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Mr. Peter Quackenbush &
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Michigan Department of Environmental Quality
Constitution Hall – 4 South
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Subject: **Draft Final Phase 2 PFCs Site Inspection Report**
Selfridge Air National Guard Base, Mt. Clemens, Michigan
Contract No. W9133L-14-D-0001, TO 0007
AECOM Project Number: 60520893

Dear Mr. Quackenbush & Mr. Ostaszewski,

Please find an electronic copy of the Site Inspection Report for the above referenced installation. Please contact me at (301) 820-3246 or via e-mail (mike.myers@aecom.com) if you have any questions or comments.

Yours Sincerely,

Mike Myers
Project Manager

Cc:

Mr. James King	ANG Program Manager
Ms. Megan Donahue	AECOM Task Manager
Mr. Mark MacEwan	AECOM Senior Program Director

Draft Final Site Inspection Report
Air National Guard Phase II Regional Site Inspections for Per- and Polyfluoroalkyl Substances

Selfridge Air National Guard Base
Mt. Clemens, Michigan
NGB/A4OR

Contract No. W9133L-14-D-0001, Task Order No. 0007

September 2018

NGB/A4OR
Shepperd Hall
3501 Fetchet Avenue
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20762-5157

Executive Summary

Under contract to the National Guard Bureau, Operations Division, Restoration Branch (NGB/A4OR), AECOM has conducted a basewide Comprehensive Environmental Response, Compensation, and Liability Act Site Inspection (SI) for per- and polyfluoroalkyl substances (PFAS) at Selfridge Air National Guard Base (ANGB), 127th Wing in Macomb County, Selfridge Air National Guard Base, Mt. Clemens, Michigan. The objectives for the SI were to: (1) determine the presence or absence of PFAS in soil, surface water, or sediment at 25 potential release locations (PRLs) and in groundwater immediately downgradient of each PRL, (2) assess if PFAS from the base are migrating off site and (3) determine if the concentrations of PFAS at each PRL are present in quantities or concentrations that warrant no further action (NFA) or additional investigation as part of the Expanded SI or Remedial Investigation / Feasibility Study phase, and if so, what the appropriate data quality objectives (DQOs) should be.

PFAS are not currently regulated at the federal level; however, Perfluoro-octanesulfonate (PFOS) and Perfluorooctanoic acid (PFOA) in groundwater and surface water are regulated by the Michigan Department of Environmental Quality (MDEQ). MDEQ has adopted the United States Environmental Protection Agency (US EPA) Lifetime Health Advisory (HA) levels for PFOS and PFOA to protect against potential risk from exposure to these compounds via drinking water (MDEQ 2018a). For Perfluorobutanesulfonate (PFBS), the US EPA tapwater regional screening level (RSL) was used that is protective of the drinking water exposure pathway for a residential receptor (US EPA, 2018).

The MDEQ has established Water Quality Standards (WQS) that are protective of surface waters for both drinking water and non-drinking water sources. The WQS for drinking water is 11 ng/L and the WQS for non-drinking water standard is 12 ng/L for PFOS. As shown on **Figure 4-1** (located in **Appendix A**), Wet Wells/Drainage Basins 340 (PRL 20), 980 (PRL 23), and 990 (PRL 24) are all located on shore of Lake Saint (St.) Clair, which is a drinking water source. Wet Wells/Drainage Basins 507 (PRL 21) and 508 (PRL 22) are located on the Clinton River, which is not a drinking water source but does discharge to Lake St. Clair. Since municipal drinking water is obtained from Lake St Clair, the WQS for drinking water (11 ng/L) was selected to conservatively screen all surface water that is discharging from Selfridge ANGB.

The MDEQ has not developed direct contact soil screening levels; therefore, the US EPA residential soil direct contact RSLs were calculated for PFOS, PFOA, and PFBS (US EPA, 2018). These values were considered in establishing the project action levels (PALs) that are provided in Appendix C, Laboratory Quality Assurance Project Plan, in the Final SI Work Plan (WP) (AECOM, 2017). The purpose of the PAL is to select an analytical laboratory method that can provide accurate data (i.e., quantitative results with known precision and bias) that is protective of regulatory limits (e.g., the drinking water HAs and MDEQ WQS) and risk-based screening criteria (e.g., RSLs) to define the presence or absence of PFAS to the best extent practicable. There are no PALs for Perfluoroheptanoic acid (PFHpA), Perfluorohexanesulfonate (PFHxS), or Perfluorononanoic acid (PFNA) due to lack of toxicity data.

- Groundwater:
  - PFOS and PFOA: A PAL of 70 nanograms per liter (ng/L) was promulgated in 2018 by the State of Michigan for PFOS and PFOA; the individual and combined concentrations of PFOA and PFOS will be compared with the 70 ng/L PAL (MDEQ, 2018a).
  - PFBS: A PAL of 400,000 ng/L was developed for PFBS utilizing the US EPA tapwater RSLs most recently updated in May 2018, using a target hazard quotient (THQ) equal to 1.0 (US EPA, 2018).
- Soil
  - PFOS and PFOA: PALs of 1,260 nanograms per gram (ng/g) for both PFOS and PFOA were conservatively calculated using the US EPA RSL calculator (May 2018 version). The calculated PALs were derived using a THQ equal to 1.0 and are protective of a residential receptor coming into direct contact with soil (i.e., incidental ingestion of soil, dermal contact and outdoor inhalation of particulates) (US EPA, 2018).
  - PFBS: A PAL of 1.26×10^6 ng/g was conservatively calculated using the US EPA RSL calculator (May 2018 version). The calculated PAL was derived using a THQ equal to 1.0 and

is protective of a residential receptor coming into direct contact with soil (i.e., incidental ingestion of soil, dermal contact and outdoor inhalation of particulates) (US EPA, 2018). US EPA does provide a generic residential direct contact soil RSL of 1.30×10^6 ng/g dated May 2018 (US EPA, 2018). However, the ANGBs around the country have chosen to use the more stringent, calculated RSL for screening PFBS.

- Surface Water:
  - PFOS and PFOA: WQS were obtained from the June 2018 Table 1 Residential and Nonresidential Groundwater Criteria by the State of Michigan after the SI WP was finalized and were set at 11 ng/L for PFOS and 420 ng/L for PFOA for surface waters that are used for drinking water (MDEQ, 2018a). These levels are used as the PALs for this SI Report.
  - PFBS: The State of Michigan has not promulgated a surface water screening level for PFBS; therefore, the surface water PAL is equivalent to the groundwater PAL, defined above.
- Sediment:
  - PFOS, PFOA, and PFBS: PALs were not specifically defined for sediment in the SI WP (AECOM, 2017), and there are no federal or state sediment-specific screening criteria readily available. For purposes of this SI Report, the sediment PALs are equivalent to the soil PALs, defined above.

Twenty-five PRLs at Selfridge ANGB were selected for SI activities based on a Preliminary Assessment (PA) site visit conducted in March 2016. The results of the PA site visit were documented in the *Final Perfluorinated Compounds Preliminary Assessment Site Visit Report* (BB&E, Inc. [BB&E], 2016). During the PA site visit, 28 PRLs were identified and of those 28 locations, 25 were recommended for additional investigation. Installation Restoration Program (IRP) Site 3 - Fire Training Area (FTA) #1 (PRL 2) and IRP Site 15 - FTA Area #3 (PRL 3) were recommended for NFA. IRP Site 3 - FTA #1 was used from 1952 to 1959 and IRP Site 15 - FTA #3 was used from 1959 through 1964. During that time frame, it was assumed that aqueous film-forming foam (AFFF) was not used based on information obtained. Building 105 - Supply (PRL 19) was recommended for NFA since there were no known AFFF releases (BB&E, 2016).

The SI field activities were completed between December 2017 and June 2018 culminating in the collection of 142 soil samples, 37 groundwater samples, eight sediment samples, and eight surface water samples that were analyzed for six PFAS consistent with the US EPA third Unregulated Contaminant Monitoring Rule (UCMR-3) (US EPA, 2012). A summary of the maximum sampling results exceeding PALs for each PRL is provided in **Table ES-1.**

Table ES-1. Summary of Maximum Sampling Results Exceeding PALs

PRL Number	PRL Name	Media	Result Exceeding PAL[a, b, c, d]		
			PFOS	PFOA	PFBS
1	**IRP Site 2 (Fire Training Area #2)**	**Groundwater**	**17,000 ng/L**	**5,500 ng/L**	--
		Soil	--	--	--
4	**Building 154 – Fuel System Repair**	**Groundwater**	**Combined total exceeded the PAL (116 U ng/L)[d]**		--
		Soil	--	--	--
5	Building 1401 – USCG Hangar	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	-	--
6	Building 1461 – USCG Hangar	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
7	Building 1416 – Army National Guard Hangar	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
8	**Building 1422 – DHS Hangar**	**Groundwater**	**11,000 ng/L**	**850 ng/L**	--
		Soil	--	--	--
9	Building 1436 – DHS Hangar	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
10	**Building 859 – Fire Department**	**Groundwater**	**530 ng/L**	**890 ng/L**	--
		Soil	--	--	--
11	Building 501 – Former Wastewater Treatment Plant	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
12	**Nozzle Testing Area**	**Groundwater**	**84 J+ ng/L**	--	--
		Soil	**1,900 ng/g**	--	--
13	**C16 – AOC**	**Groundwater**	**84 U* ng/L**	**370 ng/L**	--
		Soil	**1,700 ng/g**	--	--
14	CRF – AOC	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
15	**East Ramp**	**Groundwater**	**Combined PFOS + PFOA exceeds the PAL (80 J+ ng/L)[d]**		--
		Soil	--	--	--
16	West Ramp	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
17	**Former Building 33 – Fire Department**	**Groundwater**	**3,200 J+ ng/L**	**400 J+ ng/L**	--
		Soil	--	--	--
18	Former Building 176 – Vehicle Maintenance	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
20	**Wet Well/Drainage Basin 340**	**Surface Water**	**170 ng/L**	--	--
		Sediment	--	--	--
21	**Wet Well/Drainage Basin 507**	**Surface Water**	**2,400 ng/L**	--	--
		Sediment	--	--	--
22	**Wet Well/Drainage Basin 508**	**Surface Water**	**2,000 ng/L**	--	--
		Sediment	--	--	--
23	**Wet Well/Drainage Basin 980**	**Surface Water**	**33 ng/L**	--	--
		Sediment	--	--	--
24	**Wet Well/Drainage Basin 990**	**Surface Water**	**490 ng/L**	--	--
		Sediment	--	--	--

PRL Number	PRL Name	Media	Result Exceeding PAL[a, b, c, d]		
			PFOS	PFOA	PFBS[d]
25	Aircraft Crash Sites	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
26	**Drainage Basin 1420/Outfall 006A**	**Surface Water**	**970 ng/L**	--	--
		Sediment	--	--	--
27	Sludge Drying Beds	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
28	IRP Site 9- Sludge Application Area	Groundwater	Combined total does not exceed the PAL		--
		Soil	--	--	--
NA	Base Boundary Wells	Groundwater	Combined total does not exceed the PAL		--

Note: PRL 2 - IRP Site 3 (Fire Training Area #1), PRL 3 - IRP Site 15 (Fire Training Area #3) and PRL 19- Building 105 - Supply were recommended for NFA and are not included in the table (BB&E, 2016).

(a) MDEQ, 2018a. Remediation and Redevelopment Division. Environmental Contamination Response Activity Rules. Table 1. Groundwater: Residential and Nonresidential, Part 201 Generic Cleanup Criteria and Screening Levels. Effective 10 January 2018 and updated on 25 June 2018.

(b) US EPA, 2018. RSLs, May 2018. PFBS groundwater PAL based on RSL for tap water. Soil PALs were calculated using the RSL calculator. The RSLs are protective of a residential receptor and a THQ equal to 1.0.

(c) MDEQ, 2018b. Rule 57 Water Quality Values. Surface Water Assessment Section.15 March 2018. Values are protective of drinking water.

(d) While both PFOS and PFOA were not detected above the PAL, combined (PFOS + PFOA) groundwater concentration exceeded the PAL.

Table ES-1 lists the compounds that exceed the following PALs. Compounds without PALs are included in the **Section 5** Tables.

Summary of the Screening Criteria

Analyte	Groundwater (ng/L)	Soil and Sediment (ng/g)	Surface Water (ng/L)
PFOS	70	1,260	11
PFOA	70	1,260	420
PFOA+PFOS	70	NA	NA
PFBS	400,000	1.26×10^6	400,000

Bolded value indicates that the analyte was detected above the PAL.

-- indicates that the analyte was not detected above the PAL.AOC = Area of Concern
DHS = Department of Homeland Security
FTA = Fire Training Area
IRP = Installation Restoration Program
J+ = Reported value may not be accurate or precise, and the result may be biased high.
NA = Not Applicable
NFA = no further action
ng/L = nanograms per liter
ng/g = nanograms per gram
PFBS = Perfluorobutanesulfonate
PFOA = Perfluorooctanoic acid
PFOS = Perfluoro-octanesulfonate
PRL = potential release location
THQ = target hazard quotient
U* = Positive value reported by laboratory was changed during data validation to non-detect at elevated quantitation limit due to blank detection but is still considered to be a positive detect-See Section 5.1.
USCG = United States Coast Guard

PFAS were detected in groundwater, soil, surface water and/or sediment sampled at each PRL. PFAS were detected above the PALs in groundwater at eight of the 25 PRLs investigated and were detected in soil above the PALs at two of the 25 PRLs. PFAS concentrations exceeded PALs in surface water at six of the PRLs sampled; however, it was not detected above PALs in any of the co-located sediment samples.

As provided in **Table ES-1,** the highest detected concentrations in groundwater were recorded at IRP Site 2 - FTA #2 (PRL 1) where PFOS was detected at a concentration of 17,000 ng/L, which exceeds the individual PAL of 70 ng/L. For soil, the only PFAS detected above the PAL was in one sample where PFOS was detected at a concentration of 1,900 ng/g from the Nozzle Testing Area (PRL 12). The highest detection of PFAS in surface water that exceeded the PAL of 11 ng/L was PFOS detected at a concentration of 2,400 ng/L from a sample taken from Wet Well/Drainage Basin 507 (PRL 21). PFAS were not detected above the PAL in any sediment sample.

Based on the groundwater data obtained from base boundary wells, it does not appear that PFAS were detected, so off-base migration of PFAS in groundwater is not likely. However, the off-base migration of PFAS in surface water has been established because PFAS were detected in all five Wet Well/Drainage Basins.

The following recommendations are provided for consideration based on the SI results:

- Further investigation at all 25 PRLs is necessary to determine the nature and extent of PFAS contamination due to detectable levels at all PRLs.
- Develop an expanded conceptual site model (CSM) that considers localized groundwater and surface water flow paths to select future sampling locations. To refine the CSM for Selfridge ANGB, an environmental sequence stratigraphy (ESS) analysis could be performed to generate new cross sections. This information could:
    - Identify and map (the composition, shape, and interconnectivity of) potentially undefined fluvial channels and other geologic features at the plume scale.
    - Construct a geologically defensible framework of the subsurface that better defines subsurface heterogeneity, accurately predicts preferential pathways, and reduces data gaps.
    - Achieve a greater understanding of groundwater and dissolved contaminant flow preferential pathways and thus target areas for active remedial implementation.
    - Reduce the number of future wells for plume measurements through stratigraphic guidance.
- Conduct a synoptic basewide groundwater sampling event to confirm the groundwater flow direction.
- Complete the delineation of PFAS as part of an Expanded SI or a Remedial Investigation that could consist of:
    - Expanding the groundwater sampling program to complete horizontal and vertical delineation of the PFAS impacts. Further groundwater investigation at the base boundary is recommended due to the presence of PFAS in groundwater above their respective PALs.
    - Installing and sampling new and existing downgradient off-base monitoring wells to better define the PFAS that may have migrated off-base and installation of upgradient monitoring wells to better define the PFAS that may have migrated on-base (from off-base sources) .
    - Conducting additional surface water and sediment sampling both on-base and off-base to determine the nature and extent of PFAS impacts in these media. Potential locations include the Clinton River to the south and Lake St. Clair, a drinking water source, to the east.

  - Perform additional groundwater and soil sampling and analysis of an expanded list of PFAS (in addition to the six UCMR-3) and precursor analysis to determine if significant source areas related to precursor substances are present. Precursor substances have been demonstrated to oxidize into PFOS and PFOA via biological and abiotic processes and thus could provide a lingering source of PFOS and PFOA in soil and groundwater.

- Conduct preliminary site-specific risk assessment calculations in order to identify contaminants of potential concern in every media and establish preliminary remedial goals for screening purposes.

DQOs are proposed based on the results of the SI and are presented in **Section 6.6.** A summary of these DQOs are presented in **Table ES-2**. Additional sampling and analysis is required at each PRL not achieving a NFA status to establish the nature and extent of PFAS for each applicable media and determine if there is a complete receptor pathway. For soil, additional sampling and analysis is required to determine if a source area exists, and if so, what is the vertical and horizontal extent for both the vadose and saturated zones. For groundwater, additional sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells in both upgradient and off-base locations. Additional surface water and sediment samples are required at PRLs where the presence of PFAS in surface water has been identified including upstream and downstream surface water and sediment sampling at on- and off-base locations.

Samples from all five wet wells exceeded the MDEQ WQS. Three of the five wet wells discharge to Lake St. Clair directly and two wet wells discharge to the Clinton River, which flows into Lake St. Clair. At the request of MDEQ, an Outfall Surface Water Sampling Results letter report was submitted to MDEQ on 20 April 2018 in advance of this SI Report. A Notice of Violation (NOV) was submitted to the ANG dated 19 July 2018 as a result of the analytical results presented in the referenced letter report. The following items are recommended to address the NOV.

- Complete a short-term storm water characterization study under wet and dry conditions in compliance with the conditions of the NOV;
- Evaluate the stormwater conveyance system which should include a study to determine if groundwater is infiltrating the storm water system;
- Conduct a dye test study in the Clinton River and Lake St. Clair to evaluate the mixing zone and potential for impacts to the Mount Clemens water treatment plant and water intake. Collect a representative number of samples in the Clinton River and Lake St. Clair during the dye test and analyze for PFAS compounds to calibrate the dye test results;
- Conduct a PFAS loading storm water management model to evaluate impacts under multiple remedial options; and
- Determine if an interim remedial action is feasible to reduce PFAS impacts to the Clinton River and Lake St. Clair.

Table ES-2. Relevant Data Quality Objectives

PRL No.	PRL Description	Compounds Above PALs	Sampling Recommendation(s) and Objectives
1	IRP Site 2 (Fire Training Area #2)	Groundwater: PFOS, PFOA	Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
4	Building 154 – Fuel System Repair	Groundwater: Combined PFOS + PFOA[1]	
5	Building 1401 – USCG Hangar	None[2]	Groundwater: Although PALs for the individual compounds were not exceeded, PFAS were detected in some groundwater samples. Therefore, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
6	Building 1461 – USCG Hangar	None[2]	
7	Building 1416 – Army National Guard Hangar	None[2]	
8	Building 1422 – DHS Hangar	Groundwater: PFOS, PFOA	Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
9	Building 1436 – DHS Hangar	None[2]	Groundwater: Although PALs were not exceeded, PFAS were detected in the groundwater sample. Therefore, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
10	Building 859 – Fire Department	Groundwater: PFOS, PFOA	Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
11	Building 501 – Former Wastewater Treatment Plant	None[2]	Groundwater: Although PALs were not exceeded, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, additional PFAS were detected in soil samples. Therefore, surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.

PRL No.	PRL Description	Compounds Above PALs	Sampling Recommendation(s) and Objectives
12	Nozzle Testing Area	Groundwater: PFOS Soil: PFOS	Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Additional surface and subsurface soil samples is proposed to determine the nature and extent in the vertical and horizontal directions given the potential for a fire department to have soil impacts in a spatial direction.
13	C16 – AOC	Groundwater: PFOS, PFOA Soil: PFOS	
14	CRF – AOC	None[2]	Groundwater: Although PALs were not exceeded, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in two soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
15	East Ramp	Groundwater: PFOS + PFOA	Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
16	West Ramp	None[2]	Groundwater: Although PALs were not exceeded, PFAS were detected in groundwater samples. Therefore, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
17	Former Building 33 – Fire Department	Groundwater: PFOS, PFOA	Groundwater: Determine the nature and extent both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
18	Former Building 176 – Vehicle Maintenance	None[2]	Groundwater: Although PALs were not exceeded, PFAS were detected in the groundwater sample. Therefore, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.

PRL No.	PRL Description	Compounds Above PALs	Sampling Recommendation(s) and Objectives
20	Wet Well/ Drainage Basin 340	Surface Water: PFOS	Surface Water and Sediment: Complete a short-term storm water characterization study in compliance with the MDEQ NOV. Conduct additional sampling of surface water and sediment downstream beyond the base boundary to determine the extent of surface water and sediment impacts and support the evaluation of whether there are unacceptable risks to ecological or human health receptors.
21	Wet Well/ Drainage Basin 507	Surface Water: PFOS	
22	Wet Well/ Drainage Basin 508	Surface Water: PFOS	
23	Wet Well/ Drainage Basin 980	Surface Water: PFOS	
24	Wet Well/ Drainage Basin 990	Surface Water: PFOS	
25	Aircraft Crash Sites	None[2]	Groundwater: Although PALs were not exceeded, PFAS were detected in groundwater samples. Therefore, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells. Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
26	Drainage Basin 1420/Outfall 006A	Surface Water: PFOS	Surface Water and Sediment: PFAS were detected in surface water and sediment samples, but PALs were not exceeded in sediment samples. Additional sampling of surface water and sediment downstream beyond the base boundary is proposed to determine the extent of surface water and sediment impacts and support the evaluation of whether there are unacceptable risks to ecological or human health receptors.
27	Sludge Drying Beds	None[2]	Groundwater: Although PALs were not exceeded, PFAS were detected in the groundwater. Therefore, additional groundwater sampling is proposed to better define potential groundwater impacts both vertically and horizontally through the sampling of existing and additional new monitoring wells.
28	IRP Site 9- Sludge Application Area	None[2]	Soil: Although PALs were not exceeded, PFAS were detected in soil samples. Therefore, additional surface and subsurface soil samples are proposed to determine if an unidentified source exists and if so, to determine the nature and extent in the vertical and horizontal directions given the potential for soil to groundwater migration.
General			Groundwater: (1) Collect additional groundwater samples in upgradient locations to quantify potential impacts from upgradient sources; (2) collect additional groundwater samples off-base from a limited number of new monitoring wells to determine if PFAS impacts beyond the base boundary are increasing or decreasing.

Note:

1 PFOS and PFOA were not detected at the PRL; however, the analytical results were above the screening criteria and the combined value of the non-detect reported value for PFOS + PFOA was above the PAL.

2 The combined value of PFOS + PFOA was less than the PAL.