



RELATIVE RISK SITE EVALUATION



Kellogg Air National Guard Base (Battle Creek), 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 Kellogg Air National Guard Base (ANGB) (Battle Creek) 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 Kellogg APT (Battle Creek), MI then enter the AR Number 472066 in the "AR #" field for the PA. For the SI, enter the AR Number 585945. 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.

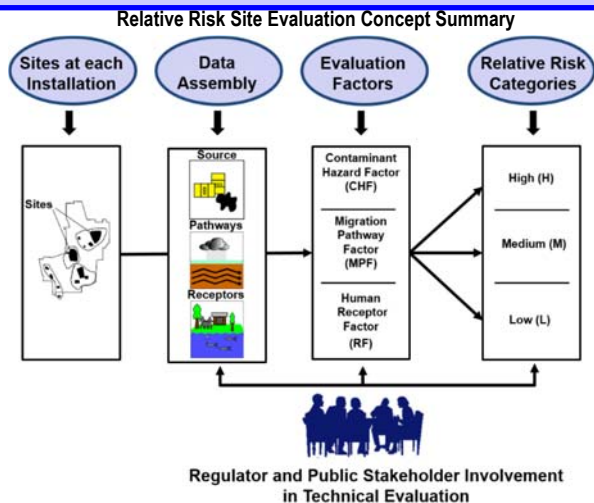


Q. What is the Relative Risk Site Evaluation (RRSE)?

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.



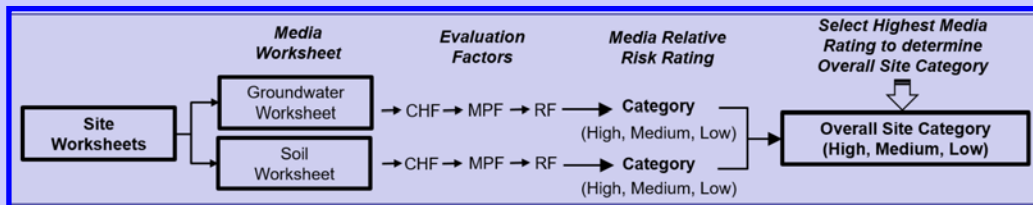
Sites at Each Installation

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

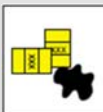


A. Restoration sites in CERCLA phases prior to remedy-in-place are evaluated in the process. Worksheets are developed for environmental media at each site. For consistency across all the Installations, only surface soil (0-1 foot deep) and groundwater media were evaluated in the RRSE.

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/>

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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.



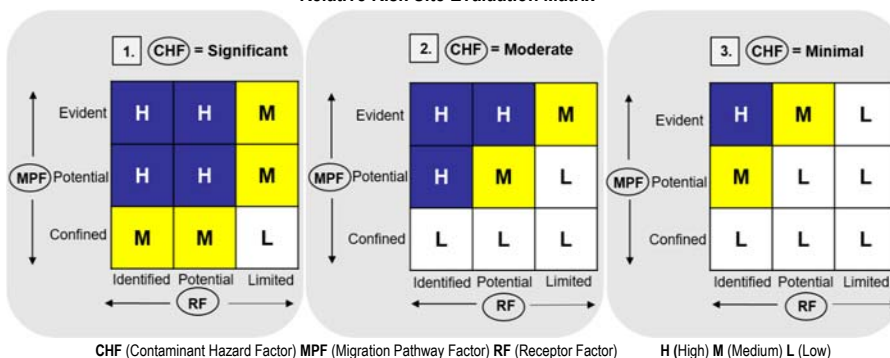
RELATIVE RISK SITE EVALUATION, cont.

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

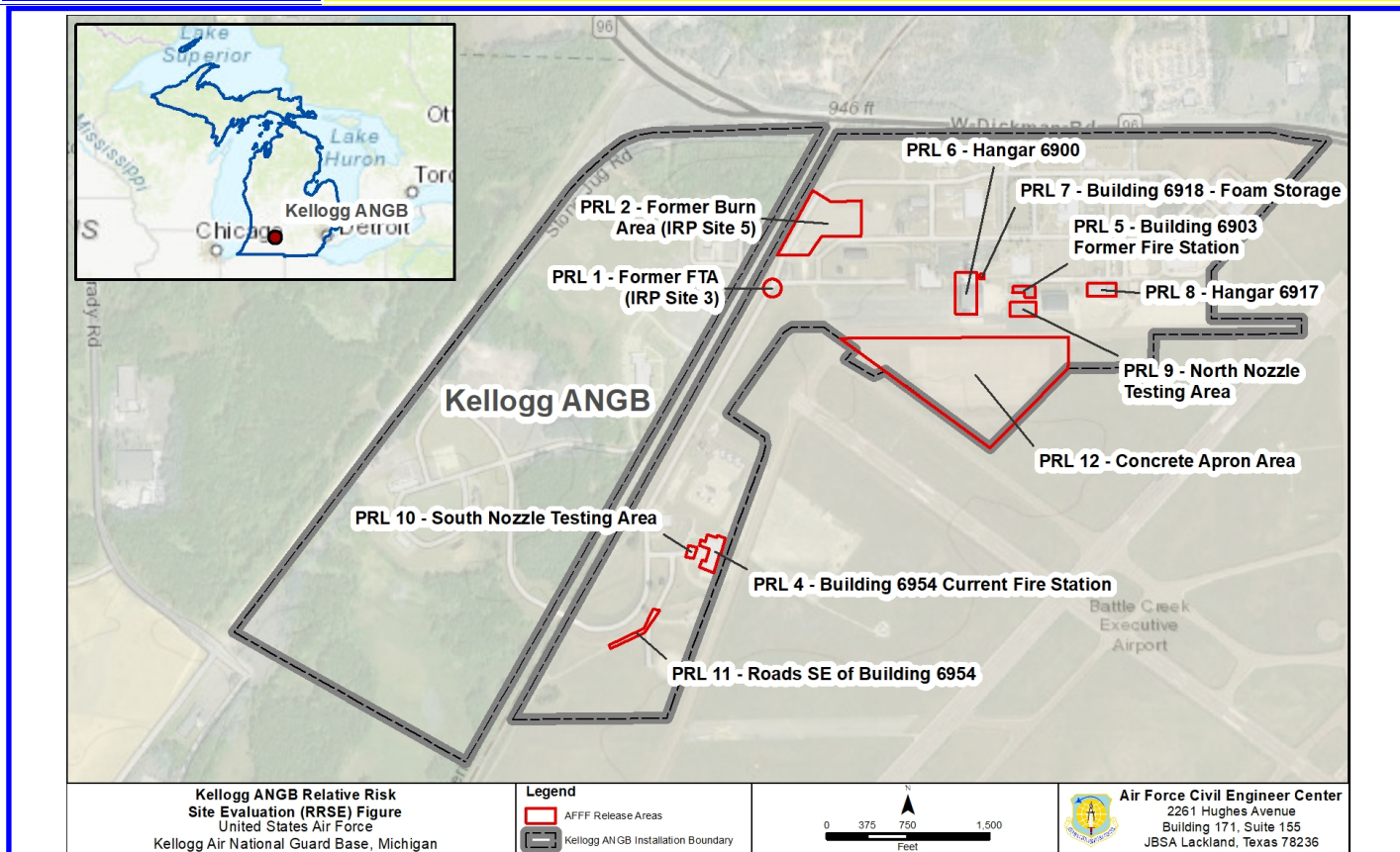
Q. How do I participate as Stakeholder?



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 Kellogg APT (Battle Creek)

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



Notes:

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

Site Background Information

| | | | |
|------------------------------------|---|---|-------------------|
| Installation: | Kellogg Air National Guard Base (ANGB) | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Former Fire Training Area - Installation Restoration Program Site 3 - PRL-1 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

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|--|--|
| Brief Site Description: | <p>The Former Fire Training Area (FTA) encompasses approximately 0.6 acres located approximately 1150 feet south of Dickman Road and 200 feet east of Grand Trunk Western Railroad tracks. According to the preliminary assessment (PA) Report, firefighting training exercises were conducted at this site from 1977 to 1986 in an area with a diameter of approximately 85 feet surrounded by an earthen berm. Approximately 54,000 to 74,000 gallons of waste mixtures, including jet propulsion fuel #4, oils, hydraulic fluids, and spent cleaning solvents were reportedly floated on top of water, ignited, and extinguished during these exercises. Remedial action activities in 1997 included the installation of a 12-inch, 105-foot (ft.) diameter clay cap, installation and operation of an air sparging/soil vapor extraction system. The PA Report stated that it was assumed that Aqueous Film Forming Foam (AFFF) was used from 1977 to 1986 during firefighting training activities; however, per- and polyfluoroalkyl substances (PFAS) were not contaminants of concern under the Installation Restoration Program (IRP) while remedial activities were conducted. As such, soil and/or groundwater samples were not analyzed for PFAS.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. below ground surface (bgs), in the same direction as natural surface water movement.</p> <p>PRL-1 is a grassy open area, soils are exposed and vegetated.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), and perfluorobutane sulfonate (PFBS) have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. The State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above lifetime health advisory (LHA). The state provided bottled water to eight homes, with 25 homes being provided filters. It is likely there are additional potable wells within four miles of the base. PRL-1 is located within the base boundary near service roads and a taxiway. Receptors would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-1

AFFF Release Area #: AFFF 1

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|-------------|------------------------------|-------------------------|--------|
| PFOS | 53 | 0.04 | 1325.0 |
| PFOA | 23 | 0.04 | 575.0 |
| PFBS | 0.49 | 0.602 | 0.8 |

| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 1900.8 |
|-----------|-----------|-----------------------------------|---------------|
|-----------|-----------|-----------------------------------|---------------|

| | | |
|---------------|-------------------|--|
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ |
| 100 > CHF > 2 | M (Medium) | |
| 2 > CHF | L (Low) | |

| | | |
|-----------|------------------|----------|
| CHF Value | CHF VALUE | H |
|-----------|------------------|----------|

Migratory Pathway Factor

| | | |
|---------------------------------|---|---|
| Evident | Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well). | 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: Kellogg ANGB

Site ID: PRL-1

AFFF Release Area #: AFFF 1

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.13 | 0.126 | 1.0 |
| PFOA | 0.0013 | 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. | | |
| 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 |

Site Background Information

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|------------------------------------|---------------------------------------|---|-------------------|
| Installation: | Kellogg ANGB | Date: | 08/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Former Burn Area - IRP Site 5 - PRL-2 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

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|--|---|
| Brief Site Description: | <p>The Former Burn Area – IRP Site 5, was used as a burn area and firefighting training exercises were carried out a few times in 1978 to ignite and subsequently extinguish a damaged aircraft prior to it being shipped off-base for disposal. The burn area was located in the southwestern portion of IRP Site 5, in the central eastern portion of the base. Approximately 1,800 to 2,400 gallons of fuel and/or solvents were reported to have been used in this area. Under the IRP, sampling activities were conducted during a site inspection (SI) in 1991, which included groundwater sampling for volatile organic compounds (VOCs). VOCs detected in the groundwater were attributed to IRP Site 3. A removal action, including soil stabilization and capping as part of a Source Removal Action Plan was completed in 1995. The PA Report stated that AFFF was likely used during the 1978 training exercises; however, PFAS were not contaminants of potential concern (COPCs) under the IRP while remedial activities were conducted. As such, soil and/or groundwater samples were not analyzed for PFAS.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>PRL-2 is covered in asphalt with adjacent grassy areas.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. TReceptors would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-2

AFFF Release Area #: AFFF 2

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|---------------------------------|---|--|-------------|
| PFOS | 1 | 0.04 | 25.0 |
| PFOA | 0.11 | 0.04 | 2.7 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 27.7 |
| 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: Kellogg ANGB

Site ID: PRL-2

AFFF Release Area #: AFFF 2

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.012 | 0.126 | 0.1 |
| PFOA | 0.00033 | 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. | | M |
| Limited | No potential for receptors to have access to contaminated soil. | | |
| Receptor Factor | DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H). | | M |
| Soil Category | | | LOW |

Site Background Information

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|------------------------------------|--|---|-------------------|
| Installation: | Kellogg ANGB | Date: | 08/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Current Fire Station - Bldg 6954 - PRL-4 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

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|--|---|
| Brief Site Description: | <p>Building 6954 was constructed in 1997 and renovated in 2005. At the time of the 2015 PA site visit, AFFF was being stored in 5-gallon buckets in a storage room of this building and in an AFFF foam trailer; however, there was no AFFF fire safety system (FSS) in the building. The floor drains in Building 6954 were connected to the sanitary sewer system via an oil/water separator (OWS) which is connected to the City of Battle Creek's wastewater treatment plant (WWTP). According to base personnel, there was never an on-base WWTP. During the 2015 PA site visit, the Fire Chief reported that there were no known releases of AFFF at Building 6954.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>PRL-4 is surrounded by grassy areas and asphalted roadways.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-4

AFFF Release Area #: AFFF 4

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|--|---|--|-------------|
| PFOS | 1.6 | 0.04 | 40.0 |
| PFOA | 0.042 | 0.04 | 1.0 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 41.1 |
| 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 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: Kellogg ANGB

Site ID: PRL-4

AFFF Release Area #: AFFF 4

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|-------------|
| PFOS | 0.29 | 0.126 | 2.3 |
| PFOA | 0.00079 | 0.126 | 0.0 |
| 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 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: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Former Fire Station - Bldg 6903 - PRL-5 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

| | |
|--|---|
| Brief Site Description: | <p>Building 6903 was constructed in 1960 and housed the fire department until 1997. As noted during the PA site visit, there was no AFFF FSS installed in the former fire station. It was noted that AFFF would have been stored at this location, but the quantities of stored material were not known by base personnel. The building is equipped with floor drains that lead to the sanitary sewer and are routed to the City's WWTP. Base personnel were unaware of any releases of AFFF at this building.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>Soil samples were collected from asphalted areas at PRL-5.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-5

AFFF Release Area #: AFFF 5

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|-------------|------------------------------|-------------------------|--------|
| PFOS | 1.8 | 0.04 | 45.0 |
| PFOA | 0.21 | 0.04 | 5.2 |
| PFBS | 0.015 | 0.602 | 0.0 |

| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 50.3 |
|-----------|-----------|-----------------------------------|-------------|
|-----------|-----------|-----------------------------------|-------------|

| | | |
|---------------|-------------------|--|
| 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 |
|-----------|------------------|----------|

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: Kellogg ANGB

Site ID: PRL-5

AFFF Release Area #: AFFF 5

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.049 | 0.126 | 0.4 |
| 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. | | M |
| Limited | No potential for receptors to have access to contaminated soil. | | |
| Receptor Factor | DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H). | | M |
| Soil Category | | | Low |

Site Background Information

| | | | |
|------------------------------------|---------------------|---|-------------------|
| Installation: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Hangar 6900 - PRL-6 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

| | |
|--|---|
| Brief Site Description: | <p>Hangar 6900 was constructed in 1960. At the time of the 2015 PA site visit, Hangar 6900 contained an AFFF FSS. The system was equipped with overhead piping and oscillating monitors in the four corners of the hangar, and one each along the eastern and western central portions of the hangar. The hangar was the former home of several A-10 and C-21 aircraft until 2013. The building is equipped with floor drains which are connected to an OWS and the sanitary sewer system, and subsequently routed to the City of Battle Creek's WWTP. The PA Report stated that during bi-annual AFFF system testing, the floor drains would be plugged and hangar doors left open. The AFFF that was released during the tests was allowed to flow onto the hangar apron and naturally dissipate. The Fire Chief reported that the system has not been used since approximately 2010 when the system was taken out of service. During the last scheduled AFFF FSS test, the foam was drained from within the FSS pipes. Current use of Hangar 6900 is for vehicle and equipment parking/storage, an exercise area, and offices. Storm water in the vicinity of the building is directed to Outfall #2 in the southwestern portion of the base.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>Soil samples were collected from asphalted areas near the apron area.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-6

AFFF Release Area #: AFFF 6

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|-------------|------------------------------|-------------------------|--------|
| PFOS | 0.051 | 0.04 | 1.3 |
| PFOA | 0.19 | 0.04 | 4.7 |
| PFBS | 0.25 | 0.602 | 0.4 |

| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 6.4 |
|-----------|-----------|-----------------------------------|-----|
|-----------|-----------|-----------------------------------|-----|

| | | |
|---------------|------------|--|
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ |
| 100 > CHF > 2 | M (Medium) | |
| 2 > CHF | L (Low) | |

| | | |
|-----------|------------------|----------|
| CHF Value | CHF VALUE | M |
|-----------|------------------|----------|

Migratory Pathway Factor

| | | |
|---------------------------------|---|---|
| Evident | Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well). | 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: Kellogg ANGB

Site ID: PRL-6

AFFF Release Area #: AFFF 6

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.01 | 0.126 | 0.1 |
| 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. | | M |
| Limited | No potential for receptors to have access to contaminated soil. | | |
| Receptor Factor | DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H). | | M |
| | | Soil Category | LOW |

Site Background Information

| | | | |
|------------------------------------|---------------------------------------|---|-------------------|
| Installation: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Foam Storage Bldg - Bldg 6918 - PRL-7 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

| | |
|--|---|
| Brief Site Description: | <p>Building 6918 was constructed in 1988 to house an 800-gallon AFFF tank. This tank was the AFFF source for the FSS installed in Hangar 6900 (PRL 6), and fed the system via underground piping. According to the PA Report, no inadvertent releases of AFFF have been documented at this building which has a concrete floor and no drains. As noted during the AECOM site visit in December 2016, although the FSS in Hangar 6900 had been taken out of service, and not used since 2010, the 800-gallon tank's level indicator showed that the tank is more than half full. Base personnel indicated that actions were underway to empty the remaining AFFF from the tank and piping.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>Soil samples were collected from grassy areas adjacent to the foam storage building.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-7

AFFF Release Area #: AFFF 7

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|--|---|--|--------------|
| PFOS | 25 | 0.04 | 625.0 |
| PFOA | 1.3 | 0.04 | 32.5 |
| PFBS | 0.042 | 0.602 | 0.1 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 657.6 |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CHF Value | CHF VALUE | | H |
| <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: Kellogg ANGB

Site ID: PRL-7

AFFF Release Area #: AFFF 7

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.078 | 0.126 | 0.6 |
| PFOA | 0.00029 | 0.126 | 0.0 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 0.6 |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CHF Value | CHF VALUE | | L |
| <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 |

Site Background Information

| | | | |
|------------------------------------|---------------------|---|-------------------|
| Installation: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Hangar 6917 - PRL-8 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

| | |
|--|---|
| Brief Site Description: | <p>Hangar 6917 was constructed in 1988. At the time of the 2015 PA site visit, Hangar 6917 contained an AFFF FSS. The system was equipped with overhead piping and oscillating monitors in the four corners of the hangar, and one each along the eastern and western central portions of the hangar. The hangar formerly housed several aircraft until 2013 when all aircraft left the Kellogg ANGB. Hangar 6917 is equipped with floor drains which are connected to an OWS and the sanitary sewer system, which is connected to the City of Battle Creek's WWTP. No documentation was available on FSS testing at this hangar during the 2015 PA site visit; however, base personnel recall that testing of the AFFF FSS was performed in a similar fashion to the tests at Hangar 6900 (PRL 6). During the 2016 AECOM site visit during the SI, the Fire Chief indicated that the system has not been used since approximately 2010 when the system was taken out of service. Despite having been taken out of service, AFFF still remains within the system. An AFFF storage tank is located in the fire room of the hangar and contains less than 500 gallons of AFFF. Storm water in the vicinity of the hangar is routed to Outfall #2 (PRL 14) in the southwestern portion of the base.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>Soil samples were collected from the asphalted area adjacent to the apron area, as well as a landscaped area in front of the hangar.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-8

AFFF Release Area #: AFFF 8

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|-------------|------------------------------|-------------------------|--------|
| PFOS | 0.82 | 0.04 | 20.5 |
| PFOA | 0.048 | 0.04 | 1.2 |
| PFBS | 0.026 | 0.602 | 0.0 |

| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 21.7 |
|-----------|-----------|-----------------------------------|-------------|
|-----------|-----------|-----------------------------------|-------------|

| | | |
|---------------|-------------------|--|
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ |
| 100 > CHF > 2 | M (Medium) | |
| 2 > CHF | L (Low) | |

| | | |
|-----------|------------------|----------|
| CHF Value | CHF VALUE | M |
|-----------|------------------|----------|

Migratory Pathway Factor

| | | |
|---------------------------------|---|---|
| Evident | Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well). | 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: Kellogg ANGB

Site ID: PRL-8

AFFF Release Area #: AFFF 8

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.041 | 0.126 | 0.3 |
| PFOA | 0.00016 | 0.126 | 0.0 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 0.3 |
| 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 | | 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 |

Site Background Information

| | | | |
|------------------------------------|--------------------------------|---|-------------------|
| Installation: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | North Nozzle Test Area - PRL-9 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

| | |
|--|---|
| Brief Site Description: | <p>Annual nozzle testing with AFFF was performed on the asphalt area along the flight line south of building 6903 – Former Fire Station (PRL 5). These tests used approximately five gallons of AFFF which was allowed to naturally dissipate after testing. During the 2015 PA site visit, the Fire Chief reported that testing was conducted in this area for many years until approximately 2001, although it is unclear when testing began.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>PRL-9 is an asphalt covered area.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to restricted personnel/flightline workers with controlled or restricted frequency of access due to the PRL being located on the apron.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-9

AFFF Release Area #: AFFF 9

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|--|---|--|--------------|
| PFOS | 3.8 | 0.04 | 95.0 |
| PFOA | 2.1 | 0.04 | 52.5 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 147.5 |
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ | |
| 100 > CHF > 2 | M (Medium) | | |
| 2 > CHF | L (Low) | | |
| CHF Value | CHF VALUE | | 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: Kellogg ANGB

Site ID: PRL-9

AFFF Release Area #: AFFF 9

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.013 | 0.126 | 0.1 |
| PFOA | 0.00034 | 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: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | South Nozzle Testing Area - PRL-10 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

| | |
|--|--|
| Brief Site Description: | Annual nozzle testing with AFFF was performed on the asphalt area west of Building 6954 – Current Fire Station (PRL 4). These tests used approximately five gallons of AFFF which was allowed to naturally dissipate into downgradient areas. Tests in this area were conducted from 2001 until 2014. |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>Soil samples were collected from the asphalted ramp as well as the adjacent grassy area.</p> |
| Brief Description of Receptors: | The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries. |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-10

AFFF Release Area #: AFFF 10

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|-------------|------------------------------|-------------------------|--------|
| PFOS | 0.33 | 0.04 | 8.3 |
| PFOA | 0.18 | 0.04 | 4.5 |
| PFBS | 0.12 | 0.602 | 0.2 |

| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 12.9 |
|-----------|-----------|-----------------------------------|------|
|-----------|-----------|-----------------------------------|------|

| | | |
|---------------|------------|--|
| CHF > 100 | H (High) | $CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$ |
| 100 > CHF > 2 | M (Medium) | |
| 2 > CHF | L (Low) | |

| | | |
|-----------|------------------|----------|
| CHF Value | CHF VALUE | M |
|-----------|------------------|----------|

Migratory Pathway Factor

| | | |
|---------------------------------|---|---|
| Evident | Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well). | 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: Kellogg ANGB

Site ID: PRL-10

AFFF Release Area #: AFFF 10

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|-------------|
| PFOS | 0.64 | 0.126 | 5.1 |
| PFOA | 0.0025 | 0.126 | 0.0 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 5.1 |
| 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: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Roads SE of BLDG 6954 - PRL-11 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: MEDIUM | | | |

Site Summary

| | |
|--|---|
| Brief Site Description: | <p>The PA Report noted that on the 4th of November 2015, approximately 15 gallons of 3% AFFF mixed with 1,000 gallons of water were accidentally spilled from a City of Battle Creek's Fire Department vehicle on and along the asphalt and dirt roadways southeast of the current Fire Station, Building 6954. Remedial actions occurred promptly which commenced with notification to the Michigan Department of Environmental Quality (MDEQ) and the ANG, and involved soil excavation and stormwater ditch inspection. Approximately 300 cubic feet of soil was excavated from depths between two to six inches below ground surface (bgs). Inspections conducted in the area of the spill noted that no surface water or groundwater was impacted.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>The roads are in a grassy area, with exposed soils.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: NA

AFFF Release Area #: AFFF 11

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|-------------|------------------------------|-------------------------|--------|
| PFOS | 0.017 | 0.04 | 0.4 |
| PFOA | 0.0096 | 0.04 | 0.2 |
| PFBS | 0.053 | 0.602 | 0.1 |

| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 0.8 |
|-----------|-----------|-----------------------------------|------------|
|-----------|-----------|-----------------------------------|------------|

| | | |
|---------------|-------------------|--|
| 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 | L |
|-----------|------------------|----------|

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

MEDIUM

Soil Worksheet

Installation: Kellogg ANGB

Site ID: PRL-11

AFFF Release Area #: AFFF 11

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.0066 | 0.126 | 0.1 |
| 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. | | M |
| Limited | No potential for receptors to have access to contaminated soil. | | |
| Receptor Factor | DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H). | | M |
| Soil Category | | | Low |

Site Background Information

| | | | |
|------------------------------------|------------------------------|---|-------------------|
| Installation: | Kellogg ANGB | Date: | 8/26/2021 |
| Location (State): | Michigan | Media Evaluated: | Groundwater, Soil |
| Site Name and ID: | Concrete Apron Area - PRL-12 | Phase of Execution (e.g., RI, Record of Decision (ROD)): | N/A |
| RPM's Name: | Jim King | Agreement Status (e.g., Federal Facility Agreement date signed): | N/A |
| OVERALL SITE CATEGORY: HIGH | | | |

Site Summary

| | |
|--|---|
| Brief Site Description: | <p>Although there were no records of AFFF usage on the concrete apron and ramp area adjacent to the hangars in the southeastern portion of the base during the PA site visit in 2015, the area may have been impacted by AFFF when aircraft were present prior to 2013.</p> |
| Brief Description of Pathways: | <p>Kellogg ANGB lies within the Kalamazoo River basin. The principal aquifers in the vicinity of the base include the surficial aquifer, consisting of glacial drift deposits, and the underlying bedrock aquifer, the Marshall Sandstone. The confining layer separating the two aquifers is the glacial till, which, by nature, has low effective porosity, low hydraulic conductivity, and low specific yields. Groundwater occurs in usable quantities in both the glacial deposits and the Marshall Formation. These two aquifers are reported to be connected hydrologically and in some areas the two aquifers function as a single hydrologic unit. Groundwater at the base generally flows toward the north to northwest 10-40 ft. bgs, in the same direction as natural surface water movement.</p> <p>The concrete apron is a large asphalt area, with neighboring exposed grassy area.</p> |
| Brief Description of Receptors: | <p>The City of Battle Creek provides potable water to the base, which comes from the Marshall Sandstone Aquifer and is drawn from the Verona Well Field located approximately 5 miles northeast of the base, which is not in the apparent groundwater flow direction from the base. Onsite PRL wells appear to be screened in the same aquifer (surficial glacial aquifer) as nearby drinking water wells. PFAS including PFOA, PFOS, and PFBS have been detected at multiple on-site wells at varying concentrations. Offsite, there are three water wells, all located to the northwest (downgradient) of the Base, one of them being listed as an irrigation well, while the other two are listed as public. Additional private potable wells are located hydraulically downgradient from the base - there are three known drinking water wells located approximately 1 mile downgradient of the base. State of Michigan has collected approximately 75 samples from drinking water wells in the vicinity of the base, with 20 of the wells having detections, two of which, were above LHA. The state provided bottled water to eight homes, with 25 homes being provided filters; likely additional potable wells within four miles of the base. PRL-4 access would be limited to commercial/industrial workers with controlled or restricted frequency of access due to the PRL being located within the base boundaries.</p> |

Groundwater Worksheet

Installation: Kellogg ANGB

Site ID: PRL-12

AFFF Release Area #: AFFF 12

| Contaminant | Maximum Concentration (ug/L) | Comparison Value (ug/L) | Ratios |
|--|---|--|--------------|
| PFOS | 18 | 0.04 | 450.0 |
| PFOA | 0.37 | 0.04 | 9.3 |
| CHF Scale | CHF Value | Contamination Hazard Factor (CHF) | 459.3 |
| 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 | | 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: Kellogg ANGB

Site ID: PRL-12

AFFF Release Area #: AFFF 12

| Contaminant | Maximum Concentration (mg/kg) | Comparison Value (mg/kg) | Ratios |
|---------------------------------|---|--|------------|
| PFOS | 0.0023 | 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. | | |
| 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 |