



RELATIVE RISK SITE EVALUATION



Former Richmond Air National Guard Station, Virginia

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 (ANG). 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 Former Richmond Air National Guard Station (ANGS) PFAS PA and SI can be found at the AFCEC 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, scroll down the Installation List and click on Richmond IAPT (Byrd Fd), VA, then enter the AR Number 470213 in the "AR #" field for the PA. For the SI, enter the AR Number 587579. 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

AFCEC - U.S. Air Force Civil Engineer Center

AFFF - Aqueous Film Forming Foam

ANG - Air National Guard

ANGB - Air National Guard Base

AR - Administrative Record

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

CHF - Contaminant Hazard Factor

DoD - Department of Defense

EPA - US Environmental Protection Agency

HA - Health Advisory

MPF - Migration Pathway Factor

PA - Preliminary Assessment

PFAS - Per-and polyfluoroalkyl substances

PFBS - Perfluorobutanesulfonic acid

PFOA - Perfluorooctanoic acid

PFOS - Perfluorooctane sulfonate

PRL - Potential Release Location

RF - Receptor Factor

RI - Remedial Investigation

RRSE - Relative Risk Site Evaluation

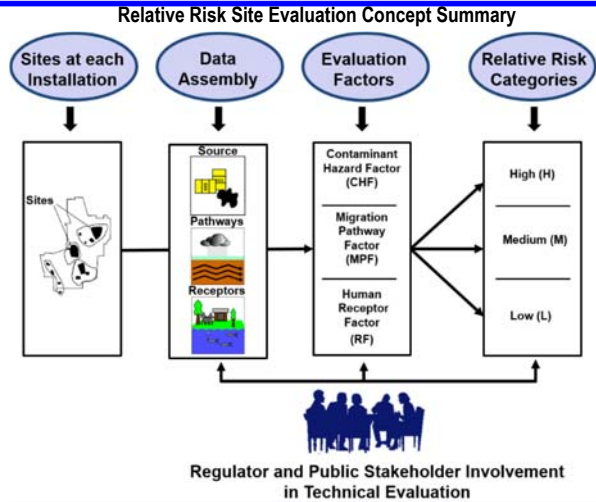
SI - Site Inspection

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

A. RRSE is a methodology to sequence environmental restoration work used by the 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.

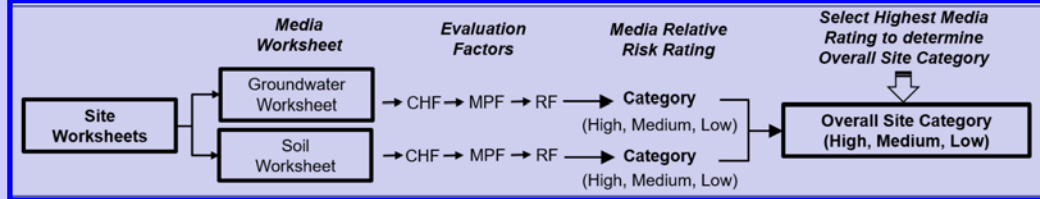


Sites at Each Installation

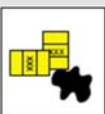
What restoration sites are required to be evaluated in the RRSE process?

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 CHF is determined by dividing the maximum level for a contaminant at each site by the approved screening values (i.e., risk-based comparison values). Contaminant concentration ratios are totaled to arrive at a 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 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 RF is determined by a receptor's, such as humans, potential to come into contact with contaminated media. RFs are designated as: identified, potential, or limited (**High, Medium, and Low**). **Identified** rating is given when receptors are in contact or threat of contact with contaminated media. **Potential** is given when receptor may contact contaminated media. **Limited** is given when there is little or no contact with contaminated media.

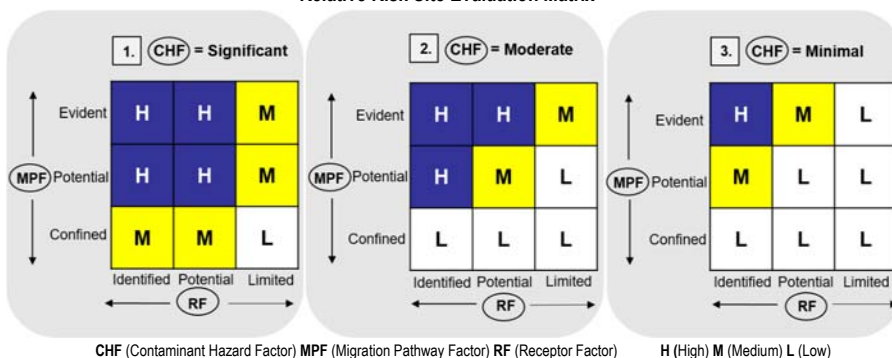
RELATIVE RISK SITE EVALUTION, cont.

Media Relative Risk Rating

Q. How is the media relative risk rating determined?

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

Relative Risk Site Evaluation Matrix



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

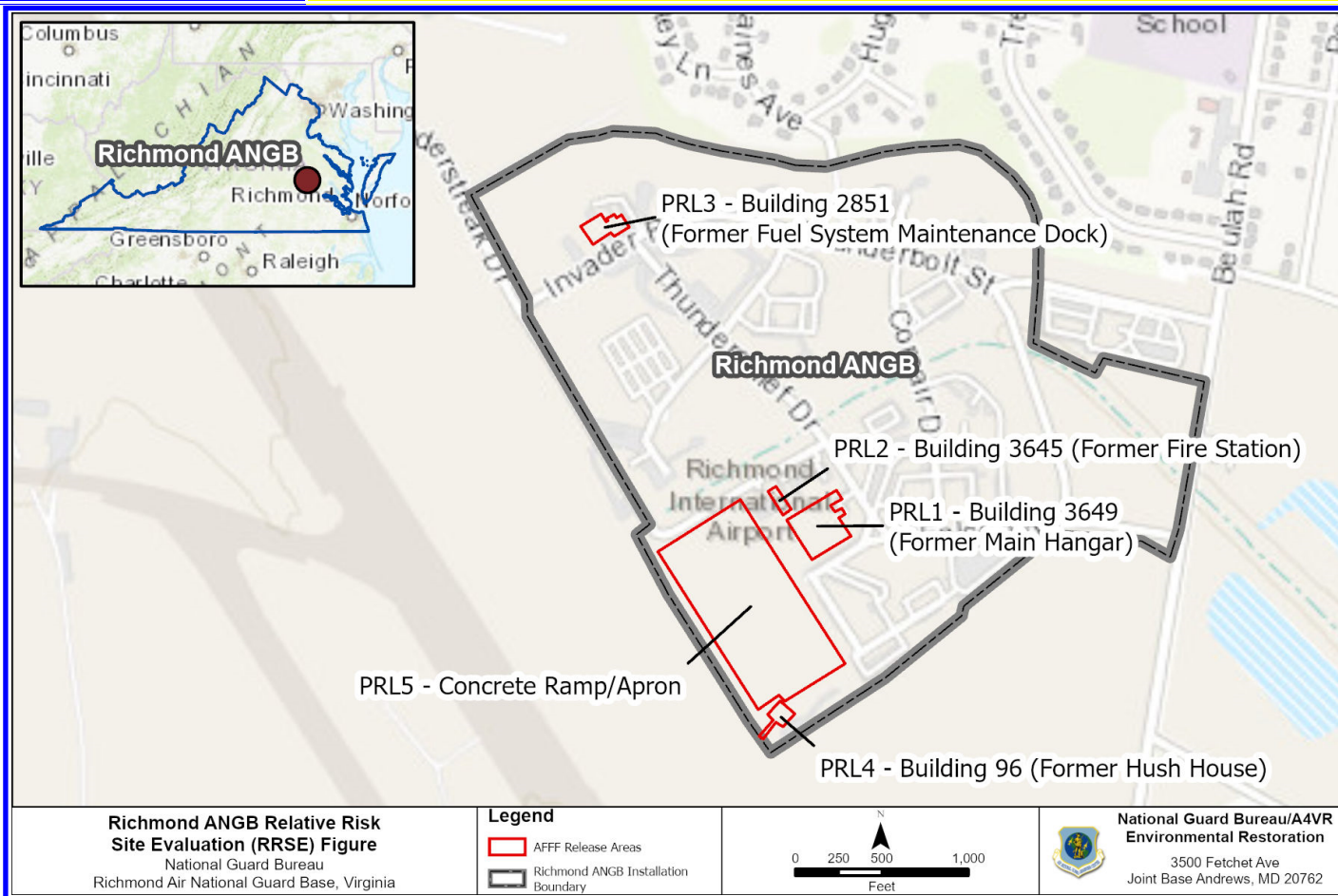
Q. How do I participate as Stakeholder?



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 Former Richmond ANGB (Byrd Field), VA

Overall Site Category	Site Name (Sites are shown on the map below and RRSE Worksheets are attached)
HIGH	
MEDIUM	PRL 1, PRL 2, PRL 3, PRL 5
LOW	PRL 4



Site Background Information			
Installation:	Former Richmond ANGS (Byrd Field)	Date:	08/05/2022
Location (State):	Virginia	Media Evaluated:	Groundwater, Soil
Site Name and ID:	PRL 1, Building 3649/ Former Main Hangar	Phase of Execution (e.g., RI, Record of Decision)	N/A
RPM's Name:	Jenna Laube	Agreement Status (e.g., Federal Facility Agreement)	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	PRL 1 consists of Building 3649, the former Main Hangar, in the southern area of this former ANGS location. It is unknown if aqueous film forming foam (AFFF) was utilized or stored at this location; however, based on the dates of operation and the use of the building, AFFF may have been present at this location. The former Main Hangar (64,605 square ft.) was constructed in 1958 with concrete block walls and a concrete floor and was equipped with an Oil Water Separator (OWS). Photographs taken during the 2001 Environmental Baseline Survey (EBS) site visit show the presence of overhead piping which may indicate that a Fire Suppression System (FSS) was a part of this structure. No record of historical AFFF use or spills were noted.
Brief Description of Pathways:	The area surrounding the building is paved and maintained grass. Surface cover at this PRL is primarily concrete. A surface water drainage ditch is located northeast of the building. The depth to groundwater across the site is 9 to 14 ft. below ground surface (bgs). The groundwater flow direction in both the upper and lower portions of the aquifer is generally to the southeast toward White Oak Swamp Creek. Clay and silty-clay soils are present from the ground surface to depths of approximately 14 to 17 feet below ground surface. Below this depth, the formation transitions to a silty-sand/clayey sand aquifer to a depth of approximately 30 feet below ground surface and then transitions to clayey-sand and gravel aquifer. A silty-clay at the base of the lower aquifer of undetermined thickness was encountered at a depth of 48 feet below ground surface. The surficial Yorktown aquifer is the most susceptible to contamination by surface pollutants because it is unconfined to semi-confined. Groundwater flow in both the upper and lower portions of the Yorktown aquifer are toward White Oak Swamp Creek.
Brief Description of Receptors:	Activities at the Base have been typical of those at most airports and military air bases, including fueling and maintenance operations. These activities are consistent with industrial/commercial receptor scenarios such as installation personnel and contractors. The Base is supplied with municipal water purchased from the Henrico County Department of Public Utilities. Henrico County municipal water is derived from the James River approximately eight miles south of the Base. In the 2001 EBS, two domestic water supply wells were identified beyond the airfield between one-half and one mile to the east-southeast (downgradient) of the Base. One fire protection well was identified between ½ and one mile to the west of the Base. Seven additional wells were identified in the surrounding area greater than one mile from the Base. No water supply wells were identified on Base. Based on the regional groundwater flow direction and the location of these municipal supply wells, groundwater from this PRL would not likely impact these municipal supply water wells. Soils in the area of this PRL are primarily covered by concrete. Any contact with surrounding grassy areas would be minimal.

Groundwater Worksheet

Installation: Richmond IAP Byrd Field

Site ID: PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios
PFOS	0.181	0.04	4.5
PFOA	0.0392	0.04	1.0
PFBS	0.00908	0.602	0.0

CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	5.5
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CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CHF Value	CHF VALUE	M
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Migratory Pathway Factor

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

Receptor Factor

Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)	
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)	M
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).	M

Groundwater Category

MEDIUM

Soil Worksheet

Installation: Former Richmond ANGTS (Byrd Field)

Site ID: PRL 1

AFFF Release Area #: AFFF 1

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.0142	0.126	0.1	
PFOA	0.000746	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	
Migratory Pathway Factor				
Evident	Analytical data or observable evidence that contamination is present at a point of exposure			
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined			
Confined	Low possibility for contamination to be present at or migrate to a point of exposure		L	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Receptor Factor				
Identified	Receptors identified that have access to contaminated soil			
Potential	Potential for receptors to have access to contaminated soil			
Limited	No potential for receptors to have access to contaminated soil		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Soil Category			LOW	

Site Background Information			
Installation:	Former Richmond ANGTS (Byrd Field)	Date:	08/05/2022
Location (State):	Virginia	Media Evaluated:	Groundwater, Soil
Site Name and ID:	PRL 2, Building 3645/ Former Fire Station	Phase of Execution (e.g., RI, Record of Decision)	N/A
RPM's Name:	Jenna Laube	Agreement Status (e.g., Federal Facility Agreement)	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	PRL 2 consists of Building 3645 the former Fire Station in the southern area of this former ANGTS location. It is unknown if AFFF was utilized at this location; however, based on the dates of operation and the use of the building, AFFF may have been used. The former Fire Station (6,191 square ft.) was built in 1958 with concrete block walls and a sealed concrete floor. Aircraft Rescue Fire Fighting vehicles had been parked inside the Fire Station. No historic OWSs are association with the Fire Station. The sanitary sewer at the Base was connected to the local owned treatment works (POTW). No records of known releases of AFFF have been identified.
Brief Description of Pathways:	The area surrounding the building is paved and maintained grass. Soil is accessible in the unpaved, grass-covered areas but are minimal. A surface water drainage ditch is located northeast of the building. The depth to groundwater across the site is 9 to 14 ft. bgs. The groundwater flow direction in both the upper and lower portions of the aquifer is generally to the southeast toward White Oak Swamp Creek. Clay and silty-clay soils are present from the ground surface to depths of approximately 14 to 17 feet below ground surface. Below this depth, the formation transitions to a silty-sand/clayey sand aquifer to a depth of approximately 30 feet below ground surface and then transitions to clayey-sand and gravel aquifer. A silty-clay at the base of the lower aquifer of undetermined thickness was encountered at a depth of 48 feet below ground surface. The surficial Yorktown aquifer is the most susceptible to contamination by surface pollutants because it is unconfined to semi-confined. Groundwater flow in both the upper and lower portions of the Yorktown aquifer are toward White Oak Swamp Creek.
Brief Description of Receptors:	Activities at the Base have been typical of those at most airports and military air bases, including fueling and maintenance operations. These activities are consistent with industrial/commercial receptor scenarios such as installation personnel and contractors. The Base is supplied with municipal water purchased from the Henrico County Department of Public Utilities. Henrico County municipal water is derived from the James River approximately eight miles south of the Base. In the 2001 EBS, two domestic water supply wells were identified beyond the airfield between one-half and one mile to the east-southeast (downgradient) of the Base. One fire protection well was identified between ½ and one mile to the west of the Base. Seven additional wells were identified in the surrounding area greater than one mile from the Base. No water supply wells were identified on Base. Based on the regional groundwater flow direction and the location of these municipal supply wells, groundwater from this PRL would not likely impact these municipal supply water wells. Soils in the area of this PRL are primarily covered by concrete. Any contact with surrounding grassy areas would be minimal.

Groundwater Worksheet

Installation: Richmond IAP Byrd Field

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	1.68	0.04	42.0	
PFOA	0.588	0.04	14.7	
PFBS	0.307	0.602	0.5	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	57.2	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)			
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M	
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)			
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)		M	
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).		M	
Groundwater Category			MEDIUM	

Soil Worksheet

Installation: Former Richmond ANG (Byrd Field)

Site ID: PRL 2

AFFF Release Area #: AFFF 2

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.173	0.126	1.4
PFOA	0.00669	0.126	0.1
PFBS	0.000599	1.9	0.0
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	1.4
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CHF Value	CHF VALUE		L
<u>Migratory Pathway Factor</u>			
Evident	Analytical data or observable evidence that contamination is present at a point of exposure		
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
Confined	Low possibility for contamination to be present at or migrate to a point of exposure		L
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
<u>Receptor Factor</u>			
Identified	Receptors identified that have access to contaminated soil		
Potential	Potential for receptors to have access to contaminated soil		
Limited	No potential for receptors to have access to contaminated soil		L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
Soil Category			LOW

Site Background Information			
Installation:	Former Richmond ANGTS (Byrd Field)	Date:	08/05/2022
Location (State):	Virginia	Media Evaluated:	Groundwater, Soil
Site Name and ID:	PRL 3, Building 2851/Former Fuel System Maintenance Dock	Phase of Execution (e.g., RI, Record of Decision)	N/A
RPM's Name:	Jenna Laube	Agreement Status (e.g., Federal Facility Agreement)	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	PRL 3 consists of Building 2851, the Former Fuel System Maintenance Dock in the northwestern portion of this former ANGTS location. The building (17,052 square ft) was built in 1977 with concrete walls, a concrete pad for the floor, and floor drains that are connected to a 2,000-gallon OWS system. This OWS system was noted to have been installed in 1996, replacing the original 400-gallon OWS. Both OWS systems were constructed of steel and drained to the sanitary sewer. The building had an AFFF system with four turrets and a 150-gallon AFFF tank. The storage tank was noted to be sweating during the 2015 site visit, indicating that some liquid likely remained inside the tank. No records of known releases of AFFF were identified at the Former Fuel System Maintenance Dock.
Brief Description of Pathways:	The area surrounding the building is paved and maintained grass. Soil is accessible in the unpaved, grass-covered areas, which are minimal. The depth to groundwater across the site is 9 to 14 ft. bgs. The groundwater flow direction in both the upper and lower portions of the aquifer is generally to the southeast toward White Oak Swamp Creek. Clay and silty-clay soils are present from the ground surface to depths of approximately 14 to 17 feet below ground surface. Below this depth, the formation transitions to a silty-sand/clayey sand aquifer to a depth of approximately 30 feet below ground surface and then transitions to clayey-sand and gravel aquifer. A silty-clay at the base of the lower aquifer of undetermined thickness was encountered at a depth of 48 feet below ground surface. The surficial Yorktown aquifer is the most susceptible to contamination by surface pollutants because it is unconfined to semi-confined. Groundwater flow in both the upper and lower portions of the Yorktown aquifer are toward White Oak Swamp Creek.
Brief Description of Receptors:	Activities at the Base have been typical of those at most airports and military air bases, including fueling and maintenance operations. These activities are consistent with industrial/commercial receptor scenarios such as installation personnel and contractors. The Base is supplied with municipal water purchased from the Henrico County Department of Public Utilities. Henrico County municipal water is derived from the James River approximately eight miles south of the Base. In the 2001 EBS, two domestic water supply wells were identified beyond the airfield between one-half and one mile to the east-southeast (downgradient) of the Base. One fire protection well was identified between ½ and one mile to the west of the Base. Seven additional wells were identified in the surrounding area greater than one mile from the Base. No water supply wells were identified on Base. Based on the regional groundwater flow direction and the location of these municipal supply wells, groundwater from this PRL would not likely impact these municipal supply water wells. Soils in the area of this PRL are primarily covered by concrete. Any contact with surrounding grassy areas would be minimal.

Groundwater Worksheet

Installation: Richmond IAP Byrd Field

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.31	0.04	7.8	
PFOA	0.303	0.04	7.6	
PFBS	0.0105	0.602	0.0	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	15.3	
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)			
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M	
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)			
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M	
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).		M	
Groundwater Category			MEDIUM	

Soil Worksheet

Installation: Former Richmond ANGUS (Byrd Field)

Site ID: PRL 3

AFFF Release Area #: AFFF 3

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.0123	0.126	0.1	
PFOA	0.000611	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	
Migratory Pathway Factor				
Evident	Analytical data or observable evidence that contamination is present at a point of exposure			
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined			
Confined	Low possibility for contamination to be present at or migrate to a point of exposure		L	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Receptor Factor				
Identified	Receptors identified that have access to contaminated soil			
Potential	Potential for receptors to have access to contaminated soil			
Limited	No potential for receptors to have access to contaminated soil		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Soil Category			LOW	

Site Background Information			
Installation:	Former Richmond ANGTS (Byrd Field)	Date:	08/05/2022
Location (State):	Virginia	Media Evaluated:	Groundwater, Soil
Site Name and ID:	PRL 4, Building 96 – Former Hush House/Jet Engine Test Cell	Phase of Execution (e.g., RI, Record of Decision)	N/A
RPM's Name:	Jenna Laube	Agreement Status (e.g., Federal Facility Agreement)	N/A
OVERALL SITE CATEGORY: LOW			

Site Summary	
Brief Site Description:	<p>PRL 4 consists of Building 96 the former Jet Engine Test Cell, also referred to as a Hush House. The Hush House was built in 1992 at the southern boundary of this former ANGTS location as a requirement of the conversion of the Base to the F-16 airframe. The Hush House is a 5,440 square ft building equipped with metal walls and a concrete pad floor. Floor drains are present within the Hush House. One of the floor drains is connected to a 2,000-gallon steel OWS that was installed in 1992. The OWS discharges to the sanitary sewer. The remainder of the floor drains within the Hush House discharge directly to the sanitary sewer. An uncovered, concrete-bermed fuel storage area was adjacent to the west of the Former Hush House. No records of known releases of AFFF were identified as part of the PA investigation.</p>
Brief Description of Pathways:	<p>The area surrounding the building is paved and maintained grass. Soil is accessible in the unpaved, grass-covered areas. A surface water drainage ditch is located northeast of the building. The depth to groundwater across the site is 9 to 14 ft. bgs. The groundwater flow direction in both the upper and lower portions of the aquifer is generally to the southeast toward White Oak Swamp Creek. Clay and silty-clay soils are present from the ground surface to depths of approximately 14 to 17 feet below ground surface. Below this depth, the formation transitions to a silty-sand/clayey sand aquifer to a depth of approximately 30 feet below ground surface and then transitions to clayey-sand and gravel aquifer. A silty-clay at the base of the lower aquifer of undetermined thickness was encountered at a depth of 48 feet below ground surface. The surficial Yorktown aquifer is the most susceptible to contamination by surface pollutants because it is unconfined to semi-confined. Groundwater flow in both the upper and lower portions of the Yorktown aquifer are toward White Oak Swamp Creek.</p>
Brief Description of Receptors:	<p>Activities at the Base have been typical of those at most airports and military air bases, including fueling and maintenance operations. These activities are consistent with industrial/commercial receptor scenarios such as installation personnel and contractors. The Base is supplied with municipal water purchased from the Henrico County Department of Public Utilities. Henrico County municipal water is derived from the James River approximately eight miles south of the Base. In the 2001 EBS, two domestic water supply wells were identified beyond the airfield between one-half and one mile to the east-southeast (downgradient) of the Base. One fire protection well was identified between ½ and one mile to the west of the Base. Seven additional wells were identified in the surrounding area greater than one mile from the Base. No water supply wells were identified on Base. Based on the regional groundwater flow direction and the location of these municipal supply wells, groundwater from this PRL would not likely impact these municipal supply water wells. Soils in the area of this PRL are primarily covered by concrete. Any contact with surrounding grassy areas would be minimal.</p>

Groundwater Worksheet

Installation: Richmond IAP Byrd Field

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOA	0.0113	0.04	0.3	
PFBS	0.0205	0.602	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 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			
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)		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	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)			
Potential	Existing downgradient drinking water well beyond 4 miles with no contaminant detection(s) or no known drinking water wells downgradient and groundwater is currently or potentially usable for drinking water (i.e., EPA Class I or II groundwater) or other beneficial use (e.g., agricultural)		M	
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).		M	
Groundwater Category			LOW	

Soil Worksheet

Installation: Former Richmond ANGUS (Byrd Field)

Site ID: PRL 4

AFFF Release Area #: AFFF 4

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios	
PFOS	0.0159	0.126	0.1	
PFOA	0.000866	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	
Migratory Pathway Factor				
Evident	Analytical data or observable evidence that contamination is present at a point of exposure			
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined			
Confined	Low possibility for contamination to be present at or migrate to a point of exposure		L	
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Receptor Factor				
Identified	Receptors identified that have access to contaminated soil			
Potential	Potential for receptors to have access to contaminated soil			
Limited	No potential for receptors to have access to contaminated soil		L	
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L	
Soil Category			LOW	

Site Background Information			
Installation:	Former Richmond ANGTS (Byrd Field)	Date:	08/05/2022
Location (State):	Virginia	Media Evaluated:	Groundwater, Soil
Site Name and ID:	PRL 5, Concrete Apron/Ramp	Phase of Execution (e.g., RI, Record of Decision)	N/A
RPM's Name:	Jenna Laube	Agreement Status (e.g., Federal Facility Agreement)	N/A
OVERALL SITE CATEGORY: MEDIUM			

Site Summary	
Brief Site Description:	PRL 5 consists of a Concrete Ramp/Apron east of the flightline in the southwestern portion of this former ANGTS location. A wash rack with a drain was present on the southern portion of the apron. Storm water from the remainder of the Concrete Ramp/Apron area reportedly flows to the north toward an unnamed ditch that is a tributary of White Oak Swamp Creek. No records of known releases of AFFF have been identified.
Brief Description of Pathways:	This area comprising this PRL is concrete. The depth to groundwater across the site is 9 to 14 ft. below ground surface (bgs). The groundwater flow direction in both the upper and lower portions of the aquifer is generally to the southeast toward White Oak Swamp Creek. Clay and silty-clay soils are present from the ground surface to depths of approximately 14 to 17 feet below ground surface. Below this depth, the formation transitions to a silty-sand/clayey sand aquifer to a depth of approximately 30 feet below ground surface and then transitions to clayey-sand and gravel aquifer. A silty-clay at the base of the lower aquifer of undetermined thickness was encountered at a depth of 48 feet below ground surface. The surficial Yorktown aquifer is the most susceptible to contamination by surface pollutants because it is unconfined to semi-confined. Groundwater flow in both the upper and lower portions of the Yorktown aquifer are toward White Oak Swamp Creek.
Brief Description of Receptors:	Activities at the Base have been typical of those at most airports and military air bases, including fueling and maintenance operations. These activities are consistent with industrial/commercial receptor scenarios such as installation personnel and contractors. The Base is supplied with municipal water purchased from the Henrico County Department of Public Utilities. Henrico County municipal water is derived from the James River approximately eight miles south of the Base. In the 2001 EBS, two domestic water supply wells were identified beyond the airfield between one-half and one mile to the east-southeast (downgradient) of the Base. One fire protection well was identified between ½ and one mile to the west of the Base. Seven additional wells were identified in the surrounding area greater than one mile from the Base. No water supply wells were identified on Base. Based on the regional groundwater flow direction and the location of these municipal supply wells, groundwater from this PRL would not likely impact these municipal supply water wells. Soils in the area of this PRL are primarily covered by concrete. Any contact with surrounding grassy areas would be minimal and only during intrusive activities.

Groundwater Worksheet

Installation: Richmond IAP Byrd Field

Site ID: PRL 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (ug/L)	Comparison Value (ug/L)	Ratios	
PFOS	0.33	0.04	8.3	
PFOA	0.162	0.04	4.1	
PFBS	0.0738	0.602	0.1	
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	12.4	
CHF > 100	H (High)	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$		
100 > CHF > 2	M (Medium)			
2 > CHF	L (Low)			
CHF Value	CHF VALUE		M	
Migratory Pathway Factor				
Evident	Analytical data or direct observation indicates that contamination in the groundwater has moved to a point of exposure (e.g., well)			
Potential	Contamination in the groundwater has moved beyond the source or insufficient information available to make a determination of Evident or Confined		M	
Confined	Analytical data or direct observation indicates that the potential for contaminant migration from the source via groundwater is limited (possibly due to geological structures or physical controls)			
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		M	
Receptor Factor				
Identified	Impacted drinking water well with detected contaminants or existing downgradient water supply well within 4 miles and groundwater is current source of drinking water (EPA Class I or IIA groundwater)			
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)		M	
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).		M	
Groundwater Category			MEDIUM	

Soil Worksheet

Installation: Former Richmond ANG (Byrd Field)

Site ID: PRL 5

AFFF Release Area #: AFFF 5

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
PFOS	0.0586	0.126	0.5
CHF Scale	CHF Value	Contamination Hazard Factor (CHF)	0.5
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		L
Migratory Pathway Factor			
Evident	Analytical data or observable evidence that contamination is present at a point of exposure		
Potential	Contamination has moved beyond the source, could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined		
Confined	Low possibility for contamination to be present at or migrate to a point of exposure		L
Migratory Pathway Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
Receptor Factor			
Identified	Receptors identified that have access to contaminated soil		
Potential	Potential for receptors to have access to contaminated soil		
Limited	No potential for receptors to have access to contaminated soil		L
Receptor Factor	DIRECTIONS: Record the single highest value from above in the box to the right (maximum value = H).		L
Soil Category			LOW