RELATIVE RISK SITE EVALUATION

Will Rogers Air National Guard Base, Oklahoma

Introduction

The Department of Defense (DoD) identified certain per- and polyfluoroalkyl substances (PFAS) as emerging contaminants of concern which affected installations across the Air Force. When the term "Air Force" is used in this fact sheet, it includes Air National Guard. Specifically, perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and perfluorobutanesulfonic acid (PFBS) are components of legacy Aqueous Film Forming Foam (AFFF) that the Air Force began using in the 1970s as a firefighting agent to extinguish petroleum fires. The U.S. Environmental Protection Agency (EPA) issued lifetime drinking water Health Advisories (HA) for PFOS and PFOA, and health-based regional screening levels for PFBS.

The Air Force has systematically evaluated potential AFFF releases on all Installations and former Installations. It began with the Preliminary Assessments, or PAs, that identified potential release areas. First responders, fire chiefs, and hangar staff were interviewed to determine where a release or a spill may have occurred on an Installation (for example, aircraft crash site or an accidental hangar AFFF release). Once the information in the PA was collected, we began Site Inspections, or SIs, to take soil and water samples and analyzed the media for PFAS compounds at the potential release areas. The intention of the SI was to determine if a release had occurred and to determine the impacts to soil and/or groundwater. The next step in the process is called the Relative Risk Site Evaluation, or RRSE, which is a tool used to sequence Sites/Installations to begin a Remedial Investigation, or RI. Air Force Installations are at the beginning of the more detailed investigative stage, the RI, to determine, where action is needed and to identify remedial technologies.

The Will Rogers Air National Guard Base (ANGB) PFAS PA and SI can be found at the Air Force CERCLA Administrative Record (AR): https://ar.afcec-cloud.af.mil/ Scroll to the bottom of the page and click on “Continue to site”, then select Air National Guard (e.g., Active, ANG, BRAC), scroll down the Installation List and click on Oklahoma City (Will Rogers), OK, then enter the AR Number 474888 in the “AR #” field for the PA. For the SI, enter the AR Number 581000. Then click “Search” at the bottom of the page. Click on the spy glass to view the document.

More information on the Air Force response to PFOS and PFOA can be found at: https://www.afcec.af.mil/WhatWeDo/Environment/Perfluorinated-Compounds/

Acronyms

AFFF - Aqueous Film Forming Foam

ANGB - Air National Guard Base

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CHF – Contaminant Hazard Factor

DoD - Department of Defense

EPA – US Environmental Protection Agency

FTA – Fire Training Area

HA – Health Advisory

MPF – Migration Pathway Factor

PA – Preliminary Assessment

PFAS - Per-and polyfluoroalkyl substances

PFBS – Perfluorobutanesulfonic acid

PFOS - Perfluorooctane sulfonate

PFOA - Perfluorooctanoic acid

PRL - Potential Release Location

RCRA – Resource Conservation and Recovery Act

RF – Receptor Factor

RI – Remedial Investigation

RRSE – Relative Risk Site Evaluation

SI – Site Inspection

SWMU – Solid Waste Management Unit

RELATIVE RISK SITE EVALUATION, cont.

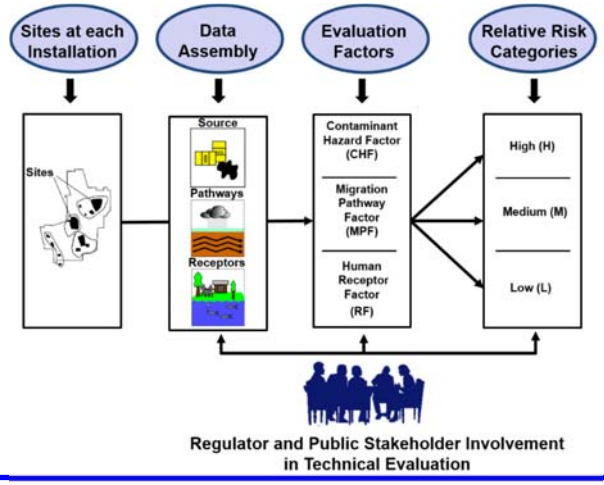
Q. What is the Relative Risk Site Evaluation (RRSE)?

A. RRSE is a methodology to sequence environmental restoration work used by the Department of Defense (DoD). The RRSE process is used to evaluate the relative risk posed by an environmental restoration site in relation to other sites. The DoD fundamental premise in site prioritization is "worst first," meaning the DoD Component shall address sites that pose a relatively greater potential risk to public safety, human health, or the environment before sites posing a lesser risk. Relative risk is not the sole factor in determining the sequence of environmental restoration work, but it is an important consideration in the priority setting process. The methodology is described in the DoD, Relative Risk Site Evaluation Primer, Summer 1997 Revised Edition: https://denix.osd.mil/references/dod/policy-guidance/relative-risk-site-evaluation-primer/

Q. What is the RRSE framework?

A. The RRSE framework provides a DoD-wide approach for evaluating the relative risk to human health and the environment posed by contamination present at sites. The **Relative Risk Site Evaluation Concept Summary** (shown in the figure) illustrates the selection of sites, evaluation of the site data using three evaluation factors, and placement into high, medium, and low categories. The relative risk site evaluation framework is based on information fundamental to risk assessment: sources, pathways, and receptors to sequence restoration work. The RRSE is not a baseline risk assessment or health assessment in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. Regulators and public stakeholders in the environmental restoration process are provided the opportunity to participate in the process in accordance with the DoD Defense Environmental Restoration Program.

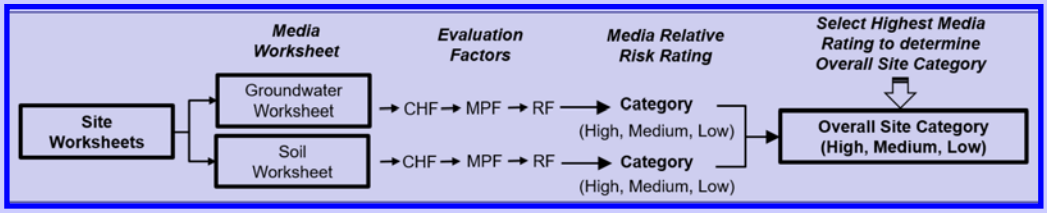
Relative Risk Site Evaluation Concept Summary



Sites at Each Installation

Q. What restoration sites are required to be evaluated in the RRSE process?

A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.



The figure shows the process for a media to be evaluated using the contaminant hazard factor (CHF), the migration pathway factor (MPF), and the receptor factor (RF). Each media is scored to obtain a relative risk rating of High, Medium, or Low. The highest media rating determines the Overall Site Category.

Q. How is the Contaminant Hazard Factor (CHF) determined?

A. The Contaminant Hazard Factor (CHF) is determined by dividing the maximum level for a contaminant at each site by the approved screening values (i.e., comparison values). Contaminant concentration ratios are totaled to arrive at a **Contaminant Hazard Factor (CHF).** A CHF sum of greater than 100 earns a **Significant (High)** ranking. **Moderate (Medium)** is when the total is 2 to 100. **Minimal (Low)** is when a CHF is less than two.

FOR MORE INFORMATION

Air Force Civil Engineer Center
Environmental Restoration Program
www.afcec.af.mil

AFCEC CERCLA
Administrative Record (AR)
https://ar.afcec-cloud.af.mil/

POINT OF CONTACT
Matt Voorhees NGB/A4VR
(240) 612-7275
matthew.voorhees.1@us.af.mil

Q. How is the Migration Pathway Factor (MPF) determined?

A. The movement of contamination at a site is evaluated and assigned a **Migration Pathway Factor (MPF)** rating.

Ratings for MPFs are designated as: **evident**, **potential**, or **confined** (for **High, Medium, and Low**). **Evident** exposure means the contamination is at a point where exposure to humans or the environment can occur, such as at a drinking water well. **Potential** ratings are given to sites where exposure may happen. A **confined** rating is given to sites where a low possibility for exposure may occur.

Q. How is the Receptor Factor (RF) determined?

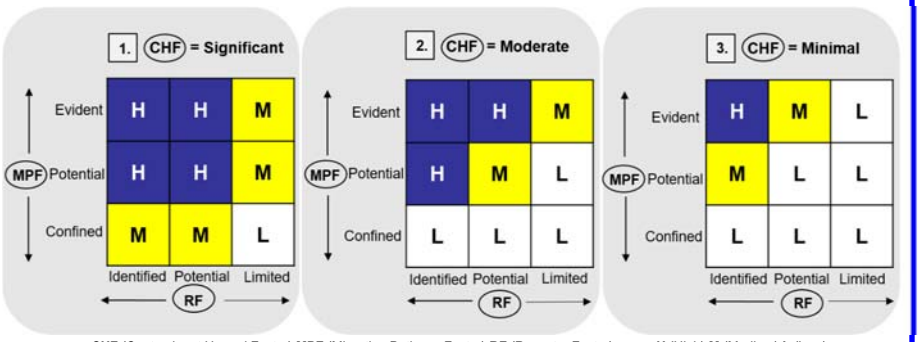
A. The **Receptor Factor (RF)** is determined by a receptor's, such as humans, potential to come into contact with contaminated media. **RFs** are designated as: identified, potential, or limited **(High, Medium, and Low). Identified** rating is given when receptors are in contact or threat of contact with contaminated media. **Potential** is given when receptor may contact contaminated media. **Limited** is given when there is little or no contact with contaminated media.

RELATIVE RISK SITE EVALUTION, cont.

Media Relative Risk Rating

Q. How is the media relative risk rating determined?
A. Use the chart to determine the relative risk rating for each media evaluated. Start by choosing the **CHF** result of the evaluation. If the **CHF** is **Significant**, use **box 1.**; if **Moderate**, use **box 2.**; if **Minimal**, use **box 3.** Then find the **MPF** and **RF** results and move to the square where the results meet. That square indicates the media relative risk rating. For example, if the **CHF** is **Significant (go to box 1.)**, the **MPF** is **Potential** and the **RF** is **Identified**, then the rating is High (**H**).

Relative Risk Site Evaluation Matrix



CHF (Contaminant Hazard Factor) **MPF** (Migration Pathway Factor) **RF** (Receptor Factor) **H** (High) **M** (Medium) **L** (Low)

Overall Site Category

Q. How do I determine the Overall Site Category?
A. The highest relative risk media rating becomes the **Overall Site Category** for the site. For example, if a site has a groundwater relative risk rating of **High**, and soil relative risk rating of **Low**, then the Overall Site Category rating for the site is **High**.

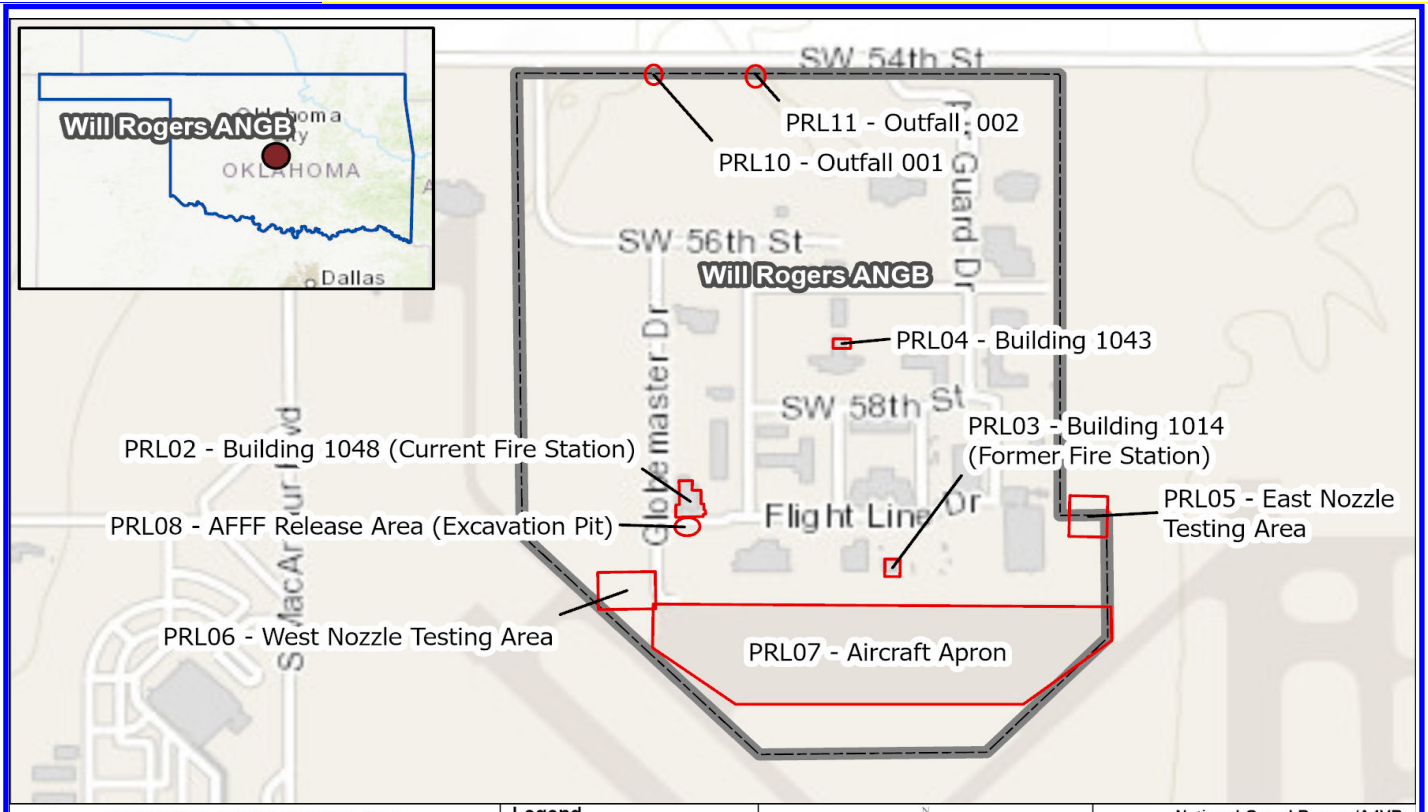
Regulatory and Stakeholder Involvement

Q. **How do I participate as Stakeholder?**

A. To offer opportunity to participate in RRSE, the Air Force announces a public comment period in your local newspaper. There is also opportunity to participate during installation Restoration Advisory Committees where active. Installation Restoration Advisory Committee meetings are also announced in your local newspaper.

Relative Risk Site Evaluation Summary Will Rogers ANGB, OK

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	PRL 2, PRL 3, PRL 4, PRL 5, PRL 6, PRL 7, PRL 8, PRL 10, PRL 11
MEDIUM	
LOW	



Will Rogers ANGB Relative Risk Site Evaluation (RRSE) Figure
National Guard Bureau
Will Rogers Air National Guard Base, Oklahoma

Legend
AFFF Release Areas
Will Rogers ANGB Installation Boundary

0 250 500 1,000
Feet

National Guard Bureau/A4VR Environmental Restoration
3500 Fetchet Ave
Joint Base Andrews, MD 20762

AFFF Area is another term for Potential Release Location (PRL).

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/1/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 1048 - Current Fire Station - PRL 2	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Since 1997, Building 1048 has been the location of the current fire station on the Installation. As reported in the PA, a total of 2,086 gallon (gal) of AFFF are stored at this location within the five crash and rescue vehicles, a 500-gal storage trailer, and two 500-gal overhead storage tanks. There are no documented releases of AFFF at this location. Any incidental releases of AFFF within the building would drain to floor trench drains, which discharge to the sanitary sewer. PRL 2 and PRL 8 (AFFF Release Area Excavation Pit) are co-located. PRL 8 is the location of a 50 gal application of AFFF to an excavation during a fuel release as a precautionary measure.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 feet (ft). Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft below ground surface (bgs), flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. Surface cover at PRL 2 is primarily covered by the building and PRL 8, which is adjacent is covered by an asphalt parking lot.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the Oklahoma Water Resources Board (OWRB) database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft deep and is screened between 515 and 825 ft. bgs the other is 866 ft. deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 2 and PRL 8 are within the base boundaries and appears accessible to military and civilian personnel. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation Will Rogers ANG

Site ID: PRL 2 **AFFF Release Area #:** AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	7.2	0.04	180.0
PFOA	0.79	0.04	19.8
PFBS	1.3	0.602	2.2

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	201.9
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	H

Migratory Pathway Factor		
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor		
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Will Rogers ANG

Site ID: PRL 2 **AFFF Release Area #:** AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	1.9	0.126	15.1
PFOA	0.0028	0.126	0.0
PFBS	0.0012	1.9	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	15.1
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	M

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	H
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H

Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	M
Limited	No potential for receptors to have access to contaminated soil	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Soil Category	**HIGH**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/1/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 1014 - Former Fire Station - PRL 3	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Between approximately 1958 and 1997, Building 1014 was the site of the former fire station on Will Rogers ANGB. The building has since been removed and all that exists now at this location is grass and asphalt. The PA Report states that there were no documented releases of AFFF, but it is likely AFFF was used at this location since 1980. Based on construction drawings, the building was partially equipped with floor drains which discharged to the sanitary sewer in the bathroom areas while the truck bay area drains appear to have led to the storm sewer.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft bgs, flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. The building at PRL 3 has been removed and all that exist now is grass and asphalt.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft. deep and is screened between 515 and 825 ft. bgs the other is 866 ft. deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 3 is within the base boundaries near the aircraft apron. There appears to be a fence limiting the area to authorized personnel. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation Will Rogers ANG

Site ID: PRL 3 **AFFF Release Area #:** AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	10	0.04	250.0
PFOA	3.3	0.04	82.5
PFBS	0.79	0.602	1.3

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	333.8
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CHF Value	CHF VALUE	H

Migratory Pathway Factor

Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor

Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Will Rogers ANG

Site ID: PRL 3 **AFFF Release Area #:** AFFF 3

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.072	0.126	0.6
PFOA	0.0016	0.126	0.0
PFBS	0.00011	1.9	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.6**
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**L**

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	L
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	
Limited	No potential for receptors to have access to contaminated soil	L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
	Soil Category	**LOW**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/1/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 1043 - North Maintenance - PRL 4	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Building 1043 is centrally located at Will Rogers ANGB and is the location of the vehicle maintenance facility for many of the maintenance and support vehicles at the Installation. A documented release of 10 gal of AFFF occurred in the building in 2007. The release occurred during maintenance of a fire rescue vehicle. It was believed that the AFFF released would have drained to the building trench drains, which discharge to an OWS before being discharged to the sanitary sewer.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft bgs, flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. PRL 4 is covered by the building and surrounded by pavement.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft. deep and is screened between 515 and 825 ft. bgs the other is 866 ft deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 4 is within the base boundaries and appears to be in a fenced area. However, based on its usage as a maintenance facility, it is likely accessible to military and civilian personnel. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation Will Rogers ANG

Site ID: PRL 4 **AFFF Release Area #:** AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	2.3	0.04	57.5
PFOA	0.31	0.04	7.8
PFBS	0.17	0.602	0.3

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	65.5
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	M

Migratory Pathway Factor

Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor

Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Will Rogers ANG

Site ID: PRL 4 **AFFF Release Area #:** AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0024	0.126	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.0
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	L

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	L
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L

Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	
Limited	No potential for receptors to have access to contaminated soil	L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
	Soil Category	**LOW**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/1/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	East Nozzle Testing Area - PRL 5	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The East Nozzle Testing Area is a grassy area located on the eastern edge of the Base, just north of the concrete apron near Building 1011. It was reported that between the early 1980s and early 1990s, nozzle testing occurred at least annually at this location. Volumes of less than 1 gal of AFFF, per test, per vehicle would likely have been used and allowed to dissipate in the grassy area.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. PRL 5 is covered fairly equally by pavement and vegetation.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft. deep and is screened between 515 and 825 ft. bgs the other is 866 ft deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 5 is within the base boundaries near the aircraft apron. There appears to be a fence limiting the area to authorized personnel. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation Will Rogers ANG

Site ID: PRL 5 **AFFF Release Area #:** AFFF 5

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.33	0.04	8.3
PFOA	0.036	0.04	0.9
PFBS	0.051	0.602	0.1
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**9.2**
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**M**

Migratory Pathway Factor		
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
Receptor Factor		
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Will Rogers ANG

Site ID: PRL 5 **AFFF Release Area #:** AFFF 5

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.22	0.126	1.7
PFOA	0.0013	0.126	0.0
PFBS	0.00023	1.9	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.8
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	L

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

Migratory Pathway Factor

Evident	Analytical data or observable evidence that contamination is present at a point of exposure	H
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H

Receptor Factor

Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	M
Limited	No potential for receptors to have access to contaminated soil	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Soil Category	**MEDIUM**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/1/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	West Nozzle Testing Area - PRL 6	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The West Nozzle Testing Area is a grassy area located on the western edge of the concrete apron near Building 1013. It was reported that between the early 1980s and early 1990s, nozzle testing occurred at least annually at this location. Volumes of less than 1 gal of AFFF, per test, per vehicle would likely have been used and allowed to dissipate in the grassy area.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft bgs, flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. PRL 6 is covered by vegetation with some exposed soil in the form of a vehicle trail present.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft. deep and is screened between 515 and 825 ft. bgs the other is 866 ft deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 6 is within the base boundaries near the aircraft apron. However, it appears not to be within the fenced area and so would be accessible to military personnel and civilians. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation Will Rogers ANG

Site ID: PRL 6 **AFFF Release Area #:** AFFF 6

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	2.6	0.04	65.0
PFOA	0.73	0.04	18.3
PFBS	0.67	0.602	1.1
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**84.4**
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**M**

Migratory Pathway Factor		
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
Receptor Factor		
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Will Rogers ANG

Site ID: PRL 6 **AFFF Release Area #:** AFFF 6

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.35	0.126	2.8
PFOA	0.0058	0.126	0.0
PFBS	0.00028	1.9	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2.8
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	M

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	H
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H

Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	M
Limited	No potential for receptors to have access to contaminated soil	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Soil Category	**HIGH**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/1/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Aircraft Apron - PRL 7	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The main Aircraft Apron is located at the southern end of the Base. Historical operations in this area may have resulted in the periodic releases of AFFF to the concrete surface, which ultimately could have drained to grassy areas surrounding the apron or to the Base storm drain system.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft bgs, flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. PRL 7 is a concrete aircraft apron.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft. deep and is screened between 515 and 825 ft. bgs the other is 866 ft deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 7 is within the base boundaries and fenced off along with the flight line and so has restricted access. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation Will Rogers ANG

Site ID: PRL 7 **AFFF Release Area #:** AFFF 7

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	1.9	0.04	47.5
PFOA	0.6	0.04	15.0
PFBS	0.23	0.602	0.4

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	62.9
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	M

Migratory Pathway Factor		
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor		
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation Will Rogers ANG

Site ID: PRL 7 **AFFF Release Area #:** AFFF 7

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.11	0.126	0.9
PFOA	0.00097	0.126	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.9**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**L**

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

Migratory Pathway Factor		
Evident	Analytical data or observable evidence that contamination is present at a point of exposure	
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	L
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L

Receptor Factor		
Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	
Limited	No potential for receptors to have access to contaminated soil	L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
	Soil Category	**LOW**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/29/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	AFFF Release Area - Excavation Pit - PRL 8	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	In 1991, excavation activities just south of PRL 2 (Building 1048 - Current Fire Station) hit an airport-owned underground fuel pipeline. Approximately 50 gal of AFFF were applied within the excavation as a precaution due to the fuel release. The AFFF would have ultimately dissipated within the excavation footprint to the soil and groundwater. PRL 8 and PRL 2 are co-located.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft bgs, flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. PRL 8 is co-located with PRL 2, the location of the current fire station.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft deep and is screened between 515 and 825 ft. bgs the other is 866 ft. deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 2 and PRL 8 are within the base boundaries and appears accessible to military and civilian personnel. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation: Will Rogers ANG

Site ID: PRL 8 **AFFF Release Area #:** AFFF 8

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	1.3	0.602	2.2
PFOA	0.79	0.04	19.8
PFOS	7.2	0.04	180.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	201.9
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	H

Migratory Pathway Factor		
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor		
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Soil Worksheet

Installation: Will Rogers ANG

Site ID: PRL 8 **AFFF Release Area #:** AFFF 8

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFBS	0.0012	1.9	0.0
PFOA	0.0028	0.126	0.0
PFOS	1.9	0.126	15.1

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	15.1
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	L (Low)		
CHF Value		CHF VALUE	M

Migratory Pathway Factor

Evident	Analytical data or observable evidence that contamination is present at a point of exposure	H
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined	
Confined	Low possibility for contamination to be present at or migrate to a point of exposure	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H

Receptor Factor

Identified	Receptors identified that have access to contaminated soil	
Potential	Potential for receptors to have access to contaminated soil	M
Limited	No potential for receptors to have access to contaminated soil	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M
	Soil Category	**HIGH**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/1/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater
Site Name and ID:	Outfall 001 - PRL 10	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Outfall 001 is located at the northwestern corner of Will Rogers ANGB and is one of two primary stormwater discharge outfalls leaving the Base. Outfall 001 is a concrete, open drainage ditch that discharges stormwater north under SW 54th street. Standing water was noted during the PA, but water levels are dependent on precipitation. Outfall 001 is the major drainage outfall location for the Base stormwater drainage system.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft bgs, flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. PRL 10 is located in a grassy area.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft. deep and is screened between 515 and 825 ft. bgs the other is 866 ft deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 10 is within the base boundaries and appears accessible to military and civilian personnel. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation Will Rogers ANG

Site ID: PRL 10 **AFFF Release Area #:** AFFF 10

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	3.3	0.04	82.5
PFOA	0.24	0.04	6.0
PFBS	0.3	0.602	0.5

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	89.0
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value		CHF VALUE	M

Migratory Pathway Factor		
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor		
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**

Site Background Information			
Installation:	Will Rogers ANG	**Date:**	10/29/2021
Location (State):	Oklahoma	**Media Evaluated:**	Groundwater
Site Name and ID:	Outfall 002 - PRL 11	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Matt Voorhees	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Outfall 002 is one of two primary stormwater discharge outfalls at Will Rogers ANGB. It is located along the north-central boundary of the Base. Outfall 002 drains the portions of the Base originating from the southeastern corner near Building 1011. All of the components associated with this outfall are buried and only accessible by catch basins or manholes on Base. Outfall 002 ultimately discharges to the north, off Base via a concrete culvert that runs beneath SW 54th Street.
Brief Description of Pathways:	Will Rogers ANGB is located on the western edge of the Anadarko Basin. The stratigraphy underlying the unconsolidated sediment at the Base consists of Permian rocks and includes the Hennessey Group and Garber and Wellington formations, which dip gently to the west. The uppermost portion of the Hennessey Group is a sequence of brown shale/mudstone with smaller interbedded siltstones and sandstones overlying the Garber and Wellington formations. The sandstone intervals that typically occur at the base of the Hennessey Formation range in thickness from 1 to 15 ft. Previous site work at the Base has indicated that shallow groundwater, approximately 12 - 19 ft bgs, flows to the west-northwest and then to the north near the western edge of the Base, generally following the surface water flow. PRL 11 is located in a grassy area on the north-central base boundary.
Brief Description of Receptors:	No potable water wells are reported at Will Rogers ANGB. Public drinking water across the airport is supplied by the Oklahoma City Water Utilities Trust. According to the OWRB database, two public water wells exist within 1 mile of the Base. Both are located just south of Highway 152 (upgradient). One of the wells is 830 ft. deep and is screened between 515 and 825 ft. bgs the other is 866 ft deep and is screened between 484 and 861 ft. bgs. Another water well, located ½ to 1 mile north-northeast (generally downgradient) of the Base, is listed as a public water supply well serving a population of 22,498. PRL 10 is within the base boundaries and appears accessible to military and civilian personnel. PFAS including PFOA, PFOS, and PFBS have been detected in multiple monitoring wells on the installation at varying concentrations.

Groundwater Worksheet

Installation: Will Rogers ANG

Site ID: PRL 11 **AFFF Release Area #:** AFFF 11

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	0.12	0.602	0.2
PFOA	0.189	0.04	4.7
PFOS	0.59	0.04	14.7

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	19.7
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CHF Value	CHF VALUE	M

Migratory Pathway Factor

Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)	
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined	M
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	M

Receptor Factor

Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	H
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	
Limited	No known water supply wells downgradient and groundwater is not considered potential drinking water source and is of limited beneficial use (Class III)	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	H
	Groundwater Category	**HIGH**