):
		None					Jason Hayes
QA/QC'd by:	Thomas W. Hensel				Q	A/QC Date:	6/15/2017



Project Name:	Site En	Inspection of AFFF Release Are	as e	Project Nu	umber:		775303101.0025	
Contract:		FA8903-16-D-0027		Task Orde	er:		0004	
Installation:		Patrick AFB (PTRCK)		Start Date	:		05/23/17	
Location ID:		MW02001		End Date:	-		05/23/17	
Technician(s):				Jason Hayes	, Jason Drizd			
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations	
PTRCK02-SO-0	01	05/23/17 1000	0 - 1	SP			None	
PTRCK02-SO-0	02	05/23/17 1005	2 - 3	SM			None	
						DE0	(FRI FRI) TOO (FRI 2000) VOO (FRI 2000)	
Sample Collection Method:	-	Grab		Analysis/I	-	PFC	(S (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)	
Sample Container Type(s):		4 oz HDPE		Preservati	ive(s):		Ice (4 °C)	
Associated Blank Sample		None					Signature:	
Notes:							Name (print):	
		None					Jason Hayes	
QA/QC'd by:	Thomas W. Hensel				Q	A/QC Date:	6/14/2017	



Project Name:	Site En	Inspection of AFFF Release Are	as e	Project No	umber:		775303101.0025
Contract:		FA8903-16-D-0027		Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)	_	Start Date	:		05/23/17
Location ID:		MW02002		End Date:	-		05/23/17
Technician(s):				Jason Hayes	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol		ı	Comments/Observations
PTRCK02-SO-0	003	05/23/17 0905	0 - 1	SP			None
PTRCK02-SO-0	004	05/23/17 0910	2 - 3	SM			None
Sample Collection Method:		Grab		Analysis/I	Method(s):	PFCs	(EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservat	ive(s):		Ice (4 °C)
Associated Blank Sample	es:	DTDOV 5D 00 004					Signature:
		PTRCK-FD-SO-001					
Notes:							Name (print):
		None					Jason Hayes
QA/QC'd bv:	Thomas W. Hensel				Q/	VQC Date:	6/14/2017



Project Name:	Site Env	Inspection of AFFF Release Are	as e	Project No	umber:		775303101.0025
Contract:		FA8903-16-D-0027		Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)		Start Date	:		05/23/17
Location ID:		MW02003		End Date:	-		05/23/17
Technician(s):				Jason Hayes	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations
PTRCK02-SO-0	05	05/23/17 0925	0 - 1	SP			None
PTRCK02-SO-0	06	05/23/17 0930	2 - 3	SM			None
Sample Collection Method:		Grab		Analysis/I	Method(s):	PFC	s (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservat	ive(s):		Ice (4 °C)
Associated Blank Sample	es:						Signature:
		None					
Notes:							Name (print):
		None					Jason Hayes
QA/QC'd by:	Thomas W. Hensel				Q/	A/QC Date:	6/14/2017

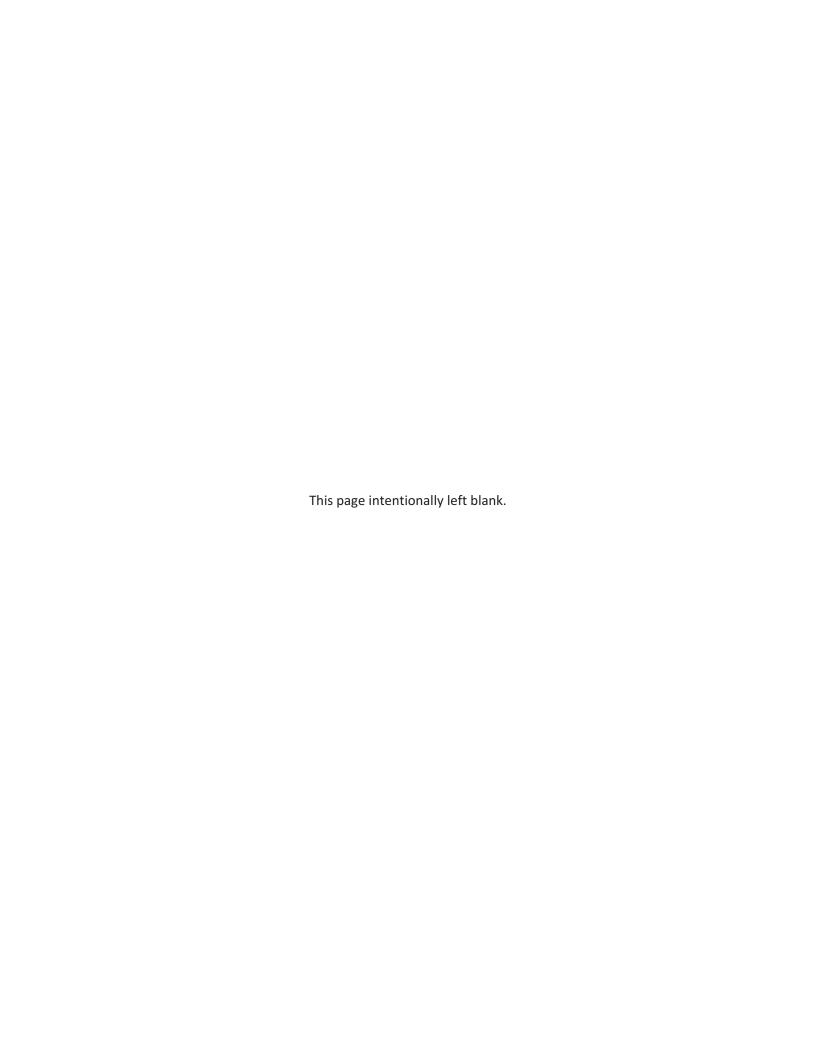


Project Name:	Site En	Inspection of AFFF Release Are vironmental Programs Worldwid	eas le	Project N	umber:		775303101.0025
Contract:		FA8903-16-D-0027		Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)		Start Date:			05/22/17
Location ID:		MW03001		End Date:	_		05/22/17
Technician(s):				Jason Hayes	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations
PTRCK03-SO-0	001	05/22/17 17:50	0 - 1	SP			None
PTRCK03-SO-0	002	05/22/17 18:00	2 - 3	SM			None
Sample Collection Method:		Grab		Analysis/l	Method(s):	PFC	es (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservat	ive(s):		Ice (4 °C)
Associated Blank Sampl	es:						Signature:
		None					
		None					
Notes:							Name (print):
		None					Jason Hayes
QA/QC'd by:	Thomas W. Hensel				QA	/QC Date:	6/14/2017



Project Name:		Inspection of AFFF Release Area vironmental Programs Worldwide		Project Number:			775303101.0025
Contract:		FA8903-16-D-0027		Task Orde	er:		0004
Installation:		Patrick AFB (PTRCK)		Start Date	:		05/23/17
Location ID:		MW03002		End Date:	-		05/23/17
Technician(s):				Jason Hayes,	, Jason Drizd		
Sample ID		Sample Date/Time	Sample Depth (ft)	USCS Symbol			Comments/Observations
PTRCK03-SO-0	03	05/23/17 1420	0 - 1	SP			None
PTRCK03-SO-0	04	05/23/17 1425	2 - 3	SM			None
Sample Collection Method:		Grab		Analysis/N	Method(s):	PFCs	s (EPA 537), TOC (EPA 9060), VOCs (EPA 8260)
Sample Container Type(s):		4 oz HDPE		Preservati	ive(s):		Ice (4 °C)
Associated Blank Sample	es:	None					Signature:
Notes:		None					Name (print):
Notes:							name (pmit):
		None					Jason Hayes
QA/QC'd by:	Thomas W. Hensel				Q	A/QC Date:	6/14/2017

# APPENDIX C-6 SCREENED WELL CONSTRUCTION FORMS



Writecler Project Name: Site Inspection of AFFF Release Areas Environmental Programs Worldwide  Contract Number: FA8903-16-0-00277 Task Order: Location ID: Drilling Subcontractor: AnDilli, Ibc Drilling Subcontractor: AnDilling Method: DPT Bend Sales Bend Date: Todd Ives, Keink Anderson DPT Bend Date: Technician(s) Jason Hayes, Jason Dixed  Type of Well: Sik Up See survey data  Type of Well: See survey data  Type of Bene (TOR) TOC/TOR Difference (in): See survey data  Depth to Water (ft): Date:	DRM		
Installation: Patrick APB (PTRCK) Drilling Subcontractor: Amobil, Inc. Drilling Subcontractor: Amobil, Inc. Drilling Personnel: Todd Ives, Keith Anderson Start Date: End Date: Technician(e)  Type of Well: Stock Up Messuring Point: Top of Riser (TOR) TOC/TOR Difference (in): See survey data  Protective Casing: Type: Dimensions (in) Stickup (ft): Length (ft): Guard Post: OS2317  Approximate Diameter of Borehole (in): 4  Depth to Water (ft): 4.5 During Drilling: A.5 Date: 052317  Post Development: See development log Date: 052317  Hydrologic Unit: W  Water added during difling (gal): None Water emoved during development (gal): None  Water emoved during development (gal): None Top of Filter Pack (ft): 0  Top of Filter Pack (ft): 14.5  Bottom of Screened Interval (ft): 14.5  Bottom of Filter Pack (ft): 14.5  Bottom of Filter Pack (ft): 14.5  Bottom of Filter Pack (ft): 14.5  Bottom of Borehole (ft): 14.7  Notes: Pre-packed temporary well, no sand or bentonite added. Pro6 = Prof. Upper/Stainless Size (Lover.  Name (print): Signature: Name (print): Name (pr	775303101.0025		
Installation: Patrick APB (PTRICK)  Drilling Subcontractor: AnnOwl, Inc.  Drilling Personnel: Todd Ives, Keith Andorson  Start Date: End	0004		
Drilling Subcontractor:  Todd Ivex, Kelfh Anderson Start Date: Fechnician(s)  Foetnician(s)  Top of Rawr (TOR)  Depth to Water (ft): Date:  05/23/17  Post Development: Date: 05/23/17  None  Water added during development (gal):  None  Water added during development (gal):  None  Water added during firling above of Filter Pack (ft):  Op of Filter Pack (ft):  Op of Filter Pack (ft):  Southwater (ft):  A.5  Dono of Filter Pack (ft):  Op of Screen Interval (ft):  14.5  Southom of Screened Interval (ft):  14.5  Southom of Filter Pack (ft):  Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Filter Pack (ft): Oppose Screen Interval (ft):  A.5  Southom of Borehole (ft):  A.5  Sump/End Cap:  Notes:  Pre-packed temporary well, no sand or bentontle added. PVS = PVC Upper/Stankes Steel Lower.  Notes:  Pre-packed temporary well, no sand or bentontle added. PVS = PVC Upper/Stankes Steel Lower.  Name (print):  Name	AFFF Release Area 1		
Drilling Method: DPT End Date: End Date: End Date: Drilling Method: DPT End Date: End Date: End Date: Drilling Method: DPT End Date: End Date: Drilling Method: DPT End Date: Drilling Method: DPT End Date: Diversal Stack Up Measuring Point: Diversal Stack Up Measuring Point: Difference (in): See survey data  Depth to Water (ft): A-5 During Drilling: A-5 Date:	MW01001		
Corling Method: Technician(s)  Stock Up  Stock	05/23/17		
Fechnician(s)  Type of Well:  Slick Up Type of Well:  Top of Raer (TOR) Type:  Type:  See survey data  Protective Casing: Type:  Length (ft):  Length (ft):  Length (ft):  Length (ft):  Length (ft):  Length (ft):  Surface Pad: Type:  Length (ft):  Surface Pad: Type:  Length (ft):  Thickness (in):  Annular Seal (grout at Material:  Installation Melt  Material:  Type:  Installation Melt  Material:  Type:  Installation Melt  Hydration time  Filter Pack Material:  Size (Sieve Size installation Melt  Surface Pad:  Type:  Length (ft):  Thickness (in):  Annular Seal (grout at Material:  Installation Melt  Hydration time  Filter Pack Material:  Size (Sieve Size installation Melt  Surging time:  Well Casing (Solid Ris Manufacturer:  Type/Material:  Size (Sieve Size installation Melt  Surging time:  Well Casing (Solid Ris Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Length (ft):  Jiameter (in):  Length (ft):  Sottom of Filter Pack (ft):  14.5  Sottom of Filter Pack (ft):  Annulacturer:  Type/Material:  Size (Sieve Size installation Melt  Surging time:  Well Casing (Solid Ris Manufacturer:  Type/Material:  Diameter (in):  Length (ft):  Sottom of Filter Pack (ft):  14.5  Sottom of Filter Pack (ft):  Annulacturer:  Type/Material:  Diameter (in):  Length (ft):  Sottom of Filter Pack (ft):  Sottom of Filter Pack (ft):  Sottom of Filter Pack (ft):  Annulacturer:  Type/Material:  Size (Sieve Size installation Melt  Surging time:  Well Casing (Solid Ris Manufacturer:  Type/Material:  Diameter (in):  Length (ft):  Sottom of Filter Pack (ft):  Sottom of Filter Pack (ft):  Annular Seal (pounds in the pounds in t	05/23/17		
Type of Well:  Measuring Point:  Top of Reer (TOR)  See survey data  Approximate Diameter of Borehole (in):  4.  Depth to Water (ft):  Date:  OS/23/17  Post Development:  Date:  OS/23/17  None  Mater added during initialiting (as):  Mater added during initiality (as):  Mater added during levelopment (gal):  None  Mater removed during levelopment (gal):  Top of Bentonite Seal (ft):  Top of Filter Pack (ft):  O  Top of Filter Pack (ft):  O  Top of Screenel Interval (ft):  And Screened Interval (ft):  14.5  Sottom of Screened Interval (ft):  14.5  Sottom of Filter Pack (ft):  Sottom of Filter Pack (ft):  Sottom of Screened Interval (ft):  14.5  Sottom of Borehole (ft):  14.5  Sottom of Borehole (ft):  14.5  Sottom of Borehole (ft):  Sottom of Borehole (ft):  Sottom of Screened Interval (f			
Measuring Point:  Top of Riser (TOR)  TOC/TOR Difference (in):  See survey data  Type:  Length (ft):  Guard Post:  Length (ft):  Guard Post:  Length (ft):  Surface Pad:  Type: Length (ft): Width (ft): Thickness (in): Thick			
Dimensions (in) See survey data  Dimensions (in) Stickup (ft): Length (ft): Length (ft): Length (ft): Journal Dilimensions (in) Stickup (ft): Length (ft): Journal Dilimensions (in) Stickup (ft): Length (ft): Journal Drilling: Jo			
Stickup (ft): Length (ft): Guard Post: Depth to Water (ft): Date: See development: Date: O5/23/17  Post Development: See development log Date: O5/23/17  Annular Seal (grout at Material: Installation Met Hydration time Hydration time Hydration time Filter Pack (ft): Op of Bentonite Seal (ft): Op of Filter Pack (ft): Op of Screen Interval	SLS		
Length (ft): Guard Post:  Popt to Water (ft): During Drilling: Date: O5/23/17  Post Development: Date: O5/23/17  Post Development: Date: O5/23/17  None  Vater added during irrilling (gal): None Vater removed during levelopment (gal): Vater removed during levelopment (gal): Vater removed during levelopment (gal): Vater pack (ft): Op of Filter Pack (ft): Op of Screen Interval (ft): Op of Scree	NA		
As a proximate Diameter (f Borehole (in):    As   As   As   As   As     During Drilling:	NA		
As surface Pad: Depth to Water (ft): Depth to Water (ft): Date: Da	NA		
Depth to Water (ft):  Date:  Date:  O5/23/17  Post Development:  Date:  O5/23/17  Post Development:  See development log  bydrologic Unit:  W  Water added during  Irilling (gal):  Water are removed during  levelopment (gal):  None  Well Casing (Solid Ris Manufacturer:  Material:  Type:  Installation Mett Hydration time  Filter Pack Material:  Size (Sieve Size Installation Mett Surging time:  Well Casing (Solid Ris Manufacturer:  Type/Material:  Diameter (in):  Well Casing (Solid Ris Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Well Screen:  Manufacturer:  Type/Material:  Diameter (in):  Well Screen:  Solid Ris Manufacturer:  Type/Material:  Diameter (in):  Well Casing (Solid Ris Manufacturer:  Type/Material:  Diameter (in):  Well Casing (Solid Ris Manufacturer:  Type/Material:  Diameter (in):  Solid Ris Manufacturer:  Type/Material:  Size (Sieve Size  Signature:  None  Pro-packed temporary well, no sand or bentonte added.  PVS = PVC Upper/Stainless Steel Lower.  Name (orint):	NA		
During Drilling: Date: Date: Doscarding Drilling: Date: Date: Doscarding Drilling: Date: Date: Doscarding Drilling: Date: Date: Doscarding Drilling: Date: Date: Date: Doscarding Drilling: Date: Date: Date: Date: Doscarding Drilling: Date: D			
During Drilling: Date:  05/23/17  Post Development: See development (og			
Date:    Post Development:   See development log	None		
Post Development: Date:    OS23/17	NA		
Date:  O5/23/17  Annular Seal (grout at Material: Installation Met Bentonite Seal: Manufacturer: Material: Type: Installation Met Hydration time Vater removed during levelopment (gal):  Op of Bentonite Seal (ft):  Op of Filter Pack (ft):  Op of Screen Interval (ft):  Op of Scr	NA		
Annular Seal (grout at Material: Installation Met Material: Type: Installation Met Hydration time levelopment (gal):  None    Pilter Pack Material: Manufacturer: Material: Size (Sieve Size Installation Met Surging time: Size (Sieve Size Installation Met Surging time: Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Diameter (in): Diameter (in): Diameter (in): Diameter (in): Siottom of Filter Pack (ft): 14.5    Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.	NA		
Material: Installation Met Bentonite Seal: Manufacturer: Mater added during rilling (gal): Mater removed during evelopment (gal): None  None  None  Filter Pack Material: Manufacturer: Material: Size (Sieve Size Installation Method Surging time)  op of Filter Pack (ft):  op of Screen Interval (ft):  op of Screen Interval (ft):  iottom of Screened Interval (ft):  iottom of Filter Pack (ft):  iottom of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Name (orint):  Name (orint):  Name (orint):			
Installation Met Bentonite Seal:  Manufacturer: Material: Type: Installation Met Hydration Met Size (Sieve Size Installation Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Sottom of Filter Pack (ft):  Installation Met Hydration Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Sottom of Filter Pack (ft): Installation Met Hydration Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Sottom of Filter Pack (ft): Installation Met Hydration Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Sottom of Filter Pack (ft): Installation Met Hydration Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Sottom of Filter Pack (ft): Installation Met Hydration Met Hydration Met Hydration Met Hydration Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Sottom of Filter Pack (ft): Installation Met Hydration Met Hydration Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Sottom of Filter Pack (ft): Installation Met Hydration Met Hydration Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Sottom of Filter Pack (ft): Installation Met Hydration M	•		
Water added during rilling (gal):  None  Filter Pack Material:  Manufacturer:  Material:  Manufacturer:  Material:  Size (Sieve Size Installation Mett Surging time:  Nop of Filter Pack (ft):  O  Well Casing (Solid Ris Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Well Screen:  Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Nottom of Filter Pack (ft):  Nottom of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Name (print):  Name (print):	NA		
Manufacturer: Material: Type: Installation Met Hydration time  Filter Pack Material: Size (Sieve Size Installation Met Surging time:  Op of Filter Pack (ft):  Op of Screen Interval (ft):  Op of Screen Interval (ft):  Op of Screen Interval (ft):  Option of Screened Interval (ft):  Option of Scree	od: NA		
Manufacturer: Material: Type: Installation Met Hydration time  Filter Pack Material: Size (Sieve Size Installation Met Surging time:  Op of Bentonite Seal (ft):  Op of Filter Pack (ft): Op of Screen Interval (ft): Op of Screen Interval (ft): Ottom of Screened Interval (ft): Ottom of Filter Pack (ft): Ottom of Filter Pack (ft): Ottom of Borehole (ft):  I 4.5  Ottom of Borehole (ft):  Ottom of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Manufacturer: Type/Material: Length (ft): Diameter (in): Length (ft): Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Name (orint):			
Material: Type: Installation Mett Hydration time  Filter Pack Material: Size (Sieve Size Installation Mett Surging time:  Op of Bentonite Seal (ft): Op of Filter Pack (ft): Op of Screen Interval (ft			
Aster added during rilling (gal):  None  None  None  None  None  None  None  None  None  Filter Pack Material:  Manufacturer:  Material:  Size (Sieve Size Installation Mett Surging time:  Nop of Filter Pack (ft):  O  Well Casing (Solid Ris Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Well Screen:  Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Well Screen:  Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Solottom of Filter Pack (ft):  Interval (ft):  Interval (ft):  Notion of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Name (print):  Name (print):	NA		
Installation Meting later removed during evelopment (gal):  None  None  None  None  None  None  None  None  None  Filter Pack Material:  Manufacturer:  Material:  Size (Sieve Size Installation Meting Surging time:  Nop of Filter Pack (ft):  O  Well Casing (Solid Rism Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Well Screen:  Manufacturer:  Type/Material:  Length (ft):  Diameter (in):  Length (ft):  Slot Size (in):  Slot Size (in):  Slot Type:  Sump/End Cap:  Name (print):  Value of Toc.  Name (print):  Name (print):	NA		
Atter removed during evelopment (gal):  None    Hydration time   Hydration time   Hydration time   Filter Pack Material:   Manufacturer:   Material:   Size (Sieve Size   Installation Met   Surging time:   Surging time:   Well Casing (Solid Ris   Manufacturer:   Type/Material:   Length (ft):   Diameter (in):   Diameter (in):   Diameter (in):   Diameter (in):   Length (ft):   Diameter (in):   Length (ft):   Slot Size (in):   Slot Type:   Sump/End Cap:   Sump/End Cap:   Signature:   Signature:   Name (orint):   Name (orint)	NA		
Filter Pack Material: Manufacturer: Material: Size (Sieve Size Installation Met Surging time: Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Length (ft): Slot Size (in): Slot Type: Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Name (print):	•		
Filter Pack Material: Manufacturer: Material: Size (Sieve Size Installation Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Length (ft): Slottom of Filter Pack (ft): 14.5 Sottom of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	rs): NA		
Manufacturer: Material: Size (Sieve Size Installation Mett Surging time:  Top of Filter Pack (ft):  O  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Length (ft): Diameter (in): Length (ft): Slottom of Filter Pack (ft): 14.5  Bottom of Borehole (ft):  14.7  Very and or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Name (print):			
Material: Size (Sieve Size Installation Met Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Length (ft): Slottom of Filter Pack (ft):  Bottom of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Name (print):			
Size (Sieve Size Installation Method Surging time:  Sop of Filter Pack (ft):  Op of Screen Interval (ft	Prepack		
Installation Meti Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Diameter (in): Diameter (in): Diameter (in): Length (ft): Diameter (in): Length (ft): Slottom of Filter Pack (ft): 14.5  Bottom of Borehole (ft): 14.7  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Name (print):	1S		
Surging time:  Surging time:  Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Length (ft): Diameter (in): Length (ft): Slottom of Filter Pack (ft): Slottom of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):			
Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Length (ft): Slottom of Filter Pack (ft): 14.5  Sottom of Borehole (ft): 14.7  Sottom of Borehole (ft): Slot Size (in): Slot Size (in): Slot Type: Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):			
Well Casing (Solid Ris Manufacturer: Type/Material: Length (ft): Diameter (in):  Bottom of Screened Interval (ft): 14.5  Bottom of Filter Pack (ft): 14.5  Bottom of Borehole (ft): 14.7  Well Screen:  Manufacturer:  Type/Material:  Diameter (in):  Length (ft):  Slot Size (in):  Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Depths and heights are referenced to ground surface unless specified TOC.  Name (print):	None		
Manufacturer: Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Length (ft): Diameter (in): Length (ft): Diameter (in): Length (ft): Slottom of Filter Pack (ft): Length (ft): Slot Size (in): Slot Type: Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):			
Type/Material: Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Length (ft): Diameter (in): Sottom of Filter Pack (ft): Slot Size (in): Slot Size (in): Slot Type: Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	·		
Length (ft): Diameter (in): Well Screen: Manufacturer: Type/Material: Diameter (in): Length (ft): Slottom of Filter Pack (ft): 14.5 Slot Size (in): Slot Type: Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature: Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	Silver-Line Enviro-Pure		
Diameter (in):  Well Screen:  Manufacturer: Type/Material: Diameter (in): Length (ft): Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	PVC		
Well Screen:  Manufacturer: Type/Material: Diameter (in): Length (ft): Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	5.0		
Manufacturer: Type/Material: Diameter (in): Length (ft): Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	2.0		
ottom of Screened Interval (ft):  14.5  Manufacturer: Type/Material: Diameter (in): Length (ft): Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Page 14.5  Name (print):			
ottom of Filter Pack (ft):  14.5  Ottom of Borehole (ft):  14.7  14.5  Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  PName (print):	Silver-Line Enviro-Pure		
Diameter (in): Length (ft): Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  PName (print):	PVS		
Softom of Filter Pack (ft):  14.5  Length (ft): Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	2.0		
Slot Size (in): Slot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Name (print):	10.0		
Solot Type:  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	0.01		
Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.  Name (print):	Factory Slot		
otes:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Possible sand heights are referenced to ground surface unless specified TOC.  Name (print):	. actory clos		
Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  epths and heights are referenced to ground surface unless specified TOC.  Name (print):	End cap		
Name (print):			
	Jason Hayes		
all elevations are referenced to MSL (NAVD 88).			

amec foster wheeler	SCREE	ENED WELL CO	DNSTRUCTION FORM	1
Project Name:	Site Inspection of AFFF Relea Environmental Programs Wo		Project Number:	775303101.0025
Contract Number:	FA8903-16-D-0027		Task Order:	0004
Installation:	Patrick AFB (PTRCK)		Location ID:	AFFF Release Area 1
Drilling Subcontractor:	AmDrill, Inc.		Well ID:	MW01002
Drilling Personnel:	Todd Ives, Keith Anders	son	Start Date:	05/24/17
	DPT		End Date:	05/24/17
Drilling Method:	Jason Hayes, Jason Dr	izd	End Date:	332
Technician(s)	Jacon Hayes, Jacon Di	izu		
Type of Well:	Stick Up	1111	Protective Casing:	
Measuring Point:	Top of Riser (TOR)	_	Type:	SLS
TOC/TOR Difference (in):	See survey data	_	Dimensions (in):	NA
`		_	Stickup (ft):	NA
			Length (ft):	NA
Approximate Diameter			Guard Post:	NA
of Borehole (in):	4	_	_	
			Surface Pad:	
Depth to Water (ft):	4.5	_	Туре:	None
During Drilling:	4.5	_	Length (ft):	NA
Date:	05/24/17		Width (ft):	NA
Post Development:	See development log		Thickness (in):	NA
Date:	05/24/17	_	Annular Seal (grout above we	II seal):
			Material:	NA
Hydrologic Unit:	W	_	Installation Method:	NA
			Bentonite Seal:	
			Manufacturer:	
			Material:	NA
Water added during			Type:	NA
drilling (gal):	None	_	Installation Method:	NA
Water removed during			Hydration time (hrs):	NA NA
development (gal):	None	_	Filter Pack Material:	
			Manufacturer:	Prepack
			Material:	18
Top of Bentonite Seal (ft):	0	_7	Size (Sieve Size):	20/40
			Installation Method:	Gravity
Top of Filter Pack (ft):	0		Surging time:	None
			Well Casing (Solid Riser Abov	· · · · · · · · · · · · · · · · · · ·
			Manufacturer:	Silver-Line Enviro-Pure
Top of Screen Interval (ft):	4.4	_	Type/Material:	PVC
			Length (ft):	5.0
			Diameter (in):	2.0
			Well Screen:	
Bottom of Screened Interval (ft)	14.4		Manufacturer:	Silver-Line Enviro-Pure
, ,			Type/Material:	PVS
			Diameter (in):	2.0
Bottom of Filter Pack (ft):	14.4	<b></b>	Length (ft):	10.0
` '		7   -	Slot Size (in):	0.01
Bottom of Borehole (ft):	14.6	<b>—</b>	Slot Type:	Factory Slot
, ,		<b>-</b>		·
			Sump/End Cap:	End cap
	ted temporary well, no sand or bento VS = PVC Upper/Stainless Steel Lo		Signature:	
Depths and heights are reference All elevations are referenced to M	SL (NAVD 88).	cified TOC.	Name (print):	Jason Hayes
QA/QC'd by: Thomas W. Hen	isel		0.4/0.0	C Date: 6/15/2017

amec foster wheeler	SCREE	NED WELL CO	INSTRUCTION FOR	RM
Project Name:	Site Inspection of AFFF Releas Environmental Programs Wor		Project Number:	775303101.0025
Contract Number:	FA8903-16-D-0027		Task Order:	0004
Installation:	Patrick AFB (PTRCK)		Location ID:	AFFF Release Area 1
Drilling Subcontractor:			Well ID:	MW01003
Drilling Personnel:	Todd Ives, Keith Anderse	on	Start Date:	05/24/17
Drilling Method:	DPT		End Date:	05/24/17
Technician(s)	Jason Hayes, Jason Driz	zd	Liid Date.	
Type of Well:	Stick Up	1111	Protective Casing:	
Measuring Point:	Top of Riser (TOR)		Type:	SLS
TOC/TOR Difference (in):	See survey data		Dimensions (in):	NA
· · · —			Stickup (ft):	NA
			Length (ft):	NA
Approximate Diameter			Guard Post:	NA
of Borehole (in):	4			
			Surface Pad:	
Depth to Water (ft):	3.5		Type:	None
During Drilling:	3.5		Length (ft):	NA NA
Date:	05/24/17		Width (ft):	NA NA
Post Development:	See development log		Thickness (in):	NA NA
Date:	05/24/17		A	
			Annular Seal (grout above Material:	well seal): NA
Hudralagia I Init.	W		<del></del>	
Hydrologic Unit:			Installation Method:	IVA
			Bentonite Seal:	NA
			Manufacturer: Material:	NA NA
Water added during			Type:	NA NA
drilling (gal):	None		Installation Method:	NA NA
Water removed during			Hydration time (hrs)	-
development (gal):	None		,	<del></del>
			Filter Pack Material:	
			Manufacturer:	Prepack
			Material:	18
Top of Bentonite Seal (ft):	0	- JIII	Size (Sieve Size):	20/40
			Installation Method:	Gravity
			Surging time:	None
Top of Filter Pack (ft):	0		Well Casing (Solid Riser Al	pove Screen):
			Manufacturer:	Silver-Line Enviro-Pure
Top of Screen Interval (ft):	2.6		Type/Material:	PVC
			Length (ft):	5.0
			Diameter (in):	2.0
		<b></b>	Well Screen:	
Bottom of Screened Interval	(ft): 7.6		Manufacturer:	Silver-Line Enviro-Pure
Bottom of ocicenca interval			Type/Material:	PVS
			Diameter (in):	2.0
Bottom of Filter Pack (ft):	7.6	<b></b>	Length (ft):	5.0
` ,			Slot Size (in):	0.01
Bottom of Borehole (ft):	7.8		Slot Type:	Factory Slot
		•	Sump/End Cap:	End cap
Notes: Pre-p	packed temporary well, no sand or bento PVS = PVC Upper/Stainless Steel Lo		Signature:	
Depths and heights are referent All elevations are referenced to	nced to ground surface unless spec	ified TOC.	Name (print):	Jason Hayes
QA/QC'd by: Thomas W. F	Hensel		ΩΔ	/QC Date: 6/15/2017
				0/10/2011

amec foster wheeler	SCREE	NED WELL CO	NSTRUCTION FOR	M
Project Name:	Site Inspection of AFFF Releas Environmental Programs Woo		Project Number:	775303101.0025
Contract Number:	FA8903-16-D-0027		Task Order:	0004
Installation:	Patrick AFB (PTRCK)		Location ID:	AFFF Release Area 1
	AD-ill I		Well ID:	MW01004
Drilling Personnel:	Todd Ives, Keith Anderso	on	Start Date:	05/24/17
Drilling Method:	DPT		End Date:	05/24/17
Technician(s)	Jason Hayes, Jason Driz	zd	Liid Date.	
Type of Well:	Stick Up		Protective Casing:	
Measuring Point:	Top of Riser (TOR)		Type:	SLS
TOC/TOR Difference (in):	See survey data		Dimensions (in):	NA NA
[ · · · · · · · · · · · · · · · · · · ·	-		Stickup (ft):	NA
			Length (ft):	NA
Approximate Diameter			Guard Post:	NA
of Borehole (in):	4			
			Surface Pad:	
Depth to Water (ft):	5		Type:	None
During Drilling:	5		Length (ft):	NA
Date:	05/24/17		Width (ft):	NA
Post Development:	See development log		Thickness (in):	NA
Date:	05/24/17			
			Annular Seal (grout above v	
Hudralania Haite	W		Material:	NA NA
Hydrologic Unit:	vv		Installation Method:	IVA
			Bentonite Seal:	
			Manufacturer:	NA
			Material:	NA NA
Water added during	None		Type: Installation Method:	NA NA
drilling (gal):	None			-
Water removed during development (gal):	None		Hydration time (hrs):	NA .
development (gai):	None		Filter Pack Material:	
			Manufacturer:	Prepack
			Material:	18
Top of Bentonite Seal (ft):	0	_	Size (Sieve Size):	20/40
rop or Bontonico ocur (it).	·	· <b></b>	Installation Method:	Gravity
		<b>—</b>	Surging time:	None
Top of Filter Pack (ft):	0			
			Well Casing (Solid Riser Ab	ove Screen):
			Manufacturer:	Silver-Line Enviro-Pure
Top of Screen Interval (ft):	3.6		Type/Material:	PVC
			Length (ft):	5.0
			Diameter (in):	2.0
		<b>└</b>	Well Screen:	
Bottom of Screened Interval	(ft): 13.6		Manufacturer:	Silver-Line Enviro-Pure
	(1.5).		Type/Material:	PVS
			Diameter (in):	2.0
Bottom of Filter Pack (ft):	13.6	<b></b>	Length (ft):	10.0
, ,			Slot Size (in):	0.01
Bottom of Borehole (ft):	13.8		Slot Type:	Factory Slot
			Sump/End Cap:	End cap
Notes: Pre-	packed temporary well, no sand or bento PVS = PVC Upper/Stainless Steel Lo		Signature:	
Depths and heights are refere All elevations are referenced to	nced to ground surface unless spec o MSL (NAVD 88).	ified TOC.	Name (print):	Jason Hayes
QA/QC'd by: Thomas W. I	Hensel		QA/	QC Date: 6/15/2017

#### SCREENED WELL CONSTRUCTION FORM amed foster wheeler Site Inspection of AFFF Release Areas Project Name: Project Number: 775303101.0025 Environmental Programs Worldwide FA8903-16-D-0027 0004 Contract Number: Task Order: Patrick AFB (PTRCK) AFFF Release Area 1 Installation: Location ID: AmDrill, Inc. MW01005 Drilling Subcontractor: Well ID: Todd Ives, Keith Anderson 05/24/17 Drilling Personnel: Start Date: DPT 05/24/17 Drilling Method: End Date: Jason Hayes, Jason Drizd Technician(s) Stick Up Type of Well: **Protective Casing:** Top of Riser (TOR) Type: Measuring Point: See survey data NA Dimensions (in): TOC/TOR Difference (in): Stickup (ft): Length (ft): Approximate Diameter **Guard Post:** of Borehole (in): Surface Pad: Depth to Water (ft): Type: **During Drilling:** Length (ft): 05/24/17 Date: Width (ft): Post Development: See development log Thickness (in): 05/24/17 Date: Annular Seal (grout above well seal): Material: Hydrologic Unit: W Installation Method: Bentonite Seal: Manufacturer: Material: Water added during NA Type: drilling (gal): Installation Method: Water removed during Hydration time (hrs): development (gal): Filter Pack Material: Manufacturer: Prepack Material: Top of Bentonite Seal (ft): Size (Sieve Size): Installation Method: Gravity Surging time: Top of Filter Pack (ft): Well Casing (Solid Riser Above Screen): Silver-Line Enviro-Pure Manufacturer: PVC Top of Screen Interval (ft): 4.8 Type/Material: Length (ft): Diameter (in): Well Screen: Bottom of Screened Interval (ft): 14.8 Manufacturer: Silver-Line Enviro-Pure Type/Material: Diameter (in): Bottom of Filter Pack (ft): 10.0 Length (ft): 0.01 Slot Size (in): Bottom of Borehole (ft): 15.0 Slot Type: Factory Slot Sump/End Cap: End cap Notes: Pre-packed temporary well, no sand or bentonite added. Signature: PVS = PVC Upper/Stainless Steel Lower Depths and heights are referenced to ground surface unless specified TOC. Name (print): Jason Hayes All elevations are referenced to MSL (NAVD 88). QA/QC Date: Thomas W. Hensel QA/QC'd by: 6/15/2017

#### SCREENED WELL CONSTRUCTION FORM amed foster wheeler Site Inspection of AFFF Release Areas Project Name: Project Number: 775303101.0025 Environmental Programs Worldwide FA8903-16-D-0027 0004 Contract Number: Task Order: Patrick AFB (PTRCK) AFFF Release Area 1 Installation: Location ID: AmDrill, Inc. MW01006 Drilling Subcontractor: Well ID: Todd Ives, Keith Anderson 05/24/17 Drilling Personnel: Start Date: DPT 05/24/17 Drilling Method: End Date: Jason Hayes, Jason Drizd Technician(s) Stick Up Type of Well: **Protective Casing:** Top of Riser (TOR) Type: Measuring Point: See survey data NA Dimensions (in): TOC/TOR Difference (in): Stickup (ft): Length (ft): Approximate Diameter **Guard Post:** of Borehole (in): Surface Pad: Depth to Water (ft): Type: **During Drilling:** Length (ft): 05/24/17 Date: Width (ft): Post Development: See development log Thickness (in): 05/24/17 Date: Annular Seal (grout above well seal): Material: Hydrologic Unit: W Installation Method: Bentonite Seal: Manufacturer: Material: Water added during NA Type: drilling (gal): Installation Method: Water removed during Hydration time (hrs): development (gal): Filter Pack Material: Manufacturer: Prepack Material: Top of Bentonite Seal (ft): Size (Sieve Size): Installation Method: Gravity Surging time: Top of Filter Pack (ft): Well Casing (Solid Riser Above Screen): Silver-Line Enviro-Pure Manufacturer: PVC Top of Screen Interval (ft): 4.6 Type/Material: Length (ft): Diameter (in): Well Screen: Bottom of Screened Interval (ft): 14.6 Manufacturer: Silver-Line Enviro-Pure Type/Material: Diameter (in): Bottom of Filter Pack (ft): 10.0 Length (ft): 0.01 Slot Size (in): Bottom of Borehole (ft): 14.8 Slot Type: Factory Slot Sump/End Cap: End cap Notes: Pre-packed temporary well, no sand or bentonite added. Signature: PVS = PVC Upper/Stainless Steel Lower Depths and heights are referenced to ground surface unless specified TOC. Name (print): Jason Hayes All elevations are referenced to MSL (NAVD 88). QA/QC Date: Thomas W. Hensel QA/QC'd by: 6/15/2017

Contract Number: PASSON Secretary Se	Contract Number: FA8903-16-D-0027 Task Order: Installation: Patrick AFB (PTRCK) Location ID: A Drilling Subcontractor: AmDrill, Inc. Well ID: Drilling Personnel: Todd Ives, Keith Anderson Start Date: Drilling Method: Hand Auger End Date: Technician(s) Jason Hayes, Jason Drizd  Type of Well: Flush Mount Top of Riser (TOR) Type: TOC/TOR Difference (in): See survey data  Depth to Water (ft): 4 During Drilling: 4 During Drilling: 4 Drilling Mount Task Order:  Task Order:  Location ID: A Well ID:  Protective Casing:  Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Surface Pad: Type: Length (ft):	0004  FFF Release Area 2  MW02001  05/23/17  05/23/17  SLS  NA
Description	Installation: Patrick AFB (PTRCK) Location ID: A Drilling Subcontractor: AmDrill, Inc. Well ID: Drilling Personnel: Todd Ives, Keith Anderson Start Date: Drilling Method: Hand Auger End Date: Technician(s) Jason Hayes, Jason Drizd  Type of Well: Flush Mount Top of Riser (TOR) Type: TOC/TOR Difference (in): See survey data  Approximate Diameter of Borehole (in): 2  Depth to Water (ft): 4 During Drilling: 4  Location ID: A Mell ID: Well ID: Well ID: Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Surface Pad: Type: Length (ft):	FFF Release Area 2  MW02001  05/23/17  05/23/17  SLS  NA
Installation: Please APR EPTINCH   Continue   Continue	Installation: Patrick AFB (PTRCK)  Drilling Subcontractor: AmDrill, Inc.  Well ID:  Drilling Personnel: Todd Ives, Keith Anderson Start Date:  Drilling Method: Hand Auger End Date:  Technician(s)  Type of Well: Flush Mount  Type of Well: Top of Riser (TOR)  TOC/TOR Difference (in): See survey data  Approximate Diameter of Borehole (in): 2  During Drilling: 4  During Drilling: 4  Location ID: A  Well ID:  Well ID:  Protective Casing:  Type:  Dimensions (in):  Stickup (ft):  Length (ft):  Surface Pad:  Type:  Length (ft):	MW02001 05/23/17 05/23/17 SLS NA
Drilling Sub-contractor; Drilling Sub-contractor; Drilling Membed: I Tool Since, Manie Andersono Technician(s) I Technician(s) I Technician(s) I Tool of Beau Filter Major Measuring Point: Tool of Rem (TOR) TOC/TOR Difference (in): Sees survey data  TOC/TOR Difference (in): Sees survey data  TOC/TOR Difference (in): Sees survey data  Top of Remote (in):  2 During Drilling: 4 During Drilling: 4 During Drilling: 4 Date: 06/23/17  Protective Casing: Type: Sickup (it): NAA Guard Post: NAA Guard Post: NAA Guard Post: NAA Guard Post: NAA Post Development: See development: Date: 06/23/17  Annular Seal (grout above well seal): Mater added during Thickness (in): NA Mater added during Mater added during Mater added during Mater added during Type: NA Material: NA Material: NA Type: NA Material: NA Type: NA Material: NA Material: NA Type: NA Material: NA Material: NA Material: NA Type: NA Material: NA Material: NA Material: NA Type: NA Material: NA Type: NA Material: NA M	Drilling Subcontractor:  AmDrill, Inc.  Well ID:  Drilling Personnel:  Todd Ives, Keith Anderson  Start Date:  End Date:  Technician(s)  Type of Well:  Measuring Point:  Top of Riser (TOR)  TOC/TOR Difference (in):  See survey data  Type:  Approximate Diameter  of Borehole (in):  During Drilling:  AmDrill, Inc.  Well ID:  Start Date:  End Date:  Protective Casing:  Type:  Dimensions (in):  Stickup (ft):  Length (ft):  Surface Pad:  Type:  Length (ft):	05/23/17 05/23/17 SLS NA
Depth to Water (ft):  Date:  Depth to Water (ft):  Date:  Dost Development:  NA  Thickness (in):  NA  Annular Seal (grout above well seal):  Martifacture:  NA  Material:  NA  Type:  NA  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Filler Pack Material:  Martifacture:  Proportion Method:  Martifacture:  Proposk  Material:  Martifacture:  Proposk  Material:  Martifacture:  Size (Size Size):  Diameter (in):  None  Well Screen:  Manufacture:  Show-Line Enviro-Pure  Type/Material:  Prof Clamping (in):  Solution of Filter Pack (it):  Proposk  Manufacture:  Show-Line Enviro-Pure  Type/Material:  Prof Clamping (in):  Solution of Filter Pack (it):  Proposk  Manufacture:  Show-Line Enviro-Pure  Type/Material:  Prof Clamping (in):  Solution of Filter Pack (it):  Domenser (in):  Domenser	Drilling Personnel: Todd Ives, Keith Anderson Start Date:  Drilling Method: Hand Auger End Date:  Flochnician(s) Jason Hayes, Jason Drizd  Flype of Well: Flush Mount Top of Riser (TOR)  FOC/TOR Difference (in): See survey data  Approximate Diameter of Borehole (in): 2  Depth to Water (ft): 4  During Drilling: 4  Flush Mount Protective Casing:  Type:  Dimensions (in):  Stickup (ft):  Length (ft):  Surface Pad:  Type:  Length (ft):	05/23/17 SLS NA
Drilling Method:   Javan Hopper, Javan Dud	Drilling Method:    Flush Mount   Protective Casing:   Type of Well:   Top of Riser (TOR)     Dimensions (in):   Stickup (ft):   Length (ft):   Guard Post:   Option During Drilling:   4   Length (ft):   Length (ft):	05/23/17 SLS NA
Type of Welt:    Flush Maurit   Measuring Point:   Tool of Base (TOR)	Technician(s)  Jason Hayes, Jason Drizd  Type of Well:  Flush Mount  Top of Riser (TOR)  TOC/TOR Difference (in):  See survey data  Type:  Dimensions (in):  Stickup (ft):  Length (ft):  Guard Post:  Depth to Water (ft):  During Drilling:  4  Description:  Jason Hayes, Jason Drizd  Protective Casing:  Type:  Dimensions (in):  Stickup (ft):  Length (ft):  Surface Pad:  Type:  Length (ft):	SLS NA
Type of Well:    Fauth Mount   Type of Well:   Top of Reser (TOR)   Type:   SLS	Type of Well:    Flush Mount   Type:   Type:   Dimensions (in):   See survey data   Dimensions (in):   Stickup (ft):   Length (ft):   Guard Post:   Of Borehole (in):   2   Surface Pad:   Type:   During Drilling:   4   Length (ft):   Length (ft):   Cupth	NA
Measuring Point: Top of Riser (TOR) See survey date  TOCITOR Difference (in): See survey date  Top of Bornhole (in): 2 Depth to Water (tt): 4 Depth to Water (tt): 4 Depth to Water (tt): Post Development: Date: 05/23/17  Post Development: See development (in): NA  Width (tt): NA  Annular Seal (grout above well seal): Material: NA  Thickness (in): NA  Annular Seal (grout above well seal): Material: NA  Installation Method: NA  Material: NA  Type: NA  Material: NA  Type: NA  Installation Method: NA  Hydrotion time (hrs): NA  Filter Pack Material: Manufacturer: Manufacturer: NA  Material: 15  Size of Control of Control None  Well Casing (Solid Riser Above Screen): Manufacturer: TypeMaterial: PVC  Length (tt): Solid Riser Above Screen): Manufacturer: TypeMaterial: PVC  Length (tt): Solid Riser Above Screen): Manufacturer: TypeMaterial: PVC  Length (tt): Solid Size (in): Solid	Measuring Point:  Top of Riser (TOR)  Type:  Dimensions (in):  Stickup (ft):  Length (ft):  Guard Post:  Depth to Water (ft):  During Drilling:  4  Length (ft):	NA
Measuring Point:  Too of River (TOR) TOC/TOR Difference (in):  See survey data  TOC/TOR Difference (in):  See survey data  TOC/TOR Difference (in):  See survey data  Top of Borneloi (in):  2  Depth to Water (it): 4  Depth to Water (it): 4  Depth to Water (it): 9  Post Development: Bee development (ig) Date: 05/23/17  Annular Seal (grout above well seal): Material: NA  Installation Method: NA  Material: NA  Material: NA  Material: NA  Material: NA  Material: NA  Material: NA  Type: NA  Material: NA  Filter Pack Material: Manufacturer: Manufacturer: Manufacturer: Manufacturer: Manufacturer: Manufacturer: NA  Material: NA  Type: None  Well Casing (Solid Riser Above Screen): Manufacturer: Type/Material: PYC  Length (it): Sol Dimeter (in):	Measuring Point: Top of Riser (TOR)  TOC/TOR Difference (in): See survey data  Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post:  Depth to Water (ft): 4  During Drilling: 4  Type: During Drilling: 4  Type: Dimensions (in): Stickup (ft): Length (ft): Surface Pad: Type: Length (ft):	NA
Dimensions (in):  Size survey data  Dimensions (in):  Approximate Diameter of Borohole (in):  2 Depth to Water (it):	TOC/TOR Difference (in):  See survey data  Dimensions (in): Stickup (ft): Length (ft): Guard Post:  Surface Pad: Type: During Drilling:  4  Length (ft):	
Approximate Diameter of Borehole (in):  2 Depth to Water (ft):	Stickup (ft): Length (ft): Surface Pad: Depth to Water (ft): During Drilling:   Stickup (ft): Length (ft): Surface Pad: Type: Length (ft):	NA
Approximate Diameter  Approximate Diameter  A Borshole (in):  2 Depth to Water (ft):	Approximate Diameter  Open to Water (ft):  During Drilling:  Length (ft):  Guard Post:  Surface Pad:  Type:  Length (ft):	
Approximate Diameter 4 Borchole (in):  2 Depth to Water (it):	Approximate Diameter  of Borehole (in):  Depth to Water (ft):  During Drilling:  4  Clear Post:  Surface Pad:  Type:  Length (ft):	NA
Depth to Water (ft):  During Drilling:	Depth to Water (ft):  During Drilling:  4  Surface Pad:  Type:  Length (ft):	
Depth to Water (tf):    During Drilling:	Surface Pad:	101
During Drilling: Date:  0523/17 Post Development: See development: See development bg 05/23/17  Hydrologic Unit:  W  Water added during diffling (gal): Nanular Seal (grout above well seal): Material: NA Installation Method: NA Material: NA Hydration time (hrs): NA Material: NA Type: NA  Filter Pack Material: Manufacturer: Prepack Material: Size (Sieve Size): 2040 Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0 Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0 Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Well Casing (Solid Riser Above Screen): Manufacturer: Siver-Line Enviro-Pure Type/Material: PVC Length (ft): Sio Size (in): 0.01 Siot Type: Factory Stot Signature:  Signature:	During Drilling: 4 Length (ft):	
During Drilling: Date:  0523177 Post Development: See development tog: 052317  Post Development: Date:  052317  Annular Seal (grout above well seal): Material: NA Installation Method: Na Installatio	During Drilling: 4 Length (ft):	None
Date: 0523477  Post Development: See development log 0523477  Date: 05623477  Annular Seal (grout above well seal): Material: NA Installation Method: NA  Mater added during development (gal): None  Water added during development (gal): None  Water ended during development (gal): None  Top of Bentonite Seal (ft): 0  Top of Bentonite Seal (ft): 0  Filter Pack Material: NA Installation Method: NA Hydration time (hrs): NA  Hydration time (hrs): NA  Filter Pack Material: Manufacturer: Prepack Material: Manufacturer: Prepack Material: None  Top of Filter Pack (ft): 0  Well Casing (Solid Riser Above Screen): Manufacturer: Skee-Line Enviro-Pure Type/Material: PVG  Length (ft): 5.0  Diameter (in): 1.0  Well Screen: Manufacturer: Skee-Line Enviro-Pure Type/Material: PVG  Length (ft): 5.0  Diameter (in): 0.01  Slot Size (in): 0.01  Slot Size (in): 0.01  Slot Type: Factory Std.  Signature:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lover.  Peepliss and heights are referenced to ground surface unless specified TOC.		NA
Post Development: Date:    OSC2917		NA
Date: 05/23/17  Hydrologic Unit: W  Annular Seal (grout above well seal):  Material: NA Installation Method: NA  Bentonite Seal:  Manufacturer: NA Material: NA Type: NA Installation Method: NA  Hydration time (hrs): NA  Hydration time (hrs): NA  Filter Pack Material: Si Size (slew Size): 20/40 Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Siver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Siver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Well Screen: Solid Size (in): 0.01 Slot Size (in): 0.01 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:		NA
Annular Seal (grout above well seal):  Material:  NA  Installation Method:  NA  Material:  NA  Type:  NA  Material:  NA  Type:  NA  Installation Method:  NA  Type:  NA  Installation Method:  NA  Type:  NA  Installation Method:  NA  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Filter Pack Material:  Manufacturer:  Prepack  Material:  Size (Sleve Size):  20440  Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  1.0  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  Diameter (in):  2.0  Length (ft):  5.0  Diameter (in):  2.0  Length (ft):  5.0  Soltom of Filter Pack (ft):  Soltom of Borehole (ft):  7.7  Bottom of Borehole (ft):  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stanless Steel Lower.  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stanless Steel Lower.  Signature:		
Material:  NA  Type:  NA  Material:  NA  Type:  NA  Material:  NA  Type:  NA  Material:  NA  Hydration ime (hrs):  N		al):
Installation Method: NA  Bentonite Seal:  Manufacturer: NA  Material: NA  Type: NA  Installation Method: NA  Material: NA  Type: NA  Installation Method: NA  Hydratol method: NA  Hydratol method: NA  Hydratol method: NA  Hydratol method: NA  Hydraton time (hrs): NA  Filter Pack Material: 1S  Size (Sieve Size): 20/40  Installation Method: Size  Manufacturer: Prepack  Material: 1S  Size (Sieve Size): 20/40  Installation Method: NA  Hydraton time (hrs): NA  Well Casing (Solid Riser Above Screen):  Manufacturer: Siver-Line Enviro-Pure  Type/Material: PVC  Length (ft): 5.0  Diameter (in): 1.0  Well Screen:  Manufacturer: Siver-Line Enviro-Pure  Type/Material: PVC  Length (ft): 5.0  Diameter (in): 2.0  Length (ft): 5.0  Siot Size (in): 0.01  Slot Type: Factory Sixt  Sump/End Cap: End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Staniess Steel Lower.  Signature:  Signature:	· · · · · · · · · · · · · · · · · · ·	•
Water added during drilling (gal): None Water removed during development (gal): None  Filter Pack Material: Manufacturer: Prepack Material: NA Hydration time (hrs): NA  Hydration time (hrs): Na  Hydration time (hrs): Na  Hydration time (h		
Mater added during drilling (gal): None Nater removed during development (gal): None None None None None None None None	installation Method:	IVA
Mater added during drilling (gal): None Nater removed during development (gal): None None  None  None  None  None  None  None  None  None  None  None  Filter Pack Material: NA Hydration time (hrs): NA  Hydration time (hrs): NA  Hydration time (hrs): NA  Hydration time (hrs): NA  Hydration time (hrs): NA  Filter Pack Material: Manufacturer: Prepack Material: NSize (Sieve Size): 20/40 Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Solot Size (in): 3.0 O.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Slainless Steel Lower.	Bentonite Seal:	
Mater added during drilling (gal): None  Filter Pack Material: None  None  None  None  None  Filter Pack Material: None  None  None  None  None  None  None  None  None  Filter Pack Material: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:		NA
Water added during drilling (gal):  None Water removed during development (gal):  None  None  Filter Pack Material:  Manufacturer:  Prepack Material:  Size (Sleve Size):  20/40 Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC Length (ft):  5.0 Diameter (in):  1.0  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS Diameter (in):  2.0 Length (ft): 5.0 Slot Size (in): 5.0 Slot Size (in): 5.0 Slot Type:  Factory Slot  Sump/End Cap:  End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Depaths and heights are referenced to ground surface unless specified TOC.		
Arilling (gal): Nater removed during development (gal): None    None   None   None   None		
Water removed during development (gal):  None  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Filter Pack Material:  Manufacturer:  Prepack Material:  Size (Sieve Size):  20:40 Installation Method:  Gravity Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC Length (ft):  5.0 Diameter (in):  Length (ft):  7.7  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS Diameter (in):  2.0 Length (ft):  5.0 Slot Size (in):  O.01 Slot Type:  Factory Slot  Sump/End Cap:  End cap  Notes:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.		
Filter Pack Material:  Manufacturer:  Prepack Material:  Size (Sieve Size):  20/40 Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC Length (ft):  5.0 Diameter (in):  Length (ft):  Solid Sizer Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS Diameter (in):  Length (ft):  5.0 Diameter (in):  Length (ft):  Silver-Line Enviro-Pure  Type/Material:  PVS Diameter (in):  Solid Size (in):  Diameter (in):  Solid Size (in):  Sol		
Filter Pack Material:  Manufacturer:  Material:  Manufacturer:  Prepack  Material:  1S  Size (Sieve Size):  20/40  Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC  Length (ft):  5.0  Diameter (in):  1.0  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  2.0  Length (ft):  5.0  Slott Size (in):  Slott Type:  Factory Slot  Sump/End Cap:  End cap  Notes:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Peepths and heights are referenced to ground surface unless specified TOC.		- IVA
Manufacturer: Prepack Material: 1S Size (Sieve Size): 20/40 Surging time: None  Fop of Filter Pack (ft): 0  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Sottom of Filter Pack (ft): 7.7  Sottom of Borehole (ft): 7.9  Sottom of Borehole (ft): 5.0 Sottom of Borehole (ft): 5.0 Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Sottom of Filter Pack (ft): 5.0 Sottom of Filter Pack (ft): 5.0 Sottom of Borehole (ft): 5.0 Sottom of Borehole (ft): 5.0 Sottom of Borehole (ft): 5.0 Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Sottom of Filter Pack (ft): 5.0 Sottom of Borehole (ft): 5.0 Sottom of Bore		
Material:  Size (Sieve Size):  1S  Size (Sieve Size):  1S  Size (Sieve Size):  1S  Size (Sieve Size):  1S  Size (Sieve Size):  20/40  Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC  Length (ft):  5.0  Diameter (in):  1.0  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  2.0  Length (ft):  Solt Size (in):  Solt Size		Durant
Size (Sieve Size): 20/40 Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Soltom of Filter Pack (ft): 7.7  Bottom of Borehole (ft): 7.9  Size (Sieve Size): 20/40 Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 5.0 Slot Size (in): 9.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:		· · · · · · · · · · · · · · · · · · ·
Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Sottom of Filter Pack (ft): 7.7  Bottom of Borehole (ft): 7.9  Surpy/End Cap: End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Signature: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap		
Surging time: None    Surging time: None		
Top of Filter Pack (ft):    O		· · · · · · · · · · · · · · · · · · ·
Well Casing (Solid Riser Above Screen):  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Size (in): Slot Size (in): Slot Type: Factory Slot  Sump/End Cap: End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:		None
Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:		
Top of Screen Interval (ft):  2.7  Type/Material: Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 5.0 Slot Size (in): Slot Type: Factory Slot  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.		· ·
Bottom of Screened Interval (ft):  Bottom of Screened Interval (ft):  T.7  Well Screen:  Manufacturer:  Type/Material:  PVS  Diameter (in):  2.0  Length (ft):  5.0  Slot Size (in):  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  End cap  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.		
Bottom of Screened Interval (ft):  7.7  Well Screen:  Manufacturer:  Type/Material:  PVS  Diameter (in):  2.0  Length (ft):  5.0  Slot Size (in):  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  End cap  Notes:  Pre-packed temporary well, no sand or bentonite added.  PVS  Signature:  Prespected to ground surface unless specified TOC.	Fop of Screen Interval (ft): 2.7 Type/Material:	
Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.	Length (ft):	5.0
Manufacturer: Silver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 2.0  Length (ft): 5.0  Slot Size (in): 0.01  Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Silver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 2.0  Length (ft): 5.0  Slot Size (in): 0.01  Slot Type: Factory Slot  Sump/End Cap: End cap	Diameter (in):	1.0
Asottom of Screened Interval (ft):  7.7  Manufacturer:  Type/Material:  PVS  Diameter (in):  2.0  Length (ft):  5.0  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Silver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  2.0  Length (ft):  Slot Size (in):  Slot Type:  Factory Slot  Signature:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.	Wall Screen:	
Type/Material: PVS Diameter (in): 2.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature: Signature:		Silver Line Envire Bure
Bottom of Filter Pack (ft):  7.7  Length (ft):  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:  Poepths and heights are referenced to ground surface unless specified TOC.		
Bottom of Filter Pack (ft):  Bottom of Borehole (ft):  7.7  Length (ft):  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  End cap  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.		
Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.		
Sottom of Borehole (ft):  7.9  Slot Type:  Factory Slot  Sump/End Cap:  End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.		
Notes:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.		
Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Depths and heights are referenced to ground surface unless specified TOC.	Bottom of Borehole (ft): 7.9 Slot Type:	Factory Slot
Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pepths and heights are referenced to ground surface unless specified TOC.	<u> </u>	
Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:  Depths and heights are referenced to ground surface unless specified TOC.	Sump/End Cap:	End cap
Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:  Depths and heights are referenced to ground surface unless specified TOC.		
PVS = PVC Upper/Stainless Steel Lower.  Depths and heights are referenced to ground surface unless specified TOC.		
Depths and heights are referenced to ground surface unless specified TOC.		
Depths and heights are referenced to ground surface unless specified TOC.		
Depths and heights are referenced to ground surface unless specified TOC.		
Name (print): Jason Hayes	Depths and heights are referenced to ground surface unless specified TOC.	

QA/QC Date:

6/14/2017

QA/QC'd by: Thomas W. Hensel

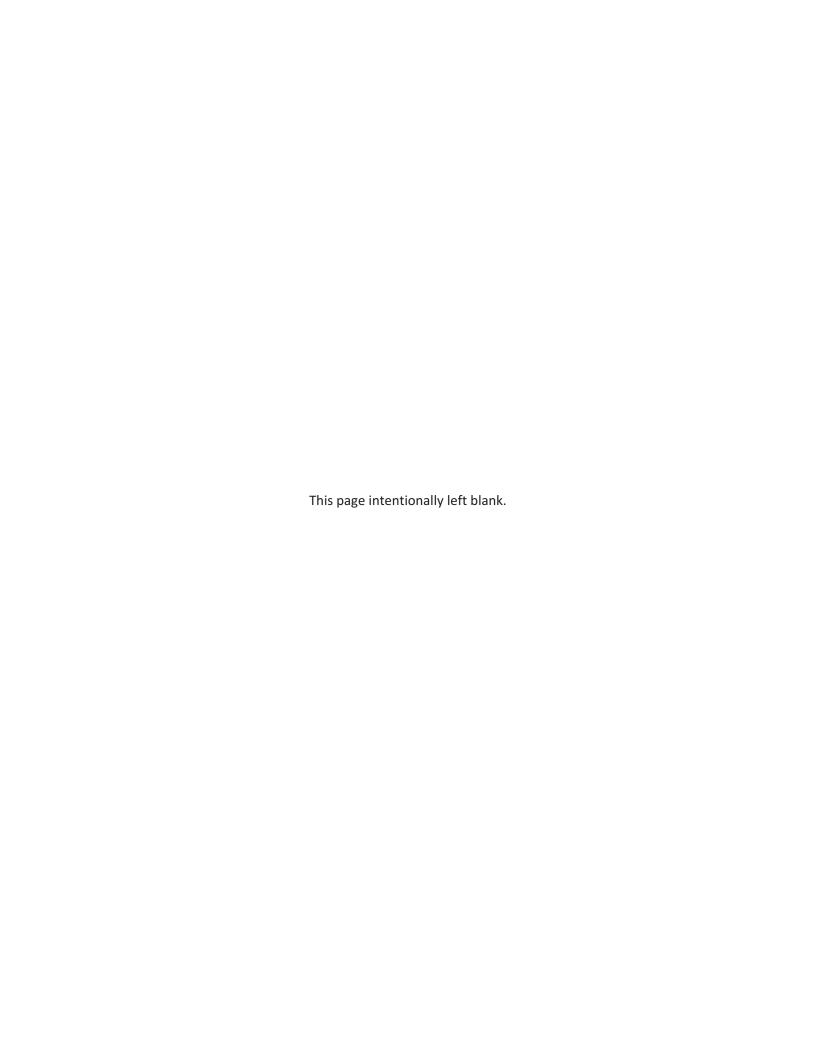
Topict Name   Sile Inspection of AFFF Release Areas   Enviromental Propages Violendade   Project Number:   TASIA (10.000)	Contract Number:  Installation:  Drilling Subcontractor:  Drilling Personnel:  Drilling Method:  Fechnician(s)  Fype of Well:  Measuring Point:  FOC/TOR Difference (in):  Approximate Diameter  of Borehole (in):  During Drilling:  Date:	Environmental Programs Worldwide  FA8903-16-D-0027  Patrick AFB (PTRCK)  AmDrill, Inc.  Todd Ives, Keith Anderson  Hand Auger  Jason Hayes, Jason Drizd  Flush Mount  Top of Riser (TOR)  See survey data  2  4  4  05/23/17  See development log	Task Order: Location ID: Well ID: Start Date: End Date:  Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post:  Surface Pad: Type: Length (ft):	0004  AFFF Release Area 2  MW02002  05/23/17  05/23/17  SLS  NA  NA  NA  NA
Trilling Subcontractor:  ARTH Pallistacy APE PTRICK; ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Date: ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK; ACCION ID: ARTH Date: ACCION ID: ARTH Date: ACCION ID: ARTH Pallistacy APE OTTRICK ACCION ID: ARTH Date: ACCION ID: ARTH	nstallation:  Drilling Subcontractor:  Drilling Personnel:  Drilling Method:  Technician(s)  Type of Well:  Measuring Point:  TOC/TOR Difference (in):  Approximate Diameter of Borehole (in):  Depth to Water (ft):  During Drilling:  Date:	Patrick AFB (PTRCK)  AmDrill, Inc.  Todd Ives, Keith Anderson  Hand Auger  Jason Hayes, Jason Drizd  Flush Mount  Top of Riser (TOR)  See survey data  2  4  4  05/23/17  See development log	Location ID:  Well ID: Start Date: End Date:  Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post:  Surface Pad: Type: Length (ft):	AFFF Release Area 2  MW02002  05/23/17  05/23/17  SLS  NA  NA  NA
Assertabletion: Plants ARE (PTROX) Inc. Well ID: MAXOD2 Intilling personnel: Tools Incs, Kolff Andolson Start Date: 05/23/17 Flant Mount Specific (Inc.)  Jacon Hopes, Jacon Dord  Start Date: 05/23/17 End Date: 05/23/17 End Date: 05/23/17 End Date: 05/23/17  End Date: 05/23/17  Floor Well: Flash Mount Specific (Inc.)  Jacon Hopes, Jacon Dord  Protective Casing: Type: Sk.S Dimensions (In): NA Stickup (It): NA Guard Post: NA Stickup (It): NA Stickup (It): NA Guard Post: NA Stirlace Pad: NA Surface Pad: NA Width (It): NA Width (It): NA Width (It): NA Width (It): NA Midth (It): NA Installation Method: NA Installatio	nstallation:  prilling Subcontractor:  prilling Personnel:  prilling Method:  prilling:  prilling:  prilling:  prilling:  prilling:  prilling:  prilling:  prilling:  prilling:	AmDrill, Inc. Todd Ives, Keith Anderson Hand Auger Jason Hayes, Jason Drizd  Flush Mount Top of Riser (TOR) See survey data  2  4  4  05/23/17 See development log	Well ID: Start Date: End Date:  Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post:  Surface Pad: Type: Length (ft):	MW02002 05/23/17 05/23/17 SLS NA NA NA
Well ID: MAYOGROZ  Titling Personnel: Total hies. Kelish Anderson  Frank Augur  Schniclan(s)  Jason Hayse, Jason Dood  Protective Casing:  Type: SLS  Dimensions (in): NA  Sickup (ft): NA  Anual Post: NA  Sickup (ft): NA  Anual Post: NA  Thickness (in): NA  Installation Method: NA  Installat	rilling Subcontractor:  rilling Personnel:  rilling Method: echnician(s)  /pe of Well: easuring Point:  DC/TOR Difference (in):  pproximate Diameter Borehole (in):  epth to Water (ft):  During Drilling:  Date:	Todd Ives, Keith Anderson Hand Auger Jason Hayes, Jason Drizd  Flush Mount Top of Riser (TOR) See survey data  2  4  4  05/23/17 See development log	Well ID: Start Date: End Date:  Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post:  Surface Pad: Type: Length (ft):	05/23/17 05/23/17 SLS NA NA NA
rilling Personnel:    Touth Mount   Start Date:   05/23/17	rilling Personnel: rilling Method: echnician(s)  ype of Well: easuring Point: DC/TOR Difference (in): pproximate Diameter is Borehole (in): epth to Water (ft): During Drilling: Date:	Todd Ives, Keith Anderson Hand Auger Jason Hayes, Jason Drizd  Flush Mount Top of Riser (TOR) See survey data  2  4 4 05/23/17 See development log	Start Date: End Date:  Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post:  Surface Pad: Type: Length (ft):	05/23/17  SLS  NA  NA  NA  NA
Hilling Method: Jamon Hoyes, Jason Dord  Jamon Hoyes, Jason Dord  Find Date:    Georgian House   Georgian Ho	rilling Method: echnician(s)  ype of Well: easuring Point: OC/TOR Difference (in):  pproximate Diameter f Borehole (in):  epth to Water (ft): During Drilling: Date:	Hand Auger Jason Hayes, Jason Drizd  Flush Mount Top of Riser (TOR) See survey data  2  4  4  05/23/17 See development log	Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post: Surface Pad: Type: Length (ft):	05/23/17  SLS  NA  NA  NA  NA
ype of Welt:  Flack Mount COCTOR Difference (in):  See survey data  Difference (in):  Post Development: Date:  OS22477  Post Development: See development: Date:  OS22477  Post Development: Date:  OS22477  Annular Seal (grout above well seal): Material:  NA  Installation Method: NA  Material: NA  Installation Method: NA  Hydraton time (ftrs): NA  Sick (in): NA  Sick (in): NA  Guard Post: NA  Surface Pad: Type: None Length (it): NA  Thickness (in): NA  Annular Seal (grout above well seal): Material: NA  Installation Method: NA  Material: NA  Installation Method: NA  Hydraton time (ftrs): NA  Filter Pack Material:  Manufacturer: Prepack Material:  Manufacturer: Prepack Material:  Size (Sieve Size): Correct Size (Sieve Size): None  Well Casing (Solid Riser Above Screen): Manufacturer: Size (Sieve Size): Size (Sie	rechnician(s)  Sype of Well:  Measuring Point:  OC/TOR Difference (in):  Supproximate Diameter of Borehole (in):  Depth to Water (ft):  During Drilling:  Date:	Jason Hayes, Jason Drizd  Flush Mount Top of Riser (TOR) See survey data  2  4  4  05/23/17 See development log	Protective Casing: Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post: Surface Pad: Type: Length (ft):	SLS NA NA NA
ype of Well:  Flush Mount  I go of Stere (TOR)  OC/T OR Difference (in):  See survey data  Frequency (in):  See survey data  OC/T OR Difference (in):  See survey data  Douring Drilling:  Date:  OS/2317  Post Development:  Date:  OS/2317  See overacpment by Date:  OS/2317  Annular Seal (grout above well seal): Material:  NA  Installation Method:  NA  Material:  NA  Material:  NA  Material:  NA  Material:  NA  Material:  NA  Installation Method:  NA  Material:  NA  Filter Pack (ft):  Op of Bentonite Seal (ft):  Op of Screen Interval (ft):  See overacpment in a seal or bentonite added. Projection of Borehole (ft):  See overacpment by Date:  OVERAGE (TOR)  None  Projective Casing: Type: SLS  Dimensions (in):  NA  Stickup (ft): NA  Length (ft): NA  Length (ft): NA  Width (ft): NA  Annular Seal (grout above well seal): Material: NA  Installation Method: NA  Material: NA  Naterial: NA  Naterial: NA  Naterial: NA  Filter Pack Material: Manufacturer: NA  Material: NA  Filter Pack Material: Manufacturer: Sive-Line Enviro-Pure Type-Material: None  Well Casing (Solid Riser Above Screen): Manufacturer: Type-Material: PVG  Diameter (in): NA  Well Casing (Solid Riser Above Screen): Manufacturer: Type-Material: PVG  Diameter (in): NA  Well Casing (Solid Riser Above Screen): Manufacturer: Type-Material: PVG  Diameter (in): NA  Well Casing (Solid Riser Above Screen): Manufacturer: Type-Material: PVG  Diameter (in): NA  Well Casing (Solid Riser Above Screen): Manufacturer: Type-Material: PVG  Diameter (in): NA  NA  Material: NA  Materi	ype of Well:  leasuring Point:  OC/TOR Difference (in):  pproximate Diameter f Borehole (in):  lepth to Water (ft):  During Drilling:  Date:	Flush Mount Top of Riser (TOR) See survey data  2  4  4  05/23/17 See development log	Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post: Surface Pad: Type: Length (ft):	NA NA NA NA
Surface Pack  Dimensions (in):  See Survey data  Type: SLS  Dimensions (in): See Survey data  Type: Surface Pack  Surface Pack: Type: None Length (ft): NA  Length (ft): NA  Length (ft): NA  Length (ft): NA  Surface Pack: Type: None Length (ft): NA  Thickness (in): NA  Annular Seal (grout above well seal): Material: NA  Installation Method: NA  Annular Seal: Naterial: NA  Installation Method: NA  Hydration time (hrs): NA  Hydration	easuring Point:  OC/TOR Difference (in):  pproximate Diameter f Borehole (in):  epth to Water (ft):  During Drilling:  Date:	Top of Riser (TOR)  See survey data  2  4  4  05/23/17  See development log	Type: Dimensions (in): Stickup (ft): Length (ft): Guard Post: Surface Pad: Type: Length (ft):	NA NA NA NA
Top of Reser (TOR)	leasuring Point:  OC/TOR Difference (in):  approximate Diameter f Borehole (in):  bepth to Water (ft):  During Drilling:  Date:	See survey data  2  4  4  05/23/17  See development log	Dimensions (in): Stickup (ft): Length (ft): Guard Post: Surface Pad: Type: Length (ft):	NA NA NA NA
Dimensions (In): NA Stickup (In): NA Width (It): NA Width (It): NA Width (It): NA Material: NA Installation Method: NA Hydration time (In): NA Material: NA Installation Method: NA Hydration time (In): NA Material: NA Installation Method: NA Hydration time (In): NA Material: NA Installation Method: NA Hydration time (In): NA Material: NA Installation Method: Stickup (In): NA Material: NA Installation Method: NA Hydration time (In): NA Material: NA Installation Method: Stickup (In) Mate	Approximate Diameter of Borehole (in):  Depth to Water (ft):  During Drilling:  Date:	2 4 4 05/23/17 See development log	Stickup (ft): Length (ft): Guard Post: Surface Pad: Type: Length (ft):	NA NA NA
Sickup (ft): NA Length (ft): NA Date: 0562317  Post Development: See development by Date: 0562317  Post Development: W  See development: W  See development by W  Installation Method: NA Installation Method: NA Installation Method: NA Installation Method: NA Material: NA Installation Method: NA Hydration time (tray): NA Hydration	pproximate Diameter If Borehole (in): Depth to Water (ft): During Drilling: Date:	2 4 4 05/23/17 See development log	Length (ft): Guard Post: Surface Pad: Type: Length (ft):	NA NA
Length (ft): NA Guard Post: NA  Surface Pad: Type: None Length (ft): NA Date: 05/23/17  Post Development: See development log Date: 05/23/17  Date: 05/23/17  Width (ft): NA Thickness (in): NA Thickness (in): NA Annular Seal (grout above well seal): Material: NA Installation Method: NA Material: NA Material: NA Installation Method: NA Material: NA Material: NA Material: NA Material: NA Filter Pack (ft): NA Type: None  Width (ft): NA Thickness (in): NA Material: NA Material: NA Material: NA Material: NA Filter Pack (ft): NA Material: NA Filter Pack (ft): NA Material: NA Hydration time (ftrs): NA Filter Pack (ft): NA Material: NA Materia	f Borehole (in): Depth to Water (ft): During Drilling: Date:	4 4 05/23/17 See development log	Length (ft): Guard Post: Surface Pad: Type: Length (ft):	NA
Surface Pad:   Surface Pad:   Type:   None	r Borehole (in): Depth to Water (ft): During Drilling: Date:	4 4 05/23/17 See development log	Guard Post:  Surface Pad:  Type:  Length (ft):	NA
septh to Water (ft):    Earth to Water (ft):   Date:   05/23/17	f Borehole (in): Depth to Water (ft): During Drilling: Date:	4 4 05/23/17 See development log	Surface Pad: Type: Length (ft):	
tepth to Water (ft):    During Drilling:   4	Depth to Water (ft):  During Drilling:  Date:	4 4 05/23/17 See development log	Type: Length (ft):	None
tepth to Water (ft):    During Drilling:	During Drilling:  Date:	4 05/23/17 See development log	Type: Length (ft):	None
During Drilling: Date:    OS/23/17	During Drilling:  Date:	4 05/23/17 See development log	Length (ft):	INUITE
Date: 0523/17  Post Development: See development log Date: 05/23/17  Date: 05/23/17  Annular Seal (grout above well seal): NA Material: NA Hydration time (hrs): NA Waterial: Size (Sieve Size): 20/40 Installation Method: Gravity Surging time: None  Op of Filter Pack (ft): 0  Op of Filter Pack (ft): 3.0  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0  Diameter (in): 1.0  Length (ft): 5.0  Diameter (in): 1.0  Length (ft): 5.0  Siot Size (in): 0.01  Siot Size (in): 0.01  Siot Size (in): 0.01  Siot Size (in): 0.01  Siot Type: Factory Sot Sump/End Cap: End cap	Date:	05/23/17 See development log		
Post Development: Date:    OS23/17		See development log	MAI: -141- (54).	
Date: 05/23/17  Date: 05/23/17  Annular Seal (grout above well seal):  Material: NA Installation Method: NA  Bentonite Seal:  Manufacturer: NA Material: NA  Type: NA Installation Method: NA Hydration time (hrs): Na Hydrat	rost pevelopment:			
Annular Seal (grout above well seal):  Material:  Material:  NA  Installation Method:  NA  Bentonite Seal:  Manufacturer:  NA  Material:  NA  Type:  NA  Type:  NA  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Filter Pack Material:  Manufacturer:  Prepack  Material:  Size (Sieve Size):  20/40  Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC  Length (ft):  5.0  Diameter (in):  1.0  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  1.0  Length (ft):  5.0  Diameter (in):  1.0  Length (ft):  5.0  Sitot Type:  Factory Sitot  Sump/End Cap:  End cap  ottes:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.	Deter	05/23/17	Thickness (in):	INA
Material:  NA  Installation Method:  NA  Bentonite Seal:  Manufacturer:  NA  Material:  NA  Type:  NA  Installation Method:  NA  Type:  NA  Installation Method:  NA  Type:  NA  Installation Method:  NA  Hydration time (frs):  NA  Filter Pack Material:  Size (Sieve Size):  20/40  Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Siver-Line Enviro-Pure  Type/Material:  PVC  Length (ft):  Solid Size (in):  Diameter (in):  1.0  Well Screen:  Manufacturer:  Siver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  1.0  Length (ft):  5.0  Stottom of Filter Pack (ft):  Solid Size (in):  O.01  Slot Size (in):  O.01  Slot Size (in):  O.01  Slot Size (in):  O.01  Slot Type:  Factory Stot  Sump/End Cap:  End cap  Signature:	Date:			
Installation Method: NA  Water added during Irilling (gal): None  Water removed during levelopment (gal): None  Filter Pack Material: NA  Type: NA  Installation Method: NA  Hydration time (hrs): NA  Hydration time (hrs): NA  Filter Pack Material: Manufacturer: Prepack  Material: 1S  Size (Sieve Size): 20/40  Installation Method: Gravely  Surging time: None  Well Casing (Solid Riser Above Screen):  Manufacturer: Siver-Line Enviro-Pure  Type/Material: PVC  Length (ft): 5.0  Diameter (in): 1.0  Well Screen:  Manufacturer: Siver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 1.0  Length (ft): 5.0  Stottom of Filter Pack (ft): 8.0  Site (sieve Size): 20/40  Installation Method: NA  Well Casing (Solid Riser Above Screen):  Manufacturer: Siver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 1.0  Length (ft): 5.0  Stot Size (in): 0.01  Slot Size (in): 0.01  Slot Type: Factory Slot  Sump/End Cap: End cap  Signature:				*
Bentonite Seal:  Manufacturer:  NA  Material:  NA  Type:  NA  Installation Method:  NA  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Filter Pack Material:  Manufacturer:  Siver-Line Enviro-Pure  Type/Material:  PVC  Length (ft):  5.0  Diameter (in):  1.0  Well Screen:  Manufacturer:  Siver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  1.0  Length (ft):  5.0  Stot Size (in):  0.01  Slot Type:  Factory Stot  Sump/End Cap:  End cap  Signature:			Material:	
Manufacturer: NA Material: NA Type: NA Installation Method: NA Hydration time (hrs): Na Hydratical (heading in time (hrs): Na Hydration time (hrs): Na Hydration time (hrs): Na Hydratical (heading in time (hrs): Na Hy	lydrologic Unit:	W	Installation Method: _	NA
Manufacturer: NA Material: NA Type: NA Installation Method: NA Hydration time (hrs): Na Hydratical (heading in time (hrs): Na Hydration time (hrs): Na Hydration time (hrs): Na Hydratical (heading in time (hrs): Na Hy				
Mater added during irilling (gal):  None  Filter Pack Material:  Naturation Method:  None  None  None  None  None  None  Filter Pack Material:  Naturation Method:  None  None			Bentonite Seal:	
Atter added during rilling (gal):  None  N			Manufacturer:	NA
Installation Method: NA Hydration time (hrs):			Material:	NA
Atter removed during evelopment (gal):  None  Hydration time (hrs):  NA  Hydration time (hrs):  NA  Filter Pack Material:  Manufacturer:  Prepack Material:  Size (Sieve Size):  20/40 Installation Method:  Gravity Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Type/Material:  PVC Length (ft):  5.0 Diameter (in):  1.0  Well Screen:  Manufacturer:  Type/Material:  PVC Length (ft):  5.0 Diameter (in):  1.0 Length (ft):  5.0 Slot Size (in):  Diameter (in):  1.0 Length (ft):  5.0 Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  End cap  Signature:	Vater added during		Type:	NA
Filter Pack Material:  Manufacturer:  Prepack Material:  Size (Sieve Size):  20/40 Installation Method:  Gravity Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC Length (ft):  Jointom of Screened Interval (ft):  Solution of Filter Pack (ft):  None  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS Diameter (in):  Length (ft):  Solution of Filter Pack (ft):  Solution of Borehole	rilling (gal):	None	Installation Method:	NA
Filter Pack Material:  Manufacturer:  Manufacturer:  Manufacturer:  Manufacturer:  Manufacturer:  Size (Sieve Size):  20/40  Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC  Length (ft):  5.0  Diameter (in):  1.0  Length (ft):  Sottom of Filter Pack (ft):  8.0  Sottom of Filter Pack (ft):  Sottom of Borehole (ft):  8.2  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.	Vater removed during		Hydration time (hrs):	NA
Filter Pack Material:  Manufacture:  Prepack Material:  Manufacture:  Size (Sieve Size):  20/40 Installation Method:  Gravity Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC Length (ft):  5.0 Diameter (in): 1.0  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS Diameter (in): 1.0  Length (ft): 5.0 Soltom of Filter Pack (ft): 8.0  Soltom of Filter Pack (ft): 8.1  Soltom of Filter Pack (ft): Soltom of Filte	levelopment (gal):	None		
Manufacturer: Prepack Material: 1S Size (Sieve Size): 20/40 Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Sottom of Filter Pack (ft): 8.0  Sottom of Filter Pack (ft): 5.0 Sottom of Borehole (ft): 8.2  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Solt Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap	,	_	Filter Pack Material:	
Material:  Size (Sieve Size):  Installation Method:  Gravity  Surging time:  None  Well Casing (Solid Riser Above Screen):  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVC  Length (ft):  5.0  Diameter (in):  1.0  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  1.0  Length (ft):  5.0  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  PVS  Silver-Line Enviro-Pure  Type/Material:  Silver-Line Enviro-Pure  Type/Materia				Prenack
Size (Sieve Size): 20/40 Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Slot Size (in): 0.01 Slottom of Borehole (ft): 8.2  Sump/End Cap: End cap  Signature:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.				
Installation Method: Gravity Surging time: None  Well Casing (Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Slottom of Filter Pack (ft): 8.0  Souttom of Filter Pack (ft): 8.0  Souttom of Borehole (ft): 8.2  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap	on of Pontonito Cool (ft).	0		
Surging time: None  Surging time: None  Well Casing (Solid Riser Above Screen):  Manufacturer: Silver-Line Enviro-Pure  Type/Material: PVC  Length (ft): 5.0  Diameter (in): 1.0  Well Screen:  Manufacturer: Silver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 1.0  Length (ft): 5.0  Sottom of Filter Pack (ft): 8.0  Sottom of Filter Pack (ft): 8.0  Sottom of Borehole (ft): 8.2  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:  Signature:  Signature: None  Signature: None  Signature: Silver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 1.0  Length (ft): 5.0  Sottom of Borehole (ft): 5.0  Signature: Signature: Silver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 1.0  Length (ft): 5.0  Signature: Silver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 1.0  Length (ft): 5.0  Signature: Silver-Line Enviro-Pure  Type/Material: PVS  Diameter (in): 1.0  Length (ft): 5.0  Signature: Silver-Line Enviro-Pure  Type/Material: PVS  Silver-Line Enviro-Pu	op of Bentonite Seaf (it):			
Well Casing (Solid Riser Above Screen):  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Slottom of Filter Pack (ft): 8.0  Souttom of Filter Pack (ft): 8.2  Southout of Borehole (ft): 8.2  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap				
Well Casing (Solid Riser Above Screen):  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Solid Riser Above Screen): Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:			Surging time:	None
Manufacturer: Silver-Line Enviro-Pure Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Diameter (in): 1.0  Length (ft): 5.0 Solution of Filter Pack (ft): 8.0  Solution of Filter Pack (ft): 8.0  Solution of Borehole (ft): 8.2  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap	op of Filter Pack (ft):	0		
Type/Material: PVC Length (ft): 5.0 Diameter (in): 1.0  Well Screen: Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Diameter (in): 1.0  Length (ft): 5.0 Solution of Filter Pack (ft): 8.0  Solution of Filter Pack (ft): 8.0  Solution of Borehole (ft): 8.2  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Solution of Filter Pack (ft): 5.0 Signature: Factory Slot  Sump/End Cap: End cap			Well Casing (Solid Riser Abo	ve Screen):
Length (ft): 5.0 Diameter (in): 1.0  Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0  Length (ft): 5.0 Slottom of Filter Pack (ft): 5.0 Slottom of Borehole (ft): 5.0 Slott Size (in): 0.01 Slott Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:			Manufacturer:	Silver-Line Enviro-Pure
Diameter (in):    Diameter (in):   1.0	op of Screen Interval (ft):	3.0	Type/Material:	PVC
Well Screen:  Manufacturer: Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Length (ft): 5.0 Slot Size (in): 0.01 Slottom of Borehole (ft): 8.2  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap			Length (ft):	5.0
Well Screen:  Manufacturer:  Type/Material:  PVS  Diameter (in):  Length (ft):  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Well Screen:  Manufacturer:  Silver-Line Enviro-Pure  Type/Material:  PVS  Diameter (in):  Length (ft):  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  End cap			Diameter (in):	1.0
ottom of Screened Interval (ft):  8.0  Manufacturer: Type/Material: PVS Diameter (in): Length (ft): 5.0 Slot Size (in): Ottom of Borehole (ft):  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Silver-Line Enviro-Pure Type/Material: PVS Diameter (in): 1.0 Length (ft): Slot Type: Factory Slot Sump/End Cap: End cap				
Type/Material: PVS Diameter (in): 1.0 Length (ft): 5.0 Slot Size (in): 0.01 Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature: Signature:				
Diameter (in): Length (ft): Slot Size (in): Slot Type: Factory Slot  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Signature:	ottom of Screened Interval	(ft): 8.0	Manufacturer:	
Softon of Filter Pack (ft):  Slot Size (in): Slot Size (in): Slot Type: Factory Slot  Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Prespect to ground surface unless specified TOC.			Type/Material:	PVS
Slot Size (in):  Slot Size (in):  Slot Type:  Factory Slot  Sump/End Cap:  End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Signature:			Diameter (in):	1.0
Slot Size (in):  Slot Type:  Sump/End Cap:  End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Signature:	Sottom of Filter Pack (ft):	8.0	Length (ft):	5.0
Slot Type: Factory Slot  Sump/End Cap: End cap  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:  Prespective to ground surface unless specified TOC.				0.01
Sump/End Cap:  Pre-packed temporary well, no sand or bentonite added. PVS = PVC Upper/Stainless Steel Lower.  Signature:	Sottom of Borehole (ft):	8.2		Factory Slot
otes:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Poths and heights are referenced to ground surface unless specified TOC.				
Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:  Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.			Sump/End Cap:	End cap
Pre-packed temporary well, no sand or bentonite added.  PVS = PVC Upper/Stainless Steel Lower.  Signature:	lotes:			7. 77 F
Depths and heights are referenced to ground surface unless specified TOC.			Signature:	
	Depths and heights are referer	nced to ground surface unless specified To	Name (print):	Jason Hayes

775303101.0025
0004
AFFF Release Area 2
MW02003
05/23/17
05/23/17
00/20
SLS
NA NA
NA NA
NA NA
NA NA
NA
None
NA
NA
NA
seal):
NA
NA
NA
NA
NA
NA
NA NA
190.
Prepack
18
20/40
Gravity
None
Screen):
Silver-Line Enviro-Pure
PVC
5.0
1.0
Silver-Line Enviro-Pure
PVS
1.0
5.0
0.01
Factory Slot
End cap
Jason Hayes
D

amec foster wheeler	SCREE	ENED WELL CO	DNSTRUCTION FORM	I
Project Name:	Site Inspection of AFFF Release Environmental Programs Wo		Project Number:	775303101.0025
Contract Number:	FA8903-16-D-0027		Task Order:	0004
Installation:	Patrick AFB (PTRCK)		Location ID:	MW03001
Drilling Subcontractor:	AmDrill, Inc.		Well ID:	AFFF Release Area 3
Drilling Personnel:	Todd Ives, Keith Anders	on	Start Date:	05/22/17
Drilling Method:	DPT		End Date:	05/22/17
Technician(s)		Jason Ha	yes, Jason Drizd	
	Flush Maunt	1111	Protostive Coniner	
Type of Well:	Flush Mount Top of Riser (TOR)	-	Protective Casing: Type:	SLS
Measuring Point: TOC/TOR Difference (in):		-	Dimensions (in):	NA NA
TOC/TOR Difference (iii).	000 00110) uutu	-	Stickup (ft):	NA NA
			Length (ft):	NA
Approximate Diameter			Guard Post:	NA
of Borehole (in):	4	-	_	
B 41 4 144 4 (62)			Surface Pad:	
Depth to Water (ft):	4	-	Type:	None NA
During Drilling: Date:	05/22/17	-	Length (ft):	NA NA
	See development log	-	Width (ft):	
Date:	05/22/17	-	Thickness (in):	107
		-	Annular Seal (grout above we	II seal):
			Material:	NA
Hydrologic Unit:	W	_	Installation Method:	NA
			Bentonite Seal:	
			Manufacturer:	NA
			Material:	NA
Water added during			Туре:	NA
drilling (gal):	None	_	Installation Method:	NA
Water removed during			Hydration time (hrs):	- NA
development (gal):	None	-	Filter Pack Material:	
				Prepack
			Manufacturer: Material:	1S
Top of Bentonite Seal (ft):	0	_	Size (Sieve Size):	20/40
		- 🕒 💮	Installation Method:	Gravity
		<b>—</b>	Surging time:	None
Top of Filter Pack (ft):	0	_		
			Well Casing (Solid Riser Abov	
Top of Screen Interval (ft):	4.0		Manufacturer: Type/Material:	Silver-Line Enviro-Pure PVC
rop of Screen litter var (it).		7	Length (ft):	5.0
			Diameter (in):	2.0
		L		
	(f)		Well Screen:	0, 1, 5, 5
Bottom of Screened Interval	(ft): 14.0	_	Manufacturer:	Silver-Line Enviro-Pure PVS
			Type/Material: Diameter (in):	2.0
Bottom of Filter Pack (ft):	14.0	<b>└──→</b>	Length (ft):	10.0
Dottom of Filter Fack (it).		7	Slot Size (in):	0.01
Bottom of Borehole (ft):	14.2		Slot Type:	Factory Slot
		•	Sump/End Cap:	End cap
		*		
Notes: Pre-p	packed temporary well, no sand or bento PVS = PVC Upper/Stainless Steel Lo		Signature:	
Depths and heights are referer All elevations are referenced to	nced to ground surface unless spec	rified TOC.	Name (print):	Jason Hayes
	JIVISL (NAVD 00).			

amec foster wheeler	SCREE	ENED WELL CO	DNSTRUCTION FORI	М
Project Name:	Site Inspection of AFFF Relea Environmental Programs Wo		Project Number:	775303101.0025
Contract Number:	FA8903-16-D-0027		Task Order:	0004
Installation:	Patrick AFB (PTRCK)		Location ID:	AFFF Release Area 3
Drilling Subcontractor:	AmDrill, Inc.		Well ID:	MW03002
Drilling Personnel:	Todd Ives, Keith Anders	son	Start Date:	05/23/17
Drilling Method:	DPT		End Date:	05/23/17
Technician(s)	Jason Hayes, Jason Dr	izd		
Type of Well:	Flush Mount		Protective Casing:	
Measuring Point:	Top of Riser (TOR)	_	Type:	SLS
TOC/TOR Difference (in):	See survey data	-	Dimensions (in):	NA NA
			Stickup (ft):	NA NA
Approximate Diameter			Length (ft): Guard Post:	NA NA
1	4		Guaru r ost.	101
		_	Surface Pad:	
Depth to Water (ft):	5	_	Type:	None
During Drilling:	5	_	Length (ft):	NA
Date:	05/23/17	_	Width (ft):	NA
Post Development:	See development log	_	Thickness (in):	NA
Date:	05/23/17	-	Ammulan Caal (masut alt aug un	all apply
			Annular Seal (grout above w Material:	eli seai): NA
Hydrologic Unit:	W		Installation Method:	
		-	installation metriod.	
			Bentonite Seal:	
			Manufacturer:	
Materia de de descriper			Material:	NA NA
Water added during drilling (gal):	None		Type: Installation Method:	NA NA
Water removed during	Hone	-	Hydration time (hrs):	
development (gal):	None		,	
_		-	Filter Pack Material:	
			Manufacturer:	Prepack
			Material:	1S
Top of Bentonite Seal (ft):	0	_7	Size (Sieve Size):	20/40
			Installation Method:	Gravity
- C = 11 C 1 C 1			Surging time:	None
Top of Filter Pack (ft):	0		Well Casing (Solid Riser Abo	·
Ton of Conson Interval (ft).	4.4		Manufacturer:	Silver-Line Enviro-Pure PVC
Top of Screen Interval (ft):	4.4	- H	Type/Material: Length (ft):	5.0
			Diameter (in):	2.0
	1.00		Well Screen:	
Bottom of Screened Interva	I (ft): 14.4		Manufacturer:	Silver-Line Enviro-Pure PVS
			Type/Material:	2.0
Bottom of Filter Pack (ft):	14.4	<b>└</b>	Diameter (in): Length (ft):	10.0
Bottom of Finer Fack (it).		7	Slot Size (in):	0.01
Bottom of Borehole (ft):	14.6		Slot Type:	Factory Slot
			Sump/End Cap:	End cap
Notes:	-packed temporary well, no sand or bento PVS = PVC Upper/Stainless Steel Lo		Signature:	
Depths and heights are refere All elevations are referenced	enced to ground surface unless specto MSL (NAVD 88).	cified TOC.	Name (print):	Jason Hayes
QA/QC'd by: Thomas W.	Hensel		QA/G	C Date: 6/14/2017

# APPENDIX C-7 WELL DEVELOPMENT LOGS





wheeler											
Project Name:					Release Are		Project N	umber:			775303101.0025
Contract:	•		F	A8903-16-D	-0027		Task Orde	er:			0004
Installation:			Pa	atrick AFB (F	TRCK)		Date Start	ted/Date Co	mpleted:		5/23/2017
Well ID:				MW0100	)1			oth to Water			5.4
Measuring Point				Top of Cas				th of Well (f			15.0
Development Me				PUMPE	D			Water After I			5.4
Total Volume Pu	rged (gal):			37.5			1 Casing Volume (gal):				1.6
Technician(s):			1	Jason Dri	Zd I	0	3 Casing	Volumes (ga	al):		4.7
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/23/17 1710			2.5								Pumping Started
05/23/17 1715	15	5.40	2.5	27.39	7.51	3.631	0.23	-160.4	30.4	12.5	Clear
05/23/17 1720	15	5.40	2.5	27.05	7.29	3.699	0.41	-197.4	8.20	25.0	Clear
05/23/17 1725	15	5.40	2.5	27.01	7.17	3.753	0.12	-234.2	5.63	37.5	Clear
	1										
	1										
	1										
				\							
Instruments (M Equipment Calibrate		wodei, a	Y	es	- W-t O	Calibrated Within	, ,		l. D.		Yes
			'	urbidity Mete		ality Meter, Water Hach 2100Q 15060 YSI 556 MPS 06H	C041690,	Geosubmersib	ie Pump		
Calculations:											Signature:
Saturated well ca	asing volume:	V= Π(R^2	)H*7.48 ga	ıl/ft^3							
V = Volume (gal/ft) Π = 3.14 R = well radius (ft) = H = height of water		n)/12 (in/ft))/	2)			=∏ * (2.	0 (in)/12 (in/ft	!)H*7.48 gal/ft^ ))/2)^2 * 9.60 * 1.6 gal.			
Notes:											Name (print):
2		Shee	en on surfac	e of water, p	ossible petro	leum product. Noti	iceable odor.				Jason Drizd
QA/QC'd by:	Thomas W. H	ensel						C	A/QC Date:		6/14/2017



Project Name:					Release Ar		Project No	umber:			775303101.0025
Contract:	-		F	A8903-16-E	0-0027		Task Orde	er:			0004
Installation:	-		Pa	atrick AFB (F	PTRCK)			ted/Date Co	mpleted:		5/24/2017
Well ID:	_			MW0100	)2		Initial Dep	th to Water	(ft):		5.42
Measuring Point:	_			Top of Ris				th of Well (f			15.0
Development Method:	_			PUMPE	D				Purging (ft):		5.42
Total Volume Purged (g	gal):			44				Volume (gal			1.6
Technician(s):				Jason Hag	yes	1	3 Casing	Volumes (ga	al):		4.7
	e Depth eet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1523			2								Pumping Started
05/24/17 1535	15	5.92	2	28.25	7.61	2.632	0.91	-171.3	11.2	24	Hydrocarbon odor
	15	5.92	2	27.51	7.49	2.682	1.05	-179.4	2.91	36	Hydrocarbon odor
05/24/17 1545	15	5.92	2	27.18	7.45	2.657	1.09	-182.7	2.5	44	Hydrocarbon odor
							+				
	+				t		1				
Instruments (Manufa Equipment Calibrated (Y/N):		Model, a		No.): ′es		Calibrated Within	Criteria (Y/N):	:			Yes
			Т	urbidity Met		ality Meter, Water Hach 2100Q 14070 YSI 556 MPS 13E	C033883,	Geosubmersib	le Pump		
Calculations:											Signature:
Saturated well casing v	volume:	V= Π(R^2	)H*7.48 ga	al/ft^3							o.ga.a.o.
V = Volume (gal/ft) Π = 3.14 R = well radius (ft) = (well di H = height of water column i		n)/12 (in/ft))/	2)			=Π * (2.	0 (in)/12 (in/ft	)H*7.48 gal/ft/ ))/2)^2 * 9.58 * 1.6 gal.			
Notes:											Name (print):
110.63.				Stror	ng hydrocarb	on odor					Jason Hayes
QA/QC'd by: Thom	nas W. H	ensel						(	QA/QC Date:		6/15/2017



wneeler											
Project Name:					Release Ar ams Worldwid		Project N	umber:			775303101.0025
Contract:			F	A8903-16-E	) <u>_</u>		Task Orde	or.			0004
nstallation:	-			atrick AFB (F		<del></del>		ted/Date Co	mnleted:		5/24/2017
Well ID:	•			MW0100				th to Water			5.51
Measuring Point				Top of Ris		<del></del>		th of Well (f			10.0
Development Me				PUMPE					Purging (ft):		5.92
Total Volume Pu				40							0.7
Technician(s):	ii gca (gai).			Jason Hay	VAS	<del></del>	1 Casing Volume (gal): 3 Casing Volumes (gal):				2.2
r commonanto).			1	ouson na	1	Specific	Jeasing	volunies (g	ai).		
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (Gpm)	Temp. (°C)	pH (units)	Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1550			2								Pumping Started
05/24/17 1601	8.5	5.92	2	28.29	7.54	3.203	2.11	-253.9	23.9	22	Hydrocarbon odor
05/24/17 1605	8.5	5.92	2	28.12	7.51	3.210	0.57	-258.4	3.32	30	Hydrocarbon odor
05/24/17 1610	8.5	5.92	2	28.15	7.49	3.225	0.60	-265.6	0.74	40	Hydrocarbon odor
							+				-
											+
									-		
						ļ	1		ļ		1
						ļ	1		1		1
						ļ			ļ		
						ļ	1		1		
						ļ	1		1		
Instruments (N	lanufacturer,	Model, a	nd Serial	No.):							
Equipment Calibrate	ed (Y/N):		Υ	'es		Calibrated Within	Criteria (Y/N):	:			Yes
			Т	urbidity Met	er, Water Qu	ality Meter, Water	Level Meter, (	Geosubmersib	ole Pump		
						Hach 2100Q 14070			•		
						YSI 556 MPS 13I	0102082				
Calculations:											Signature:
Saturated well c	asing volume:	V= Π(R^2	:)H*7.48 ga	ıl/ft^3							
							V E/D40	)     <del>                                 </del>	10		
V = Volume (gal/ft)						-□ * /2		)H*7.48 gal/ft/			
Π = 3.14	- (all -!! : "	-\/40 (0.10)	(0)			=11" (2.		))/2)^2 * 4.49 <sup>;</sup> 0.7 gal.	r.40 yal/itro		
R = well radius (ft) =		n)/12 (in/ft))/	2)				_	o.r gai.			
H = height of water	column (It)										
Notes:											Name (print):
10163.											(print).
				Lludes	narhan ada-	nrecent					Jason Haves
				riyurd	ocarbon odor	hieseill					Jason Hayes
											<u> </u>
QA/QC'd by:	Thomas W. H	ensel						(	QA/QC Date:		6/15/2017



Mileefei											
Project Name:					Release Ar		Project No	umber:			775303101.0025
Contract:			F	-A8903-16-E	0-0027		Task Orde	er:			0004
Installation:	•			atrick AFB (F		·		ted/Date Co	mpleted:		5/24/2017
Well ID:				MW0100	)4		Initial Dep	th to Water	(ft):		5.39
Measuring Point				Top of Ri				th of Well (f			15.0
Development Me				PUMPE	D				Purging (ft):		5.69
Total Volume Pu	ırged (gal):			40				Volume (gal			1.6
Technician(s):				Jason Ha	yes		3 Casing	Volumes (ga	al):		4.7
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1608			2								Pumping Started
05/24/17 1618	15	5.69	2	27.25	7.77	0.455	0.69	-177.7	43	20	
05/24/17 1623	15	5.69	2	26.97	7.92	0.425	0.98	-172.1	9.82	30	
05/24/17 1628	15	5.69	2	26.82	7.87	0.491	0.84	-163.6	4.11	40	
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			-	-							
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									†		
Instruments (N Equipment Calibrate		Model, a		No.): ′es		Calibrated Within	Criteria (Y/N):	:			Yes
			Т	Turbidity Met		ality Meter, Water Hach 2100Q 14070 YSI 556 MPS 13D	C033883,	Geosubmersib	ole Pump		
Calculations:											Signature:
Saturated well c	asing volume:	V= Π(R^2	?)H*7.48 ga	al/ft^3							
V = Volume (gal/ft) Π = 3.14 R = well radius (ft) = H = height of water		n)/12 (in/ft))/	/2)			=Π * (2.	0 (in)/12 (in/ft	!)H*7.48 gal/ft/ ))/2)^2 * 9.61 * 1.6 gal.			
Notes:											Name (print):
110163.					None						Jason Hayes
QA/QC'd by:	Thomas W. H	ensel							QA/QC Date:		6/15/2017
with a common to the common to									" Duic.		· · · · · · · · · · · · · · · · · · ·



Mileefei											
Project Name:					Release Ar		Project No	umber:			775303101.0025
Contract:	•		F	A8903-16-E	0-0027		Task Orde	or.			0004
Installation:	•			atrick AFB (F				ted/Date Co	mpleted:		5/24/2017
Well ID:	•			MW0100				th to Water			5.44
Measuring Point	:			Top of Ris				th of Well (f			15.0
Development Me				PUMPE					Purging (ft):		5.83
Total Volume Pu				32				Volume (gal			1.6
Technician(s):	.gou (gui).			Jason Hay	ves			Volumes (ga			4.7
				T		Specific	U Guomig	rotanico (gi	l		
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/24/17 1625			2								Pumping Started
05/24/17 1631	15	5.83	2	27.76	7.90	0.756	0.71	-220.8	5.03	12	
05/24/17 1636	15	5.83	2	27.85	7.60	0.787	0.45	-199.4	4.32	22	
05/24/17 1541	15	5.83	2	27.56	7.65	0.689	0.82	-196.8	2.52	32	
						ļ			ļ		
Instruments (M Equipment Calibrate		Model, a	Y	'es		Calibrated Within					Yes
			Т	urbidity Met		lality Meter, Water Hach 2100Q 14070 YSI 556 MPS 13I	C033883,	Geosubmersib	ole Pump		
Calculations:											Signature:
Saturated well ca	asing volume:	V= Π(R^2	)H*7.48 ga	al/ft^3							orginaturo.
V = Volume (gal/ft) Π = 3.14 R = well radius (ft) = H = height of water		n)/12 (in/ft))/	2)			=Π * (2.	0 (in)/12 (in/ft)	)H*7.48 gal/ft/ ))/2)^2 * 9.56 * 1.6 gal.			
Notes:											Name (print):
Notes:											reame (print).
					None						Jason Hayes
QA/QC'd by:	Thomas W. H	lensel							QA/QC Date:		6/15/2017



wheeler												
Project Name:					Release Ard		Project Number:				775303101.0025	
Contract:	-		F	A8903-16-D	)-0027		Task Order:				0004	
Installation:			PTRCK				ted/Date Co			5/24/2017		
Well ID:			MW0100				oth to Water	. ,		5.52		
Measuring Point			Top of Ris				th of Well (f			15.0		
Development Method:				PUMPE	D				Purging (ft):		5.76	
Total Volume Pu Technician(s):	rged (gai):		loon	40 n Hayes, Au	drov Vorko			Volume (ga			4.7	
rechnician(s):			Jasui	i nayes, Au	liey forke	Specific	Jeasing	Volumes (ga	ai).			
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)	
05/24/17 16:49			2								Pumping Started	
05/24/17 17:00	15	5.76	2	27.35	8.01	0.342	0.93	-176.0	49.8	20		
05/24/17 17:05	15	5.76	2	27.22	7.97 7.92	0.346	0.98	-196.6	15.3	30 40		
05/24/17 17:10	15	5.76		27.12	7.92	0.345	0.91	-187.6	9.45	40		
							+					
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Instruments (M Equipment Calibrate		модеі, а	Y	'es		Calibrated Within					Yes	
			T	urbidity Mete		ality Meter, Water Hach 2100Q 14070 YSI 556 MPS 13I	C033883,	Geosubmersib	ole Pump			
Calculations:											Signature:	
Saturated well ca	asing volume:	V= Π(R^2	)H*7.48 ga	al/ft^3								
V = Volume (gal/ft) Π = 3.14 R = well radius (ft) = H = height of water		n)/12 (in/ft))/	2)			=∏ * (2.	0 (in)/12 (in/ft	2)H*7.48 gal/ft/ ))/2)^2 * 9.48 <sup>;</sup> 1.6 gal.				
Notes:											Name (print):	
None											Jason Hayes	
QA/QC'd by: Thomas W. Hensel QA/QC Date:									6/15/2017			



wheeler												
Project Name:					Release Ar		Project Number:				775303101.0025	
Contract:	-		F	A8903-16-E	0-0027		Task Orde	er:			0004	
Installation:	-		Pa	atrick AFB (F	PTRCK)		Date Start	ted/Date Co	mpleted:		5/23/2017	
Well ID:	-			MW0200				oth to Water			7.65	
Measuring Point				Top of Cas				th of Well (f			10.0	
Development Me				PUMPE	D				Purging (ft):		7.65	
Total Volume Pu	rged (gal):			6			1 Casing Volume (gal):				0.1	
Technician(s):			1	Jason Dri	zd		3 Casing	Volumes (g	al):		0.3	
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)	
05/23/17 0909			0.5								Pumping Started	
05/23/17 0920	10	7.65	0.5	28.33	7.26	0.579	1.32	-10.9	45.2	2	Clear	
05/23/17 0924	10	7.65	0.5	27.92	6.95	0.574	1.28	-18.4	8.86	4	Clear	
05/23/17 0928	10	7.65	0.5	28.09	6.96	0.573	1.40	-23.6	5.64	6	Clear	
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					-							
					-							
									1		+	
											+	
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	+				-				-		+	
											+	
Instruments (M	lanufacturer.	Model, a	nd Serial	No.):					L		<u> </u>	
Equipment Calibrate		,		'es		Calibrated Within	Criteria (Y/N):	:			Yes	
				Turbidity N		Quality Meter, Wa Hach 2100Q 15060	ter Level Met		Pump			
						YSI 556 MPS 06F	K1082AL					
Calculations:										Signature:		
Saturated well ca	asınıy volume:	v – 11(K^2	ווי. 1 .46 ga	ai/10°3								
<b>V</b> = Volume (gal/ft)								!)H*7.48 gal/ft/				
Π = 3.14						=∏ * (1.		))/2)^2 * 2.35 *	* 7.48 gal/ft^3			
R = well radius (ft) = H = height of water		n)/12 (in/ft))/	(2)				=	0.1 gal.				
											Name (mint)	
Notes:											Name (print):	
					None						Jason Drizd	
					140116						Jason Drizu	
QA/QC'd by:	Thomas W. H	ensel						(	QA/QC Date:		6/14/2017	



Project Name:					Release Ar		Project Nu	umber:			775303101.0025	
Contract:	-			ental Progra A8903-16-D	ems Worldwid	de	Task Order:				0004	
nstallation:		Pa	atrick AFB (F				ted/Date Co	•		5/23/2017		
Well ID:	-			MW0200				th to Water			7.18	
Measuring Point			Top of Ris				th of Well (f			10.0		
Development Method: Fotal Volume Purged (gal):				PUMPE	D				Purging (ft):		7.18 0.1	
i otai volume Pu Technician(s):	irgea (gai):	14 Jason Drizd						Volume (ga	-		0.3	
recrimician(s).			1	Jason Di	izu	Specific	3 Casing Volumes (gal):					
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)	
05/23/17 0828			0.5								Pumping Started	
05/23/17 0839	10	7.18	0.5	28.54	7.75	0.795	0.94	72.4	315	2	Cloudy	
05/23/17 0843	10	7.18	0.5	28.28	7.43	0.764	7.78	62.9	127	4	Cloudy	
05/23/17 0847	10	7.18	0.5	28.22	7.03	0.773	1.28	69.7	153	6	Cloudy	
05/23/17 0851	10	7.18	0.5	27.91	6.93	0.778	1.17	65.5	50.2	8	Cloudy	
05/23/17 0855	10	7.18	0.5	27.97	7.00	0.776	1.26	58.3	25.7	10	Clear	
05/23/17 0859	10	7.18	0.5	27.92	7.06	0.773	1.28	51.7	15.5	12	Clear	
05/23/17 0903	10	7.18	0.5	28.18	7.02	0.770	1.25	47.7	9.87	14	Clear	
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						-						
						<b>-</b>						
						<b>-</b>						
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							1		1			
							1		1			
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	+					1			1		1	
			<del> </del>			1	+				1	
Instruments (N	lanufacturer	Model a	nd Sprial	No )·								
Equipment Calibrate		wouci, a		es		Calibrated Within	Criteria (V/N)				Yes	
_quipment Oalibrate	SG (1/14).		•		4-t \\/-t	-			Dumm		100	
				Turbially i		Quality Meter, Wa Hach 2100Q 15060		er, Peristallic	Pump			
						YSI 556 MPS 06H						
Calculations:											Signature:	
											olginataro.	
Saturated well c	asing volume:	V= Π(R^2	:)H*7.48 ga	ıl/ft^3								
							V= E/DA2	)H*7.48 gal/ft	<b>N</b> 2			
V = Volume (gal/ft)						=∏ * <i>(</i> 1.	0 (in)/12 (in/ft)					
Π = 3.14 R = well radius (ft) =	= (well diameter (in	1)/12 (in/ft))	(2)			(1.		0.1 gal.	320.0			
H = height of water		, (, it))/	,									
Notes:											Name (print):	
					None						Jason Drizd	
											<u> </u>	
QA/QC'd by:	Thomas W. H	ensel							QA/QC Date:		6/14/2017	
∝~v∝ouby.	as w. n	011301						,	arvac Date.		0/17/201/	



wheeler												
Project Name:					Release Ar		Project Number:				775303101.0025	
Contract:		F	A8903-16-D	)-0027		Task Order:				0004		
nstallation:		Pa	atrick AFB (F				ted/Date Co			5/23/2017		
Well ID:			MW0200				th to Water			6.69		
Measuring Point			Top of Cas				th of Well (f			10.0		
Development Me			PUMPE	D				Purging (ft):		6.69		
Total Volume Pu	irged (gal):	12 Jason Drizd						Volume (ga			0.1	
Technician(s):			I	Jason Dii	Zu	Specific	3 Casing Volumes (gal):			0.4		
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)	
05/23/17 0935			0.5								Pumping Started	
05/23/17 0947	10	6.69	0.5	28.39	7.62	0.541	1.44	10.0	112	3	Cloudy	
05/23/17 0953	10	6.69	0.5	27.86	7.52	0.534	1.40	19.0	26.4	6	Clear	
05/23/17 0959	10	6.69	0.5 0.5	27.91	7.33 7.33	0.535 0.533	1.61	20.0	14.3 9.7	9	Clear Clear	
05/23/17 1005	10	6.69	0.5	27.91	1.33	0.533	1.59	21.3	9.7	12	Clear	
	-					-			1			
					-		+					
							+					
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	1				<del>                                     </del>	<del> </del>						
							+					
Instruments (M Equipment Calibrate		Model, a		No.): es		Calibrated Within	Criteria (Y/N):				Yes	
				Turbidity N		Quality Meter, Wa Hach 2100Q 15060 YSI 556 MPS 06F	C041690,	er, Peristaltic I	Pump			
Calculations:											Signature:	
Calculations: Saturated well casing volume: V= Π(R^2)H*7.48 gal/ft^3											orginature.	
V = Volume (gal/ft) T = 3.14 R = well radius (ft) = H = height of water		n)/12 (in/ft))/	(2)			=Π * (1.	0 (in)/12 (in/ft)	()H*7.48 gal/ft/ ())/2)^2 * 3.31 * 0.1 gal.				
Notes:											Name (print):	
10103.											(p/)	
					None						Jason Drizd	
QA/QC'd by: Thomas W. Hensel QA/QC Date:									6/14/2017			



#### WELL DEVELOPMENT LOG

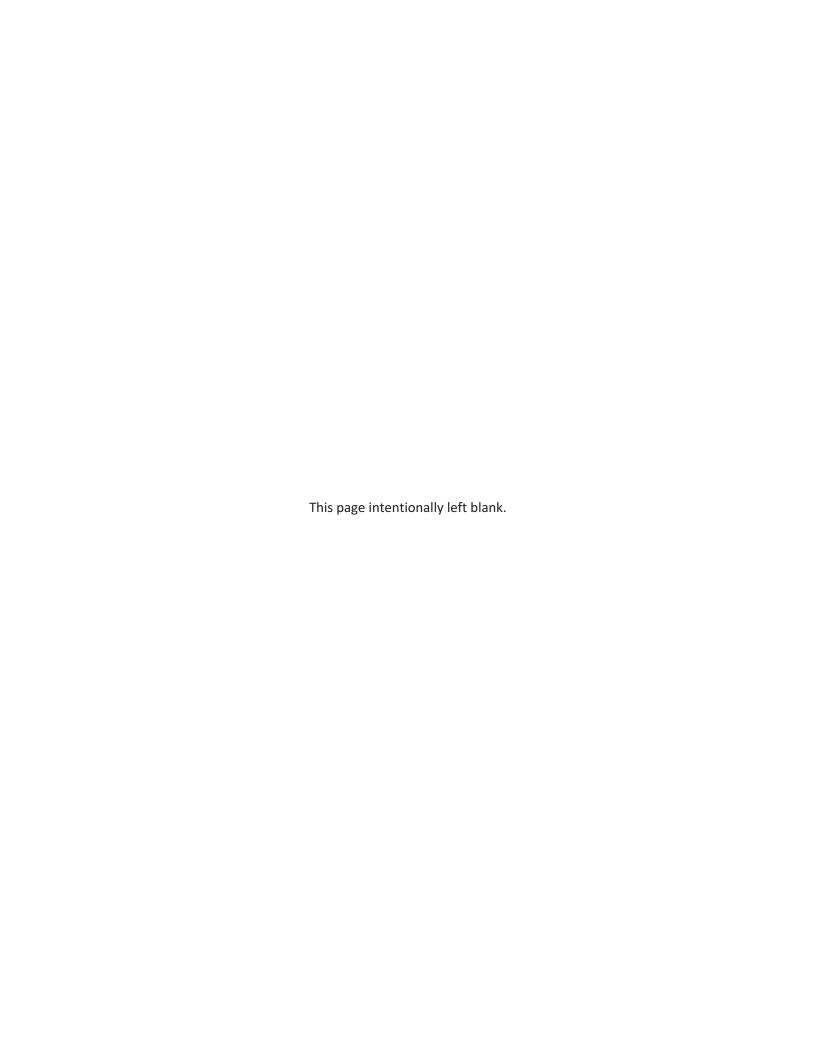
Wileelei											
Project Name:					Release Ard Ims Worldwid		Project No	umber:			775303101.0025
Contract:	-		F	A8903-16-E	0-0027		Task Orde	er:			0004
Installation:	-			atrick AFB (F				ted/Date Co	mpleted:		5/22/2017
Well ID:	-			MW0300				th to Water	-		5.6
Measuring Point	:			Top of Ris	ser			th of Well (f			15.0
Development Me	thod:			PUMPE	D		Depth to \	Water After	Purging (ft):		5.6
Total Volume Pu	rged (gal):			55				Volume (gal			1.5
Technician(s):				Jason Dri	izd		3 Casing	Volumes (ga	al):		4.6
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Specific Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/22/17 1758			2.5			ì					Pumping Started
05/22/17 1808	15	5.80	2.5	26.95	7.74	18.81	0.87	-175.1	160	25	Clear
05/22/17 1817	15	5.78	2.5	26.48	7.39	18.93	1.52	-171.9	10.4	37.5	Clear
05/22/17 1822	15	5.76	2.5	26.49	7.45	18.92	1.53	-177.6	7.57	50	Clear
05/22/17 1825	15	5.64	2.5	26.44	7.47	19.18	1.49	-184.2	5.29	55	Clear
					t						
Instruments (M Equipment Calibrate		Model, a		No.): 'es		Calibrated Within	Criteria (Y/N):	:			Yes
				Turbio		ater Quality Meter, Hach 2100Q 15060 YSI 556 MPS 06k	C041690,	mersible Pum	p		
Calculations:											Signature:
Saturated well ca	asing volume:	V= Π(R^2	!)H*7.48 ga	al/ft^3							
V = Volume (gal/ft) Π = 3.14 R = well radius (ft) = H = height of water		n)/12 (in/ft)).	(2)			=⊓ * (2.	0 (in)/12 (in/ft	)H*7.48 gal/ft/ ))/2)^2 * 9.40 * 1.5 gal.			
Notes:											Name (print):
					None						Jason Drizd
QA/QC'd by:	Thomas W. H	ensel							QA/QC Date:		6/14/2017



#### WELL DEVELOPMENT LOG

wheeler											
Project Name:					Release Ar		Project N	umber:			775303101.0025
Contract:	•		F	A8903-16-E	0-0027		Task Orde	er:			0004
Installation:				atrick AFB (F				ted/Date Co	mpleted:		5/23/2017
Well ID:	•			MW0300				oth to Water	-		5.25
Measuring Point	:			Top of Cas				th of Well (f			15.0
Development Me				PUMPE					Purging (ft):		5.25
Total Volume Pu				50				Volume (ga			1.6
Technician(s):	. 904 (94.).			Jason Dri	izd			Volumes (g			4.8
						Specific	- C Guomig	(9	L.,.	_	
Date/Time	Intake Depth (feet)	Water Level (feet)	Rate (GPM)	Temp. (°C)	pH (units)	Electrical Conductance (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Cum. Volume (gal.)	Comments/Observations During Purging (color, sediment, etc.)
05/23/17 1412			3								Pumping Started
05/23/17 1420	15	5.61	3	27.93	7.93	0.984	1.54	-59.0	56.1	24	Cloudy
05/23/17 1424	15	5.61	3	27.02	7.05	0.969	1.11	-62.2	8.57	36	Clear
05/23/17 1428	15	5.61	3	26.88	7.05	0.961	1.15	-82.8	6.20	48	Clear
									1		
									1		
									1		
									1		
									1		
									1		
Instruments (M Equipment Calibrate		Model, a		No.):		Calibrated Within	Criteria (Y/N):	:			Yes
			Т	urbidity Met		ality Meter, Water Hach 2100Q 15060 YSI 556 MPS 06k	C041690,	Geosubmersit	ole Pump		
Calculations:											Signature:
Saturated well ca	asing volume:	V= Π(R^2	)H*7.48 ga	al/ft^3							oignature.
V = Volume (gal/ft) Π = 3.14 R = well radius (ft) = H = height of water		n)/12 (in/ft))/	2)			=∏ * (2.	0 (in)/12 (in/ft)	!)H*7.48 gal/ft <sup>/</sup> ))/2)^2 * 9.75 <sup>-</sup> 1.6 gal.			
Notes:											Name (print):
											· · · /[F::::/-
					None						Jason Drizd
QA/QC'd by:	Thomas W. H	ensel							QA/QC Date:		6/14/2017

## APPENDIX C-8 WATER QUALITY SAMPLING INSTRUMENT CALIBRATION FORMS





Project Name:		Site	Inspection o	of AFFF Release	Areas Environmental Prog	rams Worldwi	de	Project	Number:		77530	3101.0025
Contract:		FA	8903-16-D-0	0027	Task Order:	0004		Date:		-	05	5/22/17
Installation:				Patric	k AFB (PTRCK)			Calibra	tion Start T	ime:	,	10:15
Sample Technic	cian(s):			J	ason Drizd			- Calibra	tion End Ti	me:		10:54
					Readings	s Before Ca	libration					
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Baron Pres (mm	sure	Сог	nments
			4.00	N/A								
05/22/17	1015	N/A	6.80	N/A	1.12	N/A	N/A	185.8	N/	/A		None
			0.60	N/A	_							
			9.62	N/A								
						s After Cal	ibration					
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Baron Pres (mm	sure	Сог	nments
05/22/17	1054	N/A	4.00 7.01 9.93	9.58 20.2 99.4 792	1.00	8.21	N/A	200.0	N.	/A		None
Calibration Ma	aterials Record	d:										
	pH (	Calibration Standa	rds		Specific Electrical Condi		ty, Dissolved O RP) Calibration		Oxidation		Turbidity Sta	ndards
Standard	Cal. Star	ndard Lot#	Expi	ration Date	<u>Standard</u>	Cal. Stan	dard Lot #	Expiration	Date	Standard	Cal. Standard Lot #	Expiration Date
pH (4)	70	BB162	C	02/28/19	Spec. Conductance	7GE	3161	02/28/	18	10	N/A	09/30/17
pH (7)	<b>7</b> G	B164	(	02/28/19	Salinity	N	//A	05/22/	17	20	N/A	09/30/17
pH (10)	70	GB166	(	02/28/19	D.O.	N	//A	05/22/	17	100	N/A	08/31/17
					ORP	7G0	C226	12/31/	17	800	N/A	09/30/17
Instruments (I	Manufacturer,	Model, and Seria	al No.):		Notes:					Signature		
		Manufacture	er/Model	Serial No						Oignatare	•	
Water Quality N	leter:	YSI 556 N	MPS	06K1082AL	1							
Turbidity Meter	:	Hach 210	)0Q	14070C033883	1		N/A					
Calibrated Withir	n Acceptance Crit	teria (Y/N):		Yes	_							
If No, Provide Ex	xplanation:		NA							Name (pri	nt):	Jason Drizd
QA/QC'd by:		Thomas W. Hensel							QA	/QC Date:	6/	14/2017



Project Name:		Site	Inspection of	of AFFF Release	Areas Environmental Prog	ırams Worldwi	de	Project	Number:		77530	3101.0025
Contract:		FA	8903-16-D-0	0027	Task Order:	0004		Date:		_	05	5/23/17
Installation:				Patric	k AFB (PTRCK)			Calibra	tion Start T	ime:		0737
Sample Technic	cian(s):			J	ason Drizd			Calibra	tion End Ti	me:		0818
					Readings	s Before Ca	libration					
		1_		<u> </u>	Specific Electrical			l	Baror	netric		
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Pres (mm	sure	Co	mments
			3.98	N/A								
05/23/17	0800	N/A	6.83	N/A	0.956	N/A	N/A	197	N	/A		None
i			40.00	N/A								
			10.33	N/A								
1					Reading	gs After Cal	ibration					
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Baror Pres (mm	sure	Con	mments
			4.00	9.9					,	0,		
05/23/17	0818	N/A	7.00	20.2	1.000	8.21	N/A	200	N	/A		None
[			10.05	799								
Calibration Ma	aterials Recor	d:										
	рН	Calibration Standa	ırds		Specific Electrical Cond Reduction		ty, Dissolved O RP) Calibration		Oxidation		Turbidity Sta	andards
Standard	Cal. Sta	ndard Lot#	<u>Expi</u>	iration Date	Standard	Cal. Stan	dard Lot #	Expiration	<u>Date</u>	Standard	Cal. Standard Lot #	Expiration Date
pH (4)	70	GB162	(	02/28/19	Spec. Conductance	7GE	3161	02/28/	18	10	N/A	09/30/17
pH (7)	70	GB164	(	02/28/19	Salinity	N	/A	05/04/	17	20	N/A	09/30/17
pH (10)	70	GB166	(	02/28/19	D.O.	N	/A	05/04/	17	100	N/A	08/31/17
					ORP	7G0	D226	12/31/	17	800	N/A	09/30/17
Instruments (	Manufacturer,	Model, and Seria	al No.):		Notes:					Signature	ı:	
		Manufacture		Serial No						J		
Water Quality N		YSI 556 N		06K1082AL	_							
Turbidity Meter		Hach 210	00Q	15060C041690	-	N	one					
Calibrated Within	n Acceptance Cri	iteria (Y/N):		Yes	-							
If No, Provide Ex	xplanation:		NA							Name (pri	nt):	Jason Drizd
QA/QC'd by:		Thomas W. Hensel					<u> </u>		QA	/QC Date:	6/	14/2017

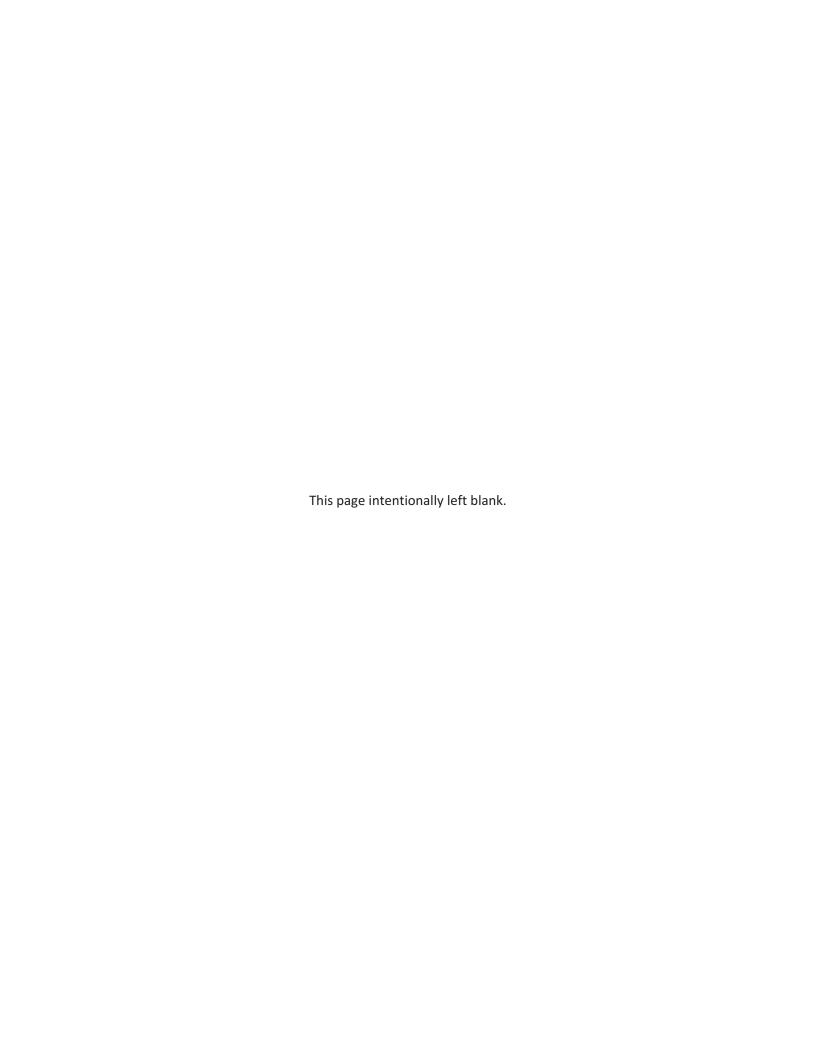


Project Name:		Site	Inspection o	of AFFF Release	Areas Environmental Prog	rams Worldwi	de	Project	Number:		77530	3101.0025
Contract:		FA	8903-16-D-0	0027	Task Order:	0004		Date:		-	05	/24/17
Installation:				Patric	k AFB (PTRCK)			Calibra	tion Start T	ime:		0641
Sample Technic	cian(s):			J	ason Drizd			Calibra	tion End Ti	me:	-	0656
					Readings	s Before Ca	libration					
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Baror Pres (mm	sure	Сог	nments
			4.18	N/A								
05/24/17	0641	N/A	6.78	N/A	0.992	N/A	N/A	190.1	N	/A		None
				N/A								
			10.35	N/A								
					Reading	s After Cal	ibration					
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Baror Pres (mm	sure	Сог	nments
05/24/17	0655	N/A	4.00 7.00 10.06	9.98 20.2 101 799	1.000	8.22	N/A	200.0	N			None
Calibration Ma	aterials Record	d:								•		
	pH (	Calibration Standa	rds		Specific Electrical Cond Reductio		ty, Dissolved O RP) Calibration		Oxidation		Turbidity Sta	ndards
Standard	Cal. Sta	ndard Lot #	<u>Expi</u>	ration Date	Standard	Cal. Stan	dard Lot #	Expiration	n Date	Standard	Cal. Standard Lot #	Expiration Date
pH (4)	70	GB162	0	02/28/19	Spec. Conductance	7GE	3161	02/28/	18	10	NA	09/30/17
pH (7)	70	B164	(	)2/28/19	Salinity	N	I/A	05/24/	17	20	NA	09/30/17
pH (10)	70	BB166	(	02/28/19	D.O.	N	I/A	05/24/	17	100	NA	08/31/17
					ORP	7G0	C226	12/31/	17	800	NA	09/30/17
Instruments (I	Manufacturer,	Model, and Seria	al No.):		Notes:					Signature		
		Manufacture	er/Model	Serial No						Signature	•	
Water Quality N	leter:	YSI 556 N	MPS	06K1082AL	_							
Turbidity Meter	:	Hach 210	00Q	15060C041690	1	N	lone					
Calibrated Withir	n Acceptance Cri	teria (Y/N):		Yes	]							
If No, Provide Ex	xplanation:		NA							<b>Name</b> (pri	nt):	Jason Drizd
QA/QC'd by:		Thomas W. Hensel							QA	/QC Date:	6/	14/2017



Project Name:		Site	Inspection o	of AFFF Release	Areas Environmental Prog	rams Worldwi	ide	Project	Number:		77530	3101.0025
Contract:		FA	8903-16-D-0	0027	Task Order:	0004		- Date:		-	05	5/25/17
Installation:				Patricl	k AFB (PTRCK)			Calibra	tion Start T	ime:		0726
Sample Technic	cian(s):			J	ason Drizd			Calibra	tion End Ti	me:		0745
					Readings	s Before Ca	alibration					
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Pres	netric sure Hg)	Cor	mments
			4.00	N/A								
05/25/17	0727	N/A	6.95	N/A	0.989	N/A	N/A	203.9	N	/A		None
			10.25	N/A	-							
			10.23	N/A								
<u> </u>						s After Cal	ibration					
Date	Time (24hr)	Temperature (°C)	pH (SU)	Turbidity (NTUs)	Specific Electrical Conductance (mS/cm)	D.O. (mg/L)	Salinity (%)	ORP/Eh (mV)	Pres	netric sure Hg)	Cor	mments
05/25/17	0741	N/A	4.00 7.00 10.04	10.3 20.4 103 799	1.000	8.22	N/A	200	N	/A		None
Calibration Ma	aterials Recor	d:										
	рН	Calibration Standa	rds		Specific Electrical Condi		ty, Dissolved O RP) Calibration		Oxidation		Turbidity Sta	indards
Standard	Cal. Sta	ndard Lot #	Expi	ration Date	<u>Standard</u>	Cal. Stan	dard Lot#	Expiration	n Date	Standard	Cal. Standard Lot #	Expiration Date
pH (4)	70	3B162	С	02/28/19	Spec. Conductance	7GE	3161	02/28/	18	10	NA	09/30/17
pH (7)	70	GB164	С	)2/28/19	Salinity	N	I/A	05/25/	17	20	NA	09/30/17
pH (10)	70	3B166	С	02/28/19	D.O.	N	I/A	05/25/	17	100	NA	08/31/17
					ORP	7G0	C226	12/31/	17	800	NA	09/30/17
Instruments (	Manufacturer,	Model, and Seria	•	Serial No	Notes:					Signature	:	
Water Quality N	Meter:	YSI 556 N	MPS	06K1082AL								
Turbidity Meter	r:	Hach 210	00Q	15060C041690	]	N.	lone					
Calibrated Within	n Acceptance Cri	iteria (Y/N):		Yes		N	IONE					
If No, Provide Ex	xplanation:		NA							Name (pri	nt):	Jason Drizd
QA/QC'd by:		Thomas W. Hensel							QA	/QC Date:	6/	15/2017

## APPENDIX C-9 GROUNDWATER SAMPLING LOGS



SITE NAME:			Patrick A	FB (PTR	CK)			SITE LOC	ATION:				AFFF I	Release	Area 1			
WELL NO:		MV	V01001			SA	AMPLE ID:		Р	TRCK01-0	GW-001		DATE:			05/2	5/17	
								PURGING	DATA									
WELL VOLUME	ER (inches):  2 EPURGE: 1 WEL		ING DIAM	1/4		CTATI	5	to	15		ATIC WATER	5.33	TH (feet):	PURG	SE PUN	IP TYPE OF		t:
(only fill out if ap							CDEPTH	IO WATER)	X WE	LL CAPA	UIIY							
	OLUME PURGE:	1 EQUIPM	ENT VOL.	= PUMP	VOLUME	E + (TUBIN	NG CAPAC	ITY X	TUBIN	G LENGT	H) + FLOW C	ELL V	OLUME					
(only fill out if ap	oplicable)			=	gallon	s + (	gall	ons/foot X		fee	et) +		gallons =	gall	ons			
INITIAL PUMP (	OR TUBING DEPT 7	H IN WELL	- FIN	AL PUMP	OR TUB	ING DEPT	TH IN WEL	_ (feet):	PURG		ATED AT: 758		PURGING END 0840	DED AT:	: TOT	AL VOLUM	E PURGE 21	ED (liters):
TIME	VOLUME PURGED ({Purging- Volume])	PUR	UME	PURGE (mL/i		DEPTH 1 WATER (feet)	R (stan	dar (°C)		COND. nS/cm)	DISSOL\ OXYGE (mg/L	EN	ORP (mV)		RBIDITY	COI	LOR	ODOR
0806	4		1	50	00	5.33	7.6	7 26.14		7.470	0.23		-245.5		3.22	Cle	ear	Salty
0814	8	1	2	50	00	5.33	7.5	4 26.20		6.982	0.36		-272.7		1.69	Cle	ear	
0822	12	2	4	50	00	5.33	7.4	5 26.25		6.910	1.41		-287.7		1.37	Cle	ear	
0830	16	4	0	50	00	5.33	7.3	9 26.23		7.255	1.49		-292.8		1.19	Cle	ear	
0838	20	6	0	50	00	5.33	7.3	7 26.27	-	7.278	1.21		-294.6		1.60	Cle	ear	
								_										
					1			+	1					1		+		
					+		-				-			+		+		
																+		
					1			+						1				
					ĺ													
						Final Valu				7.278	1.21		-294.6		1.60			
	TY (Gallons Per F E DIA. CAPACITY	•				25" = 0.06			.37; 4 = 0.004;	4" = 0.65;		; 6"  /2" = 0		' = 5.88 = 0.016				
	IPMENT CODES:	B = Ba		BP = Blac				ric Submersi			P = Peristalti			her (Sp				
								SAMPLING	DATA									
SAMPLED BY (	PRINT) / AFFILIAT				SAMPLE SIGNATI								PLING			SAMPLING		
	Jason D Amec Foster				010147111	JIKE(O).						INITI	ATED AT: 0840			ENDED AT:	0842	
PUMP OR TUB	ING DEPTH IN				TUBING						FIELD-FIL	TERE		lo	FI	LTER SIZE		NA
WELL (feet):	IIIO DEI IIIIII		7		MATERIA CODE:	AL		HDPI			Filtration E					N		
FIELD DECONT		PUMF		No		TUBING:			No		•	DUPL	LICATE:			None	Collected	i
SAMPLE ID	IPLE CONTAINER	MAT.			PRI	ESERVAT		LE PRESER\			FINAL		ENDED ANALY			IPLING PMENT		E PUMP FLOW RATE
CODE	# CONTAINERS	CODE	VOLI			USED Ice (4 °C)		ADDED IN			pH ot Recorded		PFAS (EPA 537			ODE APP	(mL	per minute)
MW01001	2	HDFE	12	.5		ICE (4 C)	,	IN	A	IN	ot Recorded		-FA3 (EFA 337	,		AFF		250
REMARKS:									None									
MATERIAL CO		mber Glas					ligh Dens	ty Polyethyle	ne; I	LDPE = Lo	ow Density F	olyeti	nylene; PP	= Poly	propyle	ene;		
SAMPLING EQ	UIPMENT CODES		= After (TI = Revers				B = Ba SM = Str	iler; BP = aw Method (1		r Pump; Gravity Dr			Submersible I r (Specify)	Pump;				
NOTES:	The above do     STABILIZATIO	N CRITER	IA FOR F	RANGE O	F VARIA	TION OF L	AST THRE	E CONSECU	TIVE R					· ·				. Little Land
	pH: + 0.2 units Togreater) Turbidit									ungs < 20	% saturation	(see T	abie FS 2200-2	z); optio	rially, +	u.∠ mg/L oi	+ 10% (v	wriicnever is
QA/QC'd by:	Thomas W. He	nsel												QA/C	QC Dat	e:	6/15/2	2017

SITE NAME:			Patrick A	FB (PTR	CK)			SITE L	OCATION:	:				A	FFF R	Release	Area 1	1			
WELL NO:		MV	V01002			SA	AMPLE ID:		F	PTRCK0	)1-GV	V-002		D	ATE:				05/25/1	17	
								PURGIN	G DATA												
WELL DIAMETE	ER (inches):	TUB	ING DIAMI	ETER (in 1/4	ches):		WELL SO	REEN INTI to	ERVAL DE 15	PTH:	STAT	TIC WATER	5.31	ΓΗ (feet)	:	PURG	E PUN	MP TYP	PE OR B	AILER:	
WELL VOLUME (only fill out if ap	PURGE: 1 WEL plicable)	L VOLUMI	E= (TOTA	AL WELL	DEPTH	- STATI	C DEPTH	O WATER	) X WE	ELL CAF	PACIT	ſΥ									
= ( 15.0 feet – 5	.31 feet) X 0.08	2 gallons/fo	ot X 3.7	85 liters/	gallon =	6.0 liters															
EQUIPMENT VO (only fill out if ap	DLUME PURGE:	1 EQUIPM	ENT VOL.	= PUMF	VOLUM	E + (TUBIN	NG CAPAC	ITY X	TUBIN	IG LENG	GTH)	+ FLOW C	ELL V	OLUME							
				=	gallon	ıs + (	gall	ons/foot X			feet)	+		gallons :	=	gallo	ons				
INITIAL PUMP C	OR TUBING DEPT 7	H IN WELL	- FINA	AL PUMF	OR TUE	BING DEPT 7	'H IN WEL	_ (feet):	PUR	SING NI	O84		1	PURGINO	9 END 0930	ED AT:	ТОТ	AL VO		PURGED 21	(liters):
TIME	VOLUME PURGED ({Purging- Volume])	CUM VOL PUR (lite	UME GED	PURGI (mL	E RATE 'min)	DEPTH T WATER (feet)		dar (°C		COND. (mS/cm)	)	DISSOLV OXYGE (mg/L)	ĒΝ	ORI (mV			BIDIT	Y	COLO	R	ODOR
08:56	4	4	1	50	00	5.31	7.3	7 26.4	5	4.445		0.24		-293	.2	1	1.74		Clear		None
09:04	8	1	2	50	00	5.31	7.2	9 26.4	1	4.548		1.18		-292		1	1.47		Clear		None
09:12	12	2		1	00	5.31	7.2		_	4.611		1.16		-294		1	1.96		Clear		None
09:20	16		0		00	5.31	7.2		_	4.761		0.87		-294		-	1.37		Clear		None
09:28	20	6	0	51	00	5.31	7.2	6 26.5	U	4.866		0.81	-	-296	.6	1	1.29		Clear		None
																-		_			
													-					+			
						Final Valu	ues 7.2	6 26.5	0	4.866		0.81		-296	.6	1	1.29				
	ΓΥ (Gallons Per F DIA. CAPACITY					.25" = 0.06			= 0.37; 6" = 0.004	4" = 0.6		5" = 1.02; .006; 1	6" /2" = 0	= 1.47;		= 5.88 = 0.016					
	IPMENT CODES:	B = Ba			dder Pur			ric Subme				Peristaltion				ner (Spe	ecify)				
D								SAMPLIN	IG DATA												
SAMPLED BY (F	PRINT) / AFFILIAT Jason D Amec Foster	rizd			SAMPLE	ER(S) 'URE(S):							SAMF	TED AT				SAMPL ENDE			
PUMP OR TUBI		VVIICCICI			TUBING	i						FIELD-FIL	TERE		0932 No	0	F	ILTER S	SIZE (µı	0934 m): NA	Δ
WELL (feet):	NO DEI IIIIN		7		MATERI CODE:	IAL		HD	PE			Filtration E							NA	,	
FIELD DECONT		PUMF		No		TUBING:			No				DUPL	ICATE:				1	None Co	ollected	
SAMPLE ID	PLE CONTAINER	SPECIFIC MAT.			PR	RESERVAT		LE PRESE	RVATION TAL VOL		F	FINAL		NDED A				MPLING			PUMP FLOW ATE
CODE	# CONTAINERS	CODE	VOLU			USED		ADDED I	N FIELD (	mL)		pH						ODE			er minute)
MW01002	2	HDPE	12	5		Ice (4 °C)			NA		Not	Recorded	Р	FAS (EP	A 537)	)	-	APP			500
																士					
REMARKS:									None	•											
									NOIR	в											
MATERIAL COL		mber Glas					ligh Densi	ty Polyethy	ylene;	LDPE =	Low	Density P	olyeth	ylene;	PP :	= Polyp	ropyle	ene;			
SAMPLING EQU	JIPMENT CODES	: APP	= After (Th	rough) l	Peristalti	ic Pump;	B = Ba	iler; Bi	P = Bladde			ESP = Ele		Submers (Specify		ump;					
	The above do     STABILIZATION	not const	itute all of	the info	rmation	required b	y Chapter	62-160, F.	A.C.												
	pH: + 0.2 units Togreater) Turbidity	emperatur	<b>e:</b> + 0.2 o0	Specif	ic Cond	uctance: +	5% Diss	lved Oxyg	en: all rea							); option	nally, +	· 0.2 mg	g/L or +	10% (wh	ichever is
QA/QC'd by:	Thomas W. He	nsel														QA/Q	C Da	te:		6/15/20	17

SITE NAME:			Patrick A	FB (PTR	CK)			SITE LOCA	ATION:				AFFF F	Release /	Area 1			
WELL NO:		MV	V01003			SAMI	PLE ID:		P.	TRCK01-	-GW-003		DATE:			05/2	5/17	
								PURGING D	DATA									
WELL DIAMETE	ER (inches):	TUB	ING DIAM		iches):	W	ELL SCR	EEN INTERV	/AL DEF	PTH: ST	TATIC WATE	5.42		PURGE	E PUM	P TYPE OF		₹:
WELL VOLUME	PURGE: 1 WEL	L VOLUMI	E = (TOTA	1/4 AL WELL	DEPTH	- STATIC D		to D WATER)		L CAPA	CITY	3.42	2			-		
(only fill out if ap	pplicable)																	
	5.42 feet) X 0.08						0404013	5V V	TUDING	LENOT	11) · El OW	OFLI	VOLUME					
(only fill out if ap	DLUME PURGE:	1 EQUIPMI	ENI VOL.	= PUMF	VOLUM	IE + (TUBING	CAPACII	Y X	TUBING	i LENG I	H) + FLOW	CELL	VOLUME					
, , , , , ,	,,			=	gallor	ns + (	gallor	ns/foot X		fee	et) +		gallons =	gallo	ns			
INITIAL PUMP (	OR TUBING DEPT	H IN WELL	- FIN	AL PUMF	OR TUE	BING DEPTH I	N WELL	(feet):	PURG		ATED AT:		PURGING END	ED AT:	TOTA	AL VOLUMI		ED (liters):
	7					7		1		C	)944		1026				21	
TIME	VOLUME PURGED ({Purging- Volume])	CUM VOL PUR (lite	UME GED		E RATE /min)	DEPTH TO WATER (feet)	pH (standa d units			COND. nS/cm)	DISSOL OXYG (mg/	SEN	ORP (mV)		BIDITY TUs)	COI	LOR	ODOR
0952	4	4	1	5	00	5.43	7.64	27.41		2.032	0.0	7	-297.8	5	.68	Cle	ear	None
1000	8	1	2	5	00	5.43	7.51	27.51	:	2.038	0.0	9	-306.3	3	.44	Cle	ear	None
1008	12	2	4	5	00	5.43	7.46	27.55	:	2.069	0.19	9	-310.4	2	.11	Cle	ear	None
1016	16	4	0	5	00	5.43	7.45	27.55	:	2.097	0.2	1	-311.2	2	.05	Cle	ear	None
1024	20	6	0	5	00	5.43	7.44	27.59	:	2.106	0.2	3	-310.5	2	.05	Cle	ear	None
												-						
				411 4		Final Values		27.59		2.106	0.2		-310.5		.05			
	TY (Gallons Per F E DIA. CAPACITY				3/16" = (	.25" = 0.06; 0.0014: 1/4	2" = 0.1 = 0.002		37; 4 : 0.004;	" = 0.65; 3/8" :			•	= 5.88 = 0.016				
	IPMENT CODES:	B = Ba			dder Pui			c Submersib			P = Peristal			her (Spe	ecify)			
								SAMPLING	DATA									'
SAMPLED BY (F	PRINT) / AFFILIAT				SAMPLE	ER(S) 'URE(S):						SAN	MPLING		5	SAMPLING		
	Jason D Amec Foster				SIGNAT	UKE(3).						INIT	FIATED AT:		E	ENDED AT:		
					TUBING	3					FIELD-F	II TED	1026 RED: N	lo	EII	TER SIZE	1028	NA
PUMP OR TUBI WELL (feet):	ING DEPTH IN		7		MATER CODE:			HDPE					oment Type:		1 11		(μπ). IA	INA
FIELD DECONT	TAMINATION:	PUMF	):	No	CODE.	TUBING:			No			<del></del>	PLICATE:				Collecte	d
SAM	IPLE CONTAINER	SPECIFIC	ATION					E PRESERV	ATION			JK!	TENDED ANALY	ele		PLING	SAMPL	E PUMP FLOW
SAMPLE ID	# CONTAINERS	MAT. CODE	VOLU	JME	PF	RESERVATIVE		TOTAL		T	FINAL		AND/OR METHO			PMENT DDE	(ml	RATE per minute)
CODE MW01003	2	HDPE	12		-	USED Ice (4 °C)	$\dashv$	ADDED IN F			pH lot Recorded	+	PFAS (EPA 537	+		IPP	(IIIL	500
IVIVVU IUUS		HDITE	12			100 (4 0)	-	INF	•	IN	.o. r.ecolued	+	. 17.0 (El'A 007	,	P	. 1	$\vdash$	000
												T						
					<u> </u>					$\perp$		+		+			—	
REMARKS:	<u>I</u>	<u> </u>			<u> </u>													
ļ									None									
MATERIAL COI		mber Glas		= Clear C	Blass; Other (Sp	HDPE = Higl	h Density	Polyethyler	ne; L	DPE = L	ow Density	Polye	ethylene; PP	= Polypi	ropyle	ne;		
SAMPLING EQI	UIPMENT CODES	: APP :	= After (Th	nrough)	Peristalti	ic Pump;	B = Bail M = Stra	er; BP = w Method (Tu		r Pump; ravity Dr			ic Submersible F er (Specify)	Pump;				
	1. The above do 2. STABILIZATIO pH: + 0.2 units T	N CRITER	IA FOR F	RANGE C	F VARIA	TION OF LAS	T THREE	CONSECUT	TIVE RE					?); option	ally, +	0.2 mg/L or	r + 10% (	whichever is
	greater) Turbidit	y: all readir												QA/Q				
www.acaby:	Thomas W. He	11301												WH/W	o Dat	·.	6/15/	2017

SITE NAME:			Patrick A	FB (PTR	CK)			S	ITE LOCA	TION:						AFFF F	Release	e Area	1		
WELL NO:		MV	V01004			SA	AMPLE ID:	:		PT	RCK01	-GW	-004		1	DATE:			05	5/25/17	
	•							PU	RGING D	ATA											
WELL DIAMETE	ER (inches):	TUB	ING DIAM	ETER (in	ches):		WELL SO		N INTERVA to	AL DEP	TH: S	TAT	IC WATER	5.35	TH (fee	t):	PURC	GE PUI	MP TYPE	OR BAILE	R:
WELL VOLUME (only fill out if ap	PURGE: 1 WEL	L VOLUMI	E= (TOTA	AL WELL	DEPTH	- STATI	C DEPTH	TO W	ATER) X	WEL	L CAPA	ACIT	Y								
= ( 15.0 feet – 5	5.35 feet) X 0.08	2 gallons/fo	ot X 3.7	85 liters/	gallon =	6.0 liters															
EQUIPMENT VO (only fill out if ap	DLUME PURGE:	1 EQUIPM	ENT VOL.	= PUMF	VOLUM	IE + (TUBIN	NG CAPAC	CITY	Х	TUBING	LENG1	TH) +	FLOW C	ELL V	OLUME						
				=	gallor	ns + (	gall	lons/fo	oot X		fe	eet) +			gallons	=	gall	lons			
INITIAL PUMP (	OR TUBING DEPT 7	H IN WELL	- FIN	AL PUMF	OR TUE	BING DEPT	'H IN WEL	L (feet	t):	PURGI	NG NIT	1134			PURGIN	IG END 1216	DED AT	: TO	TAL VOLU	ME PURG 21	GED (liters):
TIME	VOLUME PURGED ({Purging- Volume])	PUR	UME		E RATE /min)	DEPTH WATER		ndar	TEMP. (°C)		OND. IS/cm)		DISSOLV OXYGE (mg/L)	EN.	OF (m			RBIDIT NTUs)	Y C	OLOR	ODOR
1142	4	4	1	5	00	5.35	7.5	50	26.90	C	).548		0.13		-23	2.4		59.1		Clear	None
1150	8	1	2	5	00	5.35	7.3	88	26.83	C	).545		0.18		-24	1.9		9.34	1	Clear	None
1158	12		4	1	00	5.35	7.4	-	26.98		).543		0.25		-26		+	7.25		Clear	None
1206	16		0	-	00	5.35	7.4	-	27.18		).542		0.65		-27		+	3.72	_	Clear	None
1214	20	6	0	5	00	5.35	7.4	18	27.19	C	).541		0.68		-28	3.9		3.49		Clear	None
								1													
								4						_			-				
								+									-				
						Final Valu	ues 7.4	18	27.19	C	).541		0.68	$\dashv$	-28	3.9		3.49			
WELL CAPACIT	TY (Gallons Per F	oot): 0.75	j" = 0.02;	1" = 0	.04; 1	.25" = 0.06	i; 2" = 0	0.16;	3" = 0.3	7; 4	" = 0.65	i;	5" = 1.02;	6"	= 1.47;	12"	' = 5.88				
	DIA. CAPACITY								5/16" =		3/8"				0.010;		= 0.016				
PURGING EQU	IPMENT CODES:	B = Ba	iller;	BP = Bla	dder Pui	mp; E	SP = Elect		ubmersible		); F	PP =	Peristaltion	c Pum	p;	0 = 0t	her (Sp	ecity)			
SAMPLED BY (F	PRINT) / AFFILIAT	ION:			SAMPLE									SAMI	PLING				SAMPLIN	G	
	Jason D Amec Foster				SIGNAT	URE(S):								INITI	ATED A				ENDED A		0
PUMP OR TUBI	NG DEDTH IN				TUBING	;							FIELD-FIL	TERE	D:	1216 N	lo	F	ILTER SIZ	121 'E (um):	NA NA
WELL (feet):	NO DEI IIIIN		7		MATER CODE:	IAL			HDPE				Filtration E			e:				NA	
FIELD DECONT		PUMF		No		TUBING:				No				DUPL	ICATE:				PTR	CK-FD-GV	V-03
SAMPLE ID	IPLE CONTAINER	SPECIFIC MAT.			PF	RESERVAT		PLE PI	TOTAL '		<del>- 1</del>	F	INAL		NDED .				MPLING IIPMENT	SAMPI	LE PUMP FLOW RATE
CODE	# CONTAINERS	CODE	VOLU			USED		AD	DED IN FI				рН		ND/OR N				ODE	(ml	_ per minute)
MW01004	2	HDPE	12	:5		Ice (4 °C)	ı		NA		1	Not F	Recorded	F	PFAS (E	PA 537	")		APP	-	500
																				+	
											+			-			$\dashv$			+-	
REMARKS:	ı																				
										None											
MATERIAL COI		mber Glas					ligh Dens	ity Po	lyethylene	e; L	DPE = L	Low	Density P	olyeth	ylene;	PP	= Poly	propyl	ene;		
SAMPLING EQI	S = Sili	cone; T : APP:	= Teflon; = After (Th				B = Ba	ailer;	BP = E	Bladder	Pump;	;	ESP = Ele	ectric	Subme	sible F	Pump;				
NOTES:	1. The change is		= Revers						ethod (Tu	bing G	ravity D	)rain	); O =	Othe	(Speci	fy)					
	<ol> <li>The above do</li> <li>STABILIZATION</li> </ol>									I <u>VE</u> RE	<u>ADI</u> NGS	<u>S (</u> SI	EE FS 221	12, SE	CTION	3)					
	pH: + 0.2 units To greater) Turbidity	emperatur	e: + 0.2 o	Specif	ic Cond	uctance: +	5% Diss	olved	Oxygen:	all readi							2); optio	nally,	+ 0.2 mg/L	or + 10%	(whichever is
	ground i arbidit	, an readil	.gu > ∠U IV	. o, opu	uny + 0		. 5 70 (WITICI	.10461	.o greater)												
QA/QC'd by:	Thomas W. He	nsel															QA/0	QC Da	te:	6/15	/2017

SITE NAME:			Patrick A	FB (PTR	CK)			S	SITE LOCA	TION:						AFFF F	Releas	e Area	1		
WELL NO:		MV	V01005			S	AMPLE ID	:		P	RCK01	-GW	/-005			DATE:			05	5/25/17	
						•		PU	JRGING D	ATA											
WELL DIAMETE	ER (inches):	TUB	ING DIAMI	ETER (in	ches):		WELL SO		N INTERV to	AL DEF	TH: S	TAT	IC WATER	5.52	TH (fee	t):	PUR	GE PU	MP TYPE	OR BAILE	R:
WELL VOLUME (only fill out if ap	E PURGE: 1 WEL	L VOLUMI	E= (TOTA	AL WELL	DEPTH	- STATI	C DEPTH	TO W	'ATER) X	WEL	L CAPA	ACIT	Υ								
= ( 15.0 feet – 5	5.52 feet) X 0.08	2 gallons/fo	ot X 3.7	85 liters/	gallon =	5.9 liters															
EQUIPMENT VO (only fill out if ap	OLUME PURGE:	1 EQUIPM	ENT VOL.	= PUMF	VOLUM	IE + (TUBII	NG CAPAC	CITY	Х	TUBING	ELENG'	TH) ·	+ FLOW C	ELL V	OLUME						
()	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			=	gallor	ns + (	gal	lons/fo	oot X		fe	eet) +	+		gallons	=	ga	llons			
INITIAL PUMP (	OR TUBING DEPT 7	H IN WELL	- FINA	AL PUMF	OR TUE	BING DEPT	TH IN WEL	L (fee	et):	PURG	NG NIT	1234			PURGIN	IG END 1316	DED A	Γ: TO	TAL VOLU	ME PURO 21	SED (liters):
TIME	VOLUME PURGED ({Purging- Volume])	PUR	UME		E RATE /min)	DEPTH WATER	R (star	ndar	TEMP. (°C)		OND. nS/cm)		DISSOLV OXYGE (mg/L)	ΕN	OF (m			RBIDIT NTUs)		OLOR	ODOR
1242	4	4	1	5	00	5.52	7.6	61	26.80	(	0.292		0.17		-17	9.4		28.6		Clear	None
1250	8	1	2	5	00	5.52	7.7	70	26.94	(	0.293		0.19		-21	4.5		20.2		Clear	None
1258	12		4	1	00	5.52	7.8	-+	27.29		0.294	_	0.24		-22			7.73		Clear	None
1306	16	6	0	-	00	5.52	7.8	-+	27.31		0.294	_	0.26		-23 -23			5.97 6.87	_	Clear Clear	None
1314	20	6	0	5	JU	5.52	7.8	52	21.21	(	1.294		0.28		-23	5.1		6.87		Clear	None
												_									
								+				-									
								$\dashv$									1				
						Final Val	ues 7.8	32	27.27	(	).294	1	0.28		-23	5.1		6.87			
	TY (Gallons Per F					.25" = 0.06			3" = 0.3		" = 0.65		5" = 1.02;		' = 1.47;		' = 5.88				
	E DIA. CAPACITY IPMENT CODES:	(Gal./Ft.): B = Ba			3/16" = 0				5/16" = ubmersible				006; 1/ Peristaltion		0.010; nr:	5/8": O = Ot	= 0.01				
		5-50	,	J. – J.u	uuo u.	р, _	0 2.00		MPLING D		, ·		· oriotaiti		.p,	0 - 0.	(0	pooy/			
SAMPLED BY (I	PRINT) / AFFILIAT				SAMPLE	ER(S) URE(S):									PLING				SAMPLIN		
	Jason D Amec Foster				0.0.0.	0112(0).								INITI	ATED A	T: 1316			ENDED A	ιΤ: 131	8
PUMP OR TUBI	ING DEPTH IN		7		TUBING				HDPE			1	FIELD-FIL	TERE	D:	N	lo	F	ILTER SIZ		NA
WELL (feet):					MATER CODE:								Filtration E	<del></del>		e:				NA	
FIELD DECONT	FAMINATION: MPLE CONTAINER	PUMP		No	1	TUBING:	SAMI	PIFP	RESERVA	No				DUP	LICATE:					ne Collect	
SAMPLE ID CODE	# CONTAINERS	MAT.	VOLU	JME	PF	RESERVAT			TOTAL '	VOL		F	INAL		ENDED ND/OR I			EQL	MPLING JIPMENT CODE		LE PUMP FLOW RATE L per minute)
MW01005	2	HDPE	12	5		USED Ice (4 °C)	)	AD	DED IN FI NA	ELD (m		Not F	pH Recorded	F	PFAS (E	PA 537	<b>'</b> )		APP	(	500
											_						_				
																	_ †			1	
DEMARKS.																					
REMARKS:										None											
MATERIAL CO	DES. AC A	mber Glas	60	Class	Nana.	UDDE I	link Dana	iti. Da	li redhi ile m		DDE I	l	Damaitu D	alı sat		DD	Deli				
WATERIAL COI		cone; T					nign Dens	ity Po	olyethylene	e; L	DPE = I	LOW	Density P	oiyet	nyiene;	PP	= Poly	propyl	ene;		
SAMPLING EQ	UIPMENT CODES		= After (Th = Revers				B = Ba SM = St		BP = E lethod (Tu		Pump;		ESP = Ele ); O =		Subme r (Speci		Pump;				
NOTES:	The above do     STABILIZATION									IVE RE	ADING	S (S	EE FS 221	12, SE	CTION	3)					
	pH: + 0.2 units Togreater) Turbidit	emperatur	<b>e:</b> + 0.2 o0	Specif	ic Cond	uctance: +	5% Diss	olved	Oxygen:	all read							2); opti	onally,	+ 0.2 mg/L	or + 10%	(whichever is
QA/QC'd by	Thomas W. He	nsel															QA/	QC Da	ıte:	6/15	5/2017
LAIGO G Dy.																	471	50		5,10	

SITE NAME:			Patrick A	FB (PTRCK)			SITE LOCA	ATION:				AFFF R	elease A	rea 1			
WELL NO:		MV	/01006		SAN	MPLE ID:		PT	TRCK01-G	W-006		DATE:			05/25	/17	
	l.						PURGING D										
WELL DIAMETE	ER (inches):	TUB	NG DIAMI	ETER (inches	: V	WELL SCR	EN INTERV	'AL DEF	PTH: STA	TIC WATER	DEPTH (fee	et):	PURGE	PUMP T	YPE OR	BAILER:	
	2			1/4		5	to	15		!	5.42				PF		
WELL VOLUME (only fill out if ap	PURGE: 1 WEL	L VOLUMI	E= (TOTA	AL WELL DEP	TH - STATIC	DEPTH TO	WATER) X	K WEL	LL CAPACI	TY							
	5.42 feet) X 0.08	2 gallons/fo	ot X 3.7	85 liters/gallor	= 5.9 liters												
EQUIPMENT V	OLUME PURGE:	1 EQUIPM	ENT VOL.	= PUMP VOL	UME + (TUBING	G CAPACIT	Y X -	TUBING	3 LENGTH	) + FLOW CE	LL VOLUME						
(only fill out if ap	plicable)																
INITIAL DLIMD	OR TUBING DEPT	H IN WELL	IEINI		llons + ( FUBING DEPTH		s/foot X	DUDG	feet)		gallons		gallor	TOTAL V	/OLUME	DUDGE	) (litera):
/ A	7	IIIIN VVLLL	FINA	AL PUMP OR	7	I IIN WELL (	ieet).	PURG	10- 10-		PURGII	1122	ED AT:	TOTAL V	OLUME	21	J (liters):
	VOLUME	CUN	/UL.														
TIME	PURGED ({Purging- Volume])	VOL PUR (lite	UME GED	PURGE RA' (mL/min)	DEPTH TO WATER (feet)	) pH (standa d units)			COND. nS/cm)	DISSOLVI OXYGEI (mg/L)	u I O	RP iV)	TURE (NT		COL	OR	ODOR
10:48	4	4	1	500	5.42	7.73	26.90	(	0.553	0.15	-24	2.0	9.	17	Cle	ar	None
10:56	8	1	2	500	5.42	7.53	26.84	(	0.592	0.18	-25	8.3	6.	06	Cle	ar	None
11:04	12	2	4	500	5.42	7.59	27.07	(	0.595	0.28	-26	1.1	4.:	26	Cle	ar	None
11:12	16	4	0	500	5.42	7.61	27.17	(	0.605	0.55	-26	3.3	3.	05	Cle	ar	None
11:20	20	6	0	500	5.42	7.58	27.06	(	0.607	0.57	-26	3.9	3.	51	Cle	ar	None
					Final Value	s 7.58	27.06	(	0.607	0.57	-26	3.9	3.	51			
WELL CAPACI	TY (Gallons Per F	oot): 0.75	" = 0.02;	1" = 0.04;	1.25" = 0.06;	2" = 0.1	6; 3" = 0.3	37; 4	l" = 0.65;	5" = 1.02;	6" = 1.47	12"	= 5.88				
TUBING INSIDE	DIA. CAPACITY	(Gal./Ft.):	1/8" = 0.0	0006; 3/16	= 0.0014; 1/4	4" = 0.0026	; 5/16" =	0.004;	3/8" =	0.006; 1/2	2" = 0.010;	5/8" =	0.016				
PURGING EQU	IPMENT CODES:	B = Ba	iler; l	BP = Bladder	Pump; ESF		Submersibl		p; PP	= Peristaltic	Pump;	O = Oth	er (Spec	ify)			
CAMPLED BY /	PRINT) / AFFILIAT	ION:		Ican	PLER(S)		SAMPLING D	DATA		1.				la			
SAMPLED BT (	Jason D				IATURE(S):						SAMPLING INITIATED A	T·			PLING ED AT:		
	Amec Foster									ľ	INITIATED A	1122		LIND	LD AI.	1124	
PUMP OR TUB	ING DEPTH IN		_	TUB						FIELD-FILT	ERED:	No	)	FILTE	R SIZE (	um): N	A
WELL (feet):			7	COE	ERIAL E:		HDPE			Filtration Ed	quipment Typ	e:			NA	ı.	
FIELD DECONT		PUMP		No	TUBING:			No			DUPLICATE				None (	Collected	
	IPLE CONTAINER		ATION				PRESERVA		- 1		INTENDED	ANALYS	SIS	SAMPLIN			PUMP FLOW
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLU	JME	PRESERVATIV USED		TOTAL ADDED IN FI			FINAL pH	AND/OR			EQUIPME CODE			RATE er minute)
MW01006	2	HDPE	12	25	Ice (4 °C)		NA			Recorded	PFAS (E	PA 537)	+	APP			500
					. ,						•						
										J							
									_				-				
REMARKS:																	
								None									
MATERIAL CO		mber Glas	-	= Clear Glass		gh Density	Polyethylene	e; L	DPE = Lov	w Density Po	olyethylene;	PP =	Polypre	opylene;			
SAMPLING FO	S = Sili UIPMENT CODES	cone; T		O = Other nrough) Peris		B = Baile	r. RD_D	Bladde	r Pump;	FSP - EIA	ctric Subme	rsible P	ıımı.				
JAMIT LING EQ	m 00DE3			e Flow Perist			Method (Tu				Other (Spec		ι <b>ρ</b> ,				
NOTES:	1. The above do	not const	itute all of	f the informat	on required by	Chapter 62	2-160, F.A.C.										
	2. STABILIZATIO																
	pH: + 0.2 units Togreater) Turbidit								iings < 20%	saturation (s	see rable FS	2200-2)	; optiona	ıııy, + 0.2	mg/L or	+ 10% (w	nichever is
<u> </u>	- ,			,		,	3/										
QA/QC'd by:	Thomas W. He	nsel											QA/QC	Date:		6/15/2	017

SITE NAME:			Patrick A	FB (PTR	CK)			SITE LOC	ATION:				AFFF	Release /	Area 2				
WELL NO:		MW	/02001			SA	AMPLE ID:		PT	PTRCK02-GW-001 DATE: 05/23/17									
	•					•		PURGING I	DATA				•						
WELL DIAMETE	1		ING DIAM	1/4			5	to	10		ATIC WATER	6.69	H (feet):	PURGE	E PUM	P TYPE OF P		₹:	
(only fill out if ap			,				C DEPTH T	O WATER)	X WEL	L CAPAC	CITY								
	5.69 feet) X 0.04							T	T. ID.II.										
(only fill out if ap	DLUME PURGE: ·	1 EQUIPMI	ENT VOL.	= PUMF	VOLUM	E + (TUBIN			TUBING	LENGTH	H) + FLOW C	ELL VC	DLUME						
INITIAL PLIMP (	OR TUBING DEPT	H IN WELL	leini	=	gallor	ns + ( BING DEPT		ns/foot X	DUDGU	fee	t) + TED AT:		gallons = PURGING EN	gallo		AL VOLUM	E DI IDGI	ED (litere):	
/e ()	8.5		1	ALT OWN	OIT TO	8.5		(icct).	rorton		203		1214		1017	AL VOLOW	5.5	LD (mors).	
TIME	VOLUME PURGED ({Purging- Volume])	CUM VOL PUR (lite	UME GED		E RATE 'min)	DEPTH 1 WATEF (feet)				OND. S/cm)	DISSOL\ OXYGE (mg/L	ΞN	ORP (mV)		BIDITY TUs)	COI	LOR	ODOR	
1205	1	1	1	5	00	6.69	6.92	27.97	0	.535	0.53		40.6	9.10 Clear NA 9.98 Clear NA					
1207	2		3	-	00	6.69	6.72	_	+	.538	0.42	_	39.5	5 9.98 Clear					
1209	3	(		1	00	6.69	6.68		+	.537	0.38	-	37.1	-	.05		ear	NA	
1211	4	1	0	5	00	6.69	6.69	28.00	0	.537	0.36		34.0 6.60 Clear					NA	
								+				+		-					
												$\dashv$							
												+							
												$\dashv$							
						Final Valu	ies 6.69	28.00	0	.537	0.36		34.0	6	i.60				
	TY (Gallons Per F					.25" = 0.06			.37; 4' = 0.004;	' = 0.65;	5" = 1.02; 0.006; 1	; 6" = /2" = 0.0		" = 5.88 = 0.016					
	IPMENT CODES:	B = Ba			dder Pu			c Submersik			= Peristalti		,	ther (Spe	ecify)				
SAMDLED BY (	PRINT) / AFFILIAT	ION:			SAMPLE	=D/C\		SAMPLING	DATA						I.				
SAMPLED BT (	Jason D Amec Foster	rizd				URE(S):						SAMPI INITIA	TED AT: 1214			SAMPLING ENDED AT:	1216		
PUMP OR TUBI WELL (feet):	NG DEPTH IN		8.5		TUBING MATER			HDPE			FIELD-FIL		): I	No	FIL	TER SIZE		NA	
FIELD DECONT	AMINATION:	PUMP	):	No	CODE:	TUBING:			No		i illi adoli L	DUPLI	- ''				Collecte	d	
SAMPLE ID	IPLE CONTAINER	SPECIFIC MAT.			PF	RESERVAT		E PRESERV. TOTAL			FINAL		NDED ANAL			PLING PMENT	SAMPL	E PUMP FLOW RATE	
CODE MW02001	# CONTAINERS	CODE	VOLU			USED Ice (4 °C)		ADDED IN F			pH ot Recorded		D/OR METHO			DDE PP	(mL	per minute)	
														_					
REMARKS:									None										
MATERIAL COI		mber Glas					ligh Densit	y Polyethylei	ne; Li	OPE = Lo	w Density P	olyethy	ylene; PF	e Polypi	ropyle	ne;			
SAMPLING EQI	UIPMENT CODES		= Terion; = After (Th = Revers	rough)	Peristalti	ic Pump;	B = Bai	er; BP =	Bladder				Submersible (Specify)	Pump;					
	The above do     STABILIZATION	not consti	itute all of	the info	rmation F VARIA	required b	y Chapter (	62-160, F.A.C	:. TIVE RE	ADINGS	(SEE FS 22	12, SEC	CTION 3)						
	pH: + 0.2 units To greater) Turbidity									ngs < 20°	% saturation	(see Ta	ble FS 2200-	2); option	ally, +	0.2 mg/L oi	+ 10% (	whichever is	
QA/QC'd by:	Thomas W. He	nsel												QA/Q	C Date	e:	6/14/	2017	

SITE NAME:			Patrick A	FB (PTRCK)			SITE LOCA	ATION:				AFFF R	Release A	Area 2			
WELL NO:		MV	V02002		S.	AMPLE ID:		P <sup>-</sup>	TRCK02-G	W-002		DATE:	I		05/2	3/17	
							PURGING D	ATA									
WELL DIAMETE	1			ETER (inche		5	to	10			7.18	TH (feet):	PURGE	PUMP '	TYPE OF		:
(only fill out if ap			,			IC DEPTH T	O WATER)	X WEI	LL CAPACI	ITY							
	7.18 feet) X 0.04  OLUME PURGE:					NG CAPACI	TY X	TUBING	G LENGTH	) + FLOW CE	ELL V	OLUME					
(only fill out if ap																	
INITIAL PUMP	OR TUBING DEPT	H IN WELL	- FINA		gallons + ( R TUBING DEP		ns/foot X (feet):	PURG	feet)		_	gallons = PURGING END	gallo ED AT:		VOLUME	PURGE	D (liters):
	9				9				10:	25		1044				7.5	
TIME	VOLUME PURGED ({Purging- Volume])	PUR	MUL. UME :GED ers)	PURGE RA		R (stand			COND. nS/cm)	DISSOLV OXYGE (mg/L)	N	ORP (mV)		BIDITY TUs)	COL	.OR	ODOR
1030	2.5	2	.5	500	7.18	7.01	28.50		0.771	0.33		2.3	1:	2.5	Cle	ar	NA
1035	5	7	.5	500	7.18	6.88	28.37	(	0.769	0.44	4 1.7 7.11 Clear NA						NA
1040	7.5	1	5	500	7.18	6.83	28.39	-	0.769	0.59		1.4	5	.10	Cle	ar	NA
						_				1							
						_				-							
						-				1							
						_				+							
						+				1							
						_				+							
						+				†							
											T						
											T						
											İ						
				411	Final Val				0.769	0.59		1.4		.10			
	TY (Gallons Per F E DIA. CAPACITY								1" = 0.65; 3/8" =	5" = 1.02; 0.006: 1/3	ە 2" = 0		= 5.88 = 0.016				
	IPMENT CODES:	B = B		BP = Bladde			c Submersib			= Peristaltic			her (Spe	cify)			
							SAMPLING I	DATA									
SAMPLED BY (	PRINT) / AFFILIAT Jason D				MPLER(S) SNATURE(S):							PLING			MPLING		
	Amec Foster				. ,						INITIA	ATED AT: 1103		EN	DED AT:	1107	
PUMP OR TUB	ING DEPTH IN				BING					FIELD-FILT	TERE		0	FILTE	ER SIZE		NA NA
WELL (feet):			9		TERIAL DE:		HDPE			Filtration Ed	quipm	nent Type:			N.	Α	
FIELD DECON		PUMF		No	TUBING:			No			DUPL	ICATE:			PTRCK-	FD-GW-0	01
	IPLE CONTAINER	1	1		PRESERVAT		E PRESERVA. TOTAL		<del>- 1</del>	FINAL		ENDED ANALYS		SAMPL			PUMP FLOW
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOLU	JME	USED	145	ADDED IN F			pH	A۱	ND/OR METHO	D	COD			per minute)
MW02002	2	HDPE	12	5	Ice (4 °C	)	NA	<b>\</b>	Not	t Recorded	Р	PFAS (EPA 537)	)	APF	<b>-</b>		250
		-											_				
		-				+							+				
						+							$\dashv$				
REMARKS:								N.		_	_						
								None									
MATERIAL CO		Amber Glas	-	= Clear Glas		High Densit	y Polyethylen	ie; L	DPE = Lov	w Density Po	olyeth	nylene; PP :	= Polypr	opylene	;		
CAMPI IN C.		cone; T			r (Specify)	B 5.	lor: DD	Died 1	z Du	E60 -:	not=! -	Submere!!!-	)				
	UIPMENT CODES	RFPP	= Revers	e Flow Peris	staltic Pump; staltic Pump;		w Method (Tu	ubing G	r Pump; Gravity Dra			Submersible P r (Specify)	rump;				
NOTES:	The above do     STABILIZATION				-	-			EADINGS (	SEE FS 221	12, SE	CTION 3)					
	pH: + 0.2 units T greater) Turbidit								lings < 20%	saturation (	see T	able FS 2200-2	); option	ally, + 0.2	2 mg/L or	+ 10% (v	hichever is
QA/QC'd bv-	Thomas W. He	ensel											QA/Q	C Date:		6/14/2	2017
													, -4				

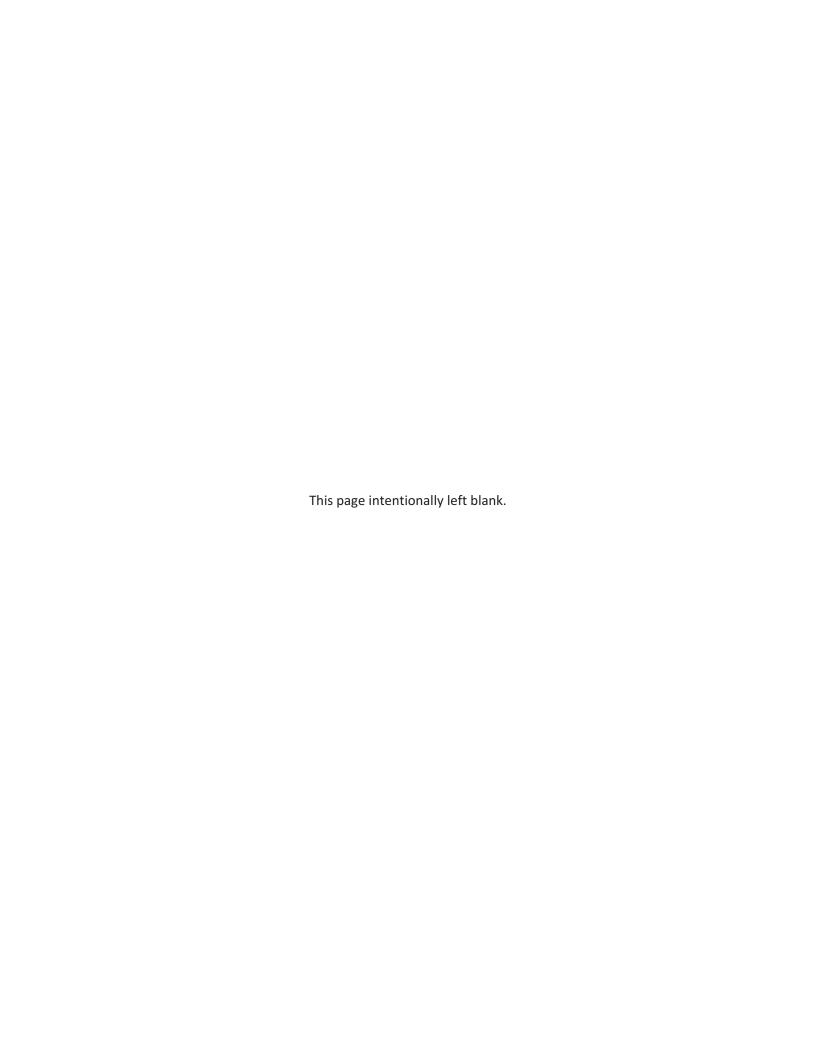
SITE NAME:	SITE LOCATION:  Patrick AFB (PTRCK)  AFFF Release Area 2																			
WELL NO:		MV	/02003			SA	AMPLE ID:		PT	RCK02-0	GW-003		DAT	E:		05/2	3/17			
								PURGING	DATA											
WELL DIAMETE	ER (inches):	TUBI	NG DIAMI	ETER (in 1/4	ches):		WELL SC	reen inter to	VAL DEP 10	TH: ST	ATIC WATER	7.65	ΓΗ (feet):	PUF	RGE PU	MP TYPE OI P	R BAILEF	₹:		
WELL VOLUME (only fill out if ap	PURGE: 1 WEL plicable)	L VOLUME	E= (TOTA	AL WELL	DEPTH	- STATIO	C DEPTH T	O WATER)	X WEL	L CAPAC	CITY									
= ( 10.0 feet – 7	.65 feet) X 0.04	1 gallons/fo	ot X 3.7	85 liters/g	gallon =	0.4 liters														
EQUIPMENT VO (only fill out if ap	DLUME PURGE:  plicable)	1 EQUIPMI	ENT VOL.	= PUMP	VOLUM	IE + (TUBIN	NG CAPAC	TY X	TUBING	LENGTH	H) + FLOW C	CELL V	OLUME							
				=	gallor			ns/foot X		fee			gallons =		allons					
INITIAL PUMP C	OR TUBING DEPT 9	H IN WELL	FINA	AL PUMP	OR TUE	BING DEPT	'H IN WELL	(feet):	PURGI		ATED AT: 116	F	PURGING E		AT: TO	TAL VOLUM	E PURGI 5	ED (liters):		
TIME	VOLUME PURGED ({Purging- Volume])	CUM VOL PUR (lite	UME GED	PURGE (mL/	E RATE 'min)	DEPTH 1 WATER (feet)				OND. S/cm)	DISSOLV OXYGE (mg/L	EN	ORP (mV)	Т	URBIDIT (NTUs)		LOR	ODOR		
1127	1	1	ı	50	00	7.65	7.03	28.63	0	.580	0.54	1	-28.1		8.76 Clear NA 5.67 Clear NA					
1129	2	3		50		7.65	6.86	_		.578	0.54		-26.1		NA					
1131	3	(		50		7.65	6.76			.576	0.46	-+	-25.1		4.29		ear	NA		
1133	4	1	0	50	00	7.65	6.68	28.48	0	.575	0.44	1	-24.8		3.10	Cl	ear	NA		
												+		+						
									+					+						
							-		+					+						
									+											
									1					+						
						Final Valu	ues 6.68	28.48	0	.575	0.44	,	-24.8	+	3.10					
WELL CAPACIT	ΓΥ (Gallons Per F	oot): 0.75	" = 0.02;	1" = 0	.04; 1	.25" = 0.06	i; 2" = 0	16; 3" = 0	.37; 4	" = 0.65;	5" = 1.02	; 6"	= 1.47;	12" = 5.8	88		l			
	DIA. CAPACITY	(Gal./Ft.): B = Ba			3/16" = ( dder Pui			e6; 5/16" ic Submersil	= 0.004; ble Pump		0.006; 1 P = Peristalti	1/2" = 0 ic Pum		8" = 0.0 Other (	16 Specify)					
			,					SAMPLING		,			μ, σ		,					
SAMPLED BY (F	PRINT) / AFFILIAT Jason D				SAMPLE SIGNAT	ER(S) URE(S):						SAMP	LING TED AT:			SAMPLING ENDED AT:				
	Amec Foster												113	35			1137			
PUMP OR TUBI WELL (feet):	NG DEPTH IN		9		TUBING MATER CODE:			HDP	≣		FIELD-FIL Filtration E			No	F	ILTER SIZE	(µm): IA	NA		
FIELD DECONT	AMINATION:	PUMP	:	No	CODE:	TUBING:			No				ICATE:				Collecte	d		
SAMPLE ID	PLE CONTAINER	SPECIFIC MAT.			PF	RESERVAT		E PRESERV TOTA			FINAL		NDED ANA			MPLING JIPMENT	SAMPL	E PUMP FLOW RATE		
CODE	# CONTAINERS	CODE	VOLU			USED		ADDED IN	FIELD (m		pН		ID/OR MET		(	APP	(mL	per minute)		
MW02003	2	HUPE	12	5		Ice (4 °C)		IN	А	INC	ot Recorded	Р	FAS (EPA 5	037)		APP		500		
REMARKS:												1					<u> </u>			
									None											
MATERIAL CO		mber Glas cone; T					ligh Densit	y Polyethyle	ne; L	DPE = Lo	ow Density F	Polyeth	ylene; l	PP = Po	lypropy	lene;				
SAMPLING EQI	JIPMENT CODES	: APP =	After (Th	rough) l	Peristalti	ic Pump;	B = Bai	ler; BP =	Bladder				Submersib (Specify)	le Pump	o;					
	The above do     STABILIZATION	not consti	itute all of	the info	rmation F VARIA	required b	y Chapter AST THRE	62-160, F.A.C E CONSECU	TIVE RE	ADINGS	(SEE FS 22	212, SE	CTION 3)							
	pH: + 0.2 units To greater) Turbidit									ngs < 20°	% saturation	(see Ta	able FS 220	0-2); opt	tionally,	+ 0.2 mg/L o	r + 10% (	whichever is		
QA/QC'd by:	Thomas W. He	nsel												QA	/QC Da	nte:	6/14/	2017		

SITE NAME:			Patrick A	FB (PTR	CK)			SITE LOCA	ATION:					А	FFF R	telease	e Area	3			
WELL NO:		MV	/03001			SAME	PLE ID:		P.	TRCK03	3-GW-	GW-001 DATE: 05/24/17									
								PURGING D	ATA												
WELL DIAMETE	ER (inches):	TUB	ING DIAM		ches):	W	ELL SCR	REEN INTERV	AL DEF	PTH: S	STATIO	C WATER	5.56	TH (feet):		PURG	GE PUI	MP TYPE	OR BAILE	ER:	
WELL VOLUME	PURGE: 1 WEL	L VOLUMI	E = (TOTA	1/4 AL WELL	DEPTH	- STATIC D	_	to D WATER)		LL CAP	ACITY		5.50						FF		
(only fill out if ap																					
	5.56 feet) X 0.08 DLUME PURGE:						CADACII	rv v	TUDING	O L ENIC	TII\ .	FLOW CE	TII \/	OLUME							
(only fill out if ap		I EQUIPINI	ENI VOL.	- PUIVIF	VOLUM	E + (TUBING	CAPACII	ГҮ Х	IUBING	3 LENG	ıп)+	FLOW C	ELL V	OLUME							
	. ,			=	gallon	ns + (	gallor	ns/foot X		fe	eet) +			gallons =	:	gall	lons				
INITIAL PUMP (	OR TUBING DEPT 7	H IN WELL	- FIN	AL PUMF	OR TUE	BING DEPTH I	N WELL	(feet):	PURG	ING NIT		D AT:		PURGING		ED AT	: TO	TAL VOLU		GED (liters):	
	1			1	1	7	<del></del>		-		1254				1316			1	21		
TIME	VOLUME PURGED ({Purging- Volume])	CUM VOL PUR (lite	UME GED		E RATE /min)	DEPTH TO WATER (feet)	pH (standa d units			COND. mS/cm)		DISSOLV OXYGE (mg/L)	N	ORF (mV)			RBIDIT NTUs)	Y	COLOR	ODOR	
1302	4	4	1	5	00	5.52	7.67	26.89		2.228		0.08		-257.	2		84.6		Clear	None	
1310	8	1	2	5	00	5.52	7.35	26.99	:	2.223		0.07		-270.	70.1 18.9 Clear None						
1318	12	2	4	5	00	5.52	7.30	27.03	:	2.209		0.06		-279.	4		13.3		Clear	None	
1326	16	4	0	5	00	5.52	7.30	26.95	:	2.204		0.11		-289.	8		7.12		Clear	None	
1334	20	6	0	5	00	5.52	7.31	26.92	:	2.198		0.12		-293.	3		6.94		Clear	None	
															-						
													[								
				411 4		Final Values		26.92		2.198		0.12		-293.		= 5.88	6.94				
	TY (Gallons Per F E DIA. CAPACITY				.04; 1 3/16" = 0	.25" = 0.06; 0.0014: 1/4'	2" = 0.1 = 0.002			4" = 0.65 3/8"	5; 5 " = 0.0	5" = 1.02; 106· 1/		= 1.47; 0.010;		= 5.88 : 0.016					
	IPMENT CODES:	B = Ba			dder Pur			c Submersib				Peristaltic					ecify)				
								SAMPLING I	DATA											'	
SAMPLED BY (F	PRINT) / AFFILIAT				SAMPLE	ER(S) 'URE(S):							SAME	PLING				SAMPLIN	1G		
	Jason D Amec Foster				SIGNAT	UKE(3).							INITIA	ATED AT:				ENDED /			
					TUBING	i					I.	IELD-FILT	TERE		1336 No		-	II TED SI	133 ZE (µm):		
PUMP OR TUBI WELL (feet):	ING DEPTH IN		7		MATERI CODE:			HDPE				iltration E				-	-	1 _ 1 \ 0	NA	NA	
FIELD DECONT	TAMINATION:	PUMP	):	No	JUDE:	TUBING:			No					ICATE:				No	ne Collect	ed	
SAM	IPLE CONTAINER	SPECIFIC	ATION				SAMPL	E PRESERVA	ATION				INITE	ENDED AI	MAI V	ele		MPLING	SAMP	LE PUMP FLOW	
SAMPLE ID	# CONTAINERS	MAT. CODE	VOLI	JME	PR	RESERVATIVE		TOTAL		., Τ		NAL		ND/OR ME				IPMENT CODE	/m	RATE L per minute)	
CODE MW03001	2	HDPE	12			USED Ice (4 °C)	$\dashv$	ADDED IN F				pH ecorded	-	PFAS (EPA	A 5271	+		APP	- (111	500	
IVIVVUOUUI		HDITE	12			100 (4 0)	-	INP	•	-+	AUL PO	Soorueu		. 7.0 (EP/	, 551)	+		. 11 1	+	000	
																士					
						<del></del>	$\Box$	<del></del>		$\Box$											
																$\perp$			_		
REMARKS:	<u>I</u>	<u> </u>			<u> </u>																
ļ									None												
MATERIAL COI		mber Glas		= Clear C	lass; ther (Sp	HDPE = High	h Density	Polyethylen	ie; L	DPE =	Low D	Density Po	olyeth	nylene;	PP :	Poly	propyl	ene;			
SAMPLING EQI	UIPMENT CODES	: APP :	= Tenon, = After (The = Revers	nrough)	Peristalti	ic Pump;	B = Bail M = Stra	er; BP = w Method (Tu		r Pump Gravity [		ESP = Ele ; O =		Submers r (Specify		ump;					
	1. The above do 2. STABILIZATIO pH: + 0.2 units To	N CRITER	IA FOR F	RANGE C	F VARIA	TION OF LAS	T THREE	CONSECUT	IVE RE						-	); optio	nally -	+ 0,2 ma/l	or + 10%	(whichever is	
	greater) Turbidit	y: all readir								95 - 2	_0,0 30		,500 1		_00 2,						
QA/QC'd by:	Thomas W. He	nsel														QA/C	QC Da	te:	6/14	1/2017	

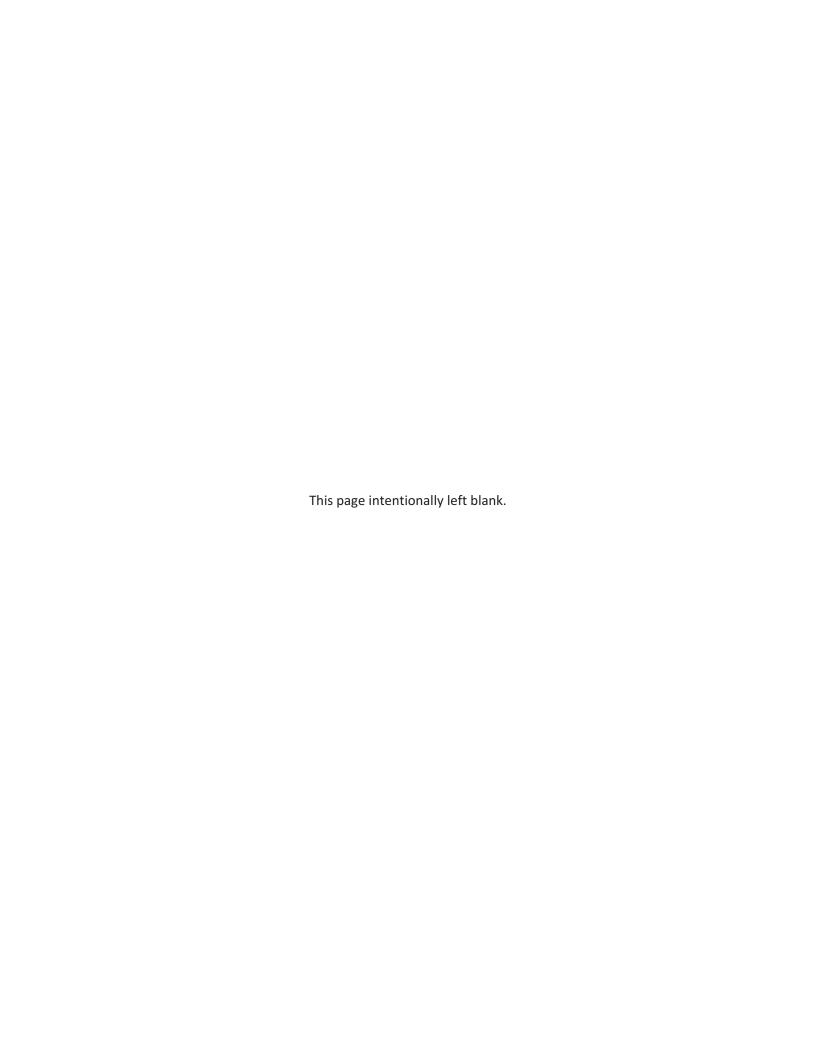
SITE NAME:			PTRCK -	Patrick /	AFB			5	SITE LOCA	TION:						AFFF F	Release	e Area	3		
WELL NO:		MV	/03002			S	AMPLE ID	:		P	TRCK0:	3-GV	/-002		[	DATE:			05/2	24/17	
	•							Pι	JRGING D	ATA											
WELL DIAMETE	2		ING DIAMI	1/4			5		N INTERV to	15				5.25	TH (feet	):	PURC	GE PUI	MP TYPE O	R BAILEF	₹:
(only fill out if ap			,				C DEPTH	TO W	/ATER) X	WEL	L CAP	ACIT	Υ								
	5.25 feet) X 0.08							21772 /	., -		=			=							
(only fill out if ap	OLUME PURGE: oplicable)	1 EQUIPM	ENI VOL.	= PUMF						IUBING			+ FLOW C	ELL V							
INITIAL PUMP (	OR TUBING DEPT	H IN WELL		= AL PUMF	gallor OR TUE	is + ( BING DEPT	_	lons/fo L (fee		PURG		feet) TIAT	+ ED AT:		gallons PURGIN		_	lons : TO	ΓAL VOLUM	IE PURG	ED (liters):
	7			ı		7						140	2	_		1450	1			25	
TIME	VOLUME PURGED ({Purging- Volume])	CUM VOL PUR (lite	UME GED		E RATE /min)	DEPTH WATER	R (star	ndar	TEMP. (°C)		OND. nS/cm)		DISSOLV OXYGE (mg/L)	EN	OR (m)			RBIDIT NTUs)	Y co	LOR	ODOR
1410	4	4		1	00	5.25	7.3	-	26.54		0.935		0.27		-120		+	16.4 12.8	_	lear lear	None
1418	8	1	2	-	00	5.25	7.4	-	26.90 26.92		0.925		0.26		-181 -205		+	None			
1426 1432	12 16		0	1	00	5.25	7.5	-	26.55		0.927		0.47		-200		+	12.0		lear lear	None None
1440	20	6		1	00	5.25	7.5	-	26.58		0.932		0.91		-229		_	10.9		lear	None
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						Final Val	ues 7.5	51	26.49	(	0.928		0.89		-229	9.4		7.28			
WELL CAPACI	TY (Gallons Per F	oot): 0.75	" = 0.02;	1" = 0	.04; 1	.25" = 0.06	6; 2" = 0	0.16;	3" = 0.3	7; 4	" = 0.6	5;	5" = 1.02;	6'	= 1.47;	12"	= 5.88	1	•		
	DIA. CAPACITY	, ,						_	5/16" =					/2" = (			= 0.016				
PURGING EQU	IPMENT CODES:	B = Ba	iller; i	DP = DIA	dder Pui	пр; Е	SP = Elec		MPLING D		p;	PP =	Peristaltion	c Pull	р;	0 = Oti	her (Sp	эеспу)			
SAMPLED BY (I	PRINT) / AFFILIAT	ION:			SAMPLE									SAMI	PLING				SAMPLING	;	
	Jason D Amec Foster				SIGNAT	URE(S):								INITI	ATED AT				ENDED AT		
PUMP OR TUBI	ING DEPTH IN				TUBING								FIELD-FIL	TERE		1450 N	lo	F	ILTER SIZE	1452 E (µm):	NA NA
WELL (feet):	INO DEI III III		7		MATER CODE:	IAL			HDPE				Filtration E			e:				NA AN	
FIELD DECONT		PUMF		No		TUBING:				No				DUPI	ICATE:				PTRCK	-FD-GW-	-002
SAMPLE ID	IPLE CONTAINER	SPECIFIC MAT.			PF	RESERVAT		PLE P	RESERVA TOTAL			F	INAL		NDED A				MPLING IIPMENT	SAMPL	E PUMP FLOW RATE
CODE	# CONTAINERS	CODE	VOLU	JME		USED		AD	DED IN FI		nL)		рН	Al	ND/OR M	IETHO	D		ODE	(mL	per minute)
MW03002	2	HDPE	12	5		Ice (4 °C)	)		NA			Not	Recorded	F	PFAS (EF	PA 537	)		APP	₩	250
																	-			+	
											$\dashv$						$\dashv$			+-	
REMARKS:																					
										None											
MATERIAL COI		mber Glas			-		High Dens	ity Po	olyethylene	e; L	.DPE =	Low	Density P	olyetl	nylene;	PP	= Poly	propyl	ene;		
SAMPLING EQ	S = Sili		= After (Th	rough)	Peristalti	ic Pump;	B = B			Bladdei			ESP = Ele				Pump;				
NOTES:	1. The above do		= Revers						lethod (Tu 60, F.A.C.	bing G	ravity I	Drair	i); O =	Othe	(Specif	у)					
	2. STABILIZATIO	N CRITER	IA FOR R	RANGE C	F VARIA	TION OF L	AST THR	EE C	ONSECUTI												
	pH: + 0.2 units To greater) Turbidity										ings < 2	20%	saturation (	(see T	able FS	2200-2	?); optio	nally, -	+ 0.2 mg/L o	r + 10% (	whichever is
QA/QC'd bv	Thomas W. He	nsel															QA/0	QC Da	te:	6/14/	2017
20 a by.																			-		-

SITE NAME:	E: SITE LOCATION: AFFF Release Area 3																			
WELL NO:		610	-MW17			S	AMPLE ID:		PTRO	K03-GW	/-610-MW17		DATE: 05/24/17							
	•							PURGING	DATA				•							
WELL DIAMETE	ER (inches):	TUB	NG DIAM	ETER (in	ches):		WELL SC	REEN INTER	RVAL DEF	PTH: ST	TATIC WATE	R DEP 4.28	TH (feet):	PURG	SE PUI	MP TYPE OI P	R BAILEF	₹:		
WELL VOLUME (only fill out if ap	PURGE: 1 WEL	L VOLUMI	E= (TOT/	AL WELL	DEPTH	- STATI	C DEPTH 1	O WATER)	X WE	L CAPA	CITY			•						
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(omy mi out ii up	piloabio			=	gallor	ns + (	galle	ons/foot X		fee	et) +		gallons =	galle	ons					
INITIAL PUMP (	OR TUBING DEPT 6	H IN WELL	FIN	AL PUMF	OR TUE	BING DEP	TH IN WELI	(feet):	PURG		ATED AT: 1533		PURGING EN 1551		: TO1	TAL VOLUM	E PURGI 9	ED (liters):		
TIME	VOLUME PURGED ({Purging- Volume])	CUM VOL PUR (lite	UME GED		E RATE /min)	DEPTH WATEI (feet)	R (stand	dar (°C)		COND. nS/cm)	DISSOL' OXYG (mg/L	EN	ORP (mV)		RBIDIT NTUs)	Y co	LOR	ODOR		
1536	1.5	1	.5	5	00	4.28	7.5	28.34		4.524	2.22	2	-103.7	:	35.0 Yellow Non					
1539	3	4	.5	5	00	4.28	7.3	28.03		4.864	1.79	9	-123.3		None					
1542	4.5	9		1	00	4.28	7.2		_	4.889	1.89		-124.1	-	5.84	_	low	None		
1545	6		5	-	00	4.28	7.2			4.837	1.60		-110.7		5.78	_	low	None		
1548	7.5	22	2.5	5	00	4.28	7.3	28.38	-	4.865	1.52	2	-126.4	,	5.20	Ye	low	None		
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WELL OADAOI	E)/ (0-II B E		" 0.00	411 0		Final Val				4.865	1.52		-126.4		5.20					
	TY (Gallons Per F DIA. CAPACITY					1.25" = 0.06 0.0014;			u.s7; 4 '= 0.004;	" = 0.65; : "3/8		2; 6 1/2" = 0		" = 5.88 = 0.016						
PURGING EQU	IPMENT CODES:	B = Ba	iler;	BP = Bla	dder Pui	mp; E	SP = Elect	ic Submers	ible Pum	o; P	P = Peristalt	ic Pum	p; O = 0	ther (Sp	ecify)					
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SAMPLED BY (F	PRINT) / AFFILIAT Jason D Amec Foster	rizd			SAMPLI	TURE(S):							PLING ATED AT:			SAMPLING ENDED AT:				
		VVIICEIEI			TUBING	}					FIELD-FIL	TEDE	1551 D:	No	-	ILTER SIZE	1555 (um):	NA		
PUMP OR TUBI WELL (feet):	NG DEPTH IN		6		MATER CODE:			HDP	PΕ		Filtration I			NO	Г		(μπ). Α	INA		
FIELD DECONT	AMINATION:	PUMF	:	No	CODE.	TUBING:			No			<del>,</del>	ICATE:			None	Collecte	d		
	IPLE CONTAINER	SPECIFIC	ATION					LE PRESER				INTE	ENDED ANAL	YSIS		//PLING	SAMPL	E PUMP FLOW		
SAMPLE ID CODE	# CONTAINERS	MAT. CODE	VOL	JME	PF	RESERVAT USED	IVE	ADDED IN	AL VOL FIELD (n	nL)	FINAL pH	ΑN	ND/OR METHO	DD		IPMENT ODE	(mL	RATE per minute)		
610-MW17	2	HDPE	12	25		Ice (4 °C	)	1	NA	N	lot Recorded	F	PFAS (EPA 53	7)		APP		500		
										+		+								
										+		-								
REMARKS:		<u> </u>			<u>I</u>					<u> </u>		1					<u> </u>			
			The sam	ple ID sh	ould have	e been PTF	RCK03-GW	-003 (TWH),	can not cl	nange as	it is PTRCK0	)3-GW-	610-MW17 on	the chai	in of co	ostody.				
MATERIAL COI		mber Glas			-		ligh Densi	y Polyethyle	ene; L	.DPE = L	ow Density F	Polyeth	nylene; PP	P = Polyp	oropyl	ene;				
SAMPLING EQI	S = Sili	cone; T : APP:	= Teflon; = After (TI				B = Ba	iler; BP	= Bladde	r Pump;	ESP = E	lectric	Submersible	Pump;						
NOTES:	The above do	RFPP	= Revers	e Flow F	eristaltio	c Pump;		aw Method (		ravity Dr			(Specify)	-						
	STABILIZATIO					-				EADINGS	S (SEE FS 22	212, SE	CTION 3)							
	pH: + 0.2 units To greater) Turbidity	emperatur	e: + 0.2 o	Specif	ic Cond	uctance: -	5% Disso	lved Oxyge	n: all read					2); optio	nally, +	0.2 mg/L o	+ 10% (	whichever is		
		-	.gu > 20 N	o, opu	uny + 0		. 570 (WITHCI	oron io gredi	-ι <i>j</i>											
QA/QC'd by:	Thomas W. He	nsel												QA/Q	QC Da	te:	6/14/	2017		

# APPENDIX D LABORATORY ANALYTICAL REPORTS (DVD)



### APPENDIX E DATA VALIDATION REPORT



# DATA VALIDATION REPORT SITE INSPECTION OF AQUEOUS FILM FORMING FOAM (AFFF) RELEASE AREAS ENVIRONMENTAL PROGRAMS WORLDWIDE PATRICK AIR FORCE BASE

Samples Collected Between 22 and 25 May 2017

#### **Prepared for:**

Air Force Civil Engineer Center

Joint Base San Antonio – Lackland, Texas



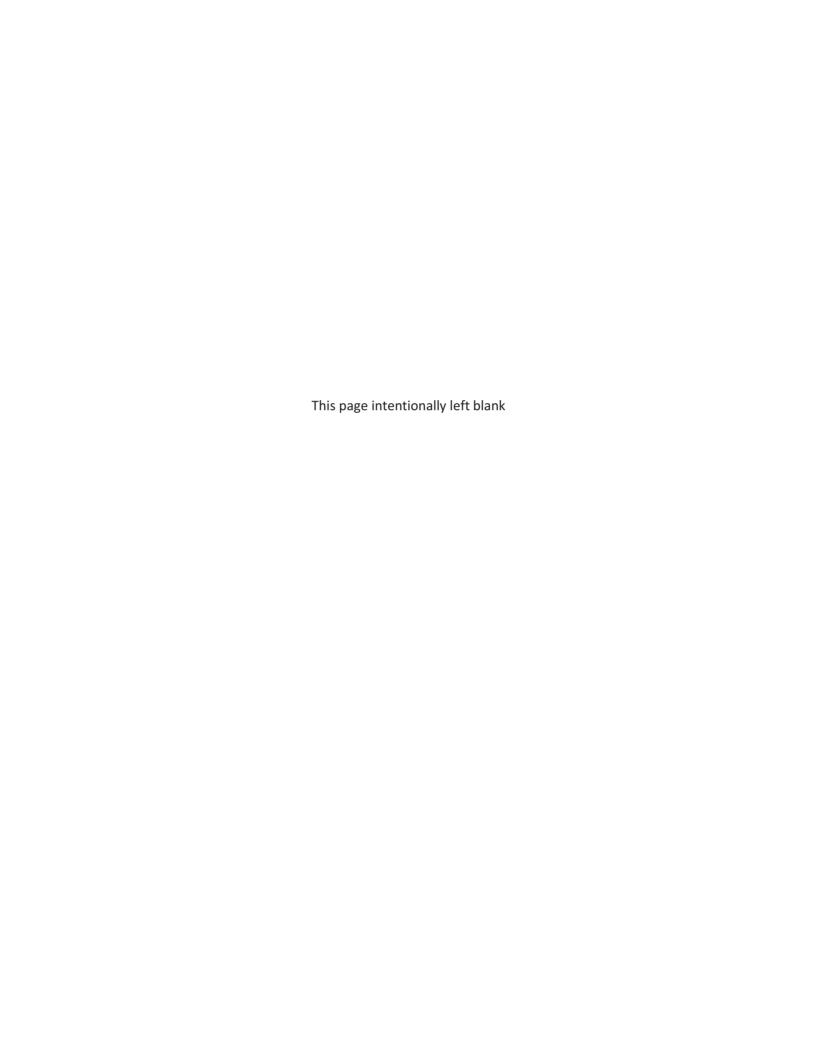


Prepared by:



Contract FA8903-16-D-0027 Task Order 0004

**July 2017** 



#### Page i

#### **TABLE OF CONTENTS**

1.0	INTRODUCTIO	N	1
2.0	DATA VALIDAT	ION METHODOLOGY	3
3.0	3.1 Labora 3.2 Matrix 3.3 Surrog 3.4 Blank (	OF DATA QUALITY INDICATORS	5 5 5
4.0	DEFINITIONS C	OF QUALIFIERS THAT MAY BE USED DURING DATA VALIDATION	7
5.0	QUALIFICATION	N REASON CODES	9
6.0	CHAIN OF CUS	TODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION	11
7.0	7.1 Per- ar 7.1.1 7.1.2 7.1.3 7.1.4 7.1.5 7.1.6 7.1.7 7.1.8 7.1.9 7.1.10 7.1.11	,	
8.0	Field Duplicate	Results	21
9.0	SUMMARY AN	D CONCLUSIONS	23
REFERE	NCES		25

#### **LIST OF TABLES**

Table 1	Field Samples Submitted to	SGS Accutest
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Table 2 Field Duplicate Detections

Table 3 Qualifiers Added During Validation

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide Patrick Air Force Base, SGS Accutest Job FA44407 DVR July 2017 Page ii This page intentionally left blank

#### **ACRONYMS AND ABBREVIATIONS**

% percent

μg/L micrograms per liter

6:2 FTS 6:2 Fluorotelomer sulfonate 8:2 FTS 8:2 Fluorotelomer sulfonate

AFFF Aqueous Film Forming Foam

CCV Continuing Calibration Verification
CLP Contract Laboratory Program

COC Chain of Custody

DoD Department of Defense

DL detection limit

EPA United States Environmental Protection Agency
EtFOSAA Ethylperfluorooctane sulfonamidoacetic acid

ICV Initial Calibration Verification

ID Identification

LCS Laboratory Control Sample

LCSD Laboratory Control Sample Duplicate

LOQ Limit of Quantification

MeFOSAA Methylperfluorooctane sulfonamidoacetic acid

MS Matrix Spike

MSD Matrix Spike Duplicate

PFASs Per- and polyfluoroalkyl substances

PFBS Perfluorobutanesulfonic acid

PFDA Perfluorodecanoic acid
PFDoA Perfluorododecanoic acid
PFHpA Perfluoroheptanoic acid
PFHxA Perfluorohexanoic acid

PFHxS Perfluorohexanesulfonic acid

PFNA Perfluorononanoic acid

# Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide Patrick Air Force Base, SGS Accutest Job FA44407 DVR July 2017 Page iv

PFOA Perfluorooctanoic acid

PFOS Perfluorooctanesulfonic acid
PFTeDA Perfluorotetradecanoic acid
PFTrDA Perfluorotridecanoic acid
PFUnA Perfluoroundecanoic acid

QC Quality Control

QPP Quality Program Plan

RPD Relative Percent Difference

SGS SGS Accutest

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 1

#### 1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) collected eighteen water samples (including two field duplicates, two equipment blanks, one proficiency testing sample, and one field blank) and twenty-two soil samples (including two field duplicates) between 22 and 25 May 2017, from Patrick Air Force Base, located in Brevard County, Florida. Amec Foster Wheeler submitted the samples to SGS Accutest (SGS), located in Orlando, Florida on 26 May 2017. SGS assigned the samples to sample delivery group FA44407. SGS analyzed the samples for per- and polyfluoroalkyl substances (PFASs) by modified United States Environmental Protection Agency (EPA) Method 537. A list of these samples by field sample identification (ID), sample collection date, sample matrix, and laboratory sample ID is presented in Table 1.

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA444407 DVR
July 2017
Page 2

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#### 2.0 DATA VALIDATION METHODOLOGY

Amec Foster Wheeler performed EPA Stage 4 validation on 10 percent (%) of the samples and EPA Stage 2B validation on the remaining samples associated with this sampling event, as indicated on Table 1. The Stage 4 validation includes review of the quality control (QC) results in the laboratory's analytical report and reported on QC summary forms as well as recalculation checks and review of the instrument raw data outputs. The Stage 2B validation includes review of the QC results in the laboratory's analytical report and reported on QC summary forms, with no review of the associated raw data. Data from equipment and field blanks did not undergo validation because results from these samples are only used to assess data usability for field samples. This data validation has been performed in general accordance with:

- Amec Foster Wheeler, 2016. Draft, Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas, Environmental Programs Worldwide, Quality Program Plan (QPP), Contract FA8903-16-D-0027, Task Order 0004, December 2016.
- Department of Defense (DoD), 2013. DoD Quality Systems Manual for Environmental Laboratories, Version 5.0. July 2013.
- EPA, 2009. Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry, Version 1.1, September 2009. EPA Document #: EPA/600/R-08/092.
- EPA, 2014. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Superfund Organic Methods Data Review, EPA/540-R-014-002.

The CLP guideline was written specifically for the CLP, and has been modified for the purposes of this data review where it differs from method-specific, QPP-specified, and laboratory-specified QC requirements.

The laboratory's certified analytical report and supporting documentation were reviewed to assess the following:

- Data package and electronic data deliverable completeness;
- Laboratory case narrative review;
- Chain of custody (COC) compliance;
- Holding time compliance;
- QC sample frequency;
- Initial calibration, initial calibration verification (ICV), and continuing calibration verification (CCV) compliance with method-specified criteria;
- Presence or absence of laboratory contamination as demonstrated by laboratory blanks;

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide Patrick Air Force Base, SGS Accutest Job FA44407 DVR July 2017

Page 4

- Accuracy and bias as demonstrated by recovery of surrogate spikes, laboratory control sample (LCS), and matrix spike (MS) samples;
- Internal standard recoveries;
- Analytical precision as relative percent difference (RPD) of analyte concentration between laboratory duplicates or MS/MS duplicate (MSD);
- Sampling and analytical precision as RPD of analyte concentration between field duplicates;
- Assessment of field contamination as demonstrated by field and equipment blanks;
- Insofar as possible, the degree of conformance to method requirements and good laboratory practices.

In general, it is important to recognize that no analytical data are guaranteed to be correct, even if all QC audits are passed. Strict QC serves to increase confidence in data, but any reported value may potentially contain error.

Page 5

## 3.0 EXPLANATION OF DATA QUALITY INDICATORS

Summary explanations of the specific data quality indicators reviewed during this data quality review are presented below.

## 3.1 LABORATORY CONTROL SAMPLE RECOVERIES

LCSs and LCS duplicates (LCSDs) are aliquots of analyte-free matrices that are spiked with the analytes of interest for an analytical method, or a representative subset of those analytes. The spiked matrix is then processed through the same analytical procedures as the samples they accompany. LCS recovery is an indication of a laboratory's ability to successfully perform an analytical method in an interference-free matrix.

### 3.2 MATRIX SPIKE RECOVERIES

MSs and MSDs are prepared by adding known amounts of the analytes of interest for an analytical method, or a representative subset of those analytes, to an aliquot of sample. The spiked sample is then processed through the same extraction, concentration, cleanup, and analytical procedures as the unspiked samples in an analytical batch.

MS recovery and precision are an indication of a laboratory's ability to successfully recover an analyte in the matrix of a specific sample or closely related sample matrices. It is important not to apply MS results for any specific sample to other samples without understanding how the sample matrices are related.

## 3.3 SURROGATE SPIKE RECOVERIES

Surrogate spikes are used to evaluate accuracy, method performance, and extraction efficiency in each individual sample. Surrogate compounds are compounds not normally found in environmental samples, but which are similar to target analytes in chemical composition and behavior in the analytical process.

## 3.4 BLANK CONCENTRATIONS

Blank samples are aliquots of analyte free matrix that are used as negative controls to verify that the sample collection, storage, preparation, and analysis system does not produce false positive results.

Equipment blanks are prepared by passing analyte-free water through or over sample collection equipment and collecting the water in sample containers. Equipment blanks are analyzed for the analytical suite required for the project. Equipment blanks are used to monitor for possible sample contamination during the sample collection process and serve as a check on the effectiveness of field decontamination procedures.

Field blanks are prepared by pouring an aliquot of analyte-free water into a sample container in the field. Field blanks are analyzed for the analytical suite required for the project. Field blanks are used to monitor for possible sample contamination originating from the water used for equipment decontamination.

Laboratory, equipment, and field blanks are processed by the laboratory using exactly the same procedures as the field samples. Target analytes should not be found in laboratory blanks.

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 6

When target analytes are detected in blanks, analyte concentrations in the associated samples less than 10 times the concentration detected in the blank will be B qualified.

## 3.5 LABORATORY AND FIELD DUPLICATES

Laboratory and field duplicate analysis verifies acceptable method precision by the laboratory at the time of preparation and analysis and/or sampling precision at the time of collection.

Page 7

## 4.0 DEFINITIONS OF QUALIFIERS THAT MAY BE USED DURING DATA VALIDATION

- B The analyte was detected in the sample and an associated blank and the concentration detected in the sample was less than ten times the concentration detected in the blank.
- **U** The analyte was analyzed for, but was not detected.
- J The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- Q The analyte is both B qualified because of blank detection and J qualified because of an additional QC issue.
- UJ The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R The sample result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 8

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## 5.0 QUALIFICATION REASON CODES

Amec Foster Wheeler applied the following reason code to the data during validation:

FDD	Field duplicate imprecision
LCL	Low LCS recovery. Analytical result may be biased low.
SGH	High surrogate recovery. Analytical result may be biased high.
SGL	Low surrogate recovery. Analytical result may be biased low.

TR Detected concentration is less than the limit of quantification (LOQ).

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 10

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Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 11

## 6.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION

The samples were received at the laboratory under proper COC, intact, properly preserved, and at temperatures less than the QPP-specified maximum of 10 degrees Celsius.

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 12

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## 7.0 SPECIFIC DATA VALIDATION FINDINGS

Results from these samples may be considered usable with the limitations and exceptions described Sections 7.1 through 0.

## 7.1 PER- AND POLYFLUOROALKYL SUBSTANCES BY MODIFIED EPA METHOD 537

PFAS results generated by SGS are usable with the limitations described in Sections 7.1.1 through 7.1.11.

## 7.1.1 Holding Times

The aqueous samples were extracted for PFASs within the QPP-specified maximum holding time of 14 days from sample collection and the extracts were analyzed within the QPP-specified maximum hold time of 28 days from extraction. The solid samples were extracted for PFASs within the method-recommended maximum holding time of 60 days from sample collection and the extracts were analyzed within the method-recommended 30 days from extraction.

## 7.1.2 Initial Calibrations

The ICALs associated with the analysis of these samples met the QSM-specified criteria of correlation coefficients greater than 0.99 and the calibration standards calculating to 70 to 130% of its true concentrations.

### 7.1.3 Initial Calibration Verification

ICV recoveries were within the QPP-specified 75% to 125% limits, with the following exceptions.

• Ethylperfluorooctane sulfonamidoacetic acid (EtFOSAA) recovery was high at 129% in the ICV associated with samples PTRK02-GW-002, PTRK-FD-GW-001, PTRK-GW-001, PTRK02-GW-001, PTRK02-GW-003, PTRK01-GW-001, PTRK01-GW-002, PTRK03-GW-001, and PTRK03-GW-002. EtFOSAA was not detected in these samples and data usability is not adversely affected by the potential high analytical bias.

## 7.1.4 Continuing Calibration Verification

CCV recoveries were within the QPP specified 75% to 125% limits, with the following exception.

 Perfluorohexanoic acid (PFHxA) recovery was low at 71.7% in the closing CCV associated with the diluted analysis of sample PTRK01-SO-007. Only perfluorooctanesulfonic acid (PFOS) was reported from the diluted analysis of this sample and data usability is not adversely affected.

## 7.1.5 Laboratory Blanks

PFASs were not detected in the laboratory blanks associated with these samples.

## 7.1.6 Field and Equipment Blanks

PFASs were not detected in the field and equipment blanks associated with these samples.

## 7.1.7 Laboratory Control Sample Accuracy

LCS recoveries were within QPP-specified 70 to 130% limits, with the following exceptions:

- Perfluorododecanoic acid (PFDoA) (64%), perfluorotridecanoic acid (PFTrDA) (62%), perfluorotetradecanoic aicd (PFTeDA) (67%), 6:2 fluorotelomer sulfonate (6:2 FTS) (140%), and 8:2 fluorotelomer sulfonate (8:2 FTS) (136%) recoveries were outside specified limits in the LCS associated with samples PTRK02-GW-002, PTRK-FD-GW-001, and PTRK-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler UJ qualified the non-detected PFDoA, PFTrDA, and PFTeDA results from samples PTRK02-GW-002 and PTRK-FD-GW-001 because of potential low analytical bias. (Qualifier and reason code: UJ-LCL)
  - 6:2 FTS and 8:2 FTS were not detected in these samples and data usability is not adversely affected by the potential high analytical bias.
  - Sample PTRK-GW-001 is a proficiency testing sample, not a field sample, and no qualifiers were applied to the sample results.
- PFDoA (68%), PFTrDA (63%), and PFTeDA (66%) recoveries were low in the LCS associated with samples PTRK02-GW-001, PTRK02-GW-003, PTRK01-GW-001, PTRK01-GW-002, PTRK03-GW-001, and PTRK03-GW-002. Amec Foster Wheeler UJ qualified the non-detected PFDoA, PFTrDA, and PFTeDA results from these samples because of the potential low analytical bias. (Qualifier and reason code: UJ-LCL)
- PFTrDA and PFTeDA recoveries were low at 64% and 68%, respectively, in the LCS associated with samples PTRK03-GW-610-MW17, PTRK-FD-GW-002, PTRK01-GW-003, PTRK01-GW-004, PTRK01-GW-005, and PTRK01-GW-006. Amec Foster Wheeler UJ qualified the non-detected PFTrDA and PFTeDA results from these samples because of the potential low analytical bias. (Qualifier and reason code: UJ-LCL)

## 7.1.8 Matrix Spikes/ Matrix Spike Duplicates

SGS performed MS and MSD analyses on samples PTRK01-GW-001, PTRK01-SO-010, and PTRK01-GW-006. Recoveries were within the QPP-specified 70 to 130% limits and RPDs between MS and MSD results were less than the QPP-specified maximum of 30%, with the following exceptions.

- Perfluorodecanoic acid (PFDA) recovery was high at 131% in the MS performed on sample PTRK01-GW-001. PFDA was not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Perfluorohexanesulfonic acid (PFHxS) (182%-MSD), PFOS (230%-MSD), and 6:2 FTS (34%, 250%) recoveries were outside specified limits in the MS and/or MSD performed on sample PTRK01-SO-010.
   The concentrations of the spikes for PFHxS, PFOS, and 6:2 FTS in the native, unspiked sample were

greater than four times the concentration of the spike and it is not possible to evaluate data usability based on spike recoveries for these analytes.

• All PFAS analytes were outside of specified limits in the MS and MSD performed on sample PTRK01-GW-006. This sample and the MS/MSD were performed at 250 and 200-fold dilutions. At these dilutions, it is not possible to accurately resolve the added spikes of target analytes. It is not possible to evaluate data usability based on spike recoveries for this sample.

### 7.1.9 **Surrogate Recoveries**

Surrogate recoveries were within the QPP-specified 70 to 130% limits, with the following exceptions:

- Recoveries of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFHxA were low in the analysis of samples PTRK02-SO-004 (67%), PTRK02-SO-006 (66%), and PTRK-FD-SO-001 (66%). These recoveries were within laboratory-specified limits and SGS did not re-extract or reanalyze these samples. Amec Foster Wheeler J qualified the detected and UJ qualified the non-detected 6:2 FTS, perfluorobutanesulfonic acid (PFBS), perfluoroheptanoic acid (PFHpA), PFHxA, PFHxS, PFOS, and perfluorooctanoic acid (PFOA) results from these samples because of the potential low analytical bias. (Qualifier and reason code: J/UJ-SGL)
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 143% in the undiluted analysis of sample PTRK-FD-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected perfluorononanoic acid (PFNA) result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, perfluoroundecanoic acid (PFUnA), PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recoveries of the surrogate compounds <sup>13</sup>C<sub>2</sub>-PFHxA (152%), <sup>13</sup>C<sub>2</sub>-PFDA (166%), and d5-EtFOSAA (146%) were high in the 5-fold dilution performed on sample PTRK-FD-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFOS result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFHxA was low at 65% in the undiluted analysis of sample PTRK01-SO-001. This recovery was within laboratory-specified limits and SGS did not re-extract or reanalyze these samples. Data limitations are summarized below.

- Amec Foster Wheeler J qualified the detected 6:2 FTS, PFBS, PFHpA, PFHxA, PFHxS, and PFOA
  results from this sample because of the potential low analytical bias. (Qualifier and reason code:
  J-SGL)
- PFOS was reported from the diluted analysis of this sample and data usability is not adversely affected.
- Surrogate compounds were not recovered in the 10-fold dilution performed on sample PTRK01-SO-007, the 20-fold dilution performed on sample PTRK03-GW-001, the 25-fold dilution performed on sample PTRK01-GW-005, the 50-fold dilution performed on sample PTRK01-SO-009, and the 250-fold dilutions performed on samples PTRK01-GW-004 and PTRK01-GW-006. These samples were diluted past the instrument's ability to accurately resolve the surrogate compounds and it is not possible to evaluate data usability based on surrogate recoveries for these analyses.
- Recovery of the surrogate compound d5-EtFOSAA was high at 161% in the diluted analysis of sample PTRK01-SO-010. EtFOSAA and methylperfluorooctane sulfonamidoacetic acid (MeFOSAA) were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 147% in the analysis of sample PTRK02-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 159% in the undiluted analysis of sample PTRK02-GW-003. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recoveries of the surrogate compounds <sup>13</sup>C<sub>2</sub>-PFHxA (156%), <sup>13</sup>C<sub>2</sub>-PFDA (199%), and d5-EtFOSAA (169%) were high in the 2-fold dilution performed on sample PTRK02-GW-003. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFOS result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.

- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 166% in the analysis of sample PTRK01-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 179% in the undiluted analysis of sample PTRK01-GW-002. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
  - 8:2 FTS was reported from the diluted analysis of this sample and data usability is not adversely affected.
- Recoveries of the surrogate compounds <sup>13</sup>C<sub>2</sub>-PFDA and d5-EtFOSAA were high at 178% and 139%, respectively, in the 2-fold dilution of sample PTRK01-GW-002. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected 8:2 FTS result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - The remaining associated analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFHxA was low at 64% in the 2-fold dilution of sample PTRK01-SO-006. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFOS result from this sample because of the potential low analytical bias. (Qualifier and reason code: J-SGL)
  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 179% in the undiluted analysis of sample PTRK03-GW-001. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)

- 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 156% in the 2-fold dilution of sample PTRK03-GW-001. All associated analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recovery of the surrogate compound <sup>13</sup>C<sub>2</sub>-PFDA was high at 160% in the undiluted analysis of sample PTRK03-GW-002. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFNA result from this sample because of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - 8:2 FTS, PFUnA, PFDoA, PFTrDA, PFTeDA, and PFDA were not detected in this sample and data usability is not adversely affected by the potential high analytical bias.
- Recoveries of the surrogate compounds <sup>13</sup>C<sub>2</sub>-PFHxA (132%), <sup>13</sup>C<sub>2</sub>-PFDA (166%), and d5-EtFOSAA (150%) were high in the 5-fold dilution performed on sample PTRK03-GW-002. Data limitations are summarized below.
  - Amec Foster Wheeler J qualified the detected PFHxS and PFOS results from this sample because
    of the potential high analytical bias. (Qualifier and reason code: J-SGH)
  - The remaining analytes were reported from the undiluted analysis of this sample and data usability is not adversely affected.
- Recoveries of the surrogate compound d5-EtFOSAA were low in the undiluted analysis of samples PTRK-FD-GW-002 and PTRK01-GW-003 at 66% and 69%, respectively. Amec Foster Wheeler UJ qualified the non-detected EtFOSAA and MeFOSAA results from these samples because of the potential low analytical bias. (Qualifier and reason code: UJ-SGL)

## 7.1.10 Internal Standard Recoveries

Internal standard recoveries were within the QPP-specified limits of 50 to 150% of the average area counts measured during the initial calibration, with the following exception:

• Recoveries of the internal standard <sup>13</sup>C<sub>2</sub>-6:2 FTS were high in the undiluted analysis of samples PTRK01-SO-008 and PTRK01-SO-010 at 264% and 250%, respectively. 6:2 FTS and 8:2 FTS were reported from the diluted analyses of these samples and data usability is not adversely affected.

## 7.1.11 Data Reporting and Analytical Procedures

SGS J qualified analytes with concentrations between the detection limit (DL) and the LOQ. Amec Foster Wheeler agrees that these results are quantitatively uncertain and has J qualified these results. (Qualifier and reason code: J-TR)

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 19

Due to limitations in SGS' laboratory information management system, the laboratory reports incorrectly reference "extractables by GCMS by Method EPA 537 Mod" in the case narrative and "GC/MS semi-volatiles" in the table of contents and in section dividers. The samples were analyzed referencing EPA 537 Mod in the sample report forms using liquid chromatography/tandem mass spectroscopy, as specified in the raw analytical data forms.

SGS calibrates their instrument using linear and branched isomers, but the solution used for calibration verification and spiking contains linear isomers only. The analytical software is unable to correctly autointegrate analytes when peaks for both linear and branched isomers are present, so the initial calibrations, CCVs, and samples containing both linear and branched isomers require manual integration. Other software limitations include not being able to print more than one chromatogram for each analyte and having the printed baselines appear high due to poor printing resolution. Since the manual integrations are performed to ensure that both linear and branched isomers are included in the analytical results, Amec Foster Wheeler's review of the manual integrations is a check to make sure both linear and branched isomer peaks are fully integrated.

A proficiency testing sample, PTRCK-GW-001, was submitted to SGS on 23 May 2017 containing 0.100 micrograms per liter ( $\mu$ g/L) of PFOA and 0.200  $\mu$ g/L of PFOS. SGS analyzed the sample and detected 0.0977  $\mu$ g/L for PFOA and 0.153  $\mu$ g/L for PFOS, results which are within the established acceptance range of 60 to 140% of the spike value

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 20

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## 8.0 FIELD DUPLICATE RESULTS

Amec Foster Wheeler collected field duplicates with samples PTRK02-GW-002 (PTRK-FD-GW-001), PTRK02-SO-003 (PTRK-FD-SO-001), PTRK03-SO-004 (PTRK-FD-SO-002), and PTRK03-GW-002 (PTRK-FD-GW-002). Detected results and RPDs for the field duplicate are summarized in Table 2. Precision values were within the QPP-specified limits of less than 30% RPD or the difference between analytical results less than the LOQ, with the following exceptions.

- The RPD between PFOS results from sample PTRK03-SO-004 and its field duplicate PTRK-FD-SO-002 was high at 58%. Amec Foster Wheeler J qualified the detected PFOS results from these samples because of potential sampling or analytical imprecision. (Qualifier and reason code: J-FDD)
- RPDs between PFHxS and PFOS results from sample PTRK03-GW-002 and its field duplicate PTRK-FD-GW-002 were both high at 50%. Amec Foster Wheeler J qualified the detected PFHxS and PFOS results from these samples because of the potential sampling or analytical imprecision. (Qualifier and reason code: J-FDD)

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 22

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Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 23

## 9.0 SUMMARY AND CONCLUSIONS

Amec Foster Wheeler evaluated a total of 576 data records from field samples during the validation. Amec Foster Wheeler J or UJ qualified 133 records (23%) as estimated values because of field duplicate imprecision, low LCS recoveries, high or low surrogate recoveries, and/or analyte concentrations between the DL and the LOQ. Qualified data are summarized in Table 3.

Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide Patrick Air Force Base, SGS Accutest Job FA44407 DVR July 2017 Page 24

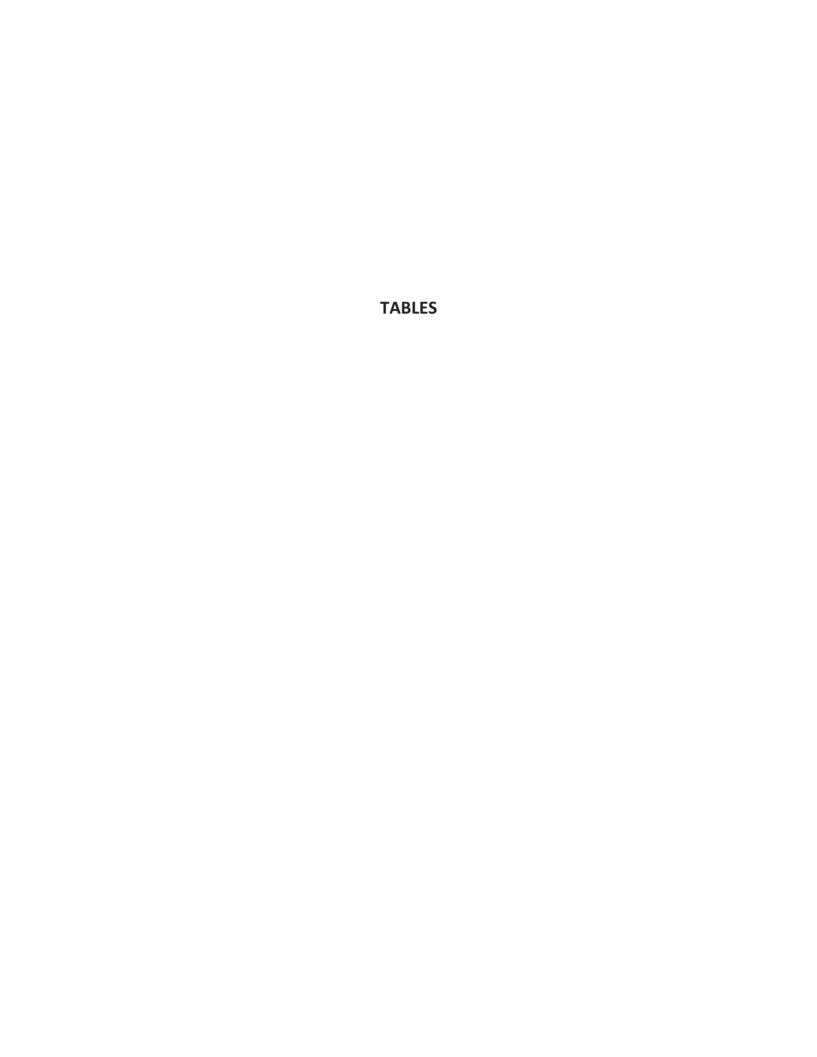
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Site Inspection of Aqueous Film Forming Foam Release Areas, Environmental Programs Worldwide
Patrick Air Force Base, SGS Accutest Job FA44407 DVR
July 2017
Page 26

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# Field Samples Submitted to SGS Accutest Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide Patrick Air Force Base, Florida

Sample Identification	Collection Date	Sample Matrix	Laboratory SDG	Laboratory Sample Identification	Notes
PTRK02-SO-001	23-May-17	Soil	FA44407	FA44407-1	
PTRK03-SO-001	22-May-17	Soil	FA44407	FA44407-2	
PTRK02-GW-002	23-May-17	Groundwater	FA44407	FA44407-3	
PTRK02-SO-002	23-May-17	Soil	FA44407	FA44407-4	
PTRK02-SO-003	23-May-17	Soil	FA44407	FA44407-5	
PTRK02-SO-004	23-May-17	Soil	FA44407	FA44407-6	
PTRK02-SO-005	23-May-17	Soil	FA44407	FA44407-7	Stage IV
PTRK02-SO-006	23-May-17	Soil	FA44407	FA44407-8	Stage IV
PTRK03-SO-002	22-May-17	Soil	FA44407	FA44407-9	Stage IV
PTRK-FD-GW-001	23-May-17	Groundwater	FA44407	FA44407-10	Field Duplicate of Sample PTRK02-GW-002
PTRK-FD-SO-001	23-May-17	Soil	FA44407	FA44407-11	Field Duplicate of Sample PTRK02-SO-003
PTRK-GW-001	23-May-17	Groundwater	FA44407	FA44407-12	Proficiency Testing Sample
PTRK01-SO-001	23-May-17	Soil	FA44407	FA44407-13	
PTRK01-SO-002	23-May-17	Soil	FA44407	FA44407-14	
PTRK01-SO-003	24-May-17	Soil	FA44407	FA44407-15	
PTRK01-SO-004	24-May-17	Soil	FA44407	FA44407-16	
PTRK01-SO-009	24-May-17	Soil	FA44407	FA44407-17	
PTRK01-SO-010	24-May-17	Soil	FA44407	FA44407-18	MS/MSD
PTRK02-GW-001	23-May-17	Groundwater	FA44407	FA44407-19	Stage IV
PTRK02-GW-003	23-May-17	Groundwater	FA44407	FA44407-20	Stage IV
PTRK03-SO-003	23-May-17	Soil	FA44407	FA44407-21	
PTRK03-SO-004	23-May-17	Soil	FA44407	FA44407-22	
PTRK-EB-001	23-May-17	QC Water	FA44407	FA44407-23	Equipment Blank
PTRK-FD-SO-002	23-May-17	Soil	FA44407	FA44407-24	Field Duplicate of Sample PTRK03-SO-004
PTRK01-GW-001	25-May-17	Groundwater	FA44407	FA44407-25	MS/MSD
PTRK01-GW-002	25-May-17	Groundwater	FA44407	FA44407-26	
PTRK01-SO-005	24-May-17	Soil	FA44407	FA44407-27	
PTRK01-SO-006	24-May-17	Soil	FA44407	FA44407-28	
PTRK01-SO-007	24-May-17	Soil	FA44407	FA44407-29	
PTRK01-SO-008	24-May-17	Soil	FA44407	FA44407-30	
PTRK03-GW-001	24-May-17	Groundwater	FA44407	FA44407-31	
PTRK03-GW-002	24-May-17	Groundwater	FA44407	FA44407-32	
PTRK03-GW-610-MW17	24-May-17	Groundwater	FA44407	FA44407-33	
PTRK-EB-002	24-May-17	QC Water	FA44407	FA44407-34	Equipment Blank
PTRK-FB-001	24-May-17	QC Water	FA44407	FA44407-35	Field Blank
PTRK-FD-GW-002	24-May-17	Groundwater	FA44407	FA44407-36	Field Duplicate of Sample PTRK03-GW-002
PTRK01-GW-003	25-May-17	Groundwater	FA44407	FA44407-37	·
PTRK01-GW-004	25-May-17	Groundwater	FA44407	FA44407-38	
PTRK01-GW-005	25-May-17	Groundwater	FA44407	FA44407-39	
PTRK01-GW-006	25-May-17	Groundwater	FA44407	FA44407-40	MS/MSD

## Notes:

MS/MSD = Matrix Spike / Matrix Spike Duplicate SDG = Sample Delivery Group

## **Field Duplicate Detections**

## Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide

## Patrick Air Force Base, Florida

Analyte	LOQ	Primary Sample	Field Duplicate	Units	RPD	Notes			
Samples PTRK02-GW-002 and PTRK-FD-GW-001									
PFHxA	0.015	0.0996	0.0969	μg/L	2.7%				
PFHpA	0.015	0.0776	0.0771	μg/L	0.65%				
PFOA	0.015	0.0482	0.0481	μg/L	0.21%				
PFNA	0.015	0.0253	0.0269	μg/L	6.1%				
PFBS	0.015	0.0245	0.0248	μg/L	1.2%				
PFHxS	0.015	0.618	0.637	μg/L	3.0%				
PFOS	0.077	0.950	1.17	μg/L	21%				
	Samples PTRK02-SO-003 and PTRK-FD-SO-001								
PFOS	0.0019	0.00144 J	0.00097 U mg/k		NC	± LOQ			
	Sam	ples PTRK03-SO-00	4 and PTRK-FD-SO-0	02					
PFHxA	0.0020	0.00099 U	0.000292 J	mg/kg	NC	± LOQ			
PFOS 0.0020 0.00797		0.00439	mg/kg	58%	J-FDD				
	Samı	oles PTRK03-GW-00	2 and PTRK-FD-GW-0	002					
PFHxA	0.015	0.279	0.324	μg/L	15%				
PFHpA	0.015	0.0707	0.0825	μg/L	15%				
PFOA	0.015	0.155	0.151	μg/L	2.6%				
PFNA	0.015	0.0115 J	0.00984 J	μg/L	16%				
PFBS	0.015	0.396	0.411	μg/L	3.7%				
PFHxS	0.077	1.91	1.14	μg/L	50%	J-FDD			
PFOS	0.077	3.07	1.84	μg/L	50%	J-FDD			
6:2 FTS	0.038	0.0300 J	0.0289 J	μg/L	3.7%				

## **Notes:**

μg/L = micrograms per liter

6:2 FTS = 6:2 fluorotelomer sulfonate

LOQ = limit of quantification

NC = not calculable

PFBS = perfluorobutanesulfonic acid

PFHpA = perfluoroheptanoic acid

PFHxA = perfluorohexanoic acid

PFHxS = perfluorohexanesulfonic acid

PFNA = perfluorononanoic acid

PFOA = perfluorooctanoic acid

PFOS = perfluorooctanesulfonic acid

RPD = relative percent difference

## **Qualifier Definitions:**

- J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- U = The analyte was analyzed for, but was not detected above the reported limit of detection.

## **Reason Codes:**

± LOQ = The difference between analyte concentrations is less than the LOQ, indicating acceptable sampling and analytical precision.

FDD = Field duplicate imprecision.

# Qualifiers Added During Validation Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide Patrick Air Force Base, Florida

Sample Identification	Analyte	Results	Validation Qualifiers and Reason Codes		
PTRK01-GW-001	6:2 FTS	0.0254 μg/L	J TR		
PTRK01-GW-001	PFDoA	0.012 μg/L	UJ LCL		
PTRK01-GW-001	PFNA	0.00806 μg/L	J SGH, TR		
PTRK01-GW-001	PFTeDA	0.012 μg/L	UJ LCL		
PTRK01-GW-001	PFTrDA	0.012 μg/L	UJ LCL		
PTRK01-GW-002	8:2 FTS	0.489 μg/L	J SGH		
PTRK01-GW-002	PFDoA	0.012 μg/L	UJ LCL		
PTRK01-GW-002	PFNA	0.0271 μg/L	J SGH		
PTRK01-GW-002	PFTeDA	0.012 μg/L	UJ LCL		
PTRK01-GW-002	PFTrDA	0.012 μg/L	UJ LCL		
PTRK01-GW-003	EtFOSAA	0.032 μg/L	UJ SGL		
PTRK01-GW-003	MeFOSAA	0.032 μg/L	UJ SGL		
PTRK01-GW-003	PFDA	0.0101 μg/L	J TR		
PTRK01-GW-003	PFTeDA	0.012 μg/L	UJ LCL		
PTRK01-GW-003	PFTrDA	0.012 μg/L	UJ LCL		
PTRK01-GW-004	PFNA	2.81 μg/L	J TR		
PTRK01-GW-004	PFTeDA	3 μg/L	UJ LCL		
PTRK01-GW-004	PFTrDA	3 μg/L	UJ LCL		
PTRK01-GW-005	PFTeDA	0.012 μg/L	UJ LCL		
PTRK01-GW-005	PFTrDA	0.012 μg/L	UJ LCL		
PTRK01-GW-006	PFBS	2.37 μg/L	J TR		
PTRK01-GW-006	PFHpA	2.44 μg/L	J TR		
PTRK01-GW-006	PFNA	1.18 μg/L	J TR		
PTRK01-GW-006	PFTeDA	2.9 μg/L	UJ LCL		
PTRK01-GW-006	PFTrDA	2.9 μg/L	UJ LCL		
PTRK01-SO-001	6:2 FTS	0.00294 mg/kg	J SGL, TR		
PTRK01-SO-001	PFBS	0.000803 mg/kg	J SGL, TR		
PTRK01-SO-001	PFDoA	0.00119 mg/kg	J TR		
PTRK01-SO-001	PFHpA	0.0016 mg/kg	J SGL, TR		
PTRK01-SO-001	PFHxA	0.00462 mg/kg	J SGL		
PTRK01-SO-001	PFHxS	0.0473 mg/kg	J SGL		
PTRK01-SO-001	PFOA	0.0129 mg/kg	J SGL		
PTRK01-SO-001	PFUnA	0.00179 mg/kg	J TR		
PTRK01-SO-002	PFBS	0.00126 mg/kg	J TR		
PTRK01-SO-002	PFDA	0.000976 mg/kg	J TR		
PTRK01-SO-002	PFNA	0.0019 mg/kg	J TR		
PTRK01-SO-002	PFUnA	0.000732 mg/kg	J TR		
PTRK01-SO-003	MeFOSAA	0.00371 mg/kg	J TR		
PTRK01-SO-003	PFDA	0.00149 mg/kg	J TR		
PTRK01-SO-003	PFHpA	0.00191 mg/kg	J TR		
PTRK01-SO-003	PFNA	0.00099 mg/kg	J TR		
PTRK01-SO-004	6:2 FTS	0.00393 mg/kg	J TR		
PTRK01-SO-004	PFHpA	0.00154 mg/kg	J TR		
PTRK01-SO-004	PFHxA	0.00145 mg/kg	J TR		
PTRK01-SO-005	PFDA	0.000672 mg/kg	J TR		
PTRK01-SO-005	PFHxA	0.000742 mg/kg	J TR		
PTRK01-SO-005	PFHxS	0.0012 mg/kg	J TR		
PTRK01-SO-006	PFHxA	0.000336 mg/kg	J TR		

# Qualifiers Added During Validation Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide Patrick Air Force Base, Florida

Sample Identification	Analyte	Results	Validation Qualifiers and Reason Codes		
PTRK01-SO-006	PFHxS	0.000707 mg/kg	J TR		
PTRK01-SO-006	PFOS	0.115 mg/kg	J SGL		
PTRK01-SO-007	PFHpA	0.000609 mg/kg	J TR		
PTRK01-SO-007	PFNA	0.000645 mg/kg	J TR		
PTRK01-SO-007	PFOA	0.00178 mg/kg	J TR		
PTRK01-SO-008	PFBS	0.000965 mg/kg	J TR		
PTRK01-SO-008	PFNA	0.000961 mg/kg	J TR		
PTRK01-SO-009	PFDA	0.000555 mg/kg	J TR		
PTRK01-SO-009	PFHpA	0.00117 mg/kg	J TR		
PTRK01-SO-009	PFNA	0.00185 mg/kg	J TR		
PTRK01-SO-009	PFOA	0.0011 mg/kg	J TR		
PTRK01-SO-010	PFHpA	0.00195 mg/kg	J TR		
PTRK02-GW-001	PFDoA	0.012 μg/L	UJ LCL		
PTRK02-GW-001	PFHpA	0.00859 μg/L	J TR		
PTRK02-GW-001	PFHxA	0.0099 μg/L	J TR		
PTRK02-GW-001	PFNA	0.00449 μg/L	J SGH, TR		
PTRK02-GW-001	PFOA	0.00968 μg/L	J TR		
PTRK02-GW-001	PFTeDA	0.012 μg/L	UJ LCL		
PTRK02-GW-001	PFTrDA	0.012 μg/L	UJ LCL		
PTRK02-GW-002	PFDoA	0.012 μg/L	UJ LCL		
PTRK02-GW-002	PFTeDA	0.012 μg/L	UJ LCL		
PTRK02-GW-002	PFTrDA	0.012 μg/L	UJ LCL		
PTRK02-GW-003	PFBS	0.0127 μg/L	J TR		
PTRK02-GW-003	PFDoA	0.012 μg/L	UJ LCL		
PTRK02-GW-003	PFHpA	0.0121 μg/L	J TR		
PTRK02-GW-003	PFNA	0.0133 μg/L	J SGH, TR		
PTRK02-GW-003	PFOS	1.33 μg/L	J SGH		
PTRK02-GW-003	PFTeDA	0.012 μg/L	UJ LCL		
PTRK02-GW-003	PFTrDA	0.012 μg/L	UJ LCL		
PTRK02-SO-001	PFOS	0.000593 mg/kg	J TR		
PTRK02-SO-003	PFOS	0.00144 mg/kg	J TR		
PTRK02-SO-004	6:2 FTS	0.0038 mg/kg	UJ SGL		
PTRK02-SO-004	PFBS	0.00096 mg/kg	UJ SGL		
PTRK02-SO-004	PFHpA	0.00096 mg/kg	UJ SGL		
PTRK02-SO-004	PFHxA	0.00096 mg/kg	UJ SGL		
PTRK02-SO-004	PFHxS	0.00096 mg/kg	UJ SGL		
PTRK02-SO-004	PFOA	0.00096 mg/kg	UJ SGL		
PTRK02-SO-004	PFOS	0.000651 mg/kg	J SGL, TR		
PTRK02-SO-006	6:2 FTS	0.0038 mg/kg	UJ SGL		
PTRK02-SO-006	PFBS	0.00095 mg/kg	UJ SGL		
PTRK02-SO-006	PFHpA	0.00095 mg/kg	UJ SGL		
PTRK02-SO-006	PFHxA	0.00095 mg/kg	UJ SGL		
PTRK02-SO-006	PFHxS	0.00095 mg/kg	UJ SGL		
PTRK02-SO-006	PFOA	0.00095 mg/kg	UJ SGL		
PTRK02-SO-006	PFOS	0.00381 mg/kg	J SGL		
PTRK03-GW-001	PFDoA	0.012 μg/L	UJ LCL		
PTRK03-GW-001	PFNA	0.0195 μg/L	J SGH		
PTRK03-GW-001	PFTeDA	0.012 μg/L	UJ LCL		

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Sample Identification	Analyte	Results	Validation Qualifiers and Reason Codes			
PTRK03-GW-001	PFTrDA	0.012 μg/L	UJ LCL			
PTRK03-GW-002	6:2 FTS	0.03 μg/L	J TR			
PTRK03-GW-002	PFDoA	0.012 μg/L	UJ LCL			
PTRK03-GW-002	PFHxS	1.91 μg/L	J SGH, FDD			
PTRK03-GW-002	PFNA	0.0115 μg/L	J SGH, TR			
PTRK03-GW-002	PFOS	3.07 μg/L	J SGH, FDD			
PTRK03-GW-002	PFTeDA	0.012 μg/L	UJ LCL			
PTRK03-GW-002	PFTrDA	0.012 μg/L	UJ LCL			
PTRK03-GW-610-MW17	EtFOSAA	0.0161 μg/L	J TR			
PTRK03-GW-610-MW17	PFTeDA	0.012 μg/L	UJ LCL			
PTRK03-GW-610-MW17	PFTrDA	0.012 μg/L	UJ LCL			
PTRK03-SO-001	PFHxA	0.000341 mg/kg	J TR			
PTRK03-SO-001	PFOS	0.00181 mg/kg	J TR			
PTRK03-SO-002	PFOS	0.00124 mg/kg	J TR			
PTRK03-SO-004	PFOS	0.00797 mg/kg	J FDD			
PTRK-FD-GW-001	PFDoA	0.012 μg/L	UJ LCL			
PTRK-FD-GW-001	PFNA	0.0269 μg/L	J SGH			
PTRK-FD-GW-001	PFOS	1.17 μg/L	J SGH			
PTRK-FD-GW-001	PFTeDA	0.012 μg/L	UJ LCL			
PTRK-FD-GW-001	PFTrDA	0.012 μg/L	UJ LCL			
PTRK-FD-GW-002	6:2 FTS	0.0289 μg/L	J TR			
PTRK-FD-GW-002	EtFOSAA	0.032 μg/L	UJ SGL			
PTRK-FD-GW-002	MeFOSAA	0.032 μg/L	UJ SGL			
PTRK-FD-GW-002	PFHxS	1.14 μg/L	J FDD			
PTRK-FD-GW-002	PFNA	0.00984 μg/L	J TR			
PTRK-FD-GW-002	PFOS	1.84 μg/L	J FDD			
PTRK-FD-GW-002	PFTeDA	0.012 μg/L	UJ LCL			
PTRK-FD-GW-002	PFTrDA	0.012 μg/L	UJ LCL			
PTRK-FD-SO-001	6:2 FTS	0.0039 mg/kg	UJ SGL			
PTRK-FD-SO-001	PFBS	0.00097 mg/kg	UJ SGL			
PTRK-FD-SO-001	PFHpA	0.00097 mg/kg	UJ SGL			
PTRK-FD-SO-001	PFHxA	0.00097 mg/kg	UJ SGL			
PTRK-FD-SO-001	PFHxS	0.00097 mg/kg	UJ SGL			
PTRK-FD-SO-001	PFOA	0.00097 mg/kg	UJ SGL			
PTRK-FD-SO-001	PFOS	0.00097 mg/kg	UJ SGL			

## Qualifiers Added During Validation Site Inspection of Aqueous Film Forming Foam (AFFF) Release Areas Environmental Programs Worldwide Patrick Air Force Base, Florida

Sample Identification Analyte		Results	Validation Qualifiers and Reason Codes		
PTRK-FD-SO-002	PFHxA	0.000292 mg/kg	J TR		
PTRK-FD-SO-002	PFOS	0.00439 mg/kg	J FDD		

### Notes:

μg/L = micrograms per liter PFHxA = perfluorohexanoic acid 6:2 FTS = 6:2 fluorotelomer sulfonate PFHxS = perfluorohexanesulfonic acid 8:2 FTS = 8:2 fluorotelomer sulfonate PFNA = perfluorononanoic acid EtFOSAA = ethylperfluorooctane sulfonamidoacetic acid PFOA = perfluorooctanoic acid MeFOSAA = methylperfluorooctane sulfonamidoacetic acid PFOS = perfluorooctanesulfonic acid PFBS = perfluorobutanesulfonic acid PFTeDA = perfluorotetradecanoic acid PFTrDA = perfluorotridecanoic acid PFDA = perfluorodecanoic acid PFDoA = perfluorododecanoic acid PFUnA = perfluoroundecanoic acid PFHpA = perfluoroheptanoic acid

## **Validation Qualifiers**

- J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- UJ = The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

## **Reason Codes**

FDD = Field duplicate imprecision.

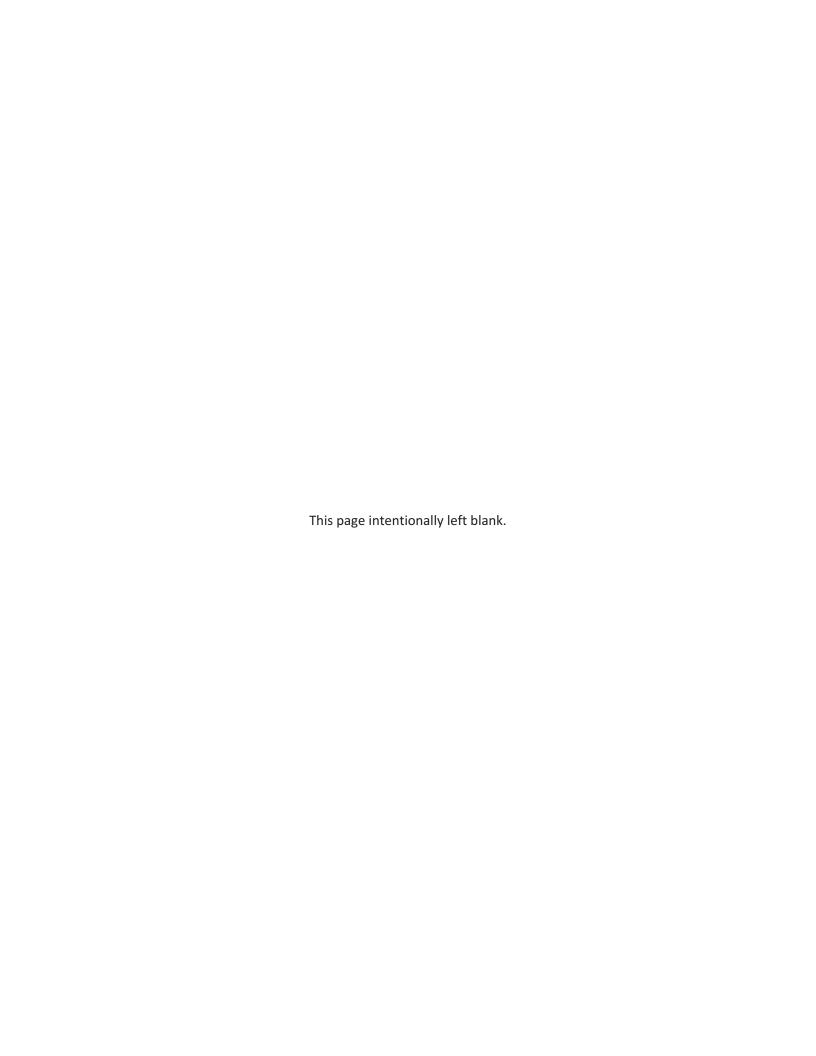
LCL = Low laboratory control sample recovery. Analytical result may be biased low.

SGH = High surrogate recovery. Analytical result may be biased high.

SGL = Low surrogate recovery. Analytical result may be biased low.

TR = Detected concentration is less than the limit of quantification.

## APPENDIX F IDW NON-HAZARDOUS WASTE MANIFEST



# NON-HAZARDOUS WASTE MANIFEST

		1. Generator's US TA ID No. M		Manifest Doc	nifest Doc No. 2. I		2. Page 1 of				
	NON-HAZARDOUS MANIFEST		1 0 1	10192		1					
		nerator's Name and Mailing Address: Patric Air Force Base				A. Manife	A. Manifest Number				
							B. State Generator's ID				
	5. Transporter 1 Company Name	K DOWERS 321-853-4289	6. US EPA	ID Number		+		-			
			1.50			C. State Tr	ansporter!	s ID			
Н	EVERGREEN WASTE LLC		GAR DO	GAR 000 034 710			D. Transporter's Phone 7707395600				
						The second secon	E. State Transporter's ID F. Transporter's Phone				
	9. Designated Facility Name and Site	Address	10. US EPA	A ID Number							
	Covanta				G. State Facility ID						
	3920 Goshen Industrial Blvd					H. State F.	acility Phon	e 706-771-91	100		
	Augusta GA 30906						11 114 11				
	Augusta GA 30900			1 100					200		
G	11. Description of Waste Materials			No.	Type	13. Total Quantity	14. Unit Wt./Vol.	1. M	isc. Commen	ts	
E N E	A NONREGULATE NONHAZARDOUS	D MATERIA	ίι,	7	DM	3525	-e J	7			
R						111					
A T O	B NONREGULAT NONHAZARDOUS	ED MATERI	AL,	1	DM	955	Р		121		
R	С										
	D			-	-				-		
	В										
									- 30		
	W										
	J. Additional Descriptions for Mater 11A: IDW Water	rials Listed Above		K. Disposal Location							
	11 B: IDW Soils									2	
				Cell	Cell			Level			
				Grid							
	15. Special Handling Instructions and Additional Information WASTE FOR INCINERATON ONLY										
		- 0 1	The second commence of the second		_	A CONTRACTOR					
	Purchase Order #		EMERGENCY C	ONTACT / PH	IONE NO.:	256-759-3	922 DANIE	LE WASKE			
	16. GENERATOR'S CERTIFICATE:		TO THE					The state of		S Total	
	I hereby certify that the above-descri							, have been fu	lly and	J (2.7)	
	accurately described, classified and p Printed Name	ackaged and are in prop	er condition for transp	ortation acco	ording to a	ррисаріе геди	iations.	Month	Day	Year	
8	MICHALL KILL	gave to						7.7		4-1	
4	17. Transporter 1 Acknowledgement	of Receipt of Materials		6		E-57101	A PART	1 100		1000	
A	Printed Name							Month	Day	Year	
5	Jan In	n - n temp						10		1200	
9	18. Transporter 2 Acknowledgement	of Receipt of Materials					ALCONO.	Page 11	PARKE		
9	Printed Name		Signature					Mosth	Day	Year	
T.			No recording								
	19. Certificate of Final Treatment/Disposal										
1	I certify, on behalf of the above listed applicable laws, regulations, permits	treatment facility, that		vledge, the a	bove desc	ribed waste w	as manage	d in compliant	ce with all		
	20. Facility Owner or Operator: Cert	ification of receipt of no	n-hazardous materials	covered by t	his manife	st.					
	Printed Name		Signature					Mante	buy.	Year	
	White: TREATMENT STORAGE DISPOSAL FACILITY COPY Blue: GENERATOR #2 COPY Yellow: GENERATOR #1 COPY										

Gold TRANSPORTER #1 COPY

PINK FACILITY USE ONLY