



RELATIVE RISK SITE EVALUATION



Alpena County Regional Airport, Michigan

Introduction

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

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

The Alpena County Combat Readiness Training Center (CRTC) PFAS PA and SI can be found at the Air Force CERCLA Administrative Record (AR): <https://ar.afcec-cloud.af.mil/> Scroll to the bottom of the page and click on "Continue to site", then select Air National Guard (e.g., Active, ANG, BRAC), scroll down the Installation List and click on Alpena County Regional Airport, MI, then enter the AR Number 468994 in the "AR #" field for the PA. For the SI, enter the AR Numbers 571391 and 571392. 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
AST – Aboveground Storage Tank	PFOS - Perfluorooctane sulfonate
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act	PFOA - Perfluorooctanoic acid
CHF – Contaminant Hazard Factor	RCRA – Resource Conservation and Recovery Act
DoD - Department of Defense	RF – Receptor Factor
EPA – US Environmental Protection Agency	RI – Remedial Investigation
FTA – Fire Training Area	RRSE – Relative Risk Site Evaluation
HA – Health Advisory	PRL - Potential Release Location
MPF – Migration Pathway Factor	SI – Site Inspection
PA – Preliminary Assessment	SWMU – Solid Waste Management Unit
PFAS - Per-and polyfluoroalkyl substances	



RELATIVE RISK SITE EVALUATION, cont.

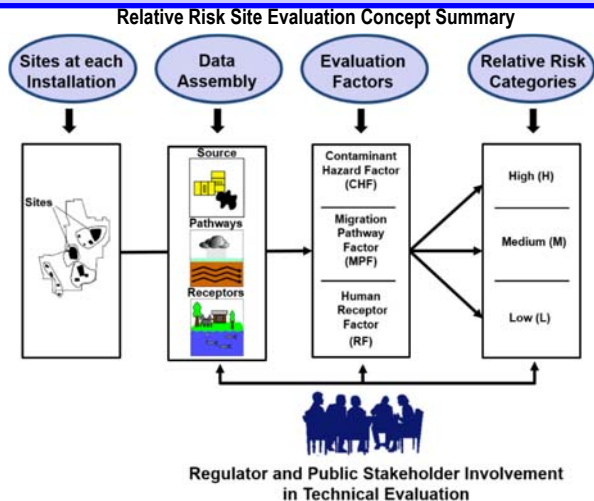


Q. What is the Relative Risk Site Evaluation (RRSE)?

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

Q. What is the RRSE framework?

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



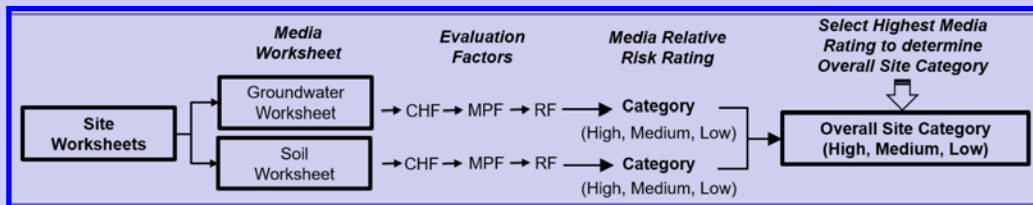
Sites at Each Installation

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

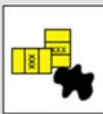


A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.

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



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



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

FOR MORE INFORMATION

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

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

POINT OF CONTACT

Bill Myer NGB/A4VR
774.994.7265

william.myer.2@us.af.mil

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

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



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

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

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



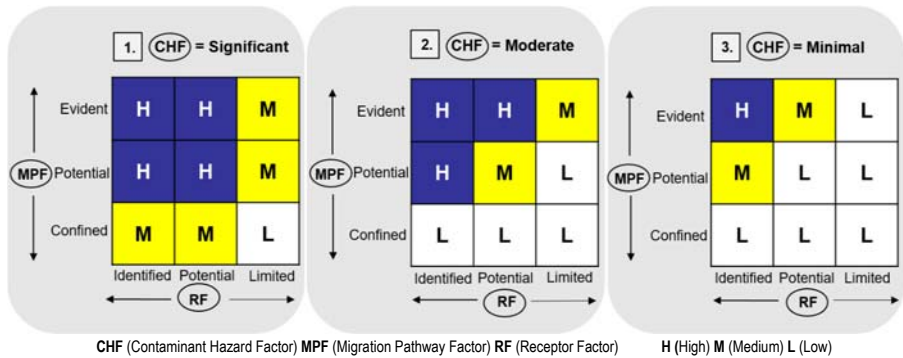
RELATIVE RISK SITE EVALUATION, cont.

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

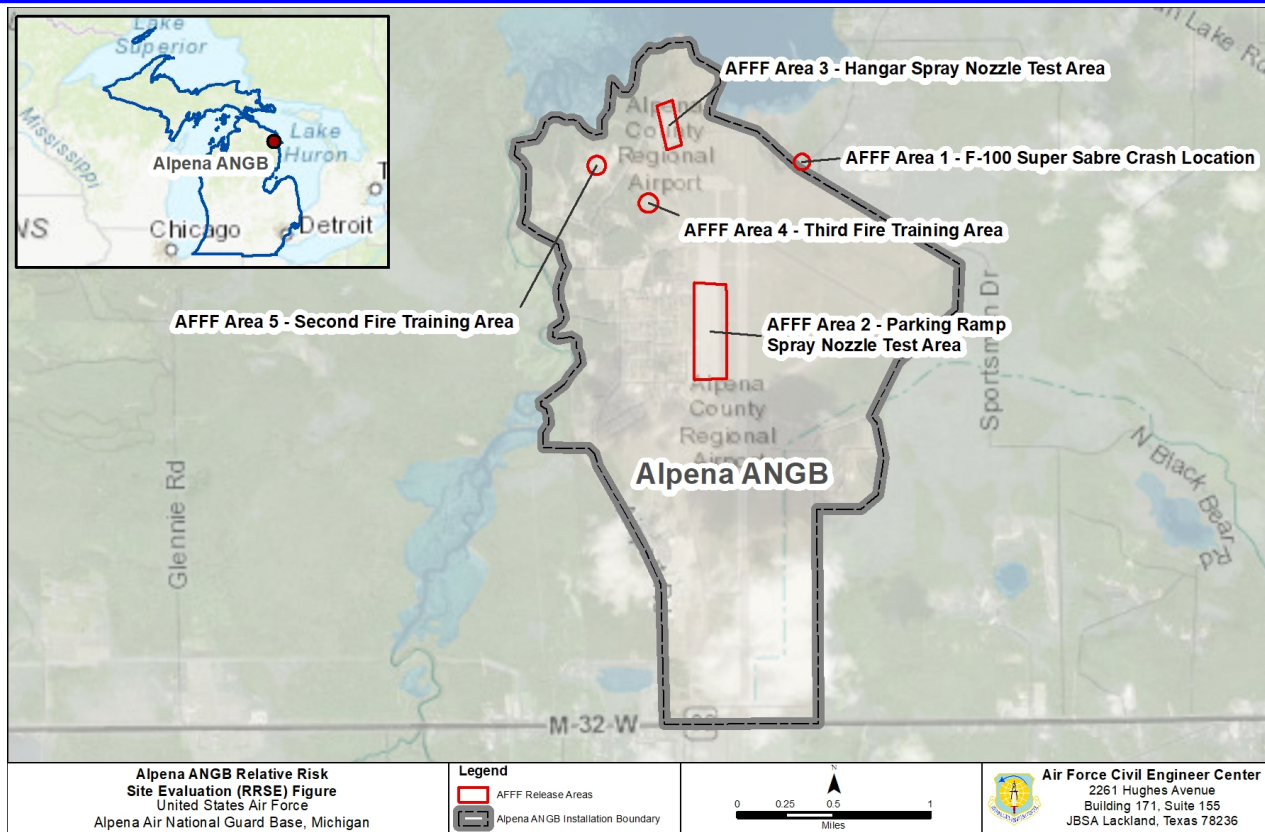
Q. How do I participate as Stakeholder?

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 Alpena County Regional Airport, MI

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	AFFF Area 1, AFFF Area 2, AFFF Area 3, AFFF Area 4, and AFFF Area 5
MEDIUM	none
LOW	none



Notes:
Aqueous Film Forming Foam (AFFF) Area is another term for Potential Release Location (PRL).

Site Background Information

Installation:	Alpena County Regional Airport & Combat Readiness Training Center (CRTC)	Date:	08/20/2021
Location (State):	Michigan	Media Evaluated:	Groundwater, Soil
Site Name and ID:	F-100 Super Sabre Crash - Aqueous Film Forming Foam Area 1 (AFFF Area 1)	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Bill Myer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	In 1977, a single-seat Air National Guard (ANG) F-100 Super Sabre aircraft crashed on the north end of the airport runway near Gate 16, as shown on Figure 3 in Appendix A. The crash site is a vegetated area with trees and underbrush on the north side of Perimeter Road within Alpena County Regional Airport property. The Alpena CRTC Fire Department responded to the aircraft crash, but the type and volume of fire-fighting foam used at the crash site is not known. The crash location is an unpaved, wooded area, with no impervious surfaces and, thus, any Aqueous Film Forming Foam (AFFF) applied during the emergency response would have infiltrated into the subsurface. The crash location is believed to be adjacent to a wetland, but because the precise location is unknown, it is possible that the crash location is within the wetland.
Brief Description of Pathways:	Groundwater flow at AFFF Area 1 is NW, and ranged from 4.65-7.66 feet (ft.) below top of casing (btoc) (672.04-671.99 ft. above mean sea level (amsl)). The main hydrogeological units are: the uppermost unconfined shallow aquifer, the confined Traverse Group limestone, and the confined Detroit River Group. Alpena CRTC is within the outcrop, and recharge area, of the Quaternary Age lacustrine sand of NE Michigan. This glacial sand is ~20 - 60 ft. thick, consists of sand, pebbles, and cobbles with lenses of red-brown clay, forms the surficial aquifer in the area, and is separated from the Traverse Group limestone by a 1-2 ft. thick layer of discontinuous gray clay. The major influence to groundwater flow direction in the aquifer is the large sinkhole at the NE end of the tarmac area (SW of AFFF Area 4), which acts as a recharge conduit to the semi-confined aquifer in the Traverse Group, whose fractured limestones contain conduits that act as preferred flow paths. Sinkholes in the Detroit River Group may allow downward vertical migration of groundwater from the shallow and limestone aquifers above, and due to the nature of these formations, groundwater flow within these two groups is generally unknown. AFFF 1 is a wooded area so infiltration, with precipitation, into the permeable soils is likely, which then could become part of the shallow groundwater system.
Brief Description of Receptors:	There are numerous off-Base groundwater receptors within a 4-mile radius and downgradient (NW) of AFFF Area 1. It is anticipated that the shallow groundwater flow would discharge to Lake Winyah before reaching these wells. Most of Alpena CRTC drinking water is supplied off-Base, by Alpena Township, and no public water supply wells are located within 4 miles of the Base. There is one active drinking water well located in the ammunition area, ~1 mile south (upgradient) of AFFF Area 1, which serves a small portion of the Base population with drinking water. The well was sampled on 21 October 2016 with results indicating that concentrations of PFOS and PFOS were below the detection limit (< 2.0 ppt). The Detroit River Group was formerly tapped by three water production wells at Alpena CRTC from depths of ~540 to 1,110 ft. below ground surface (bgs). Two of the wells have been abandoned, with the last one, inactive. The Michigan Department of Health and Human Services (MDHHS) recently retested drinking water wells near the Alpena CRTC for per- and polyfluoroalkyl substances (PFAS). 71 of 124 owners participated, with retesting indicating that PFAS were found in 19 of the wells, including perfluorooctane sulfonic acid (PFOS), perfluorooctanoic acid (PFOA) and perfluorobutanesulfonic acid (PFBS). Home owners with PFAS detections have been offered water filters. AFFF Area 1 (crash area) is outside the fenced perimeter of the base, so surface soil receptors would have unlimited access, as it is accessible to the general public.

Groundwater Worksheet

Installation: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	3	0.04	75.0
PFOA	0.022	0.04	0.5
PFBS	0.02	0.602	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	75.5
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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: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.011	0.126	0.1
PFOA	0.0004	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.		H
Potential	Potential for receptors to have access to contaminated soil.		
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).		H
Soil Category			MEDIUM

Site Background Information

Installation:	Alpena County Regional Airport (CRTC)	Date:	08/23/2021
Location (State):	Michigan	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Parking Ramp Spray Nozzle Test Area - AFFF Area 2	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Bill Myer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>From the 1970s until 2014, annual spray nozzle testing for fire engines was performed on the concrete parking ramp on the east side of Alpena CRTC, in front of the old fire station (Building 28). The practice was discontinued in 2014 and AFFF is now used only during emergency responses. The area is bordered to the north by concrete, to the west and south by grass and concrete roads, and to the east by grassy areas. Five fire engines performed annual testing to ensure proper equipment operation. Each fire engine contained between 56 and 500 gallons of AFFF. During the annual testing, 20 gallons or less of AFFF was discharged from each fire engine (less than 100 gallons total) onto the concrete. Surface runoff fluids from the testing would travel to the edge of the concrete onto the grass and infiltrate into the sandy soil.</p>
Brief Description of Pathways:	<p>Groundwater flow at AFFF Area 2 is northward, and ranged from 4.36-7.56 ft. btoc (676.34-675.88 ft. amsl). The main hydrogeological units are: the uppermost unconfined shallow aquifer, the confined Traverse Group limestone, and the confined Detroit River Group. Alpena CRTC is within the outcrop, and recharge area, of the Quaternary Age lacustrine sand of NE Michigan. This glacial sand is ~20 - 60 ft thick, consists of sand, pebbles, and cobbles with lenses of red-brown clay, forms the surficial aquifer in the area, and is separated from the Traverse Group limestone by a 1-2 ft thick layer of discontinuous gray clay. The major influence to groundwater flow direction within the aquifer is the large sinkhole at the NE end of the tarmac area (SW of AFFF Area 4), which acts as a recharge conduit to the semi-confined aquifer in the Traverse Group, whose fractured limestones contain conduits that act as preferential flow paths. Sinkholes into the Detroit River Group may allow downward vertical migration of groundwater from the shallow and limestone aquifers above, and due to the nature of these formations, groundwater flow within these two Groups is generally unknown. AFFF Area 2 is concrete, so infiltration is minimal, depending on the concrete condition. Runoff would be to the east, into the grass/soil where it would combine with precipitation and become part of the shallow groundwater system.</p>
Brief Description of Receptors:	<p>There are numerous off-Base groundwater receptors within a 4-mile radius and downgradient (N) of AFFF Area 2. It is anticipated, but not confirmed, that the shallow groundwater flow would discharge to Lake Winyah before reaching these wells. The closest private drinking water well downgradient of AFFF Area 2 is over a mile to the NE. Most of Alpena CRTC drinking water is supplied off-Base, by Alpena Township, and no public water supply wells are located within 4 miles of the Base. There is one active drinking water well located in the ammunition area, ~0.5 miles SE (side-gradient) of AFFF Area 2, which serves a small portion of the Base population with drinking water. The well was sampled on 21 October 2016 with results indicating that concentrations of PFOS and PFOS were below the detection limit (< 2.0 ppt). The Detroit River Group was formerly tapped by three water production wells at Alpena CRTC from depths of ~540 to 1,110 ft. bgs. Two of the wells have been abandoned, with the last one, inactive. The MDHHS recently retested drinking water wells near Alpena CRTC for PFAS. 71 of 124 owners participated, and results indicate that PFAS (including PFOS, PFOA, and PFBS) were found in 19 wells. Homeowners with PFAS detections have been offered water filters. Surface soil receptors would most likely be commercial/industrial workers with special permission to be within a restricted area, as the Parking Ramp is within the flightline security fence.</p>

Groundwater Worksheet

Installation: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.23	0.04	5.8
PFOA	0.025	0.04	0.6
PFBS	0.0096	0.602	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	6.4
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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).	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: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0059	0.126	0.0
PFOA	0.00078	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.0
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	CHF VALUE		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:	Alpena County Regional Airport (CRTC)	Date:	08/25/2021
Location (State):	Michigan	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Hangar Spray Nozzle Test Area - AFFF Area 3	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Bill Myer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>From the 1970s until 2014, if the Parking Ramp Spray Nozzle Test Area (AFFF Area 2) was not accessible when the annual testing of the fire engines was due, the testing was performed on the concrete parking ramp outside of the maintenance hangar (Building 601) on the north end of Alpena CRTC, approx. 400 ft. east of the intersection of Hangar Road and Maintenance Road. The practice was discontinued in 2014, and AFFF is now used only during emergency responses. The parking ramp is bordered to the north by alert shelters (Buildings 603, 604, 605, and 607), to the west by the maintenance hangar, and to the south and east by grassy areas. Each of the five fire engines released less than 20 gallons of AFFF (total of less than 100 gallons per event) onto the concrete, but there is no clear estimate on the number of tests that were performed in this area. Surface runoff fluids from the testing traveled to the edge of the concrete, onto the grassy areas, and infiltrated into the sandy soil.</p>
Brief Description of Pathways:	<p>Groundwater flow at AFFF Area 3 is southward, and ranged from 15.09-16.74 ft. btoc (672.89-673.12 ft. amsl). The main hydrogeological units are: the uppermost unconfined shallow aquifer, the confined Traverse Group limestone, and the confined Detroit River Group. Alpena CRTC is within the outcrop, and recharge area, of the Quaternary Age lacustrine sand of NE Michigan. This glacial sand is ~20-60 ft. thick, consists of sand, pebbles, and cobbles with lenses of red-brown clay, forms the surficial aquifer in the area, and is separated from the Traverse Group limestone by a 1-2 ft thick layer of discontinuous gray clay. The major influence to groundwater flow direction in the aquifer is the large sinkhole at the NE end of the tarmac area (SW of AFFF Area 4), which acts as a recharge conduit to the semi-confined aquifer in the Traverse Group, whose fractured limestones contain conduits that act as preferred flow paths. Sinkholes into the Detroit River Group may allow downward vertical migration of groundwater from the shallow and limestone aquifers above, and due to the nature of these formations, groundwater flow within these two Groups is generally unknown. AFFF Area 3 is concrete, so depending on the condition, infiltration is minimal. Runoff would be to the east, into the grass/soil where it would combine with precipitation and become part of the shallow groundwater system.</p>
Brief Description of Receptors:	<p>There are numerous off-Base groundwater receptors within 4 miles downgradient (south) of AFFF Area 3. The Michigan Department of Environment, Great Lakes, and Energy (EGLE) website shows two private water supply wells. One well (~1.25 miles S) is on airport property and screened in glacial drift from 38-42 ft. bgs. The second well (~1.3 miles SW) is screened in glacial drift from 25-30 ft. bgs. It is anticipated that shallow groundwater will discharge to the sinkhole rather than travel further S and W to impact the drinking water wells. Most of Alpena CRTC drinking water is supplied off-Base, by Alpena Township, and no public water supply wells are located within 4 miles of the Base. An active drinking water well is located in the ammunition area, ~1.5 miles to the SE (side-gradient). The Detroit River Group was tapped by three water production wells at Alpena CRTC from depths of ~540 to 1,110 ft. bgs. Two of the wells have been abandoned, with the last one, inactive. The MDHHS recently retested drinking water wells near Alpena CRTC for PFAS. 71 of 124 owners participated, and results indicate that PFAS (including PFOS, PFOA, and PFBS) were found in 19 wells. Homeowners with PFAS detections have been offered water filters. Surface soil receptors would have limited access to contaminated soil, such as firefighters, or commercial/industrial workers with special permission to be in a restricted area.</p>

Groundwater Worksheet

Installation: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	1.1	0.04	27.5
PFOA	0.48	0.04	12.0
PFBS	0.084	0.602	0.1
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	39.6
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	CHF VALUE		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).		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
<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

Soil Worksheet

Installation: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.13	0.126	1.0
PFOA	0.00092	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.0
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	CHF VALUE		L
<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.		
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:	Alpena County Regional Airport (CRTC)	Date:	08/25/2021
Location (State):	Michigan	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Third Fire Training Area (FTA) -AFFF Area 4	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Bill Myer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Third FTA was designated "Site 4" in the Installation Restoration Program (IRP) documents at Alpena CRTC, and has been designated AFFF Area 4 for the current project. The former FTA is a grassy field located on the west side of Hangar Road, ~100 feet north of the large sinkhole in the northern portion of Alpena CRTC. The area is bordered on the south by the sinkhole, to the north and east by grassy areas, and to the west by wooded areas. The third FTA was active from 1974 to 1986, and consisted of a concrete pad, earthen dikes, and an underground pipeline. Training activities reportedly occurred ~10 times per year at the site, in which fuel was pumped through the pipeline from a tanker to the concrete pad and ignited. There are no record logs indicating whether AFFF was used during the training exercises or the quantity of AFFF released at the site. All concrete structures and other associated building materials associated with the FTA have been removed.</p>
Brief Description of Pathways:	<p>Groundwater depths at AFFF Area 4 ranged from 19.24-24.22 ft. btoc (665.98-660.59 ft. amsl), and flow is SW. The main hydrogeological units are: the uppermost unconfined shallow aquifer, the confined Traverse Group limestone, and the confined Detroit River Group. Alpena CRTC is within the outcrop, and recharge area, of the Quaternary Age lacustrine sand of NE Michigan. This glacial sand is ~20-60 ft. thick, consists of sand, pebbles, and cobbles with lenses of red-brown clay, forms the surficial aquifer in the area, and is separated from the Traverse Group limestone by a 1-2 ft. thick layer of discontinuous gray clay. The major influence to groundwater flow direction within the aquifer is the large sinkhole at the NE end of the tarmac area (SW of AFFF Area 4), which acts as a recharge conduit to the semi-confined aquifer in the Traverse Group, whose fractured limestones contain conduits that act as preferential flow paths. Sinkholes into the Detroit River Group may allow downward vertical migration of groundwater from the shallow and limestone aquifers above, and due to the nature of these formations, groundwater flow within these two Groups is generally unknown. AFFF Area 4 is within a grassy area, so infiltration into the soil with precipitation to become part of the shallow groundwater system was likely.</p>
Brief Description of Receptors:	<p>There are numerous off-Base groundwater receptors within 4 miles downgradient (SW) of AFFF Area 4. The EGLE website shows two private water supply wells to the S and SW of the site area. One well (~1 mile S), on airport property, is screened in glacial drift from 38-42 ft. bgs. The second well (~1 mile SW) is screened in glacial drift, 25-30 ft. bgs. It is anticipated that shallow groundwater will discharge to the sinkhole rather than travel further south and west to impact the drinking water wells. Most of Alpena CRTC drinking water is supplied off-Base, by Alpena Township, and no public water supply wells are located within 4 miles of the Base. An active drinking water well is located in the ammunition area, ~1 mile to the SE (side-gradient). The well was sampled on 21 October 2016 with results indicating that concentrations of PFOS and PFOS were below the detection limit (< 2.0 ppt). The Detroit River Group was formerly tapped by three water production wells at Alpena CRTC from depths of ~540 to 1,110 ft. bgs. Two of the wells have been abandoned, with the last one, inactive. The MDHHS recently retested drinking water wells near Alpena CRTC for PFAS. 71 of 124 owners participated, and results indicate that PFAS (including PFOS and PFOA) were found in 19 wells. Homeowners with PFAS detections have been offered water filters. Surface soil receptors would have potential access to contaminated soil, such as commercial/industrial workers with controlled or restricted frequency of access.</p>

Groundwater Worksheet

Installation: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	67	0.04	1675.0
PFOA	15	0.04	375.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	2050.0
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	CHF VALUE		H
<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).		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
<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

Soil Worksheet

Installation: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.39	0.126	3.1
PFOA	0.0013	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	3.1
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.		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:	Alpena County Regional Airport (CRTC)	Date:	08/25/2021
Location (State):	Michigan	Media Evaluated:	Groundwater, Soil
Site Name and ID:	Second Fire Training Area (FTA) -AFFF Area 5	Phase of Execution (e.g., RI, Record of Decision (ROD)):	N/A
RPM's Name:	Bill Myer	Agreement Status (e.g., Federal Facility Agreement date signed):	N/A
OVERALL SITE CATEGORY: HIGH			

Site Summary

Brief Site Description:	<p>The Second FTA was designated "Site 5" in the IRP documents at Alpena CRTC and has been designated AFFF Area 5 for the current project. The former FTA is in the northwest portion of Alpena CRTC, ~600 ft. south of the shore of Lake Winyah, and 600 ft. west of Maintenance Rd. The area currently consists of an open grassy field with dirt roads crossing it. The area is bordered to the north by a Military Operations on Urban Terrain training area, to the east by a Rapid Runway Repair training area, to the west by wooded areas, and to the south by lacustrine sand outcrops. The sand is quarried to make sand bags for training exercises at the facility. Two to three fire training exercises were reportedly conducted each year between 1965-1974. The site had no formal containment structures such as a concrete pad or berm, so during each exercise, ~300 gallons of JP-4 was released directly to the ground surface and ignited. There are no record logs indicating whether AFFF was used during the training exercises or the quantity of AFFF released at the site. Given years of operation, however, it is presumed that AFFF may have been used.</p>
Brief Description of Pathways:	<p>Groundwater depths at AFFF Area 5 ranged from 3.85-6.38 ft. btoc (673.17-674.88 ft. amsl), and flow direction is east. The main hydrogeological units are: the uppermost unconfined shallow aquifer, the confined Traverse Group limestone, and the confined Detroit River Group. Alpena CRTC is within the outcrop, and recharge area, of the Quaternary Age lacustrine sand of NE Michigan. This glacial sand is ~20-60 ft thick, consists of sand, pebbles, and cobbles with lenses of red-brown clay, forms the surficial aquifer in the area, and is separated from the Traverse Group limestone by a 1-2 ft. thick layer of discontinuous gray clay. The major influence to groundwater flow direction in the aquifer is the large sinkhole at the northeast end of the tarmac area (southwest of AFFF Area 4), which acts as a recharge conduit to the semi-confined aquifer in the Traverse Group, whose fractured limestones contain conduits that act as preferential flow paths. Sinkholes into the Detroit River Group may allow downward vertical migration of groundwater from the shallow and limestone aquifers above, and due to the nature of these formations, groundwater flow within these two Groups is generally unknown. AFFF Area 5 is located in a gravelly/grassy area, so infiltration is likely where it would combine with precipitation and become part of the shallow groundwater system.</p>
Brief Description of Receptors:	<p>There are numerous off-Base groundwater receptors within 4 miles downgradient (east) of AFFF Area 5. The EGLE website shows two private water supply wells to the S and SW of the site area. One well (~1 mile S), on airport property, is screened in glacial drift from 38-42 ft. bgs. The second well (~1 mile SW) is screened in glacial drift, 25-30 ft. bgs. Most of Alpena CRTC drinking water is supplied off-Base, by Alpena Township, and no public water supply wells are located within 4 miles of the Base. There is one active drinking water well located in the ammunition area, ~1 mile to the southeast (side-gradient). The Detroit River Group was formerly tapped by three water production wells at Alpena CRTC from depths of ~540 to 1,110 ft. bgs. Two of the wells have been abandoned, with the last one, inactive. The MDHHS recently retested drinking water wells near Alpena CRTC for PFAS. 71 of 124 owners participated, and results indicate that PFAS (including PFOS, PFOA, and PFBS) were found in 19 wells. Homeowners with PFAS detections have been offered water filters. Surface soil receptors would have potential access to contaminated soil, such as commercial/industrial workers with controlled or restricted frequency of access, as this area of the base is very active.</p>

Groundwater Worksheet

Installation: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	2.3	0.04	57.5
PFOA	0.41	0.04	10.2
PFBS	0.19	0.602	0.3

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	68.0
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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).	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: Alpena County Regional Airport (CRTC)

Site ID: AFFF Area 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0015	0.126	0.0
PFOA	0.00022	0.126	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.0
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	CHF VALUE		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.		M
Limited	No potential for receptors to have access to contaminated soil.		
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M
Soil Category			LOW