RELATIVE RISK SITE EVALUATION

Cheyenne Air National Guard Base, Wyoming

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, Site Inspections, or SIs, were initiated 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 Cheyenne Air National Guard Base (ANGB) PFAS PA and SI can be found at the Air Force Comprehensive Environmental Response, Compensation, and Liability Act (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 Cheyenne Municipal Airport, WY, then enter the AR Number 474982 in the “AR #” field for the PA. For the SI, enter the AR Number 581274. 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

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CHF – Contaminant Hazard Factor

DoD - Department of Defense

EPA – US Environmental Protection Agency

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

RF – Receptor Factor

RI – Remedial Investigation

RRSE – Relative Risk Site Evaluation

SI – Site Inspection

RELATIVE RISK SITE EVALUATION, cont.

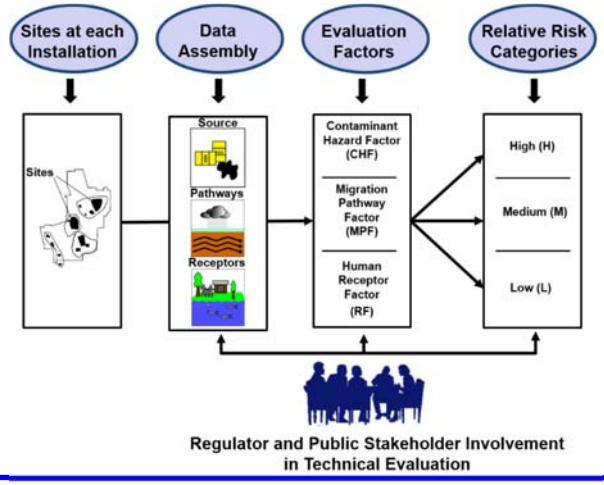
Q. What is the Relative Risk Site Evaluation (RRSE)?

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.

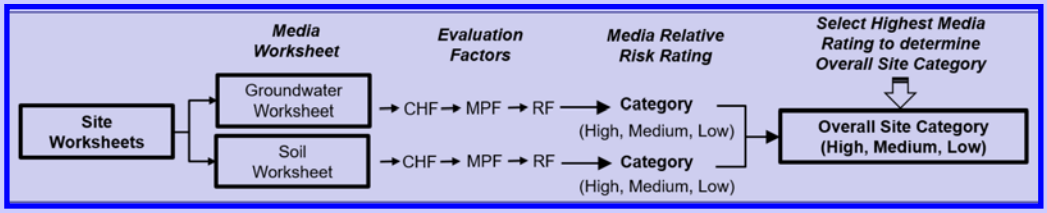
Relative Risk Site Evaluation Concept Summary



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., risk-based 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
Mark Dickerson NGB/
A4VR (240) 612-8445
mark.dickerson@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

1. CHF = Significant

MPF \ RF	Identified	Potential	Limited
Evident	H	H	M
Potential	H	H	M
Confined	M	M	L

2. CHF = Moderate

MPF \ RF	Identified	Potential	Limited
Evident	H	H	M
Potential	H	M	L
Confined	L	L	L

3. CHF = Minimal

MPF \ RF	Identified	Potential	Limited
Evident	H	M	L
Potential	M	L	L
Confined	L	L	L

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**.

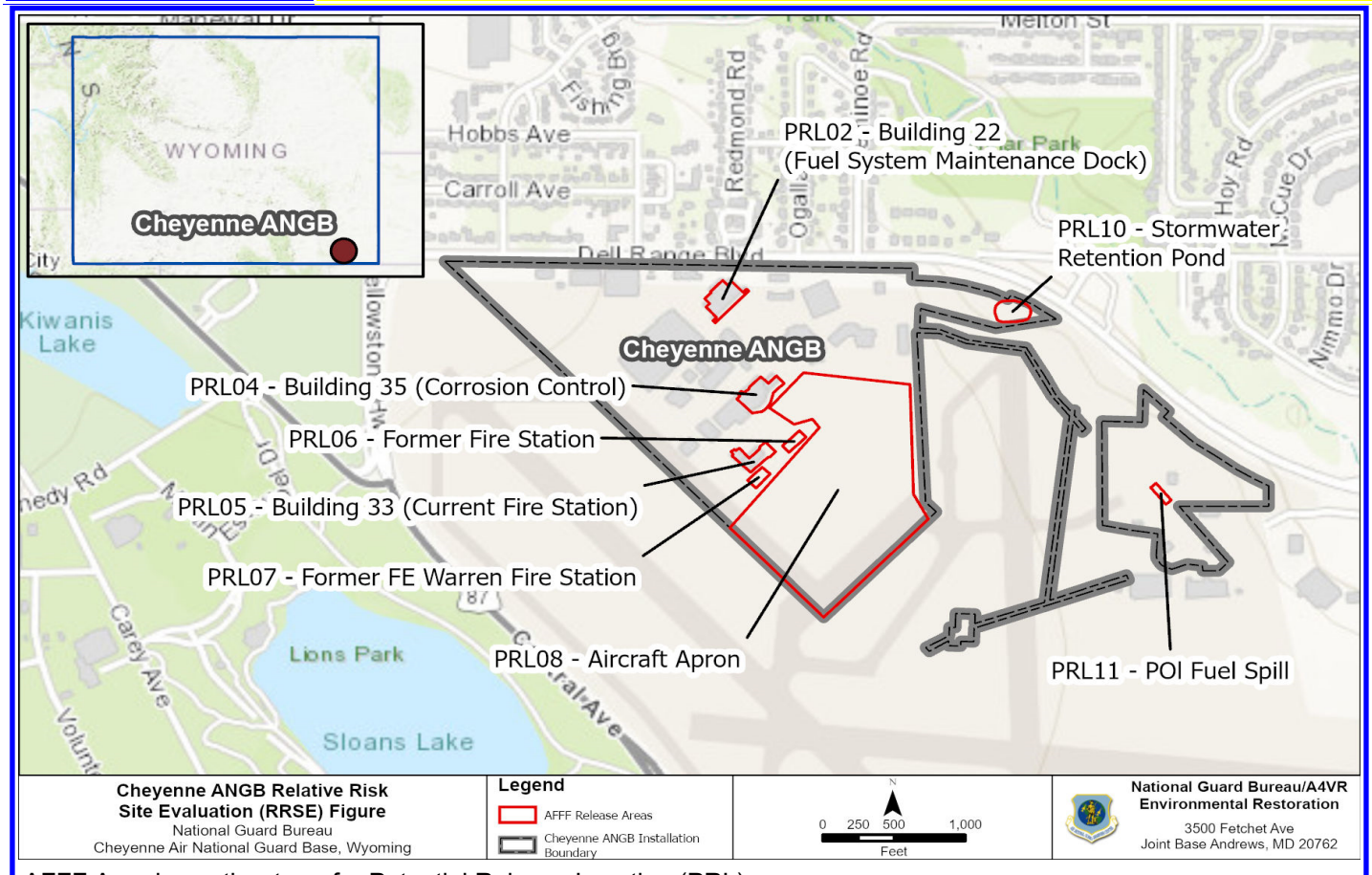
Regulatory and Stakeholder Involvement

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 Cheyenne ANGB, NY

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



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

Site Background Information			
Installation:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 22 - Fuel System Maintenance Dock - PRL 2	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Building 22 was constructed in 1968. An aqueous film forming foam (AFFF) fire suppression system (FSS) was installed within the building (unknown date) and deactivated in 1999. Annual system testing would release approximately 100 gallons of AFFF and cause an approximate 1-ft. foam buildup on the hangar floor. The foam was hosed down the floor drains, which were reportedly connected to an oil/water separator (OWS) with subsequent discharge to the stormwater retention pond. However, discussions with Base personnel during the August 17, 2017, site visit confirmed that two OWSs existed at Building 22 (one connected to a sanitary sewer and the other connected to a storm sewer), and AFFF discharge from the building floor drains would be to the sanitary sewer. Currently, a 400-gal AFFF storage tank remains in the building with an unknown quantity of AFFF inside. Any accidental spills within Building 22 would be released to the floor drains.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major water bearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 2 is primarily covered in a building/pavement with small landscaped areas.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the Environmental Data Resources (EDR) Radius Map™ Report with Geocheck®, dated December 17, 2015 (EDR 2015), lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANGB. The closest cross/downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANGB. This well is listed on the Federal Public Water Supply database and belongs to the Cheyenne Board of Public Utilities. The distance from PRL 2 to the water well is unknown. Soil receptors would be unlikely since the area is covered in pavement, but PRL 2 is accessible to civilian and military personnel. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations.

Groundwater Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.88	0.04	22.0
PFOA	2.5	0.04	62.5
PFBS	0.34	0.602	0.6

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	85.1
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 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 Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.018	0.126	0.1
PFOA	0.00021	0.126	0.0
PFBS	0.0009	1.9	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.1**
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**	**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	M
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).	M
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	**LOW**

Site Background Information			
Installation:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 35 - Corrosion Control - PRL 4	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Building 35 was constructed in 1994 and serves as the corrosion control hangar. An AFFF Fire suppression system was installed during construction but was retrofitted from AFFF to high-expansion foam (HEF) in 1999. Prior to the conversion, the system was tested annually using approximately 100 gallons of raw foam, which would cause an approximate 1-ft foam buildup on the hangar floor. This foam was then hosed down the floor drains, which were reportedly connected to an OWS with subsequent discharge to the stormwater retention pond. However, discussions with Base personnel during the August 17, 2017, site visit confirmed that the OWS was connected to the sanitary sewer, and AFFF discharge from the building floor drains would be to the sanitary sewer.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major waterbearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 4 is primarily covered in a building/pavement with small landscaped areas.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the EDR Radius Map™ Report with Geocheck®, dated December 17, 2015, lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANG Base. The closest cross/ downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANG Base. The distance from PRL 4 to the water well is unknown. Soil receptors would be unlikely since the area is primarily covered in pavement, but PRL 4 is accessible to civilian and military personnel.

Groundwater Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	12	0.04	300.0
PFOA	1.2	0.04	30.0
PFBS	0.99	0.602	1.6

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	331.6
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	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 Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.012	0.126	0.1
PFOA	0.00043	0.126	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
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	M
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).	M

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:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Building 33 - Current Fire Station - PRL 5	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	Building 33 was constructed in 1990 and currently houses the Fire Department (FD). AFFF is stored in the building on fire rescue vehicles as well as bulk storage. At the time of the preliminary assessment (PA), the quantity of AFFF stored at Building 33 was approximately 2,181 gal. The FD historically housed eight vehicles containing AFFF, but at the time of the PA there were only four vehicles, which held approximately 741 gallons of AFFF. There was an additional 440 gal of AFFF in 55-gal drums, and a foam trailer carrying 1,000 gal. Vehicle cleaning is performed inside the bay area of the building. The wash water (or any incidental foam releases) are discharged to the sanitary sewer (and ultimately to the city of Cheyenne's wastewater treatment facility) via floor drains. Typically, fire rescue vehicles are also filled with AFFF in the bay area unless there is an emergency and the vehicles need to be filled elsewhere. Historically, the filling was conducted via an overhead fill system, but at the time of the PA it was performed by hand using a transfer pump. A 2,000-gal aboveground AFFF storage tank for the overhead fill system is installed just underneath the ceiling of Building 33. The tank was emptied and is permanently out of use. At least one release of AFFF within the Fire Station was documented (unknown date and quantity). The City of Cheyenne had reported a disruption in microbe performance at the wastewater treatment facility due to the presence of foam. Any incidental releases of AFFF within the building would enter the floor drains, which lead to an OWS that ultimately discharges to the sanitary sewer system. During the SI, monitoring wells in this area were used to evaluate both PRL 5 and PRL 7, as the sites are co-located.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major waterbearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 5 is primarily covered in a building/pavement with small areas of landscaping.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the EDR Radius Map™ Report with Geocheck®, dated December 17, 2015, lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANG Base. The closest cross/ downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANG Base. The distance from PRL 5 to the water well is unknown. Soil receptors would be unlikely since the area is primarily covered in pavement, but PRL 5 is accessible to civilian and military personnel.

Groundwater Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	89	0.04	2225.0
PFOA	5.4	0.04	135.0
PFBS	3	0.602	5.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2365.0
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	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 Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0093	0.126	0.1
PFOA	0.00013	0.126	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.1**
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	M
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).	M

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:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Former Fire Station - PRL 6	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The Former Fire Station was located just east of the Current Fire Station. The building's construction date is unknown, but FD personnel recall its existence in 1986. It was demolished in approximately 1990. Due to the time frame of its use as a Fire Station, this area is believed to have stored/used AFFF.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major waterbearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 6 is primarily covered in pavement with small landscaped areas.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the EDR Radius Map™ Report with Geocheck®, dated December 17, 2015, lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANG Base. The closest cross/ downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANG Base. The distance from PRL6 to the water well is unknown. Soil receptors would be unlikely since the area is primarily covered in pavement, but PRL 6 is accessible to civilian and military personnel.

Groundwater Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	23	0.04	575.0
PFOA	2.9	0.04	72.5
PFBS	1.5	0.602	2.5

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	650.0
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 Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.023	0.126	0.2
PFBS	0.00014	1.9	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**0.2**
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	M
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).	M

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:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Former F.E. Warren Fire Station - PRL 7	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The F.E. Warren Air Force Base once operated a Fire Station just south of Building 33. The building's construction date is unknown, but FD personnel recall its existence in 1986. It was demolished sometime after 1990. Due to the timeframe of its use as a Fire Station, this area is believed to have stored/used AFFF. During the SI, monitoring wells in this area were used to evaluate both PRL 5 and PRL 7, as the sites are co-located.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major waterbearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 7 is primarily covered in pavement with small areas of landscaping.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the EDR Radius Map™ Report with Geocheck®, dated December 17, 2015, lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANG Base. The closest cross/ downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANG Base. The distance from PRL 7 to the water well is unknown. PRL 7 is located along the flightline, which would restrict access to authorized personnel.

Groundwater Worksheet

Installation: Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFBS	3	0.602	5.0
PFOA	5.4	0.04	135.0
PFOS	89	0.04	2225.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2365.0
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	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)	
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).	
	Groundwater Category	**NA**

Soil Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.43	0.126	3.4
PFOA	0.00068	0.126	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**3.4**
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CHF Value		**CHF VALUE**	**M**

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

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	
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	**MEDIUM**

Site Background Information			
Installation:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	Aircraft Apron - PRL 8	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	The aircraft apron occupies a large portion on the eastern side of the Base. In the late-1990s/early 2000s, a fuel spill (unknown quantity) occurred at Apron Spot 5 and approximately 1 gal of AFFF was applied to the area as a precaution. This use of AFFF and other potential releases to the apron could have ultimately drained to grassy areas surrounding the apron or to the Base storm drain system. The storm drain system would discharge to the Stormwater Retention Pond located in the northeastern corner of the property.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major waterbearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 8 is primarily covered in pavement; however, the samples were collected from the grassy area located east/northeast of the aircraft apron.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the EDR Radius Map™ Report with Geocheck®, dated December 17, 2015, lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANG Base. The closest cross/ downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANG Base. The distance from PRL 8 to the water well is unknown. Soil receptors would be unlikely since the area is primarily covered in pavement, but PRL 4 is accessible to civilian and military personnel.

Groundwater Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	4.3	0.04	107.5
PFOA	1.8	0.04	45.0
PFBS	0.53	0.602	0.9
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**153.4**
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**	**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)	
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)	L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).	L
	Groundwater Category	**MEDIUM**

Soil Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.32	0.126	2.5
PFOA	0.006	0.126	0.0
PFBS	0.000075	1.9	0.0
CHF Scale	**CHF Value**	**Contamination Hazard Factor (CHF)**	**2.6**
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	
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	**MEDIUM**

Site Background Information			
Installation:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater
Site Name and ID:	Stormwater Retention Pond - PRL 10	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The stormwater retention pond was originally built between 1980 and 1982 as a concrete-lined pond. It was cleaned out and rebuilt in 2005 with a new liner. According to the Base Stormwater Pollution Prevention Plan (SWPPP), this pond receives stormwater from Drainage Basin 1 (DA-001), which encompasses the central and western portions of the Base for an approximate total drainage area of 58 acres. A small amount of wastewater from building floor drains is also routed to this pond via oil/ water separators. This pond then discharges to Dry Creek via an unnamed drainage ditch.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major waterbearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 10 is primarily covered in water and grass.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the EDR Radius Map™ Report with Geocheck®, dated December 17, 2015, lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANG Base. The closest cross/ downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANG Base. The distance from PRL 10 to the water well is unknown. Soil receptors would be unlikely since the area is within a fenced area of the installation.

Groundwater Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	4.9	0.04	122.5
PFOA	8.5	0.04	212.5
PFBS	1.7	0.602	2.8

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	337.8
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	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**

Site Background Information			
Installation:	Cheyenne ANG / Wyoming ANG	**Date:**	10/1/2021
Location (State):	Wyoming	**Media Evaluated:**	Groundwater, Soil
Site Name and ID:	POL Fuel Spill - PRL 11	**Phase of Execution (e.g., RI, Record of Decision (ROD)):**	N/A
RPM's Name:	Mark Dickerson	**Agreement Status (e.g., Federal Facility Agreement date signed):**	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary	
Brief Site Description:	The petroleum, oil, and lubricants (POL) facility includes Buildings 10 and 11 and is located on the eastern portion of the Base. In 2002, approximately 5 gal of AFFF were used on a 7,100-gal fuel spill. This release of AFFF was discharged to the catch basin located within the POL facility. According to the Base SWPPP, runoff from this area is routed to an OWS, which is periodically evacuated through a lift station at Outfall SDO-006.
Brief Description of Pathways:	Cheyenne ANGB is underlain by fill and unconsolidated terrace and alluvial fan deposits. The fill deposits are estimated to range in thickness from 5 to 25 ft. The underlying Ogallala Formation consists of lenticular beds of discontinuous sand and gravel and is estimated to be between 300 and 350 ft. thick beneath the Base. The Ogallala Formation and the underlying White River Group are considered to be the major waterbearing units of the High Plains aquifer system in southeastern Wyoming. This aquifer system supplies water to hundreds of private wells in the city of Cheyenne and adjoining suburban areas, and is also the chief source of water for the public-supply wells in the city well field. The groundwater flow direction is generally from southwest to northeast, toward Dry Creek, the closest surface water body. PRL 11 is primarily covered in pavement, but a grassy area is located east/northeast of the spill area.
Brief Description of Receptors:	No potable water wells are located on Cheyenne ANG Base. Drinking water is supplied to the Base by the City of Cheyenne. A review of the EDR Radius Map™ Report with Geocheck®, dated December 17, 2015, lists a total of 173 water wells within a 1-mile radius of the Cheyenne ANG Base. The closest cross/ downgradient drinking water well is located ½ to 1 mile north of the Cheyenne ANG Base. The distance from PRL 11 to the water well is unknown. Soil receptors would be civilian and military personnel accessing Building 11. No residential areas are near PRL 11.

Groundwater Worksheet

Installation Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.56	0.04	14.0
PFOA	0.36	0.04	9.0
PFBS	2.3	0.602	3.8

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	26.8
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 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 Cheyenne ANG / Wyoming ANG

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

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOA	0.0038	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	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	**LOW**