



RELATIVE RISK SITE EVALUATION



Joe Foss Field ANGB, South Dakota

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.

Joe Foss Field 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 Joe Foss Field ANG Base, then enter the AR Number 471744 in the "AR #" field for the PA. For the SI, enter the AR Number 575499 and 599859. 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

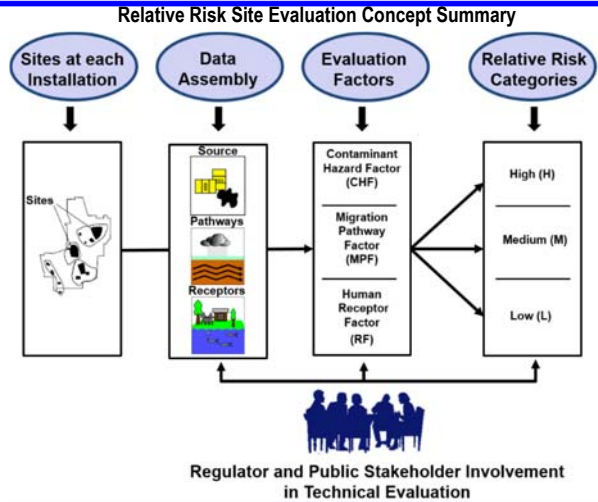
AFFF - Aqueous Film Forming Foam	PFBS – Perfluorobutanesulfonic acid
ANGB - Air National Guard Base	PFOS - Perfluorooctane sulfonate
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act	PFOA - Perfluorooctanoic acid
CHF – Contaminant Hazard Factor	PRL - Potential Release Location
DoD - Department of Defense	RCRA – Resource Conservation and Recovery Act
EPA – US Environmental Protection Agency	RF – Receptor Factor
FTA – Fire Training Area	RI – Remedial Investigation
HA – Health Advisory	RRSE – Relative Risk Site Evaluation
MPF – Migration Pathway Factor	PRL - Potential Release Location
PA – Preliminary Assessment	SI – Site Inspection
PFAS - Per-and polyfluoroalkyl substances	

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/>

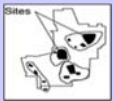
Q. What is the RRSE framework?

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 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.



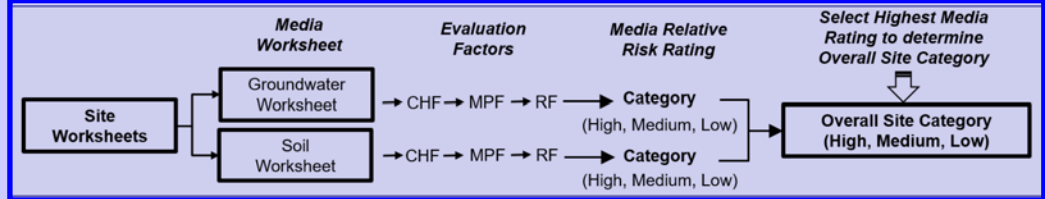
Sites at Each Installation

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

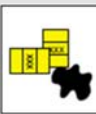


A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.

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

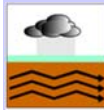
AFCEC CERCLA
Administrative Record (AR)
<https://ar.afcec-cloud.af.mil/>

POINT OF CONTACT

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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.



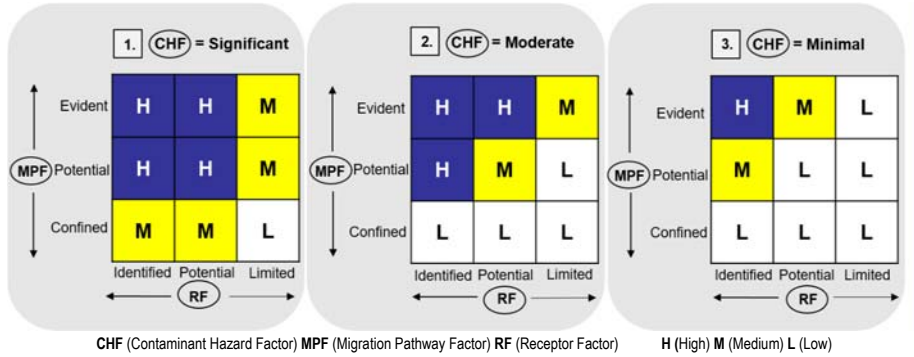
RELATIVE RISK SITE EVALUATION, cont.

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



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**.

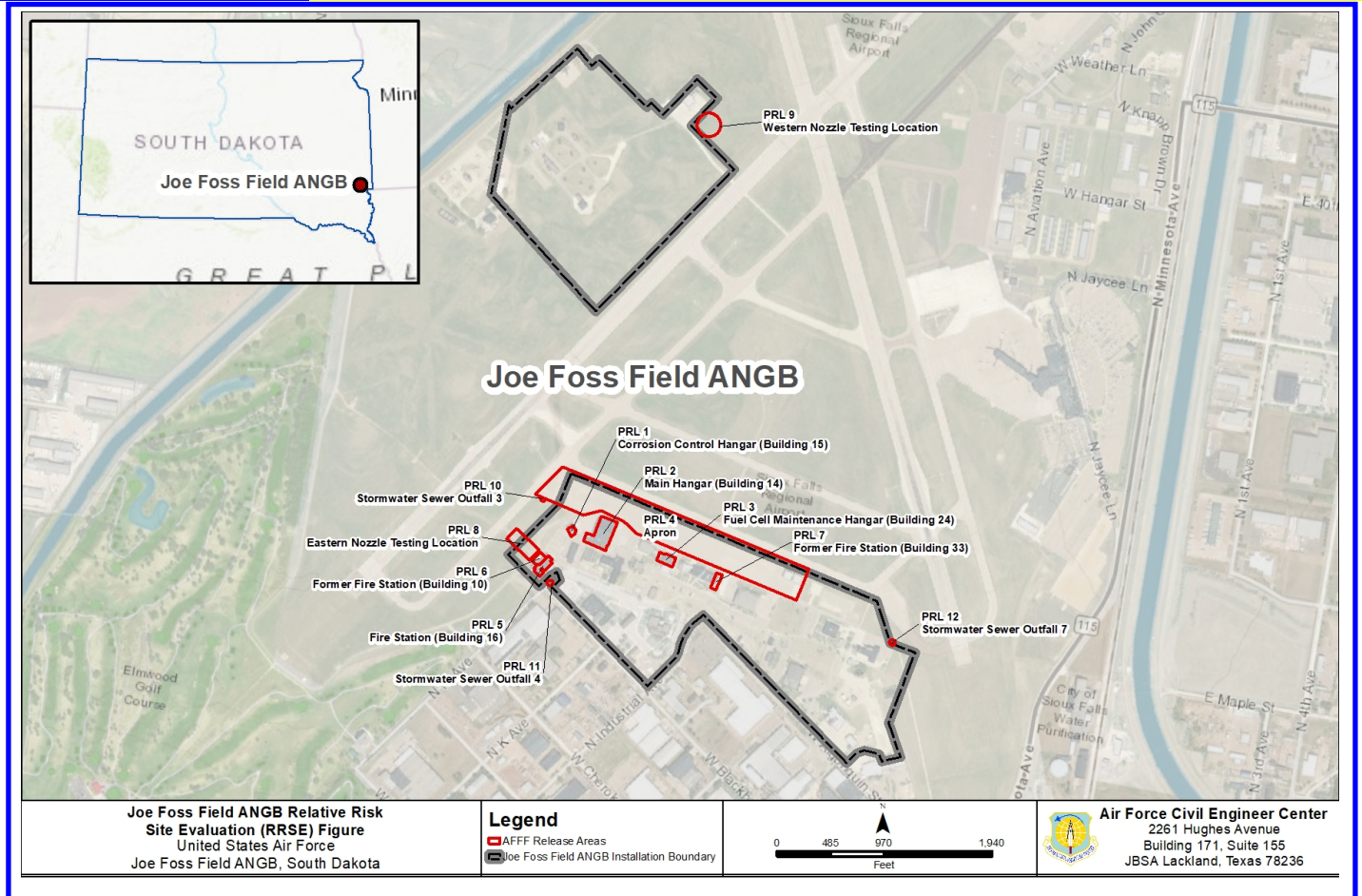
Regulatory and Stakeholder Involvement

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 Joe Foss Field, ANGB, SD

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	PRL 1, PRL 2, PRL 3, PRL 4, PRL 5, PRL 6, PRL 7, PRL 8, PRL 10, PRL 12
MEDIUM	PRL 9, PRL 11
LOW	None



Site Background Information

Installation:	Joe Foss Field Air National Guard Base (ANGB)	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Corrosion Hangar Bldg 15 - PRL 1	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Corrosion Control Hangar was constructed in 1992 and was equipped with an Aqueous Film Forming Foam (AFFF) fire suppression system (FSS). The FSS incorporates a 100 gallon above ground storage tank (AST) and was stored in the mechanical room. The Corrosion Control Hangar floor drains discharge to an oil/water separator (OWS) which then discharges to the sanitary sewer. Upon activation of an alarm when AFFF was released in the building, a diverter valve prior to the OWS inlet line, activates to direct the floor drain's discharge to an underground storage tank (UST). Prior to 2013, after any FSS testing or false activations, the contents of the UST holding tank were slowly meter pumped into the City sanitary sewer with the City's prior approval. In 2013, the City began denying requests for holding tank discharges into the sanitary sewer due to foaming issues and POTW upsets. In 2014, a small wastewater evaporator unit was purchased to concentrate the holding tank AFFF discharges to minimize waste volume. The resulting concentrated FSS discharge waters were shipped as waste through a waste disposal contract. Smaller releases would have been contained within the floor drain system. Larger releases could have impacted soil and groundwater outside the building in the vicinity of the hangar doors. The AFFF system was tested every five years releasing 15-20 gallons/test event. A release of AFFF occurred in Building 15 in 1999 of an unknown quantity.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till within the glacial outwash layer. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Groundwater flow is generally to the west. The boundaries of this PRL are limited to the building which is surrounded by concrete or asphalt paving material.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and perfluorobutane sulfonate (PFBS) have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The Environmental Data Resources (EDR) map in the preliminary assessment (PA) (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.384	0.04	9.6
PFOA	0.548	0.04	13.7
PFBS	0.204	0.602	0.3

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	23.6
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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
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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).	H
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined.	
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).	H

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: Joe Foss Field ANGB

Site ID: PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.153	0.126	1.2
PFOA	0.000908	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.2
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		L
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Main Hangar Bldg 14 - PRL 2	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Main Hangar was constructed in 1977 and is equipped with an AFFF FFS. The FFS includes a 600 gallon AST containing AFFF. In addition, AFFF was stored in the mechanical room. The Main Hangar is equipped with a concrete 280-gallon liquid interceptor vault which captures discharges from floor drains within the building. AFFF released within the building would be captured in the floor drains and discharge to the vault. Upon activation of the AFFF FFS an air activated valve closes the outlet pipe to the sanitary sewer. Smaller releases would have been contained within the floor drain system. Larger releases could have impacted soil and groundwater outside the building in the vicinity of the hangar doors on the east and west sides of the building.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Groundwater flow is generally to the west. The boundaries of this PRL are limited to the building which is surrounded by concrete or asphalt paving material.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	1.8	0.04	45.0
PFOA	0.077	0.04	1.9
PFBS	0.05	0.602	0.1

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	47.0
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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
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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: Joe Foss Field ANGB

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0146	0.126	0.1
PFOA	0.000599	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
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		L
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Fuel Cell Maintenance Hangar Bldg 24 - PRL 3	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Fuel Cell Maintenance Hangar was constructed in 1950 and is equipped with an AFFF FSS. The current FFS includes a 200 gallon AST containing AFFF. In addition, AFFF was stored in the mechanical room of this hangar. The Fuel Cell Maintenance Hangar floor drains discharge to an OWS which then discharges to the sanitary sewer. Upon activation of an alarm when AFFF was released in the building, a diverter valve prior to the OWS inlet line, activates to direct the floor drain's discharge to an UST. Prior to 2013, after any FSS testing or false activations, the contents of the UST holding tank were slowly meter pumped into the City sanitary sewer with the City's prior approval. In 2013, the City began denying requests for holding tank discharges into the sanitary sewer due to foaming issues and POTW upsets. In 2014, a small wastewater evaporator unit was purchased to concentrate the holding tank AFFF discharges to minimize waste volume. The resulting concentrated FSS discharge waters were shipped as waste through a waste disposal contract. Smaller releases would have been contained within the floor drain system. Larger releases could have impacted soil and groundwater outside the building in the vicinity of the hangar doors on the north side of the building.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Groundwater flow is generally to the west. The boundaries of this PRL are limited to the building which is surrounded by concrete or asphalt paving material except for a small grassy strip to the northwest side.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	2	0.04	50.0
PFOA	0.063	0.04	1.6
PFBS	0.416	0.602	0.7

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	52.3
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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
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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: Joe Foss Field ANGB

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0127	0.126	0.1
PFOA	0.000399	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.1
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		L
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Apron - PRL 4	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Apron is a concrete parking area for F-16 aircraft located along the northern boundary of the eastern parcel of the Base. No known releases of AFFF were reported by 114th Fighter Wing (FW) personnel, however due to the nature of the use of the Apron for aircraft operations, there is the potential that AFFF was used in the area. If releases of AFFF occurred in this area it would have dispersed with precipitation and either run-off as sheet flow toward the south and infiltrated in pervious areas adjacent to the Apron or flowed to the stormwater system. Stormwater from the western two-thirds of the apron flows to the west (Outfall 3), while the eastern one-third of the apron flows to the east (Outfall 7). Stormwater enters the conveyance system through drain inlets located along the south side of the Apron. Stormwater from Facility Outfall 3 eventually discharges at the Big Sioux River approximately 0.6 miles west of the outfall via municipal storm sewer. Stormwater from Outfall 7 eventually discharges at the Big Sioux River Diversion Canal located approximately 0.4 miles east of Outfall 7 via municipal storm sewer. A portion of the Apron had soil excavated and was designated IRP Site 12.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Groundwater flow is generally to the west. The boundaries of this PRL are limited to the concrete apron.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	4.1	0.04	102.5
PFOA	0.13	0.04	3.2
PFBS	0.341	0.602	0.6

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	106.3
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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
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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: Joe Foss Field ANGB

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0434	0.126	0.3
PFOA	0.00138	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.4
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		L
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Fire Station Bldg 16 - PRL 5	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The current fire station was built in 2000 and houses vehicles and a foam trailer. The only AFFF stored on-Base, outside of fire suppression systems at Buildings 14, 15 and 24, is in the foam trailer and in 5-gallon totes stored at Building 16. When needed, the totes are used to manually refill the reservoirs in the crash trucks. The Fire Station building has interior trench drains which discharge to a liquid waste interceptor (350 gallon concrete vault), that either discharged to the sanitary sewer, or in the case of an AFFF release would be pumped. The waste interceptor is cleaned by a licensed contractor on a 3 to 4 month basis. According to Fire Station personnel, very minor releases of AFFF likely occurred during filling of equipment which would have been rinsed into trench drains. AFFF could have been released to the environment through cracks and joints in the concrete floor, through leaking drains or the bay doors entrance.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Groundwater flow is generally to the west. The boundaries of this PRL are the building which is surrounded by concrete or asphalt paving material.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	31.5	0.04	787.5
PFOA	3.21	0.04	80.3
PFBS	0.815	0.602	1.4

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	869.1
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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
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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).	H
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined.	
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).	H

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: Joe Foss Field ANGB

Site ID: NA

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	1.14	0.126	9.0
PFOA	0.00775	0.126	0.1
PFBS	0.00172	1.9	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	9.1
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
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Former Fire Station Bldg 10 - PRL 6	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The former fire station, former Bldg. 10, was demolished in approximately 2001. Currently, there is a parking area in the building's approximate former location. Vehicles containing AFFF were stored and refilled with AFFF inside the former building. Fire Station personnel could not recall if trench drains were located inside the building. According to Fire Station personnel, minor releases of AFFF likely occurred during the filling of equipment and could potentially have been released to the environment through cracks and joints in the concrete floor and/or through the bay doors entrance.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Groundwater flow is generally to the west. The boundaries of this PRL are limited to the asphalt parking area (building removed 2001).</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. All wells on-Base or in the vicinity of the Base have been shut down. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 6

AFFF Release Area #: AFFF 6

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	113	0.04	2825.0
PFOA	13	0.04	325.0
PFBS	6.2	0.602	10.3

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	3160.3
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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
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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).	H
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined.	
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).	H

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: Joe Foss Field ANGB

Site ID: PRL 6

AFFF Release Area #: AFFF 6

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	1.98	0.126	15.7
PFOA	0.00469	0.126	0.0
PFBS	0.00165	1.9	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	15.8
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.	
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:	Joe Foss Field ANGB	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Former Fire Station Bldg 33 - PRL 7	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The former fire station, former Bldg. 33, was demolished in approximately 2001. Building 37 was constructed in the approximate location of former Building 33. Vehicles containing AFFF were stored and refilled with AFFF inside the former building. Fire Station personnel could not recall if trench drains were located inside the building. According to Fire Station personnel, minor releases of AFFF likely occurred during the filling of equipment and could potentially have been released to the environment through cracks and joints in the concrete floor and bay doors entrance.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Groundwater flow is generally to the west. The boundaries of this PRL are a building, concrete paved areas and a narrow grassy strip (building removed and replaced with other features).</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.6	0.04	15.0
PFOA	0.016	0.04	0.4
PFBS	0.01	0.602	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	15.4
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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
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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: Joe Foss Field ANGB

Site ID: PRL 7

AFFF Release Area #: AFFF 7

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.266	0.126	2.1
PFOA	0.00101	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2.1
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
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/30/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Eastern Nozzle Testing Area - PRL 8	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Eastern Nozzle Testing Location is a grassy area located west of the Current Fire Station. Prior to 1991, the City provided fire protection at the Base. During that time ,according to current Fire Station personnel, nozzle testing was conducted in this area on a weekly basis. After 1991, ANG assumed responsibility for fire protection at the Base and testing was performed approximately monthly. According to facility personnel, foam was allowed to dissipate in the area. No nozzle testing using AFFF is currently conducted.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. Municipal wells on and in the vicinity of the Base are screened in the unconsolidated deposits above bedrock (up to 40 feet thick). Groundwater table depths vary from 0 to 20 feet. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. Groundwater discharges into the Big Sioux River. Groundwater pumpage occurs primarily in the southern third of the aquifer by the City of Sioux Falls municipal water supply well field. Joe Foss Field is within the boundaries of the Big Sioux River 100- to 500-year floodplain. A diking system was installed protecting the installation from the 100-year flood and was subsequently raised above the 500-year floodplain by the City of Sioux Falls. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Some systems discharge to the Big Sioux River (0.6 miles west of Outfall 3 & 4), Big Sioux River diversion canal (0.4 miles east of Outfall #7), and the remainder drain into a wetland located on Elmwood Golf Course which discharges into the Big Sioux River. Groundwater flow is generally to the west. The boundaries of this PRL are concrete and grassy areas.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 8

AFFF Release Area #: AFFF 8

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	370	0.04	9250.0
PFOA	21.1	0.04	527.5
PFBS	15.9	0.602	26.4

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	9803.9
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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
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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).	H
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined.	
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).	H

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: Joe Foss Field ANGB

Site ID: PRL 8

AFFF Release Area #: AFFF 8

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	10.8	0.126	85.7
PFOA	0.126	0.126	1.0
PFBS	0.0758	1.9	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	86.8
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
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/31/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Western Nozzle Testing Area - PRL 9	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Western Nozzle Testing Location is a grassy area located southeast of the Hush House immediately outside the Base boundary. Nozzle testing was performed approximately once per month in this location. Fire Station personnel estimate that approximately one gallon was discharged during each test and was allowed to dissipate. No nozzle testing using AFFF is currently conducted. This PRL was not investigated during this SI because it is located off-Site and the ANG Request for Proposal Amendment 0001 stipulated that no sampling was required at this site.</p> <p>This PRL is in the vicinity of the Base fire training area IRP Site 3 and IRP Site 4 Aircraft Engine Trim Area. During the Expanded SI, surface soil and three subsurface samples were collected. In addition, six groundwater samples were collected.</p>
Brief Description of Pathways:	<p>The Site is covered concrete and is underlain by approximately 40 feet of unconsolidated glacial sands, gravels and till overlying the Sioux Quartzite. The aquifer is located in the sediment and ranges in thickness from 4 to 48 feet. Municipal wells are screened in the unconsolidated deposits above the Sioux Quartzite. Recharge to the Big Sioux Aquifer is by infiltration of precipitation and seepage from the Big Sioux River. During this ESI, groundwater was measured to have a flow direction primarily from east to west, toward the Big Sioux River. This is a different flow direction than previously understood groundwater flow directions due to the cessation pumping wells at the Joe Foss and surrounding areas that are impacted by PFAS contamination. Soil pathways at PRL 9 include dust inhalation and direct soil exposure during construction activities. Joe Foss Field is within the boundaries of the Big Sioux River 100- to 500-year floodplain. A diking system was installed protecting the installation from the 100-year flood and was subsequently raised above the 500-year floodplain by the City of Sioux Falls. Drainage is by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Some areas drain to the Big Sioux River diversion canal and the remainder drain into a wetland located on Elmwood Golf Course. The wetland then discharges into the Big Sioux River.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System. PRL 9 is outside the Base boundaries north of the west parcel.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 9

AFFF Release Area #: AFFF 9

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOA	0.5	0.04	12.5
PFOS	0.19	0.04	4.7
PFBS	19	0.602	31.6

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	48.8
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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
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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: Joe Foss Field ANGB

Site ID: NA

AFFF Release Area #: AFFF 9

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFBS	0.001	1.9	0.0
PFOS	2.5	0.126	19.8
PFOA	0.01	0.126	0.1
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	19.9
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
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/31/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater
Site Name and ID:	Stormwater Outfall 3 - PRL 10	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>A surface drain inlet located at the Base boundary near the southwest corner of the Apron (PRL 4) has been designated as Outfall 3 for Drainage Area 3. This portion of the Base drainage system receives stormwater flow from: the Corrosion Control Hangar (PRL 1), Main Hangar (PRL 2), Fuel Cell Maintenance Hangar (PRL 3), Former Building 33 (PRL 7), and a portion of the Apron (PRL 4). The drainage pathway continues from the Outfall 3 drain inlet in a 48 inch underground pipe for approximately one-half mile to its discharge point in a wetland adjacent to the Big Sioux River. No known releases of AFFF to the stormwater system were reported by 114th FW personnel.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. A diking system was installed protecting the installation from the 100-year flood and was subsequently raised above the 500-year floodplain by the City of Sioux Falls. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Some systems discharge to the Big Sioux River (0.6 miles west of Outfall 3 & 4), Big Sioux River diversion canal (0.4 miles east of Outfall #7), and the remainder drain into a wetland located on Elmwood Golf Course which discharges into the Big Sioux River. Groundwater flow is generally to the west. This PRL discharges to an underground piping system. This PRL is a grassy area immediately adjacent to the airfield apron.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 10

AFFF Release Area #: AFFF 10

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	5.33	0.04	133.2
PFOA	0.0548	0.04	1.4
PFBS	0.105	0.602	0.2

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	134.8
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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
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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:	Joe Foss Field ANGB	Date:	8/31/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater
Site Name and ID:	Stormwater Outfall 4 - PRL 11	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>A manhole located at the Base boundary has been designated Outfall 4 from Drainage Area 4. This portion of the Base drainage system receives stormwater flow from: Fire Station (PRL 5), Former Building 10 (PRL 6), and the Eastern Nozzle Testing Area (PRL 8). The drainage pathway continues from the Outfall 4 manhole in a 48 inch underground pipe for approximately one-half mile to its discharge point in a wetland adjacent to the Big Sioux River. No known releases of AFFF to the stormwater system were reported by 114th FW personnel.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. A diking system was installed protecting the installation from the 100-year flood and was subsequently raised above the 500-year floodplain by the City of Sioux Falls. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Some systems discharge to the Big Sioux River (0.6 miles west of Outfall 3 & 4), Big Sioux River diversion canal (0.4 miles east of Outfall #7), and the remainder drain into a wetland located on Elmwood Golf Course which discharges into the Big Sioux River. Groundwater flow is generally to the southwest. This PRL discharges to an underground piping system. Surface water entering the underground piping system eventually discharge to the wetland at the nearby golf course.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFC impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFC concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System. Access to the Base is through a controlled gate and is surrounded by a perimeter fence.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 11

AFFF Release Area #: AFFF 11

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.0131	0.04	0.3
PFOA	0.0654	0.04	1.6
PFBS	0.197	0.602	0.3
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2.3
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
<u>Migratory Pathway Factor</u>			
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
<u>Receptor Factor</u>			
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:	Joe Foss Field ANGB	Date:	8/31/2021
Location (State):	South Dakota	Media Evaluated:	Groundwater
Site Name and ID:	Stormwater Outfall 7 - PRL 12	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Keith Freihofer	Agreement Status (e.g., Federal Facility Agreement date signed):	USEPA Administrative Order RCRA 3008(H)
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>A surface drain inlet located at the Base boundary east of the Apron has been designated Outfall 7 for Drainage Area 7. This portion of the Base drainage system receives stormwater flow from a portion of the Apron (PRL 4). Drainage continues underground via the municipal storm sewer for 0.4 miles to the east and eventually discharges at the Big Sioux River Diversion Canal. No known releases of AFFF to the stormwater system were reported by the 114th FW personnel.</p>
Brief Description of Pathways:	<p>The geology in the region consists of crystalline bedrock overlain by as much as 200 feet of glacial deposits. Approximately 200 feet of glacial sediment cover the quartzite over most of the region. The sediment consists primarily of glacial till and glacial outwash. The primary water-bearing stratum in the area of the Base is the Big Sioux Aquifer. The Big Sioux Aquifer is an alluvium mantled outwash that consists of silt, fine to coarse sand, and gravel. The aquifer overlies a relatively impermeable glacial till. A diking system was installed protecting the installation from the 100-year flood and was subsequently raised above the 500-year floodplain by the City of Sioux Falls. The stormwater drainage discharges into the Big Sioux River by overland flow to storm drain inlets and catch basins, which are collected by a network of underground pipes. Some systems discharge to the Big Sioux River (0.6 miles west of Outfall 3 & 4), Big Sioux River diversion canal (0.4 miles east of Outfall #7), and the remainder drain into a wetland located on Elmwood Golf Course which discharges into the Big Sioux River. Groundwater flow is generally to the west. This PRL is a surface drain inlet which discharges into an underground piping system.</p>
Brief Description of Receptors:	<p>The City supplies water to 178,500 citizens. The local water supply includes the Big Sioux River, the Big Sioux Aquifer, the Middle Skunk Creek Aquifer, and purchased water from the Lewis and Clark Regional Water System. The Sioux Falls Public Water Supply has three water supply wells within the Base boundary. Nineteen municipal wells in the airport area, which accounts for approximately (28%) of the municipal water supply production, have been put on standby (shutdown) due to PFAS impacts. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. All wells on-Base or in the vicinity of the Base have been shut down. The Lewis and Clark Water System is providing water to the City to compensate for the deficit caused by the well shutdown. In addition, four of eight private wells, located approximately 1.5 miles southwest of the Base boundary and across the Big Sioux River channel, reported PFAS concentrations in a 2017 sampling event conducted by the Sioux Falls Water Division. The EDR map in the PA (2016) shows 44 wells within a 2-mile radius that potentially could be downgradient from the Base depending on the groundwater flow direction (varies from southwest to south to southeast). In July 2016 the City treated drinking water was checked for PFAS presence and levels were well below the EPA health advisory levels. The City proactively continues to annually PFAS test wells that remain as a source of drinking water, as well as monthly checks of the treated waters supplied by the Lewis & Clark Regional Water System. PRL 12 is immediately outside the Base boundaries adjacent to Runway 33.</p>

Groundwater Worksheet

Installation: Joe Foss Field ANGB

Site ID: PRL 12

AFFF Release Area #: AFFF 12

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.25	0.04	6.3
PFOA	0.15	0.04	3.8
PFBS	1.3	0.602	2.2

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	12.2
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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
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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