FIFTH FIVE-YEAR REVIEW REPORT FOR MULTIPLE SITES AT FAIRCHILD AIR FORCE BASE, WASHINGTON

FINAL

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Final

Fifth Five-Year Review Report for Multiple Sites at Fairchild Air Force Base, Washington

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFFF	Aqueous Film-Forming Foam
Air Force	U.S. Air Force
amsl	absolute mean sea level
ARAR	Applicable or Relevant and Appropriate Requirement
Bay West	Air Force Contractor for remediation activities on Fairchild Air Force Base
BaA	benzo[a]anthracene
BaP	benzo[a]pyrene
BbF	benzo[b]fluoranthene
BkF	benzo[k]fluoranthene
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	Contaminant of concern
COPC	Contaminant of potential concern
cPAH	carcinogenic polynuclear aromatic hydrocarbon
CPP	Comprehensive Planning Platform
Cr	chromium
CRL	Craig Road Landfill
CSM	Conceptual Site Model
CTC	carbon tetrachloride
CUL	clean up level
CY	cubic yards
DCE	dichloroethene
DGI	Data gap investigation
DNAPL	dense, non-aqueous phase liquid
EPA	U.S. Environmental Protection Agency
ERD	Enhanced reductive dechlorination
ERP	Environmental Restoration Program
ESD	Explanation of Significant Differences
FFA	Federal Facility Agreement
FPR	free product recovery
FS	Feasibility study
FYR	Five-Year Review
GAC	Granular activated carbon
GETS	Groundwater extraction and treatment system
IC	Institutional control
IDP	Installation Development Plan
IRP	Installation Restoration Program
ISCO	In-Situ Chemical Oxidation
ISCR	in-situ chemical reduction
LFI	limited field investigation
LNAPL	light, non-aqueous phase liquid
LUC	land use control
LUCIP	Land Use Control Implementation Plan
MAROS	monitoring and remediation optimization software
MCL	Maximum contaminant level
MMRP	Military Munitions Program
MNA	monitored natural attenuation

MRO	motor oil range organics
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
NDA	northeast disposal area
NFA	No Further Action
NPL	National Priorities List
O&M	operations and maintenance
OU	operable unit
OWS	oil-water separator
PA/SI	preliminary assessment/site investigation
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PFBS	perfluorobutanesulfonic acid
PP	Proposed Plan
PPA	Proposed Plan Amendment
PVC	polyvinyl chloride
RA	remedial action
RAB	Remedial Advisory Board
RACR	remedial action completion report
RA-O	remedial action operations
RAOs	remedial action objectives
RAWP	Remedial Action Work Plan
RC	response complete
RI	Remedial Investigation
ROD	Record of Decision
RODA	Record of Decision Amendment
RPO	Remedial Process Optimization
RSL	Regional Screening Level
SDA	southwest disposal area
SVE	soil vapor extraction
TCE	trichloroethene
TM	technical memorandum
TPH	total petroleum hydrocarbons
TPH-D	total petroleum hydrocarbons diesel range organics
TPH-G	total petroleum hydrocarbons gasoline range organics
U.S.C.	United States Code
UCL	upper confidence level
UFP-QAPP	Uniform Federal Policy-Quality Assurance Project Plan
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
UU/UE	unlimited use/unrestricted exposure
VC	vinyl chloride
VCP	Voluntary Cleanup Program
VI	vapor intrusion
VOC	volatile organic compound
WDOE	Washington Department of Ecology

WWTP	wastewater treatment plant
µg/L	micrograms per Liter

1.0 INTRODUCTION

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The United States Air Force (USAF) completed this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), Executive Order 12580 (1987), Federal Facility Agreement for Fairchild Air Force Base (USAF 1990), and considering USAF policy. This report complies with the United States Environmental Protection Agency (USEPA's) Comprehensive Five-Year Review Guidance (USEPA 2001) and generally follows the USEPA's recommended template (USEPA 2016). The Department began cleaning up contamination in 1975 under the Installation Restoration Program (IRP). The IRP addresses contamination from a hazardous substance or pollutant or contaminant. In 2001, DoD established the Military Munitions Response Program (MMRP) to address sites (referred to munitions response sites or MRSs) known or suspected to contain unexploded ordnance, discarded military munitions, or munitions constituents. The IRP and MMRP collectively fall under the Environmental Restoration Program (ERP). Through the IRP and MMRP, DoD complies with environmental cleanup laws, such as CERCLA.

This is the Fifth FYR for the Fairchild Air Force Base (AFB) (**Figure 1-1**). This site was placed on the National Priorities List (NPL) in March 1989. The initial FYR triggering action was the earliest initiation of a removal action at the Craig Road Landfill site in March 1993. The triggering action for this statutory review is the completion of the Fourth Five-Year Review Report for Fairchild AFB, Washington on August 12, 2018 (USAF 2019); which covered the period of 13 August 2013 through 12 August 2018. The review period covered is from 13 August 2018 through 12 August 2023. Fairchild AFB conducted this Fifth FYR based on data collected through 31 December 2022. Data included in draft and draft final document versions was reviewed and is included in this Five-Year review. All draft and draft final versions of documents are noted as 'in preparation' within the text of this report and are clearly identified within Reference list provided in **Appendix A**. The FYR was prepared because hazardous substances, pollutants, or contaminants remaining at the sites above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Fairchild AFB CERCLA NPL Site consists of nine Operable Units (OUs). OUs at Fairchild AFB were historically established based upon priority status for environmental investigation and remediation, as documented in the FFA between Fairchild AFB, USEPA, and Washington Department of Ecology (WDOE) (USAF 1990). Restoration sites posing the greatest potential risk to human health and the environment were classified as Priority One sites, while lower risk sites were classified as Priority Two sites and the lowest risk sites were characterized as Priority Three sites. The following list describes the existing OUs at Fairchild AFB:

- **OU-1:** Craig Road Landfill (CRL), off-Base Priority I IRP site;
- **OU-2:** Priority I, on-base Priority I IRP sites;
- **OU-3:** Priority II, on-base Priority II IRP sites;
- **OU-4:** Priority III, on-base Priority III IRP sites SD034, SD038, and SS019 (no further action);
- **OU-5:** SS-39, on-base Priority III IRP site SS039 formerly in OU-4;
- **OU-6:** SR-939 Munitions Site, on-base MMRP site;
- **OU-7:** SD-37 Interim, formerly part of OU-4 (no decision document);
- **OU-8:** Priority Three Sites RW011 & WP036; and

- **OU-9:** PFAS (no decision document)

OUs 1 through 9 include 36 distinct IRP Sites, which are listed in **Table 1-1**. Summaries of contaminants of concern (COCs), remedial action objectives (RAOs), completed remedial actions (RAs), and current site status are provided in **Tables 1-1** and **1-2**. OUs addressed in this Five-Year Review include those sites at Fairchild Air Force Base which have both a decision document and have not achieved the criteria for site closure with UU/UE prior to this FYR period. The sites within the OUs addressed by the following Records of Decision (ROD)s:

- **OU-1:** Record of Decision Craig Road Landfill (USAF 1993a);
- **OU-2**: Record of Decision On-Base Priority One Operable Units (USAF 1993b);
- **OU-3:** Record of Decision for Priority Two Sites (USAF 1995b);
- **OU-5**: Interim Record of Decision OU5-Spill Site 39 (SS-39) Chlorinated Hydrocarbon Plume (USAF 2011); and
- **OU-6:** SR-939 Munitions Site – ROD for (USAF 2021)
- **OU-8:** Record of Decision Site RW011 and Site WP036 (USAF 2022)

This FYR includes two OU-3 sites [DP012 (SW-10) and DP013 (SW-11)] where the original ROD selected no further action (NFA) as the site remedy; but conditions have been identified that require LUCs to prevent unacceptable risk to human health (see **Section 5**).

SR939 was established as OU-6 in 2021 (USAF 2021). The ROD did not establish FYRs as a requirement since the remedial actions were anticipated to bring the site to UU/UE. The selected remedy of excavation was completed in June 2022 and the SR939 Remedial Action Completion Report (RACR) is currently under regulatory review. Since the remedy has been implemented and functioned as intended, OU-6 is not included in this FYR.

A ROD was signed in 2022 that established sites RW011 and WP036 as OU-8 (USAF 2022). The ROD did not establish Five-Year Reviews as requirement since the remedial actions are anticipated to bring the sites to UU/UE. However, since the remedies have not yet been implemented, OU-8 was included in this FYR.

1.1 BACKGROUND

Background information in this section is provided for Fairchild AFB in general and for each site. Pertinent site features are shown in **Figures 4-1** through **8-4**, and site photographs are provided in the Site Inspection Report (**Appendix C**).

1.1.1 Installation Overview

Fairchild AFB encompasses approximately 4,300 acres located approximately 12 miles west of Spokane, Washington (**Figures 1-1** and **1-2**). Established in 1942, the base has had numerous missions ranging from a repair depot for damaged aircraft returning from World War II, a Strategic Air Command bomber wing during the Cold War, to its current primary mission as the largest air refueling wing in the USAF.

1.1.2 Physical Characteristics of the Base Vicinity

The following provides a brief overview of the generalized geology and groundwater occurrence in the vicinity of Fairchild AFB. More detailed descriptions and evaluations of geology and groundwater occurrence, with respect to nature and extent of contamination, are presented in early Remedial Investigation (RI) reports, annual remedial action operations (RA-O) reports (see **Appendix A** for a list of documents reviewed), and in the Basewide Conceptual Site Model for Fairchild AFB (AECOM 2012). The

climate at Fairchild AFB is semi-arid. The mean annual precipitation is 15.7 inches with majority occurring between October and March.

1.1.2.1 General Geology

The geology in the vicinity of the base consists of three primary strata. The near-surface geology is characterized by alluvial sediments (primarily sand and gravel with some silt deposits) that generally vary from 0 to 50 feet thick. The alluvial sediments generally were deposited by receding floodwaters associated with glacial Lake Missoula. Beneath the alluvium is a thick sequence of layered basalt bedrock associated with the regional Columbia River Basalt Group. The basalt bedrock represents a series of individual flows that vary from a few feet to hundreds of feet thick. Interbedded layers of sand, silt, and clay occur between individual basalt flows; these interbeds can range from several feet to over 40 feet thick beneath the base. Massive granitic bedrock underlies basalt at depth.

The uppermost basalt at the Fairchild AFB is referred to as Basalt A. It is separated from a deeper basalt sequence (Basalt B) by a layer of low-permeability clay (Interbed A). Within the immediate vicinity of the base, Basalt A varies in thickness from about 50 to 160 feet. Multiple remedial investigation (RI) activities conducted at the base have provided a detailed characterization of geologic and hydrogeologic conditions within the alluvial sediments, Basalt A, and, to a lesser extent, the upper portions of Basalt B.

The top of the Basalt A unit is fractured and highly weathered in places, whereas the center portion of Basalt A is more massive with infrequent fractures and lower permeability. Interbed A generally consists of a laterally extensive, silty claystone that is approximately 5 to 30 feet thick. Basalt B generally is porous and vesicular at the top and progressively denser and less vesicular with depth.

1.1.2.2 Groundwater Occurrence

The uppermost groundwater at the base typically is encountered from 3 to 30 feet below ground surface (bgs) in alluvium and/or within the fracture and weathered upper portion of Basalt A under unconfined conditions. The lower Basalt A is less porous and poorly permeable; therefore, it is not a significant pathway for groundwater flow. Groundwater flow within alluvium and Basalt A generally for the western and central portions of the base is northeasterly. However, east of the base the Basalt A is an uplifted, possibly a faulted outcrop area such that more of the saturated zone is within the lower (less permeable) portion of the Basalt A. The effect of the outcrop area is to restrict and divert eastward groundwater flow and forms a flow divide approximately along the flightline. Groundwater flow is typically divided by the flightline; flow is northerly areas north and west of the flightline and southeasterly in areas south and east of the flightline.

In some areas, hydraulic connection exists between alluvium and shallow basalt water-bearing zones. In other areas, the shallow alluvium and basalt bedrock water-bearing zones are separated by a low permeability silt/clay layer.

1.1.2.3 Land Use and Demographics

Fairchild AFB lies within unincorporated Spokane County. The majority of land surrounding the base is zoned for rural traditional development, with some mining (sand and gravel), light industrial, and commercial zoning east of the base. The predominant land use in the base vicinity is agriculture, which includes cattle grazing and non-irrigated cultivation of wheat, hay, and alfalfa. The City of Airway Heights and a western extension of the City of Spokane lie one mile northeast and east of the base, where the land is zoned for mining (sand and gravel), light industrial development, and commercial development. Residential zoning is present farther to the northeast and east within the City of Airway Heights.

Approximately 10,000 military personnel and civilians reside or are employed at Fairchild AFB. Family housing and dormitory units house approximately 3,700 residents. Within the base boundary, land is both developed and undeveloped. The base water supply is groundwater that is piped from near the Spokane River (nine miles to the northeast) and distributed throughout all on-base locations. One on-base water supply well (Well #2) provides supplemental water during the summer when demand increases for irrigation. Well #2 is located near the southern end of the base, along the eastern base boundary near Hallet Road (**Figure 1-1-**). It is 400 feet deep, with perforated casing at depths of 205 to 215 feet and 380 to 400 feet. The City of Airway Heights has a population of over 6,500 residents.

1.2 FIVE-YEAR REVIEW SUMMARY

Site Identification		
Site Name:	Fairchild Air Force Base (AFB)	
EPA ID:	Craig Road Landfill: WAR000000923; On-Base: WA9571924647	
Region: 10	State: WA	**City/Country:** Fairchild AFB, Spokane
Site Status		
NPL Status: Final		
Multiple OUs? Yes	Has the site achieved construction completion? No	
Review Status		
Lead agency: Other Federal Agency If "Other Federal Agency" was selected above, enter Agency name: US Air Force		
Author name (Federal or State Project Manager): Megan Riccobono, AFCEC/CZOM		
Author affiliation: US Air Force		
Review Period: 15 September 2022 – 20 July 2023		
Date of site inspection: 24-26 April 2023		
Type of review: Statutory		
Review number: 5		
Triggering action date: 12 August 2018		
Due date (five years after triggering action date): 12 August 2023		

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
Craig Road Landfill [a]	1	**LF002**	SW-8	Craig Road Landfill	RA required	Groundwater monitoring, groundwater extraction and treatment, SVE, landfill cap maintenance, ICs	TCE (groundwater and soil)	• Landfill capped (1995), • Groundwater extraction and treatment system (GETS) operational in 1995. • ISCO and SVE treatability testing (2011-2013) • Groundwater monitoring
On-Base Priority One Sites [a]	2	**LF001**	SW-1	Old Base Landfill	RA required	ICs (groundwater monitoring in support of FYR next scheduled for 2026)	TCE (groundwater)	• Groundwater monitoring (through 2008, transition to every 5 years 2012, 2017, 2022)
		SS018*	PS-2	Refueling Pit Area	RA required	Groundwater monitoring, free-product monitoring and removal, ICs. Site transferred to VCP and consolidated into TU506	Benzene and TPH-D (groundwater)	• Free-product recovery (last observed 2008).

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
		SS026*	PS-8	Spill Site - Flightline	RA required	ICs, site transferred to VCP, and consolidated into TU500	Benzene (groundwater)	• Groundwater monitoring (through 2008)
		FT004	FT-1	FT-1 Fire Training Area	RA required	ICs for PFAS	COC: Benzene and TPH-D[c] (groundwater and soil); PFOS/PFOA (groundwater and soil) COPC: PFAS	• Soil bioventing and groundwater air sparging (indefinite shutdown 2006), • soil monitoring (discontinued in 2008) • groundwater monitoring (discontinued in 2018)
		WP003	WW-1	Industrial Wastewater Lagoon System	RA required	Groundwater monitoring, ICs	COC: TCE, TCE Degradation products[b], arsenic[b] (groundwater)	• GETS (indefinite shutdown 2006), • source area investigation completed in 2000
Priority Two Sites [a]	3	OT016	IS-3	Reciprocating Engine Test Cell - Bldg 2150	ICs required	UU/UE Closure 4 Apr 2019	PCBs (sediment)	• Sump removed and Bldg. 2150 demolished (1996)

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
		OT017*	IS-4	Former Jet Engine Test Stand	RA required	ICs, site transferred to VCP; NFA request December 2017; UU/UE achieved in 2019 through DGI and NFA	TPH-D (soil)	• Soil monitoring (through 2006), • soil excavation and landfarming completed 2006, • groundwater monitoring (through 2010)
		ST006*	PS-1	POL Bulk Storage	RA required	ICs, site transferred to VCP NFA for groundwater via 2019 TM; LUCs remain for soil	TPH-D and Benzene (groundwater);	• Soil bioventing (indefinite shutdown 2006), • soil monitoring (discontinued in 2008)[d]
		SS009*	PS-5	Former Fuel Oil Tank, Wherry Housing	RA required	ICs, site transferred to VCP	TPH-D (groundwater and soil)	• Groundwater monitoring (through 1998)
		ST010*	PS-7	Fuel Oil Storage Tanks	RA required	Groundwater monitoring discontinued in 1998 and monitoring wells decommissioned in 1999.	TPH-D (groundwater and soil)	• Groundwater monitoring (through 1998)

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
						ICs, site transferred to VCP in 2018; SC request in 2020 with WDOE approval and acceptance of UU/UE conditions in 2021		
		SD031	PS-10	Fuel Truck Maintenance Facility	RA required	UU/UE Closure 4 Nov 2019. TCE in groundwater transferred to SS039.	TCE and TPH-D (soil)	• Excavation and offsite incineration of TCE contaminated soils completed in 1996, • soil monitoring (through 1998), • Bldg 1060 demolished and remaining OWS removed in 2012.
		FT032	FT-2	Fire Training Area	RA required	UU/UE Closure in 2018	TPH-D (groundwater and soil)	• Soil monitoring through 2006, • soil excavation and landfarming completed 2006, • groundwater monitoring through 2010.

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
		DP022	SW-4	Waste Disposal N of Bldg 2451	NFA	UU/UE Closure in 1995; reconfirmed in 2020	PAH and metals (soil)	• None
		DP024	SW-7	Waste Disposal S of Taxiway #10	NFA	UU/UE Closure in 1995; reconfirmed in 2020	PAH and metals (soil)	• None
		DP012	SW-10	Disposal Area Near WANG Test Cell	NFA	ICs[e]	Sodium (soil)	• None
		DP013	SW-11	Disposal Area at Warrior Park	NFA	ICs	Sodium (soil)	• None
Priority Three Sites [a]	4	SD034	SD-34	Contaminated Soil at Bldg. 1012	NE	ICs[e]	TPH and PAH (soil)	• Interim removal action (soil) completed 1998.
		SD038	SD-38	Contaminations at Ditches, Pipes, and Culverts	NE	ICs[e]	TPH and arsenic	• Interim removal action (soil) completed 1998.
		SS019	SS-19	Mercury Valve Vault Site	NE	ICs[e]	Mercury	• Interim removal action (soil, vault water) completed
	5	**SS039**	SS-39	Orphan TCE Plumes	RA Required	Groundwater monitoring, ISCO, ICs	COC: TCE, CTC, 1,1-DCE, chloroform, and PCE (groundwater)	• Pilot testing for groundwater treatment completed 2011, 2013, • CSM update completed 2013,

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
							COPC: PFAS from RS001P and SS008P-sub	• vapor intrusion evaluation 2013, • ISCO to support groundwater treatment remedial design 2013 • Groundwater monitoring 2015 - present
	6	SR939	NE	Machine Gun Range, Facility 2074	RA required	Selected remedy not subject to FYRs	Lead (soil)	
	7	SD037	SD-37	Groundwater and Sediment Contamination at Oil/Water Separators	NE	Groundwater monitoring, ICs[e]	TCE, TPH, and arsenic (groundwater)	• Bioreactor demonstration for groundwater treatment completed 2011, • EISB pilot study (2017) • ISCO injections completed Sep 2021
		AOC01	AOC-1	AOC 1	NE	Site administratively closed 20 June	TPH and lead (soil)	• None

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
						2018 and contamination transferred to SD037		
	8	**RW011**	SW-6	Weapon Storage Area Radioactive Disposal Area	RA required	Selected remedy not subject to FYRs	PAH (soil)	• Interim removal action (soil) completed 2011.
		WP036	WP-36	Contaminated Groundwater at Sediment at Bldg. 1419	RA required	Selected remedy not subject to FYRs	PAHs, TPH, and mercury (sediment)	• None
	N/A	AOC02	AOC-2	AOC 2	NE	ICs[e], site transferred to VCP; UU/UE Closure August 2018	TPH (soil)	• None
		SS033	SS-33	SWMU-18 Solvent Storage at Bldg. 1419	NE	ICs[e], site transferred to VCP; Memo requesting UU/UE Closure submitted 2019	SVOCs and TPH (soil)	• Interim removal action (soil) completed 1998
		ST035	ST-35	Contaminated Soil at Bldg 2165	NE	ICs[e], site transferred to VCP; Memo requesting UU/UE	TPH (soil)	• Interim removal action (soil) completed 1998

Table 1-1
Fairchild AFB Open Installation Restoration Program (IRP) Sites under CERCLA Purview

Priority Grouping / ROD	OU	Site ID	Historic Site ID	Site Name	Site Status when ROD Signed [b]	Current Status	COCs and COPCs	Remedial Actions Completed
						Closure submitted 2019		
NE	TBD	DP064	NA	Construction Debris Landfill/Former Coal Storage Area	NE	ICs[e]	PAH and metals	• None
		OW058	NA	Hotspot #5 TPH Contamination	NE	ICs[e]	TPH, TCE, CTC, benzene, chloroform, naphthalene	• None
PFAS[f]	9	RS001	NA	Fire Station 1	NE	RI; ICs per AF policy	PFAS	• None
		RS002	NA	B-52 Crash Location 1994	NE	RI; ICs per AF policy	PFAS	• None
		RS003 (migration to WP003, FT032, & DP024)	NA	Calibration Area	NE	RI; ICs per AF policy	PFAS	• None
		FT004[g]	FT-1	FT-1 Fire Training Area	NE	RI; ICs per AF policy	PFAS	• None
		SS008[g]		Pumphouse B/Crash Site	NE	RI; ICs per AF policy	PFAS	• None

Notes:
Bolded sites included in this FYR.
* Sites move to the State VCP
[a] Craig Road Landfill ROD signed February 1993; On-Base Priority One sites ROD signed July 1993; Priority Two sites ROD signed December 1995; Site SS-39 Interim ROD signed August 2011. RODs for remaining Priority Three sites OU-4 and OU-7 are anticipated to be completed in 2017-2018. OU-6 is reserved for the final Site SS-39 ROD.

[b] Status of site when ROD was signed.
[c] At Site FT004, TPH-D was not established as a COC in the ROD, but it is a known contaminant in soil and groundwater at this site at concentrations above current MTCA Method A CULs.
[d] Routine soil monitoring at Site ST006 discontinued in 2005; soil monitoring may be resumed if access to the Vet Road area or beneath the entire tank farm can be achieved, when the tank farm is no longer in use.
[e] Institutional controls have not been formally identified in a ROD as a component of the remedy; however, Fairchild AFB has proactively implemented controls
[f] Additional sites likely to be added to the PFAS grouping as USEPA Regional Screening Levels (RSL) are published for additional PFAS constituents
[g] Site where "legacy" contaminants have been remediated, but PFAS remains.

Acronyms:
AFB: Air Force Base
COCs: contaminants of concern;
COPCs: contaminants of potential concern;
CTC: carbon tetrachloride
ESD: Explanation of Significant Differences;
GETS: groundwater extraction and treatment system.
ICs: Institutional Controls;
LTM: long-term monitoring;
LTO: long-term operation of remedial systems;
NA: not applicable
NE: not established
NFA: No Further Action
OU: Operable Unit;
PAH: polycyclic aromatic hydrocarbons;
PFOS: Perfluorooctanesulfonic acid.
PFOA: Perfluorooctanoic acid.
ROD: Record of Decision;
RA: Remedial Action
SVE: soil vapor extraction;
TBD: to be determined;
TCE: trichloroethene;
TPH: total petroleum hydrocarbons (D-diesel range)
VCP: Voluntary Cleanup Program;
VI: vapor intrusion
WDOE: Washington Department of Ecology

Table 1-2
ROD Summary Table

OU	Site ID	Site Name	Decision Document	Selected Remedy	Remedial Action Objective	COCs
1	LF002	Craig Road Landfill	• Craig Road Landfill ROD (USAF 1993a) • ESD 1 (USAF 1996) • ESD 2 (USAF 2016) • RODA (USAF 2021)	GETS, Landfill CAP for NDA and SDA, SVE, LTM, ICs. ISCO, ISCR	• Prevent consumption by area residents of groundwater containing COCs exceeding federal maximum contaminant levels (MCLs); • Restore contaminated groundwater in the upper aquifer to safe drinking levels; • Minimize migration of contaminants from fill material to groundwater; • Prevent human exposure to contaminants contained in subsurface soil and debris; and • Prevent further migration of contaminated groundwater across the site boundary and to the lower aquifer.	TCE in groundwater, soil, and landfill debris.
2	LF001	Old Base Landfill	• On-Base Priority One Sites ROD (USAF 1993a) • ESD (USAF 2019)	ICs, MNA Assessment, LTM	• Prevent residential exposure to potential contaminants within subsurface soil and debris; • Minimize movement of contaminants from debris to groundwater; • Prevent consumption of groundwater with contamination exceeding drinking water MCLs; • Restore contaminated groundwater to drinking water quality; and • Prevent further migration of contaminated groundwater.	TCE in groundwater

Table 1-2
ROD Summary Table

OU	Site ID	Site Name	Decision Document	Selected Remedy	Remedial Action Objective	COCs
2	SS018*	Refueling Pit Area	• On-Base Priority One Sites ROD (USAF 1993a) • ESD (USAF 2018)	ICs, MNA Assessment, Passive Product Removal, LTM	• To restore groundwater to drinking water quality within a reasonable time frame.	Benzene and TPH-D in groundwater
2	SS026*	Spill Site - Flightline		ICs, MNA Assessment	• To restore groundwater to drinking water quality within a reasonable time frame.	Benzene in groundwater
2	FT004	FT-1 Fire Training Area		ICs, In-Situ Bioventing Treatment System, Air Sparge System, LTM	• Remediate soils to levels that are protective of groundwater • Restore groundwater to drinking water quality.	Benzene in soil and groundwater
2	WP003	Industrial Wastewater Lagoon System		ICs, GETS, LTM, Additional Source Investigation.	• Restrict Site from future residential or agricultural uses. • Restore groundwater to drinking water quality	TCE in groundwater
3	OT016	Reciprocating Engine Test Cell - Bldg 2150	• Priority Two Sites ROD (USAF 1995a) • ESD (USAF 2018)	ICs	NA[1]	PCBs in soil
3	OT017*	Former Jet Engine Test Stand		ICs, MNA	• Remediate soils to achieve clean up levels (CULs) below the state cleanup standard.	TPH-D in soil
3	ST006*	POL Bulk Storage		IC's, In-Situ Bioventing,	• Remediate soils to achieve state CULs for TPH-D.	TPH-D in soil, Benzene and TPH-D in groundwater.

Table 1-2
ROD Summary Table

OU	Site ID	Site Name	Decision Document	Selected Remedy	Remedial Action Objective	COCs
				MNA Assessment, LTM	• Remediate groundwater to below MCL for benzene and below the MTCA Method A CUL for TPH-D.	
3	SS009*	Former Fuel Oil Tank, Wherry Housing		ICs, MNA Assessment, LTM	• Remediate groundwater and soil to below CULs.	TPH-D in soil and groundwater
3	ST010*	Fuel Oil Storage Tanks		ICs, MNA Assessment, LTM	• Remediate groundwater and soil to achieve state CULs.	TPH-D in soil and groundwater.
3	SD031	Fuel Truck Maintenance Facility		ICs, Excavation and Ex- Situ Treatment and Disposal, MNA	• Remediate soils to achieve state CULs that are protective of groundwater Prevent exposure to contaminated soil.	TPH-D and TCE in soil
3	FT032	Fire Training Area	• Priority Two Sites ROD (USAF 1995a) • ESD (USAF 2018)	ICs, MNA Assessment, LTM	• Remediate soils and groundwater to achieve state CULs	TPH-D in soil and groundwater
3	DP022	Waste Disposal N of Bldg 2451		NFA	NA[1]	Naphthalene, and cPAHs in soil.
3	DP024	Waste Disposal South of Taxiway #10		NFA	NA[1]	Newly identified COPCs include cPAHs, naphthalene, and metals.
3	DP012	Disposal Area Near WANG Test Cell		LUCs	NA[1]	NA[1]

Table 1-2
ROD Summary Table

OU	Site ID	Site Name	Decision Document	Selected Remedy	Remedial Action Objective	COCs
3	DP013	Disposal Area at Warrior Park		LUCs, Vegetative Cap.	• Mitigate physical hazards associated with buried metal debris and sodium filled valves.	No chemical COCs
5	SS039	Orphan TCE Plumes	SS039 Interim ROD (USAF 2011)	ICs, ISCO, MNA Assessment, Vapor Intrusion Pathway Assessment and Indoor Air Sampling, LTM	• Prevent exposure via ingestion, inhalation, and dermal contact to groundwater impacted by Site SS-39 COCs exceeding MCLs; • Prevent plume expansion and contaminant migration beyond the current limits of the plume; and • Restore Site SS-39 groundwater to its expected maximum beneficial uses where practicable and within a reasonable timeframe.	Dissolved Chlorinated VOCs in Groundwater
6	SR939	Munitions Site	ROD Munitions Response Site SR939 Machine Gun Range, Facility 2074 (USAF 2021)	Excavation	• Prevent human exposure via ingestion, inhalation, and dermal contact to lead within soil in excess of the cleanup goal (95% upper confidence limit [UCL] for lead in soil is less than the MTCA Method A CUL of 250 mg/kg) for future use as UU/UE.	Lead
7	No ROD					

Table 1-2
ROD Summary Table

OU	Site ID	Site Name	Decision Document	Selected Remedy	Remedial Action Objective	COCs
8	RW011	Weapon Storage Area Radioactive Disposal	ROD Sites RW011 and WP036 (USAF 2022)	Excavation	• Prevent human exposure via ingestion, inhalation, and dermal contact to cPAHs (BaA, BaP, BbF, BkF, chrysene, DBA, and IP) as BaP-TTEC within RW011 soil in excess of the cleanup goal for future use UU/UE.	cPAHs
8	WP036	Contaminated Groundwater and Sediment at Bldg 1454	ROD Sites RW011 and WP036 (USAF 2022)	Offsite disposal and sludge drying bed soils.	• Protect populations of ecological receptors, including infaunal communities and wildlife, by limiting exposure to cadmium, mercury, silver, DRO, and MRO in sediment in excess of the cleanup goal for future use as UU/UE; • Protect populations of ecological receptors, including wildlife, by limiting exposure to zinc in soil from SIS in excess of the cleanup goal for future use as UU/UE; • Protect populations of ecological receptors, including wildlife, by limiting exposure to lead, mercury, and zinc from SDB in soil; and • Prevent human exposure to PAHs within Imhoff tank sludge and DRO and MRO withing Imhoff tank water.	Cadmium, mercury, silver, zinc, and PAHs
9	No ROD					

Notes:
* Sites move to the State VCP
1 - No RAOs established in ROD

Acronyms:
COC - Contaminants of Concern
COPC - Contaminants of Potential Concern
ESD – Explanation of Significant Differences
GETS - Groundwater Extraction and Treatment System
ICs - Institutional Controls
ISCO – In Situ Chemical Oxidation
LTM - Long Term Monitoring
LUCs – Land Use Controls
MNA - Monitored Natural Attenuation
NA - Not Applicable
NFA – No Further Action Required.
ROD - Record of Decision
TCE - Trichloroethylene
TPH-D – Diesel Range Total Petroleum Hydrocarbons
VOCs – Volatile Organic Compounds

Table 1-3
Major Participants in the Fifth FYR

Participant	Affiliation	Title; Role / Area of Expertise
Megan Riccobono	AFCEC / CZOM	Fairchild AFB Remedial Project Manager (RPM); provide information, documentation, and background data as requested, and coordinated access.
Kate Need	AFCEC / CZOM	Section Chief; co-author, 10+ years in environmental restoration field and experience writing FYRs
Doug Janulewicz	AFCEC / CZOM	Minot AFB RPM; primary author, 20+ years in environmental restoration field and experience writing FYRs
Holly O'Dell	AFCEC / CZOM	Offutt AFB RPM; co-author, 20+ years in environmental restoration field and experience writing FYRs
Shannon Garcia	AFCEC / CZTE	Toxicology Subject Matter Expert; co-author and reviewer
Jason Sherman	HAF/JAOE-FSC Restoration Branch	Senior Attorney; reviewer
Joe Marsh	USACE – Seattle District	Environmental Protection Specialist; completed site visit
Abbi Power	Ageiss	Senior Geologist; Regulatory Expert; Technical Review
Jack Mapes	Ageiss	Environmental Scientist; completed site visits, technical review
Jeniffer Montes	Cherokee Federal	Senior Environmental Engineer; Technical Review
Rich Francis	USEPA Region 10	EPA Remedial Project Manager / Regulatory Reviewer; reassigned during FYR period
Jaclyn Satira	USEPA Region 10	EPA Remedial Project Manager / Regulatory Reviewer

Acronyms:
AFCEC – Air Force Civil Engineer Center
CZOM – Environmental Directorate, Operations Division, Midwest Region
CZTE – Environmental Directorate, Technical Division
HAF/JAOE-FSC – Headquarters Air Force, Judge Advocate-Operations and International Law/Environmental Law and Litigation – Field Support Center
USACE – United States Army Corps of Engineers
USEPA – United States Environmental Protection Agency

2.0 OVERVIEW

2.1 CHRONOLOGY OF MAJOR EVENTS

Fairchild AFB generated hazardous waste throughout its seven-decade history as an aircraft maintenance and refueling station. Most of the waste generated for recycling or disposal was fuel oil, machine oil, or solvents. Releases of these material to the environment occurred from landfilling, discharge to the base wastewater drainage system, fire training exercises, and accidental spills and leaks.

As part of the four-phase IRP process, Fairchild AFB initiated investigations of potentially hazardous waste releases in September 1984. The IRP was designed so that each military branch could conduct its own inspections and take appropriate actions in compliance with the NCP under CERCLA.

In March 1989, Fairchild AFB was listed on USEPA's National Priorities List (NPL). In January 1990, Fairchild AFB, USEPA, and WDOE signed a Federal Facility Agreement (USAF 1990) establishing schedules and priority rankings for environmental investigation and remediation.

Individual OU major events are summarized in **Appendix B**.

2.2 FIVE-YEAR REVIEWS

The First Five-Year Review Report for Priority One and Two Sites was completed in January 2001 (USAF 2001). The Second Five-Year Review Report was completed in August 2008 (USAF 2008). The Third Five-Year Review Report was signed by the USAF on 12 August 2013. The Fourth Five-Year Review Report was signed by the USAF on 9 January 2019. Subsequent sections provide discussion of progress since the last Five-Year Review.

2.3 PROGRESS SINCE LAST REVIEW

Protectiveness determinations and statements from the Fourth FYR are presented in **Table 2-1**. Recommendations were made for all OUs to address issues limiting long-term protectiveness. These recommendations, as well as the current status, are presented in **Table 2-2** and generally fall into the categories listed below.

- **Basewide:** Update the documentation (Installation Development Plan [IDP] or Comprehensive Planning Platform [CPP]) for on-base LUCs to support proper implementation.
- **OU-1, OU-2 (WP003), and OU05:** Supplement current off-base LUCs to prevent the use of contaminated groundwater and to address potential vapor intrusion (VI).
- **OU-1, OU-2 (WP003), OU-3 (DP022 & DP024):** Complete definition of on- and off-base impacts for existing and newly identified COCs/COPCs.
- **OU-1, OU-2 (WP003):** Update site COCs via an Explanation of Significant Difference (ESD) or Record of Decision-Amendment (RODA) to include newly identified COCs/COPCs.
- **OU-3 (DP012):** Clarify and formalize LUCs via an ESD.
- **OU-5:** Complete Interim ROD activities so sufficient information is available to evaluate remedy performance.

2.4 FIVE-YEAR REVIEW PROCESS

2.4.1 Administrative Components

This Fifth Five-Year Review was completed by AFCEC personnel. Fairchild AFB personnel (Megan Riccobono) with AFCEC/CZOM coordinated review activities.

The review schedule was established by the review team and included the following components:

- Community notification and involvement;
- Document and data review;
- Site inspections; and
- Interviews.

2.4.2 Community Notification and Involvement

The public was given notice that Fairchild AFB commenced this Fifth Five-Year Review through a legal notice published in the Spokesman Review on 14 March 2023. A copy of the public notice is included in **Appendix D**. The notice invited the public to submit comments to the Remedial Project Manager (RPM) or the FAFB Public Affairs Office. The published notice also informed the reader that the RODs and other reports related to the FAFB remediation effort are available for review on the USAF Administrative Record (https://ar.afcec-cloud.af.mil/). No comments were received following the notice.

An additional public notice will be published in the Spokesman Review following completion of the Fifth Five-Year Review and the final version of this Fifth Five-Year Review will be provided to Fairchild AFB Restoration Advisory Board (RAB) members and added to the USAF Administrative Record.

2.4.3 Site Interviews

Invitations for interviews were extended to the staff from the Air Force, USEPA, and the public, including FAFB environmental office personnel, AFCEC RPM, USEPA Project Manager WDOE PM, RAB members, and the contractor currently responsible for the on-going remediation (Bay West). Three individuals provided comments through written submittals (two RAB members and Bay West). Fairchild AFB and AFCEC personnel were consulted for this Five-Year Review during site inspections and follow-up discussions regarding contaminant history, RAs, LUCs, and changes that occurred at each OU since the last Five-Year Review.

During the Five-Year Review process, interviews were conducted to document any perceived problems or successes with the remedy implementation to date. The results of these interviews are summarized below. Interview forms for all Fairchild AFB Sites were sent out to multiple entities with three returned. The major points from the interview comments provided by are summarized below and complete records of the responses are provided in **Appendix D**:

- Groundwater plumes have generally reduced in size and concentration; efforts are on-going.
- The community is generally satisfied with the current cleanup actions for known chemicals but emphasize their desire for more information and action taken concerning per- and polyfluoroalkyl substances (PFAS).
- The community would like more transparency and productive RAB meetings.

The input above was used in this FYR process as a check on the findings, to ensure no potential problems with the remedy were overlooked, and to aid in formulating recommendations to enhance overall project performance.

2.4.4 Site Inspection

For this FYR, site inspections were completed by Joseph Marsh (USACE) and Jack Mapes (AGEISS) on 24-26 April 2023. The site inspections are documented in a Site Inspection Report included as **Appendix C**. Photographs are included in the Site Inspection Report. The purpose of these inspections was to assess the protectiveness of the remedies.

2.4.5 Document and Data Review

Documents and data used in preparing this Fifth FYR are presented in **Appendix A**. These documents were either downloaded from the USAF Administrative Record, gathered directly from AFCEC/CZOM personnel, or reviewed during the site inspection (in support of the Fifth Five-Year Review). Groundwater monitoring analytical results and groundwater elevation measurements from through December 2022 were used in assessing remedy performance and evaluating trends for this Fifth FYR period.

In addition to reviewing reports and documents, potential changes in applicable or relevant and appropriate requirements (ARAR) were evaluated for the OUs at FAFB to determine if the selected remedies remain protective. Each action- or location-specific ARAR and any change to the applicable standard or criterion are discussed in **Appendix F.** There have been no changes to the action- or location-specific ARARs that impact the protectiveness of the remedy during the review period. The selected remedies remain protective based on the ARAR assessment.

Chemical-specific ARARs for groundwater and soil cleanup levels for all OUs are discussed in **Appendix G**. Toxicity values used to calculate risk-based cleanup levels for some chemicals of concern have changed since the final RODs were signed for the OUs (**Tables G-1** to **G-4**). Evaluation of the changes in toxicity values determined the current risk-based cleanup levels result in cancer risks within USEPA's generally acceptable risk range of 1×10^{-4} to 1×10^{-6} and the noncancer hazard quotient does not exceed 1, therefore, cleanup levels in the remedies remain protective.

The toxicity evaluation for OU 1, 2, 3, and 5 do not exceed cleanup levels (**Table G-5**). Several cleanup values have decreased for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene and indeno(1,2,3-cd)pyrene since the decision documents have been signed. Benzo(a)pyrene and 1,2,4 trimethylbenzene do not have a corresponding cleanup value from the 2012 toxicity assessment, however, the current values do not exceed EPA's RSL.

2.4.6 Technical Assessment

The technical assessment follows USEPA guidance provided in Exhibit 3-3 of the Comprehensive Five-Year Review Guidance (USEPA 2001) and is designed to incorporate all elements of the updated guidance (USEPA 2012a, b, c). The Five-Year Review process must determine whether the remedy at a site is protective of human health and the environment. The USEPA guidance describes three questions used to provide a framework for organizing and evaluating data and information to ensure all relevant issues are considered when determining the protectiveness of a remedy. The technical assessments address these three questions:

- **Question A:** Are the remedies functioning as intended by the decision documents?
- **Question B:** Are the exposure assumptions, toxicity data, CULs, and remedial action objectives used at the time of remedy selection still valid?
- **Question C:** Has any other information come to light that could call into question protectiveness of the remedies?

2.4.7 Issues and Recommendations

Site-specific issues and recommendations are presented in each section while overall are presented here.

2.4.7.1 Basewide Issues/Recommendations

Basewide Issues and Recommendations				
All OUs	**Issue Category:** Institutional and Engineering Controls			
	Issue: Update the Installation Development Plan (IDP) to describe the specific on-base LUCs for each site, the reason for the control, and the areas where the controls are applied. Ensure Base personnel have access to information concerning its existence, purpose, and maintenance requirements.			
	Recommendation: The new Comprehensive Planning Platform (CPP) sufficiently identifies LUCs associated with IRP sites and appropriately categorizes the constraints at sites that require LUCs. Overall, the CPP is not a complete replacement for the IDP; however, by including the IRP sites and their specific LUCs into the CPP, it is a working measure until either the CPP and its associated documents completely replace the IDP or the IDP is fully updated and integrated with the CPP.			
Affect Current Protectiveness	***Affect Future Protectiveness***	***Party Responsible***	***Oversight Party***	***Milestone Date***
No	Yes	USAF	USEPA	December 2026

2.4.7.2 Other Issues – PFAS

Per- and polyfluoroalkyl substance (PFAS) have been recognized as a persistent environmental contaminant, with concerns rising about their ubiquity, bioaccumulation potential, and health implications. At Fairchild AFB, systematic efforts are in motion to delineate the distribution and potential impacts of PFAS, particularly those linked to the usage and storage of USAFs aqueous film-forming foam (AFFF), a known source of specific PFAS compounds.

The Preliminary Assessment (PA) for Perfluorinated Compounds (PFCs) (CH2M Hill 2015) identified locations where PFCs may have been released into the environment from the usage or storage of USAF aqueous film-forming foam (AFFF). The PA researched 19 areas and recommended three areas to move to the Site Inspection (SI) phase due to known or suspected AFFF releases. The remaining 14 areas were recommended for no additional investigation due to unknown or suspected releases of AFFF.

The SI conducted from 2016 through 2019 (Amec 2019) investigated the three AFFF release areas based on the results of the PA and two additional areas based on information collected during the SI installation scoping visit in 2016. These areas were initially identified as AFFF Areas 1 through 5 and assigned site-specific IDs as follows:

AFFF Release Area	Site ID	Site Name
1	FT004P-Sub	FT-1 Fire Training Area
2	RS003P	Calibration Area
3	SS008P-Sub	Pumphouse B/Crash Site
4	RS002P	B-52 Crash Location 1994
5	RS001P	Fire Station 1

Potential off-base groundwater receptors were identified via a desktop well inventory and site reconnaissance downgradient of FT004P-Sub/AFFF Release Area 1. Potential receptors were identified east of the installation, and analytical results from monitoring wells installed along the eastern installation boundary were above 70 ppt (the reference point used in accordance with DoD policy) for PFOS and PFOA and below the USEPA tap water Regional Screening Level (RSL) for PFBS. Off-base sampling of residential wells commenced in April 2017 and is currently on-going. Current response actions for private wells impacted by PFOS/PFOA with concentrations greater than 70 ppt include connection to municipal water supply, installation/operation of a point-of-entry treatment systems, and/or provision of bottled water. A wellhead treatment system was installed at the impacted City of Airway Heights municipal water well. number 9.

The remedial investigation (RI) to define the nature and extent of the PFAS contamination at the areas listed above has been on-going since 2020. To date, samples have been collected from soils, groundwater, surface water, and sediments. However, the data has not yet defined the extent of PFAS contamination so step out sampling continues.

PFOS/PFOA impacts above USEPA RSLs were identified in all AFFF Areas. Many of the AFFF Areas have the potential to affect the Fairchild OUs discussed in this FYR. The OUs are discussed below in relation to potential PFOS/PFOA impacts from AFFF areas based on information collected during the SI (Amec 2019) and RI.

- **OU-1 – Craig Road Landfill.** There is no known use or disposal of AFFF within the Craig Road Landfill; however, will be evaluated as part of the due diligence efforts for non-AFFF PFAS sources.

- **OU-2 – On-Base Priority One Sites.**
  - LF001 and SS018 are up-gradient of RS001P and SS008P-sub; therefore, are not likely to be impacted by PFAS from these locations.
  - SS026 is down-gradient of RS001P and SS008P-sub; therefore, the groundwater at SS026 may be impacted by PFAS migrating from these locations.
  - FT004 has confirmed PFAS impacts in soil, groundwater, surface water, and sediment. FT004P-Sub is part of the ongoing PFAS remedial investigation (RI).
  - WP003 has confirmed PFAS impacts to surface water and sediment from RS003P.

- **OU-3 – Priority Two Sites.**
  - FT032 and DP024 have confirmed PFAS impacts to soil and groundwater from RS003P, and the RI sampling efforts are extending downgradient of RS003P toward OT017.
  - SD031 and DP012 are up-gradient of RS001P and SS008P-sub; therefore, are not likely to be impacted by PFAS from these locations.

- **OU-5 – SS039**: SS039 has confirmed PFAS impacts to soil and groundwater from RS001P and SS008P-sub as they are within the SS039 boundary.

- **OU-8 – RW011 & WP036.** RW011 is not near any know AFFF source areas. WP036 is not near any of the known AFFF impacted areas; however, since the former wastewater treatment plant (WWTP) received sanitary sewage from FAFB buildings (including flightline buildings) it is being evaluated as part of the due diligence efforts for non-AFFF PFAS sources.

Due diligence activities for non-AFFF sources of PFAS are currently underway; therefore, more PFAS source area may be discovered. The USAF and USEPA have made a new OU to address PFAS impacts at Fairchild AFB. Therefore, potential PFASA impacts were not considered in evaluating the protectiveness of the OUs in this FYR.

2.4.8 Protectiveness Statement

A FYR should determine whether the remedy is protective of human health and the environment. A protectiveness statement will be made for each OU and an additional, comprehensive site-wide protectiveness statement for those sites that reached response complete. The Fairchild AFB CERCLA NPL Site has not reached response completion; therefore, a site-wide protectiveness statement will not be made during this review.

The determination of whether the remedy remains protective of human health and the environment is based on the information and data used to answer the Technical Questions A, B, and C (as stated in **Section 2.4.6**).

Based on the evaluation performed in the FYR, a remedy may be determined to be:
- Protective;
- Protective once the remedy is completed;
- Protective in the short-term; however, in order for the remedy to be protective in the long-term, follow-up actions are needed;
- Not protective, unless action(s) is taken to ensure protectiveness; or
- Protectiveness cannot be determined until further information is obtained.

2.5 NEXT REVIEW

The next review (Sixth Five-Year Review) will be completed five years following the expected completion date of this Five-Year Review; anticipated by 12 August 2028.

A statutory review is required for:
- OU-1: LF002
- OU-2: LF001 and WP003
- OU-3: DP012 and DP013
- OU-5: SS039

A policy review is required for OU subsites that fall under the CERCLA petroleum exemption section 101(14) and 101(33) and have been transferred to the WDOE VCP or when the ROD did not require FYRs but the remedy has yet to be fully implemented. The policy review may be prepared with the statutory review, as an addendum to the statutory review, or under a separate cover.
- OU-2: SS018 and SS026
- OU-3: ST006 and SS009
- OU-8: RW011 and WP036

The following OU subsites no longer require inclusion in the FYR as Remedial Action Objectives (RAOs) were met and the sites are at UU/UE conditions or contamination has been transferred to/combined with another site:
- OU-2: FT004
- OU-3: ST010, OT016, OT017, DP022, DP024, SD031, and FT032
- OU-4: SD034, SD038, and SS019
- OU-6: SR939
- OU-7: AOC1
- AOC2, SS033, and ST035

Table 2-1
Protectiveness Determinations and Statement from the Fourth Five-Year Review

OU #	Protectiveness Determination	Protectiveness Statement
1	Protectiveness Deferred	A protectiveness determination of the remedy at OU-1 cannot be made until further information is obtained. Further information will be obtained by taking the following actions: further characterize/investigate the downgradient plume; assess VI risk to potential off-base receptors, add COPCs to the OU-1 ROD, clarify facility-wide institutional controls through the IDP; and implement appropriate off-base LUCs. It is expected the issues impacting short-term protectiveness will be addressed by January 2019, at which time a protectiveness determination will be made.
2	Short-term Protective	The remedy at OU-2 currently protects human health and the environment in the short term because facility wide LUCs preventing exposures to contaminated groundwater are in place, and monitoring of off-base residential water supply wells provides no evidence of exposure to contaminated groundwater at concentrations above MCLs. However, in order for the remedy to remain protective in the long term, the following actions need to be taken to ensure protectiveness: Implement off-base LUCs at Site WP003, further characterize/investigate existing arsenic, vinyl chloride, and TCE groundwater plumes exceeding CULs at Site WP003; prepare a FS Addendum to evaluate additional alternative remedial actions to address remaining arsenic, vinyl chloride, and TCE contamination at Site WP003; and prepare a decision document modification to update the site remedy to address additional COPCs at Site WP003, and update the IDP to clarify institutional controls. The USAF is actively sampling water supply wells and implementing removal actions to provide alternative drinking water for those sources with PFOS and PFOA concentrations above the health advisory. The USAF will continue site investigation to determine nature and extent of PFOS and PFOA contamination which will be necessary to assess human health and ecological risk. Groundwater has been restored to drinking water quality for benzene at Site SS018 and for all COCs at Sites LF001 and SS026 through MNA. TPH concentrations in groundwater associated with Site SS018 continue to naturally attenuate and will be monitored until concentrations are below CUL s. Site access is restricted by current land use and facility-wide LUCs are in place preventing future development, soil disturbance, and groundwater use.
3	Protective	The remedy at OU-3 currently protects human health and the environment because LUCs preventing exposures to contaminated media are in place. The ROD did not specify specific RAOs for OT016, SD031, and FT032, but site closure

Table 2-1
Protectiveness Determinations and Statement from the Fourth Five-Year Review

OU #	Protectiveness Determination	Protectiveness Statement
		objectives have been achieved at these sites. The remaining contaminants at sites OT017, ST006, SS009, and ST010 fall under the CERCLA petroleum exemption and will be addressed under the WDOE VCP. For the remedy to be protective in the long-term, facility-wide ICs should be clarified through an update of the IDP. Currently, there is no decision document that formally describes or implements remedies at DP022 and DP024, but post-ROD investigations are underway at these sites. In addition, new COPCs have been identified at the site since the Third Five-Year Review that were not considered during the original RI/FS and subsequent ROD. Facility-wide ICs are in place which prevent exposure to potentially contaminated media at these sites. The results of the post-ROD investigations will determine what additional action, if any, is needed at these sites. Currently, there is no decision document that formally describes or implements remedies at DP012 and DP013; however, these sites are subject to annual inspection and facility-wide ICs to ensure there is no physical exposure to subsurface debris.
5	Will be protective	The remedy at OU-5 will be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risk. To be protective in the long-term, facility-wide ICs should be clarified through an update of the IDP, and off-base LUCs should be implemented.

Table 2-2
Fourth FYR Issues/Recommendations and Progress Since

OU #	Issue	Recommendation	Milestone Date	Current Status	Implementation/Status Description	Completion Date (if applicable)
All	Proper implementation of on-base LUCs relies on a current and complete Installation Development Plan (IDP). Review of the IDP indicates it is outdated and incomplete. To date, however, there have been no unacceptable exposures to landfill contents, contaminated soil or contaminated groundwater.	Update the IDP to describe the specific on-base LUCs for each site, the reason for the control, and the areas where the controls are applied. Ensure Base personnel have access to information concerning its existence, purpose, and maintenance requirements.	December 2019	On-going	The new Comprehensive Planning Platform (CPP) sufficiently identifies LUCs associated with ERP sites and appropriately categorizes the constraints at Environmental Restoration Program (ERP) sites that require LUCs. Overall, The CPP is not a complete replacement for the IDP; however, by including the ERP sites and their specific LUCs into the CPP, it is a working measure until either the CPP and its associated documents completely replace the IDP or the IDP is fully updated and integrated with the CPP.	
All	Currently, there is no document that governs the implementation and monitoring of LUCs at Fairchild AFB.	Develop a LUC Implementation Plan (or other document with similar functionality) that provides procedures for the implementation and monitoring of LUCs. This document should define the LUCs, responsible parties, inspection schedule and reporting mechanisms for LUCs at Fairchild AFB sites.	NE	On-going	A LUCIP was established in September 2019; however, has not been updated since. An update to the LUCIP is anticipated in 2024.	
OU-1, OU-2 (WP003), & OU-5	Current off-base LUCs to prevent the use of contaminated groundwater and to address potential vapor intrusion (VI) will need to be supplemented; however, no known off-base drinking water exposures are currently occurring.	Investigate off-base contamination and complete appropriate ROD modification if off-base LUCs are necessary. Ensure that specific off-base LUCs described in these documents outline what combination of ICs (i.e., restrictive covenants, permits, orders, zoning changes, state and local agency agreements) and engineering controls will be used to meet offsite performance objectives.	***OU-1***			
			December 2019	Complete	OU-1: The 2021 ROD Amendment Operable Unit 1 LF002 Craig Road Landfill expanded the LUCs to include LUC Area II and LUC Area III. LUC Area II is based on groundwater monitoring, groundwater flow, contaminant plume information, potential VI areas, and parcel boundaries. LUC Area III includes all the monitoring wells currently used to track the status of COC concentrations and trends. Administrative controls have been implemented to notify the public of drinking water exposures.	April 2019

Table 2-2
Fourth FYR Issues/Recommendations and Progress Since

OU #	Issue	Recommendation	Milestone Date	Current Status	Implementation/Status Description	Completion Date (if applicable)
			OU-2 (WP003)			
			December 2019	On-going		
			OU-5			
			December 2021	On-going	Six (6) new monitoring wells were installed off-Base to delineate the TCE plume on the north side of the Distal Plume and targeting the weathered basalt horizon. The results documented in the May 2021 report may guide subsequent off-base investigations further to the north northwest until the TCE Plume is delineated.	
OU-1	The off-base downgradient trichloroethene (TCE) plume has not been adequately characterized particularly near wells MW-118 and MW-141 where TCE concentrations continue to exceed MCLs.	Perform additional off-base investigations. Obtain rights of entry to perform investigation activities and prepare an off-base investigation Uniform Federal Policy-Quality Assurance Project Plan (UFP-QAPP) addendum.	January 2019	On-going	During the 2020 DGI, MW-601 was installed between the NDA and MW-141 to evaluate the TCE plume. MW-600A and MW-600B were installed between the SDA and MW-118 to evaluate the TCE plume. Subsequent monitoring Monitoring is ongoing.	
OU-1	Off-base vapor intrusion pathways have not been assessed. No inventory of buildings located within the proposed LUC boundary has been completed.	Perform an inventory of buildings located within the downgradient LUC boundary as a first step for assessing VI risk to potential off-base receptors. Data to be collected to improve the definition of the downgradient plume distribution and extent addressed under Recommendation 1 will be necessary to complete the evaluation of the offsite VI pathway.	January 2019	Complete	During the 2020 DGI, VMP-1 was installed adjacent to MW-141 to evaluate potential VI risk. There are residential structures near MW-141 but they consist of mobile homes set on at-grade slabs. The TCE groundwater concentrations are relatively low (near 10 µg/L) and groundwater is deep (about 100 ft); therefore, VI risks have been assumed to be low. To verify this assumption, a shallow (5-ft-deep) soil vapor probe was installed near MW-141. Sample data indicated TCE and daughter products were below detection in both September and December events. These data support the conclusion that groundwater does not pose a VI risk in this area.	December 2020

Table 2-2
Fourth FYR Issues/Recommendations and Progress Since

OU #	Issue	Recommendation	Milestone Date	Current Status	Implementation/Status Description	Completion Date (if applicable)
OU-1	Vinyl chloride, cis-dichloroethene, and chromium exceed MCLs in several monitoring wells identified at CRL and are not identified as COCs by the ROD.	Prepare a ROD modification to include site chemicals of potential concern (COPCs) present above MCLs as COCs.	December 2019	Complete	Per the 2021 RODA Operable Unit 1 LF002 Craig Road Landfill, vinyl chloride and chromium were added as COCs. The RODA updates the CULs to include WDOE Model Toxics Control Act (MTCA) Method A values and the Federal MCLs. Additionally, cis-1,2-dichloroethene was not identified as a COC in the RODA, but is included in the UFP-QAPP Addendum 2 for Off-Site groundwater monitoring sampling with a CUL) of 70 µg/L.	April 2021
OU-1	Hydraulic containment of contaminated groundwater in portions of the source area boundary may have been lost during periods of reduced manual batch mode groundwater extraction and treatment system (GETS) operations from November 2014 through March 2015; however, hydraulic containment has been restored with full operation.	Continue to monitor downgradient impacts of potential containment loss. Continue annual plume capture assessment in annual RA-O reports for LF002. Ensure that the GETS is operated at full capacity and that shut down periods are minimized until CULs are achieved.	NE	On-going	Groundwater monitoring was completed and documented in 2018 Annual RA-O Report (Bay West 2020a), 2019 RA-O Report (Bay West 2021a), 2020 RA-O Report (Bay West 2021h), 2021 Final RA-O Report (Bay West 2022d). In addition, a data gap investigation (DGI) to completed to 1) provide additional delineation to the off-base TCE plumes, 2) better explain the persistence of TCE exceedances of far distant wells MW-118 and MW-141 and 3) evaluate the potential vapor intrusion (VI) pathway in the off-base area. Overall, the data from 2010 through the present demonstrates that there had been a loss of containment from the 2011-2015 period of minimal GETS operation which appears to have been subsequently restored.	
OU-2 (FT004)	Through the PA/SI process, Fairchild AFB has confirmed that significant quantities of PFOS/PFOA-containing AFFF were historically used at FT004 and released to the environment. Where PFOS/PFOA that is likely from historic FT004 release has been identified in drinking water sources above the EPA Health Advisory concentration, the USAF has implemented removal actions to provide alternate drinking water sources. The majority of current base drinking water sources are located off the base, and the sole production well located on base has been tested and the result was 4 parts per trillion (ppt), below the EPA Health Advisory of 70 parts per trillion	Continue SI and removal action to identify and mitigate drinking water exposures. Initiate supplemental remedial investigation to determine nature and extent of contamination. Once sufficient characterization has been accomplished, institute administrative LUCs as needed to prevent exposure, pending completion of a risk assessment.	NE	On-going		

Table 2-2
Fourth FYR Issues/Recommendations and Progress Since

OU #	Issue	Recommendation	Milestone Date	Current Status	Implementation/Status Description	Completion Date (if applicable)
OU-2 (WP003)	TCE continues to exceed MCLs in off-site well MW-120, and a slow moving detached TCE plume was identified in the Draft Pre-Design Investigation Report for Site WP003 (WW-1) (Bay West 2017m). TCE has not been detected in downgradient residential monitoring wells and no drinking water exposures are currently occurring.	Complete a Feasibility Study Addendum using data collected during the pre-design investigation to screen and analyze remedy alternative to address the offsite investigation to screen and analyze remedy alternative to address the offsite TCE plume. Prepare a Proposed Plan Amendment and ROD Amendment.	January 2020	Resolution pending	A pre-design investigation report was completed which updated the current CSM, further delineates the extent of TCE, vinyl chloride, and arsenic in groundwater, and describes recent data collection that was used to support a Feasibility Study Addendum. The Feasibility Study Addendum screened and analyzed remedial alternatives, and a selected alternative remedy was presented for public review and comment in a Proposed Plan Amendment (PPA). Proposed Plan is in regulatory review.	
OU-2 (WP003)	Vinyl Chloride and arsenic exceed their respective MCLs in shallow alluvial groundwater on-site and off-base, and while regularly monitored at this site, these constituents are not identified in the ROD as site COCs.	Prepare an ESD to address vinyl chloride and arsenic as site COCs.	December 2020	Resolution pending	An ESD was prepared, however, the ESD only addressed the LUCs and not changing COCs to include VC and arsenic. See **Section 4.3.2.6**.	
OU-3 (Sites DP022 (SW-4) and DP024 (SW-7))	New COPCs have been identified at the site since the Third Five-Year Review that were not considered during the original RI/FS and subsequent ROD.	Perform additional investigation to address data gaps for site DP022 and DP024. If additional COCs are discovered at the sites complete a risk assessment, Feasibility Study and a ROD modification to address these additional contaminants.	December 2020	Complete	Additional soil and groundwater investigations were completed at Sites DP022 (SW-4) and DP024 (SW-7) in June, July, and October 2016; March, April 2017; and March 2018 (Bay West, 2020 c, f). Concentrations of chromium and arsenic were detected at concentrations above screening levels but were consistent with background concentrations at DP022 and DP024 in soils. Lead, cadmium, and BaP were detected at concentrations above screening levels at DP024 soils. PAHs were present at concentrations greater than screening levels but were associated with burned wood material, visible coal, and construction debris at DP022. According to the HHRA and the ecological risk evaluation for DP022 and DP024, the sites do not pose an unacceptable risk to human health or the environment; therefore, NFA is required to protect human health and the environment at DP022. The USAF recommended the site proceed to site closure, which is consistent with the original decision in the 1995 ROD.	

Table 2-2
Fourth FYR Issues/Recommendations and Progress Since

OU #	Issue	Recommendation	Milestone Date	Current Status	Implementation/Status Description	Completion Date (if applicable)
OU-3 (DP012 (SW-10))	A limited field investigation at site DP012 revealed the presence of buried aircraft reciprocating valves that contain elemental sodium. Because the presence of these valves presents a potential safety and health hazard, the site is inspected on an annual basis and the results of the inspection are presented in annual LUC reports. Facility-wide institutional controls are in place, but there are no site-specific LUCs memorialized. No unacceptable exposures have currently occurred.	Prepare an ESD to clarify and formalize site-specific LUCs at site DP012.	December 2020	Complete	An ESD for DP012 was prepared in November 2018. The location and site-specific LUCs were established for DP012. The LUCs will be maintained at the site until physical hazards associated with metallic debris and elemental sodium in the subsurface soil have been removed to allow for UU/UE. LUCs for DP012 will continue to be required if the affected property is transferred to another owner. The implementation mechanism for each LUC will need to be revised prior to property transfer (Bay West, 2018).	
OU-5	There is insufficient data to evaluate remedial action objectives identified in the Interim ROD (i.e., expected groundwater restoration timeline)	Complete a remedial design work plan and continue performance monitoring to determine whether selected remedies are on track to achieve expected remedial timeframes described in the Interim ROD.	NE	Complete		
OU-8	OU-8 was not addressed during the *Fourth Five-Year Review for Fairchild Air Force Base, Washington* (USAF 2019) as no remedial actions had been initiated at the site. Therefore, no issues were identified for OU-8 during the fourth five-year review.					

Acronyms:
AFB – Air Force Base
AFFF – Aqueous Film Forming Foam
COPC – contaminant of potential concern
CPP – Comprehensive Planning Platform
CRL – Craig Road Landfill
CUL – Clean Up Level
DGI – Data Gap Investigation
ERP – Environmental Restoration Program
ESD – explanation of significant differences
GETS – Groundwater Treatment and Extraction System
HHRA – human health risk assessment
IC – institutional controls
IDP – Installation Development Plan
LUCs – land use controls
MCL – maximum contaminant level
MTCA – Model Toxics Control Act
NDA - Northeast disposal area
NE – not established
OU – operable unit
PFAS – per- and poly-fluoroalkyl substances
PFOA - perfluorooctanoic acid
PFOS - perfluorooctane sulfonate
PPA - Proposed Plan Amendment
ppt – parts per trillion
RA-O – remedial action-operation
RI/FS – remedial investigation/feasibility study
ROD – record of decision
RODA – record of decision amendment
SDA – Southwest disposal area
TCE – trichloroethylene
UFP-QAPP – uniform federal policy – quality assurance program plan
USAF – United States Air Force
VI – vapor intrusion

3.0 OU-1 / LF002 (SW-8) / CRAIG ROAD LANDFILL

OU-1 is a former 39-acre, unlined landfill for general-purposed wastes with three waste disposal areas. The chronology of site events is presented in **Appendix B**.

3.1 SITE BACKGROUND

3.1.1 Physical Characteristics

Site LF002, CRL, is approximately one-half mile east of Fairchild AFB (**Figure 4-1**) and occupies approximately 39-acres of a 100-acre parcel owned by the USAF (**Figure 4-2**). LF002 was operated as an unlined, general-purpose landfill with three waste disposal areas.

- Northeast Disposal Area (NDA): The NDA occupies approximately 6-acres of the northeast corner of the site and the oldest waste disposal cell. The NDA was actively used as the main solid-waste disposal area for the base from the late 1950s until the early 1960s. A standard trench-and-fill disposal method was used in the NDA. The area was given a natural soil cover and graded following disposal activities. Depths of fill in the NDA exceed 30 feet below natural ground surface.

- Southwest Disposal Area (SDA): Then SDA occupies approximately 13-acres of the southwest corner of the property and was active from the late 1960s until the late 1970s. Disposal practices in the SDA consisted of fill-and-cover in the topographical low areas, possibly with some excavation. The SDA also was given a soil cover and then overlaid in some areas with concrete blocks and asphalt from base runway-replacement activities. Disposal depths in this area are estimated to exceed 25 feet.

- Third Disposal Area: The thirds disposal area occupied approximately 20-acres of the southeast corner of the property (south of the NDA) and was active in the late 1950s and received surface disposal of construction debris from runway work performed during base conversion.

The natural topography, which hasn't been altered, features hummocky landscapes that predominantly slope towards the east. Surrounding the LF002 site, the terrain exhibits a consistent east and southeast gradient. The directional flow of the drainage in the areas surrounding LF002 typically navigates towards the south and east. However, these drainage pathways are intentionally designed as swales, and water runoff from USAF property typically only occurs during the spring melt and periods of heavy rainfall.

3.1.2 Land Use

The current land use at OU-1 is listed as industrial and future land use is listed as industrial (Fairchild AFB, 2014). There is very little natural undisturbed surface soil across OU-1; the area has been used for landfill operations and was capped.

The land east and northeast of site LF002 (across Craig Road) is zoned by the City of Airway Heights for mining (sand and gravel) and commercial development and owned by a commercial business. Situated directly east of LF002, the landscape is distinctly dominated by a gravel quarry accompanied by various light industrial operations, including concrete and metal machining. The quarry features a large, excavated pit, measuring approximately 50 to 100-feet below the elevation of the surrounding topography. The nearest residential property, a manufactured housing area, lies immediately northeast of CRL and consists of a manufactured housing area. Additional residential areas lie approximately one-half mile to the north (across Highway 2) and approximately three-quarters of a mile to the east-northeast. The City of Spokane lies southeast of site LF002 where the land is zoned light industrial. Site LF002 itself and areas to the north,

west, and south lie within unincorporated Spokane County. The land is zoned light industrial to the north, light industrial and rural traditional to the west, and light industrial to the south.

3.1.3 Geology and Hydrogeology

The geology at LF002 consists of approximately 15 to 70 feet of alluvial sand and gravel sediments overlying basalt bedrock. Beneath the alluvial deposits at LF002 lie two major basalt flow groups (the upper aquifer Basalt A and lower aquifer Basalt B) separated by a sedimentary interbed (Interbed A) of lacustrine clay deposits. At the time of the remedial investigation in 1993, the alluvium was saturated. However, since operation of the groundwater extraction and treatment system (GETS), capping of the NDA and SDA, and decommissioning the nearby wastewater treatment plant, the alluvium was essentially dewatered, and wells completed in the alluvium are typically dry. The alluvium thickens eastward and is mined in a large quarry east of Craig Road. The alluvium in this area remains dry until approximately 2,000 to 5,000 feet east of LF002, where a northeast-trending paleochannel is encountered. Geophysical and drilling activities completed during the remedial investigation found the paleochannel thoroughly scoured and dissected Basalt A and Interbed A. The paleochannel has been filled with 250 feet of highly permeable, unconsolidated alluvium and is underlain by the Basalt B flow.

Basalt A (upper aquifer) is the uppermost basalt flow group and ranges from 90 to 140 feet thick under LF002. The uppermost 75 feet of the Basalt A flow (the Entablature Section) is vesicular, fractured, and weathered. Hydraulic testing completed for the 1993 RI and the GETS design indicates an average hydraulic conductivity of 4.7 feet per day and a transmissivity of 350 feet square feet per day.

The lower portion of the Basalt A flow (the Colonnade Section) is dense, unweathered, and minimally fractured. The hydraulic conductivity in the Colonnade Section is very low (0.01 to 0.06 feet per day); therefore, groundwater flow in Basalt A occurs primarily in the Entablature Section. Basalt A was entirely scoured away within the paleochannel cut described above. Where present, Interbed A underlies Basalt A and is 16 to 20 feet of dense clayey deposits. More detailed descriptions of site geology and hydrogeology at CRL are provided in the RI Report (SAIC 1992).

3.1.4 History of Contamination

Site LF002, Craig Road Landfill, is located approximately one-half mile east of Fairchild AFB (**Figure 4-1**) and occupies approximately 39 acres of a 100-acre parcel owned by the USAF (**Figure 4-2**). LF002 was operated as an unlined, general-purpose landfill with three waste disposal areas. The approximately 6-acres northeast disposal area (NDA) is the northeast corner of the site and the oldest waste disposal cell (**Figure 4-3**). The NDA was actively used as the main solid-waste disposal area for the base from the late 1950s until the early 1960s. A standard trench-and-fill disposal method was used in the NDA. The area was given a natural soil cover and graded following disposal activities. Depths of fill in the NDA exceed 30 feet below natural ground surface.

The approximately 13-acres southwest disposal area (SDA) is the southwest corner of the property (**Figure 4-3**) and active from the late 1960s until the late 1970s. Disposal practices in the SDA consisted of fill-and-cover in the topographical low areas, possibly with some excavation. The SDA also was given a soil cover and then overlaid in some areas with concrete blocks and asphalt from base runway-replacement activities. Disposal depths in this area are estimated to exceed 25 feet. General waste types reportedly disposed in this area included municipal and industrial wastes and construction and demolition debris; suspected disposal items are thought to include such items as solvents, dry-cleaning filters, paints, thinners, and coal ash.

The approximately 20-acre third disposal area is the southeast corner of the property (south of the NDA) (**Figure 4-3**) was active in the late 1950s and received surface disposal of construction debris from runway work performed during base conversion.

While the landfill was active, the base's wastewater treatment plant (WWTP) also was operational in the north-central portion of the 100-acre property. Treated wastewater was discharged into a percolation/evaporation pond and into a series of buried percolation trenches located on the east side of the property. Effluent from the WWTP was intermittently discharged into landfill areas to aid in waste compaction. In 1994, wastewater from the base was routed to the City of Spokane's WWTP, eliminating the discharge of treated effluent into the infiltration pond and trenches on the landfill property. The base WWTP was demolished, and its former site has been occupied by an Army Reserve asphalt plant since 1998.

3.2 RESPONSE ACTION SUMMARY

The remedy including remedial action objectives (RAOs) selected in the respective RODs are summarized for each site included in this Five-Year Review. Summaries of COCs, RAOs, completed RAs, and current site status are provided in **Tables 1-1** and **1-2**.

3.2.1 Basis for Taking Action

The USAF began investigation of potential historical releases from the past use of the LF002 area as a landfill in 1984. Between 1986 and 1991, a RI was completed to characterize and delineate LF002 contamination; TCE was identified as the primary chemical of concern (COC) in groundwater with concentrations above Washington's Model Toxics Control Act (MTCA) Method A clean-up level (CUL) of 5 micrograms per Liter (µg/L). The risk assessment completed as part of the RI identified unacceptable risk (that is, cumulative cancer risk exceeding 10^{-4}) due to exposure to groundwater under a reasonable maximum exposure scenario, with TCE identified as a primary contributor. An unacceptable risk was also identified for exposure via the air pathway. In addition, soil gas measurements indicated VOCs were present in the fill material, therefore, although risks were not quantified, direct contact with subsurface soil and debris was determined to represent an unacceptable risk.

3.2.2 Record of Decision

OU-1 is the CRL Site LF002 (SW-8), which was the first IRP site at Fairchild AFB where remedial actions (RA) were implemented. Due to its size and off-base location, this Priority One site is considered separate from the other Priority One sites and was addressed in its own ROD (USAF 1993a). RA construction was completed in 1995, which included installation of landfill caps and a GETS.

3.2.3 Remedy Selection

The CRL ROD (USAF 1993a) identified the RAOs for protection of human health, public welfare, and the environment from contamination associated with the site. The site's main COC is TCE in groundwater, soil, and landfill debris. The CRL ROD listed the following RAOs:

- Prevent consumption by area residents of groundwater containing COCs exceeding federal MCLs;
- Restore contaminated groundwater in the upper aquifer to safe drinking levels;
- Minimize migration of contaminants from fill material to groundwater;
- Prevent human exposure to contaminants contained in subsurface soil and debris; and
- Prevent further migration of contaminated groundwater across the site boundary and to the lower aquifer.

To satisfy the RAOs, components of the selected remedy for CRL include the following:

- Cap the NDA and SDA portions of the landfill;
- Extract contaminated groundwater from the upper aquifer at the landfill boundary with treatment by air stripping and granular activated carbon (treated groundwater to be discharged at an off-site location, downgradient from the landfill);
- Install an active soil vapor extraction (SVE) system in both capped areas;
- Monitor off-site water supply wells within the off-site portion of the plume and provide point-of-use treatment and/or an alternative water supply, if needed;
- Monitor groundwater in the upper and lower aquifers; and
- Implement ICs.

Fairchild AFB implemented ICs in accordance with the OU-1 ROD (USAF 1993a) to prevent potential exposure to contaminated soil, wastes, or groundwater at CRL. Implementation of ICs is evaluated annually as part of base wide annual LUC inspections as documented in Annual Reports on the Status of Land Use Controls. Specific objectives for on-site ICs at LF002 include:

- Prevent disturbance to the landfill caps, except as necessary for authorized activities;
- Prevent drilling of new wells except for monitoring wells authorized by regulators;
- Protect existing monitoring wells;
- Prevent use of contaminated groundwater for drinking water purposes;
- Prevent unauthorized soil excavations at the site;
- Notify EPA and WDOE prior to any development or redevelopment of the landfill site to ensure that the integrity of the engineered cap will not be jeopardized; and
- Ensure that in the event of a property transfer to another entity, these restrictions are attached to the land.

3.2.4 2016 ESD

The 2016 ESD (USAF 2016a) modified the remedy to optimize contaminant mass removal, decrease the time to achieve response complete (RC), and reduce life cycle costs. Specifically, the components of the remedy modifications include the following:

1) Reinstate soil vapor extraction (SVE) as a remedy to be implemented in tandem with the Groundwater Extraction and Treatment System (GETS). SVE was initially part of the 1993 selected remedy for trichloroethylene (TCE) but was removed under the 1995 ESD based on information and technologies available at that time; however, pilot studies completed in 2011 and 2012 and follow-on operations through 2014 have demonstrated that SVE is a cost-effective approach to optimize TCE mass removal. SVE will be performed in the source areas in existing or new wells. The remedy component is necessary to increase mass removal rates and decrease life cycle costs.

2) Expand the GETS to extract groundwater from new or existing wells located in source areas. These wells will be pumped in addition to the existing extraction wells (EWs) located on the downgradient margin of the site. The remedy component is necessary to lower groundwater levels in the source area to expose TCE media below the static groundwater level for SVE and to optimize dissolved phase removal by pumping higher TCE concentration groundwater.

3.2.5 2021 Remedy Modification and RODA

EPA and USAF modified the remedy again in 2021 with a RODA based on the 2016 ESD. The 2021 RODA did not change the RAOs, but made the following changes to the selected remedy:

- Updated the land use control boundaries;
- Added chromium (Cr), vinyl chloride (VC) and sodium permanganate as site COCs;
- Updated the cleanup levels to include WA MTCA levels (**Table 3-1**); and
- Added in situ chemical oxidation (ISCO) and in situ chemical reduction (ISCR) to the selected remedy since the existing remedy of SVE and GETS is inadequate to achieve response complete by the target deadline of March 2024

Table 3-1
Groundwater Cleanup Levels from 2021 ROD Amendment

Chemical	Cleanup Levels (µg/L)	Basis for Cleanup Level[1]
TCE	5	Federal MCL
Vinyl chloride	0.2	State MTCA-A MCL
Chromium	50	State MTCA-A MCL
Sodium Permanganate	0.75 mg/L[2]	Based on visual detection of purple coloration

[1] The more stringent of the Federal or State Model Toxics Control Act (MTCA) Method-A MCL was selected as the basis for the groundwater cleanup level.
[2] there are no health standards for sodium permanganate (MNO_4); a clean up level (CUL) of 0.75 milligrams per liter (mg/L) based on the limit of visual detection of purple coloration was selected as a CUL.
[3] This is the total value for chromium III and chromium VI.
TCE – trichloroethene
µg/L - micrograms per liter

3.2.6 Remedy Implementation

Annual RA-O Reports were completed in 2018, 2019, 2020, and 2021, which summarize remedial activities and associated results. The reports also contain annual evaluations for the operations and maintenance activities at LF002. Bay West maintained responsibility for the GETS operation throughout this review period. Normal operational activities included data recording, systems check, treatment system flow-rate monitoring, maintenance, and sampling.

3.2.6.1 Landfill Caps

Engineered landfill caps, consisting of composite soil, geotextile, and 30-mil polyvinyl chloride (PVC) liner, were installed over the NDA and SDA in 1994 and 1995, respectively. These caps are barriers to prevent direct contact with contaminated soil and prevent precipitation from percolating through contaminated soil/refuse and conveyance of contaminants to groundwater. Quarterly monitoring of the landfill caps is required as part of operations and maintenance of the LF002 treatment system and animal burrows are to be filled when encountered.

3.2.6.2 Groundwater Extraction and Treatment

The Site LF002 GETS was designed to remove TCE from on-site groundwater and prevent further off-site migration of contaminated groundwater.

Groundwater extraction and treatment began in 1991 as an interim action. In 1994 and 1995, the extraction system was expanded from 9 to 12 extraction wells (6 wells each in the SDA and NDA), and an air stripping unit was added to the treatment system. Groundwater from the extraction wells is pumped to the treatment

plant where TCE is volatilized through air stripping. The resulting off gas is filtered through granular activated carbon (GAC), removing hazardous constituents prior to venting to the atmosphere. The treated groundwater is discharged to the aquifer via two infiltration trenches located on-site, just west of Craig Road and downgradient of the SDA and NDA.

The treatment plant began 24-hour operation on 19 September 1995 and continued through mid-2006. Starting in mid-2006 through mid-2011, the operational schedule was modified such that the GETS was idled one to two times per year for periods typically between 10 and 14 weeks to increase TCE mass removal efficiency. Following *in situ* chemical oxidation (ISCO) pilot testing in 2011 and 2012, four extraction wells (EW-6, EW-9, EW-10, and EW-14) were taken offline to mitigate the potential release of chromium- or permanganate-impacted effluent to the downgradient infiltration line. From 2012 through 2015 the GETS was operated in a manual batch mode due to insufficient total flows for automatic full-time operation. During this period the remaining operational extraction wells were unable to meet the required minimum flow during seasonal lowering of groundwater levels (fall-winter). In 2013, EW-6 was brought back online as chromium and permanganate concentrations had decreased to acceptable levels. In 2015, sampling protocols, described in the *July 2015 Uniform Federal Policy Quality Assurance Plan (UFPQAPP) for Site LF002 (SW-8)* (Bay West 2015c), were established that allowed for limited to full operations to resume at EW-9, EW-10 and EW-14. In April 2015 the GETS was returned to full time operation.

An ESD was approved in 2016 that described modifications to the GETS to add additional groundwater extraction wells located within identified source areas to lower the water table and improve TCE dissolved mass removal efficiency using targeted SVE (USAF 2016a). Two additional groundwater extraction wells at the SDA (RW-13 and RW-14) were added in 2017 in accordance with the ESD. From September 1995 through September 2017, approximately 1.4 billion gallons of TCE contaminated groundwater was extracted and treated at CRL and approximately 1,359 pounds of TCE was removed from the extracted groundwater.

The GETS is occasionally shut down due to weather conditions (excessive cold, high winds) and maintenance. A trial shutdown of the active remediation systems at LF002 was proposed in the 2021 Annual RA-O Report. Per discussion with the USEPA on 12 December 2022 and proposed monitoring schedule and reactivation criteria presented in USAF correspondence dated 22 December 2022, the USEPA concurred with a trial shutdown. The trial systems shutdown was implemented in January 2023.

3.2.6.3 Soil Vapor Extraction

SVE was initially identified as a component of the selected remedy for CRL in the 1993 ROD for both the NDA and SDA but was not implemented until 2010. In 1996, following the finding from a post-ROD treatability study that SVE would not be effective at CRL, an ESD was prepared to eliminate active SVE from the final remedy based on the conclusion that the additional costs of an SVE system would not provide any significant decrease in overall risk from contaminants at the site (USAF 1995a).

The potential efficacy of SVE at CRL was reconsidered by the USAF in 2008. Evaluation of sampling results and GETS operational data indicated that substantial volatile organic compounds (VOC) contamination remained within the dewatered zone during active groundwater extraction and SVE treatment could enhance removal of these contaminants. With concurrence of WDOE, the USAF initiated efforts to reduce source materials at CRL (CH2M Hill 2009a). From 2010 through 2012, 22 remediation wells in the SDA and 14 remediation wells in the NDA were constructed as multipurpose wells that could be used for SVE, ISCO, or as additional monitoring wells. Following the successful pilot tests, full-scale SVE operation were initiated in February 2011, with WDOE concurrence. The USEPA concurred with continued SVE system operation in a 19 October 2012 correspondence (Bay West 2017c). In fall 2014, the

USAF temporarily suspended SVE operations due to rising groundwater elevations caused by limited GETS operation, and to allow time for development and approval of an ESD (USAF 2016a) to return SVE as a component of the remedy after its removal in the 1996 ESD (Bay West 2017c). A 2014 treatability and testing report (CH2M Hill 2014e) provided additional justification for the ESD concluding SVE provided the most cost-effective TCE mass removal technology between GETS, SVE, and ISCO.

A final ESD for OU-1 was approved in October 2016 reinstating SVE as a component of the remedy, in conjunction with expanded GETS operations described in section 4.1.2.2 (USAF 2016a). Operation of two SVE systems at the SDA and NDA was resumed in 2017. Initial wells selected for SVE were based on measured vapor and groundwater TCE concentrations with a focus on the groundwater source areas. The NDA SVE system is located just east of the leading groundwater treatment plant and consists of three operating extraction wells. The SDA SVE system consists of four operating extraction wells and is located within a small structure at the SDA.

In 2020, Bay West completed a data gap investigation (DGI) to evaluate the potential vapor intrusion (VI) pathway in the off-base area. The off-base investigation consisted of installing two soil gas probes (SGP-1 and SGP-2). The DGI was completed in accordance with recommendations of the Fourth FYR. Findings of the off-base investigation concluded the off-base TCE plumes do not appear to pose a VI risk. The soil gas concentrations in the soil gas probes were less than screening values.

The following is a summary of the 2022 vapor phase TCE removal by area:

- The 2022 annual TCE removal for the NDA SVE was 3.6 lbs. Almost all this amount was removed during the third quarter when groundwater elevations were low and before freezing conditions forced a seasonal system shutdown in the winter months. The mass removal was a decrease of 27% from last year's 4.93 lbs which had a cumulative total of 170.4 lbs;
- Because of very low vapor yields observed in 2021 (0.9 lbs for the year), the SDA-SVE system was no longer providing effective removal and therefore was not re-activated in 2022; and
- Since RA-O began in 1995, the total TCE mass removal by SVE has been 170.4 lbs in the NDA and 177.8 lbs in the SDA.

On 8 October 2021 the GAC was changed out in the SDA and NDA SVE system off-gas treatment units.

3.2.6.4 Groundwater Monitoring

A long-term monitoring program for CRL groundwater was implemented in 1995 for on-site and off-site monitoring wells completed in the upper aquifer (Basalt A) and lower aquifer (Basalt B). Tables 18A-1, 18A-2, and 18A-3 in the 2018 UFP-QAPP Addendum-I (LF002) detail the long-term groundwater monitoring program schedule for the on-site locations. Table 18-1 in the 2018 UFP-QAPP Addendum-II (Off-Site Investigation) details the long-term groundwater monitoring program schedule for the off-site locations. Evaluation of long-term groundwater monitoring data is documented in annual RA-O reports. Recommended changes in wells to be sampled, or modifications to sampling frequencies were incorporated into subsequent long-term monitoring with concurrence of WDOE and USEPA.

In 2020, Bay West completed a DGI to provide additional delineation at the off-base TCE plumes and better explain the persistence of TCE exceedances at far distal wells MW-118 and MW-141. The findings are detailed in Section 3.4.2.2.

Additional groundwater monitoring figures, performance model charts, and chemical distribution trends can be found in the Final 2021 Remedial Action Operations Report (Bay West, 2022d).

3.2.6.5 Institutional Controls

Fairchild AFB implemented ICs in accordance with the 1993 OU-1 ROD and 2021 RODA to prevent potential exposure to contaminated soil, wastes, or groundwater at CRL. Implementation of ICs is evaluated annually as part of basewide annual LUC inspections as documented in *Annual Reports on the Status of Land Use Controls* (Bay West 2018, 2020, 2021, 2022, and 2023). The 2007 Final Land Use Controls Management Plan was updated with the 2019 Final Land Use Controls Implementation Plan, incorporating changes suggested in the Fourth Five-Year Review. The objectives of LUCs for the on-base portion of the site are to maintain the effectiveness of the landfill caps and to prevent exposure to contaminated groundwater throughout the groundwater containment zone. LUCs in the on-base portion of the site are administered by the USAF. Specific objectives for on-site ICs at CRL include:

- Prevent disturbance to the landfill caps, except as necessary for authorized activities;
- Prevent drilling of new wells except for monitoring wells authorized by regulators;
- Protect existing monitoring wells;
- Prevent use of contaminated groundwater for drinking water purposes;
- Prevent unauthorized soil excavations at the site;
- Notify USEPA and WDOE prior to any development or redevelopment of the landfill site to ensure that the integrity of the engineered cap will not be jeopardized; and
- Ensure that in the event of a property transfer to another entity, these restrictions are attached to the land.

Newly designated LUC boundaries (**Figure 1-3**) were approved by the USAF in the 2021 Final Record of Decision Amendment, Operable Unit 1 LF002 Craig Road Landfill (Bay West 2021b). The amendments to LUCs are intended to prevent exposures to contaminated subsurface soil, groundwater, or indoor air - both on and downgradient from USAF property at LF002. LUCs are designated as:

- LUC Area I Groundwater Use, Potential Vapor Intrusion (VI) and Soil Use: USAF property at LF002 and its boundaries are based on USAF-owned property parcel lines;
- LUC Area II Groundwater Use and Potential VI: groundwater monitoring, groundwater flow, contaminant plume information, potential VI areas, and parcel boundaries; and
- LUC Area III Monitoring Well Protection: monitoring wells currently used to track the status of chemical concentrations and trends.

The objective of LUCs for the off-base portion of the site is to prevent exposure to contaminated groundwater throughout that portion of the contaminant plume. Because releases from on-base sources are currently affecting nearby properties, which the USAF does not own, the LUCs for the off-base portion of the contaminant plume are principally administered through the authorities of several state and local agencies. Specific objectives for off-site ICs at CRL include:

- Inspection within Groundwater LUC boundary for new wells (physical and on WDOE website) and of existing wells. Maintenance repairs and replacements to be performed as needed; and
- Inspection within Vapor Intrusion LUC boundary for new structures.

TCE-contaminated groundwater is found downgradient of USAF-owned property. Regulatory jurisdictions, which limit and/or restrict the use of groundwater in these areas, are in place under governance of the City of Airway Heights, the Spokane County Health District, and the State of Washington. Information on the status of groundwater contamination within the CRL vicinity is routinely presented at Fairchild AFB RAB meetings, which are open to the general public. Groundwater from the City of Airway Heights water supply wells (PS-1, PS-4, and PS-9) is sampled quarterly as part of the base's residential well monitoring program. Combined sampling results from these adjacent wells are provided to the city for informational and review purposes.

3.2.6.6 In Situ Chemical Oxidation/In Situ Chemical Reduction

EPA and USAF modified the remedy in 2021 with a RODA based on the 2016 ESD. Part of the RODA included the addition of ISCO and ISCR as remedy optimization if usage of the SVE and GETS is not adequate to achieve the target RC date of March 2024. ISCO and ISCR activities did not take place during this review period due to the SVE and GETS effectiveness. Since the resumption of SVE activities in Fall 2017, the estimated TCE residual mass in the NDA was reduced by 89% from 144 pounds (lbs) to 16 lbs and in the SDA has reduced by 84% from 34 lbs to 5.4 lbs. Nearly all (90%) of the TCE removal was from SVE operations with the remainder from the GETS. ISCO is no longer a recommended contingency for TCE treatment due to the SVE and GETS effectiveness.

With respect to chromium, concentrations appear to be decreasing due to natural attenuation. If concentration trends cross into the contingency zone, the alternate remedy is treatment via ISCR.

3.2.7 System Operations/Operations & Maintenance

Annual Remedial Action Operations Reports were completed in 2018, 2019, 2020, 2021, and 2022 (Bay West 2020a, 2021a [x2], 2022d, and 2023a) which summarize remedial activities and associated results. The reports also contain annual evaluations of the operations and maintenance activities at LF002. Bay West maintained responsibility for the GETS operation throughout this review period. Normal operational activities included data recording, systems check, treatment system flow-rate monitoring, maintenance, and sampling.

EPA approved an addendum to the 2014 Operation and Maintenance Plan for the Groundwater Extraction and Treatment System, Southwest Disposal Area Soil Vapor Extraction System and Landfill Cap at Craig Road Landfill in a 2018 letter with the adjusted title of Addendum to Operation and Maintenance Plan for Remediation Systems at Craig Road Landfill. The addendum includes GETS and SVE system changes reflected in O&M Plan Addendum (Bay West 2018i).

LUC inspection reports are completed annually and included in the Annual Report on the Status of Land Use Controls. During inspections animal burrows were noted in various areas at the site on the landfill cap and some small parts of the southern landfill cap have started to creep downslope. The landfill cap will continue to be monitored quarterly as part of operations and maintenance of the LF002 treatment system and animal burrows will be filled when encountered.

The GETS is over 30 years old, which is past the estimated life expectancy of this system, resulting in component failures in several extraction wells during the report period. Upon failure, the necessity of extraction at the affected area is assessed. If extraction is deemed essential, the well is repaired, otherwise, the pump is removed. Prior to 2019, the USEPA and USAF agreed to cease pumping at wells EW-03, EW-04, EW-12, and EW-13. Meanwhile, during the reporting period, components at wells EW-02, EW-06, and EW-14 underwent replacement.

3.3 PROGRESS SINCE LAST REVIEW

Protectiveness determinations and statements from the Fourth FYR are presented in **Table 2-1**. Recommendations were made for all OUs to address issues limiting long-term protectiveness. These recommendations, as well as the current status, are presented in **Table 2-2**.

3.4 FIVE-YEAR REVIEW PROCESS

3.4.1 Community Notification & Site Interviews

Information about community notifications and site interviews are discussed in **Section 2.4**. The public notification and site interviews are provided in **Appendix D**. Responses specific to OU-1 are summarized below.

Bay West Geologist and Operator

A Bay West Geologist and Operator stated the cleanup and progress of the Fairchild AFB Sites is ongoing; however, the GETS at LF002 is 30 years old and is passed its life expectancy and its best period of functionality. Since 2019, several components have needed to be replaced, causing system downtime. Old wiring shorted out a pressure gauge that monitors the water flow at the top of one of the stripper towers and both towers had to have the wiring replaced. The heater that is associated with the pressure gauge broke in 2020. The gauge, switch, and heater had to be replaced. This gauge was found to be broken again in 2023 during monthly maintenance checks.

The Bay West Geologist stated that due to decreasing trends in chemical concentrations, the remediation system was turned off in 2023 to monitor natural attenuation of the COCs. This will impact maintenance schedules and sampling routines.

Other changes include the parcel directly north of LF002 having a previous excavation filled and the parcel graded.

Restoration Advisory Board (RAB) Member

A RAB member stated they are satisfied with the current cleanup actions for known chemicals but would like action taken concerning PFAS. They have a minor concern about the shutdown of the GETS and suggests monitoring wells be installed on parcels to the north of the Site.

3.4.2 Site Specific Data Review

The following is a summary of the data collected in conjunction with the remedial actions during the review period. **Appendix A** lists the documents and specific data reviewed to gather information and background about OU-1. Further description of the data, figures, and trends can be found in **Appendix E**. Data relevant to remedy performance and progress towards meeting RAOs is summarized in this section, including data trends to evaluate whether RAOs and associated cleanup levels established in the ROD are likely to be achieved, data relevant to support engineering performance, and data related to the site-specific groundwater remedy completion strategy.

3.4.2.1 Remedy Component – Landfill Caps

Engineered landfill caps, consisting of composite soil, geotextile, and 30-mil PVC liner were installed over the NDA and SDA in 1994 and 1995, respectively.

Table 5 of the Craig Road Landfill O&M Plan (Bhate 2014a) specifies quarterly inspection of the landfill caps is required. The results of the landfill cap inspections are presented on Landfill Cover Inspection Logs and summarized in the annual RA-O reports. As part of this Five-Year Review, Landfill Cap Inspections Reports were reviewed in the 2018 Annual RA-O Report (Bay West 2020a), 2019 RA-O Report (Bay West 2021a), 2020 RA-O Report (Bay West 2021h), 2021 Final RA-O Report (Bay West 2022d), and 2022 RA-

O Draft Report (Bay West 2023a). The reports indicate both the NDA and SDA landfill caps remain intact, adequate, and stable. Both landfill caps require basic annual maintenance including noxious weed control and occasional repairs from small, shallow, animal burrows.

These conditions were verified during the site inspection (**Appendix C**). The following elements were verified:

- No signs of settlement, cracks, erosion or holes that would compromise the selected remedy;
- The vegetation cover was well maintained and intact to blend with natural vegetation in surrounding areas;
- No bulges, wet areas or water damages were observed;
- All vents and drains were found to be functional, though the functionality of the turbine gas vents could not be verified during the site visit due to lack of wind; and
- Most of the landfill showed no signs of instability, slight indications of downslope creep were observed on parts of the southern landfill cap in previous reports. While the current site inspection did not identify significant slope instability, Section 3.2.7 documented instances of the southern landfill cap starting to creep downslope. These indications, while not prominent during the last site inspection, should be continuously monitored and addressed.

3.4.2.2 Remedy Component – GETS and SVE

Groundwater Extraction and Treatment System

Per the RAOs listed in the 1993 ROD (USAF 1993a), the GETS is designed to restore TCE-contaminated groundwater in the upper aquifer to levels that are safe for drinking, and to prevent further migration of contaminated groundwater across the site boundary and to the lower aquifer. A 2016 ESD (USAF 2016a) further expanded the GETS to reduce groundwater elevations in the source area to expose TCE media below the static groundwater level for SVE and to optimize dissolved phase removal by pumping higher TCE concentration groundwater.

In July 2017, the USAF began source area pumping at RW-13 and RW-14 and the SVE was restarted within the NDA. The SVE system within the SDA was restarted in September 2017 in accordance with the 2016 ESD (Bay West 2016f) and the 2018 LF002 UFP-QAPP Addendum-I (Bay West 2018j).

The LF002 UFP-QAPP Addendum-II for Off-Site Investigation was completed in November 2019 by Bay West. The purposes of this UFP-QAPP Addendum-II are to define the data quality objectives and procedures for data collection, analysis, and data quality assurance and quality control for an investigation of the LF002 off-site areas near wells MW-141 and MW-118 and begin to define off-base LUCs.

In 2020, a DGI was performed to provide 1) additional delineation of the off-base TCE plumes, 2) evaluate persistence of TCE exceedances at distal wells MW-118 and MW-141, and 3) evaluate the potential VI pathway in the off-base area. The off-base investigation consisted of installing four new wells (MW-600A, MW-600B, MW-601, and MW- 602) and two soil gas probes (SGP-1 and SGP-2), Figure 1-2, DGI Report Site LF002, (Bay West 2021f). The DGI was performed in accordance with recommendations of the Fourth FYR. Findings of the off-base investigation are as follows:

- TCE concentrations at wells MW-118 and MW-141 likely represent detached TCE plumes that are supported by back diffusion from clay layers. The detected plumes are remnants of the original plume that was intercepted and decapitated from the source by the GETS. The remnant plumes are currently dissipating at a slow rate;
- The downgradient extent of the TCE plume at MW-118 is bounded by MW-602 set in the paleochannel; and

- The off-base TCE plumes do not appear to pose a VI risk. Soil gas concentrations in the soil gas probes were less than MTCA and USEPA's VI soil gas screening levels, 2020 Annual RA-O, (Bay West 2021a).

In 2021, the development of off-base LUCs continued. The LF002 RODA was approved and finalized by USAF. This document formalized the off-base LUCs for LF002, updated CULs, added chromium and vinyl chloride as COCs, and revised the remedy in the 1993 ROD to include ISCO or ISCR in addition to the current SVE and GETS technologies.

In December 2021 an Optimized Exit Strategy Implementation Completion Report was developed to demonstrate performance along the path to achieve site closure, or as close to site closure as practical, while maximizing effectiveness, efficiencies, and minimizing life cycle costs. In accordance with this strategy, activities at LF002 include:

- Optimize TCE vapor phase mass removal in the NDA and SDA until removal rate becomes minimal. If needed, bring an additional blower online in the NDA. Deactivate the SVE systems once TCE vapor yields decrease below 0.1 lbs per quarter;
- Operate the GETS until TCE concentrations at the property margins decrease to below the CUL. At this point, TCE concentrations would be contained on site by natural attenuation;
- Continue to optimize the monitoring program as described in the UFP-QAPP Addendum II (Bay West 2019c) and as modified by subsequent Annual Reports; and
- Continue to track concentration decreases by natural attention at the two off-site wells.

A trial shutdown of the active remediation systems at LF002 was proposed in the 2021 Annual RAO Report. Per discussion with the EPA on 12 December 2022, and proposed monitoring schedule and reactivation criteria presented in USAF correspondence dated 22 December 2022, the EPA concurred with a trial shutdown.

The GETS is over 30 years old, which is past the estimated life expectancy of this system. Due to this, a number of extractions well components failed during the reporting period. When this occurs, the need for continued extraction at the affected well is evaluated. If it is determined pumping at the EW is still needed, it is repaired. If not needed, the pump is removed. Prior to 2019, the USEPA and USAF concurred pumping at wells EW-03, EW-04, EW-12, and EW-13 were determined to be unnecessary, and pumping was discontinued. During the review period, components in EW-02, EW-06, and EW-14 were replaced.

Performance of the GETS during the Fourth Five-Year Review period was monitored through RA-Os and O&M activities identified in a 2014 O&M Plan (Bhate 2014a), 2014 UFP-QAPP (Bhate 2014b), 2014 UFP-QAPP Addendum (Bhate 2014c), and 2015 UFP-QAPP (Bay West 2015c).

Results of GETS performance monitoring and O&M is presented in 2018 Annual RA-O Report (Bay West 2020a), 2019 RA-O Report (Bay West 2021a), 2020 RA-O Report (Bay West 2021h), 2021 Draft RA-O Report (Bay West 2022d), and 2022 RA-O Draft Report (Bay West 2023a). **Table 3-2** presents the compiled annually treated groundwater volume and TCE removal mass.

Table 3-2
GETS Performance Monitoring Results Summary

Year	Total Extracted Volume (gallons)	TCE Removal (pounds)
2018	58,843,128	13.63
2019	55,135,877	6.92
2020	38,053,984	3.41
2021	57,436,288	4.04
2022	50,758,018	2.677
Total	260,227,295	30.67

Four extraction wells were taken offline (from 2012 to 2015) to prevent discharge to the infiltration gallery of water with chromium concentrations above the CUL and prevent extraction of groundwater with visible permanganate (following an ISCO pilot study). All extraction wells have been shut down since December 2022 in order to determine if COC concentrations will rebound.

Is the GETS capturing the COC plume?

Since April 2015, the GETS has been operated in full-time automatic mode, and downgradient TCE concentrations have been reduced (Bay West 2022). Monitoring wells downgradient of the NDA include MW-80 and MW-78. Monitoring wells downgradient of the SDA include MW-82, MW-83, and MW-77. In 2021 (Bay West 2022), none of these wells exceeded the TCE CUL. Statistical analysis of the TCE concentrations in the wells demonstrates stable or decreasing trends with a 4-event mean concentration below the CUL. The statistical analysis confirms the GETS has maintained capture of the NDA and SDA TCE plume (Bay West 2022). Figures 4-2 show September 2021 groundwater elevation and flow directions for the NDA and SDA, respectively.

Is the GETS treating the discharge water to below CULs AND Is the GETS working effectively?

Data presented in the annual RA-O Reports indicate the GETS liquid effluent has remained below the CUL and below laboratory detection limits during each quarterly sampling event. The GETS remains effective at treating the extracted groundwater.

Additional GETS performance monitoring and O&M data reviewed in the RA-O reports include GETS air stripping unit influent/effluent sampling data, GETS extraction well operational data and daily O&M checklists. All O&M data indicate the GETS is working effectively. Quarterly GETS liquid phase discharge compliance monitoring show the liquid effluent complies with all CULs. Quarterly GETS air phase discharge compliance monitoring results continue to comply with the TCE emission limit set forth by the Spokane Regional Clean Air Agency Notice of Construction #646. GAC was last replaced in May 2018, and monitoring data did not indicate that replacement has not been necessary since. Quarterly monitoring results are provided to the Spokane Regional Clean Air Agency.

Additionally, groundwater finite element modeling was undertaken in both 2006 and 2014 to assess the effectiveness and predict future performance of the GETS in relation to TCE contaminant migration.

Soil Vapor Extraction

As discussed in **Section 4.1.2.3** of this Five-Year Review, SVE was identified as a component of the selected remedy for CRL in the 1993 ROD (USAF 1993a), removed as a remedy in 1995 (USAF 1995b), and reinstated as a remedy component in 2016 (USAF 2016a). The results of the soil gas investigation, SVE installation, pilot study, and full-scale operation through September 2013 are presented in the SVE

and ISCO Treatability Testing Report (CH2M Hill 2014b). **Table 3-3** summarizes the TCE mass removal data through the third quarter 2022.

Table 3-3
SVE Pilot Study and Full-Scale TCE Removal Estimates through Third Quarter 2022

Disposal Area	PCE Removal (pounds)	TCE Removal (pounds)	Cis-1,2-DCE Removal (pounds)	Vinyl Chloride (pounds)
NDA	5.7	45.1	8.7	2.0
SDA	N/A	159.3	40.8	74.1
Total:	5.7	204.4	49.5	76.1

Notes:
PCE - tetrachloroethene
TCE - trichloroethene
DCE - dichloroethane
N/A – data not available

The Treatability Testing Report (CH2M Hill 2014) concluded a substantial mass of contaminants was present within fractured bedrock beneath both the SDA and NDA areas, and TCE mass is likely present in dense non-aqueous phase liquid (DNAPL) stringers extending through the highly fractured formation. Further, removal of TCE and other chlorinated VOCs by SVE was shown to increase with the availability of exposed wells screens. Based on pilot and full-scale SVE rates of TCE extraction, SVE is most efficient when groundwater levels are below the bottom of the well screens (about 85 feet bgs). SVE is a more economical method of removing TCE mass from the upper formation when compared to batch GETS operation, but GETS operation is needed to lower the water table for successful SVE. These technologies can be operated simultaneously to maximize contaminant mass removal.

SVE operations in the NDA were suspended in September 2013 due to contract limitations (Bhate 2015) and SVE operations in the SDA were suspended in October 2014 because the GETS in the SDA was shut down and the SVE well screens were no longer exposed (Bhate 2016). The SVE system in the SDA was left in place but left inactive pending approval of the 2016 ESD (USAF 2016a).

The 2016 ESD was approved, and SVE was once again a remedy component. A UFP-QAPP Addendum (Bay West 2018e) was prepared and detailed O&M procedures for the NDA and SDA SVE systems. A Remedial Design/Remedial Action Work Plan was prepared in parallel with the UFP-QAPP Addendum (Attachment C to Bay West 2018) to provide design justifications and criteria, plans and design, and an operational monitoring and optimization program for proposed remediation system upgrades to the GETS and SVE systems. The NDA and SDA SVE systems each have two 500-pound (lb) GAC vessels for air effluent VOC removal. All four GAC vessels were last changed out on 8 October 2021.

3.4.2.3 Remedy Component – Long-Term Monitoring

Long-term groundwater monitoring was selected as a remedy component for CRL in the 1993 ROD (USAF 1993a). A long-term monitoring program for CRL was implemented in 1995 for on-site and off-site monitoring wells installed in the upper and lower aquifer.

During the current review period, the scope of the long-term monitoring program was described in a UFP-QAPP Addendum 1 Site LF002, (Bay West 2018e). Since the Fourth Five-Year Review (Tetra Tech 2019), additional wells in the NDA and the SDA were to the groundwater long-term monitoring program. The current long-term monitoring scope (location, frequency, analysis) is shown in Worksheets #17 and #18 in the 2018 UFP-QAPP Addendum 1 (Bay West 2018e).

Appendix E contains figures showing the historic groundwater TCE results (through December 2022) in NDA, SDA, and off-site groundwater extraction, monitoring, and remediation wells. The locations of these wells are shown in **Figure 4-2** which also shows the extent of the TCE plume as of September 2021.

3.4.2.4 Remedy Component – Injections

EPA and USAF modified the remedy again in 2021 with a RODA based on the 2016 ESD. One of the purposes of the OU-1 RODA was to amend the COCs to include chromium and vinyl chloride. In addition, the OU-1 RODA revised the OU-1 remedy components to include ISCO (which had been implemented previously as a pilot study).

The ISCO pilot study at LF002 consisted of three rounds of ISCO injections (two in the SDA and one in the NDA) completed from July 2011 through July 2012 (CH2M Hill 2014e). In the SDA, pre- and post-injection groundwater monitoring results showed that TCE concentrations were reduced in all nine injection wells, although rebound was observed in six of these wells in later months. December 2012 and February 2013 results show further reductions in TCE concentrations after a second round of ISCO injections. ISCO injections also reduced TCE concentrations in SDA extraction wells. By August 2013, groundwater sampling results showed concentration rebound. In the NDA, pre- and post-injection groundwater monitoring results showed a similar decline and subsequent rebound in groundwater TCE concentration in the injection wells and nearby extraction wells.

An analysis of the completion of ISCO reaction and TCE rebound is done in Section 2.3 of the Final 2016 RA-O Report (Bay West 2017g). The ISCO injections in 2011 and 2012 initially oxidized nearly all the TCE in mobile porosity groundwater within the treatment area. In the first few quarters following injection, TCE concentrations were below detection limits in many of the treatment area wells. However, TCE concentrations rebounded as the groundwater re-equilibrated with either the sorbed TCE mass and/or groundwater in immobile porosity. The end of the rebound period is assumed to have occurred when the TCE concentrations stopped increasing and adopted either a decreasing trend or stable or seasonally fluctuating pattern. By these criteria, rebound injection reactions and rebound appears to have ended for nearly all wells in the NDA and SDA.

The 2018 UFP-QAPP Addendum I developed performance criteria to address whether or not on-site TCE concentration trends are on track to achieve RC by the USAF target date of 2024 (Bay West 2018e). The Remediation Monitoring Endpoint is the set of conditions that allow active forms of remediation to be discontinued at LF002. The conditions for the endpoint verify that groundwater has reached the cleanup goal of 5 µg/L for TCE as specified in the ROD. Per OSWER directive 9283.1-45, the verification can be achieved either by a mean test (upper control limit on an average) or by a trend test (upper control limit on a trendline).

In accordance with the performance monitoring program developed in the UFP-QAPP Addendum I (Bay West 2018e), TCE concentrations were statistically evaluated using a 4-event mean concentration, a 95% UCL, Mann-Kendall trend assessment, and log-linear regression projection. Performance monitoring was developed in the UFP-QAPP Addendum I (Bay West 2018e) established to follow the progress of monitoring wells towards an end goal of having TCE concentrations below the CUL. The following conditions were noted:

- Relatively immobile TCE plumes at monitoring wells MW-118, MW-141, and MW600B are outside the influence of active remediation. Decreasing trends of TCE are occurring by natural attenuation at MW-118 and MW-141(Bay West 2022d).
- The TCE mass and TCE groundwater concentrations have decreased significantly since RA-O began in 1995 (Bay West 2022d).

- The 4-event average TCE concentrations only exceeded 100 µg/L (maximum of 316 µg/L) in two wells of the 49 wells monitored in 2021. The concentrations were between 100 and 25 µg/L in six wells, between 5 and 25 µg/L in 20 wells, and the remainder (21 wells) were less than the CUL of 5 µg/L (Bay West 2022d).

Because the introduction of permanganate during the 2011/2012 ISCO pilot study increased soluble chromium in groundwater. As part of the 2021 RODA, chromium was added as a COC and concentrations in groundwater are monitored as a part of the long-term monitoring activities. The ISCO injections mobilized chromium through oxidation of relatively insoluble trivalent chromium to soluble hexavalent chromium. Initially, there were 12 wells in the SDA and 6 wells in the NDA with chromium concentrations above the CUL of 0.05 mg/L. Since the ISCO injections, chromium concentrations have decreased to below the CUL in most of these wells. The only well with chromium concentrations above the CUL was NDA-14 (Bay West 2022d).

Other chemicals at LF002, which are evaluated during long-term monitoring, include anaerobic degradation products of TCE (cis- and trans-DCE and vinyl chloride). Vinyl chloride was added as a COC as part of the 2021 RODA. Vinyl chloride exceeded its CUL and cis-1,2-DCE exceeded its MCL within the SDA and NDA. There were no CUL exceedances for trans-1,2-DCE.

The City of Airway Heights' municipal wells #1 and #4 (PS 1/4), which are located 4,000 feet east-southeast of LF002 (**Figure 4-3**), have been monitored by Fairchild AFB since 1991, and TCE concentrations have remained below the CUL. In October 2012, the City of Airway Heights completed another water supply well (PS9) located 2,650 feet east of LF002. This well was sampled in 2016 and LF002 COCs were not detected at concentrations exceeding their respective CULs or MCLs.

3.4.2.5 Remedy Component – Institutional Controls

Fairchild AFB implemented LUCs (ICs and engineering controls) in accordance with the OU-1 ROD (USAF 1993a). EPA and USAF modified the remedy in 2021 with a RODA based on the 2016 ESD. The RODA updated the LUC boundaries.

Off-Base LUCs

Off-base LUCs are required at LF002 as releases from on-base sources are affecting adjacent properties. One of the purposes of the OU-1 RODA was to clarify existing site-specific on-base LUCs and to add off-base LUCs for LF002. An updated LUC Implementation Plan is being developed and will use the OU-1 RODA to define the responsibilities of all parties involved in implementing, maintaining, and monitoring LF002 LUCs.

The USAF's role in administering the off-base LUCs primarily includes various forms of information sharing with the public, property owners, and state and local agencies. Information sharing is completed through RAB meetings and open houses.

The LF002 LUC boundary is depicted within **Figure 1-3** along with the other ERP sites' LUC boundaries. The LUC boundary includes parcels potentially impacted by contamination related to LF002.

In October 2012, the City of Airway Heights completed another water supply well (PS9) located 2,650 feet east of LF002. Well PS9 is within the off-base LUC boundary shown in **Figure 1-3**. The 2015 LUC Annual Report (Bay West 2016i) indicated that the LF002 contamination plume may impact PS9 and the well had not been sampled for LF002 COCs. Well PS9 was sampled in 2016 and LF002 COCs were not detected at

concentrations that exceed CULs. Continued monitoring of PS9 has occurred when PS9 is operations (seasonally) and no LF002 COCs were detected at concentrations exceeding the CULs

Currently Implemented LUCs

The current scope and status of LUCs at LF002 are defined in annual Fairchild AFB LUC Status Reports. The 2022 Annual LUC Report (Bay West 2023b) was used to evaluate the effectiveness of LUCs at LF002 in this Five-Year Review. Facility-wide LUCs are applicable to Site LF002 and are intended to prevent exposure to contaminated media. These facility-wide LUCs include:

- Work Clearance System;
- Installation Development Plan (IDP);
- Base Civil Engineer Work Requests; and
- Environmental Impact Analysis Process.

The 2022 Annual LUC Report (Bay West 2023b) describes the annual review and the findings of facility-wide LUCs at Fairchild AFB. With the exception of the IDP, the facility-wide LUCs appear to be in place and functioning as intended. Review of the IDP indicated the document did not describe the specific LUCs for each site or the reasons for the controls. Further, the IDP does not include LUC boundaries on maps. The IDP is used to crosscheck work completed through the Work Clearance System, Base Civil Engineering Work Requests, and the Environmental Impact Analysis Process. If the IDP is outdated or incorrect, the other facility-wide LUCs that rely on the IDP may not be functioning correctly. Updating the IDP/CPP is in progress by Fairchild AFB staff.

Engineering controls at LF002 restrict physical access to the site and maintain the integrity of the landfill cap. The following site-specific LUCs are applicable to Site LF002:

- Fencing;
- Locked gates;
- Signage; and
- Landfill Cover.

Site-specific LUC inspection checklists for LF002 were reviewed in 2022 (Bay West 2022). In addition, the site-specific LUCs were reviewed as part of the Five-Year Review site inspections (**Appendix E)**. All site-specific LUCs were found to be in good condition and functioning as intended. No deficiencies were noted.

3.4.3 Site Inspection

The inspection of the Site was conducted between April 24-26, 2023. In attendance were Joseph Marsh (USACE) and Jack Mapes (AGEISS). The purpose of the inspection was to assess the condition of the remedy and verify that the remedy is operating as intended.

The Site Inspection Team observed no apparent problems at the CRL site. Established LUCs remained in place. Landfill cover, monitoring wells, groundwater and SVE systems appear to be in normal condition. The cap appeared to be in good condition. The cap was covered in a variety of short and tall well-established grasses and small shrubs with occasional bare spots and small, shallow animal burrows. Site drainage features were rock lined and showed no siltation or damage.

The GETS and SVE systems were temporarily shut down on a trial basis. Access continues to be restricted by intact security fencing, and locked gates. Direct personnel exposure to remaining subsurface

contaminants is unlikely at this site. The landfill is regularly occupied or monitored by USAF, U.S. Army Reserve and contractor personnel.

3.5 TECHNICAL ASSESSMENT

3.5.1 Question A – Is the remedy functioning as intended by the decision documents?

The remedy for Site LF002 is being implemented in accordance with the 1993 ROD and 2021 RODA to prevent potential exposure to contaminated soil, debris, or groundwater at LF002. Remedial actions at Site LF002 are functioning as intended and are currently achieving the intent of the RAOs identified by the 1993 ROD and 2021 RODA.

3.5.1.1 Remedy Component – Landfill Caps

The engineered landfill caps on the NDA and SDA continue to operate and function as designed. The landfill caps prevent human exposure to contaminants within the landfill materials, and the caps continue to control infiltration through landfill areas to minimize migration of contaminants to groundwater. The landfill cap inspection and maintenance procedures, as implemented, will continue to maintain the effectiveness of the remedy.

3.5.1.2 Remedy Component – GETS and SVE

Groundwater Extraction and Treatment System

Contaminated groundwater in the upper aquifer continues to be restored through contaminant removal by the GETS. **Table 3-2** summarizes the results of annual RA-O Reports and indicates over 200 million gallons of groundwater were processed and over 30 pounds of TCE were removed by the GETS since 2018. The GETS performance inspection and O&M procedures, as implemented, will continue to maintain the effectiveness of the GETS.

A 2016 ESD (Bay West 2016f) further expanded the role of the GETS to reduce groundwater elevations in the source area to expose TCE media below the static groundwater level for SVE. No data are yet available, and forthcoming annual RA-O reports will assess and confirm whether or not the GETS will continue to be successful at reducing the groundwater elevations in these targeted areas.

Another objective of the GETS is to prevent further migration of contaminated groundwater across the site boundary and to the lower aquifer. Due to the 201/2012 ISCO pilot study, the GETS was operated on a manual batch mode from November 2014 through March 2015. As per the DGI, groundwater finite element modeling performed in 2006 and 2014 (CH2M Hill 2014e) predicted the GETS could be shut down for approximately 6 months before TCE in the alluvium migrated to a point where it was beyond recapture; however, this prediction is not consistent with the observed downgradient TCE increases described in the 2015 RA-O Report. As discussed in **Section 3.4.2.2**, it is theorized hydraulic capture of the plume may have been lost during part-time manual batch mode from November 2014 through March 2015. Since April 2015, the GETS has operated in full-time automatic mode, and downgradient TCE concentrations have reduced to, and remained at concentrations below the MCL. In addition, groundwater elevation and capture zone modeling discussed in **Section 3.4.2.2** support the conclusion that the GETS is currently preventing further migration of contaminated groundwater across the site boundary and to the lower aquifer.

Soil Vapor Extraction

SVE pilot tests completed in the SDA in 2009 and in the NDA in 2010 indicated SVE is an effective technology for TCE mass removal at both locations. Because of the success of the pilot tests, "full-scale" operation of the SVE system began in 2011.

Following a post-ROD SVE Treatability Study in the NDA and SDA (CH2M Hill 2014e), a 2016 ESD (USAF 2016a) re-established SVE as a remedy component. The Treatability Testing Report concluded SVE provided the most cost-effective TCE mass removal technology between GETS, SVE, and ISCO.

A *UFP-QAPP Addendum I* (Bay West 2018e) detailed O&M procedures for the NDA and SDA SVE systems. A *Remedial Design/Remedial Action Work Plan* was prepared in parallel with the UFP-QAPP Addendum (Attachment C to Bay West 2018) to provide design justifications and criteria, plans and design, and an operational monitoring and optimization program for proposed remediation system upgrades to the GETS and SVE systems.

3.5.1.3 Remedy Component – Long-Term Monitoring

In total, 53 wells at LF002 have data with four readings or more during the past FYR period and were evaluated for trend analysis (**Appendix E**), unless the data for the wells fell below the CULs or detection limit. The performance of individual wells was evaluated to determine if the TCE or Cr trends would be able to meet their respective endpoints. Wells were segregated into six groups (A through F) based on their concentrations and to better graphically display the temporal trends (**Appendix E**). In addition, four "miscellaneous wells" with low TCE levels, were also evaluated during this review period to determine if there was any trends or indication of a potential increase. Wells with Cr concentrations above the CUL was assigned to a Cr group, and wells with elevated cis-1,2-dichloroethane were also evaluated for trend analysis.

Group A wells: All of the wells within this group exceed the CUL and have not met #2 of the RAOs.

- NDA-01: This has a decreasing trend but may reach CUL in 2035.
- NDA-08: This has a decreasing trend but may reach CUL in 2032.
- RW-17: This well is not showing trends approaching the CULs. The TCE concentrations in RW-17 appear to have stabilized at about 100 ug/L.
- MW-118: This well is not showing trends approaching the CULs. Since 1991, TCE concentrations have been slowly decreasing. This orphan plume is beyond the reach of the active remedial actions. Currently, it continues to migrate away from the site.

Group B wells: All of the wells within this group exceed the CUL and have not met #2 of the RAOs.

- RW-16: This well has a decreasing trend but may reach CUL in 2026.
- RW-08: This well has a decreasing trend but may reach CUL sometime beyond 2028.
- RW-06: This well has a decreasing trend and is projected to reach CUL by the end of 2024.
- NDA-12: This well has a decreasing trend and is the only well in this group with a trend to reach the CUL by the marginal target date.

Group C wells: Two of the wells within this group exceed the CUL and have not met #2 of the RAOs. Two of the wells have met them.

- MW-600B: This well has an exceedance but with a decreasing trend and may reach the CUL by 2025.
- RW-09: This well has a decreasing trend that reached the CUL prior to the marginal target date. However, it should be noted that the last recorded value of RW-09 was 27 µg/L on 9/15/2022.

- NDA-11: This well has an exceedance but with a decreasing trend and may reach the CUL by 2025.
- EW-05: This well has a decreasing trend that reached the CUL prior to the marginal target date.

Group D wells: Two of the wells within this group exceed the CUL and have not met #2 of the RAOs. Two of the wells have met them.

- MW-96: MW-96 has a decreasing trend that extends exceeding the CUL out past 2027. However, the concentrations of TCE are currently close to 10 µg/L.
- NDA-09: This well has a decreasing trend that reached the CUL prior to the marginal target date.
- EW-14: This well has a decreasing trend. It should reach the CUL by 2023. Currently the levels of TCE are only slightly above the CUL.
- EW-06: This well has a decreasing trend that reached the CUL prior to the marginal target date.

Group E wells: Two of the wells within this group exceed the CUL and have not met #2 of the RAOs. Two of the wells in this group have met the RAOs.

- MW-141: This well appears to be stable and not increasing or decreasing. It should be noted that this well precludes achieving CUL levels no matter the remedial actions taken onsite. This orphan plume is beyond the reach of the active remedial actions and was projected to decrease by natural attenuation to less than the CUL by 2029. Currently, it continues to migrate away from the site.
- NDA-14: Well NDA-14 shows an increasing trend for TCE concentrations with the last value in the FYR period of 52 µg/L.
- EW-10: This well has a downward trend and is below or close to the CUL levels by the marginal target date.
- RW-11: This well has a downward trend and is below the CUL prior to the marginal target date.

Group F well: Three of the wells in this group are below the CUL and have met #2 or the RAOs. Four wells in this group exceed the RAOs.

- EW-2, RW-14, and RW-13 all have decreasing trends and are below the CUL prior to the marginal target date.
- NDA-13, EW-11, and EW-12 did not achieve CUL levels before the marginal target date. The concentration trends appear to be stable with TCE levels of approximately 10 µg/L or less.
- MW-63: This well shows an increasing trend and is above the CUL level by the marginal target date with the last two samples both resulting in concentrations of 27 µg/L.

Miscellaneous wells: Three of the wells in this group are below or close to the CUL and have met #2 or the RAOs. One well exceeds the CUL and does not meet the RAOs.

- MW-83, RW-07, and MW-601: These wells were below the CUL prior to the marginal target date. However, MW-601 does have an upward TCE trend that exceeded the CUL level after the marginal target date at the end of this FYR period.
- EW-07: This well appears to not have a trend. However, the overall TCE concentration remains above 10 µg/L.

cis-1,2-Dichloroethene wells: Three wells in this group are below or close to the CUL (70 µg/L) and have met #2 of the RAOs.

- RW-06, NDA-01, and NDA-08: These wells show decreasing or stable trends.
- NDA-14: This well shows an increasing trend for cis-1,2-Dichloroethene with the last value in the FYR period of 84 µg/L or slightly above the CUL.

Chromium wells: Two of the wells within this group exceed the CUL (50 µg/L) and have not met #2 of the RAOs. Two of the wells in this group have met the RAOs.

- RW-17 and RW-09: Both of these wells have decreasing Cr trends and are below the CUL by the marginal target date.
- NDA-06 and NDA-14: Neither of these two wells demonstrates either stability or a decreasing trend.

Persistence of TCE concentrations above the CUL in the two far downgradient wells (MW-118 and MW-141) preclude achieving complete response no matter the remedial actions taken on-site. These wells are beyond the reach of the current active remedial actions and concentrations are projected to decrease by natural attenuation to less than the cleanup level by 2024 to 2029. Off-base LUCs established in the ROD Amendment are protective of human health.

3.5.1.4 Remedy Component – Institutional Controls

Engineering controls currently in place effectively prevent unauthorized access to the site. The O&M and inspection activities, as implemented, maintain the effectiveness of all engineering controls.

Institutional controls implemented as a site remedy as selected by the ROD. The IDP/CPP requires updating to ensure institutional controls are functioning as intended. Because the IDP/CPP is used to crosscheck work completed through other facility-wide ICs, the systems that rely on the IDP/CPP may not be functioning correctly.

The development and finalization of off-base LUCs at LF002 was memorialized in the 2021 RODA. Information sharing is a primary mechanism for off-base LUCs.

An updated LUC Implementation Plan is being developed and will use the OU-1 RODA to define the responsibilities of all parties involved in implementing, maintaining, and monitoring LF002 LUCs.

3.5.2 Question B – Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?

Yes. RAOs and cleanup levels are still valid. The cleanup levels are the state and federal MCLs, and these values have not changed since the 2021 RODA was implemented. Land use and associated exposure pathways have not changed since the 1993 ROD and 2021 RODA were finalized. EPA has updated select exposure parameters since the original risk assessment was performed as part of the RI. In addition, EPA published updated toxicity values for TCE in 2011. TCE was identified as a COC based on the risk assessment. The incorporation of more stringent toxicity values would not change this conclusion.

Total chromium is mean by the use of "chromium" in the 2021 RODA. For the purposes of this review and on-going monitoring, it is important to differentiate between the species of chromium present. Future evaluations will specify chromium speciation (i.e., total, CR III, CR VI) being analyzed and discussed.

Changes in Standards: The 2021 RODA updated the list of COCs and their respective CULs to include WDOE MTCA Method A levels that were more stringent than Federal MCLs. TCE was identified as a COC in the 1993 ROD, and chromium and vinyl chloride were added as COCs in the 2021 RODA. Concentrations of vinyl chloride and chromium exceeded WDOE MTCA Method A and Federal MCLs during the previous Five-Year Review period.

Table 3-4.
COCs and Cleanup Levels Identified in 2021 ROD Amendment

Chemical	Cleanup Levels (µg/L)	Basis for Cleanup Level[1]
TCE	5	Federal MCL
Vinyl chloride	0.2	State MTCA-A MCL
Chromium	50	State MTCA-A MCL
Sodium Permanganate	0.75 mg/L	Based on visual detection of purple coloration

Cleanup levels for the COCs identified in the 2021 RODA are based on ARARs that have not changed.

Changes in Toxicity and Other Contaminant Characteristics: EPA published new toxicity values for TCE in 2012. Potential exposure to TCE in groundwater, if used as a drinking water source, was determined to present an unacceptable risk; therefore, TCE was identified as a COC. The current CUL for groundwater is based on the Federal MCL of 5 ug/L. Vinyl chloride and chromium were identified as COCs in the 2021 RODA. Toxicity values for these two COCs have not changed since the 2021 RODA and CULs are based on the state MCLs.

Changes in Risk Assessment Methods: Since the risk assessment performed as part of the RI, EPA has updated default exposure parameters (e.g., body weight, drinking water ingestion rates, etc.). However, these changes in exposure parameters are expected to result in only minor changes in the risk assessment results as some changes are more conservative while others are less, thus offsetting the effects. Calculation of inhalation risk is now based on reference concentrations and inhalation unit risk to evaluate noncancer hazards and cancer risk, respectively. The methods for evaluating the VI pathway have evolved since the 1993 ROD was finalized. Although COC groundwater concentrations appear to exceed EPA target groundwater VI screening levels, indicating a potential VI risk under a future residential scenario, COC concentrations in soil gas data collected during the DGI were below screening values.

Changes in Exposure Pathways: Land use and exposure pathways have not changed. No new receptors were identified. cis-1,2-Dichloroethene is a TCE degradation product and historically exceeded its MCL of 70 ug/L in several monitoring wells. Although the Fourth Five-Year Review recommended its addition as a COC, it was not added as a COC in the 2021 RODA. Data evaluated during this review period (presented in **Appendix E**) indicate only monitoring well NDA-14 has an increasing trend in cis-1,2-dichloroethene with a September 2022 value of 84 µg/L.

3.5.3 Question C – Has Any Other Information Come to Light That Could Call into Question the Protectiveness of the Remedy?

There is no known use or disposal of AFFF within the Craig Road Landfill; however, the site will be evaluated as part of the due diligence efforts for non-AFFF PFAS sources. To date, PFAS fate and transport has not been taken into consideration when implementing remedies for legacy contamination. However, as PFAS science evolves their impact on remedy effectiveness and the proposed remedy impact on PFAS fate and transport will be considered.

No new information has come to light that would call into question the protectiveness of the OU-1 remedy.

3.6 ISSUES/RECOMMENDATIONS

Issues and recommendations identified during this Five-Year Review for all OUs are presented in **Section 2.4.7** and those specific to OU-1 are presented below**.**

Issues and Recommendations Identified in the Five Five-Year Review				
OU-1: Craig Road Landfill	**Issue Category:** Institutional Controls			
	Issue: The GETS was shutdown in December 2022 to determine if COCs would rebound without active treatment.			
	Recommendation: Closely monitor the down-gradient sentinel wells for increasing COC concentrations and other parameters that would indicate loss of TCE plume containment. Consistently and closely monitor MW-141 and MW-118 for COCs to ensure alignment with natural attenuation trends and containment objectives. For MW-141 validate stability and anticipated progress towards cleanup levels by 2029. For MW-118, monitor any shifts indicative of plume migration.			
Affect Current Protectiveness No	Affect Future Protectiveness Yes	Party Responsible USAF	Oversight Party USEPA	Milestone Date DATE
OU-1: Craig Road Landfill	**Issue Category:** Remedy Performance			
	Issue: TCE concentrations in RW-17 appear to have stabilized at about 100 ug/L.			
	Recommendation: Complete a remedy evaluation for the SVE system to determine it extending it to treat RW-17 would expedite cleanup			
Affect Current Protectiveness No	Affect Future Protectiveness Yes	Party Responsible USAF	Oversight Party USEPA	Milestone Date DATE

3.6.1 Other Findings

Subsequent reports and assessment will ensure that chromium concentrations are broken down by speciation, reflecting the distinct toxicological profiles and risks associated with each form.

Environmental conditions impacted by climate change may impact the protectiveness of the implemented remedy. Increased average temperatures associated with a decrease in precipitation may lead to stressed vegetation covering the soil cap at LF002. A possible increase in wildfires may also impact the integrity of the soil cap. Wildfires are not considered a threat to the on-base GETS and SVE.

3.7 PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: *OU-1*	***Protectiveness Determination:*** Short-Term Protective
Protectiveness Statement: The remedy at OU-1 will be short-term protective of human health and the environment as chemical of concern concentrations continue to decrease, vapor intrusion pathways have been investigated, and LUCs are in place. Remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risk. However, in order for the remedy to be protective in the long-term, facility-wide ICs should be clarified through an update of the IDP or CPP.	

3.8 NEXT REVIEW

The next review (Sixth Five-Year Review) will be completed five years following the expected completion date of this Five-Year Review; anticipated by 12 August 2028.

4.0 OU-2 / PRIORITY ONE SITES

4.1 BACKGROUND

OU-2 includes seven On-Base Priority One Sites (**Table 1-1**) (LF001 [SW-1], SD005 [IS-1], SS018 [PS-2/PF-6], SS026 [PS-8], SS027 [PS-6], FT004 [FT-1], and WP003 [WW-1]). Initial environmental investigations began in 1984 and characterization of these sites began in 1986. LFI completed from 1986 to 1990 were used to direct RI activities conducted in 1991 and 1992. The RI and FS were finalized in early 1993. The OU-2 ROD finalized in July 1993 (USAF 1993b) determined that a RAs were required at sites LF001 (SW-1), SS018 (PS-2), SS026 (PS-8), FT004 (FT-1), and WP003 (WW-1). Remedial construction activities for these three sites were completed by 1998. The 1993 ROD documents an NFA decision for the two remaining IRP sites (SD005 [IS-1] and SS027 [PS-8]) in OU-2 (**Table 1-1**).

The following sites are not included in the Fifth FYR for the reasons described below:

- **FT004** achieved all RAOs in accordance with the 1993 ROD; however, due to the presence of PFAS has not achieved UU/UE conditions (Bay West 2019d). Since PFAS will be addressed in OU-9; FT004 will not be discussed as part of OU-2 in this, or subsequent, FYR.

- **SS018** has been transferred to the VCP due to remaining petroleum contamination (USAF 2018b) into flightline petroleum site TU506.

- **SS026** has been transferred to the VCP due to remaining petroleum contamination (USAF 2017f) and consolidated into flightline petroleum site TU500.

4.1.1 Geology and Hydrogeology

Generally, the geology of OU-2 consists of approximately 10 to 30 feet of alluvial deposits (silt, sand, and gravel) overlay basalt bedrock (Basalt A). The alluvium grades downward into more gravel-rich sediments terminating at the fractured and weathered bedrock surface. Groundwater is typically encountered 3 to 20 feet bgs across OU-2 sites. OU-2 has an overall easterly groundwater flow direction (AECOM 2012).

4.2 RECORD OF DECISION

The OU-2 ROD addresses seven On-Base Priority One sites (**Table 1-1**). Initial characterization of these sites was conducted from 1986 to 1989. Limited field investigations (LFI) were initiated in 1991 and completed in 1992. Field investigation results were used to direct RI activities conducted in 1993 and 1994. The OU-2 ROD (USAF 1993a) was signed in February 1993, which determined that RA and/or ICs were required at sites LF001 (SW-1), SS018 (PS-2), SS026 (PS-8), FT004 (FT-1), and WP003 (WW-1). The ROD documents an NFA decision for the two remaining IRP sites in OU-2 (**Table 1-1**).

Table 4-1 Summary of OU-2 1993 ROD CULs

Site ID	Historical Site ID	COC	Soil CUL[1] (mg/kg)	Groundwater CUL[2] (ug/L)
LF001	SW-1	TCE	--	5
WP003	WW-1	Cadmium	2*	--
		TCE	--	5
FT004	FT-1	Benzene	0.5	5
SS018	PS-2	TPH	--	1,000
		Benzene	--	5
SS026	PS-8	Benzene	--	5

-- No CUL assigned for this media.

* Based on protection of certain agricultural plants.
1) Soil MTCA Method B, Based on protection of groundwater.
2) Groundwater MTCA Method B and Federal SDWA MC; TPH is in accordance with MTCA Method A.

4.2.1 Explanation of Significant Difference

The 2018 Explanation of Significant Difference (ESD) for OU-2 ROD (USEPA 2018b) transferred two petroleum sites (SS018 and SS026) from the USEPA Superfund Program to the WDOE VCP; explained the significant differences in LUCs for LF001, WP003, and FT004; explained significant differences in CULs for FT004; and documented transfer of TCE in groundwater at SD031 to SS039 (USEPA 2019c).

In accordance with USEPA guidance, institutional controls are divided into four categories: proprietary controls, governmental controls, enforcement and permit tools with institutional control components, and informational devices. The categories that are applicable to Fairchild AFB OU-2 sites are described in more detail below:

- Enforcement and permit tools with institutional control components are legal tools, such as administrative orders, permits, FFAs, and Consent Decrees that limit certain site activities or require the performance of specific activities (e.g., monitor and report on institutional control effectiveness). These legal tools may be issued unilaterally or negotiated.

- Informational devices provide information or notification often as recorded notice in property records or as advisories to local communities, tourists, recreational users, or other interested persons that residual contamination remains on site. As such, informational devices generally do not provide enforceable restrictions. Typical informational devices include state registries of contaminated sites, notices in deeds, tracking systems, and fish/shellfish consumption advisories.

- Governmental controls impose restrictions on land ufse or resource use, using the authority of a government entity. Typical examples of governmental controls include the work clearance system, IDP, and Environmental Impact Analysis Process (EIAP).

Since issuance of the OU-2 ROD, there have been revisions to MTCA CULs that affect FT004. In addition, since implementation of the remedial actions, additional CULs for previously identified COCs have been established for FT004. Therefore, the CULs are updated to meet current MTCA Method A CULs for unrestricted land use based on the protection of groundwater and unrestricted groundwater use. The CUL differences and additional COCs are presented below.

Table 4-2 Summary of OU-2 2018 ESD CULs

Site ID	Historical Site ID	COC	Soil CUL[1] (mg/kg)	Groundwater CUL[2] (ug/L)
LF001	SW-1	TCE	--	5
WP003	WW-1	Cadmium	2*	--
		TCE	--	5
FT004	FT-1	TPH-G[3]	30[4]	--
		TPH-D[3]	2,000	500
		Xylene[3]	9	--
		Benzene	0.03	5
SS018	PS-2	TPH	--	1,000
		Benzene	--	5
SS026	PS-8	Benzene	--	5

-- No CUL assigned for this media.

* Based on protection of certain agricultural plants.
1) MTCA Method A Unrestricted Land Use CULs (WDOE, 2013). TPH-G, xylene, and benzene CULs are based on protection of groundwater; TPH-D CUL is based on preventing the accumulation of free product on the groundwater.
2) MTCA Method A Unrestricted Land Use CULs (WDOE, 2013). Benzene CUL is based on the Federal SDWA MCL.
3) New COC CUL added in this ESD.
4) Two TPH-G CULs are provided by MTCA. The lower value of 30 mg/kg is applied to FT004 due to the detection of benzene in soil.

Sites SS018 and SS026 were consolidated into flightline plumes being investigated under TU506 and TU500, respectively. The consolidation of these sites is an outcome of soil and groundwater sampling done in two phases (2015 and 2016) as part of RIs for the former TU500, TU501, TU504, and TU506 as described in the Site TU500, TU501, TU502, TU504, TU506 Multi-Site Remedial Investigation UFP-QAPP (Bay West 2015e), and at individual OWS locations as described in the OWS Multi-Site Remedial Investigation UFP-QAPP (Bay West, 2015a, 2015b). Comprehensive evaluation of these RI data, along with historical data from other flightline sites, led to the consolidation of petroleum-contaminated sites. The rationale for consolidation of these multiple sites is as follows:

- Contamination sources are located within close proximity to one another (within 100 to 200 feet);
- Consolidation of site-related documents and field events such as water level measurements will facilitate a comprehensive understanding of the sites (a Conceptual Site Model); and
- Comingled groundwater plumes can be addressed with comprehensive cleanup alternatives.

USAF, USEPA Region 10, and WDOE have concurred with the revised approach to investigate and manage TPH contamination in groundwater along the flightline as two consolidated plumes. LUCs for the two OU-2 sites that are being transferred to the WDOE VCP will be managed similarly to CERCLA sites in OU-2. The USAF monitors Fairchild AFB sites that require LUCs. In areas that have groundwater impacts, the LUCs implemented by the USAF will include restrictions on groundwater use.

To date, only petroleum product wastes have been identified based on previous use and sampling at each site. In the event that additional characterization reveals the presence of any hazardous substance, pollutant, or contaminant at any of these sites, such site(s) will be investigated pursuant to the FFA.

4.3 RESPONSE ACTION SUMMARY

The remedy, including RAOs selected in the ROD, is summarized below for each OU-2 site included in this Five-Year Review. Summaries of COCs, RAOs, completed RAs, and current site status are provided in **Tables 1-1** and **1-2**.

4.3.1 LF001 (SW-1)

LF001 is on the western boundary of the base adjacent to the west end of Parallel Taxiway B (**Figure 5-1**). The approximately 16-acre LF001 was the main disposal area for the base from 1949 to 1958 (**Figure 5-1 and Figure 5-2**). Wastes disposed at LF001 may have included industrial wastes, plating sludge, lubrication oils, cutting oils and shavings, cleaning solvents, paint wastes, and municipal solid wastes. LF001 last received waste in 1958. The landfill contains approximately 10 to 20 feet of mounded landfill material and is capped with a 1 to 3-foot non-engineered soil cover. It is currently a topographic high in an area of relatively flat natural topography.

4.3.1.1 Basis for Taking Action

Initial field investigations were completed at LF001 from 1986 through 1990. Results from these investigations were used to direct RI activities conducted in 1991 and 1992. The ROD identified TCE in groundwater as the LF001 COC. The results of the risk assessment indicated that there were no

unacceptable risks to human health posed by exposure to the soils at LF001 under both residential and industrial use scenarios. However, since the site was a former sanitary landfill, there remains a potential for buried contamination not identified during the RI to be present within the landfill. Although no sources of TCE were identified within the LF001 landfill, buried waste not identified in the RI could serve as a source of groundwater contamination. Therefore, source control alternatives for the landfill were evaluated in the FS. With respect to the TCE detected in the groundwater at LF001, the estimated cancer risk was within the acceptable cancer risk management range established under federal law and is below the state level of a lifetime cancer risk of 1 in 100,000. However, TCE concentrations were detected in three monitoring wells that exceeded the federal maximum contaminant level (MCL) standard of 5 µg/L. Therefore, groundwater cleanup alternatives were evaluated in the FS remedial action for groundwater was warranted.

4.3.1.2 Remedy Selection

The COC for LF001 (SW-1) was TCE in groundwater and the 1993 ROD established the following RAOs:

- Prevent residential exposure to potential contaminants within subsurface soil and debris;
- Minimize movement of contaminants from debris to groundwater;
- Prevent consumption of groundwater with contamination exceeding drinking water MCLs;
- Restore contaminated groundwater to drinking water quality; and
- Prevent further migration of contaminated groundwater.

To satisfy RAOs, the 1993 ROD identified the following components for the selected remedy at Site LF001:

- Maintain ICs that restrict access and prevent on-base usage of TCE-contaminated groundwater associated with the site until CULs are achieved;
- Monitor groundwater at the site to identify a trend in contaminant concentrations, estimate a time frame for restoration by natural actions, evaluate the acceptability of the estimated time frame, and implement a compliance program to estimate attainment of CULs; and
- Monitor off-site water supply wells in the site vicinity and provide point-of-use treatment and alternative water supply, if necessary.

4.3.1.3 Remedy Implementation

Institutional Controls

Fairchild AFB has implemented ICs per the ROD (USAF 1993b) to restrict site access and prevent exposure to or consumption of contaminated groundwater at LF001. It has not been necessary to provide point-of-use treatment or alternative water supply for any off-site residential water supply wells located near the site. Functioning of ICs is evaluated annually as part of base-wide annual LUC inspections as documented in Annual Reports on the Status of Land Use Controls (Bay West 2019b, 2020g, 2021g, 2022c). The USAF has identified that LUCs established in the ROD are not in compliance with current LUC guidance published by the USAF and USEPA. The ESD was approved and signed by the USAF and USEPA to update the LUC language for OU-2 sites in accordance with recent guidance. Further details on the OU-2 ESD are described in **Section 4.2.**

Groundwater Monitoring

A long-term monitoring program for the site was initiated in 1994 and consisted of quarterly monitoring of ten shallow wells. In 1998, with the approval of WDOE and USEPA, the number of long-term monitoring wells sampled was reduced from ten to three, as detected concentrations of TCE in the other seven long-term monitoring wells were routinely below the TCE MCL.

Following their review of the 2008 Annual RA-O Report (CH2M Hill 2009b), WDOE concluded that routine monitoring at the site was no longer necessary. An additional groundwater monitoring event was conducted in June 2017 in support of the Fourth Five-Year review. TCE concentrations were not detected above MCLs.

All RAOs identified in the ROD have been achieved for LF001; therefore, remedial actions are considered complete for the site. However, since landfill waste remains in place, there is potential for unidentified hazardous constituents' future releases so LF001 does not meet UU/UE criteria. A Remedial Action Completion Report (RACR) was completed in December 2018 and specifies that LUCs remain in place and groundwater monitoring will continue once every five years to support future Five-Year Reviews required for the Site (Bay West 2018o). The RACR was approved by USEPA in April 2019 (USEAP 2019b).

The five-year sampling prescribed by the RACR was completed in July 2022; however, the report has yet to be finalized; therefore, limited discussion is provided in this five-year review.

4.3.2 WP003 (WW-1)

4.3.2.1 Description and Brief History of Contamination

WP003 is south of the eastern end of the runway between the perimeter road (Rambo Road) and the north-south portion of Kilo Road (formerly known as Taxiway No. 10) (**Figure 5-8 and Figure 5-9**). The site consists of two interconnected industrial lagoons that were designed to accept industrial wastewater and stormwater treated by oil water separators (OWSs) and grit chambers located along the flightline and eastern portions of the base. However, the OWSs and grit chambers were not serviced regularly and routinely discharged untreated water directly into the lagoons. The lagoons drain into "No Name Ditch," which flows off base to the southeast. Water from No Name Ditch eventually infiltrates into the ground over a large, flat area about two miles east of the site. Waste types known to have been discharged into the lagoons in the past included JP-4, oils, industrial solvents, acids, and cleaning compounds. Until 1989, the lagoons were periodically dredged, and the dredged material was spread over the lagoon banks. The OWSs have since been removed or upgraded. In addition, the stormwater lines on the base were separated from the industrial wastewater lines, preventing any industrial cross-water flows from entering the lagoons.

4.3.2.2 Basis for Taking Action

The human health risk assessment performed as part of the RI data indicated there was no unacceptable risks to human health posed by exposure to the sediments in No Name Ditch under both residential and industrial use scenarios. With respect to the soils, the industrial and residential use cancer risk estimates were within the acceptable range based on federal law. Results of the RI indicated soils and sediments at WP003 were not a source of groundwater contamination. The cancer risk estimates for exposure to groundwater were within the acceptable risk range, however TCE was detected in groundwater at concentrations exceeding the federal MCL of 5 µg/L. No substantial vertical migration of TCE into the lower basalt aquifer system was observed.

4.3.2.3 Remedy Selection

The COC established in the OU-2 ROD for WP003 is TCE in groundwater. The ROD concluded RA was required to restrict the site from future residential or agricultural use and to restore groundwater to drinking water quality. The ROD outlined the following elements for the selected remedy at the site:

- Maintain ICs that restrict access to the site and prevent on-base usage of TCE-contaminated groundwater until CULs are achieved;

- Conduct additional source investigation activities to identify the source of groundwater TCE contamination;
- Implement a GETS using air stripping and/or carbon adsorption; and
- Monitor off-base water supply wells in the vicinity of the site and provide point-of-use treatment or alternate water supply, if necessary.

4.3.2.4 Remedy Implementation

Institutional Controls

Fairchild AFB implemented ICs per the ROD (USAF 1993b) to restrict site access and prevent exposure to or consumption of on-base contaminated groundwater at Site WP003. It has not been necessary to provide point-of-use treatment or an alternative water supply for any off-site residences located near the site. The USAF identified that LUCs established in the ROD were not in compliance with current LUC guidance published by the USAF and USEPA. An ESD was prepared in 2018 and signed by the USAF and USEPA in 2019 to update the LUC language for OU-2 sites in accordance with recent guidance (Bay West 2018j). Functioning of ICs is evaluated annually as part of base wide annual LUC inspections as documented in Annual Report on the Status of Land Use Controls (Bay West 2020b, 2021g, 2022c).

Additional Source Area Investigations

Before 2000, no formal additional source investigation activities were conducted at Site WP003. Long-term monitoring results evaluated in preparation for the First FYR (USAF 2001) suggested the source of observed TCE contamination in groundwater was likely contaminated soil. The base initiated source removal activities in October 2000. During soil removal, a cluster of 35 buried drums were discovered at a depth of 10 to 14 feet. An estimated 750 gallons of liquid waste, including sulfuric acid, heavy oils, and used hydraulic oils containing solvents such as TCE, were recovered from the drums and treated off site (CH2M Hill 2001). Approximately 225 cubic yards of contaminated soil were removed. The former excavation was backfilled with clean fill material. Prior to backfill, seven soils samples were collected from the excavation perimeter and analyzed for VOCs and TPH-D. The confirmation samples indicated that VOC and arsenic concentrations were less than the MTCA Method A CULS (Bay West 2018g).

Groundwater Extraction and Treatment System

A remedial design field investigation was conducted within an off-base portion of the TCE plume in 1993 and 1994 to provide data to design a network of groundwater extraction wells and select operating criteria for the associated GETS. Full-time groundwater extraction and treatment operations continued until December 2004. The GETS was placed in standby mode at that time in accordance with recommendations presented in the WW-1 Site Remedial Action Operations Proposed Modifications technical memorandum (CH2M Hill 2004).

From 2005 through June 2006, the GETS was required to be operational for only seven months based on the triggering conditions described in the 2004 WW-1 Site Remedial Action Operations Proposed Modifications technical memorandum (CH2M Hill 2004). From July 2006 to 2011, with the exception of a single detection of TCE above the MCL at well MW-102 during early 2011, conditions did not warrant restart of the GETS (Bhate 2015). Follow up sampling at MW-102 in April 2011 confirmed TCE concentrations were below the MCL, and restart of the GETS was not required (Bhate 2015).

Following review of the 2010 Annual RA-O Report (CH2M 2011), WDOE approved the recommendation to eliminate the provisional requirement to operate the GETS. The GETS has remained idle since July 2006.

GETS components remain at the site in operational standby; however, resumed operation is not expected. Plans are underway to remove this system in the future.

Groundwater Monitoring Program

A groundwater long-term monitoring program was initiated in 1995 using both on-base and off-base monitoring wells, and by 1999, had expanded to include 24 wells. Prior to the source removal activities conducted in October 2000 (CH2M Hill 2001), on-base TCE concentrations exceeded the MCL at up to four wells. Once source removal activities were completed in 2000, TCE concentrations began declining. TCE concentrations have been below the MCLs at all on-base wells since June 2001. TCE concentrations have been below the MCL at all off-base wells since 2003, except for MW-120.

Although not specified as a remedy by the ROD in 2001, 520 gallons of soybean oil were mixed with soil along an 84-foot-long trench immediately downgradient of MW-102 to enhance reductive dichlorination (ERD) in the source area. In 2005, liquid cheese whey was injected into five remedial wells to optimize ERD actions performed in 2001(Bay West 2015d).

Several COPCs, specifically TCE breakdown products including cis- and trans-DCE, were identified in groundwater at the site since the ROD and were included in long-term monitoring. Geochemical changes in the subsurface resulting from ERD pilot tests at the site appear to have mobilized arsenic above CULs and resulted in the accumulation of the TCE breakdown product vinyl chloride above the MCL at the Site (Bay West 2017j). Other TCE biodegradation products, including cis- and trans- DCE, are COPCs but were not detected above the MCLs of 70 and 100 µg/L MCLs, respectively.

Fourteen residential wells, east of sites WP003 and FT004 have been regularly monitored since 1998 as part of the base's residential well monitoring program. No COCs associated with WP003 have been detected in these wells exceeding any applicable CULs/MCLs.

The Fourth FYR recommended a reassessment of groundwater conditions at WP003 after it was found that TCE breakdown products, which were not previously identified as COCs in the ROD, were present in the groundwater at concentrations exceeding MCLs. Additionally, concentrations of TCE, vinyl chloride, and arsenic remain above MCLs and MTCA Method A-CULs at WP003. A Feasibility Study Addendum (FSA) was completed in November 2022. The FSA included a review of post-ROD changes in Applicable or Relevant Appropriate Requirements, the conceptual site model (CSM), and receptor risks. The review determined groundwater concentrations of vinyl chloride and arsenic at WP003 are above the USEPA MCLs and MTCA CULs. The following proposed revisions to the RAOs were included in the FSA:

- Removal of soil COC cadmium
- Addition of groundwater COC vinyl chloride and arsenic
- Cleanup of groundwater within a reasonable time frame.
    - Groundwater 30 years for TCE and vinyl chloride and off-base arsenic
    - Arsenic concentrations on-base and proximate to lagoons would require long term management
- Prevent further migration of groundwater COCs (TCE, VC, arsenic)

Additionally, since the MNA Checklist has not been previously completed USEPA Region 10 required its completions prior to review of the Proposed Plan. Currently, the A Proposed Plan, leading to a RODA, for WP003 is currently in regulatory review.

4.4 PROGRESS SINCE LAST REVIEW

Protectiveness determinations and statements from the Fourth FYR are presented in **Table 2-1**. Recommendations were made for all OUs to address issues limiting long-term protectiveness. These recommendations, as well as the current status, are presented in **Table 2-2**.

4.5 FIVE-YEAR REVIEW PROCESS

4.5.1 Community Notifications & Site Interviews

Information about community notifications and site interviews is discussed in **Section 2.4**. The public notification and site interviews are provided in **Appendix D**. There were no responses specific to OU-2.

4.5.2 OU-2 – On-Base Priority One Sites

Appendix A lists the documents and specific data reviewed to gather information and background about OU-2.

4.5.2.1 Remedy Component – Long-Term Monitoring

Long-term monitoring was selected as a remedy component for OU-2 Sites LF001, SS018, SS026, FT004, and WP003 in the 1993 ROD (USAF 1993b). Relevant key Historical information on implementation of long-term monitoring programs for OU-2 sites is presented in section 4.2. The following section describes additional long-term monitoring data and activities conducted since the Fourth Five-Year Review.

SS018 (PS-2)

A long-term monitoring program for Site SS018 was implemented in 1994. The 2016 site specific UFP-QAPP (Bay West 2016h) outlines the frequency and scope of groundwater long-term monitoring activities at SS018. Groundwater long-term monitoring analytical results are reported for SS018 in annual RA-O reports through 2015. Graph 10-1 from the UFP-QAPP (Bay West 2016h) presents a graph of historical free product recovery at site SS018. Free Product has not been observed at the site since 2008 and is no longer monitored at the site. Tables 10-1 and 10-2 and Graph 10-2 (Bay West 2016h) provide a summary of historical analytical results for benzene and TPH for SS018 monitoring wells through 2016. Benzene has not been detected above MCLs at site SS018 since March 2008. TPH-D was detected in Mar 2014 at MW-371 at a concentration of 1,200 µg/L and in April 2016 at a concentration of 1,100 µg/L exceeding both the ROD specified and current MTCA Method A CULs of 1000 µg/L and 500 µg/L respectively. Additionally, in April 2016 TPH-D was detected at MW- 109 at a concentration of 1,000 µg/L exceeding CUL s. During the remainder of 2016 TPH-D concentrations remained below the ROD CUL.

SS018 was transferred to a consolidated Site TU506 addressed under the WDOE VCP. Ongoing monitoring results for wells formerly addressed under site SS018 will be reported in future RI reports for the consolidated site. (Bay West 2019g)

WP003 (WW-1)

A long-term monitoring program for Site WP003 was implemented in 1995. The number of wells sampled, and frequency has declined over time as the result of several optimization efforts. Figure 5-9 shows the current long-term monitoring wells and selected analytes for Site WP003.

During the current five-year review period, the scope of the long-term monitoring program was described in a 2015 UFP-QAPP (Bay West 2015d). The current long-term monitoring scope (location, frequency, analysis) is outlined in Worksheets #17 and #18 in the 2015 UFP-QAPP (Bay West 2015d). Sampling design and data collection requirements for the pre-design investigation (PDI) are also described in the 2015 UFP-QAPP (Bay West 2015d).

Subsequent to the ROD several additional COPCs have been identified at the site exceeding CULs including vinyl chloride, and arsenic. Vinyl chloride is a common degradation product of TCE. Other biodegradation products including cis- and trans- DCE have not been detected above applicable CULs. Arsenic has been historically detected at the site above CUL s consisting of a background concentration of 10.7 µg/L identified in the 2015 Background Metals Study (Shaw 2015). Summaries of historical detections of vinyl chloride and arsenic are provided in Table 1-3 and time series graphs of vinyl chloride and arsenic concentrations are available in Figures3-4 and 3-5 of the 2015 UFP-QAPP (Bay West 2015d).

TCE concentrations in the source areas have remained below MCLs since 2006, indicating that the previous remedial actions have been successful in treating the original source areas. However, TCE has historically exceeded the MCL at well MW-120 located 625 feet east of the base property boundary. A time series plot of TCE concentrations at well MW-120 is provided in Figure4-3 of the 2016 RAO Report (Bay West 2017g). The 2016 Annual RA-O Report (Bay West 2017g) notes that Mann-Kendall and log-linear regression analysis of TCE concentrations observed at MW-120 since December 1995 presents a statistically significant decreasing trend. Appendix D.1 (Bay West 2017g) presents the historical TCE Groundwater concentration for WP003 monitoring wells between 1987 and 2016. TCE was not detected above the MCL in well MW-120 during fourth quarter 2016 (Bay West 2017g). Review of the data presented in the first and second quarter 2017 RA-O reports (Bay West 2017h, 2017k) indicates that TCE concentrations have remained below the MCL at well MW-120 for the first half of 2017. The 2017 PDI report (Bay West 2018g) identified a slow-moving detached plume centered approximately 200 feet southwest of MW-120 and with a trailing edge near MW-120. The 2016 RA-O Report states that the plume is moving through fine grained basal alluvial deposits that appear to end approximately 400 feet southwest of MW-120 and that East of the boundary of the basal alluvium the TCE plume appears to readily disperse to below detection as it enters faster moving groundwater present in surficial alluvium (Bay West 2017g).

The PDI was completed in 2016 to evaluate remedial options for the remaining TCE, vinyl chloride, and arsenic contamination (Bay West 2017h). Recommendations presented in the final PDI included long-term monitoring program optimization for WP003. Data presented in the PDI was used to support a future Feasibility Study Addendum, Remedial Action Work Plan (RAWP), and Remedial Design. A future ROD Amendment will be prepared to document the selected remedy and to add arsenic and vinyl chloride as COCs.

Figure 3-3 and Figure 3-4 of the PDI Report (Bay West 2018g) show the horizontal and vertical distribution of the existing TCE, vinyl chloride and arsenic plumes with updated boundaries identified in the PDI. The PDI and subsequent RA-O reports have indicated that TCE and vinyl chloride appears to be naturally attenuating and are not migrating. Additionally, long-term monitoring data suggests the overall dissolved arsenic plume boundary appears to be stable and attenuating, except for regularly observed fluctuations caused by seasonal groundwater elevation oscillations (Bay West 2017h).

Fifteen downgradient residential wells have been regularly sampled to ensure that site contamination from WP003 is not impacting potential offsite receptors. The scope and frequency of the current off-base residential monitoring program are presented in worksheet #17 of the site specific 2015 UFP-QAPP (Bay West 2015d) Locations of offsite residential wells are shown in Figure B.2-11. To date, TCE, vinyl chloride and arsenic have not been detected at or above CUL s in residential wells downgradient of WP003.

SS026 (PS-8)

In accordance with previous WDOE recommendations, a final groundwater monitoring event was completed in March 2012 in support of the Third Five-Year Review (USAF 2013). During this event, benzene was not detected above CUL s at any site SS026 wells, indicating that the site had achieved the RAOs described in the ROD (USAF 2013). No data has been presented since the last FYR that indicates changing site conditions such as altering the previous conclusion. Thus, remedial actions are complete and Site SS026 has achieved the criteria for site closure with UU/UE under CERCLA. While not addressed as site COC in the ROD, residual TPH may be present in groundwater at Site SS026 above the current MTCA Method A CUL for Unrestricted use of 500 µg/L. This TPH plume likely consists of co-mingled contamination from multiple sites located near the flightline (Bay West 2018u).

Site SS026 has been administratively closed under CERCLA. The petroleum contamination present at SS026 has been transferred and addressed at Consolidated Site TU500 within the consolidated groundwater plume (USAF 2018a).

4.5.2.2 Remedy Component – Institutional Controls

Fairchild AFB has implemented LUCs (ICs and engineering controls) in accordance with the OU-2 ROD (USAF 1993b). The Draft 2016 LUC Annual Report (Bay West 2017j) states that the 2007 LUC Management Plan is no longer used as a reference because it no longer complies with USEPA and USAF guidance. The 2007 LUC Management Plan does not reflect the procedures and processes currently being used to implement LUCs at Fairchild AFB. Since the signing of the OU-2 ROD, the USAF and USEPA have issued specific guidance and checklists that specify how LUCs should be documented in RODs and subsequent decision documents. A draft final 2017 ESD for OU-2 (USAF 2017a) explains significant differences in on-site LUCs and provides updated language for LF001, WP003, FT004, and SS018. The 2018 ESD does not address off-base LUCs for site WP003, which will be addressed in a subsequent OU-2 ROD amendment. Discussion of off-base LUCs for WP003 is provided in the following section.

Off-Base LUCs

Off-base LUCs are required at WP003 because releases from on-base sources are affecting adjacent properties. One of the purposes of the future OU-2 ROD Amendment will be to add off-base LUCs for WP003.

Section 2.2.3 of the Final 2016 Annual LUC Report (Bay West 2017j) presents off-base LUC language developed by the USAF that will be adopted for LF002 and states that similar language will be adopted to describe offsite LUCs for WP003. The complete language is included in Appendix C.2 of this Five-Year Review. As described in Appendix C.2, the USAF's role in administering the off-base LUCs primarily includes various forms of information sharing with the public, property owners, and state and local agencies. Information sharing was conducted in 2016 through a RAB meeting held on 15 November 2016. The meeting was attended by Fairchild AFB personnel, the USEPA, the Bay West team, RAB members, the WDOE, Spokane Regional Health District, the City of Spokane, and the City of Airway Heights. The meeting included a presentation of information regarding the scope of remediation that is occurring at Fairchild AFB, which included a discussion of WP003 monitoring results and plans, LUC Implementation Plan development, improvements to the Installation Development Plan, and other developments in the LUC implementation process.

In the 2016 Final Annual LUC Report (Bay West 2017j), the location of off-base LUCs is shown on the WP003 LUC Boundary Map Figure B.2-12. The LUC boundary includes parcels potentially impacted by contamination related to WP003.

Currently Implemented LUCs

The current scope and status of LUCs for OU-2 are defined in annual Fairchild AFB LUC Status Reports. The 2015 Annual LUC Report (Bay West 2016g) and Draft Final 2016 Annual LUC Report (Bay West 2017j) were reviewed to evaluate the effectiveness of LUCs at OU-2 sites in this Five-Year Review.

Facility-wide LUCs are applicable to OU-2 and are intended to prevent exposure to contaminated media. These facility-wide LUCs include:

- Work Clearance System;
- Installation Development Plan (IDP);
- Base Civil Engineer Work Requests; and
- Environmental Impact Analysis Process.

A detailed description of each facility-wide LUC in contained in **Appendix C.1**. The 2015 annual LUC report (Bay West 2016g) and draft final 2016 annual LUC report (Bay West 2017j) describe the annual review and the findings of facility-wide LUCs at Fairchild AFB. With the exception of the IDP, the facility-wide LUCs appear to be in place and functioning as intended. Review of the IDP indicated that the document did not describe the specific LUCs for each site or the reasons for the controls. Further, the IDP does not include LUC boundaries on maps. The IDP is used to crosscheck work completed through the Work Clearance System, Base Civil Engineering Work Requests, and the Environmental Impact Analysis Process. If the IDP is outdated or incorrect, the other facility-wide LUCs that rely on the IDP may not be functioning correctly.

Proposed OU-2 LUC Updates

A 2017 ESD (USAF 2017a) is in preparation (currently in Draft Final form) to update the LUC language in the ROD to ensure compliance with current USEPA and USAF published guidance. The Draft Final 2017 ESD provides specific descriptions of site LUC Performance Objectives based on RAOs and ICs identified in the OU-2 ROD (USAF 1993b). The ESD primarily focuses on on-base LUCs. (USAF 2018)

Site-specific LUC inspection checklists for OU-2 were reviewed in the Final 2021 Annual LUC Inspection Report (Bay West 2021) and Final 2022 Annual LUC Inspection Report (Bay West 2022). In addition, the site-specific LUCs were reviewed as part of the Five-Year Review site inspections (**Appendix C**). All LUCs were found to be in good condition and functioning as intended. No deficiencies were noted.

4.5.3 Site Inspection

The inspection of the Site was conducted between April 24-26, 2023. In attendance were Joseph Marsh (USACE) and Jack Mapes (AGEISS). The purpose of the inspection was to assess the condition of the remedy and verify that the remedy is operating as intended. Additional details of the site inspection are provided in **Appendix C**.

The Site Inspection Team observed no apparent problems at the OU2 Sites. Establish LUCs remained in place. While located within a secure military installation, each of these five sites are not normally accessible to base personnel or requires additional security authorization to access. Sites SS018 (contained within TU506) and SS026 (SS026 has been consolidated into site TU500) could not be accessed to complete the site visits due to active military operations but were observed at a distance to confirm no changes in LUCs. Direct personnel exposure to remaining subsurface contaminants is unlikely at these sites. Additional details of the site inspection are provided in **Appendix C**.

4.6 TECHNICAL ASSESSMENT

4.6.1 Question A – Is the remedy functioning as intended by the decision documents?

The remedies implemented at OU-2 are functioning as intended by the decision documents. Details concerning remedy functionality at each of the five OU-2 sites where remedial action was required in the ROD are provided below.

4.6.1.1 LF001 (SW-1)

Institutional controls have been implemented as a site remedy as selected by the ROD. The IDP requires updating to ensure that institutional controls are functioning as intended. Current and future potential exposure to contaminated media is prevented by LUCs, flightline access restrictions, and by the nonengineered, natural soil landfill cover. Recommendations to improve the IDP and annual LUC inspection protocols and maintenance activities for Site LF001 are provided in **Section 2.4.7**.

Groundwater long-term monitoring results at site LF001 show that TCE has not exceeded MCLs in any site wells since 2004. For this Five-Year Review, groundwater monitoring performed at Site LF001 in June 2017. Samples were collected from four site wells (MW -131, -132, -171, and -309) and analyzed for VOCs. As reported in the Final Second Quarter 2017 RA-O Report (Bay West 2017o), concentrations of TCE were below CUL s in all wells. Long term groundwater monitoring for LF001 is required to support future Five-Year Reviews due to the potential for future releases to groundwater of unidentified hazardous materials existing within landfill waste. The next groundwater monitoring event for LF001 will be conducted in 2023.

The remedy components implemented at LF001 are functioning as intended by the ROD and all RAOs have been achieved. Groundwater underlying LF001 has been restored to drinking water quality for TCE, and no further migration of contaminated groundwater has been observed associated with the site.

4.6.1.2 SS018 (PS-2)

Institutional controls have been implemented as a site remedy as selected by the ROD. The IDP requires updating to ensure that institutional controls are functioning as intended. Current and future potential exposure to contaminated groundwater is prevented by LUCs, flightline access restrictions, and impervious paved surfaces (asphalt and concrete) present at the site. No activities have been observed that violated established LUCs.

Passive free-product recovery is complete for MW-228 and MW-228A. Approximately 44.7 gallons of free product have been recovered from 1996 through 2008. No free product has been observed or recovered since 2008. Scoping Session Meeting minutes provided in Appendix A of the site specific 2016 UFP QAPP (Bay West 2016 h) indicate that free product monitoring is no longer required for site SS018. WDOE concurrence was documented in the scoping session minutes (Bay West 2016 h).

As described in **section 6.3.3**, benzene concentrations in groundwater at site SS018 have remained below MCLs since 2009. TPH-D concentrations last exceeded the ROD specified CUL for TPH-D of 1,000 µg/L at Wells MW-109 and MW-370 in April 2016. During the remainder of 2016 TPH-D concentrations remained below the ROD CUL. Therefore, by the end of 2016 all ROD-specified CULs have been achieved for groundwater at site SS018.

Groundwater concentrations of TPH-D may continue to exceed the current MTCA Method A CUL for Unrestricted use of 500 µg/L; therefore, the site has not met the conditions required for site closure with

UU/UE. As TPH-D falls under the petroleum exclusion under CERCLA §§ 101(14) and 101(33), residual petroleum contamination in groundwater associated with SS018 transferred to the WDOE VCP.

4.6.1.3 SS026 (PS-8)

Institutional controls have been implemented as a site remedy as selected by the ROD. The IDP requires updating to ensure that institutional controls are functioning as intended. Current and future potential exposure to contaminated groundwater is prevented by LUCs, and flightline access restrictions. No activities have been observed that violated established LUCs.

Benzene was last detected above the MCL in September 2005. Benzene concentrations were confirmed as remaining below MCLs during a final groundwater monitoring event conducted in 2012 in support of the Third Five-Year Review. Groundwater at SS026 has been restored to drinking water quality and all RAO's identified in the ROD have been achieved.

Although not specified as a site COC according to the ROD, groundwater concentrations of TPH-D may continue to exceed the current MTCA Method A CUL for Unrestricted use of 500 µg/L at Site SS026. The TPH plume at Site SS026 most likely consists of co-mingled contamination from multiple sites near the flightline (USAF 2017d). As TPH-D falls under the petroleum exclusion under CERCLA §§ 101(14) and 101(33), existing petroleum contamination in groundwater at Site SS026 was transferred to WDOE VCP.

4.6.1.4 FT004 (FT-1)

Institutional controls have been implemented as a site remedy as selected by the ROD. The IDP requires updating to ensure that institutional controls are functioning as intended. Current and future potential exposure to contaminated media is prevented by LUCs, and flightline access restrictions. No activities have been observed that violated established LUCs.

Remedial actions implemented since the ROD have successfully reduced benzene concentration to concentrations protective of groundwater for soils and below MCLs for groundwater. Benzene has not been detected above CUL s in any site wells since 1999 and routine monitoring for benzene was discontinued in 2008, with WDOE concurrence. Additional sampling for benzene was performed in 2012 to support the Third Five-Year Review, and all results were below detection limits. Therefore, the site has met RAOs for benzene specified by the ROD.

Although not identified as a COC in the ROD, TPH-D remains at concentrations above the current groundwater MTCA Method A for TPH-D for unrestricted land use of 500 µg/L. Additionally, TPH-D, TPH-G, and total xylenes were detected at concentrations exceeding current MTCA Method A CULs for unrestricted land use in soil samples collected in 2004 and 2008. A Final ESD for OU2 (USAF 2018b) has been completed to update the ROD CULs for TPH-G, TPH-D, and xylene in soil and TPH-D in groundwater for FT004. The 2017 Draft OU-2 ESD provides a comparison between current applicable CULs for soils and maximum concentrations detected following 2008 removal actions. As discussed in **Section 4.3.6.1**, TPH-D concentrations at FT004 have shown statistically significant stable or decreasing trends for TPH-D using Mann-Kendall analysis suggesting that residual TPH impacted soils are no longer contributing to groundwater. Residual petroleum contamination present in groundwater and potentially present in soils at the site prevents the site from achieving UU/UE conditions, however residual TPH contamination appears to be naturally attenuating at the site. This observation is both based on Mann- Kendall trend analysis performed for the TPH-D concentrations at MW-3, MW-226, and MW-247 demonstrating statistically significant stable or decreasing trends and limited detection of TPH-D at downgradient residential wells RW-19 and RW-46 below CUL s. TPH-D has not been detected in downgradient residential wells above CUL s; therefore, no exposures to TPH-D are occurring.

The 2018 RAO Report presented that FT004 had met its remediation endpoint criteria per OSWER 9283.1-45 and MTCA have been met for ROD and ESD COCs. However, the presence of PFAS at FT004 will prevent the site from achieving RC or UU/UE exposure Site Closure in the foreseeable future. LUCs will continue to be implemented due to the presence of PFAS until PFAS has been addressed in a decision document (Bay West 2018).

4.6.1.5 WP003 (WW-1)

Institutional controls have been implemented as a site remedy as selected by the ROD. The IDP requires updating to ensure that institutional controls are functioning as intended. Present and future potential exposure to contaminated on-base groundwater is prevented by LUCs and flightline access restrictions. No activities have been observed that violated established on-base LUCs.

As discussed in detail in **Section 4.3.6.2**, off-base LUCs are required at WP003 because releases from on-base sources are affecting adjacent properties. To prevent future use of impacted groundwater and remain protective in the long term off-base LUCs will need to be formalized in a decision document, however no off-base drinking water exposures are occurring. Off-base LUCs and the potential for VI for site WP003 will be addressed in a decision document modification.

Additional source investigations and subsequent removal actions described in **Section 3.0** have addressed source areas. Previously completed remedial actions have successfully reduced TCE concentration within source areas to below CUL s. TCE concentrations in groundwater have remained below MCLs at all on-base wells since February 2006. The pump and treat remedial system were deactivated in 2004. However, in fall 2007, TCE concentrations above the CUL returned to off-site well MW-120 and have continued to exceed MCLs through September 2016. TCE concentrations at MW-120 were below MCLs from December 2016 through June 2017.

Additional COPCs have been identified at the site exceeding current MCLs since the ROD including arsenic, and vinyl chloride. Progress has been made towards defining the extent and distribution of COPCs through additional investigation described in **section 5.4.2.1**; however, prior to implementation of additional remedial action, further investigation to address data gaps is necessary. As such, additional studies including a Feasibility Study Addendum will be necessary to support a decision document modification.

TCE, vinyl chloride, and arsenic groundwater contamination at WP003 have migrated off-base; however, residential monitoring confirms that contaminants are not currently impacting downgradient residential wells. Installation of additional downgradient groundwater monitoring wells has been proposed and is anticipated to confirm that offsite plumes do not pose significant future risks to downgradient residential wells. Point of use-treatment and alternate water supply provisions have not been necessary for residential wells.

While the remedy is currently protective of human health and the environment because LUCs and residential monitoring are in place that prevent exposure to contaminated groundwater, it is unclear that the remedy identified in the ROD is functioning as intended with regards to achieving the RAO of restoring groundwater to drinking water quality. The CUL established by the ROD for the entire TCE plume at WP003 is 5 µg/L. Additional investigations have identified the presence of a detached off-base TCE groundwater plume where TCE currently exceeds 5µg/L. In addition, the current remedy does not address arsenic or vinyl chloride, which are also present in groundwater at concentrations exceeding CUL s. Further investigations are required prior to re-evaluation of the remedy and analysis of additional remedial alternatives to address additional COPCs and remaining TCE contamination in groundwater. A Feasibility

Study Addendum screened and evaluated remedial alternatives. Selection of the final remedy was described in a Proposed Plan Amendment that is in regulatory review.

4.6.2 Question B – Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?

ARARs for OU-2 were identified in the OU-2 ROD (USAF 1993b). Chemical-specific, action-specific, and location-specific ARARs were reviewed and were all determined to be either applicable or relevant and appropriate as presented in **Appendix E**. No significant changes have been made to the ARARs at OU-2 that would indicate that the remedies are no longer effective. In addition, no new ARARs were identified as part of this review. A review of the human health risk assessment and the ecological risk assessment methodology and results presented in the ROD show that the methodologies applied remain protective in the short and long term.

No new exposure pathways have been identified, there are no significant changes in land or resource use on or near the site, and there are no physical site conditions that would call into question the protectiveness of the selected remedies. There have been no changes to the underlying toxicity of COCs since the previous five-year review (**Appendix G-5**).

Cleanup levels for OU-2, identified in the OU-2 ROD (USAF 1993b), were evaluated against current standards to determine if there have been any significant changes that may affect the cleanup values (**Appendix G-1**). As referenced in the *Third Five-Year Review* (USAF 2013), the MTCA Method A CULs for TPH-D in soil and groundwater have been changed since the 1993 ROD. CULs for TPH-D specified in the ROD were 200 mg/kg for soil and 1000µg/L for groundwater; revised current MTCA method A CULS is 2,000 mg/kg and 500 µg/L. The lower groundwater CUL for TPH-D likely will extend the time until CULs are achieved for some OU-2 sites; however, current LUCs sufficiently prevent exposure to impacted media, therefore protectiveness is not affected.

Vapor intrusion into indoor air was not evaluated as part of the OU-2 remedial investigation. Significant progress has been made in characterizing the vertical and horizontal extent of the TCE and vinyl chloride plume boundaries at WP003. The current VI pathway is not considered complete as there are currently no known structures overlying the identified TCE and vinyl chloride plumes; however, better downgradient plume definition will be needed to evaluate areas where VI could impact future land use development.

Additional COPCs have been identified at OU-2 sites however no new exposure pathways have been identified. For site WP003, a forthcoming OU-2 ROD Amendment will add arsenic and vinyl chloride as COCs. The CULs will be amended to include the arsenic and vinyl chloride MCLs. The RAOs presented in the ROD are sufficiently comprehensive to remain protective with the addition of these COCs.

In the 1993 ROD, TPH contaminated soil was not identified as a continuous source of groundwater contamination based on the results of the RI, and TPH was not identified as a COC in groundwater (USAF 1993a) at FT004. Therefore, CULs for TPH were not established for soils or groundwater at FT004 under the 1993 ROD. A forthcoming ESD for FT004 will update the ROD CULs for TPH-G, TPH-D, and xylene in soil and TPH-D in groundwater. Incorporation of the revised MTCA Method A CULs for soils and groundwater into the CULs will likely extend the time required for the site to achieve UU/UE status. In addition, FT004 has been identified as a potential source area of emerging contaminants PFOS and PFOA.

4.6.3 Question C – Has Any Other Information Come to Light That Could Call into Question the Protectiveness of the Remedy?

In May 2016, the USEPA published a health advisory for PFOS (USEPA 2016a) and PFOA (USEPA 2016b). The USEPA health advisories provide information on contaminants that can cause human health effects and are known or are anticipated to occur in drinking water but are non-enforceable and non-regulatory levels. The USEPA has not established national primary drinking water regulations for PFOA and PFOS. The state of Washington has also not established state drinking water standards for PFOS and PFOA.

Through the PA/SI process, Fairchild AFB has confirmed that significant quantities of AFFF containing PFOS/PFOA were historically used at FT004 and released to the environment. Additionally, the on-going RI has confirmed PFAS impacts to surface water and sediment at WP003 which have migrated from RS003P. LF001 and SS018 are up-gradient of RS001P and SS008P-sub; therefore, are not likely to be impacted by PFAS from these locations. SS026 is down-gradient of RS001P and SS008P-sub; therefore, the groundwater at SS026 may be impacted by PFAS migrating from these locations. The on-going RI will determine the extent of PFOS/PFOA-impacted environmental media.

Where PFOS/PFOA that is likely from historic Air Force activities has been identified in drinking water sources above the 2016 EPA Health Advisory concentration, the USAF has implemented removal actions to provide alternate drinking water sources. The majority of current base drinking water sources are off-base, and the sole production well located on base has been tested and the initial result was 3.1 parts per trillion (ppt) PFOS + PFOA (3.1 PFOS/ND PFOA), below the 2016 EPA Health Advisory of 70 parts per trillion (USAF 2016c). Per HQ USAF/A4 and HQ USAF/SG *Implementation Guidance for Testing of Air Force Drinking Water for Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA)* (USAF 2016b), PFOS/PFOA analysis will be added to the routine drinking water sampling plan for this well will following a modified schedule as regulated synthetic organic contaminants (sample quarterly for at least four quarters until results are "reliably and consistently" below the USEPA health advisory concentration, then sampled annually for two years. The USAF is actively sampling water supply wells and implementing removal actions to provide alternative drinking water for those sources with PFOS and PFOA concentrations above the health advisory.

No relevant changes to ecological risk methodology or ecological toxicity values were identified for the five-year review period, and no special status species changes relevant to protectiveness were identified. OU-2 lies mainly within the boundaries of an active Air Force installation regularly disturbed by Base activities. Large portions of Fairchild AFB and OU-2 contain extensive paved areas, runways, and hangars that do not provide sufficient high quality ecological habitat to support wildlife populations. Off-base portions of OU-2, Sites WP003 and FT004, have subsurface contamination not accessible by ecological receptors. In addition, no land use changes have been observed since the ROD that would make these areas attractive new habitat with new ecological exposure pathways. On-base, maintenance includes procedures to control rodents to avoid attracting predators given the risk of Bird Aircraft Strike Hazard (BASH), particularly in the airfield areas. Therefore, potential ecological habitat is regularly controlled for OU-2 through regular landscape maintenance to ensure the Air Force mission remains free from BASH risk. No new information has come to light that would call into question the protectiveness of the remedy at OU-2 sites LF001 (SW-1), SS018 (PS-2), SS026 (PS-8), and WP003 (WW-1).

4.6.4 OU-2 Technical Assessment Summary

The remedy at OU-2 sites LF001, FT004, SS018, and SS026 is protective of human health and the environment as site remedial actions have achieved all RAOs.

The remedy as implemented at OU-2 site WP003 is currently protective of human health and the environment in the short term; however, to remain protected in the long-term the recommendation of the FSA need implemented (i.e., a decision document modification to address additional COPCs (arsenic and vinyl chloride), additional investigations will be needed to evaluate the downgradient plume).

There have been no significant changes in land or resource use on or near the site, or physical changes to site conditions that call into question the short-term protectiveness of the remedies.

4.7 ISSUES/RECOMMENDATIONS

Issues and recommendations identified during this Five-Year Review for all OUs are presented in **Section 2.4.7** and those specific to OU-2 are presented below.

Issues and Recommendations Identified in the Five-Year Review				
OU-2: Site WP003 (WW-1)	**Issue Category:** Monitoring			
	Issue: Between 2007 and 2016, MW-120 was the only well with TCE CUL exceedance, with a noted seasonal exceedance in 2016. A trend analysis by Bay West in 2018 (Bay West 2018g) showed a statistically significant decreasing trend in TCE concentrations at MW-120. A slow-moving detached TCE plume was identified in the Pre-Design Investigation Report for Site WP003 (Bay West, 2018g). TCE has been detected in downgradient residential monitoring wells but not above the MCL. As a result, no drinking water exposures above regulatory standards are currently occurring. The Feasibility Study Addendum has been completed, and the Proposed Plan in under regulatory review.			
	Recommendation: Complete the Proposed Plan Amendment and ROD Amendment.			
Affect Current Protectiveness No	Affect Future Protectiveness Yes	Party Responsible USAF	Oversight Party USEPA	Milestone Date On-going
OU-2: Site WP003(WW-1)	**Issue Category:** Changed Site Conditions			
	Issue: Vinyl chloride and arsenic exceed their respective MCLs in shallow alluvial groundwater on-site and off-base, and while regularly monitored at this site, these constituents are not identified in the ROD as site COCs. Included in FSA and Proposed Plan that is in regulatory review.			
	Recommendation: Include in Proposed Plan and RODA.			
Affect Current Protectiveness No	Affect Future Protectiveness Yes	Party Responsible USAF	Oversight Party USEPA	Milestone Date On-going

Notes:

COC – contaminant of concern
COPC – contaminant of potential concern
ESD – Explanation of Significant Difference
IC – institutional control
LUC – land use control
LUCIP – Land Use Control Implementation Plan
MCL – maximum contaminant level
O&M – operations and maintenance
RA-O – remedial action objectives
RD/RW – Remedial Design/ Remedial Work Plan
ROD – Record of Decision
TCE – trichloroethene
USAF – United States Air Force
USEPA – United States Environmental Protection Agency

4.8 PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU-2	***Protectiveness Determination:*** Short-Term Protective
Protectiveness Statement: The remedies at three of the five sites within OU-2 are protective; however additional actions must be completed to have the entire OU as protective. The remedy at OU-2 subsite WP003 currently protects human health and the environment; however, in order for the remedy to be protective in the long-term, a decision document modification is necessary to update the site remedy to address additional COPCs (arsenic and vinyl chloride) and clarification to the facility-wide ICs through an update of the IDP or CPP. There are known PFAS impacts at both WP003 and FT004. An RI is underway to determine the nature and extent of the PFAS impact. The sites will proceed through the CERCLA process to determine if there is unacceptable risk to human health and the environment and implement remedies as needed.	
Subsite breakout	
Operable Unit: OU-2 subsite WP003	***Protectiveness Determination:*** Short-Term Protective
Protectiveness Statement: The remedy at OU-2 subsite WP003 currently protects human health and the environment because facility-wide LUCs preventing exposures to contaminated groundwater are in place, and monitoring of off-base residential water supply wells provides no evidence of exposure to contaminated groundwater at concentrations above MCLs. However, in order for the remedy to be protective in the long-term, a decision document modification is necessary to update the site remedy to address additional COPCs (arsenic and vinyl chloride) and clarification of facility-wide ICs through an update of the IDP or CPP. Additionally, there are known PFAS impactsWP003. An RI is underway to determine the nature and extent of the PFAS impact. The site will proceed through the CERCLA process to determine if there is unacceptable risk to human health and the environment and implement remedies as needed.	
Operable Unit: OU-2 subsite FT004	***Protectiveness Determination:*** Short-Term Protective
Protectiveness Statement: The remedy at OU-2 subsite FT004 protects human health and the environment for the ROD listed COCs. The RAOs have been met since groundwater has been restored to drinking water quality for all COCs at Site FT004. Additionally, there are known PFAS impacts FT004. An RI is underway to determine the nature and extent of the PFAS impact. The site will proceed through the CERCLA process to determine if there is unacceptable risk to human health and the environment and implement remedies as needed.	
Operable Unit: OU-2 subsite LF001	***Protectiveness Determination:*** Protective

Protectiveness Statement(s)	
Protectiveness Statement: The remedy at OU-2 subsite LF001 protects human health and the environment. The RAOs have been met since groundwater has been restored to drinking water quality for all COCs at Site LF001.	
Operable Unit: OU-2 subsites SS018 and SS026	***Protectiveness Determination:*** Protective
Protectiveness Statement: The remedy at OU-2 subsites SS018 and SS026 is protects human health and the environment. Subsites SS018 and SS026 were transferred to the VCP and are no longer included in OU-2. Site access is restricted by current land use and facility wide LUCs are in place preventing future development, soil disturbance, and groundwater use.	

4.9 NEXT REVIEW

The next review (Sixth Five-Year Review) will be completed five years following the expected completion date of this Five-Year Review; anticipated by 12 August 2028. Since OU-2 contains multiple subsites, the FYR requirement for each subsite is listed below:

- A statutory review is required for OU-2 subsites WP002.
- A policy review is required for OU-2 subsites ST018 and SS026 fall under the CERCLA petroleum exemption section 101(14) and 101(33). An OU-3 ESD (Bay West 2018) was prepared to formally transfer these sites to WDOE VCP. The policy review may be prepared with the statutory review, as an addendum to the statutory review, or under a separate cover.
- No further five-year reviews are planned for the OU-2 subsites LF001 and FT004 because all site-impacted media have reached UU/UE.

5.0 OU-3 / PRIORITY TWO SITES

5.1 BACKGROUND

OU-3 includes 20 On-Base Priority Two sites. An installation assessment/records search began in 1984. In 1986, confirmation/quantification studies were conducted and provided the basis for supplemental sampling, which began in 1988. A limited facility investigation was performed at the Priority 2 sites in 1991-1992 and based on the results, additional characterization was recommended in a RI/FS for eight of the Priority 2 sites. Detailed descriptions of site geology and hydrogeology are provided in the *Priority Two Sites RI Report* (ICF Technology 1995). The OU-3 ROD (USAF 1995) was signed in December 1995. The ROD determined RA was required at sites OT016 (IS-3), OT017 (IS-4), ST005 (PS-1), SS009 (PS-5), ST010 (PS-7), SD031 (PS-10), and FT032 (FT-2). Although DP012 (SW-10) and DP013 (SW-11) were identified as No Action sites in the 1995 ROD, a 2018 ESD formally identified LUCs for these two sites to address buried debris that may present a physical safety hazard. During this Five-Year Review period, Sites OT016 and SD031 achieved UU/UE, which was documented in RACRs (Bay West 2018, 2019), and approved for site closure. OT016 and SD031 are not further addressed in this Five-Year Review. Pertinent site features are shown in **Figures 6-1** through **6-21**.

The following sites are not included in the Fifth FYR for the reasons described below:

- **OT016** achieved all remedial action objectives in accordance with the 1995 ROD and achieved UU/UE conditions. The RACR (Bay West 2018b) documenting this was approved by USEPA in 2019 (USEPA 2019a).

- **OT017** achieved all remedial action objects for soils in accordance with the 1995 ROD and transferred to the VCP due to remaining petroleum contamination (USAF 2018b). A Data Gap Investigation (Bay West 2017v) with the purpose of determining the extent of soil contaminants (DRO, benzene, toluene, ethylbenzene, and xylenes (BTEX), carcinogenic polynuclear aromatic hydrocarbons (cPAHs), and naphthalene) exceeding MTCA Method A CULs at OT017 and to determine if additional remedial action is necessary to achieve UU/UE for site closure (SC). Based on the results of this DGI, the USAF requested a NFA in 2018 (Bay West 2018) and WDOE approved (WDOE 2019).

- **ST010** achieved all remedial action objects for soils in accordance with the 1995 ROD and transferred to the VCP due to remaining petroleum contamination (USAF 2018b). USAF and WDOE determined that ST010 has since achieved UU/UE and no further remedial action was necessary, so NFA was requested in 2018 (Bay West 2020g) and approved by WDOE (WDOE 2020).

- **SD031** achieved all remedial action objectives in accordance with the 1995 ROD and achieved UU/UE conditions in soil. The TCE in groundwater was determined to not be associated with activities at SD031 which is consistent with the 2011 SS039 IROD (USAF 2011); therefore, was transferred to SS039 (USEPA 2018b). The RACR (Bay West 2019a) documenting these conditions was approved by USEPA in 2019 (USEPA 2019b).

- **FT032** achieved all remedial action objects for soils in accordance with the 1995 ROD and transferred to the VCP due to remaining petroleum contamination (USAF 2018b). Since, USAF and WDOE determined that FT032 has achieved UU/UE and no further remedial action was necessary, so NFA was requested in 2018 (Bay West 2018) and approved by WDOE (WDOE 2018).

- **DP022** does not pose an unacceptable risk to human health or the environment, which is consistent with the original decision in the 1995 ROD. Even though the 1995 ROD concluded NFA was necessary, environmental samples associated with the coal materials and construction debris were not

previously collected. Therefore, an RI was deemed necessary to evaluate human health and ecological risk from coal materials and construction debris. The RI (Bay West 2020c) comparison of soil and groundwater analytical results to USEPA Regional Screening Level (RSLs) that are protective of residential site users identified 13 COPCs for soil and two COPCs for groundwater which were retained for the HHRA and ecological risk evaluation as appropriate. According to the HHRA and the ecological risk evaluation, the site does not pose an unacceptable risk to human health or the environment and NFA is required.

- **DP024** does not pose an unacceptable risk to human health or the environment, which is consistent with the original decision in the 1995 ROD. Even though the 1995 ROD concluded NFA was necessary, environmental samples associated with the coal materials and construction debris were not previously collected. Therefore, an RI was deemed necessary to evaluate human health and ecological risk from coal materials and construction debris. The RI (Bay West 2020c) comparison of soil and groundwater analytical results to USEPA RSLs that are protective of residential site users identified ten COPCs for soil and four COPCs for groundwater which were retained for the HHRA and ecological risk evaluation as appropriate. According to the HHRA and the ecological risk evaluation, the site does not pose an unacceptable risk to human health or the environment and NFA is required.

5.1.1 Geology and Hydrogeology

Thirty-five feet of alluvium overlay basalt bedrock. The alluvial deposits primarily consist of a massive silty clay unit with interbedded sand and gravel lenses, 5 to 15 feet (ft) thick, underlain by silty sand. The alluvium grades downward into more gravel-rich sediments, terminating at the fractured and weathered Bedrock A surface.

The shallowest water-bearing interval is within alluvium at depths of 2 to 6 ft below ground surface (bgs). The predominant groundwater flow direction is to the east-northeast. Groundwater underlying the site is not used as a drinking water source.

In several locations, including OT017 (IS-4), ST016 (PS-1), and SD031 (PS-10), the hydraulic connection between the alluvial and shallow bedrock aquifers is impeded by a low-permeability clay layer.

5.2 RECORD OF DECISION

The OU-3 ROD addresses 20 Priority Two sites (**Table 1-1**). Initial characterization of these sites was conducted from 1986 to 1989. Limited field investigations (LFI) were initiated in 1991 and completed in 1992. LFI results were used to direct RI activities conducted in 1993 and 1994. The OU-3 ROD (USAF 1995a) was signed in December 1995, which determined RA and/or ICs were required at sites OT016 (IS-3), OT017 (IS-4), ST006 (PS-1), SS009 (PS-5), ST010 (PS-7), SD031 (PS-10), and FT032 (FT-2). A 2018 ESD specified LUC requirements for DP012 (SW-10) and DP013 (SW-11) to address debris at the site, which presents a physical hazard. The ROD documents a NFA decision for the 11 remaining IRP sites in OU-3 (**Table 1-1**). RACRs (Bay West 2018, 2019) with accompanying WDOE approvals documented Sites OT016, SD031 and FT032 achieved site closure at UU/UE.

The RAOs for groundwater (applicable to sites ST006, SS009, ST010, and FT032) are:

- To prevent ingestion, inhalation, and dermal contact with final groundwater COCs on-site or off-site with cancer risk in excess of $1x10^{-6}$ or non-cancer HQ of 1, or concentrations in excess of Federal SDWA MCLs or MTCA CULs;
- To remediate contaminated groundwater to a safe level for off-site human consumption; and \
- To prevent migration of contaminated groundwater above CULs into uncontaminated zones.

The RAOs for soil (applicable to sites OT017, ST006, SS009, ST010, SD031, and FT032) are:

- To prevent ingestion, inhalation of dusts and airborne contaminated particles, and dermal contact with final soil COCs on-site or off-site with cancer risk in excess of $1x10^{-6}$ or non-cancer HQ of 1, or concentrations in excess of MTCA CULs;
- To remediate contaminated soil to a level that is protective of human health and the environment; and
- To prevent migration of final COCs to groundwater.

The following OU3 ROD CULs were selected for cleanup actions:

Table 5-1 Summary of OU-3 1995 ROD CULs

Site ID	Historical Site ID	COC	Soil CUL[1] (mg/kg)	Groundwater CUL[3] (ug/L)
ST006	PS-1	TPH	200	1,000
		Benzene	--	5[4]
SS009	PS-5	TPH	200	1,000
ST010	PS-7	TPH	200	1,000
OT017	IS-4	TPH	200	--
DP012	SW-10	--	--	--
DP013	SW-11	--	--	--
SD031	PS-10	TPH	200	--
		TCE	91[2]	--
FT032	FT-2	TPH	200	1,000

-- No CUL assigned for this media. TCE in groundwater at SD031 transferred to SS039.
1) MTCA Method A Unrestricted Land Use CUL. Based on protection of groundwater.
2) MTCA Method B CUL. Based on protection of groundwater.
3) MTCA Method A CUL.
4) Federal SDWA MCL.

The 2018 Explanation of Significant Difference (ESD) for OU-3 ROD transferred five petroleum sites (ST006, SS009, ST010, OT017, and FT032) from the USEPA Superfund Program to the WDOE VCP; explained the significant differences in LUCs for DP012 and DP013; explained significant differences in CULs for SD031; and documented transfer of TCE in groundwater at SD031 to SS039 (USEPA 2018b).

Table 5-2 Summary of OU-3 1995 ROD CULs as revised by the 2018 ESD

Site ID	Historical Site ID	COC	Soil CUL[1] (mg/kg)	Groundwater CUL[3] (ug/L)
ST006	PS-1	TPH	200	1,000
		Benzene	--	5[4]
SS009	PS-5	TPH	200	1,000
ST010	PS-7	TPH	200	1,000
OT017	IS-4	TPH	200	--
DP012	SW-10	--	--	--
DP013	SW-11	--	--	--
SD031	PS-10	TPH	2,000	--
		TCE	30[2]	--
FT032	FT-2	TPH	200	1,000

1) COCs and CULs from the OU3 ROD were based on MTCA Method A CULs for TPH-D and MTCA Method B CULs for TCE.

2) MTCA Method A Unrestricted Land Use CULs (WDOE, 2013). The TPH-D CUL is based on preventing the accumulation of free product on the groundwater, and the TCE CUL is based on protection of groundwater.

5.3 RESPONSE ACTION SUMMARY

The remedy including remedial action objectives (RAOs) selected in the respective RODs is summarized for each site included in this Five-Year Review. Summaries of COCs, RAOs, completed RAs, and current site status are provided in **Tables 1-1** and **1-2**.

5.3.1 ST006 (PS01)

Site ST006 (PS-1) is the main bulk fuel storage facility at FAFB. The site consists of four above ground fuel tanks, and their asphalt covered, bermed containment areas. The four above ground tanks store approximately 3 million gallons of JB-4. The site has been in operation since the 1950s, with tanks built between 1952 and 1960. Fuels move to and from the tank farm via underground pipes. In 1990, approximately 4,500 gallons of fuel were released at the fuel pipeline east of Storage Tank 24016, and 3,000 gallons were recovered. A second release was identified after base personnel unearthed soil contaminated with approximately 2,000 gallons of fuel near the transfer pipeline and Building 2404 (date unknown). A third release (date unknown) was identified during road construction activities in 1993, near the roadbed north of Storage Tank 2410. In addition, sludge removed from storage-tank bottoms was historically placed in bermed areas surrounding the tanks. Field investigations at Site ST006 (ICF Technology 1992 and 1995) confirmed TPH contamination in soil gas, shallow soils, and groundwater. The RI estimated approximately 37,900 CY of contaminated soil and 1.8 million gallons of contaminated groundwater were present at ST006. The location and site features are provided in **Figures 6-5** and **6-6**.

5.3.1.1 Basis for Taking Action

The risk assessment determined there was no unacceptable cancer risk or noncancer hazard associated with exposure to ST006 soil. Concentrations of TPH in soil exceeded state CULs. Ingestion of groundwater under a hypothetical future scenario resulted in an unacceptable risk with benzene and arsenic as the primary contributors. In addition, the maximum benzene concentration exceeded the MCL of 5 µg/L, and concentrations of TPH exceeded state CULs.

5.3.1.2 Remedy Selection

The COCs for site ST006 are TPH-D for soil and groundwater, and benzene in groundwater.

The RAOs are to remediate soils to achieve state CULs for TPH-D and remediate groundwater to below the MCL for benzene, and below the MTCA Method A CUL for TPH-D. The ROD outlined the following elements for the selected remedy at Site ST006:

- Maintain ICs restricting site access and require a Work Clearance Permit for intrusive activities until CULs are achieved;
- Implement an *in situ* bioventing treatment system for TPH-D-contaminated soil until concentrations decrease below CULs; and
- Monitor groundwater across the site and downgradient to assess natural attenuation and migration of TPH-D and benzene until concentrations are below the CUL/MCL.

5.3.1.3 ST006 (PS-1) Remedy Implementation

Institutional controls

FAFB implemented ICs per the OU-3 ROD (USAF 1995a) to restrict site access and limit intrusive activities at ST006. Functioning of ICs is evaluated annually as part of base-wide annual LUC inspections as documented in annual LUC reports (Bay West 2023).

Bioventing System and Soil Monitoring Program

An in-situ bioventing treatment system consisting of 14 vent wells and 4 blowers was constructed in 1998 at ST006. The system was operated until December 2006, when the system was shut down. Further details concerning operation of the ST006 bioventing system and the soil monitoring program at ST006 are summarized in **Section 5.4.2.3**. The Third Five-Year review identified the potential for TPH-impacted soils underlying Veterinary Road and the tank farm to prevent the site from achieving UU/UE (USAF 2013).

Groundwater Monitoring

A long-term groundwater monitoring program began in 1996 and consisted of semi-annual monitoring at six wells for benzene and TPH-D. In 2002, TCE was detected at two wells above the MCL (5 ug/L). In 2008, long-term monitoring frequency was reduced to annual sampling for TPH-D at three wells, and semi-annual sampling for VOCs at Well MW-195.

To support the Third Five-Year Review, six wells were sampled and analyzed for TPH-D and two for VOCs in March 2012. One well was resampled and analyzed for VOCs in June 2012. The ROD benzene CUL has been achieved in groundwater at ST006; however, TPH-D contamination may exceed CULs in three wells. As TPH-D falls under the petroleum exclusion under CERCLA §§ 101(14) and 101(33), the 2018 ESD for OU-3 transferred Site ST006 to the WDOE VCP.

5.3.2 SS009 (PS-5)

The risk assessment determined exposure to groundwater under a future hypothetical residential scenario resulted in an unacceptable cancer risk and noncancer hazard primarily due to arsenic and manganese. Because the only contaminated is remaining at the site after the removal action are found in a thin layer between 8 and 10 feet deep, direct contact with soil was not evaluated in the risk assessment. TPH-D concentrations in soil and groundwater exceeded state CULs in use at the time of 200 mg/kg and 1,000 µg/L, respectively.

5.3.2.1 Basis for Taking Action

Field investigation activities confirmed fuel oil contamination in soil and groundwater. In 1992, the base excavated and treated approximately 850 cubic yards (1,150 tons) of petroleum-contaminated soil. However, during the excavation, an approximate 2-foot layer of medium- to coarse-grained sand, located at the water table, was observed to have considerable fuel-oil contamination. In addition, an approximate 1/8-inch-thick layer of light non-aqueous phase liquid (LNAPL) fuel oil was observed at the water table, downgradient of the excavation. The predominant groundwater flow direction at Site SS009 is to the east. Field investigations completed during the RI (ICF Technology 1995) confirmed that limited TPH contamination remained in site soil and groundwater, and concentrations of TPH-D exceeded state clean up levels (CULs) at that time of 200 mg/kg in soil and 1,000 µg/L in groundwater. Therefore, soil and groundwater cleanup alternatives were evaluated (USAF 1995a). The location and site features are provided in **Figures 6-7** and **6-8**.

5.3.2.2 Remedy Selection

The COC identified in the ROD for SS009 soil and groundwater is TPH-D. The RAOs at SS009 are to remediate groundwater and soil to below CULs. The ROD outlined the following elements for the selected remedy:

- Maintain ICs that restrict site access and require a Work Clearance Permit for intrusive activities until CULs are achieved through passive natural attenuation; and
- Monitor site and downgradient groundwater to assess natural attenuation and migration of TPH-D.

5.3.2.3 SS009 (PS-5) Remedy Implementation

Institutional controls

FAFB implemented ICs per the OU-3 ROD (USAF 1995a) to restrict site access and limit intrusive activities at SS009. Functioning of ICs is evaluated annually as part of base wide annual LUC inspections as documented in annual LUC reports (Bay West 2022).

Groundwater monitoring

The long-term monitoring program was initiated in 1996 and included sampling of four monitoring wells. Analytical results from 1996 and 1997 indicated TPH-D concentrations were below the CUL. Long-term monitoring was concluded in 1998 (EA Engineering 1999). Site SS009 monitoring wells were decommissioned in 1999 (EA Engineering 2001).

Additional Source Investigations

Although historical monitoring data indicate remaining TPH contamination in soil is no longer impacting groundwater at the site, TPH-D-impacted soils remain at the site at concentrations above the MTCA Method A CULs, thus preventing site closure under UU/UE. Additional investigations performed in 2016 are documented in the SS009 DGI report (Bay West 2018). As TPH-D falls under the petroleum exclusion under CERCLA §§ 101(14) and 101(33), a 2018 ESD for OU-3 transferred SS009 from OU-3 to the WDOE VCP.

5.3.3 DP012

DP012 is near the western boundary of FAFB and just north of the base runway. DP012 was discovered in 1987 during excavation as a borrow pit to construct part of a berm around the jet engine test cell of Building 1035. During excavation at DP012, a variety of materials were uncovered, including pyrotechnic shells identified as cartridges for a bomb rack the USAF no longer used, several small wide-mouth jars, a reagent bottle partly filled with reddish liquid, metal parts identified as B-36 engine valves, and plastic sheet material. During field investigations, a surface geophysical survey was performed to determine the aerial extent of any buried debris and identify locations for subsequent test pits and soil samples. The data indicated reflection patterns typical of disturbed subsurface material and scattered buried debris (ICF, 1992). Following the geophysical survey, four test pits were dug to investigate anomalous features. There were no indications of staining, discoloration, or disturbance of the soil and no foreign objects were found in these test pits. At Test Pit 14A, a deteriorated carton of aircraft reciprocal engine valves was found at 3.5 feet below ground surface (bgs). Digging at this test pit was stopped at 3.5 feet bgs because the backhoe encountered a steel utility pipe. The carton of engine valves was left in the trench. Soil samples were collected at Test Pit 14A and analyzed for VOCs, SVOCs, and metals. All VOC and SVOC analytical results were non-detect. All metal analytical results fell within the background range of values for soils at FAFB except for thallium, which was below the USEPA screening level. Tests on five of the engine valves

indicated two contained elemental sodium; the valves were determined to present a safety hazard. During construction in 2015, approximately 25 additional valves were uncovered.

5.3.3.1 Basis for Taking Action

The ROD indicates there are no known or suspected sources of contamination at DP012, nor has there been any apparent release of chemicals to the environment. However, DP012 is a site with some documented buried debris. The conditions at DP012 do not present a potential for detrimental impact to groundwater. There are no potential surface or subsurface sources or pathways of migration at DP012; therefore, DP012 does not present any other threat to human health or environment (Bay West 2018). The presence of sodium-filled valves may present a limited threat of physical injury to persons performing excavations at the site, therefore, ICs are required to prevent intrusive activities. The 2018 ESD added additional IC requirements.

5.3.3.2 Remedy Selection

The 1995 ROD identified NFA as the selected remedy, however ICs were required to limit excavation unless protocols were in place to handle sodium-filled valves encountered during excavation. In 2016, administrative controls were placed on DP012 that included posting signs and digging restrictions in the on-Base work clearance system. The 2018 ESD specified additional requirements for LUCs as follows:

- Prevent access to, or use of, subsurface soil for restricted uses until physical hazards associated with metallic debris and elemental sodium are removed from the site;
- Prohibit development and use of the property for residential housing, schools, recreational fields, or childcare facilities until physical hazards are removed;
- Ensure if property is transferred that access restrictions convey with the land until physical hazards are removed; and
- Maintain integrity of topsoil and turf grass to mitigate physical hazards.

The location and site features are provided in **Figure 6-18 and 6-19.**

5.3.3.3 DP012 (SW-10) Remedy Implementation

Due to the physical hazards posed by subsurface debris, ICs are currently in place for DP012. Functioning of ICs is evaluated annually as part of base wide annual LUC inspections as documented in annual LUC reports (Bay West 2022c). LUCs restricting disturbance of soils at the site are in place. The site is inspected annually during site-wide LUC inspections.

5.3.4 DP013

DP013 is in the north central portion of FAFB southwest of Building 2245. Currently the site consists of a recreational area. Formerly the site served as an aircraft salvage and reclamation facility from approximately 1945 through 1958 based on aerial photos. During a 1991 geophysical survey anomalies were identified. During excavation of test pits, scattered pieces of metallic debris were observed protruding through the surface soil across the site. An assessment of engine valves removed from excavations concluded the valves were a hazard as some valves contain 10 to 15 grams elemental sodium, which reacts violently if exposed to water. The RI concluded the site had physical hazards (sharp metal debris and elemental sodium contained in engine valves) but posed no CERCLA hazards. The location and site features are provided in **Figures 6-20** and **6-21**.

5.3.4.1 Basis for Taking Action

The ROD stated because there is no unacceptable risk or hazard at DP013, there is no exposure to metals contamination, and the contamination consists largely of fragments, shards, and particles of metallic debris, no remedial action to address chemical hazards is necessary. However, in order to reduce the possibility of human contact with the physical hazards at the site (metallic debris and elemental sodium), ICs will restrict site activity to prevent or oversee intrusive activity. In addition, the USAF will consider covering the site with several inches of topsoil and establishing turf grass. The 2018 ESD added additional IC requirements.

5.3.4.2 Remedy Selection

The 1995 ROD identified NFA for DP013. Site conditions were determined to pose no unacceptable chemical risks to human health or the environment. However, as debris near the surface may present a chance of injury, the ROD specified ICs to restrict site activity to prevent or oversee intrusive activities. In addition, the ROD stated the USAF was considering installation of a vegetated cap to reduce the potential for injury. The 2018 ESD specified additional requirements for ICs as follows:

- Prevent access to, or use of, subsurface soil for restricted uses until physical hazards associated with metallic debris and elemental sodium are removed from the site;
- Prohibit development and use of the property for residential housing, schools, recreational fields, or childcare facilities until physical hazards are removed;
- Ensure if property is transferred that access restrictions convey with the land until physical hazards are removed; and
- Maintain integrity of topsoil and turf grass to mitigate physical hazards.

5.3.4.3 DP013 (SW-11) Remedy Implementation

Due to the physical hazards posed by subsurface debris, ICs are currently in place for DP013. While no documentation was available detailing the design and installation of a vegetative cap at DP013, the site is currently used as a recreation park and a maintained vegetative cap (lawn) is present at the site. Functioning of ICs is evaluated annually as part of base wide annual LUC inspections as documented in annual LUC reports (Bay West 2023b).

5.4 PROGRESS SINCE LAST REVIEW

Protectiveness determinations and statements from the Fourth FYR are presented in **Table 2-1**. Recommendations were made for all OUs to address issues limiting long-term protectiveness. These recommendations, as well as the current status, are presented in **Table 2-2**.

5.5 FIVE-YEAR REVIEW PROCESS

5.5.1 Community Notifications & Site Interviews

Community notification and site interviews are discussed in **Section 2.4**. The public notification and site interviews are provided in **Appendix C**. There were no responses specific to OU-3.

5.5.2 Site Specific Data Review

Appendix A lists the documents and specific data reviewed to gather information and background about OU-3.

5.5.2.1 Site ST006 (PS-1)

The RAOs for Site ST006 are to remediate groundwater to state and federal CULs and remediate soil to state CULs that are protective of groundwater.

The selected remedy for soil is Open System Bioventing. The bioventing system was shut down indefinitely in December 2006 based on recommendations from a RPO evaluation and concurrence from WDOE. The RPO evaluation determined remaining soil contamination was not within the radius of influence of the bioventing system (Bay West 2017). However, TPH soil contamination beneath the active facility may still remain above concentrations that allow site closure with UU/UE. Additional soil investigations are required to determine if soils currently meet CULs.

The selected remedy for groundwater is long-term monitoring. Groundwater monitoring data reviewed in annual RA-O Reports (Bhate 2015 and 2016, Bay West 2017h and 2017j) show concentrations of benzene have achieved CULs at all site monitoring wells. However, concentrations of TPH-D and MRO exceed CULs in three site monitoring wells (MW-194, MW-207, and MW-208). The Final ST006 UFP-QAPP (Bay West 2017c) describes the current ST006 groundwater sampling program to monitor TPH-D and MRO at these three wells on a quarterly basis. Section 10.2 of the UFP-QAPP establishes criteria to achieve groundwater RC. Groundwater concentrations of TPH-D and MRO must demonstrate a statistically significant decreasing or stable trend. If so, TPH-D and MRO concentrations must meet additional WDOE confirmation for compliance with the CULs (eight consecutive quarters below the CUL or 85% UCL less than the CUL, less than 10% of the samples above the CUL, and no result more than two times the CUL in the most recent three years of data). As of June 2017, the groundwater data met RC conditions. A Final Request for No Further Action for Groundwater, ST006 POL Bulk Storage (Bay West 2018) was prepared. The document concluded actions completed at ST006 have remediated all previously identified groundwater MTCA-A CUL exceedances, residual groundwater contamination allows for potable/domestic use, and groundwater LUCs are no longer needed (Bay West 2018).

The 2018 ESD formally transferred ST006 to the WDOE VCP. Any further action at ST006 will be addressed under WDOE VCP.

Site-specific exposures are prevented at ST006 through the use of facility-wide ICs (**Figures 1-3).** These facility-wide ICs include:

- Work Clearance System;
- Installation Development Plan (IDP);
- Base Civil Engineer Work Requests; and
- Environmental Impact Analysis Process.

The 2022 Annual LUC Report (Bay West 2023) describes the annual review and the findings of facility-wide LUCs at Fairchild AFB. With the exception of the IDP, the facility-wide LUCs appear to be in place and functioning as intended. Review of the IDP indicated the document did not describe the specific LUCs for each site or the reasons for the controls. Further, the IDP does not include LUC boundaries on maps. The IDP is used to crosscheck work completed through the Work Clearance System, Base Civil Engineering Work Requests, and the Environmental Impact Analysis Process. If the IDP is outdated or incorrect, the other facility-wide LUCs that rely on the IDP may not be functioning correctly.

5.5.2.2 Site SS009 (PS-5)

The OU-3 ROD (USAF 1995a) established ICs and MNA as the selected remedy for SS009. The goals of remedial action at SS009 are to remediate groundwater to state CULs and to remediate soil to state CULs that are protective of groundwater.

In 1998, WDOE agreed groundwater monitoring could be discontinued at SS009, and monitoring wells were decommissioned in 1999. As part of the DGI, six groundwater samples were collected from five soil borings. TPH-D was detected at a concentration of 1,700 µg/L at location DP10, exceeding the CUL of 500 µg/L. No other constituents were detected at concentrations exceeding CULs in the remaining groundwater samples. The SS009 DGI Report (Bay West 2018) states historical groundwater data in combination with the 2016 data suggest TPH-D groundwater contamination is attenuating naturally and not migrating off-site.

A SS009 DGI (Bay West 2018q) was also determined the extent of TPH-D soil contamination above MTCA Method A CULs and if additional remedial action is necessary to achieve UU/UE for site closure. TPH-D was detected at concentrations exceeding the CUL (2,000 mg/kg) in soil samples collected from 8-10 ft bgs at six locations. Naphthalene was detected at concentrations exceeding the CUL (5 mg/kg) in soil samples at four locations. These soil samples were collected in wet/saturated soils within the groundwater table. Based on the soil boring data, TPH-D and naphthalene contamination does not appear to be present in the vadose zone.

The 2018 ESD formally transferred SS009 to the WDOE VCP. Any further action at SS009 will be addressed under the WDOE VCP.

Site-specific exposures are prevented at SS009 through the use of facility-wide ICs (**Figures 1-3**). These facility-wide ICs include:

- Work Clearance System;
- Installation Development Plan (IDP);
- Base Civil Engineer Work Requests; and
- Environmental Impact Analysis Process.

The 2022 Annual LUC Report (Bay West 2023) describe the annual review and the findings of facility-wide LUCs at Fairchild AFB. With the exception of the IDP, the facility-wide LUCs appear to be in place and functioning as intended. Review of the IDP indicated the document did not describe the specific LUCs for each site or the reasons for the controls. Further, the IDP does not include LUC boundaries on maps. The IDP is used to crosscheck work completed through the Work Clearance System, Base Civil Engineering Work Requests, and the Environmental Impact Analysis Process. If the IDP is outdated or incorrect, the other facility-wide LUCs that rely on the IDP may not be functioning correctly.

5.5.2.3 Site DP012 (SW-10)

Based on a LFI (ICF Technology 1992), the OU-3 ROD (USAF 1995a) documented NFA for DP012. The LFI found buried aircraft reciprocating engine valves containing elemental sodium at the site. Because the presence of these valves presents a potential safety hazard, the site is inspected on an annual basis and the results of the inspection are presented in the Annual LUC Reports (Bay West 2022c). Site-specific exposures are prevented at DP012 through the use of facility-wide ICs (**Figure 1-3**).

A 2018 OU-3 ESD (USAF 2018) clarified and formalized LUCs already being accomplished in the long-term management phase. Updated LUCs described in **Section 4.3** of the 2018 OU-3 ESD (**Figure 1-3**), and

listed below, provide additional protection of human health and the environment from risks posed by physical hazards:

- Preventing access to, or the use of, subsurface soil for restricted uses until physical hazards associated with buried metallic debris and elemental sodium have been removed from the site;
- Prohibit the development and use of property for residential housing, elementary and secondary schools, or childcare facilities until physical hazards associated with buried metallic debris and elemental sodium have been removed;
- Ensure that in the event of a transfer of property to another entity, these restrictions will run with the land until physical hazards associated with buried metallic debris and elemental sodium have been removed; and
- Maintain the integrity of topsoil and turf grass in order to mitigate physical hazards associated with buried metallic debris and elemental sodium.

The 2022 Annual LUC Report indicated there were no issues or deficiencies related to LUC observed during the 2022 annual site inspection.

5.5.2.4 Site DP013 (SW-11)

There have been no RAs performed at DP013, and the OU-3 ROD (USAF 1995a) stated none were necessary. Although chemical hazards were not identified at the site, the ROD identified physical hazards associated with sharp metallic debris at or near the surface and the presence of aircraft engine valves containing small amounts of metallic sodium buried at the site. To address potential physical hazards the ROD recommended implementing ICs to restrict site activities, and the USAF consider planting and maintaining a vegetative cap to mitigate physical hazards associated with buried metal debris.

Although no documentation was found describing a vegetative cap, a vegetative cap is currently present and maintained by the USAF. Annual LUC Report (Bay West 2022c) document the annual inspection and maintenance of the vegetative cap. The 2021 Annual LUC Report indicated there were no issues or deficiencies related to LUCs observed during the 2021 annual site inspection.

A 2018 OU-3 ESD (USAF 2018) clarified and formalized LUCs already being accomplished in the long-term management phase. Updated LUCs described in **Section 4.3** of the 2018 OU-3 ESD (**Figure 1-3**), and listed below, provide additional protection of human health and the environment from risks posed by physical hazards:

- Preventing access to, or the use of, subsurface soil for restricted uses until physical hazards associated with buried metallic debris and elemental sodium have been removed from the site;
- Prohibit the development and use of property for residential housing, elementary and secondary schools, or childcare facilities until physical hazards associated with buried metallic debris and elemental sodium have been removed;
- Ensure that in the event of a transfer of property to another entity, these restrictions will run with the land until physical hazards associated with buried metallic debris and elemental sodium have been removed; and
- Maintain the integrity of topsoil and turf grass in order to mitigate physical hazards associated with buried metallic debris and elemental sodium.

5.5.3 Site Inspection

The inspection of the Site was conducted between April 24-26, 2023. In attendance were Joseph Marsh (USACE) and Jack Mapes (AGEISS). The purpose of the inspection was to assess the condition of the remedy and verify the remedy is operating as intended. Additional details of the site inspection are provided in **Appendix D**.

5.6 TECHNICAL ASSESSMENT

5.6.1 Question A – Is the remedy functioning as intended by the decision documents?

5.6.1.1 ST006 (PS-1)

Soil contamination at ST006 was addressed via bioventing. The bioventing system was shut down indefinitely in December 2006 based on recommendations from a RPO evaluation and concurrence from WDOE. The RPO evaluation determined remaining site soil contamination was not within the radius of influence of the bioventing system (Bay West 2017h). However, TPH soil contamination beneath the active facility may still remain above concentrations to allow site closure with UU/UE. Additional soil investigations are required to determine if soils currently meet CULs.

The selected remedy for groundwater is long-term monitoring. As of June 2017, the groundwater data meet RC conditions. A Final Request for No Further Action for Groundwater, ST006 POL Bulk Storage (Bay West 2018) was prepared. The document concluded actions completed at ST006 have remediated all previously identified groundwater MTCA-A exceedances, residual groundwater contamination allows for potable/domestic use, and groundwater LUCs are no longer needed (Bay West 2018).

A 2018 OU-3 ESD (USAF 2018) transferred ST006 to the WDOE VCP, and any further action at ST006 will be addressed under this state program.

ICs were implemented as a site remedy as selected by the ROD. The IDP requires updating to ensure ICs are functioning as intended. Because the IDP is used to crosscheck work completed through other facility-wide ICs, the systems that rely on the IDP may not be functioning correctly.

5.6.1.2 SS009 (PS-5)

A 2016 DGI (Bay West 2017m) confirms TPH-D and naphthalene remain in site soil at concentrations exceeding CULs. A single groundwater result exceeds the TPH-D CUL; however, the results of the DGI and historical groundwater monitoring results support the conclusion that groundwater contamination is not migrating off-site and is naturally attenuating.

Additional investigation is required to define the extent of remaining soil contamination and to determine if a removal action is necessary to meet the RAOs.

A 2018 OU-3 ESD (USAF 2018) transferred SS009 to the WDOE VCP, and any further action at SS009 will be addressed under this state program.

ICs were implemented as a site remedy as selected by the ROD. The IDP requires updating to ensure ICs are functioning as intended. Because the IDP is used to crosscheck work completed through other facility-wide ICs, the systems that rely on the IDP may not be functioning correctly.

5.6.1.3 DP012 (SW-10)

The ROD identified NFA as the selected remedy for DP012. Because of the presence of subsurface engine valves and the potential safety hazard these valves present, the site is inspected on an annual basis. The inspection results indicate the ground surface is not being disturbed. A 2018 OU-3 ESD clarified and formalized LUCs for DP013.

Site DP012 is subject to facility-wide institutional controls. The IDP requires updating to ensure institutional controls are functioning as intended. Because the IDP is used to crosscheck work completed through other facility-wide ICs, the systems that rely on the IDP may not be functioning correctly.

5.6.1.4 DP013 (SW-11)

The ROD identified NFA for DP013. Although chemical hazards were not identified at the site, the ROD identified physical hazards associated with the site from sharp metallic debris at or near the surface and the presence of aircraft engine valves containing small amounts of metallic sodium buried at the site. To address physical hazards, the ROD recommended implementing ICs, and the USAF consider planting and maintaining a vegetative cap to mitigate physical hazards associated with buried metal debris. A vegetative cap is in place and is inspected annually. The inspection results indicate that the cap is maintained and is functioning as intended. A 2018 OU-3 ESD clarified and formalized LUCs for DP013.

The IDP requires updating to ensure institutional controls are functioning as intended. Because the IDP is used to crosscheck work completed through other facility-wide ICs, the systems that rely on the IDP may not be functioning correctly.

5.6.2 Question B – Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?

ARARs for OU-3 were identified in the OU-3 ROD (USAF 1995a). Chemical-specific, action-specific, and location-specific ARARs were reviewed and determined to be either applicable or relevant and appropriate as presented in Appendix E. With the exception of the TPH-D CULs (discussed below), no changes were made to the ARARs at OU-3 that would indicate the remedies are no longer protective. In addition, no new ARARs were identified as part of this review. A review of the human health risk assessment and the ecological risk assessment methodology and results presented in the ROD show that the methodologies applied remain protective in the short and long term.

No new exposure pathways were identified, there are no significant changes in land or resource use on or near the site, and there are no physical site conditions that would call into question the protectiveness of the selected remedies. Toxicity data underlying CULs used at the time of remedy selection have been updated since the time of remedy selection. The USEPA finalized a review of TCE toxicity in 2011, and the details are addressed in the *Third Five-Year Review* (USAF 2013). There were no changes to the underlying toxicity of TCE since the previous five-year review (**Appendix G**).

Cleanup levels for OU-3, identified in the OU-3 ROD (USAF 1995a), were evaluated against current standards to determine if there were any significant changes that may affect protectiveness of the CULs (**Appendix G**). As referenced in the *Third Five-Year Review* (USAF 2013), the MTCA Method A CULs for TPH-D in soil and groundwater changed since the 1993 ROD. CULs for TPH-D specified in the ROD were 200 mg/kg for soil and 1000 µg/L for groundwater; revised current MTCA method A CULs are 2,000 mg/kg and 500 µg/L. Current LUCs sufficiently prevent exposure to impacted media, therefore protectiveness is not affected.

5.6.3 Question C – Has Any Other Information Come to Light That Could Call into Question the Protectiveness of the Remedy?

Through the CERCLA process, Fairchild AFB has confirmed PFAS impacts to soil and groundwater at FT032 and DP024 which have migrated from RS003P; additionally, the PFAS from RS003P appears to be extending toward OT017. SD031 and DP012 are up-gradient of RS001P and SS008P-sub; therefore, are not likely to be impacted by PFAS from these locations. SS026 is down-gradient of RS001P and SS008P-

sub; therefore, the groundwater at SS026 may be impacted by PFAS migrating from these locations. The on-going RI will determine the extent of PFOS/PFOA-impacted environmental media.

No additional information has come to light that would call into question the protectiveness of the OU-3 remedy.

No relevant changes to ecological risk methodology or ecological toxicity values were identified for the five-year review period, and no special status species changes relevant to protectiveness were identified. OU-3 lies entirely within an active Air Force installation regularly disturbed by Base activities. Ecological habitat of sufficient quality to support wildlife populations is not present due to extensive development.

5.6.4 OU-3 Technical Assessment Summary

Site closure objectives were achieved at OT016, OT017, ST010, SD031, and FT032. Further RAs and ICs are not necessary at this site.

The remedy at OU-3 is protective in the short-term. Site-specific exposures at OU-3 sites are prevented through the use of facility-wide ICs. As currently implemented, the facility-wide ICs continue to meet the objectives. Review of the IDP indicates the document does not describe the specific LUCs for each site or the reasons for the controls. Further, the IDP does not include LUC boundaries on maps. The IDP is used to crosscheck work completed through the Work Clearance System, Base Civil Engineering Work Requests, and the Environmental Impact Analysis Process. If the IDP is outdated or incorrect, the other facility-wide LUCs that rely on the IDP may not be functioning correctly. In order for the remedy to be protective in the long term, the IDP must be updated.

A 2018 OU-3 ESD (Bay West 2018) clarified and formalized LUCs and LUC objectives at DP012 and DP013.

SitesST006 and SS009 were transferred to the WDOE VCP. Any further action at these sites will be addressed under WDOE VCP.

5.7 ISSUES/RECOMMENDATIONS

Issues and recommendations identified during this Five-Year Review for all OUs are presented in **Section 2.4.7.** No issues specific to OU-3 were identified**.**

5.8 PROTECTIVENESS STATEMENT

The remedy at OU-3 currently protects human health and the environment because LUCs preventing exposures to contaminated media are in place. For the remedy to be protective in the long-term, facility-wide ICs should be clarified through an update of the IDP.

Protectiveness Statement(s)	
Operable Unit: *OU-3*	***Protectiveness Determination:*** Protective
Protectiveness Statement: The remedies at the four sites within OU-3 are protective	

Subsite breakout	
Operable Unit: *OU-3* subsites ST006 and SS009	***Protectiveness Determination:*** Protective
Protectiveness Statement: Exposure to contaminated media is controlled by construction permits and access controls through a Basewide order. The remaining contaminants at sites fall under the CERCLA petroleum exemption and will be addressed under the WDOE VCP. The remedy as implemented is protective; however, long-term, facility-wide ICs should be clarified through an update of the IDP/CPP.	
Operable Unit: *OU-3* subsites DP012 and DP013	***Protectiveness Determination:*** Protective
Protectiveness Statement: The remedy at OU-3 subsites DP012 and DP013 is protects human health and the environment. The RAOs to prevent physical exposure to subsurface debris are being met by LUC implementation as formalized in the 2018 OU-3 ESD (USAF 2018). Exposure to subsurface debris is controlled by construction permits and access controls through a Basewide order.	

5.9 NEXT REVIEW

The next review (Sixth Five-Year Review) will be completed five years following the expected completion date of this Five-Year Review; anticipated by 31 August 2028. Since OU-3 contains multiple subsites, the FYR requirement for each subsite is listed below:

- A statutory review is required for OU-3 subsite DP012 and DP013.
- A policy review is required for OU-3 subsites OT017, ST006, SS009, and ST010 fall under the CERCLA petroleum exemption section 101(14) and 101(33). An OU-3 ESD (Bay West 2018) was prepared to formally transfer these sites to WDOE VCP. The policy review may be prepared with the statutory review, as an addendum to the statutory review, or under a separate cover.
- No further five-year reviews are planned for the OU-3 subsites OT016, DP022, DP024, SD031, and FT032 because all site-impacted media have reached UU/UE.

6.0 OU-5 / SS039 (SS-39) / ORPHAN TCE PLUMES

6.1 BACKGROUND

OU-5, site SS039, represents the combination of sites with detected chlorinated hydrocarbons dissolved in the groundwater found along the flight line. Site SS039 groundwater is designated as a potential drinking water source. Groundwater contamination was initially identified in 1985 as a result of investigations at PS-10, IS-1, and PS-3. Field investigations were performed at these three sites from 1991-1995, at which time the "orphan" TCE plumes were consolidated into SS039. In 2002, 2005/2006, and 2007/2008, further investigations were conducted to identify COCs and extent of contamination. SS039 is a Priority Three site. An Interim ROD for OU-5, Site SS039, was signed in August 2011 (USAF 2011).

6.1.1 Physical Characteristics

SS039 covers approximately 75-acres on Fairchild AFB (**Figure 7-1**) with the areal footprint extending from the west-central portion to the northeast corner of the Base. The local communities of Airway Heights and Medical Lake lie approximately 2 miles to the northeast and 3 miles to the south, respectively. Topographic relief at Fairchild AFB is relatively flat, sloping slightly to the east-northeast. The river valleys of Deep Creek and Spokane River are located 2.5 miles north and 8 miles east, respectively, of the Base. Deep Creek and Spokane River are positioned 600 feet lower in elevation than the West Plains. Two small, unnamed tributaries to Deep Creek comprise the nearest surface water drainages 1.5 miles northwest and 1.5 miles northeast hydraulically downgradient of SS039 groundwater. No areas of archaeological interest were identified within Site SS039.

6.1.2 Land Use

Current land uses related to the known contaminant plume are comprised of Fairchild AFB with adjacent residential and commercial areas. Fairchild AFB land use consists of one major runway supported by numerous taxiways, numerous support facilities, a medical clinic, approximately 800 housing units, and an elementary school. The Fairchild AFB IDP (Fairchild AFB, 2014) specifies the USAF will continue to occupy Fairchild AFB indefinitely. Current and future land use is zoned as industrial and residential at Fairchild AFB. Adjacent land use is residential, industrial, and agricultural.

The only housing overlying SS039 that is not equipped with radon vapor mitigation systems is vacant and the July 2008 Fairchild AFB housing contract terms prevents reoccupation of these residences unless first equipped with radon vapor mitigation systems. Any new housing would need to meet current Spokane County building codes which also require radon vapor mitigation systems.

6.1.3 Geology and Hydrogeology

Alluvium and the weathered and fractured upper portions of the underlying basalt (identified as Basalt A) are the primary geologic units of interest within Site SS039 where chlorinated VOC contamination has is in groundwater. Alluvial sediments consist of non-native fill materials (generally only a few feet thick in some locations) that overlie Quaternary flood deposits that consist of various layers of sands and gravels with silt and clay deposits that are generally heterogeneous. In some areas, silt and clay deposits are dense and thick, and substantially confine groundwater in weathered basalt from alluvial groundwater. The thickness of alluvial sediments ranges from 5 feet in some proximal plume areas to over 45 feet in the central plume area and as much as 50 to 55 feet in the distal plume area (CH2M Hill 2013).

The upper portions of Basalt A comprise fractured and highly weathered basalt and, in some locations, include a silt- and/or clay-matrix-supported weathered basalt gravel. This weathered/fractured basalt varies

in thickness from a few feet to over 70 feet in some areas, and overlies dense, competent basalt, which is also part of Basalt A. The depth to competent basalt ranges from about 15 feet (just east of Building 1060) to over 65 feet in the central plume area and over 85 feet in the distal plume area (CH2M Hill 2013).

The weathered basalt horizon shows significant variability across the site in terms of fracturing and weathering. The weathered basalt is relatively firm and intact in some areas, significantly fractured in other areas (similar to gravelly deposits), and highly weathered to saprolitic in other areas, notably near the northern Base boundary. Given this variability, delineation of contacts between alluvium and weathered basalt can be difficult and should be viewed as subjective interpretation for a number of SS039 borings (CH2M Hill 2013).

Groundwater at Site SS039 is encountered at depths ranging from 3 to about 50 feet bgs. Generally, shallow groundwater within alluvium is unconfined and deeper groundwater is confined to semi-confined. Groundwater flows east northeasterly across the site through the proximal and central portions of the plume and northward across the distal portion of the plume (CH2M Hill 2013).

6.1.4 History of Contamination

Three locations within the SS039 study area were initially identified in 1985 during the Base's IRP records search as potential sources of contaminant releases, namely IRP Sites SD031, SD005, and SS007. Field investigations were completed at these sites from 1991 through 1995, at which time the "orphan" TCE plumes potentially associated with these sites were consolidated into OU-5.

SS039 is currently defined as a dissolved phase contaminant plume. TCE and CTC occur at concentrations exceeding their respective USEPA MCLs in saturated alluvium (silts, sands, and gravels) and in the uppermost weathered and fractured basalt. The plume originates near the western end of the Base in the Site SD031 vicinity (former Building 1060), continues northeasterly along the flightline, then northward towards the Base boundary near the main gate. The SS039 plume has been subdivided into three areas, as described below and shown on **Figure 7-1**.

- **Proximal Plume:** The upgradient portion of SS039 and the location of the primary TCE source. Hot Spots #1 through #4 are located in the Proximal Plume.
- **Central Plume:** The central section of SS039 that includes flightline operations areas
- **Distal Plume:** The downgradient portion of SS039 and the location of a TCE and CTC source. Hot Spot #5 is located in the Distal Plume.

6.2 RESPONSE ACTION SUMMARY

The remedy including RAOs selected in the 2011 Interim ROD is summarized in the section below. Summaries of COCs, RAOs, completed RAs, and current site status are provided in **Tables 1-1** and **1-2**.

6.2.1 Basis for Taking Action

The 2002 human health risk assessment evaluated the potential for human health impacts from chemicals released during past activities at SS039. The risk assessment evaluated a hypothetical future residential scenario where groundwater at SS039 was used as a potable source. The estimated cumulative cancer risk associated with exposure to groundwater in the upper third of the groundwater plume exceeded 10^{-4}; TCE was the primary contributor. The noncancer hazard index was below 1. For the middle portion of the plume, the estimated cumulative cancer risk exceeded 10^{-4}; carbon tetrachloride was the primary contributor

followed by TCE. The noncancer hazard index exceeded 1 where carbon tetrachloride was the primary contributor. In the distal portion of the plume the estimated cumulative cancer risk was below 10^{-4} and the noncancer hazard index was below 1, however the risk estimate for the distal portion of the plume was based on limited data, which may underestimate risk.

For known or suspected carcinogens, the NCP identifies an excess upper bound lifetime cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ for setting acceptable exposure levels at Superfund sites. A noncancer hazard index of at or below "1" is considered generally acceptable.

Estimated cancer risks for the first two-thirds of the plume and the noncancer hazard index for the middle third exceed CERCLA thresholds, thereby requiring remedial action of the entire plume. Concentrations of COCs in groundwater exceed federal MCLs.

As commercial/industrial buildings were present at the site, risk due to VI for a commercial/industrial scenario were estimated. The cumulative cancer risk estimates due to VI were below 10^{-4}. In 2006/2007, additional VI investigation we performed to include evaluation of the residential areas in the Fort Wright and Officer Capehart Housing Area. In 2014, the six occupied industrial buildings determined to have the highest potential for VI were evaluated using soil gas and indoor air data. Using both soil gas and indoor air data, VI risks were estimated. The maximum cumulative cancer risk estimates and noncancer hazard index were below 10^{-4} and 1, respectively. No response action was determined to be warranted to address the VI pathway.

6.2.2 Interim Record of Decision

The OU-5 Interim ROD was signed in August 2011 (USAF 2011) to address site SS039 (SS-39; the 'orphan' TCE groundwater plumes). OU-5, Site SS039, represents the collection of sites with dissolved chlorinated hydrocarbons detected in the groundwater found along the flightline. The groundwater contamination at SS039 was initially identified in 1985 as a result of three separate investigations at SD031(PS-10), SD005 (IS-1), and SS027 (PS-3). Field investigations and sampling were conducted at Sites SD031 (PS-10), SD005 (IS-1), and SS027 (PS-3) beginning in 1991 and continued through 1995. At that time, the 'orphan' TCE plumes were consolidated into SS039. Soil contamination at these three sites was addressed under the OU-2 and OU-3 RODs. The final remedy for OU-5 has not been selected, although the conceptual site model (CSM) has been updated and pilot studies have been conducted in the support of the remedial design.

6.2.3 Interim Remedy Selection

The COCs for site SS039 are dissolved-phase chlorinated VOCs (carbon tetrachloride, chloroform, 1,1-DCE, PCE, and TCE) in groundwater. A PP was prepared in 2009 and an Interim ROD was signed in August 2011 to address Site SS039. The following RAOs were established in the 2011 SS039 Interim ROD (USAF 2011):

- Prevent exposure via ingestion, inhalation, and dermal contact to groundwater impacted by Site SS039 COCs exceeding MCLs;
- Prevent plume expansion and contaminant migration beyond the current limits of the plume; and
- Restore Site SS039 groundwater to its expected maximum beneficial uses where practicable and within a reasonable timeframe.

While no final remedy has been established for Site SS039, the selected interim remedy for Site SS039 described in the 2011 Interim ROD consists of active groundwater treatment, monitored natural attenuation (MNA), ICs, contingent additional groundwater treatment to prevent or abate plume expansion, commercial building indoor air sampling and analysis, and contingent notification of residential buildings. The selected interim remedy for Site SS039 includes the following components:

- Implement, monitor, maintain, enforce, and report restrictions on groundwater extraction and use.
- Update the current overall plume CSM prior to finalizing remedial design.
- Indoor air sampling and analysis to evaluate whether the potential VI exposure pathway is complete in non-residential buildings located atop the VOC plume.
- Develop a remedial design for *in situ* treatment of groundwater in high-concentration portions of the chlorinated hydrocarbon plume. Implement active remedial action as designed and evaluate results.
- Transition to MNA, if post-treatment conditions are demonstrated to be appropriate, until MCLs and final cleanup levels have been met throughout the plume.
- Determine whether additional MNA is needed to meet final cleanup levels.
- Employ contingencies, if necessary, to prevent unexpected plume expansion and protect public health.
- USAF prompt notification to the regulators if it decides to construct residential housing atop the VOC plume without radon (vapor) mitigation systems or immediate notice upon discovering such mitigation systems have not been installed before groundwater cleanup levels are achieved.

A 2018 ESD for OU-3, as described in EPA RACR Memorandum signed on October 31, 2019, transfers TCE in groundwater from OU-3 (Site SD031) to Site SS039 as consistent with the 2011 Interim ROD for SS039.

6.2.4 Interim Remedy Implementation

6.2.4.1 Institutional Controls

Fairchild AFB implemented ICs per the Interim ROD (USAF 2011) to restrict groundwater extraction and use to prevent exposure to or consumption of on-base contaminated groundwater at Site SS039. Functioning of ICs is evaluated annually as part of base wide annual LUC inspections as documented in annual LUC reports (Bay West 2022c). Off-base interim LUCs were proactively established by the USAF for SS039 at Fairchild AFB as releases from on-base sources may extend from the site to off-base properties not owned by the USAF (Bay West 2022c). Off-base LUCs will be similarly developed as part of the WP003 RODA and will be proactively considered for SS039. If applicable, off-base LUCs for WP003, and SS039 will be included in the CPP (Bay West 2022c).

6.2.4.2 CSM Updates

The CSM was updated in 2013. Two phases of DGIs were performed to support the 2013 Site SS039 Conceptual Site Model Update (CH2M Hill 2013a). Phase one, conducted from October through December 2011, included the installation of 36 monitoring wells and five soil borings then sampling of 112 monitoring wells during a synoptic monitoring event. Phase two, conducted from May through August 2012, included the installation of 30 new monitoring well, and subsequent development and sampling of those wells. The

Site SS039: Conceptual Site Model Update (CH2M Hill 2013a), consisted of figures (plume maps and cross-sections) of the SS039 plume based on available data obtained from the DGIs. The CSM plume maps are updated annually in conjunction with the annual groundwater monitoring reports for Site SS039 to include changes in plume contours based on the most recent groundwater monitoring data. Further discussion of the SS039 CSM is described in **Section 6.4.2**.

6.2.4.3 Groundwater Monitoring

Annual long term groundwater monitoring activities at the site are documented in annual groundwater monitoring reports for Site SS039 (Bay West 2020, 2020, 2021, and 2022). Groundwater monitoring at the site consists of both performance monitoring and annual monitoring and is conducted in accordance with the Final SS039 Groundwater Monitoring Uniform Federal policy – Quality Assurance Project Plan (Bay West 2015b). The 2020 Annual Groundwater Monitoring Report does not include quarterly sampling events due to travel restrictions from COVID-19; only the annual report was completed for 2020. The 2022 was not finalized at the time of this FYR.

A number of post Interim ROD investigations were completed to support the CSM updates and to further delineate chlorinated VOC plumes have included groundwater monitoring at varying frequencies.

6.2.4.4 In Situ Chemical Oxidation

Interim remedial actions completed at SS039 include ISCO, which were performed to address "hot spots" within the SS039 plumes. Initial pilot test injections were completed in November 2010. The pilot test consisted of injecting dilute (1%) sodium permanganate solution at three injection wells (A1-IW1, A1-IW2, and A1-IW3) at "hot spot" Area #1. Groundwater monitoring was conducted at the injection wells and at designated performance monitoring wells before and after injections.

Although rebound was observed in some wells, ISCO was determined to be successful and full-scale implementation was recommended for "hot spots" #1 through #4. ISCO injections including injection well installations were performed at two areas ("hot spot" #1 and "hot spot" #3) of the proximal portion of the Site SS039 groundwater contaminant plume in 2013 (CH2M HILL 2014b). ISCO treatment consisted of injection of dilute solutions (1-2%) of sodium permanganate into three injection wells within "hot spot" #1 and seven injection wells within "hot spot" #3. Additional investigation data suggests that the "hot spots" previously identified as "hot spot" #2, #3, and #4 are areas of elevated TCE concentrations located within the plume core as opposed to individual source areas (Bay West 2017o). Recent performance monitoring rebound of Site contaminants has occurred following the 2013 injections. Further injections were completed in 2018 and 2021.

6.2.4.5 Indoor Air Sampling and Vapor Intrusion Pathway Assessment

Indoor Air Sampling and Vapor Intrusion Pathway Assessment

In addition to the VI investigation performed in 2006/2007, a VI pathway assessment for SS039 was completed in 2014. The assessment consisted of indoor air sampling at six buildings within SS039, identified as those likely to have the highest risk of VI. The maximum cumulative cancer risk and non-cancer hazard calculated for VI-related VOCs was below $1x10^{-6}$ and below 1, respectively, for all buildings investigated. The assessment concluded no further VI investigation or action is necessary to address VI related to SS039 (USAF 2014). This conclusion assumes continued reduction of groundwater contamination concentrations at SS039 through natural attenuation and active site remediation. If future groundwater monitoring data indicates an increase in subsurface concentrations, or if residential land use

is considered for the site, additional evaluation will be warranted to verify there is no unacceptable risk via the VI pathway.

6.3 PROGRESS SINCE LAST REVIEW

Protectiveness determinations and statements from the Fourth FYR are presented in **Table 2.1**. Recommendations were made for all OUs to address issues limiting long-term protectiveness. These recommendations, as well as the current status, are presented in **Table 2.2**.

6.4 FIVE-YEAR REVIEW PROCESS

6.4.1 Community Notifications & Site Interviews

Community notification and site interviews are discussed in **Section 2.4** and provided in **Appendix C**. One comment specific to SS039 was received and is stated below.

A Senior Environmental Scientist from Tetra Tech states the cleanup and progress of the Fairchild AFB Sites is ongoing, however, the environmental scientist's knowledge suggests there are numerous wells immediately north of the Base that are contaminated with TCE. Cleanup of base-related contaminants (TCE) is on-going and greatly appreciated (such as SS039), however, the advancement of the Distal Plume northward appears to be continuing.

6.4.2 Site Specific Data Review

Appendix A lists the documents and specific data reviewed to gather information and background about OU-5.

6.4.2.1 Remedy Component – Institutional Controls

Fairchild AFB implemented base-wide LUCs (ICs and engineering controls) in accordance with the OU-5 Interim ROD (USAF 2011) to prevent groundwater extraction and use. The Final 2022 Annual LUC Report (Bay West 2023b) states the 2007 LUC Management Plan is no longer used as a reference because it no longer complies with USEPA and USAF guidance. The 2007 LUC Management Plan does not reflect the procedures and processes currently being used to implement LUCs at Fairchild AFB.

Off-Base LUCs

Off-base LUCs are required at SS039 because releases from on-base sources are affecting adjacent properties north of the base that are not owned by the USAF.

Section 2.2.3 of the Final 2022 Annual LUC Report (Bay West 2023b) presents off-base LUC language developed by the USAF that will be adopted for LF002. The report indicates similar language will be adopted for Site SS039. The complete language is included in **Appendix E** of this Five-Year Review. As described in **Appendix E**, the USAF's role in administering the off-base LUCs primarily includes various forms of information sharing with the public, property owners, and state and local agencies. Information sharing includes the scope of remediation that is occurring at Fairchild AFB, which includes SS039 monitoring results and plans, LUC Implementation Plan development, improvements to the IDP/CPP, and other developments in the LUC implementation process. Off-base LUCs were discussed and developed further between the USAF and USEPA between 2016 and 2021.

In the Final 2022 Annual LUC Report (Bay West 2023b), the location of LUCs is shown on the SS039 LUC Boundary Map (**Figure 1-3**). The LUC boundary shown also includes an Interim Groundwater Use Restriction Area for off-base parcels potentially impacted by contamination related to SS039. The report stated that off-base parcels were visited as part of the annual LUC inspections performed in 2022 and no land use changes or monitoring network deficiencies were observed (Bay West 2023b).

Currently Implemented LUCs

The current scope and status of LUCs at SS039 is defined in annual Fairchild AFB LUC Status Reports. The Final 2022 Annual LUC Report (Bay West 2023) was used to evaluate the effectiveness of LUCs at SS039 in this Five-Year Review.

Facility-wide LUCs are applicable to SS039 and are intended to prevent exposure to contaminated groundwater through provisions for restricting extraction and use. These facility-wide LUCs include:

- Work Clearance System;
- Installation Development Plan (IDP);
- Base Civil Engineer Work Requests; and
- Environmental Impact Analysis Process.

The Final 2022 Annual LUC Report (Bay West 2023) describe the annual review and the findings of facility-wide LUCs at Fairchild AFB. With the exception of the IDP, the facility-wide LUCs appear to be in place and functioning as intended. Review of the IDP indicate the document did not describe the specific LUCs for each site or the reasons for the controls. Further, the IDP does not include LUC boundaries on maps. The IDP is used to crosscheck work completed through the Work Clearance System, Base Civil Engineering Work Requests, and the Environmental Impact Analysis Process. If the IDP is outdated or incorrect, the other facility-wide LUCs that rely on the IDP may not be functioning correctly.

Site-specific LUC inspection checklists for SS039 were reviewed in the Final 2022 Annual LUC Report (Bay West 2023). No issues or deficiencies related to LUCs observed during the 2022 annual site inspections were found at SS039 Final 2022 Annual LUC Report (Bay West 2023). LUCs were reviewed as part of the Five-Year Review site inspections (**Appendix C**).

6.4.2.2 Interim Remedy Component - Vapor Intrusion Exposure Pathway Assessment

A component of the selected remedy described in the 2011 Interim ROD includes the completion of indoor air sampling and analysis to evaluate whether the potential VI exposure pathway is complete for occupied commercial buildings overlying the VOC plume. A VI Pathway Assessment was performed in 2013 as described in the 2013 UFP QAPP Addendum for Fairchild AFB SS-39 Vapor Intrusion (VI) Evaluation (CH2M Hill 2013b) and the 2012 Vapor Intrusion Evaluation Project Planning Documents, IRP Site SS-39 Fairchild AFB (CH2M Hill 2012).

Results of the VI assessment conducted in 2013 are described in the Final 2014 Vapor Intrusion Pathway Evaluation Report (USAF 2014). Six building were identified as having the highest risk of potential VI risk based on proximity to SS039 plumes and occupancy considerations. Indoor air sampling was conducted at six buildings during the 2013 assessment. The six buildings sampled include Bldg. 285, 1034, 152, 446, 1037, and 2005. A summary of the interpretation of multiple lines of evidence conclude that the VI pathway is incomplete is provided in the 2014 VI Pathway Evaluation Report.

The critical findings of the assessment were that the maximum cumulative cancer risk and non-cancer hazard calculated for VI-related VOCs in all buildings was below 10^{-6} and 1, respectively. The report

concluded no further sampling or mitigation is warranted at these or other SS039 buildings as no unacceptable risk was identified. If future groundwater monitoring indicates an increase in subsurface concentrations, or if residential land use is considered for the site, additional VI investigation is warranted.

6.4.2.3 Interim Remedy Component – Active Groundwater Treatment

Active groundwater treatment was implemented within Hotspots #1 and #3 of the SS039 groundwater plume (**Figure 7-1**). Initial ISCO pilot testing injections were completed in November 2010 at Hotspot #1. Pilot testing consisted of injecting dilute (1%) sodium permanganate solution at three injection wells (A1-IW1, A1-IW2, and A1-IW3). Groundwater monitoring was conducted at the injection wells and designated performance monitoring wells before and after injections. Although rebound was observed in some wells, ISCO was determined to be successful and full-scale implementation was recommended for Hotspots #1 through #4. Additional injection activities were performed at Hotspots #1 and #2, Hotspots #3, Hotspot #4, and Hotspot #5 in 2018 and 2021 as summarized below.

2010 Remedial Injection Pilot Test

Additional enhanced in situ bioremediation pilot testing for Hotspot #5 was conducted in late October through November 2010. Injection of dilute (3%) emulsified vegetable oil was conducted in two injection wells (A5-IW1 and A5-IW2) to stimulate ERD. While these pilot test results indicated significant concentration reductions of chlorinated VOCs (carbon tetrachloride and TCE) at injection wells, subsurface distribution of the emulsified vegetable oil was limited due to low permeability of the targeted formation (Bay West 2015a). A 2014 TM (CH2M Hill 2014b) summarizes full scale ISCO activities and related injection well installation completed in July and August 2013. **Figures 7-2** present the treatment areas and ISCO injection well locations within the proximal portion of the SS039 groundwater plume.

The *Final SS039 Interim Remedial Design Work Plan* was completed in March 2018 to present the design for in situ treatment of groundwater in high concentration portions of the chlorinated hydrocarbon plumes with ISCO selected for Hotspots #1- #4 and enhanced in situ bioremediation (EISB) selected for Hotspot #5.

2018 Remedial Injection Activities

Remedial injections were completed over two events in 2018. The first event, May to July, included ISCO injection into Hotspots #1, #2, and #3 via injection wells. Fourteen injection wells were installed in Hotspot #1 and #2 across three transects. The targeted screened intervals of the injection wells were within the saturated weathered basalt and above competent basalt. A sodium permanganate solution was injected into the 14 new injection wells and two existing injection wells at Hotspots #1 and #2, and into 7 existing injection wells at Hotspot #3. The second event, in November, included both ISCO injections into Hotspot #4 and enhanced in situ bioremediation (EISB) injections into Hotspot #5 via direct push injection points. Sodium permanganate solution was injected into six direct push injection points at Hotspot #4. At Hotspot #5, EHC Liquid solution was injected into eight direct push injection points. In addition, approximately 0.5 liters of SDC-9 were injected into each Hotspot #5 injection point.

2020 DGI Investigation

An off-base DGI was performed in 2020 to address data gaps identified for the TCE plume during previous investigations and to support the Interim Remedial Design. The off-base DGI fieldwork occurred between March 2020 and July 2020 and included installation of 6 new monitoring wells on the northern side of the Distal Plume and targeting the weathered basalt horizon. Based on sampling results from the off-base DGI well locations, the northeastern and eastern extent of the TCE plume in this vicinity is fairly well delineated.

However, the TCE concentration at MW-540 (9.5 ug/L) and MW-541 (5.3 ug/L) exceeded the step-out criteria of 5 ug/L, therefore, the extent of the northwestern downgradient area of the Distal TCE Plume is not fully delineated.

2021 Remedial Injection Activities

An addendum for the Interim Injection Completion Report was completed in April 2021 and the Final SS039 Interim Injection Completion Report – Second Injection Event was completed in February 2022 to document in situ groundwater treatment activities completed during 2021 at Hotspot #1 and #2, Hotspot #4, and Hotspot #5 at SS039. The report details the specific activities and procedures completed during the 2021 ISCO injections to include the following:

- Construction of new injection wells and direct push injection points
- ISCO using sodium permanganate injection in the Proximal Plume where TCE is present in concentrations greater than 250 µg/L (Hotspot #1 and #2 and Hotspot #4)
- Enhanced reductive dichlorination using Newman Zone® 55 liquid solution and a 50/50 mixture of TCA-20 and SDC-9 microbe cultures in the Distal Plume where TCE and carbon tetrachloride are present (Hotspot #5)

Additional remedial injections were completed in 2021 at Hotspot #1 and #2, Hotspot #4, and Hotspot#5. Sodium permanganate solution was injected at Hotspot #1 and #2 Treatment Area using two new injection wells and three existing wells. Sodium permanganate solution was injected at Hotspot #5 into two new injection wells.

Newman Zone 55 Liquid solution was used for EISB injections at Hotspot #5. Following the injection of the Newman Zone 55 liquid solution into the alluvial formation, a 50/50 mixed culture of TCA-20 and SDC-9 followed by water was added to each injection point. Low dissolved oxygen water was used to maintain/create anaerobic conditions within the aquifer. The solutions were then piped to the injection area and injected into 16 temporary injection points at depths of 21 to 35 feet bgs.

Several key environmental questions relating to performance monitoring for Site SS039 are addressed by subsequent groundwater and RA-O monitoring reports. A brief summary of relevant findings included in the *Final SS039 2021 Annual Groundwater & Q4 Performance Monitoring Report* (Bay West 2022) are summarized below.

Have ISCO injections affected contamination concentrations in nearby monitoring wells?

Additional remedial injections were completed in 2021 at Hotspot #1 and #2 (sodium permanganate), Hotspot #4 (sodium permanganate), and Hotspot #5 (Newman Zone® 55). Due to additional injections in the remaining hotspots, wells sampled in November 2021 indicate there are no concentrations at SS039 exceeding 250 µg/L. The maximum concentration during the November 2021 sampling event was 240 µg/L at MW-430. Significant reductions were observed in Hotspot #1 and #2 performance and trend wells following the 2021 sodium permanganate injections. Concentrations at MW-512 were reduced from 64,000 µg/L in November 2020 to non-detect in November 2021. Similar reductions were seen at MW-369, MW-458, MW-501, and MW-511, and MW-513. No injections were completed in Hotspot #3 injection wells in 2021. Concentrations observed in Hotspot #3 performance monitoring wells indicated concentrations are increasing in this area as higher concentrations from upgradient migrate into the treatment area. However, concentrations downgradient of the injection well transect remain below 1 µg/L except at MW-455 with a concentration of 5.4 µg/L. Sodium permanganate injections near Hotspot #4 performance monitoring well may need more time for treatment to affect the concentrations near the well. Concentrations at MW-198 remained relatively stable from November 2020 to November 2021 sampling events at 170 µg/L to 180

µg/L, respectively. Overall, concentrations decreased in Hotspot #5 following Newman Zone® 55 injection activities in November 2021. The maximum TCE and CTC concentrations in Hotspot #5 performance monitoring wells is 62 µg/L and 97 µg/L, respectively, at MW-504. MW-504 is a trend well screened in the weathered basalt. Injections targeted the alluvium formation where the majority of the plume mass was conceptually located (URS 2017).

Are the ISCO Injections introducing /mobilizing metals in groundwater?

Performance monitoring data indicated elevated concentrations of chromium and manganese exist in wells within the radius of influence of the ISCO injections. The estimated area of chromium and manganese results above their respective screening levels has remained consistent with the estimated area in November 2020, which indicates the ISCO injections in 2018 and 2021 were successful within the area. Metals concentrations will continue to be monitored in accordance with the current performance monitoring program.

Are ISCO injections continuing to react, and after reactions have completed, are the treated areas rebounding or has rebound stabilized?

Reactions from the 2021 injection event are continuing to react as seen by the reductions in plume concentrations noted in the treatment areas. Reductions have stabilized in the Hotspot #3 treatment area since sodium permanganate injections were last completed in 2018. Continued performance and trend monitoring is recommended.

The data will be reported in separate Remedial Action Operation Reports and evaluated to determine the progress of the remedial action.

6.4.2.4 Interim Remedy Component – Conceptual Site Model Update

A CSM update is one of the components of the selected remedy for SS039 in the 2011 Interim ROD. Multiple post-Interim ROD investigations to support this effort have been completed. The CSM plume maps are updated annually in conjunction with the annual groundwater monitoring reports for Site SS039 to include changes in plume contours based on the most recent groundwater monitoring data.

The most recent TCE plume interpretations for SS039 are shown in **Figure 7-1**. The most recent CTC plume interpretation is shown on **Figure 7-2**. The language used to describe the current CSM in the *Final SS039 2021 Annual Groundwater & Q4 Performance Monitoring Report* (Bay West 2022) is provided below:

Groundwater is the primary medium of concern at the site. Possible exposure pathways are ingestion, inhalation, or dermal contact of/with contaminants in groundwater as drinking water and inhalation of contaminants through indoor air. Currently groundwater extraction and use on base as domestic or municipal drinking water is restricted; however, groundwater beneath the base meets the criteria as a source of drinking water and is protected as such by federal and state requirements. Domestic wells beyond the base boundary may access hydraulically-connected SS039 groundwater, thereby, potentially completing a pathway to off-base users. The domestic well closest to SS039 affected groundwater is approximately 750 feet from the base's northern boundary. The indoor air pathway is not complete for residents in military housing areas overlying the plume. The shallow groundwater is below MCLs and acts as a barrier for volatilization from deeper groundwater with higher concentrations that might otherwise pose a VI risk. At this time, there appear to be two primary sources in saturated soil and groundwater resulting in formation of contaminant plumes.

- Hotspot #1 is the primary source of the Proximal Plume where releases of TCE formed a relatively thin plume core (TCE greater than 250 µg/L) running approximately 2,400 feet from the source, and an overall TCE plume that has migrated approximately 5,900 feet. It appears the hotspots previously identified as Hotspots #2, #3, and #4 are not individual source areas; rather, these are areas of elevated TCE concentrations located within the plume core. The source at Hotspot #1 is west of former Building 1060 and partially contained by a competent basalt ridge. During times of higher groundwater water levels, source TCE groundwater contamination impacts groundwater south of the competent basalt ridge.
- Hotspot #5 is the primary source of the Distal Plume. The Distal Plume is a combined TCE and CTC plume that has formed in both alluvium and weathered basalt. There is some evidence that the Hotspot #5 source is only in the alluvium that overlies the weathered basalt. Additional investigation at Hotspot #5 was completed under Site OW058 (URS 2018a). Information collected during the OW058 investigation will be evaluated with SS039 and may inform future revisions to the SS039 CSM. TCE contamination above its MCL was detected at the base boundary, approximately 4,500 feet north of Hotspot #5. There is also evidence that the Distal Plume migrated beyond the base boundary based on exceedances of the MCL at MW-540 and MW-541 and historical detections above the MCL at RAW-14 in 2012 and 2013. RAW-14 is an agricultural well located 5,200 feet north of Hotspot #5. New monitoring wells MW-540 and MW-541 installed in March 2020 and sampled in July 2020 as part of the Off-Base DGI (URS, 2021a) also indicate TCE has migrated off base. Assuming contamination detected off base traveled from Hotspot #5, then the groundwater velocity in the Distal Plume is approximate 70 feet/year.

6.4.2.5 Interim Remedy Component – Long-Term Monitoring

Long-term groundwater monitoring activities at the site are documented in annual groundwater monitoring reports for Site SS039. Groundwater monitoring at the site consists of both performance monitoring and annual monitoring and is conducted in accordance with the Final SS039 Groundwater Monitoring UFP-QAPP (Bay West 2015b).

The long-term monitoring scope is shown in Worksheets #17 and #18 of the UFP-QAPP (Bay West 2015b) and is updated according to recommendations identified in annual groundwater monitoring reports. Plume and concentration trend analysis for groundwater at site SS039 is performed using Monitoring and Remediation Optimization Software (MAROS) (version2.2), which is a groundwater data trend analysis and long-term monitoring optimization tool developed by AFCEC. **Figure 7-3 and 7-4** shows the locations of northern base-boundary and off-base residential sampling wells. Environmental questions relevant to SS039 Interim ROD RAOs were identified in the Final UFP-QAPP, SS039 Orphan TCE Plume Groundwater Monitoring Plan (Bay West 2015b) and a brief summary of relevant findings included in the Final SS039 *2021 Annual Groundwater & Q4 Performance Monitoring Report* (Bay West 2022) is summarized below.

Is there adequate monitoring to identify any possible receptor exposure?

Groundwater monitoring of off-base private wells is conducted annually to monitor TCE concentrations. Groundwater monitoring of the Distal Plume located at the base residential area is also conducted annually to monitor TCE concentrations. The MAROS analysis indicates there is adequate monitoring at SS039 to identify potential receptor exposure. Based on sampling completed in November 2021, TCE results exceed the stepout criteria of 5 µg/L at two wells (MW-540 and MW-541) with a maximum concentration of 13 µg/L at MW-540. The results show the eastern downgradient lobe of the Distal Plume is well defined, but concentrations above 5 µg/L are not fully defined in the western downgradient lobe of the Distal Plume.

Are the lateral and vertical extents of the TCE plume core contour (250 µg/L) stable?

During the November 2021 sampling event all detected concentrations were below 250 µg/L. This is due to source area reductions from injection completed during the summer of 2021. A MAROS analysis was completed that included all monitoring wells associated with each plume (i.e., the evaluation was not limited to the 250 µg/L contour plume core).

At the Proximal Weathered Basalt TCE plume, MAROS indicates the source is stable, the plume mass is decreasing over time, and the distance from the source to the center of mass is increasing. Downgradient and sidegradient monitoring wells that used to be in the 250 µg/L contour in the Proximal Weathered Basalt TCE Plume demonstrate probably decreasing (MW-357), decreasing (MW-234, MW-346, MW-347, MW-348, MW-356, MW364, and MW-365), or nondetect (MW-349) trends based on Mann-Kendall Statistics and historical data. These MAROS conclusions reflect reduced concentrations following sodium permanganate injection activities in 2021. Groundwater elevations in November 2021 increased on average of 0.1 to 2.82 feet from November 2020 in the proximal plume near Hotspot #1. The November 2021 TCE concentrations show a decreasing trend as compared to the November 2020 concentrations.

At the Distal Weathered Basalt TCE plume, MAROS indicates the source is stable, the plume mass is increasing over time, and the distance from the source to the center of mass is stable. Downgradient and side-gradient monitoring wells that were on the fringe of the 250 µg/L contour in the Distal Weathered Basalt TCE plume demonstrate stable (MW459, MW-460, and MW-461), decreasing (MW-354, MW-421), or nondetect (MW-321) trends based on Mann-Kendall Statistics and historical data. These MAROS conclusions reflect the reduced concentrations following injection activities in 2021. The interpreted Distal 5 µg/L plume contour has decreased compared to the November 2020 interpretation.

At the Proximal/Central Alluvial TCE plume, MAROS indicates the source is stable, the plume mass is decreasing, and the distance from the source to the center of mass is decreasing. Downgradient and side-gradient monitoring wells that were on the fringe of the 250 µg/L contour in the Proximal/Central Alluvial TCE plume demonstrate stable (MW-199, MW-334), probably decreasing (MW-394), decreasing (MW-200, MW-333) or no trend (MW-380 and MW-401) based on Mann-Kendall Statistics and historical data. The southern 5 µg/L plume contour decreased to no longer encompass monitoring well MW-399.

Are the lateral and vertical extents of the TCE plume at the MCL contour (5 µg/L) stable?

The MAROS analysis indicates the extents of the TCE MCL contour (5 µg/L) are generally stable to decreasing, with some exceptions. All monitoring wells associated with each plume were used in the evaluation. The tail stability indicates the trend at the downgradient edge of the plume. The second moment trends from the spatial moment analysis indicate the spread or distance of contamination longitudinally (x-axis) and transversely (y-axis) about the center of mass.

For the Proximal Weathered Basalt TCE plume, MAROS indicate a probable decreasing trend for the tail stability. For the spatial moment analysis, MAROS suggests the longitudinal and transverse plume extents are increasing.

For the Central Weathered Basalt TCE plume, MAROS indicate the tail stability is probably decreasing. For the spatial moment analysis, no trends were identified for the longitudinal and transverse plume extents.

For the Distal Weathered Basalt TCE plumes, MAROS indicate stable tail stability. For the spatial moment analysis, MAROS suggests a probably decreasing trend for the longitudinal extent and transverse extent of the TCE plume.

For the Proximal/Central Alluvial TCE plume, MAROS indicate a probable decreasing trend for the tail stability. For the spatial moment analysis of the TCE plume, MAROS suggests the longitudinal and transverse plume extents are stable.

Are the lateral and vertical extents of the CTC plume core contour (250 µg/L) stable?

During the November 2021 sampling event all detected concentrations were below 250 µg/L. This is due to source area reductions from Neman Zone® 55 injection completed at Hotspot #5 during the summer of 2021 (Section 2.4.5).

The current MAROS analysis indicates the groundwater sampling data for the Distal Weathered Basalt CTC plume core is generally stable. The MAROS analysis was not limited to the 250 µg/L contour (plume core), and all monitoring wells associated with each plume were used in the evaluation.

Downgradient and side-gradient monitoring wells outside the 250 µg/L contour in the Distal Weathered Basalt CTC plume demonstrate nondetect (MW-321), probably increasing (MW-421), stable (MW-459 and MW-460), decreasing (MW-354), or no trend (MW-355 and MW-461) based on the MAROS analysis and historical data. This indicates that the plume core is not increasing.

What are contaminant trends and migration potential of contaminated groundwater?

Contaminant trends, groundwater levels, and flow paths from November 2021 are similar to historic patterns.

6.4.3 Site Inspection

The inspection of the Site was conducted between April 24-26, 2023. In attendance were Joseph Marsh (USACE) and Jack Mapes (AGEISS). The purpose of the inspection was to assess the condition of the remedy and verify that the remedy is operating as intended.

The Site Inspection Team visited Site SS039 which covers a large area from the eastern housing area south and west to the aircraft flightline operational area consisting of residential and industrial buildings, grounds, and infrastructure. No Site signage could be found. Security fencing only exists along the flightline restricting access for military security reasons and environmental access control as a side benefit. However, no other area within Site SS039 contains security fencing as a site restriction measure. No significant problems, issues or concerns were noted during the Site visit and established LUCs remain in place. Direct personnel exposure to remaining subsurface contaminants is unlikely.

6.5 TECHNICAL ASSESSMENT

6.5.1 Question A – Is the remedy functioning as intended by the decision documents?

The remedy for Site SS039 is being implemented in accordance with the Interim ROD (USAF 2011). Interim remedial actions at Site SS039 are functioning as intended and are currently achieving the majority of the interim remedial action objectives identified by the Interim ROD (USAF 2011). Facility-wide LUCs prevent exposure via ingestion and dermal contact to groundwater impacted by Site COCs exceeding preliminary cleanup goals. Investigations were performed to evaluate vapor intrusion risk for occupied commercial buildings overlying the SS039 plume; and concluded exposure to site COCs via the vapor intrusion to indoor air is not a complete exposure pathway.

Limited performance data are available to evaluate progress in achieving the RAOs at Site SS039. Monitoring data and plume analysis have demonstrated that general plume boundaries are stable: however, the extent of the northwestern downgradient area of the Distal Plume still needs fully delineated. Off-site LUCs and additional investigation of the boundary and off-base plume areas will be required in the future to ensure the final remedy is protective of human health and the environment in the long-term.

Active in situ groundwater treatment via ISCO was implemented and effectively treats Site contaminant mass at Hotspot source areas. Performance monitoring following ISCO indicates rebound of Site contaminants within treatment areas. Hotspots #1, #4, and #5 require further injections and remediation for TCE and CTC as concentrations exceed preliminary cleanup goals. Additional remedial activities including ISCO injection and completion of a final remedial design are needed to restore groundwater to maximum beneficial use within a reasonable timeframe. Although the Interim ROD indicates the timeframe to achieve federal MCLs through active treatment and MNA at site SS039 would be approximately 35 years, the interim ROD also states the actual timeline will be dependent on how the active remediation is implemented and whether groundwater conditions remain conducive to natural attenuation.

6.5.2 Question B – Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?

Yes. The land uses and exposure parameters are consistent with conditions evaluated in the baseline risk assessment and subsequent VI investigations. Although toxicity values for select COCs identified in the Interim ROD were updated since 2011, the preliminary cleanup levels are MCLs, which remain protective of future use of groundwater as a potable source. The RAOs are appropriate and remain valid.

Changes in Standards: Preliminary cleanup goals for the COCs identified in the interim ROD are the MCLs. There have been no changes in MCLs since the 2011 interim ROD was finalized.

Changes in Toxicity and Other Contaminant Characteristics: The toxicity values for PCE and TCE were updated in 2012 and 2011, respectively. Although the older values may have been used in the risk assessment, direct contact with groundwater presented an unacceptable risk if used as a potable source. Both PCE and TCE were selected as COCs with MCLs as the preliminary cleanup goals. Therefore, the changes in the toxicity values do not affect the protectiveness of the remedy. A VI evaluation occurred in 2006/2007 to investigate the potential for VI at two housing areas. The Fort Wright area include radon mitigation and the OCHA was later demolished. No unacceptable risk due to VI was identified for the on-base housing areas. In addition, in 2014 a VI pathway assessment was performed to evaluate six occupied buildings. The 2014 VI assessment would have incorporated the updated PCE and TCE toxicity values. No unacceptable risk was identified for the six buildings.

Changes in Risk Assessment Methods: Since the risk assessment was performed in 2002, EPA has updated default exposure parameters (e.g., body weight, drinking water ingestion rates, etc.). However, these changes in exposure parameters are expected to result in only minor changes in the risk assessment results as some changes are more conservative while others are less, thus off-setting the overall effects. Calculation of inhalation risk is now based on reference concentrations and inhalation unit risk to evaluate noncancer hazards and cancer risk, respectively. The methods for evaluating the VI pathway have evolved since the interim ROD was finalized in 2011 and the VI assessment was performed in 2014.

Changes in Exposure Pathways: There were no site conditions or land use changes on or near the site affecting the potential exposure pathways evaluated in the risk assessment. After the Interim ROD was finalized in 2011, TCE was detected at concentrations slightly exceeding the MCL in 2014 at off-base well RAW-14. Prior to the 2014 detections, off-base contamination associated with SS039 had not been detected. Between 2015 through 2022, TCE concentrations at RAW-14 remained below the MCL.

6.5.3 Question C – Has Any Other Information Come to Light That Could Call into Question the Protectiveness of the Remedy?

Through the CERCLA process, Fairchild AFB has confirmed PFAS impacts to soil and groundwater at SS039 from RS001P and SS008P-sub as they are within the SS039 boundary. Whether injection treatments would alter fate and transport of PFAS was not taken into account at SS039. The on-going RI will determine the extent of PFOS/PFOA-impacted environmental media.

No relevant changes to ecological risk methodology or ecological toxicity values were identified for the five-year review period, and no special status species changes relevant to protectiveness were identified. The majority of OU-5 lies within an active USAF installation regularly disturbed by Base activities. Ecological habitat of sufficient quality to support wildlife populations is not present due to extensive development. For OU-5 contamination is present in subsurface groundwater which is not accessible by ecological receptors. For the off-base portion of OU-5 no land use changes have been observed since the 2011 Interim ROD that would make this area attractive to new habitat for new ecological exposure pathways.

6.6 ISSUES/RECOMMENDATIONS

Table 6-1 summarizes issues and recommendations identified for OU-5 TCE Orphan Plumes (SS039) during this Fifth Five-Year Review.

Table 6-1
OU-5 Issues and Recommendations – TCE Orphan Plumes (SS039)

Issues and Recommendations Identified in the Fifth Five-Year Review				
OU-5: Site SS039 (SS-39)	**Issue Category:** Institutional Controls			
	Issue: Current off-base LUCs to prevent the use of contaminated groundwater may need to be supplemented; however, no known off-base drinking water exposures are currently occurring. The Final SS039 Off-Base Data Gaps Investigation Report was completed with fieldwork conducted between March 2020 and July 2020 to include installation of 6 new monitoring wells on the northern side of the Distal Plume and targeting the weathered basalt horizon. Additional TCE Plume delineation may be needed. Groundwater monitoring data from 2021 indicate concentrations above 5 µg/L are not fully defined in the western downgradient lobe of the Distal Plume. Delineation of the Distal TCE Plume may be necessary to evaluate off-base LUCs.			
	Recommendation: Evaluating the need for additional wells to delineate the Distal TCE Plume, then perform field activities and sampling, if warranted. Complete appropriate ROD modification if off-base LUCs are necessary to prevent exposure to TCE above the MCL. Ensure that specific off-base LUCs described in these documents outlines what combination of ICs (i.e., restrictive covenants, permits, orders, zoning changes, state and local agency agreements) and engineering controls will be used to meet offsite performance objectives.			
Affect Current Protectiveness	***Affect Future Protectiveness***	***Party Responsible***	***Oversight Party***	***Milestone Date***
Yes	Yes	USAF	USEPA	September 2034

6.7 PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: *OU-5*	***Protectiveness Determination:*** Short Term Protective
Protectiveness Statement: The remedy at OU-5 is currently protects human health and the environment because an interim action of in-situ remediation has been implemented and have adequately addressed all exposure pathway that could result in unacceptable risks in these areas. However, in order for the remedy to be protective in the long-term, the following actions need to be taken to ensure protectiveness: fully delineate the off-base impacts, continue through the CERCLA process to finalize a final remedy, and clarify if/where on- and off-base LUCs are necessary. There are known PFAS impacts at SS039. An RI is underway to determine the nature and extent of the PFAS impact. The sites will proceed through the CERCLA process to determine if there is unacceptable risk to human health and the environment and implement remedies as needed.	

6.8 NEXT REVIEW

The next review (Sixth Five-Year Review) will be completed five years following the expected completion date of this Five-Year Review; anticipated by 12 August 2028.

7.0 OU-8 / RW011 & WP036

7.1 BACKGROUND

7.1.1.1 RW011 – Weapons Storage Area Radioactive Disposal Area

RW011 consists of two facilities (Facility #1 - 5,000-gallon underground storage tank [UST] area; and Facility #2 - 1,000-gallon UST area) located within the boundaries of the munition's storage area (MSA; formerly known as the Weapons Storage Area) south of the base runway (**Figure 8-1**). The RW011 site layout and historical features are illustrated on **Figure 8-2**. The RW011 site features and historical operations are discussed further in **Section 2.2.2**.

Site RW011 consists of two facilities (Facility #1 and Facility #2) located within the MSA (**Figure 8-2**). During the 1950s, the MSA was an Atomic Energy Commission facility used to store and maintain nuclear components. Facilities #1 and #2 were used as work areas for nuclear components maintenance and each contained a floor drain connected to USTs that acted as secondary containment for potentially radioactive spills from laboratory and assembly buildings.

Facility #1 (5,000-gallon UST area) consisted of a laboratory building (Building 1466) with a floor drain connected to a 5,000-gallon UST. Building 1466 was demolished in 1996.

Facility #2 (1,000-gallon UST area) was an assembly building (Building 1410) with a floor drain connected to a 1,000-gallon UST. In addition, a disposal trench was located 600 feet (ft) northeast of Building 1410. Small amounts of oxidized uranium from machined parts were removed using paper towels with cleaning solvents (ethyl alcohol, acetone, trichloroethylene), and these waste materials were placed in cardboard boxes in the disposal trench (U.S. Army Corps of Engineers [USACE], 2008). Building 1410 was demolished in 2009.

The USTs at Facilities #1 and #2 were removed in 2008 (USACE, 2008). During the removal, it was noted that the USTs had bituminous coating (historically put on USTs to prevent corrosion).

7.1.1.2 WP036 - Contaminated Groundwater and Sediment at {former} Bldg. 1454

WP036 occupies approximately 10 acres in the southern portion of Fairchild AFB, within the MSA. A central feature of WP036 is an approximately 4-acre lagoon that was constructed in the 1950s and is adjacent to the former industrial wastewater treatment plant (WWTP) and the weapons storage bunkers. The WP036 site layout and historical features are illustrated on **Figure 8-1 and 8-3**.

At one time, sanitary sewage from buildings (including flightline buildings) at Fairchild AFB flowed through this former WWTP (into a primary settling tank, then to trickling filters before entering the Imhoff Tank). The Imhoff Tank is a 14-foot-square by 14-foot-deep, cone-shaped concrete tank, which served to promote further solid settling and anaerobic digestion of solids. Effluent from the Imhoff Tank was formerly discharged to the holding lagoons. Currently, the Imhoff Tank is open at the top and full of standing water. The Imhoff Tank and surrounding area is enclosed by a six-foot high fence with a locking gate. Sludge removed from the Imhoff Tank was placed in sludge-drying beds near the holding lagoons. The primary settling tank and the trickling filter have been removed. The Imhoff Tank and the frames of the sludge-drying beds are still present, and the lagoon is full of water.

7.1.2 Physical Characteristics

7.1.2.1 RW011

The topography at RW011 is generally flat with a gentle slope to the south-southeast. Surface water runoff is anticipated to infiltrate the ground surface and/or runoff following topography to the southeast. There is a drainage ditch that contains perennial surface water approximately 50 ft north of the former 5,000-gallon UST area. The drainage ditch is interpreted to be fed by shallow groundwater.

7.1.2.2 WP036

The topography at WP036 is generally flat and consists of a water-filled lagoon in the central area that is surrounded by mowed grass and rocky basalt fields bordered by access roads. Current inflows to the lagoon are from groundwater seepage and two storm water drainage ditches that enter the lagoon from the north and southwest ends of the west lobe (Northern Outfall and Western Outfall; **Figure 8-3 and 8-4**). Historically, discharge from the WWTP entered the lagoon from the western outfall. Surface water discharges from the lagoon in a channel on the southeast edge and flows to the south (Southern Outflow; **Figure 8-3**).

7.1.3 Land Use

The current and future land use at both RW011 and WP036 are designated as industrial (Fairchild AFB, 2014). Both RW011 Facility #1 and #2 areas and the surrounding area are currently vacant. The only remaining structures at RW011 are 100-ft x 100-ft barbed wire fences that surround each of the former UST locations at former Facilities #1 and #2. The area at WP036 is currently vacant.

Groundwater is designated by Washington State as a potential drinking water source. Potable water is supplied to residents and workers on Fairchild AFB from the Fort Wright well field (Water Supply Annex No. 1), approximately 12 miles northeast of Fairchild AFB. If water demand is not met, an on-base backup supply well can be used, Well #2 (Water Supply Annex No. 2; **Figure 8-1**). The Fairchild AFB on-base Well #2 is located approximately one mile south-southeast from RW011 and WP036.

7.1.4 Geology and Hydrogeology

7.1.4.1 RW011

The geology at RW011 consists of a 2- to 8-ft-thick layer of sand and gravel alluvium (glacial flood deposits) overlying weathered basalt bedrock. The shallow bedrock was blasted out to approximate depths of 10 to 15 ft bgs to facilitate subsurface installation of the USTs at RW011.

Previous site investigations found the groundwater in the glacial flood deposits at RW011 to consist of a discontinuous, thin (0- to 3-ftthick) saturated zone just above the bedrock contact. The glacial flood deposits at RW011 contain very thin and discontinuous groundwater and so are unusable for any practical purpose now or in the future.

7.1.4.2 WP036

The geology at WP036 consists of silt, clay and sand alluvium (glacial flood deposits) to depths ranging from 9 to 19 ft bgs, overlying basalt bedrock. The lagoon was blasted out of the underlying basalt bedrock and lined with silt and stiff clays.

Groundwater in the alluvium at WP036 is encountered at depths ranging from 1 to 4 ft bgs. The historical groundwater elevations indicate that groundwater at WP036 consistently discharges into the lagoon throughout the year. Therefore, there does not appear to be a significant groundwater migration pathway away from the site.

7.1.5 History of Contamination

7.1.5.1 RW011

Historical Radiation Sampling Activities

In 1971, a preliminary site investigation was performed at RW011 during which samples of various site media were collected (note that the 1971 preliminary site investigation report is not available; this information was summarized in the 2008 Supplemental Site Investigation Report (USACE 2009). Samples were collected from inside both the 1,000-gallon and 5,000-gallon USTs and were analyzed for gross alpha and gross beta contamination. Wipe sampling and surface soil sampling were conducted at the MSA buildings, above the USTs, and at the disposal trench area. All areas were tested for gross alpha contamination and reported to be releasable to the public under the Nuclear Regulatory Commission release limits with no surface contamination greater than naturally occurring levels. Direct gamma radiological surveying was conducted in five boreholes pushed into the disposal trench area in 1996. Gamma survey results from this study reported no readings greater than background soil levels.

UST Removal and Sampling Activities

The Supplemental Site Investigation Report, RW011 (USACE, 2008) details sampling and UST removal activities conducted in 2007 and 2008. The activities were completed in the disposal trench area, the 1,000-gallon UST area, and the 5,000-gallon UST area. Soil sampling indicated the backfill contained cPAHs likely from the bituminous coatings on both USTs. The cPAHs are believed to have been released as flakes of coating coming off the USTs as the material weathered and were subsequently spread and mixed by UST-removal activities in 2008.

- Investigation of the disposal trench area consisted of performing radiological surveys and collecting soil samples from 14 test trenches. The soil investigation results indicated that field-measured radiation and soil-sampled radiological constituents were consistent with background. In addition, there were no soil VOCs, PAHs, or metal concentrations greater than USEPA regional screening levels or WDOE MTCA-A or MTCA-B CULs.

- The 1,000-gallon UST was removed in August 2008. Soil samples from the former 1,000-gallon UST area excavation walls found no detectable VOCs and found metals and radionuclides were consistent with background. However, five of the eight soil samples from the sidewalls and stockpiled soil had concentrations of cPAHs that exceeded the USEPA RSLs. The soil excavated from the UST removal was used as backfill after the UST was removed.

- The 5,000-gallon UST was removed in August 2008. No soil samples were collected from the UST excavation because groundwater was encountered at a depth of 2 ft below ground surface (bgs). The fill soils surrounding the UST were returned as excavation backfill after the UST removal.

In December 2011, one test pit was excavated within the former 1,000-gallon UST basin fill and two test pits were excavated within former 5,000-gallon UST basin fill (Ahtna/Hart Crowser JV Inc. 2012). Soil samples were submitted for gasoline range organics (GRO), diesel range organics (DRO), VOCs, PAHs, and priority pollutant metals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel,

mercury, selenium, silver, thallium, and zinc). The soil analysis detected trace concentrations of each analyzed metal less than USEPA RSLs and MTCA-A and MTCA-B CULs, and DRO concentrations less than the MTCA-A CUL. The only VOC detected was naphthalene; the naphthalene detection was in one of the test pits at the 5,000- gallon UST area at a concentration less than the USEPA RSL and the MTCA-A CUL. The cPAH soil concentrations were less than USEPA RSLs except for benzo(a)pyrene (BaP) in one of the trenches at the 5,000-gallon UST area. None of the trench soil samples exceeded the MTCA-B value for the BaP total toxicity equivalent concentration (BaP-TTEC; 1.0 milligrams per kilogram [mg/kg]). (Note that the BaP-TTEC is discussed further below).

Also in December 2011, the fill materials from the 2008 excavations in the 1,000-gallon and 5,000-gallon UST areas were re-excavated, confirmation soil sampling was performed, and groundwater sampling was attempted.

- A total of 276 tons of soil were removed from the 1,000-gallon UST area. Confirmation soil samples identified an exceedance of the USEPA RSL for BaP in the soil above the bedrock on the south wall. None of the confirmation samples exceeded the MTCA-B CUL for BaP-TTEC. Push probe groundwater samples were attempted around the former 1,000-gallon UST area, but the probe hit refusal at depths of 3.5 to 7 ft before groundwater was encountered. No groundwater samples were collected from this area in 2011.

- A total of 670 tons of soil were removed from the 5,000-gallon UST area. Soil samples collected immediately above the bedrock exceeded the USEPA RSL for BaP on the west, north, and south sidewalls. None of the confirmation samples exceeded the MTCA-B CUL for BaP-TTEC.

- Two shallow groundwater samples were collected via direct push technology (at depths of 3 and 7 ft bgs) at the site perimeter northwest and southwest of the former 5,000-gallon UST in 2011. A groundwater sample was attempted to be collected downgradient of the former UST, but shallow refusal and lack of groundwater within the borings prohibited sample collection. Groundwater samples were submitted for GRO, DRO, motor oil range organics, VOCs, PAHs, and priority pollutant metals (antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, mercury, selenium, silver, thallium, and zinc) analysis. The analytical results indicated that no VOCs or PAHs were present at concentrations greater than laboratory detection limits. Chromium, copper, and lead were detected at concentrations less than the USEPA RSLs and MTCA-A and MTCA-B CULs. Antimony, arsenic, beryllium, cadmium, nickel, mercury, selenium, silver, and thallium were not detected in the samples.

In 2013, monitoring well installation and groundwater sampling activities were conducted at the former 1,000-gallon UST area (CH2MHill 2013e). Three monitoring wells (MW-451, MW-452, and MW-453) were installed to a depth of 20 ft bgs and screened between 9 and 19 ft bgs within the fractured basalt. A one-time sampling event in March 2013 was performed for analysis of metals, VOCs, and cPAHs. cPAHs were not detected in any of the monitoring wells. Acetone, ethylbenzene, and xylenes were detected at concentrations less than USEPA RSLs and MTCAA CULs. Dissolved arsenic, chromium, copper, nickel, and zinc were detected at concentrations less than USEPA RSLs and MTCA-A and MTCA-B CULs or natural background concentrations (compared to background concentrations from Shaw Environmental & Infrastructure, Inc. 2015). Following sampling the wells were abandoned. The date of the decommissioning is not available.

An RI was conducted at RW011 between March 2016 and October 2018 to assess the nature and extent of contamination (Bay West 2019e). The RW011 RI consisted of conducting a soil and groundwater investigation to characterize potential impacts from the former USTs (1,000- gallon UST area and 5,000-gallon UST area) and a bituminous coating layer encountered in a test pit along the south side of the 5,000-

gallon UST area (the test pit was dug during the RI to further investigate soil with highest cPAH concentrations).

Soil and groundwater results from the RW011 RI were compared to the applicable USEPA RSLs at a target hazard quotient of 1.0 and target risk of 10^{-6} (USEPA, 2018) and WDOE MTCA (WAC 173-340-740; WDOE 2013a) screening criteria, as well as background concentrations for metals in groundwater (Shaw Environmental & Infrastructure, Inc. 2015), to determine the extent of contamination (Bay West 2019a).

The BaP-TTEC was calculated for soil using toxic equivalency factor methodology as mixtures of cPAHs are considered to be a single hazardous substance under the MTCA (WAC 173-340- 708[8][e]) (BaP and other specific cPAHs are listed as individual hazardous substances under CERCLA). At the 1,000-gallon UST area, BaP in soil exceeded the USEPA screening level; however, there were no MTCA screening level exceedances for BaP-TTEC. At the 5,000-gallon UST area, BaP in soil exceeded the USEPA screening criterion. Soil concentrations also exceeded the MTCA screening criterion for BaP-TTEC. Additionally, soil concentrations exceeded the USEPA screening criteria for the following other cPAHs: benzo(a)anthracene (BaA), benzo(b)fluoranthene (BbF), benzo(k)fluoranthene (BkF), chrysene, dibenz(a,h)anthracene (DBA), and indeno(1,2,3-cd)pyrene (IP).

A dark, glassy seam with tar-like properties was encountered in a test pit excavated along the south side of the 5,000-gallon UST area and was visually delineated both vertically and horizontally. The seam covered an area of approximately 4 ft by 10 ft. The seam was interpreted as being composed of the bituminous coating that had been applied to the USTs at RW011. It is not known how the USTs were coated prior to installation; however, given the defined layer observed within the test pit, it is plausible that the coating was spilled or disposed of at this location. Based on this observation, the soil sample in the dark, glassy seam area is not considered representative of soil for the remainder of the site near the 5,000-gallon UST and was evaluated as a separate area, referred to as "the 5,000-gallon UST bituminous coating area."

Groundwater sampling downgradient (east) of the 5,000-gallon UST area yielded no detectable VOCs, cPAHs, or metals with the exception of total chromium detected at a concentration less than the USEPA screening level.

An HHRA and an ecological risk evaluation were performed as part of the RI; the HHRA and ecological risk evaluation are discussed in the RI Report. The RI recommended the development of a Focused Feasibility Study (FFS) to evaluate remedial alternatives to address the cPAH soil concentrations including no action, land use controls (LUCs), and soil removal and disposal.

7.1.5.2 WP036

WP036 primarily consists of an approximately 4-acre lagoon and the former WWTP and associated infrastructure. The lagoon has a partial clay liner, is filled with sediment at thicknesses up to 2 ft, and has an approximate maximum water depth of 2.8 ft (Bay West, 2019f). The lagoon was constructed in the 1950s and is located adjacent to the former industrial WWTP and the weapons storage bunkers (which currently remain in-use). The WWTP included a primary settling tank, trickling filters, an Imhoff tank housed inside former Building 1454, and SDBs. The Imhoff tank consists of an in-ground wedge-shaped tank with an open top at ground surface. Solids were removed from wastewater in the Imhoff tank. Sludge removed from the WWTP was placed in the SDBs to dewater. The SDBs consist of a series of open chambers constructed with a gravel bottom. The Imhoff tank and SDBs are the only remaining structures from the former WWTP at WP036, which became non-operational in the early 1970s (and currently remains nonoperational). Between the early 1970s and the early 1990s, the lagoon may have received some untreated wastewater when the former WWTP became overloaded, resulting in contaminated lagoon sediments and other environmental media at WP036.

Based on the WP036 RI results, lagoon sediment in the west lobe of the lagoon (**Figure 8-3**) shows the greatest impacts due to site-related contaminants including exceedances of USEPA and/or MTCA screening criteria and background concentrations (for chromium, mercury, silver) for arsenic, barium, cadmium, chromium, mercury, silver, PAHs, DRO, and motor oil range organics (MRO; Bay West, 2019f).

In lagoon surface water, arsenic, barium, chromium, and PAHs exceeded the USEPA and/or MTCA screening criteria.

In SIS, where soil surrounding the edge of the lagoon is submerged in water during high-water periods, arsenic, barium, chromium, lead, selenium, zinc, DRO, and MRO concentrations exceeded the USEPA and/or MTCA screening criteria as well as background concentrations for metals.

Surface soil was investigated at the SDB and locations where former WWTP features such as the primary settling tank and the former trickling filter were located. In the SDB soil, arsenic, barium, cadmium, chromium, lead, mercury, selenium, and zinc exceeded USEPA and/or MTCA screening criteria as well as background concentrations for metals. In the WWTP soil, arsenic, barium, and chromium exceeded USEPA and/or MTCA screening criteria.

In the Imhoff tank sludge, arsenic, chromium, PAHs, DRO, and MRO exceeded USEPA and/or MTCA screening criteria as well as background concentrations for metals. In the Imhoff tank water, arsenic, DRO, and MRO exceeded USEPA and/or MTCA screening criteria. In groundwater, arsenic and chromium exceeded the USEPA screening criteria.

7.2 RESPONSE ACTION SUMMARY

7.2.1 Basis for Taking Action

7.2.1.1 RW011

A risk assessment was performed as part of the RW011 RI (Bay West, 2019a). A hypothetical future residential receptor was included in the HHRA, and areas evaluated included the 1,000-gallon UST area, 5,000g gallon UST area, and the 5,000 gallon bituminous coating area. No unacceptable cancer risk or noncancer hazards were identified for soil in the 1,000-gallon and 5,000-gallon UST areas.

For the 5,000-gallon UST bituminous coating area, the cumulative cancer risk exceeded 10^{-4} and the noncancer HI exceeded 1 (HI of 8). The primary contributor to both cancer risk and noncancer hazard was BaP. Based on results of the HHRA, COCs identified for the 5,000-gallon UST bituminous coating area at RW011 are cPAHs in soil. The maximum COC concentration at RW011 is 200.5 mg/kg BaP-TTEC (which represents the mixture of cPAHs). There were no COPCs identified in groundwater at RW011.

The CUL for cPAHs represented as BaP-TTEC is the MTCA Method A soil CUL of 0.1 mg/kg.

The ecological risk evaluation was conducted in the form of a Terrestrial Ecological Evaluation (TEE) in accordance with MTCA WAC 173-340-7490 through 173-340-7494. Based on the current and hypothetical future (UU/UE) land uses, terrestrial plants and wildlife receptors were identified as potential ecological receptors to COPCs.

Based on the simplified TEE, the site does not pose a significant ecological risk primarily because there were no ecological pathways for hazardous substances and there were no hazardous substances greater than concentrations listed in MTCA Table 749-2. Contamination present at the site is not likely to pose a significant risk to ecological receptors.

7.2.1.2 WP036

A risk assessment was performed as part of the RI. Contaminants of potential concern included metals, DRO, MRO, and PAHs in soil, sediment, and lagoon surface water due to former WWTP activities. (Bay West, 2019b).

The HHRA included evaluation of a hypothetical future residential scenario. Based on results of the HHRA, the site does not pose an unacceptable risk to human health in any media evaluated in the HHRA.

Sludge and water contained within the Imhoff tank were not evaluated in the HHRA, because these media were contained in the Imhoff tank (i.e., no human access or exposure potential) and it was anticipated these media would be fully removed during future remedial action at WP036. PAHs were identified in the sludge at concentrations greater than USEPA screening criteria. In addition, based on the comparison of MTCA screening criteria with the Imhoff tank sludge and water, DRO and MRO concentrations indicate the Imhoff tank is a potential source of contamination to lagoon sediment, SIS, and surface water if a release were to occur. Human health COCs include PAHs in Imhoff tank sludge and DRO and MRO in Imhoff tank water. The maximum human health COC concentrations at WP036 are summarized below:

- PAHs in Imhoff tank sludge: total naphthalenes (20,600 micrograms per kilogram [µg/kg); BaP-TTEC (260 ug/kg); and
- DRO+MRO (1,520 micrograms per liter [µg/L]) in Imhoff tank water.

However, CULs were not developed for PAHs in Imhoff tank sludge or DRO and MRO in Imhoff tank water, as it is anticipated these media will be removed in their entirety.

Multiple ecological risk evaluations were performed for WP036 beginning in 1996. The final ecological risk evaluation was conducted by comparing historical data to data collected from the 2017 WP036 RI (Bay West, 2019b). Additionally, a TEE was conducted for soil. Based on the current and hypothetical future (UU/UE) land uses, aquatic and benthic invertebrates, wetland-associated birds, small mammals, amphibians, reptiles, upland birds, and aquatic vegetation were identified as potential ecological receptors.

Based on the ecological risk evaluation performed during the WP036 RI (Bay West, 2019b), the following ecological COCs are identified for WP036 (listed by media):

- Lagoon Sediment: cadmium, mercury, silver, DRO, and MRO;
- SIS as soil: lead and zinc;
- SDB soil: lead, mercury, and zinc; and
- Lagoon Surface Water: PAHs (BkF, chrysene, and DBA).

The lead concentrations in SIS (maximum 86 mg/kg) already met the CUL (220 mg/kg). Additionally, CULs were not developed for lead, mercury, or zinc in SDB soil, as it is anticipated SDB soil will be removed from the site.

7.2.2 Record of Decision

The OU-8 ROD addresses two Priority Three sites (**Table 1-1**). The RW011 initial characterization of these sites was conducted in 2008 when the USTs were removed. LFIs at RW011were initiated in 2011 and

completed in 2012. Field investigation results were used to direct RW011 RI activities conducted in 2016 to 2018. The WP036 initial characterization of these sites was conducted in 1996. LFIs were initiated at WP026 in 2008, 2010, and 2011. Field investigation results were used to direct WP036 RI activities conducted in 2017 to 2019. The OU-8 ROD (USAF 2022) was signed in March 2022, which determined RAs were required at sites RW011 and WP036.

7.2.3 Remedy Selection and Implementation

7.2.3.1 RW011 Remedy Selection

The selected remedy for RW011, as detailed in the FFS (Bay West 2020a) is the excavation and off-site disposal of cPAHs-impacted soil. After excavation, the COC-impacted soil will be disposed of at an approved off-site facility (i.e., a facility operating in compliance with the Resource Conservation and Recovery Act [RCRA] and other applicable federal or state requirements, in accordance with NCP 40 CFR 300.440). This remedy was selected for its ability to meet RAOs, cost-effectiveness, and efficiency in risk reduction by removing and contaminated soil. Additionally, it is the only alternative that will allow the site to reach UU/UE. Reaching UU/UE conditions eliminates the need for long-term monitoring, LUCs, or five-year reviews. The expected outcome is that this remedy would be protective of human health immediately upon removing the contamination.

7.2.3.2 RW011 Remedy Implementation

The excavation work at RW011 was completed between May and July 2023. Details of the remedy implementation will be included in a forthcoming RACR.

7.2.3.3 WP036 Remedy Selection

The selected remedy for WP036 is removal of contaminated lagoon sediments to ecological CULs and removal of contaminated SIS, SDB soil, and Imhoff tank sludge and water. The removed media will be disposed of off-site at an approved facility.

This remedy involves removing all lagoon sediments with COC concentrations exceeding ecological CULs; therefore, resulting in an immediate and substantial reduction in contaminant toxicity and volume at the site. The proposed removal area is provided on **Figure 8-4**. Clean soil would be placed in the excavated area to provide new habitat for infauna recovery. The expected outcome is that this remedy will be protective of human health and the environment immediately upon removing all contaminated lagoon sediment, and long-term monitoring will not be required. Lagoon surface water sampling will be conducted during the wet season after implementation.

Because the remaining site conditions would allow for UU/UE, there would be no requirement for LUCs, restrictions on future land use, or five-year reviews following the remedial action.

7.2.3.4 WP036 Remedy Implementation

Remedy implementation is delayed due to logistic issues (i.e., will there be PFAS present in the IDW, if so what contractual impacts are there since work regarding PFAS being specifically excluded from the PBR contract). If PFAS is present it doesn't impact the effectiveness of the remedy for the ROD defined COCs; however, it makes implementation more costly due to higher waste disposal costs. Additionally, this area will be researched as part of the due diligence for non-AFFF PFAS sources.

7.3 PROGRESS SINCE LAST REVIEW

OU-8 was not assessed during previous reviews.

7.4 FIVE-YEAR REVIEW PROCESS

7.4.1 Community Notifications & Site Interviews

Community notification and site interviews are discussed in **Section 2.4**. The public notification and site interviews are provided in **Appendix C**.

7.4.2 Site Specific Data Review

Appendix A lists the documents and specific data reviewed to gather information and background about OU-8.

7.4.3 Site Inspection

The inspection of the Site was conducted between April 24-26, 2023. In attendance were Joseph Marsh (USACE) and Jack Mapes (AGEISS). The purpose of the inspection was to assess the condition of the remedy and verify that the remedy is operating as intended. Additional details of the site inspection are provided in **Appendix C**.

7.5 TECHNICAL ASSESSMENT

7.5.1 Question A – Is the remedy functioning as intended by the decision documents?

The remedies at RW011 and WP036 have not yet been implemented so their functionality cannot be determined at this time.

7.5.2 Question B – Are the exposure assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of Remedy Selection Still Valid?

Yes. RAOs and cleanup levels are still valid. The cleanup levels are the MTCA CULs and these values have not changed since the 2022 ROD was implemented. Land use and associated exposure pathways have not changed since the ROD was finalized.

7.5.3 Question C – Has Any Other Information Come to Light That Could Call into Question the Protectiveness of the Remedy?

RW011 is not near any know AFFF source areas. WP036 is not near any of the known AFFF impacted areas; however, based on historic operations as a wastewater treatment plant it is highly suspected that PFAS may be present at WP036. Therefore, the remedy implementation is delayed due to logistic and contractual issues. If PFAS is present it doesn't impact the effectiveness of the remedy for the ROD defined COCs; however, it makes implementation more costly due to higher waste disposal costs. WP036 is being evaluated as part of the due diligence efforts for non-AFFF PFAS sources.

No additional information has come to light that would call into question the protectiveness of the OU-8 remedies.

7.6 ISSUES AND RECOMMENDATIONS

Issues and Recommendations Identified in this Five-Year Review				
OU-8	**Issue Category:** Institutional Controls			
	Issue: LUCs are not document in the ROD since it was anticipated remedy implementation would happen rapidly after ROD finalization.			
	Recommendation: Continue to implement facility-wide LUCs that restrict the usage of groundwater and require proper testing/disposal of media disturbed within ERP sites and include OU-8 as having LUCs in the IDP or CPP until the remedy is implemented.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	USAF	USEPA	December 2027

Other Recommendation for WP036: Remedy implementation is delayed due to logistic issues (i.e., will there be PFAS present in the IDW; if so, what contractual impacts are there since work regarding PFAS being specifically excluded from the PBR contract). If PFAS is present it doesn't impact the effectiveness of the remedy for the ROD defined COCs; however, it makes implementation more costly due to higher waste disposal costs. In order to reignite the remedy implementation, recommend determining 1) the cost to dispose of IDW in accordance with AF PFAS IDW guidance and 2) an IDW sampling strategy to determine how much of the IDW is impacted.

7.7 PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: *OU-8*	***Protectiveness Determination:*** Will be Protective
Protectiveness Statement: The remedy at OU-8 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Exposure to contaminated media is controlled by construction permits and access controls through a Basewide order.	

7.8 NEXT REVIEW

The next review (Sixth Five-Year Review) will be completed five years following the expected completion date of this Five-Year Review; anticipated by 12 August 2028.

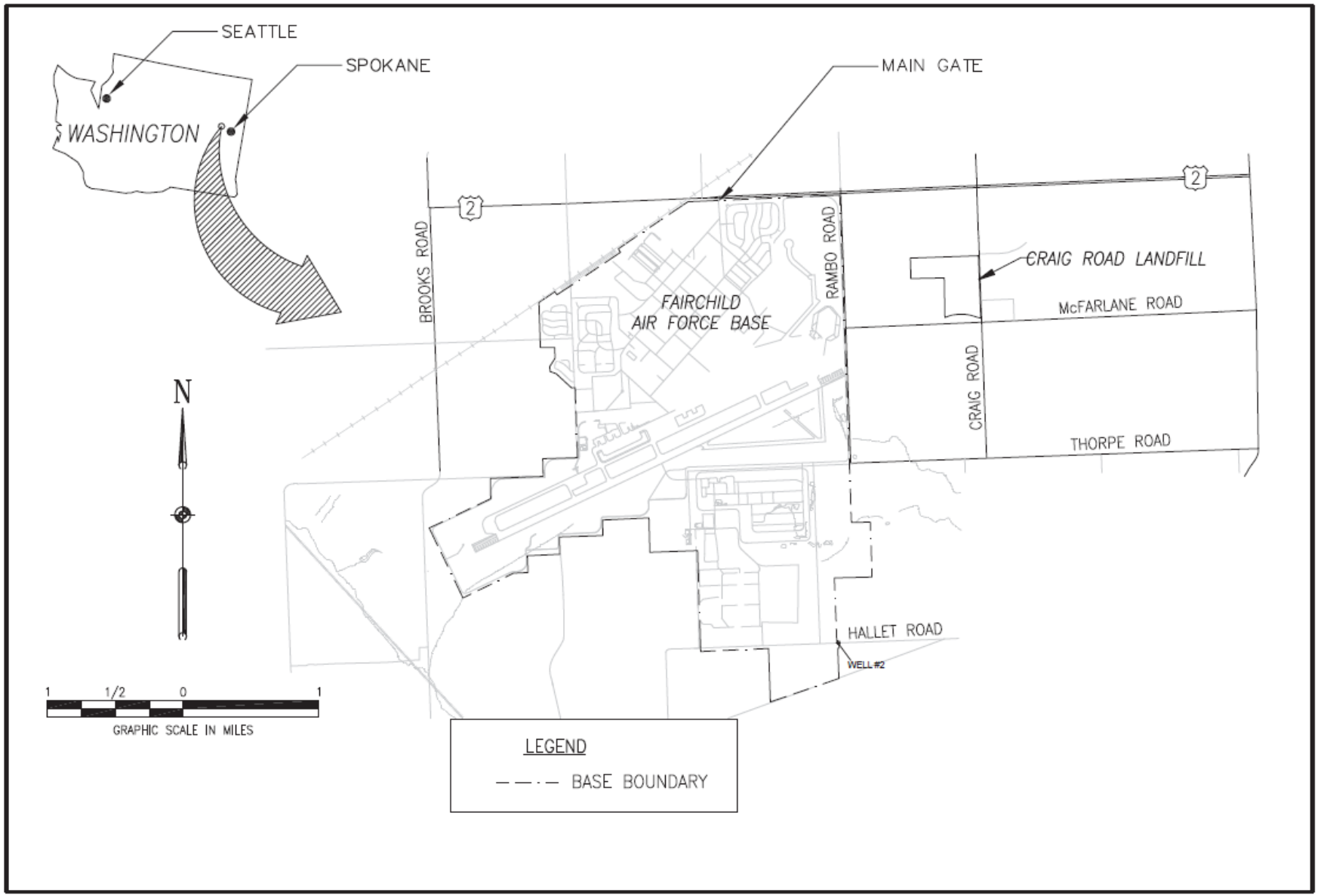
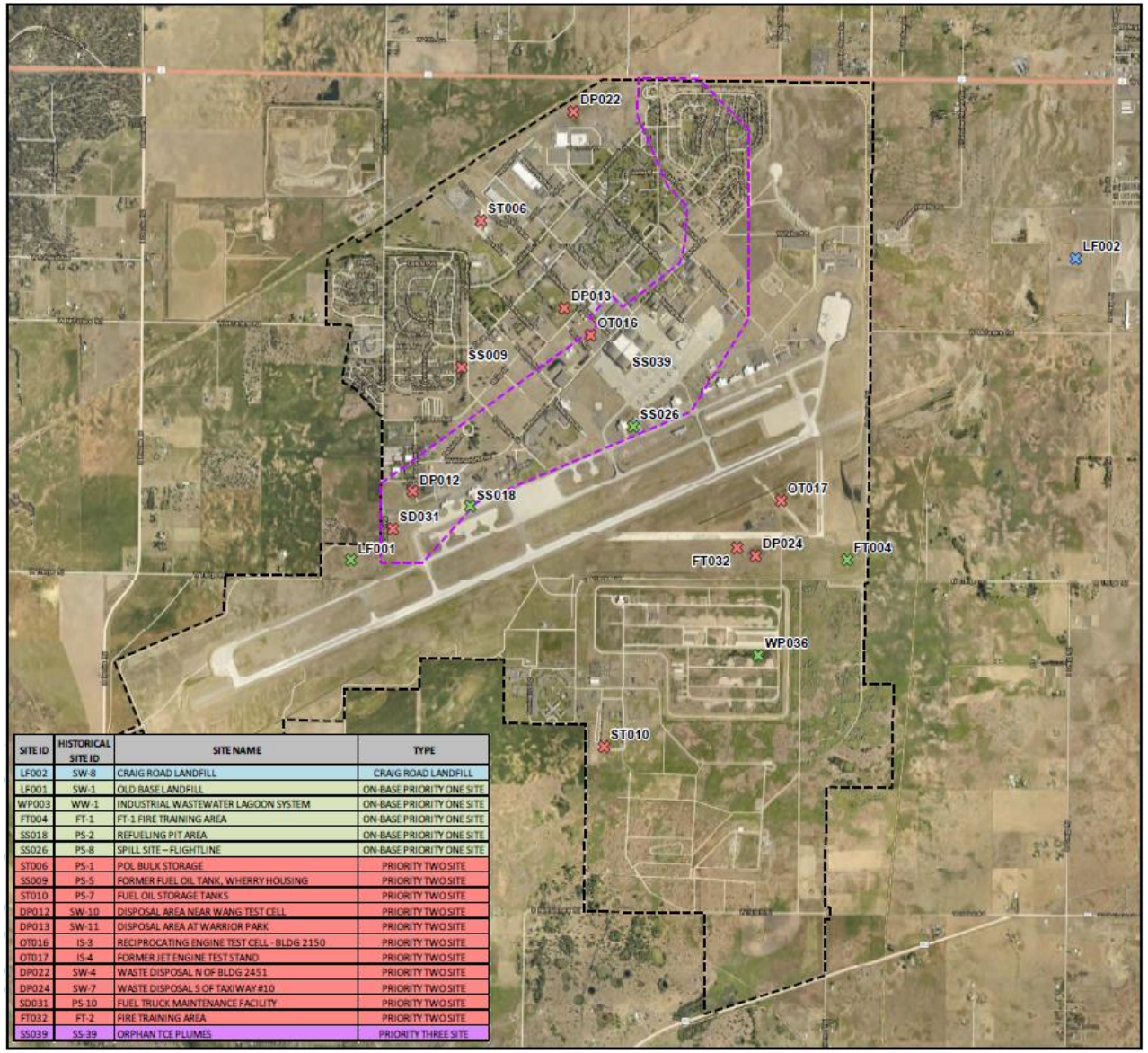


Figure 1-1: Fairchild Air Force Base Location



SITE ID	HISTORICAL SITE ID	SITE NAME	TYPE
LF002	SW-8	CRAIG ROAD LANDFILL	CRAIG ROAD LANDFILL
LF001	SW-1	OLD BASE LANDFILL	ON-BASE PRIORITY ONE SITE
WP003	WW-1	INDUSTRIAL WASTEWATER LAGOON SYSTEM	ON-BASE PRIORITY ONE SITE
FT004	FT-1	FT-1 FIRE TRAINING AREA	ON-BASE PRIORITY ONE SITE
SS018	PS-2	REFUELING PIT AREA	ON-BASE PRIORITY ONE SITE
SS026	PS-8	SPILL SITE – FLIGHTLINE	ON-BASE PRIORITY ONE SITE
ST006	PS-1	POL BULK STORAGE	PRIORITY TWO SITE
SS009	PS-5	FORMER FUEL OIL TANK, WHERRY HOUSING	PRIORITY TWO SITE
ST010	PS-7	FUEL OIL STORAGE TANKS	PRIORITY TWO SITE
DP012	SW-10	DISPOSAL AREA NEAR WANG TEST CELL	PRIORITY TWO SITE
DP013	SW-11	DISPOSAL AREA AT WARRIOR PARK	PRIORITY TWO SITE
OT016	IS-3	RECIPROCATING ENGINE TEST CELL - BLDG 2150	PRIORITY TWO SITE
OT017	IS-4	FORMER JET ENGINE TEST STAND	PRIORITY TWO SITE
DP022	SW-4	WASTE DISPOSAL N OF BLDG 2451	PRIORITY TWO SITE
DP024	SW-7	WASTE DISPOSAL S OF TAXIWAY #10	PRIORITY TWO SITE
SD031	PS-10	FUEL TRUCK MAINTENANCE FACILITY	PRIORITY TWO SITE
FT032	FT-2	FIRE TRAINING AREA	PRIORITY TWO SITE
SS039	SS-39	ORPHAN TCE PLUMES	PRIORITY THREE SITE

Figure 1-2

Fairchild Air Force Base IRP Sites

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/29/2016

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Restoration Program Site Location

Installation Boundary

SS039 Approximate On-Site Plume

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 3/9/2018 Project No. J130130

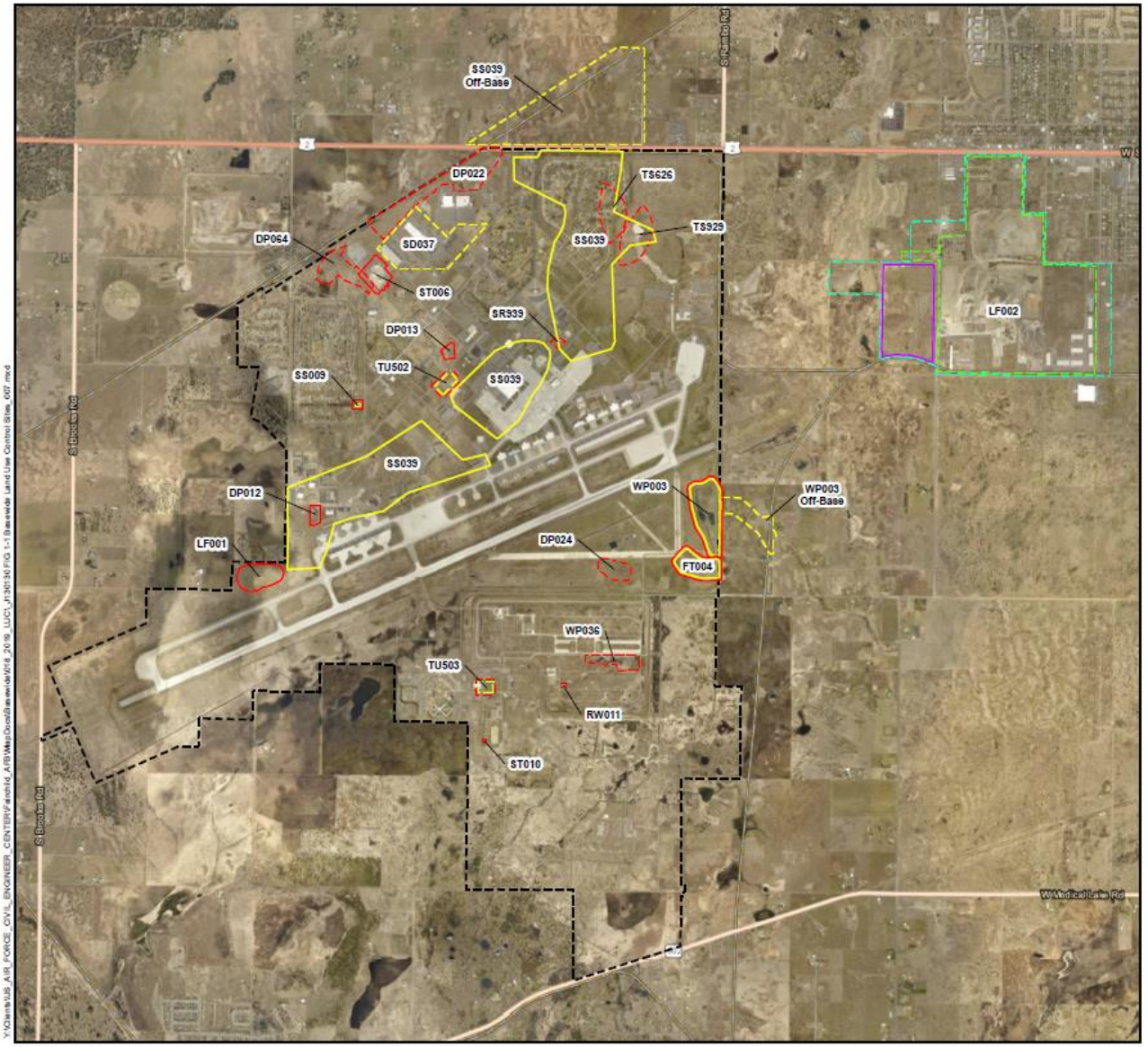


Figure 1-3

Basewide Land Use Control Sites

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2018

0 0.5 1 Miles

0 0.5 1 Kilometers

- Final Groundwater Use Restriction Area
- Final Soil Disturbance Restriction Area
- Interim Groundwater Use Restriction Area
- Interim Soil Disturbance Restriction Area
- LF002 Land Use Control Area I: Groundwater Use, Potential Vapor Intrusion, and Soil Use
- LF002 Land Use Control Area II: Groundwater Use and Potential Vapor Intrusion
- LF002 Land Use Control Area III: Monitoring Well Protection
- Installation Boundary

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Customer-Focused Environmental & Industrial Solutions

Drawn By: NJ Date Drawn/Revised: 12/31/2019 Project No. J130130



Figure 4-1

Craig Road Landfill (LF002)
Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

Craig Road Landfill (LF002) Site Boundary



Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 5/12/2015 Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\J130130 FIG 1 Craig Road Landfill LF002 Site Location Map.mxd

Figure 4-2
Craig Road Landfill (LF002) Groundwater Elevations and TCE Concentrations (September 2021)

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, March 2018

0 500 1,000 Feet
0 150 300 Meters

- Monitoring Wells and Extraction Wells (Elevation values are in FT AMSL)
- Approximate Paleochannel Extent (Basalt A Not Present)
- 10-ft Groundwater Elevation Contour (in Feet Above Mean Sea Level)
- 5-ft Groundwater Elevation Contour (in Feet Above Mean Sea Level)
- Groundwater Flow Direction
- Groundwater Capture Zone
- Craig Road Landfill (LF002) Site Boundary
- TCE Groundwater Plume above 5 ug/L

Notes:

ug/L = micrograms per liter
MP Elev. = measured point elevation
Ft. AMSL = feet above mean sea level
SWL = static water level
GW Elev. = groundwater elevation
NM = not measured
TCE = Trichloroethene

1. Groundwater elevations are based on measured and modeled data for the Entablature Section and the Alluvial Channel. Wells MW-95, MW-96, MW-141, MW-600B and MW-601 are completed in the Colonnade Section of the Basalt A. Water levels in these wells are considered approximate.
2. MW-23 is a perched zone in the alluvium. The groundwater elevation was not used.

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: NJ | Date Drawn/Revised: 3/25/2022 | Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\Basewide\2024_RAO_2021_AAR\J130130 FIG 2-3B Groundwater Elevations and TCE Concentrations (September 2021).mxd



Figure 4-3

Craig Road Landfill (LF002) Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 250 500 Feet

0 75 150 Meters

- Extraction Well
- Monitoring Well
- Remediation Well
- Railroad
- Craig Road Landfill (LF002) Site Boundary
- Northeast Disposal Area (NDA)
- Southeast Disposal Area (Rubble Area)
- Southwest Disposal Area (SDA)

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 1/18/2016 Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\LF002\JH 301 30 FIG 2 Craig Road Landfill LF002 Site Map.mxd

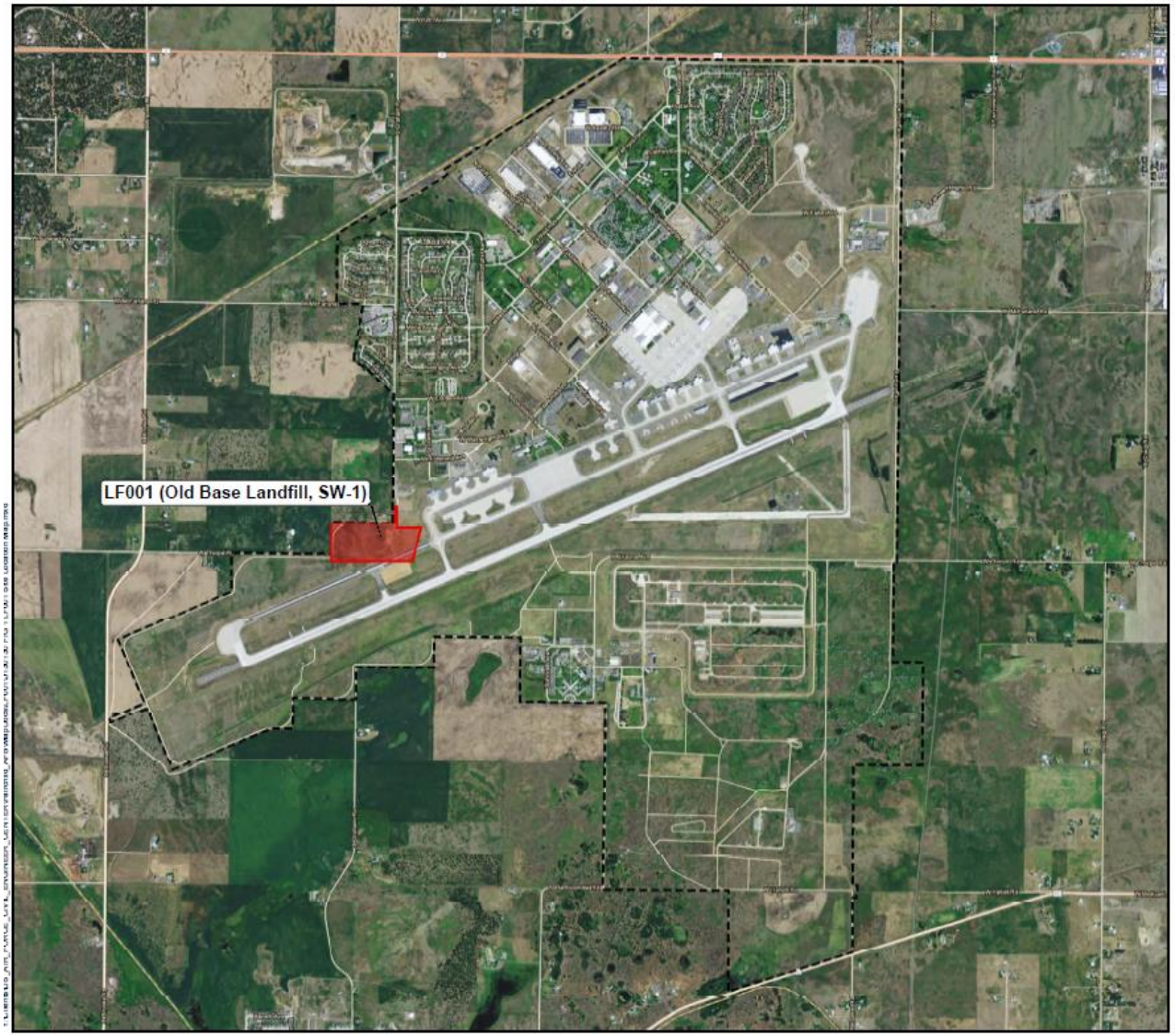


Figure 5-1

LF001 (Old Base Landfill, SW-1)
Site Location Map

Fairchild AFB, WA

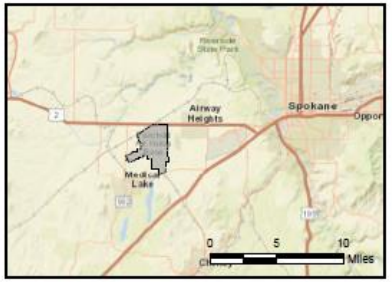


Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

LF001 (Old Base Landfill, SW-1) Site Boundary



Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 5/24/2016 Project No. J130130

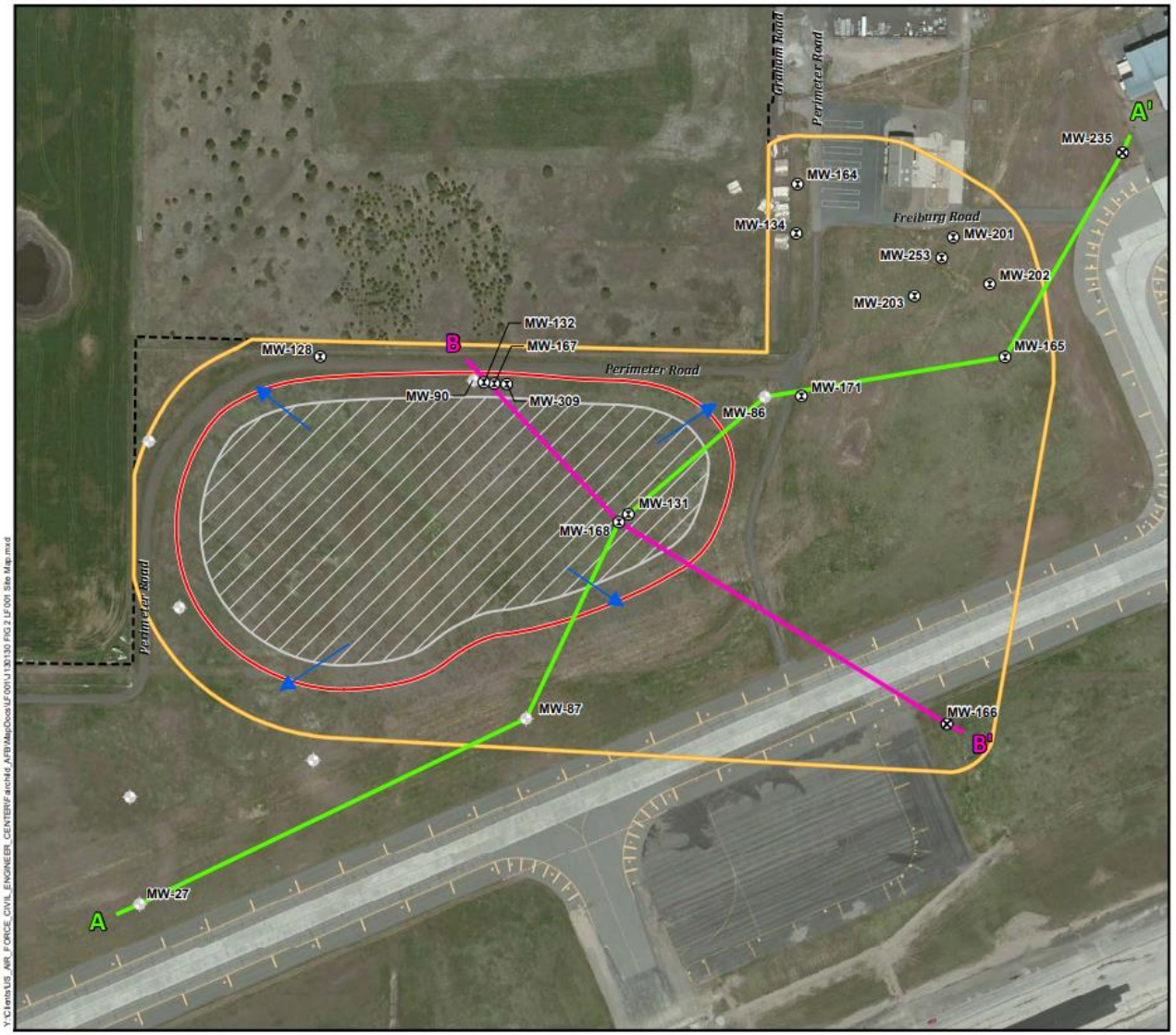


Figure 5-2

LF001 (Old Base Landfill, SW-1) Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 200 400 Feet
0 60 120 Meters

- Decomissioned Monitoring Well
- Alluvial Aquifer Monitoring Well
- RA-O Basalt A Monitoring Well
- Groundwater Flow Direction
- Cross Section A to A'
- Cross Section B to B'
- Installation Boundary
- Approximate Landfill Boundary
- Groundwater Use Restriction Area
- Soil Disturbance Restriction Area

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 5/24/2016 | Project No. J130130

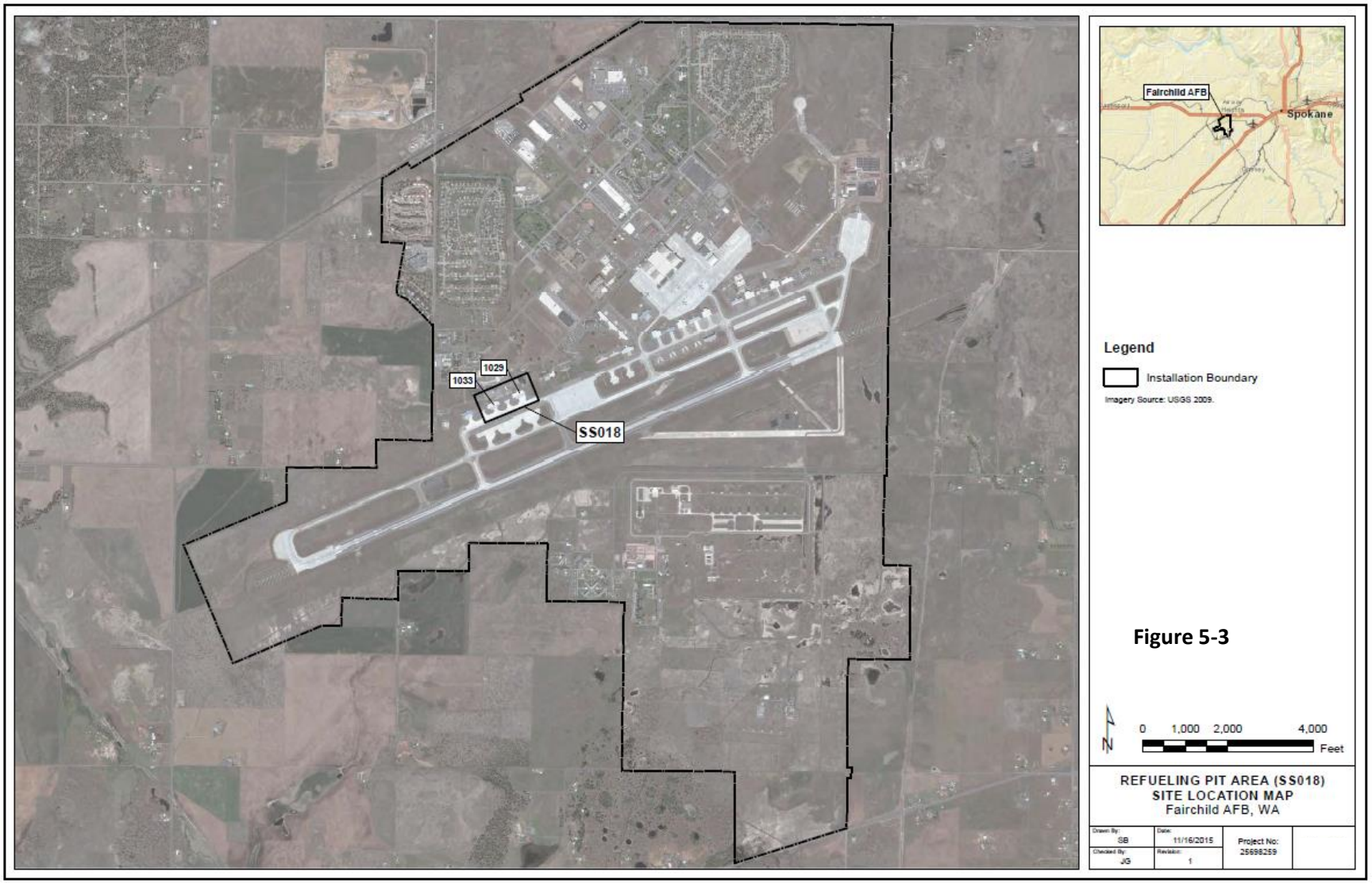

1029
1033
SS018
Fairchild AFB
Spokane
Legend
Installation Boundary
Imagery Source: USGS 2009.
0 1,000 2,000 4,000
Feet
REFUELING PIT AREA (SS018)
SITE LOCATION MAP
Fairchild AFB, WA
Drawn By: SB
Date: 11/16/2015
Checked By: JG
Revision: 1
Project No: 25698259

Figure 5-3



Figure 5-4

SS018 Refueling Pit Area Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 125 250 Feet
0 40 80 Meters

Monitoring Well

Free Product Recovery Well

Presumed Groudwater Flow Direction

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 4/5/2018 Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\Basewide\008_OU2_ESD\J130130 FIG 02-04 SS018 Site Map.mxd

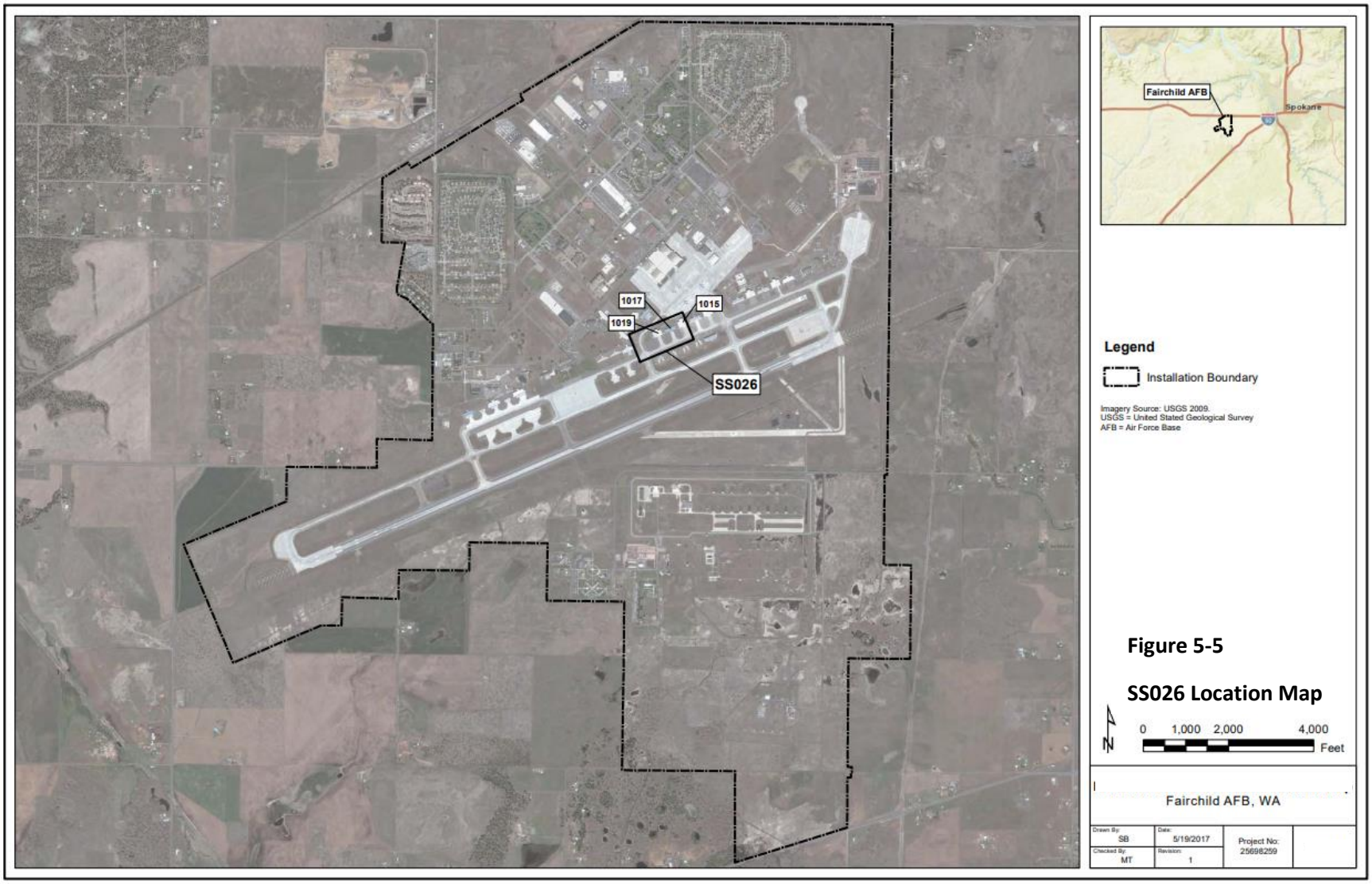

1017
1015
1019
SS026
Fairchild AFB
Spokane
Legend
Installation Boundary
Imagery Source: USGS 2009.
USGS = United Stated Geological Survey
AFB = Air Force Base
Figure 5-5
SS026 Location Map
N
0 1,000 2,000 4,000
Feet
Fairchild AFB, WA
Drawn By: SB
Date: 5/19/2017
Checked By: MT
Revision: 1
Project No: 25698259



Figure 5-6

Fire Training Area (FT004)
Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

Fire Training Area (FT004) Site Boundary



Bay West

Drawn By: SG Date Drawn/Revised: 1/30/2015 Project No. J130130

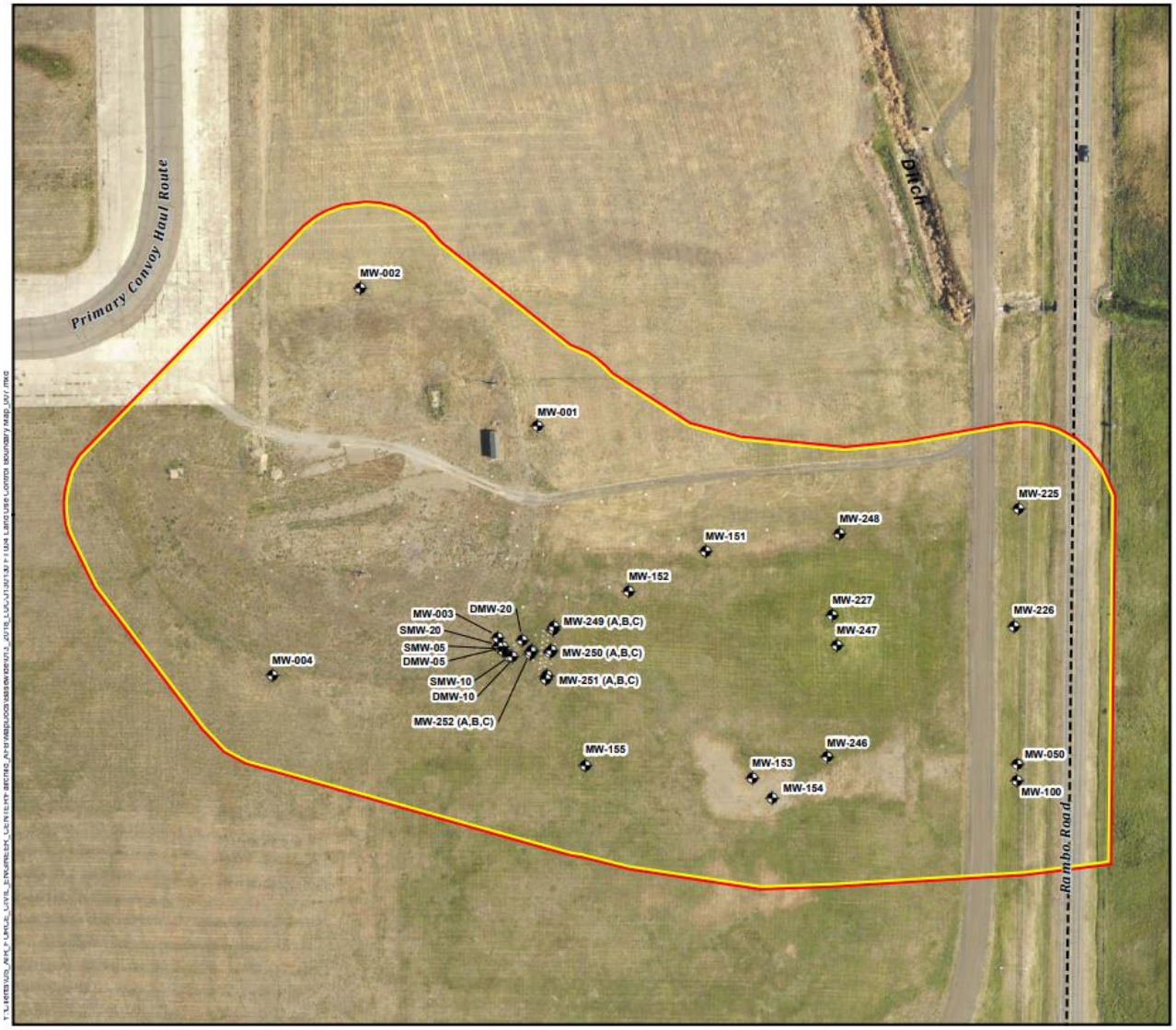


Figure 5-7

Fire Training Area (FT004)
Site Layout Map



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 100 200 Feet
0 30 60 Meters

- Monitoring Well
- Installation Boundary
- FT004 Groundwater Use Restriction Area
- FT004 Soil Disturbance Restriction Area

Bay West
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Drawn By: SG Date Drawn/Revised: 9/27/2018 Project No. J130130



Figure 5-8

WP003 (WW-1)
Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

WP003 Site Boundary



Bay West

Drawn By: SG Date Drawn/Revised: 1/29/2015 Project No. J130130

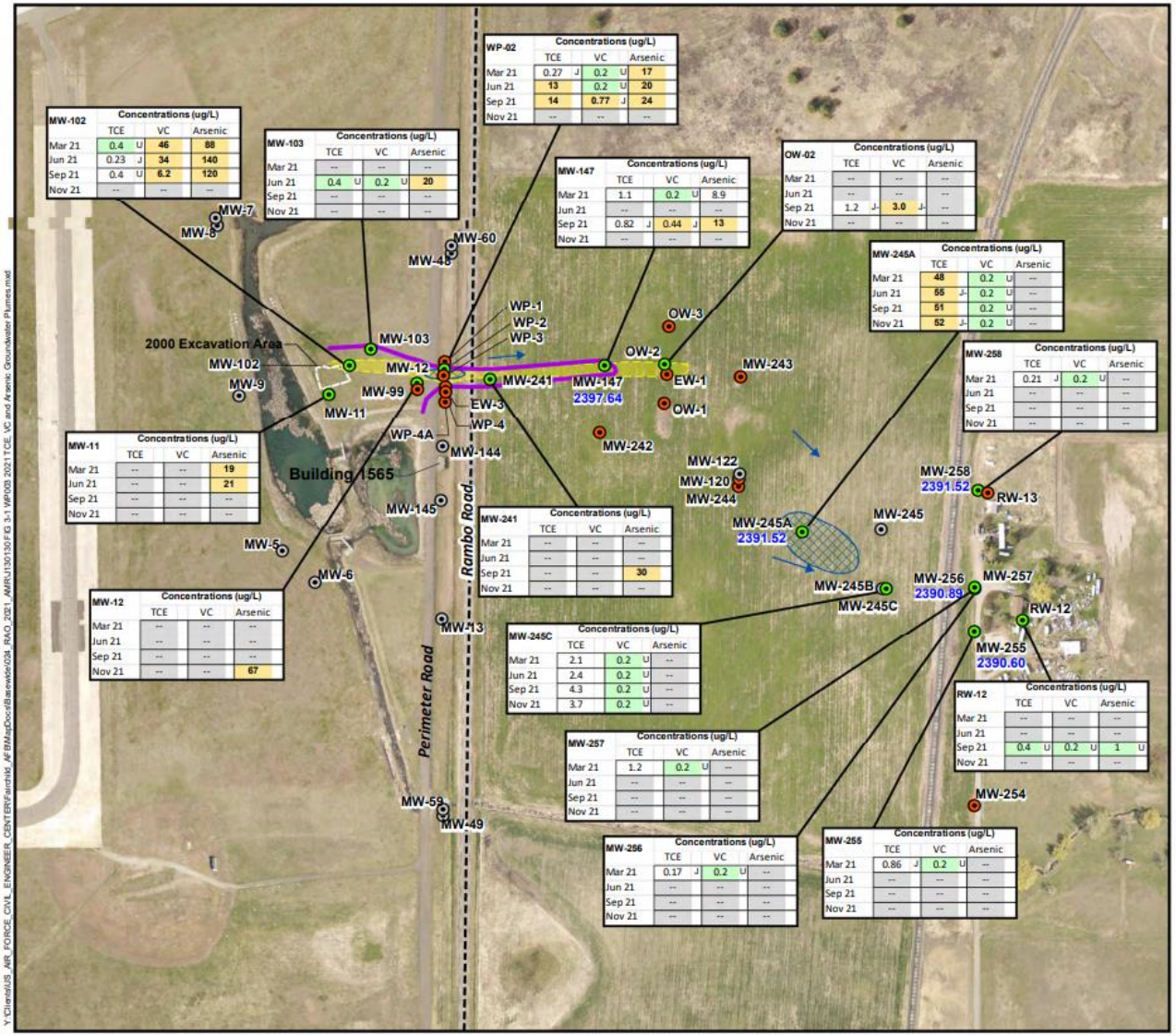


Figure 5-9

WP003 (WW-1) Site

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 200 400 Feet
0 60 120 Meters

- Wells sampled in 2021
- Wells not sampled in 2021
- Decommisioned Wells
- Groundwater Flow Direction
- Installation Boundary
- 2021 Maximum seasonal extent of arsenic greater than background (10 ug/L)
- 2021 TCE plume greater than a PAL of 5 ug/L
- 2021 VC plume greater than a PAL of 0.2 ug/L

Project Action Levels (PAL)	
Bolded and highlighed values as shown below are greater than PAL or Background	
Trichlorethene (TCE)	5
Vinyl Chloride (VC)	0.2
Arsenic (Background)	10
Below Detection	
Not Sampled/Analyzed	--

U - Constituent not detected above listed value
J- Estimated concentration

NOTES:
µg/L - micrograms per liter
PAL - project action level
TCE - Trichloroethene
VC - Vinyl Chloride
Arsenic concentrations are in dissolved forms

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SC Date Drawn/Revised: 2/28/2022 Project No. J130130

Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\Basewide\02d_RAO_2021_AMR\J130130FIG 3-1 WP003 2021 TCE, VC and Arsenic Groundwater Plumes.mxd



Figure 6-1

Reciprocating Engine Shop Building 2150, IS-3 (OT016) Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

Reciprocating Engine Shop, Building 2150, IS-3 (OT016) Site Boundary



Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 2/3/2017 Project No. J130130

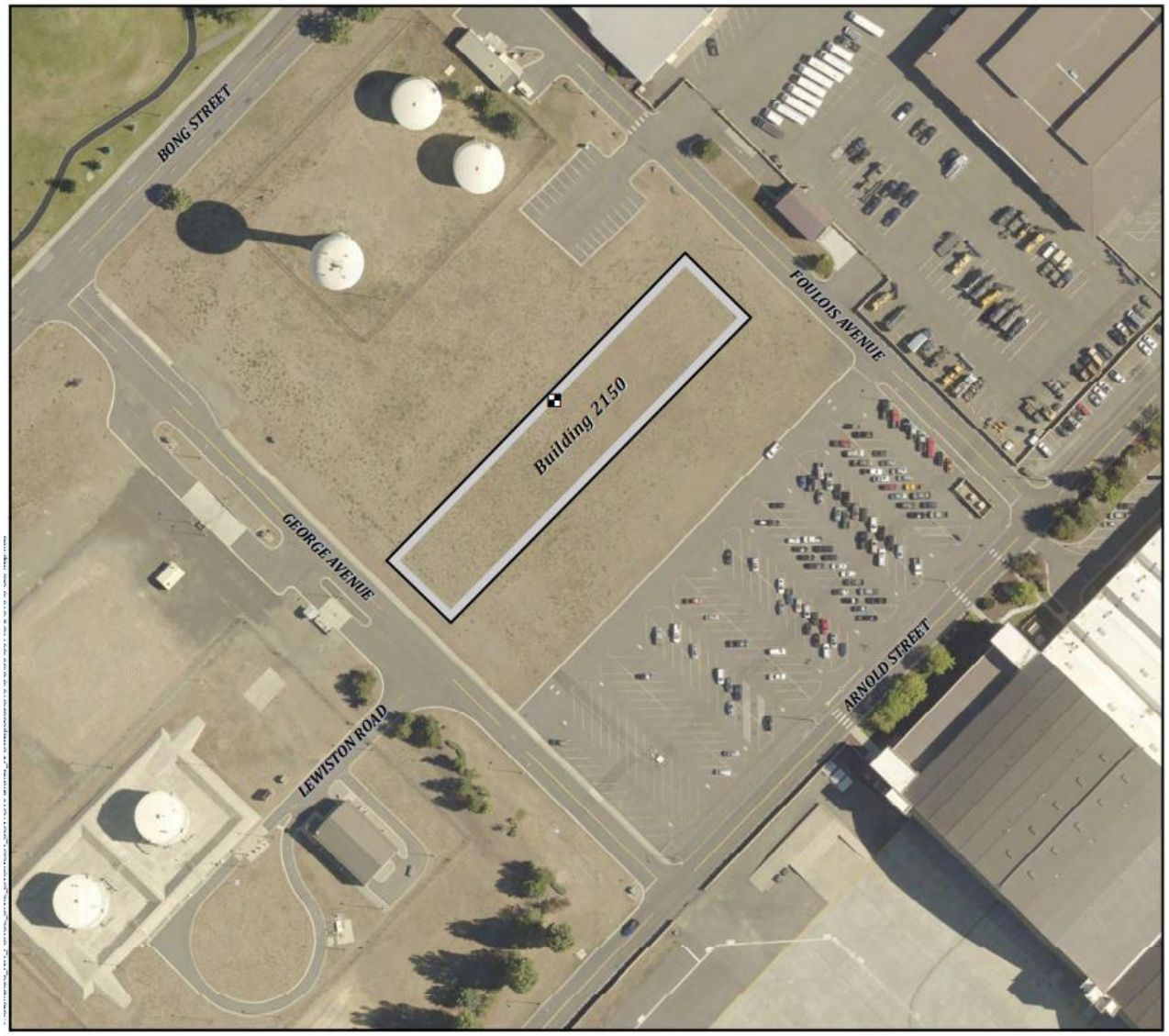


Figure 6-2

Reciprocating Engine Shop Building 2150, IS-3 (OT016) Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 100 200 Feet
0 30 60 Meters

Former Sump Location

Former Building Footprint

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 8/13/2017 Project No. J130130



Y:\Client\US_AIR_FORCE_CNTL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\OT017\J130130 FIG 16-4 OT017 Site Location Map.mxd

Figure 6-3

OT017 - Jet Engine Test Stand Building 3000 Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

OT017 - Jet Engine Test Stand Building 3000 Site Boundary



Bay West
Customer-Focused Environmental & Inspection Solutions

Drawn By: SG Date Drawn/Revised: 5/22/2015 Project No. J130130



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\OT017\J130130 FIG 10-2 OT017 Sample Location Map.mxd

Figure 6-4

OT017-Jet Engine Test Stand Building 3000 Site Map



Map Projection: NAD 1983 UTM Zone 11N. Meters
Basemap: ESRI World Imagery WMS

0 50 100 Feet
0 15 30 Meters

(940) DRO/Jet A Concentration in Soil (See Notes Below)

Proposed Direct Push Boring

Monitoring Well (Abandoned in 2010; MW-37 abandoned in 1999)

Water Flow Direction

Approximate Area of Former Excavation

Previous Sampling Grid Detections

- Not Sampled
- Non-Detect - 200 DRO/Jet A
- 200 - 2,000 DRO/Jet A
- > 2,000 DRO/Jet A

NOTES:

1) All results reported in mg/kg
2) The current MTCA Method A standard is 2,000 mg/kg DRO for unrestricted land use
3) Samples were selected from the grids, confirmation excavation samples, and randomly during RA-O performed over the period of 2001 - 2004.

Bay West

Drawn By: SLI Date Drawn/Revised: 1/1/2015 Project No. J130130



Figure 6-5

ST006 (PS-1)
Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

ST006 (PS-1) Site Boundary



Bay West
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Drawn By: SG Date Drawn/Revised: 10/13/2017 Project No. J130130

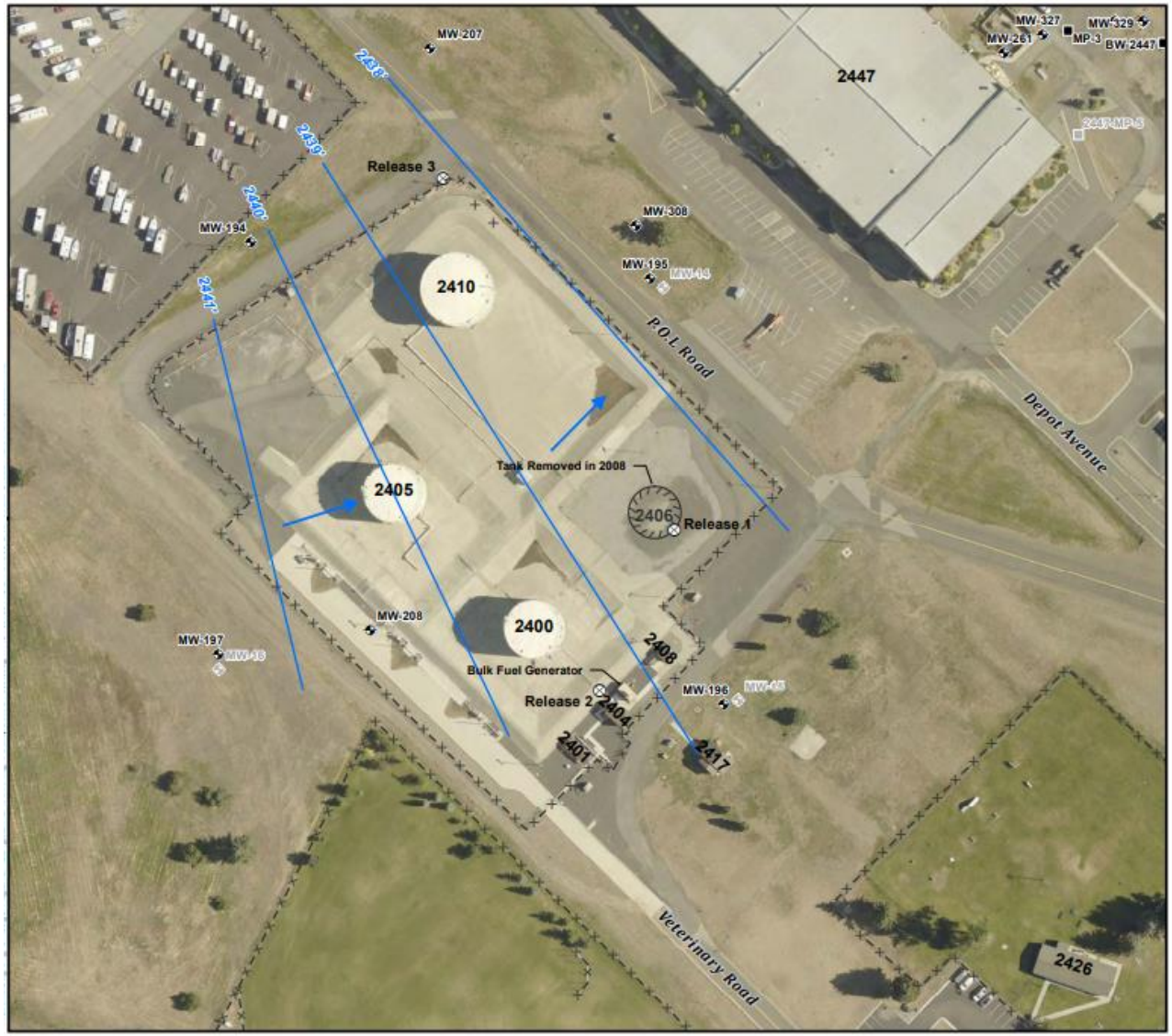


Figure 6-6

ST006 (PS-1) Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 100 200 Feet
0 30 60 Meters

- Abandoned Monitoring Well
- Abandoned Well
- Monitoring Well
- Well
- Fence
- Wet Season Groundwater Elevation Contour (Measured - March 2011)
- Approximate Location of Release
- Former Tank Location
- Groundwater Flow Direction
- 2441' Potentiometric Elevation (FT AMSL)

Bay West

Drawn By: SG Date Drawn/Revised: 10/13/2017 Project No. J130130



Figure 6-7

SS009 (Fuel Oil Storage at Wherry House) Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet

0 600 1,200 Meters

Installation Boundary

SS009 - Fuel Oil Storage Tank at Wherry Housing Site Boundary



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Drawn By: SG Date Drawn/Revised: 7/25/2016 Project No. J130130

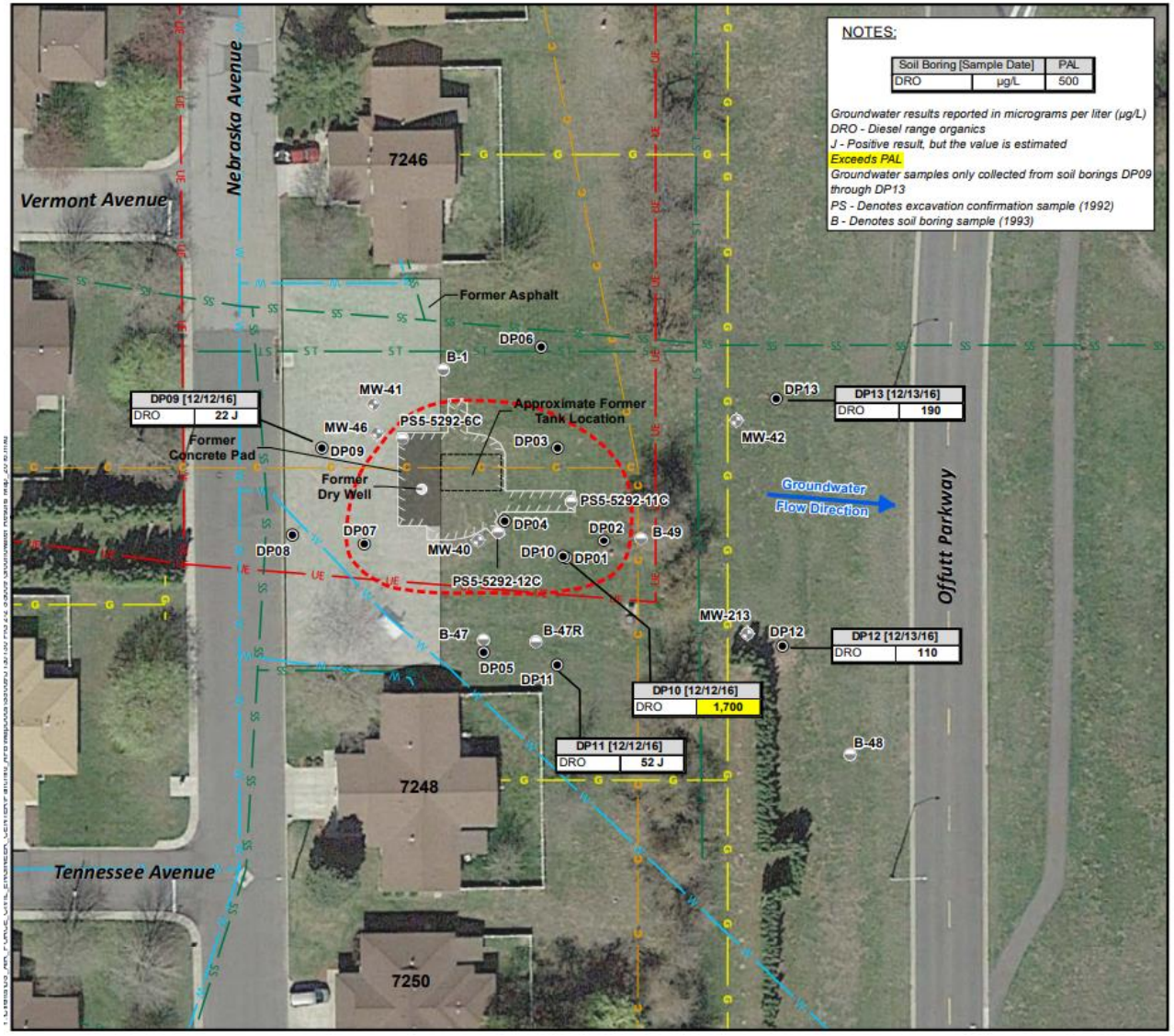


Figure 6-8

SS009 (Fuel Oil Storage Tank at Wherry House) Site Map



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: Google Earth Aerial Imagery, April 2016

0 40 80 Feet
0 10 20 Meters

- Direct Push Boring (2016)
- Previous Soil Sample (1992-1993)
- Previous Monitoring Well (Decomissioned in 1999)
- Groundwater Flow Direction
- Sanitary Sewer Line
- Storm Sewer Line
- Communication Line
- Water Line
- Gas Line
- Underground Electrical Line
- Approximate Former Tank Location
- Approximate Area of Former Excavation
- Approximate Area of Petroluem Contamination Based on Saturated Soil and Groundwater Data

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG | Date Drawn/Revised: 4/5/2017 | Project No. J130130



Figure 6-9

ST010-P-4 Pumphouse 8
Site Location Map



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2018



Installation Boundary

ST010 Site Boundary



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Drawn By: N.J. Date Drawn/Revised: 10/15/2018 Project No. J130130

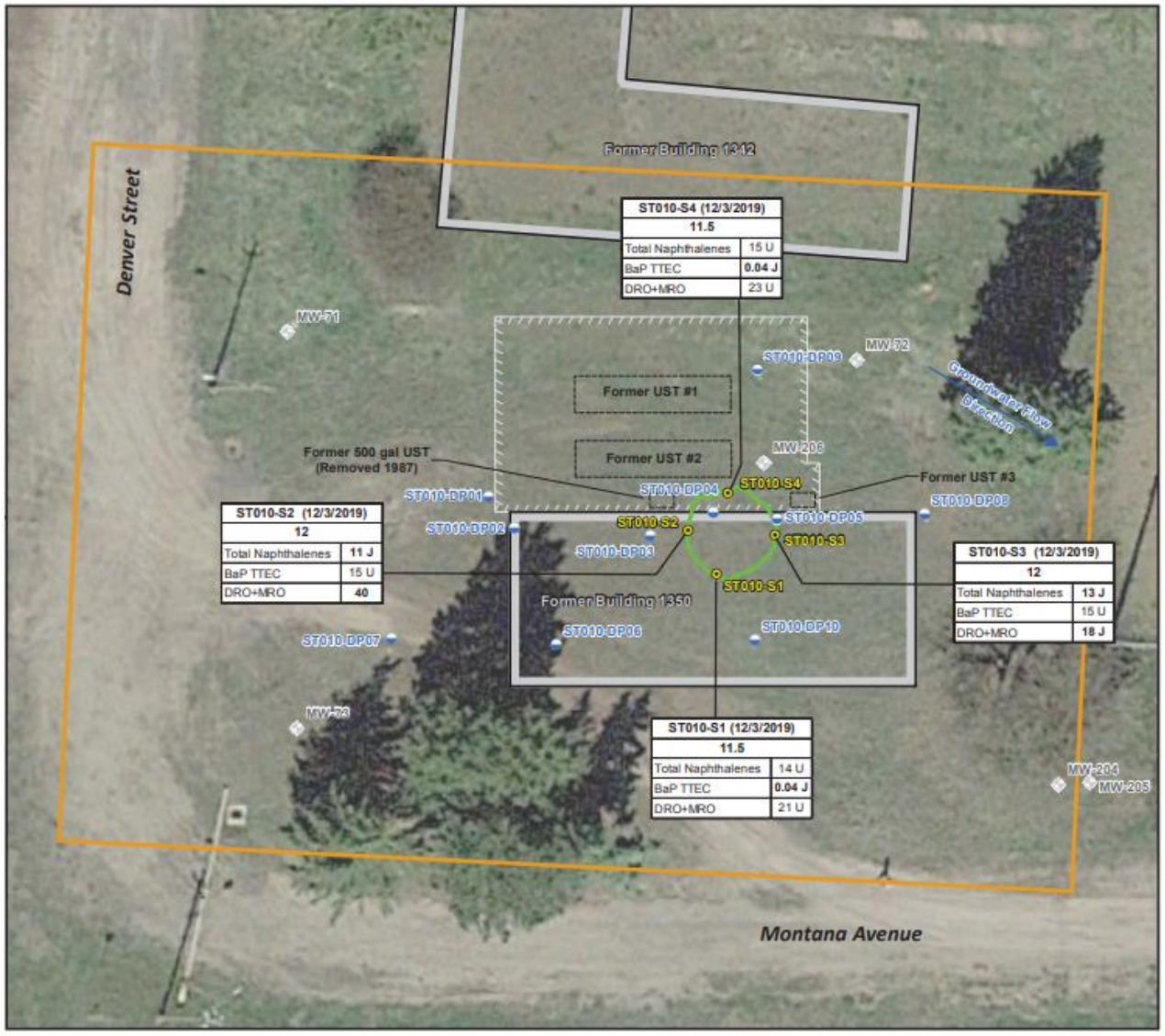


Figure 6-10

ST010-P-4 Pumphouse 8
Site Map



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: Google Earth Aerial Image, April 2016

0 20 40 Feet
0 5 10 Meters

- Confirmation Soil Sample Location
- Direct-Push Boring, Completed 2016
- Excavation Area (2019)
- ST010 Site Boundary
- Monitoring Well (Decommissioned in 1999)
- Approximate Former Tank Location
- Area of Removed Soils (1992)
- Groundwater Flow Direction

Location ID (Sample Date)		
Depth in feet below ground surface		
Analyte	Units	MTCA-A
Total Naphthalenes	µg/kg	5,000
BaP TTEC	µg/kg	100
DRO+MRO	mg/kg	2,000

Notes:

mg/kg - milligram per kilogram

µg/kg - micrograms per kilogram

MTCA-A - Model Toxics Control Act Method A Clean-up level

J - Positive result, but the value is estimated

U - Nondetect

DRO - diesel-range organics

MRO - motor oil-range organics

BaP TTEC - Benzo[a]pyrene total toxicity equivalent concentration

UST - underground storage tank

Detected results are in Bold

Bay West

Drawn By: MDH Date Drawn/Revised: 4/20/2020 Project No. J130130



Figure 6-11

SD031 Fuel Truck Maintenance Facility, Building 1060 Site Location

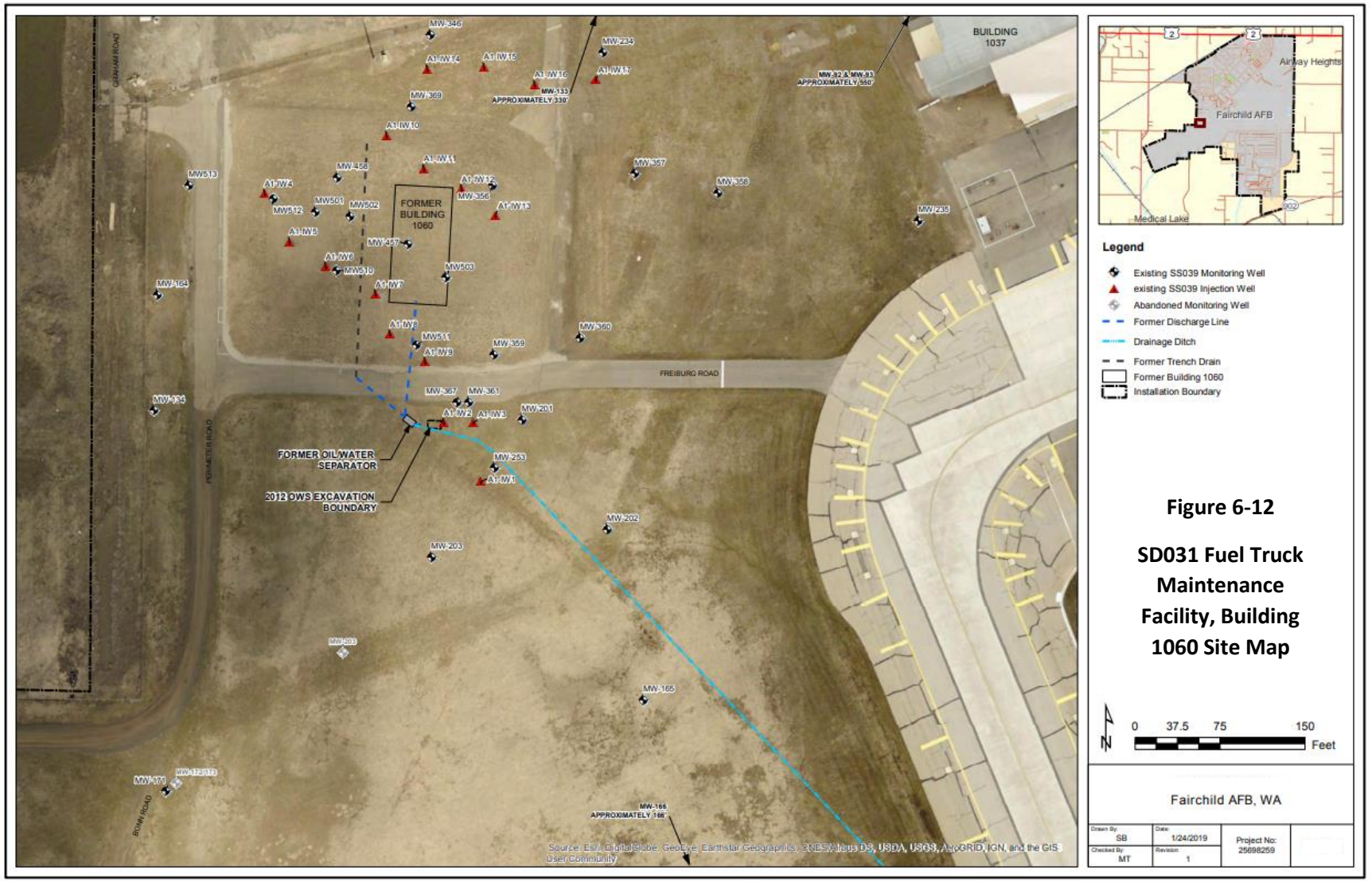


Figure 6-12

SD031 Fuel Truck Maintenance Facility, Building 1060 Site Map



Y:\Clients\US_AIR_FORCE_CIVIL_ENGINEER_CENTER\Fairchild_AFB\MapDocs\FT032\J130130 FIG 1 FT032 Site Location Map.mxd

Figure 6-13

Former Fire Training Area (FT032) Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS

0 2,000 4,000 Feet

0 600 1,200 Meters

Installation Boundary

Former Fire Training Area (FT032) Site Boundary



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Drawn By: SG Date Drawn/Revised: 11/22/2016 Project No. J130130

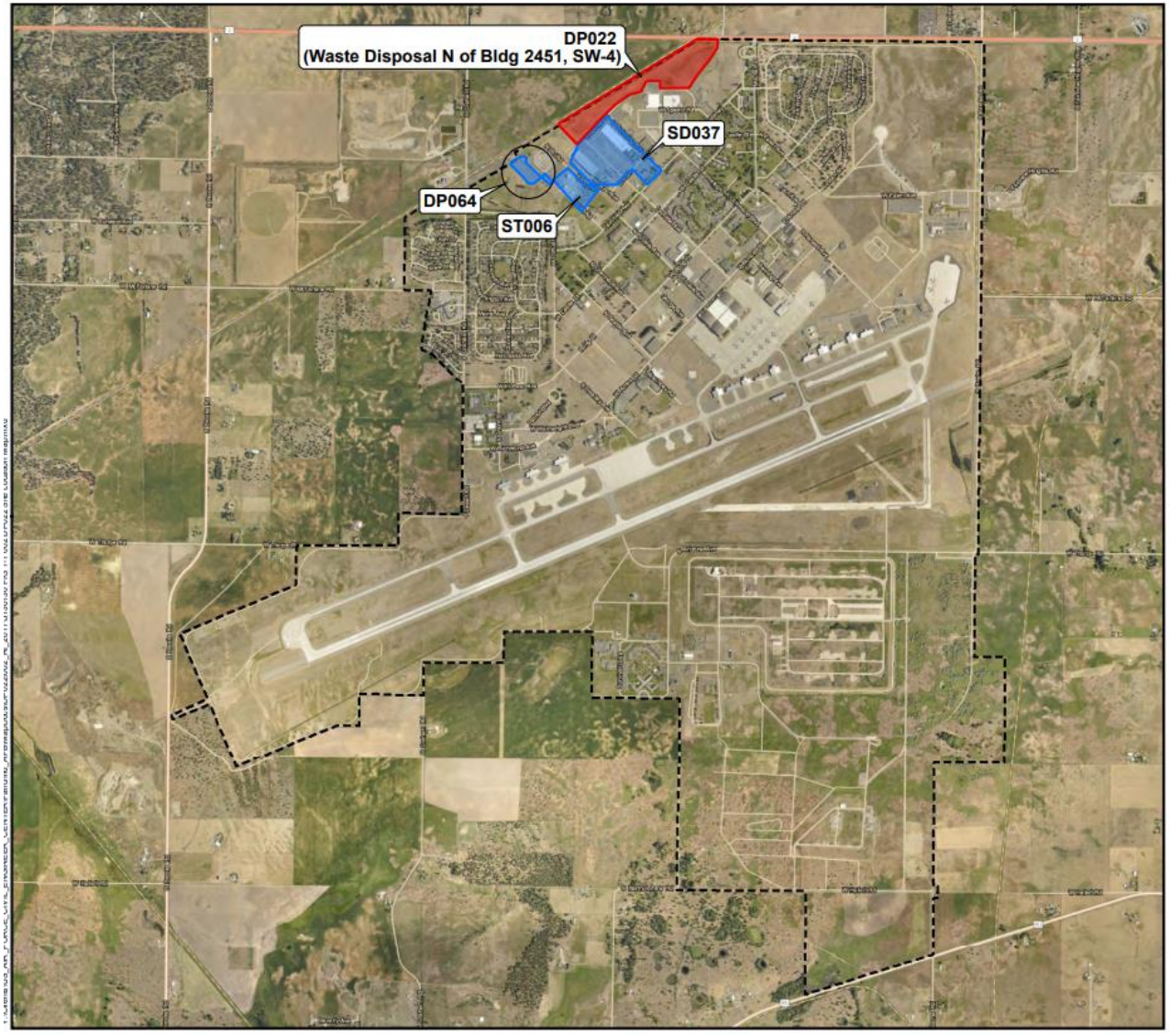


Figure 6-14

DP022 (Waste Disposal N of Bldg 2451) Site Location Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

DP022 Site Boundary

Other Site Boundaries (Labeled on Figure)



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Drawn By: SG Date Drawn/Revised: 6/4/2018 Project No. J130130



Figure 6-15

DP022 (Waste Disposal N of Bldg 2451, SW-4) Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 300 600 Feet
0 100 200 Meters

- Test Pit Location
- Monitoring Well Location
- Railroad
- Swale with Intermittent Surface Water
- Surface Elevation Contours (feet above mean sea level)
- Approximate Area of Investigation
- Former Geophysical Survey Grid (50 feet by 50 feet) and Approximate Location of Berms
- Installation Boundary

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Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 6/4/2018 Project No. J130130

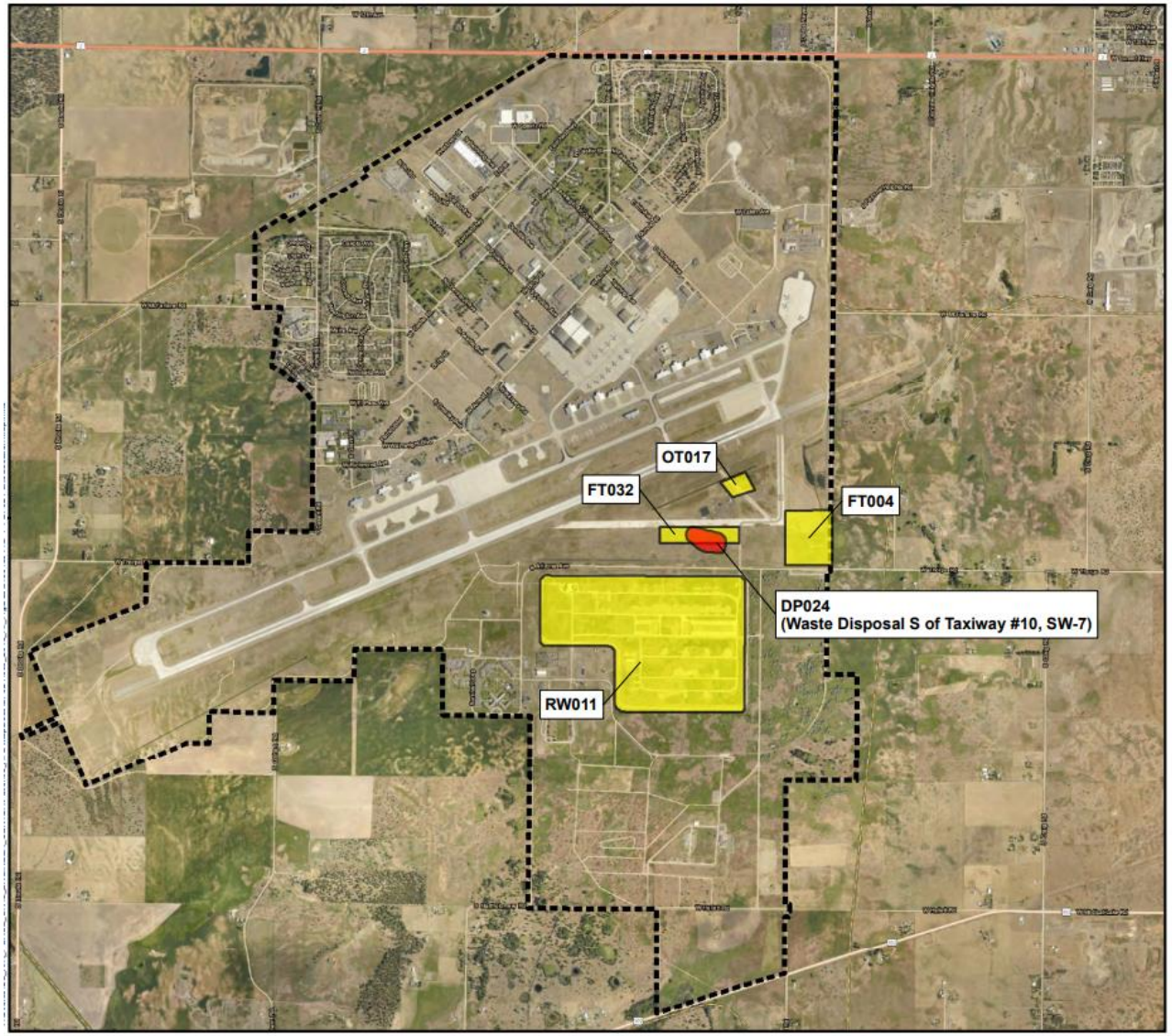


Figure 6-16

DP024 (Waste Disposal S of Taxiway #10, SW-7) Site Location Map

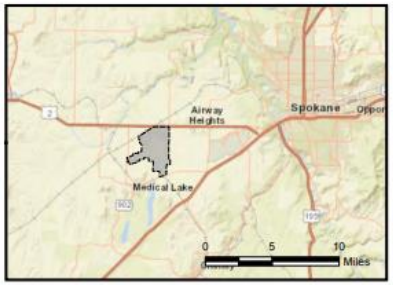
Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS, 6/26/2016

0 2,000 4,000 Feet
0 600 1,200 Meters

DP024
Approximate Site Boundary
OT017, FT032, FT004, RW011
Approximate Site Boundaries
Installation Boundary



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Date Drawn/Revised: 8/15/2018 Project No. J130130

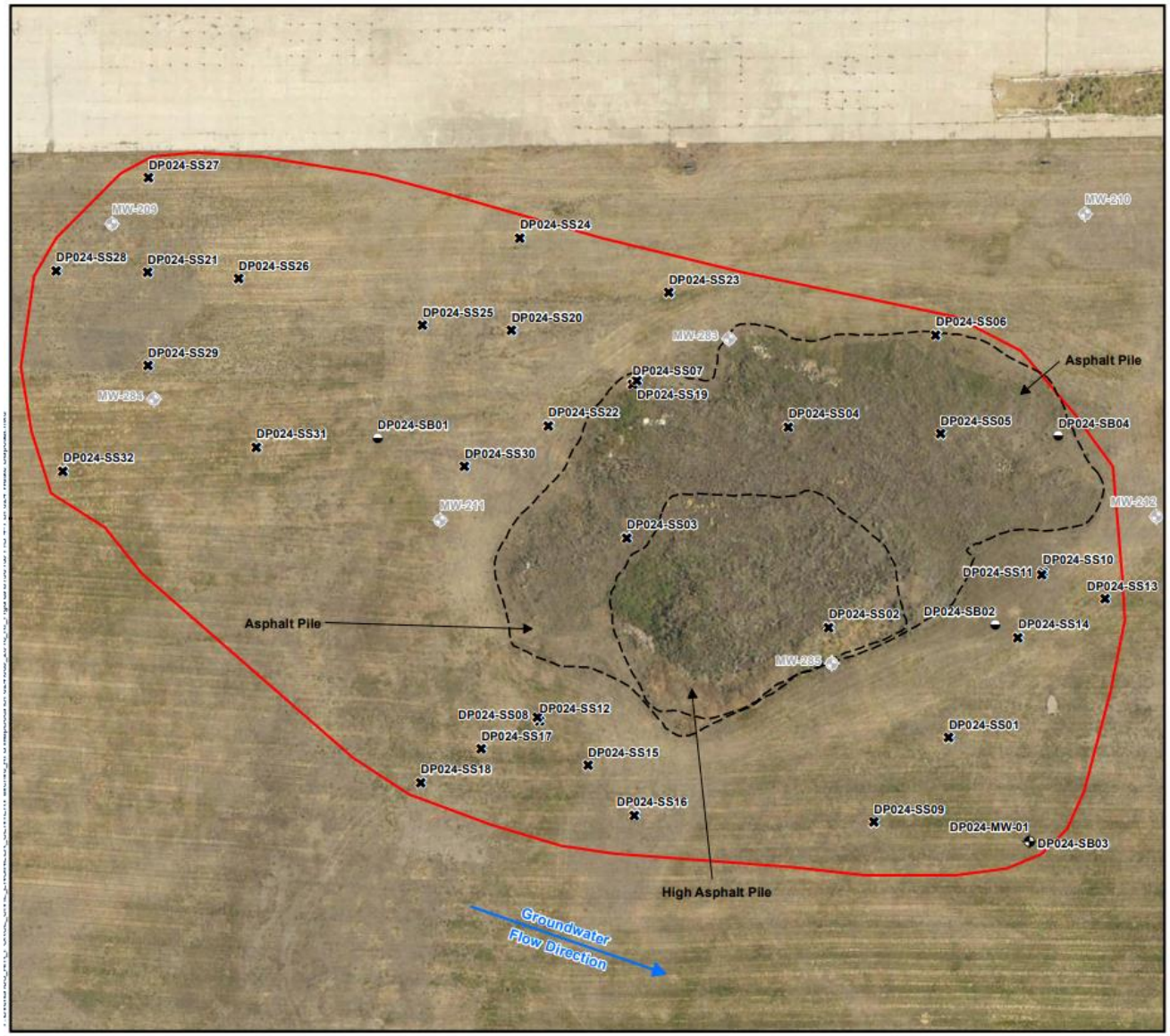


Figure 6-17

DP024 (Waste Disposal S of Taxiway #10, SW-7) Site Map



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery Web Map Service, 6/26/2016

0 100 200 Feet
0 30 60 Meters

- Monitoring Well Location
- Decommissioned Monitoring Well Location
- Soil Boring (No Groundwater Encountered)
- Discrete Soil Sample
- Asphalt Pile (Observed 2017)
- Approximate Area of Investigation

Bay West

Date Drawn/Revised: 8/15/2018 Project No. J130130

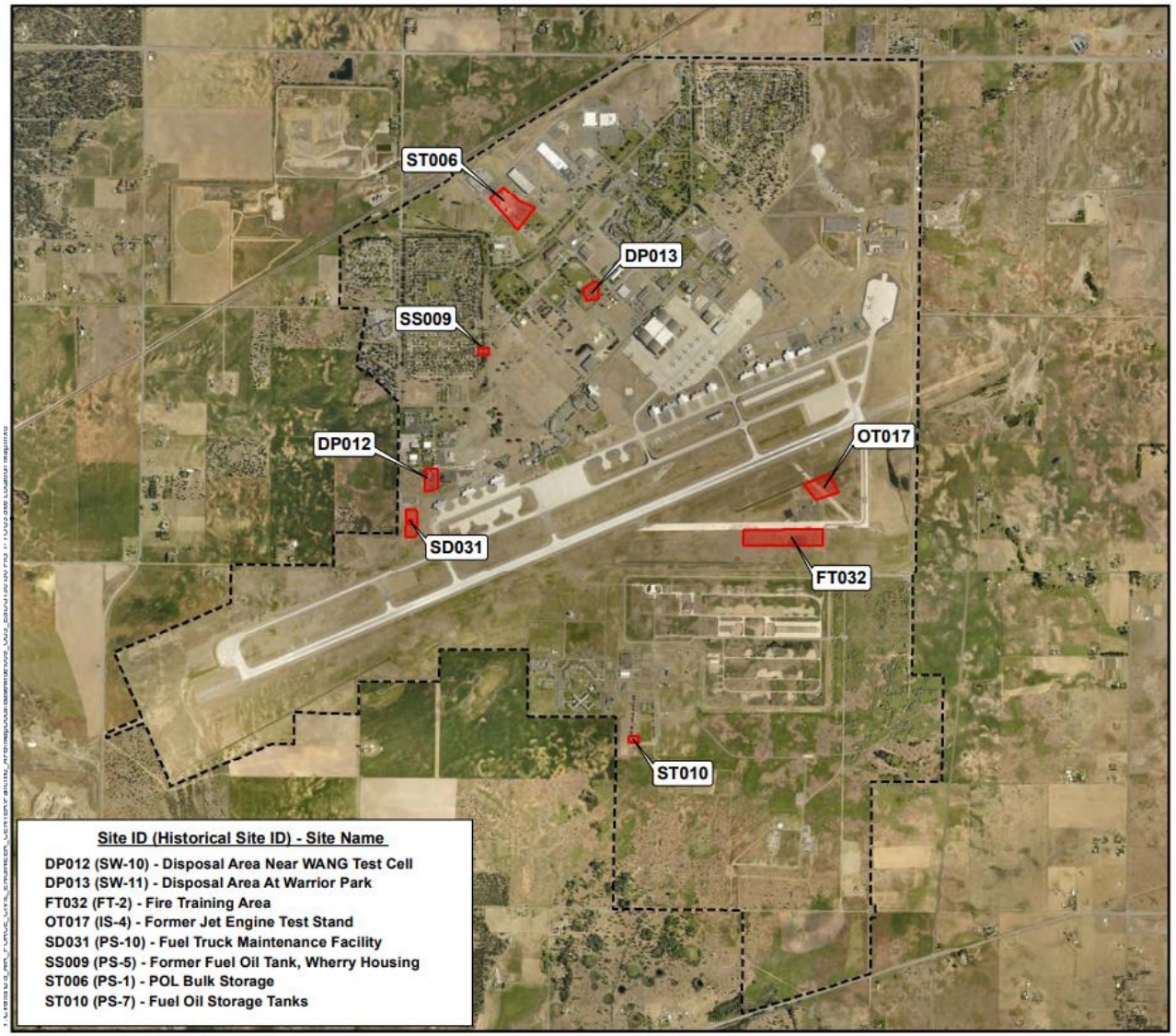


Figure 6-18

DP012 Disposal Area Near WANG Test Cell Site Location Map

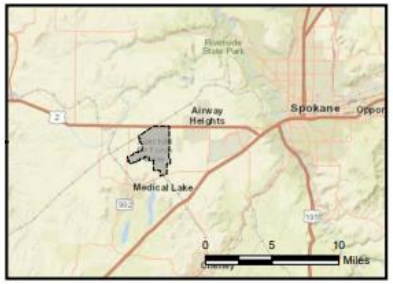


Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS 6/26/2016

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

Site Boundaries



Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 4/11/2018 Project No. J130130

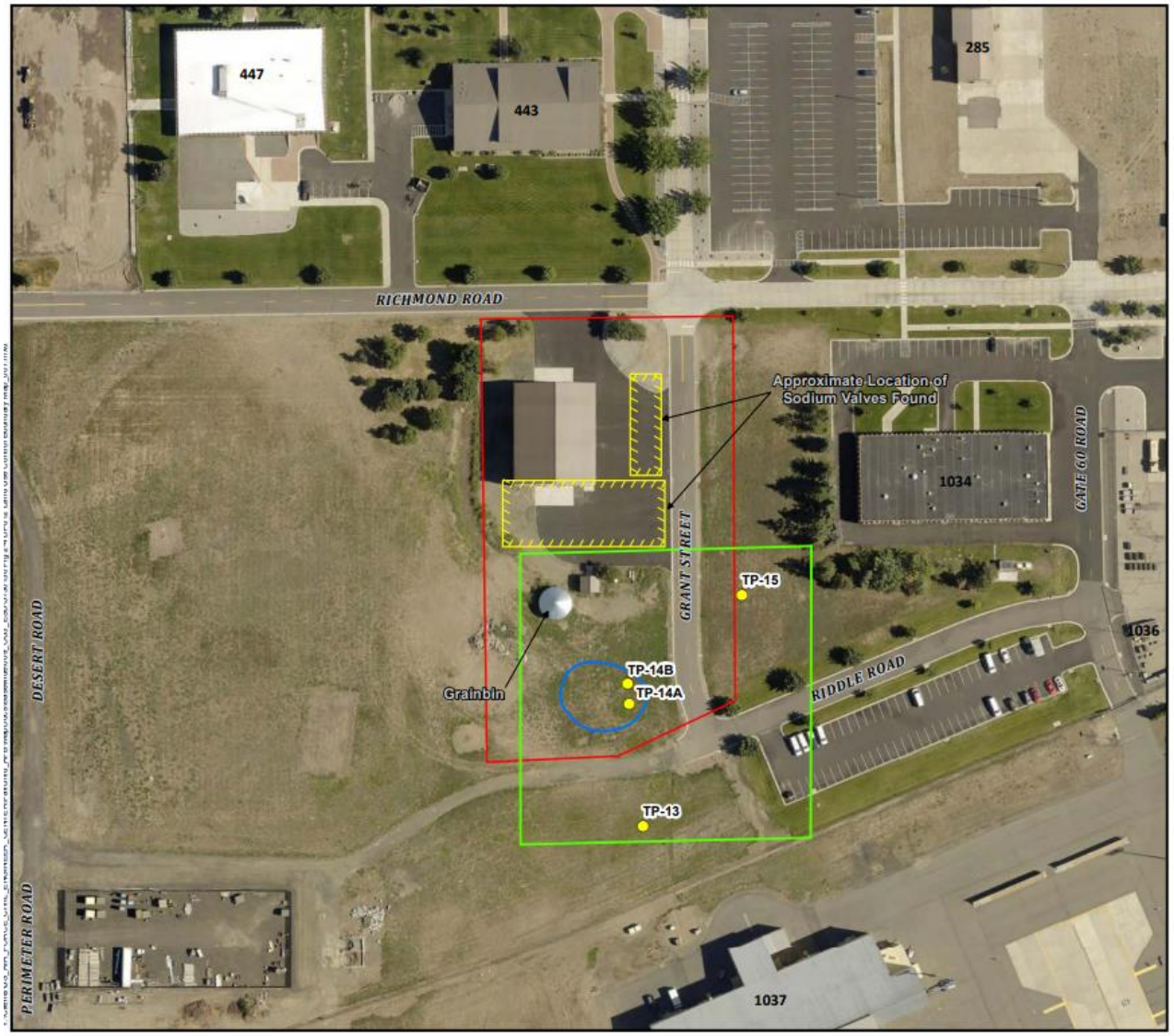


Figure 6-19

DP012 Disposal Area Near WANG Test Cell Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Aerial Imagery, 6/26/2016

0 100 200 Feet
0 30 60 Meters

- Test Pit
- Area where GPR records contain reflection patterns typical of disturbed subsurface material and buried scattered debris or objects (small)*
- Geophysical Survey Grid (300' X 300')
- Approximate Location Sodium Valves Found (Summer 2015)
- Soil Disturbance Restriction Area

* This data comes from the Limited Field Investigation Report, September 1992

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 4/11/2018 Project No. J130130

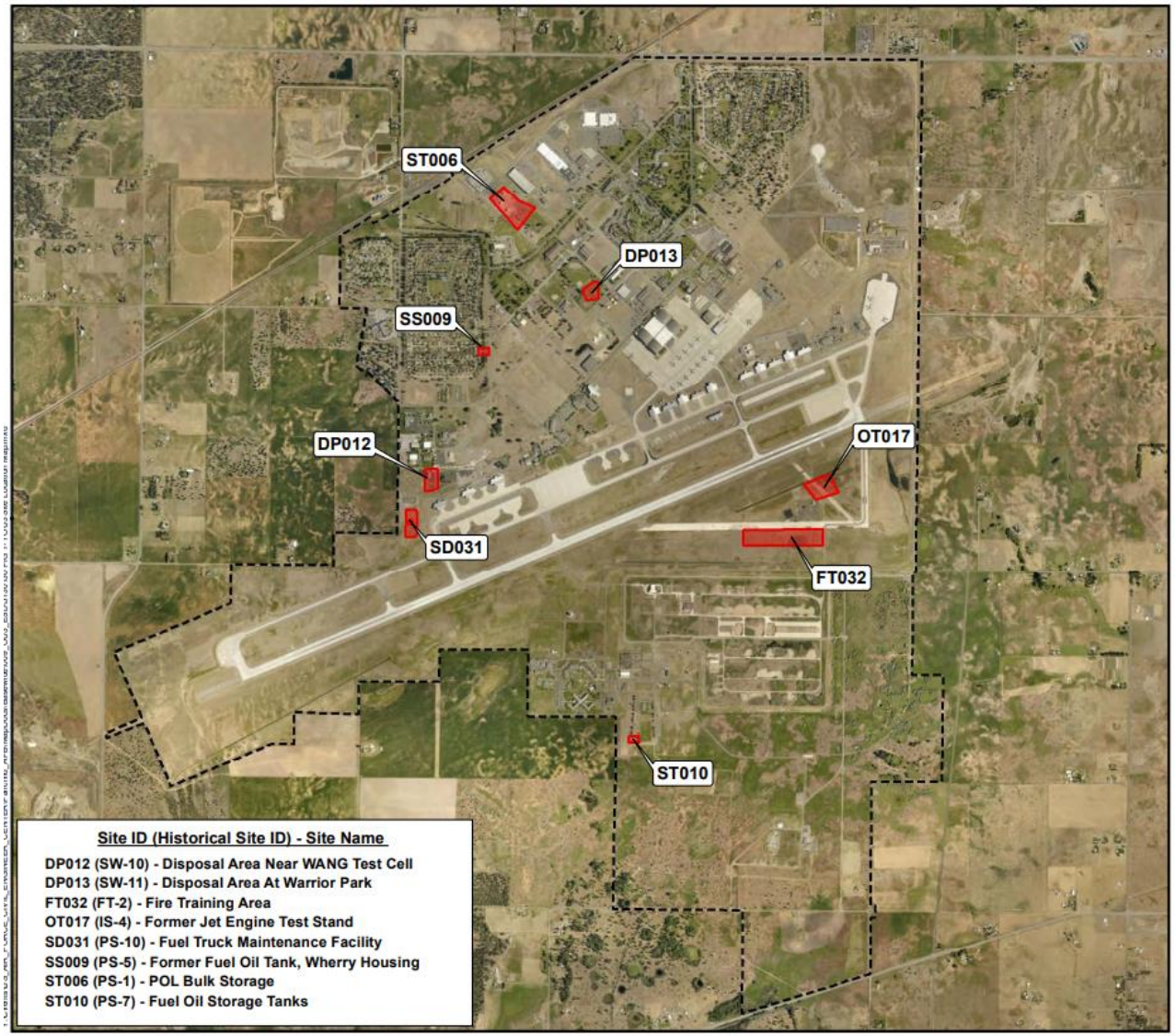


Figure 6-20

DP013 Disposal Area at Warrior Park Site Location Map

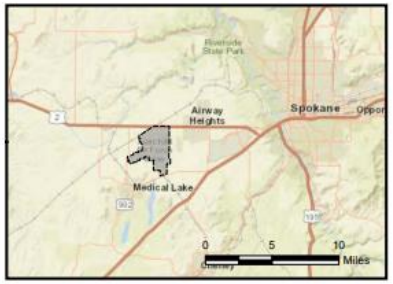


Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS 6/26/2016

0 2,000 4,000 Feet
0 600 1,200 Meters

Installation Boundary

Site Boundaries



Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 4/11/2018 Project No. J130130



Figure 6-21

DP013 Disposal Area At Warrior Park Site Map

Fairchild AFB, WA



Map Projection: NAD 1983 UTM Zone 11N, Meters
Basemap: ESRI World Imagery WMS 6/26/2018

0 100 200 Feet
0 30 60 Meters

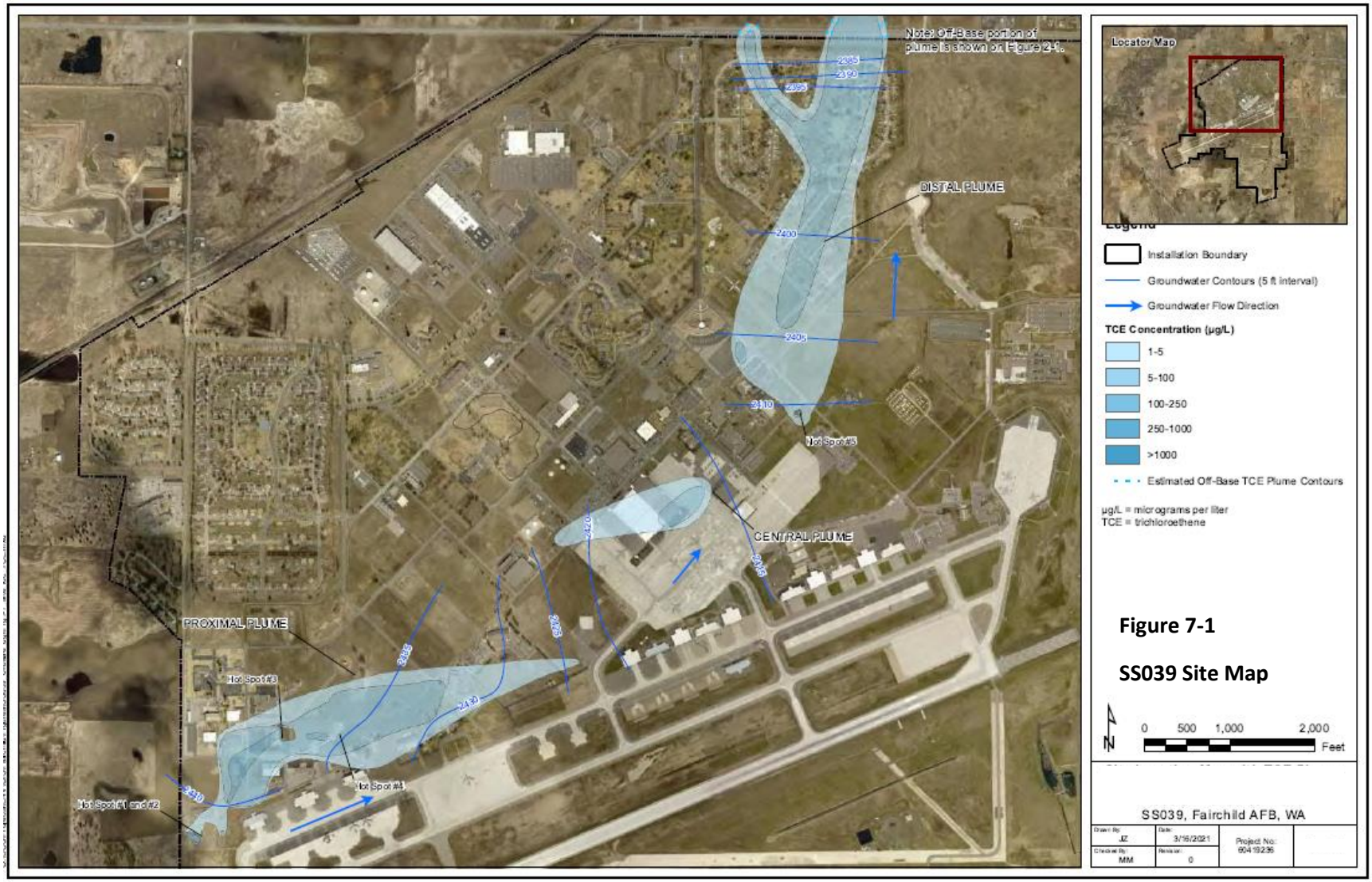
Approximate Location of Disposal Pits With Engine Valves

Soil Disturbance Restriction Area

Approximate Location of Buried Scrap Metal

Bay West
Customer-Focused Environmental & Industrial Solutions

Drawn By: SG Date Drawn/Revised: 4/11/2018 Project No. J130130


Note: Off-Base portion of plume is shown on Figure 2-1.
DISTAL PLUME
CENTRAL PLUME
PROXIMAL PLUME
Hot Spot #1 and #2
Hot Spot #3
Hot Spot #4
Hot Spot #5
2385
2390
2395
2400
2405
2410
2420
2425
2430
2435
2440
Locator Map
Legend
Installation Boundary
Groundwater Contours (5 ft interval)
Groundwater Flow Direction
TCE Concentration (µg/L)
1-5
5-100
100-250
250-1000
>1000
Estimated Off-Base TCE Plume Contours
µg/L = micrograms per liter
TCE = trichloroethene
Figure 7-1
SS039 Site Map
N
0
500
1,000
2,000
Feet
SS039, Fairchild AFB, WA
Drawn By: JZ
Date: 3/16/2021
Checked By: MM
Revision: 0
Project No: 604192.36





Legend

- Installation Boundary
- Weathered Basalt Well
- Alluvium Well
- Other Well
- Injection Well
- Temporary Injection Point
- Groundwater Flow Direction

CTC Contour (µg/L)

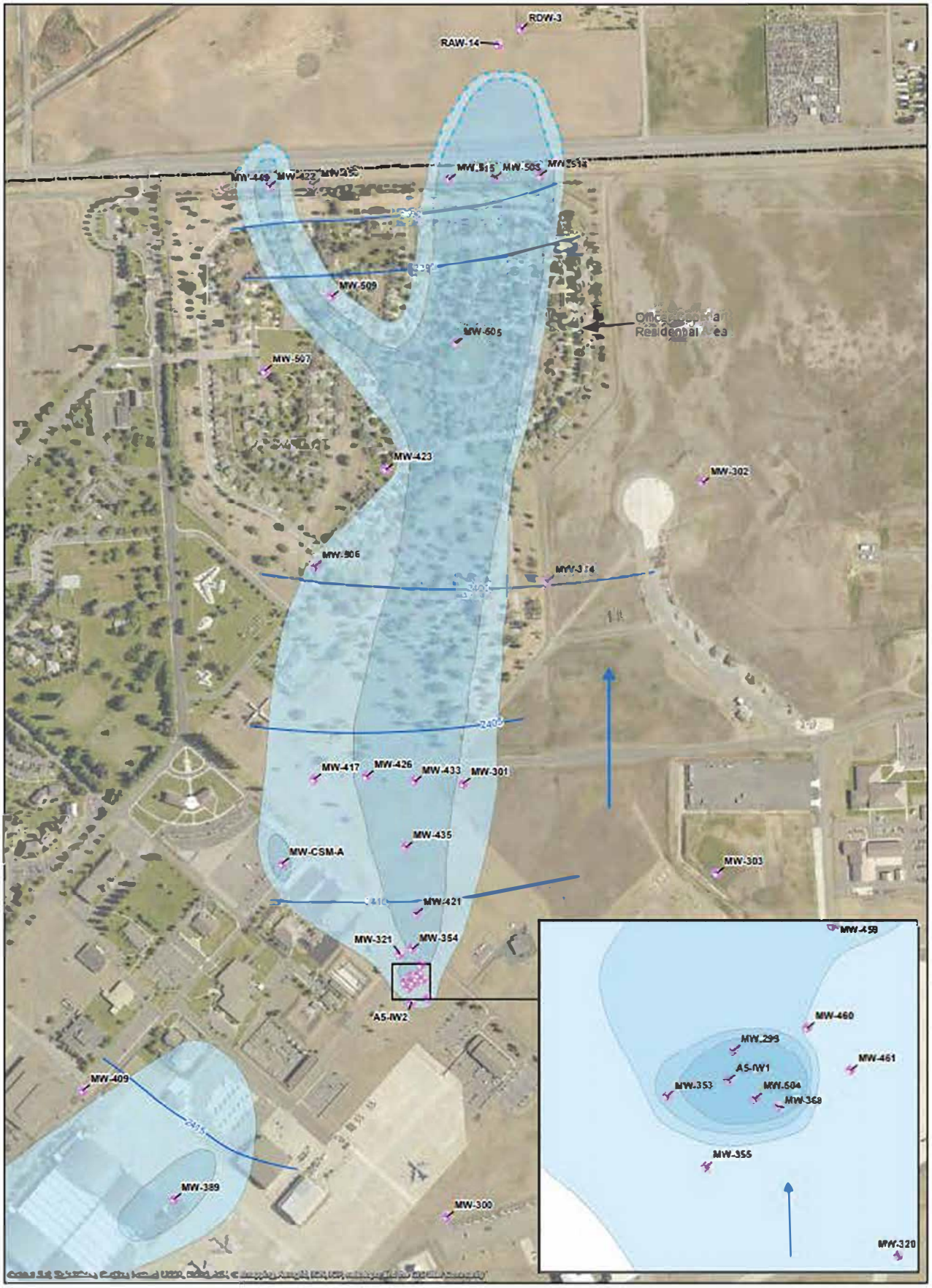
1 5 100 250

N

0 250 500 1,000 Feet

Distal CTC Plume in Alluvium and Weathered Basalt - November 2020
SS039, Fairchild AFB, WA

Drawn By:	Date:	
JZ	11/15/2021	**Figure 7-2**
Checked By:	Project No.	
EA	16170886	



Locator Map

Legend

- Weathered Basalt Monitoring Well
- Groundwater Flow Direction
- Groundwater Contours (5 foot interval, feet above mean sea level)
- Installation Boundary

µg/L = micrograms per liter
TCE = trichloroethene

TCE Concentration (µg/L)

1-5 | 5-100 | 100-250 | 250-1000 | >1000

N

0 250 500 1,000 Feet

Distal Plume Groundwater Elevations - November 2017
SS039, Fairchild AFB, WA

Drawn By	Date
JM	9/20/2018
Checked By	Project No.
JH	16170656

Figure 7-3





Legend

- Monitoring Well with November 2017 TCE Concentration (µg/L)
- Residential Well
- Proposed Monitoring Well
- Installation Boundary
- Access Agreement Area

TCE Concentration (µg/L)

- >1
- >5

TCE = trichloroethene
µg/L = micrograms per liter

N

0 250 500 1,000 Feet

Proposed Sampling at Distal Plume and Off Base in Weathered Basalt
SS039, Fairchild AFB, WA

Drawn By:	Date:	Project No:	Figure 7-4
JM	9/20/2018	60419236	
Checked By:	Revision:		
SB	0		

Figure 8-1
RW011 and WP036 Site Locations

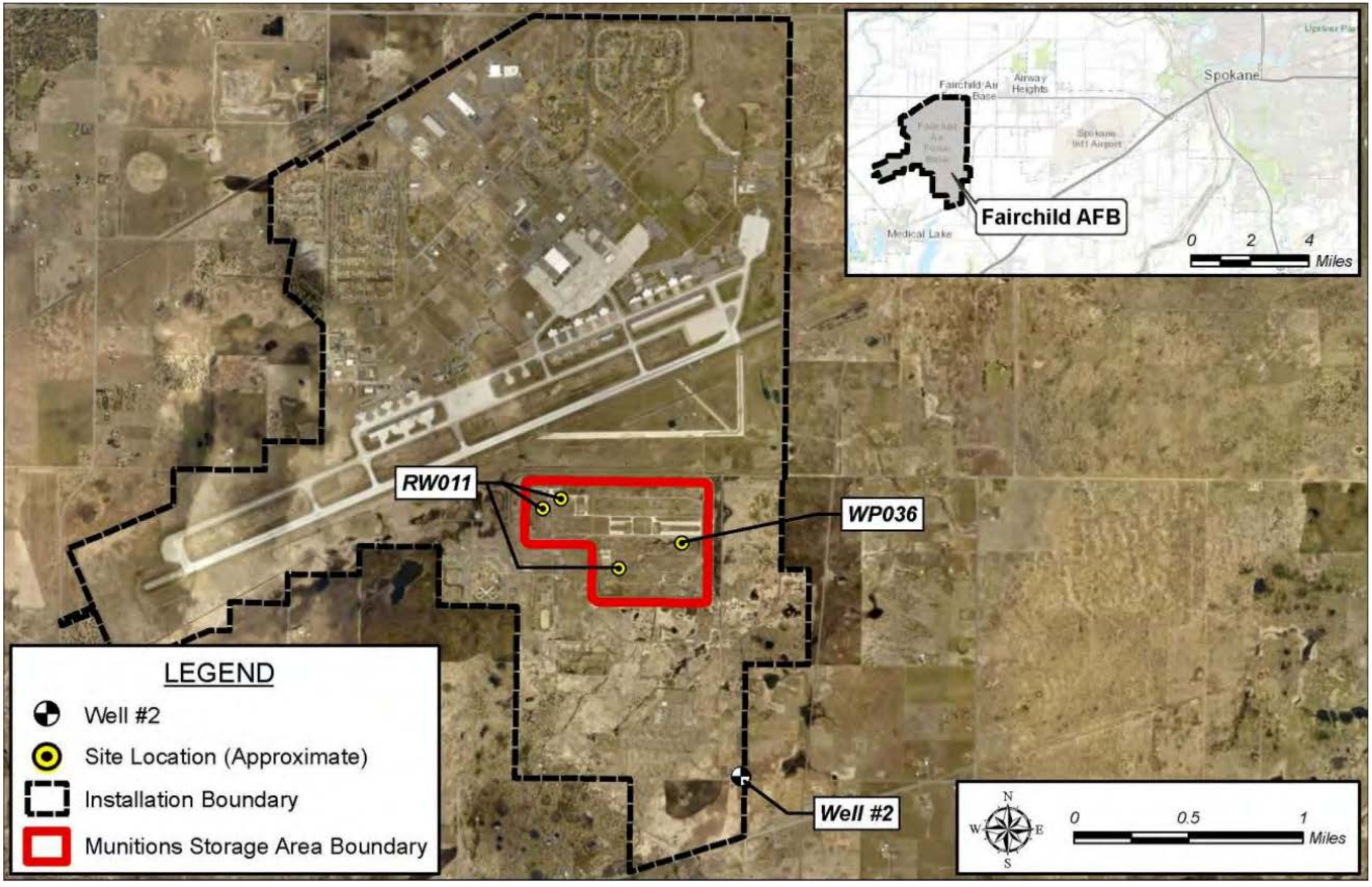


Figure 8-2 RW011 Site Area

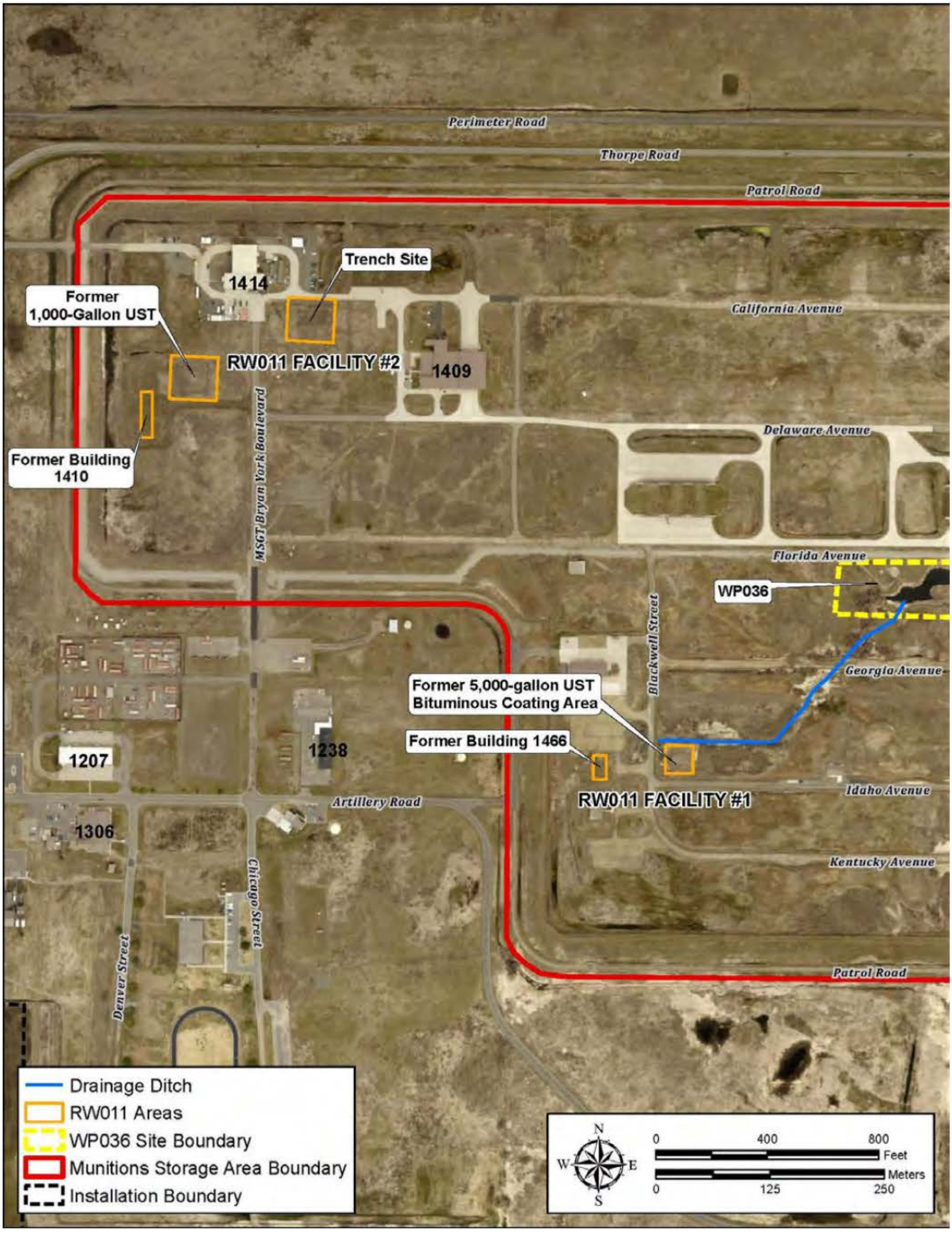


Figure 8-3
WP036 Site Area

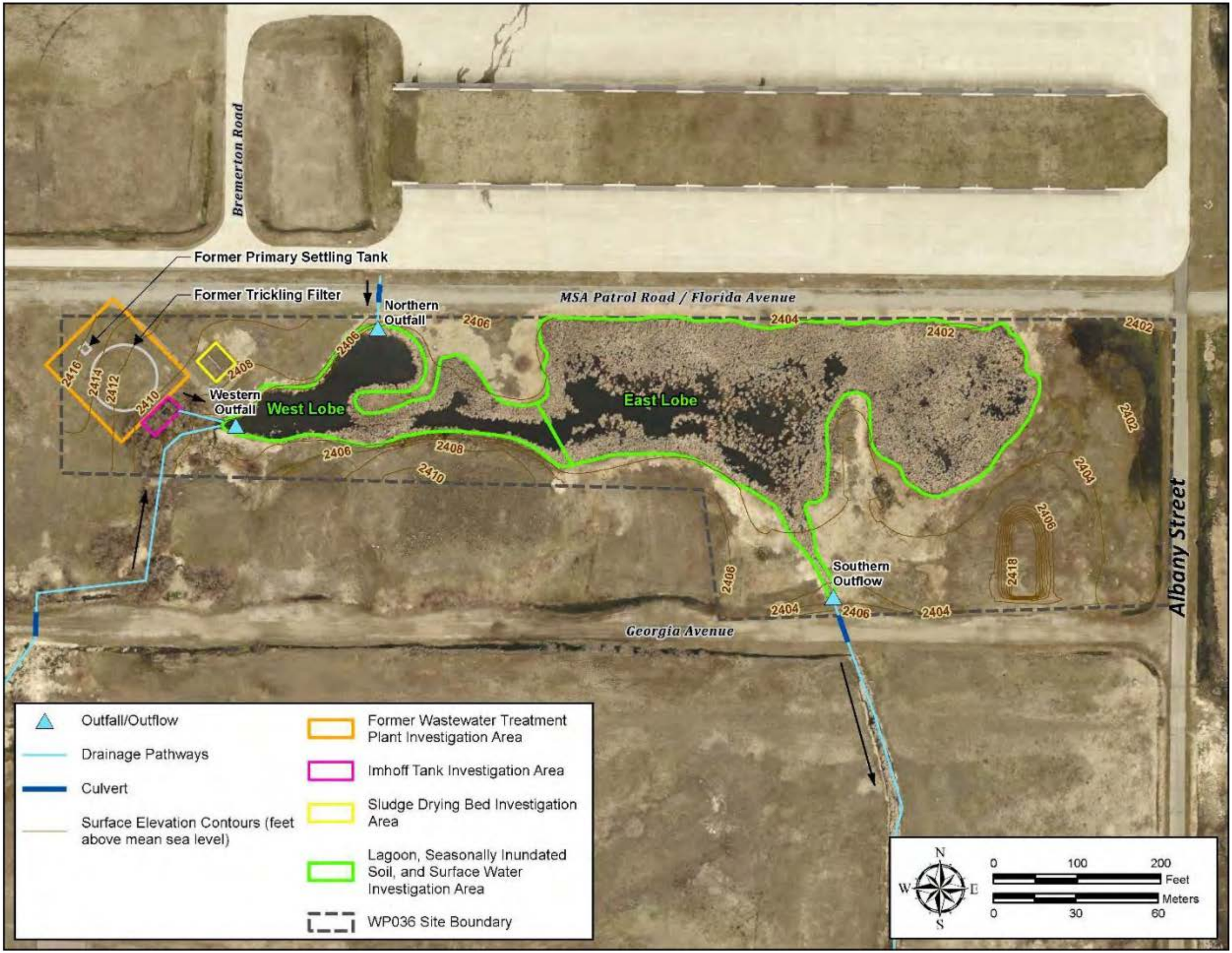
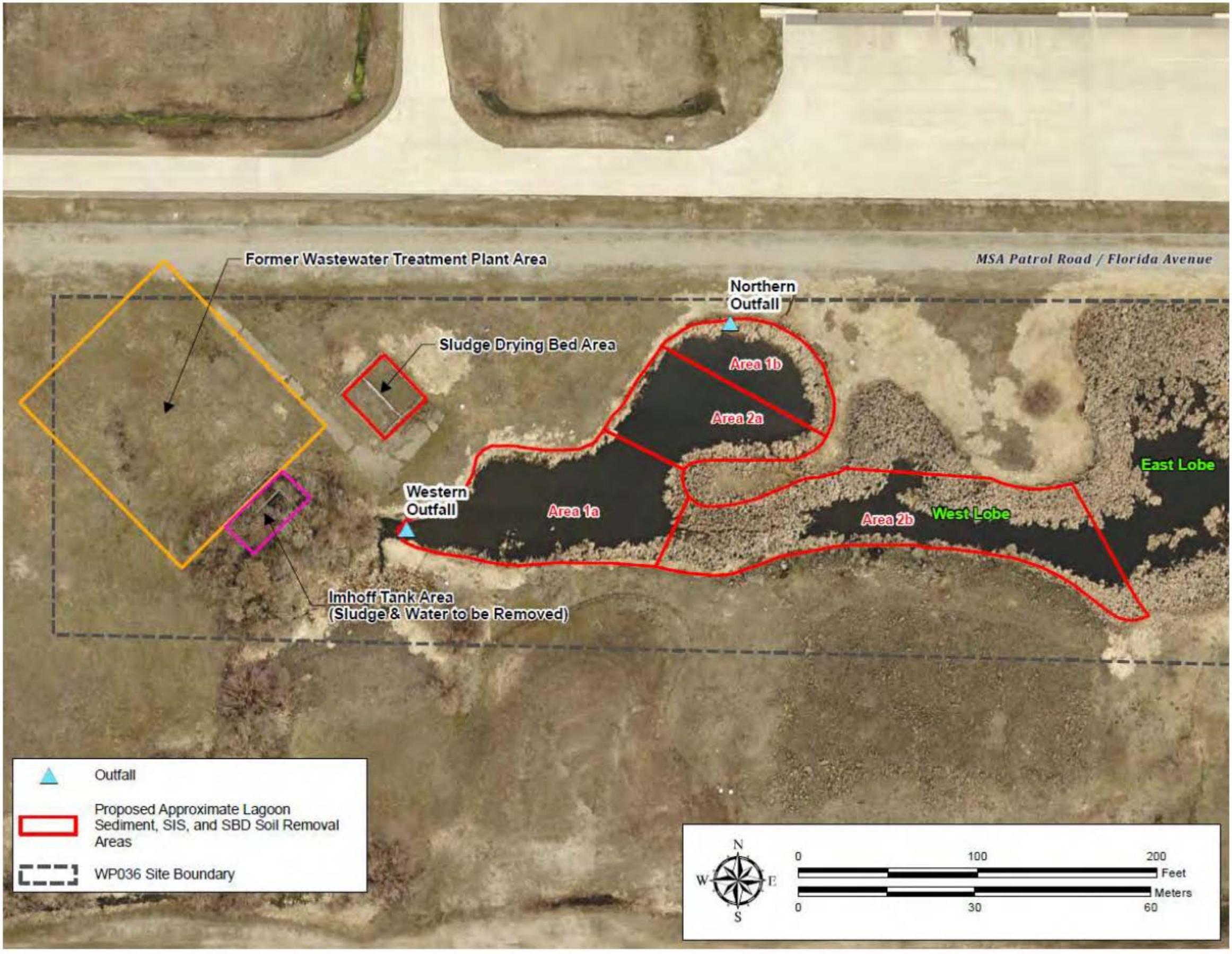


Figure 8-4
Preferred Remedial Alternative



APPENDIX A

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APPENDIX B

SITE CHRONOLOGIES

OU-1

Date	Event
1984	Contaminant source and risk evaluations began.
1986–1991	Remedial Investigation (RI)/Feasibility Study (FS) completed to delineate contamination; TCE identified as the primary COC.
1991	Implemented limited GETS to provide hydraulic containment of the plume on USAF property.
1992	RI/FS and Proposed Plan (PP) released to the public.
1993	ROD issued for hydraulic containment of groundwater. The remedy components included SVE, GETS, an engineered cap, and LUCs.
1994–1995	Installed engineered landfill caps over the NDA and SDA.
1995	Initiated full-time operation of the GETS. Implemented Remedial Action-Operations groundwater monitoring program. Issued an ESD to remove SVE as a remedy component.
2006	Implemented GETS cycling to enhance TCE removal rates.
2008	Completed an Environmental Remediation Program Optimization evaluation; recommended that SVE should be reconsidered as a potential remedy.
2009–2011	Performed SVE pilot tests in the SDA and NDA; verified SVE as an effective method of TCE mass removal. Initiated full-scale SVE operation.
2011–2012	Performed ISCO pilot tests at SDA and NDA. Successfully reduced TCE mass. ISCO left residual permanganate and chromium at concentrations greater than regulatory limits. Operated GETS on a minimal basis to prevent uptake of residual permanganate and chromium concentration increases.
2014	Suspended SVE to allow for ESD to bring this remedy under compliance with the ROD.
2016	Issued second ESD to reinstate SVE and adjust MCLs
Mid-2017	SVE is re-activated in the NDA and SDA.
2019	PP for a RODA was finalized, and a public comment period was held from March 2 to 31, 2020
2020	Off-site data gap investigation (DGI) was performed in accordance with recommendations of the fourth five-year review
2021	A RODA is approved to add ISCO as a remedy component, add VC and Cr as COCs, and to update the LUCs
2022	USAF and EPA agree to a trial SVE and GETS shutdown in December 2022 letter

OU-2

Date	Event
1984	Contaminant source and risk evaluations began.
1991-1992	Remedial Investigation completed at LF001
1993	OU-2 Records of Decision; Remedial Investigation and feasibility study completed at FT004;
1995	Remedial Action-Operations initiated at OU2 sites
1996	Bioventing system installed at FT004 along with long term groundwater monitoring
2000	Soil removal activities at FT004
2004	Final Remedial Action Operation Work Plan prepared for Priority 1 and 2 sites FT-04 (FT-1), ST-06 (PS-1), SS-18 (PS-2), SS-26 (PS-8), FT-32 (FT-2) and OT-17 (IS-4)
2005	Soil removal activities at FT004
2006	Bioventing system deactivated at FT004
2008	Soil removal activities at FT004
2009	Routine monitoring at LF001 discontinued, only completed in support of Five-Year Reviews
2013	Remedial Action Operations Reports (Quarterly)
2014	UFP QAPP Remedial Action-Operations (RA-O) and Long-Term Monitoring (LTM) at LF002, WP003, FT004, ST006, SS018, SD037, residential wells, and SS039; Remedial Action Operations Reports (Quarterly)
2015	Remedial Action Operations Reports (Quarterly); UFP QAPP Site WP003 (WW-1) for Remedial Action Operations and a Pre-Design Investigation at WP003
2016	UFP QAPP Refueling Pit Area SS018 for groundwater monitoring and long-term management; Remedial Action Operations Report Fourth Quarter and Annual 2014; UFP QAPP Former Fire Training Area FT004 (FT-1) for performance monitoring;
2017	UFP QAPP LF001 (Old Base Landfill, SW-1) Groundwater Monitoring
2018	ESD Operable Unit 2 LF001, WP003, FT004, SS018, and SS026; Pre-Design Investigation Report Site WP003 (Industrial Wastewater Lagoon System, WW-1)
2019	Remedial Action Operations Reports (Quarterly); 2018 Remedial Action Operations Report Site FT004; Fourth Five Year Review Report; UFP QAPP Feasibility Study Data Support WP003 (Industrial Wastewater Lagoon System; WW-1) for follow on to the pre-design investigation; Land Use Controls Implementation Plan
2020	UFP QAPP Addendum II Bioaugmentation Pilot Test in Support of Feasibility Study WP003 (Industrial Wastewater Lagoon System; WW-1); Remedial Action Operations Reports (Quarterly)
2021	2020 Annual Remedial Action Operations Report
2022	Annual Report on the Status of Land Use Controls in 2021; 2021 Annual Remedial Action Operations Report

OU-3

Date	Event
1986	Contaminant source and risk evaluations began.
1987	DP012 discovered during excavation as a borrow pit; geophysical survey completed along with test pits.
1990-1993	A Limited Field Investigations completed in 1991 followed by remedial investigations in 1993; geophysical survey completed along with test pits at DP013
1995	OU-3 Records of Decision
1996-1997	Additional investigation at OU-3
1997	WDOE agrees that cleanup requirements specified in the ROD with respect to OT016 have been met
1998	Report of Remediation Activities, Site PS-10; documents soil removal at SD031 (PS-10)
2002-2006	Landfarming activities completed, including returning soils to original excavation area
2004	Final Remedial Action Operation Work Plan prepared for Priority 1 and 2 sites FT-04 (FT-1), ST-06 (PS-1), SS-18 (PS-2), SS-26 (PS-8), FT-32 (FT-2) and OT-17 (IS-4)
2005	Limited Phase II Environmental Site Assessment-ST006
2008	Second Five Year Report
2010	NFA requested by USAF and granted by WDOE for FT032; wells decommissioned.
2013	Third Five Year Report and Remedial Action Operations Reports (Quarterly)
2014	Remedial Action Operations Reports (Quarterly)
2015	Remedial Action Operations Reports (Quarterly) and UFP QAPP for ST010
2016	UFP QAPP for Soil Data Gap Investigation at OT017 and SS009, UFP QAPP Waste Disposal Sites DP022 (SW-4) and DP024 (SW-7) for Remedial Investigation
2017	Data Gap Investigation Report for ST010
2018	RACR prepared for OT016, Fourth Five Year Report, ESD for Operable Unit 3, Data Gap Investigation Report for SS009, Request for No Further Action for FT032 Fire Training Area
2019	Land Use Controls Implementation Plan, UFP QAPP Addendum Cleanup Action Plan for ST010, Remedial Action Completion Report and Request for No Further Action SD031 (PS-10)
2020	Technical Memorandum No Further Action for ST010 Fuel Oil Storage Tanks, PS-7; Remedial Investigation Report Site DP022 (Wase Disposal N of Bldg 2451) recommending NFA; Remedial Investigation Report Site DP024 (Wase Disposal S of Taxiway #10, SW-7) recommending NFA
2021	Annual Report on the Status of Land Use Control in 2021 for ST006, SS009, ST010, and DP013

OU-5

Date	Event
1985	Site SS039 Groundwater contamination initially identified
1991-1995	Field investigations for groundwater contamination was conducted for three separate Sites: PS-10, IS-1, and PS-3. The results of these investigations were consolidated into the "Orphan" Trichloroethylene (TCE) plumes Site SS039.
	Soil contamination for Site SS039 is described in OU-2 and OU-3 RODs
2009	Proposed Plan for Site SS039 is finalized
2011	Interim ROD
2012	Base-wide Conceptual Site Model (CSM) for Fairchild AFB is completed by AECOM
2013	CSM is updated with data gap investigations that were completed in two phases: Phase 1 (October and December 2011) included the installation of 36 new groundwater monitoring wells and 5 soil borings. In December 2011, a synoptic monitoring event included sampling 112 monitoring wells. Phase 2 (May and August 2012) included the installation of 30 new monitoring wells. The 30 wells were sampled following development which indicated that contaminant concentrations were generally higher in the Proximal Plume compared to the Distal Plume.
May 2013	CH2M Hill finalizes Site SS039: Pre-Design Investigation Technical Memorandum for soil borings, monitoring well installation and test pits.
April – Sept 2013	CH2M Hill finalizes Site SS039: Distal Plume Groundwater Monitoring Results for April, July, and August/September 2013.
2014	CH2M Hill finalizes the August 2013 Synoptic Groundwater Monitoring Event for SS039. Results were consistent with the 2011 synoptic monitoring event findings and the Plume maps were updates to show the current extent of COCs throughout the Site.
2015	SS039 Groundwater Monitoring QAPP completed by URS.
2017	URS completes the SS039 Data Gaps Investigation: additional subsurface investigations were completed between July 2015 and March 2016 to refine the extent of chlorinated VOCs within data gap areas.
2017	URS finalizes the July and December 2015 Groundwater Monitoring Events at SS039: 29 monitoring wells were sampled during July 2015 and 132 monitoring wells were sampled during the December 2015 performance and annual groundwater monitoring event. Results were consistent with the 2013 synoptic monitoring event findings and supplemented the DGI results. All other DGI monitoring wells were added to the annual sampling program.
2018	URS completes the 2016 and 2017 Groundwater Monitoring Events at SS039
2019	URS completed the Final SS039 Interim Injection Completion Report
2020	URS completes the Draft SS039 Construction Completion Report, Final SS039 2018 Annual Groundwater and Q1 Monitoring Report, and the Final SS039 2019 Annual Groundwater and Q4 Performance Report.
2021	URS completes the Draft SS039 Off-Base Data Gaps Investigation Report that include six new monitoring wells installed on the northern side of the Distal Plume, targeting the basalt horizon.

APPENDIX C

INSPECTION REPORT

C.1 INTRODUCTION

Date of Visits: 24-26 April 2023

Location: Fairchild Air Force Base (FAFB), Washington

Purpose: To conduct site inspections at multiple operable units (OUs) at FAFB. The site inspections consisted of visual inspection and documentation of the current conditions of the remedies, sites, and surrounding areas for inclusion into the Fifth Five-Year Review Report.

Participants:

Joseph Marsh	U.S. Army Corps of Engineers, Environmental Protection Specialist	(206) 316-3847
Jack Mapes	Ageiss, Inc., Environmental Restoration Program (ERP) on-site support	(509) 247-2451

C.2 SUMMARY

This trip report presents observations made during FAFB Five Year Review site visits conducted between 24 and 26 April 2023 by a field team consisting of Joseph Marsh (Seattle District, USACE) and Jack Mapes (FAFB ERP support). The 24 sites visited include:

- OU-1: LF002 Craig Road Landfill
- OU-2: the five on-base Priority 1 sites LF001, SS018, SS026, FT004 and WP003
- OU-3: the 11 on-base Priority 2 sites OT016, OT017, ST006, SS009, ST010, SD031, FT032, DP022, DP024, DP012 and DP013
- OU-5: Priority 3 site SS039
- OU-8: RW011 and WP036
- Other sites: DP064, TS626, TS929, TU502 and TU503

No apparent problems were observed at the Craig Road Landfill site. Established Land Use Controls (LUCs) remain in place. Landfill cover, monitoring wells, groundwater and soil vapor extraction systems appear to be in normal condition and groundwater monitoring continues. The GETS and SVE systems have been temporarily shut down on a trial basis. Access continues to be restricted by intact security fencing, and locked gate. Direct personnel exposure to remaining subsurface contaminants is unlikely at this site. The landfill is regularly occupied or monitored by U.S. Air Force, U.S. Army Reserve and contractor personnel.

The five on-base Priority 1 sites consist of LF001, SS018, SS026, FT004 and WP003. No problems, issues or concerns were noted during the site visits to these locations and established LUCs remain in place. While located within a secure military installation, each one of these five sites are not normally accessible to base personnel or require additional security authorization to access. Sites SS018 (contained within TU506) and SS026 (SS026 has been consolidated into site TU500) could not be accessed to conduct the site visits due to active military operations but were observed at a distance to confirm no changes in LUCs. Direct personnel exposure to remaining subsurface contaminants is unlikely at these sites.

The 11 Priority 2 sites consist of OT016, OT017, ST006, SS009, ST010, SD031, FT032, DP022, DP024, DP012 and DP013. No significant problems, issues or concerns were noted during the site visits to these locations. All of these sites appear to maintain adequate LUCs.

Site OT016 is an open, grass-covered field near the center of the base with no security fencing or signage. There are no apparent condition concerns and base personnel were not observed walking across this site. Site OT017 appears as an open field with no condition concerns within a restricted area adjacent to the main runway. Site ST006 contains POL bulk storage tanks and system piping completely surrounded by security

fencing, warning signs, monitoring wells and an operator present on site during work hours. Site SS009 appears as an open, grass-covered lawn located within a housing area, but residents should have no direct contact with remaining subsurface contaminants. Site SD031 also appears as an open, grass-covered lawn located within a housing area, but residents should have no direct contact with remaining subsurface contaminants. Site FT032 appears as an open field with no condition concerns within a restricted area adjacent to the main runway. Site ST010 is now covered by an athletic field and running track. Personnel occupying this area should have no direct contact with remaining subsurface contaminants. DP022 is a grass-covered field with numerous coal fragments visible on the ground surface. This site has no fencing or signage to prevent access, but base personnel were not observed here during the site visit and would have no reason to routinely access this area. Site DP024 is an asphalt stockpile site with no apparent condition concerns within a restricted area adjacent to the main runway. Site DP012 is now occupied by a maintenance building, is paved with asphalt and is surrounded by an engineered stormwater drainage ditch. Site DP013 has been restored and converted into Warrior Park, available to base adults and children. Established LUCs remain in place at all of these sites. Direct personnel exposure to remaining subsurface contaminants is unlikely at these sites.

Priority 3 site SS039 covers a large area from the eastern housing area south and west to the aircraft flightline operational area consisting of residential and industrial buildings, grounds and infrastructure. No site signage could be found. Security fencing only exists along the flightline restricting access for military security reasons and environmental access control as a side benefit. However, no other area within site SS039 contains security fencing as a site restriction measure. No significant problems, issues or concerns were noted during the site visit and established LUCs remain in place. Direct personnel exposure to remaining subsurface contaminants is unlikely at this site.

Operable Unit 8 consists of sites RW-11 and WP-36: Both located within the high security Munitions Storage Area of the base not accessible to most base personnel without prior approval and military escort. No significant problems, issues or concerns were noted during the site visits to these locations, although missing radioactive waste signs and a 55-gallon waste storage drum was observed at RW-11 as described in the discussion section of this report. Direct personnel exposure to remaining surface or subsurface contaminants is unlikely at these sites. All of these sites appear to maintain adequate LUCs.

Finally, the team visited five low priority sites identified on project maps and tables as DP064, TS626, TS929, TU502 and TU503. No significant problems, issues or concerns were noted during the site visits to these locations.

Site DP064 is a tree covered, grassy field northwest of POL bulk storage site ST006 with no security fencing or signage. There are no apparent condition concerns and base personnel were not observed walking across this site. Site TS626 is located along the eastern edge of the northwest corner housing area. The site has an eastern fence line not associated with the site and no site signage could be located. The site contains houses, roads and other infrastructure along with grass-covered yards and fields. Adults and children were playing in the area, but the team found no identifiable condition concerns. Site TS929 is in an open, grass-covered field with a large circular concrete pad located immediately east of Site TS626. No identifiable condition concerns could be found here. Site TU502 is an open, grass-covered field located across the street to the southwest of Warrior Park. This site has no security fencing or signage. There are no apparent condition concerns and base personnel were not observed walking across this site. Site TU503 is also an open, grass-covered field located near the Survival Inn. This site has no security fencing or signage. There are no apparent condition concerns and base personnel were not observed walking across this site. Direct personnel exposure to remaining subsurface contaminants is unlikely at these sites. All of these sites appear to maintain adequate LUCs.

C.3 DISCUSSION

At approximately 1000 hours on 24 April 2023, Joseph Marsh arrived at the FAFB ERP office to meet with Megan Riccobono and Jack Mapes in preparation for conducting Five-Year Review site visits. After a discussion of the site visit objectives, Ms. Riccobono and Mr. Mapes prepared a general schedule. Joseph Marsh and Jack Mapes departed the Civil Engineering Squadron at approximately 1015 hours, heading for the Craig Road Landfill located off base. The weather was partly cloudy and mild, 50° F. The field team visited a total of 11 sites on 24 April 2023 and completed the fieldwork by 1600 hours.

At approximately 1200 hours on 25 April 2023, Joseph Marsh and Jack Mapes met again at the FAFB 92nd CES restoration Branch to resume the site visits. The weather was partly cloudy and mild, 55° F. On the second field day, the team visited the remaining 14 sites. The field team completed all site visit activities by 1600 hours on 25 April 2023.

The following subsections describe the observations made during each site visit.

C.3.1 LF002 (Craig Road Landfill)

At approximately 1030 hours on 24 April 2023, the field team arrived at the Craig Road Landfill. Overall, the perimeter security fence surrounding the landfill appeared to be intact and in good condition based on brief inspections from different vantage points surrounding the site.

The bi-fold chain link gate showed signs of minor wear along with minor post and barbed wire damage. However, the gate could still be opened and closed normally. The gate is normally secured by a heavy-duty steel chain and keyed padlock with restricted key access. Site identification and warning signs affixed to the gate and installed every 30 feet along the perimeter fence appeared in overall good condition, but the lettering is beginning to fade and should be replaced before the next five-year review. Mister Mapes said access to the landfill is primarily restricted to USAF, U.S. Army and USAF contractor personnel. The U.S. Army Reserve maintains a vehicle and equipment storage area covering approximately 25 percent of the landfill, located at the northwestern corner of the site.

The team drove west along an asphalt paved access road to the groundwater treatment plant, identified by a sign on the exterior wall as building 3. The overall condition of the treatment building exterior appeared to be very good. The two air stripping towers appeared to be in good condition. Some of the danger and warning signs are beginning to fade and should be replaced at some time in the future.

Mister Mapes provided a tour of the inside of the treatment building, focusing on the soil vapor extraction (SVE) and groundwater extraction and treatment systems (GETS). He explained the SVE and GETS systems were operating in December of 2022 and are currently shut down on a trial basis to perform quarterly monitoring with no active treatment to identify any changes in the site data. He continued by stating the site monitoring wells are sampled quarterly and landfill gas sampled annually. It may take more time to determine if the remedy is effective under current conditions or if the treatment system will have to be returned to normal operation. Groundwater level measurements are collected semi-annually. The site supervisor (Bay West) is reported to be performing system checks on a monthly basis while the systems are shut down. From a visual inspection, the SVE system and GETS appeared to be in very good condition with no visible problems with the pumps, tanks, valves piping or electrical components. Electrical power and water service to the building was connected during the visit. Mr. Mapes indicated all required O&M documents, safety plans, permits, records and logs were readily available on site in a separate building next to the treatment building. Mister Marsh was informed Bay West does not have costs for all LF002 activities for the last year or any year readily available. All other site documentation resides with the FAFB Restoration Program staff.

After the treatment plant walkthrough, the field team travelled site access roads to inspect the landfill site from north to south. A system of gravel roads (all in good condition) run north-south along the western landfill boundary and near landfill center. Minor gravel roads and "2 tracks" lead to extraction and monitoring well clusters at various locations.

A large oblong bermed detention pond and smaller connected rectangular shaped bermed detention pond are situated at the northern end of the landfill and appear currently unused and in good condition. A drainage culvert/outlet works system associated with the detention ponds appeared free of obstructions and functional if needed, but the system was dry.

The bottom and sidewalls of each pond showed no signs of erosion, siltation, deformation, degradation or excessive vegetative growth.

Several small trees were seen on the berm between the larger and smaller pond along with a single deciduous tree located southwest of the smaller pond.

Overall, the landfill was covered in a variety of short and tall well-established grasses and small shrubs with occasional bare spots and small shallow animal burrows, but no signs of significant stress to the vegetation or soil erosion. The landfill cover showed overall gentle slopes no greater than approximately 2:1 with no evidence of recent settlement, cracks, erosion, holes, bulges or instability. Observed site drainage features were rock lined and showed no siltation or damage.

The team viewed 12 extraction wells, 18 perimeter monitoring wells, 14 remediation wells in the north-northeast section and 27 remediation wells in the south-central section of the landfill. Some of the wells in the north section had been used for soil vapor extraction as they were still plumbed with manifolds, gauges and vapor hoses running to the treatment building. Three turbine gas vents were observed but lack of wind prevented verification of normal function of those vents.

LF002, the Craig Road Landfill, appears to be in overall good condition. Security fencing and signage land use controls remain in place and appear effective. The landfill is operating as intended with the exception of the offline treatment system. The FAFB ERP has review/approval authority for any planned future intrusive work at this site to ensure established LUCs are maintained. The site visit ended at approximately 1130 hours.

C.3.2 LF001 (Old Base Landfill)

By 1200 hours on 24 April 2023, the field team returned to FAFB. Mr. Mapes had the required flightline badge and just needed to call Base Operations to coordinate access to LF001 off the west end of the flightline by passing through a secure flightline gate. A gravel perimeter access road runs along the entire length of LF001 allowing inspection from the northwest side. The base taxiway and runway are near the southeast side. This is a high security area. Only the base Security Forces members would have routine access to this area.

Overall, the landfill was covered in a variety of short well-established grasses with scattered bare soil spots, but no signs of significant stress to the vegetation. The site appears to be regularly mowed as all of the grass is kept short. Numerous animal burrows and possible frost heaved soils are visible along the north facing slope of the landfill center – adjacent to the access road. However, the team observed no signs of sloughing, slumping or soil erosion.

The landfill cover showed overall flat to rolling, gentle slopes no greater than approximately 3:1 with no evidence of recent settlement, cracks, erosion, holes, bulges or instability. Numerous small concrete fragments of unknown origin were observed on the ground surface in places across the landfill.

Mister Marsh observed 15 flush mounted monitoring wells in good condition (some appearing relatively new) within and near LF001. MW-166 across the adjacent taxiway, could not be detected from the LF001 vantage point. Megan Riccobono confirmed these monitoring wells are sampled every five years in support of five-year reviews and long-term monitoring. All required site documentation resides with the FAFB ERP staff.

LF001, the Old Base Landfill cover and containment, appears to be in overall good condition. Fences, warning signs and 24-hour security ensure land use controls remain effective. The landfill appears to be operating as intended. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained. The site visit ended at approximately 1230 hours.

C.3.3 SS018 (Refueling Pit Area)

Site TU506 reportedly now contains site SS018. The general vicinity of SS018 is within the high security flightline area under concrete and asphalt pavement along Taxiway 1, between Buildings 1033 and 1029. Due to active military aircraft operations during the site visit, the field team was not permitted to access the site but could view the general area from a distance at 1230 hours (24 April 2023). Paved surfaces remain over the refueling pit area and the site is in very good condition. Fences, warning signs and 24-hour security ensure land use controls remain effective. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained. The site visit ended at approximately 1240 hours.

C.3.4 SS026 (Spill Site)

This site has been consolidated under site TU500 as the Southwest Flightline TPH Plume. Site SS026 is located along the flightline near Taxiway J and aircraft hangar buildings 1015, 1017, and 1019. Due to active military aircraft operations during the site visit, the field team was not permitted to access the site but could view the general area from a distance at 1240 hours (24 April 2023). Paved surfaces remain over the refueling pit area and the site is in very good condition. Fences, warning signs and 24-hour security ensure land use controls remain effective. Access to this site would be limited to Security Forces, aircrews and authorized personnel. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained. The site visit ended at approximately 1245 hours.

C.3.5 FT004 (FT-1 Fire Training Area)

Site FT004 is located between the southeast corner of the high security airfield area and Rambo Road. The field team arrived on site at approximately 1250 hours on 24 April 2023 after coordinating access through a padlocked security gate with Base Operations. This is a high security area requiring authorization from the control tower or Base Operations for access. A gravel access road passes through the center of the site and continues on to an old aircraft taxiway. The site appears as a grass and shrub covered, relatively flat field with a slight rise in terrain toward the west end.

The team observed numerous flush mounted monitoring and bioventing wells situated around the site corresponding to project site maps of the area. The original sparge and bioventing systems have been

deactivated. An approximately 10 x 26-foot (wood-frame on concrete pad) bioventing control building (Building 1570) has been abandoned on site with the access door blown off by windstorms.

All bioventing control valves, pumping and electrical system remains within the building. This site is closed, and groundwater sampling from the monitoring wells has ceased. However, sampling for PFAS is being conducted here under separate contract.

Fences, warning signs and 24-hour security ensure land use controls remain effective. Access to this site would be limited to Security Forces and essential airfield maintenance personnel. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained. The site visit ended at approximately 1300 hours.

C.3.6 WP003 (Industrial Wastewater Lagoon System)

Travelling north from site FT004 on a gravel access road west of Rambo Road, the field team arrived at WP003 at approximately 1302 hours (24 April 2023). Site WP003 is located south of the eastern end of the runway between Rambo Road and the north-south portion of Taxiway 10. The vicinity is a relatively flat, grass-covered field containing a 600 x 120-foot oval shaped water-filled lagoon draining into a smaller 250 x 120 foot oval shaped, water-filled lagoon. The lagoons have a large cable and netting system to deter birds. However, ducks and red wing blackbirds were observed in the lagoons. The lagoons contained clear water, cattails and other aquatic vegetation. The waters of these lagoons have control structures to regulate water level and discharge rates. The discharged water is directed into a ditch running south for approximately 700 feet. Along that run, a weir and gage have been installed to monitor water levels and flows. This system appears to transmit collected data via a telemetry system for offsite monitoring. The ditch is then routed east through three corrugated metal culverts passing under the gravel access road and Rambo Road to a stream heading east off the base. The culvert openings have been fitted with steel bars for security. The culverts show some damage but remain functional. The site shows no erosion or signs of disturbance. The lagoons and ditch appear to be functioning normally.

The field team noted a locked metal building on a concrete pad located on the east side of the site (Building 1565) that houses a groundwater treatment and extraction plant. Mister Mapes stated the system has been deactivated for many years, but the groundwater monitoring wells are sampled quarterly.

Fences, warning signs and 24-hour security ensure land use controls remain effective. Access to this site would be limited to Security Forces and authorized personnel. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained. The site visit ended at approximately 1330 hours.

C.3.7 OT016 (Reciprocating Engine Test Cell)

Site OT016 is located on a flat, grass-covered field between Foulois Avenue and George Avenue and north of West Arnold Street near the center of the base. Building 2150, source of site contamination, was reportedly demolished in 1996. The field team conducted a brief site visit from 0900 to 0905 hours on 26 April 2023 and noted a flat grass field with a water tank, two storage tanks and a small parking lot at the north end. No fencing or warning signs were observed, but it is believed base personnel would have no reason to routinely access or occupy this site. The team could find no indication of any surface disturbances (excavation type activities) and believe land use controls remain effective.

The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.8 OT017 (Former Jet Engine Test Stand)

The field team arrived at site OT017 at approximately 1250 hours on 24 April 2023 while simultaneously observing site FT004. Looking east of the current fire training facility, nothing remains of the former jet engine test stand. The site appears as a completely flat, grass-covered field with no signs of distress, erosion, or unauthorized dumping or excavation activities. This is a high security area requiring authorization from the control tower or Base Operations for access. Fences, warning signs and 24-hour security ensure land use controls remain effective. Access to this site would be limited to Security Forces and authorized personnel. Site visit here concluded at approximately 1255 hours. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.9 ST006 (POL Bulk Storage)

At 1300 hours on 25 April 2023, the field team visited site ST006 between POL Road and Vet Road at the north end of the base. The site consists of three large storage tanks located within large concrete containment cells, associated piping, pumping, electrical systems, generators and other support equipment. The entire site appeared to be paved with concrete and asphalt. A security fence with clear warning signs in good condition surrounded the entire facility. No obvious signs of cracks, leaks or damage could be detected at each containment cell. The team observed numerous monitoring wells surrounding the site. No petroleum staining or odors detected. A facility operator was on site during the visit and contractors were seen at the northwest corner working on system upgrades. The site appeared to be in excellent condition. Only authorized personnel are permitted to enter this facility. Site visit here concluded at 1320 hours. Fences, warning signs and daytime security ensure land use controls remain effective. Access to this site would be limited to authorized personnel. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.10 SS009 (Former Fuel Oil Tank)

At 1250 hours on 25 April 2023, the field team visited site SS009 located in the western family housing area just east of Nebraska Avenue. The site is a relatively flat, grass-covered field approximately 160 x 160 feet in size.

The team located three flush mount monitoring wells associated with the site that appear fairly new. FAFB documents indicate the four original site monitoring wells were decommissioned in 1999. Adults and children within this housing area have open access to the site but are unlikely to encounter any residual subsurface contamination. Site visit concluded at 1255 hours. Land use controls appear to remain effective as no soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.11 Site ST010 (Fuel Oil Storage Tanks)

At 1410 hours on 25 April 2023, the field team visited site ST010 located southeast of Denver Road and the SERE Pipeline Dormitory. Significant past excavation and or building demolition work in this area is evident by irregular rectangular grass patches and bare spots where grass seed did not germinate. An athletic field and running track are located adjacent to this site. No indication of recent human caused soil disturbances could be located although minor rodent burrowing and possible frost-heaved soils were seen. Site visit here concluded at 1415 hours. Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.12 SD031 (Fuel Truck Maintenance Facility)

This site was combined with SS039 in the OU3 ESD (groundwater). At 1140 hours on 24 April 2023, the field team visited site SD031 located north of Parallel Taxiway 1 off the west end of the flightline (near LF001). A gravel perimeter access road runs along the entire length of SD031 allowing inspection from the west side. This is a high security area. Only the base Security Forces members would have routine access to this area.

Overall, the site was covered in a variety of short well-established grasses with scattered bare soil spots, but no signs of significant stress to the vegetation. The site appears to be regularly mowed as all of the grass is kept short. Numerous animal burrows and possible frost heaved soils were visible. However, the team observed no signs of sloughing, slumping, soil erosion or human-caused site disturbances. Site visit here concluded at 1145 hours. Fences, warning signs and 24-hour security ensure land use controls remain effective. Access to this site would be limited to Security Forces. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.13 FT032 (Fire Training Area)

At approximately 1250 hours on 24 April 2023, the field team visited site FT032 located immediately south of old Taxiway 10 and co-located with site DP024. This is a high security area requiring authorization from the control tower or Base Operations for access.

This site is a relatively flat, area covered with grasses of various types and patches of bare soil possibly caused by rodent burrowing or frost heave. The team observed no signs of sloughing, slumping, soil erosion or human-caused site disturbances. Site visit here concluded at 1255 hours. Fences, warning signs and 24-hour security ensure land use controls remain effective. Access to this site would be limited to Security Forces. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.14 DP022 (Waste Disposal north of Building 2451)

At approximately 1345 hours on 25 April 2023, the field team walked up on the flat bluff north of Westover Street near the north border of the base.

The site appears as a relatively flat grass-covered bluff with shallow depressions at both ends and near the center in two locations. The center low spots appear to be access ramps for vehicles and tire tracks were observed in those features and across the site in several places. One deciduous tree is located near the center of the site. The team identified significant small coal fragments in site embankments, vehicle access ramps and scattered in various locations on site. Two yellow painted stick-up monitoring wells in good condition with bollards are located at the west end of the site. The site is closed, and the wells are not sampled on any regular basis. Site visit here concluded at approximately 1355 hours.

Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.15 DP024 (Waste Disposal south of Taxiway 10)

At approximately 1250 hours on 24 April 2023, the field team visited site DP024 located immediately south of old Taxiway 10 and co-located with site FT032. This is a high security area requiring authorization from the control tower or Base Operations for access. This site is a relatively flat area covered with grasses of various types and patches of bare soil possibly caused by rodent burrowing or frost heave. An asphalt debris

pile remains on site and is approximately 200 x 300 feet in area and 10 feet in height. The team observed no signs of soil erosion or human-caused site disturbances. Site visit here concluded at 1255 hours.

Fences, warning signs and 24-hour security ensure land use controls remain effective. Access to this site would be limited to Security Forces. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.16 DP012 (Disposal Area Near WANG Test Cell)

At approximately 1300 hours on 24 April 2023, the field team visited site DP012 located south of Richmond Road and West of Grant Street. A security fence surrounds the site to prevent access, but no signage exists. This site is a relatively flat area covered with asphalt pavement and grass.

A recently constructed brick and metal building exists on site along with smaller storage structures and a grain bin. What appears to be an engineered stormwater drainage ditch is located on the west side of the site. Site visit here concluded at 1310 hours.

The site security fence helps to ensure land use controls remain effective. Access to this site would be limited to USAF personnel working within the building. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.17 DP013 (Disposal Area at Warrior Park)

At approximately 1240 hours on 25 April 2023, the field team visited site DP013 located between Bong Street and Foulois Avenue. The site is completely open with no security fencing or signage. This site appears as a park with basketball court, playground and baseball field. The site has a prominent grass-covered central mound surrounded by flat grass-covered fields. Walking/running trails pass around and through the site with people jogging during the site visit. The grass appears to be distressed, possibly due to cold winter weather with snow or lack of water but may revive within a few weeks. No erosion or other soil disturbances detected. Restoration Branch reports no monitoring wells are sampled in association with this site, although one monitoring well in good condition was noted near the south end of the site. Site visit here concluded at 1255 hours.

Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.18 SS039 (Orphan TCE Plumes)

At approximately 1130 hours on 25 April 2023, the field team visited site SS039 located along a wide swath of the base from the western end of the base, running northeast along the flightline up to the main gate area. Apart from the secure flightline and associated facilities, the site is completely open with no security fencing or signage. No significant impacts to ground surface were detected during the visit. Some of the numerous site monitoring wells appeared to be in good condition. The site visit was concluded at approximately 1200 hours. Impacted groundwater within this site is not used as a drinking water source and no excavations are permitted without coordination with the FAFB ERP. Therefore, we conclude land use controls remain effective. Restoration Branch reports the site monitoring wells are sampled semi-annually.

The FAFB Restoration Branch will continue to have review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.19 RW011 (Radioactive Disposal Area)

At approximately 1320 hours on 24 April 2023, the field team coordinated access to the munitions storage area (MSA) to inspect the condition of land use controls at the RW011 "Facility 1" and "Facility 2" sites. Joseph Marsh and Jack Mapes signed in and received security badges to be worn while on site. USAF personnel were assigned as escorts required to access sites within the MSA.

The focus at Facility 1 was on the former 5,000 UST site. Joseph Marsh was on site when the UST was decommissioned by removal in August 2008, so he was familiar with the site. A security fence with barbed wire surrounds the site and the entry gate is securely padlocked. Silt curtain from the UST removal action remains on site at the inside perimeter of the fence. The "Caution Radioactive Waste" signs were originally placed on each side of the fenced enclosure, but the south side sign is missing. Recommend replacing the one missing sign. Otherwise, land use controls appear effective here.

Facility 2 was located outside of the escort required MSA and has two areas of interest: A 1,000-gallon UST site and a trench site. Joseph Marsh was on site when trenching was conducted and the UST was decommissioned by removal in March and August of 2008, so he was familiar with the site. A security fence with barbed wire and a padlocked entry gate surround both the trench site and 1,000-gallon former UST site.

At the 1,000-gallon UST site, most of the security fence, chain and padlock are in good condition. The east side of the chain link security fence shows damaged but intact barbed wires above the top rail and distorted chain link material near the same area, but the fence remains intact. Two of three reported flush mounted monitoring wells were observed within the fenced area. Restoration Branch reports the monitoring wells were last sampled during the RI conducted in 2018. Grass is growing inside the fenced area and the surrounding area is situated in a relatively flat grass-covered field.

At the trench site, the security fence, chain and padlock are in good condition. A rusted

55-gallon steel storage drum is located near the west side of the fenced area likely containing rubber boots and waste material recovered during the trenching activities in 2008. Small soil ridges could still be detected indicating the 12 trenches excavated within the fenced area. Joseph Marsh recalls three USACE health physicists scanned the site and excavated materials and found no radioactive contamination above background levels. Soil samples were collected and analyzed for radiochemistry, beryllium, lead, and VOCs to determine whether site remediation would be required. The results of the analysis are unknown and the materials in the drum may have to be tested to determine disposal options. The drum should have been properly disposed offsite many years ago. Grass is growing inside the fenced area with no signs of significant distress or soil erosion. The surrounding field is grass covered with no obvious signs of distress.

The "Caution Radioactive Waste" signs were originally placed on each side of both fenced enclosures, but the north side sign is missing on the 1,000-gallon UST site fence. Recommend replacing the one missing sign. Otherwise, land use controls appear effective at both the 1,000-gallon UST site and the trench site. The site visit was concluded at 1420 hours.

The FAFB ERP will continue to have review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.20 Site WP036 (Contaminated Groundwater and Sediment)

At approximately 1320 hours on 24 April 2023, the field team coordinated access to the munitions storage area (MSA) to inspect the condition of land use controls at site WP036 after viewing site RW011 Facility 1. Joseph Marsh and Jack Mapes signed in and received security badges to be worn while on site. USAF personnel were assigned as escorts required to access sites within the MSA.

The field team mobilized with escort to the WP036 former 5,000-gallon UST site. The team observed the inlet, outlet and west/east lobes of the site lagoon and recorded no unusual observations. Surrounding trees, shrubs, grasses and lagoon cattails appeared normal. Ducks and other birds were seen in the lagoon and surrounding area. The team mobilized to the west end of the site and observed the former primary settling tank, trickling filter, western and northern outfall, Imhoff tank and sludge drying bed area. Joseph Marsh reported the site looked exactly the same as it did in 2008 with no sign of site disturbance, erosion, flooding or other damage. Although the site is not surrounded by a security fence and has no signage, land use controls are assured due to the site location within a high security area where unauthorized personnel should never enter. Restoration Branch reports the site monitoring wells were last sampled during the RI conducted in 2018.

The site visit was concluded at 1350 hours. The FAFB ERP will continue to have review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.21 (Other Sites) Site DP064 (Construction Debris Landfill/Former Coal Storage Area)

The team visited this site at 1300 hours on 25 April 2023 (concurrent with site ST006). DP064 is located northwest of ST006, the POL bulk storage site. Overall, the site was partially covered in evergreen and deciduous trees with fully established grasses with scattered bare soil spots, but no signs of significant stress to the vegetation. The site appears to be regularly mowed as all of the grass is kept short. Few shallow animal burrows and possible frost heaved soils were visible. However, the team observed no signs of sloughing, slumping, soil erosion or human-caused site disturbances. Site visit here concluded at 1330 hours.

Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.22 (Other Sites) Site TS626 (Old Skeet Range)

The team visited this site at 1115 hours on 25 April 2023. Overall, the site was covered in a variety of short well-established grasses with scattered bare soil spots, but no signs of significant stress to the vegetation. The site appears to be regularly mowed as all of the grass is kept short. Numerous animal burrows and possible frost heaved soils were visible. However, the team observed no signs of sloughing, slumping, soil erosion or human-caused site disturbances. Site visit here concluded at 1145 hours.

Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.23 (Other Sites) Site TS929 (Skeet Range)

The team arrived for a brief site visit at 1115 hours on 25 April 2023 (concurrent inspection with site TS626). The site was covered in a variety of well-established grasses with minimal signs of stressed vegetation. The site appears to be regularly mowed. Numerous shallow animal burrows and possible frost heaved soils were visible. However, the team observed no signs of soil erosion or human-caused site disturbances. Site visit here concluded at 1145 hours.

Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.24 (Other Sites) Site TU502 (Facility 2160)

The team arrived for a brief site visit at 1500 hours on 25 April 2023. The site is south of the intersection of Bong Street and George Avenue. Original buildings 2160 and 2161 have been removed, along with associated tanks and piping. The site was covered in short well-established grass with minimal signs of stressed vegetation. The site appears to be regularly mowed as all of the grass is kept short. Numerous shallow animal burrows and possible frost heaved soils were visible. However, the team observed no signs of soil erosion or human-caused site disturbances. The team observed site monitoring wells to be in generally good condition. Site visit here concluded at 1510 hours.

Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

C.3.25 (Other Sites) Site TU503 (Facility 1212)

The team arrived for a brief site visit at 1515 hours on 25 April 2023. This site is west of building 1207 and north of Artillery Road. Original site buildings 1212 and 1226 have been removed.

The site was covered in short well-established grass with minimal signs of stressed vegetation. The site appears to be regularly mowed as all of the grass is kept short. Several shallow animal burrows and possible frost heaved soils were visible. However, the team observed no signs of soil erosion or human-caused site disturbances. Site visit here concluded at 1520 hours.

Although the site is not surrounded by a security fence and has no signage, land use controls appear to remain effective as no significant human-caused soil disturbance could be detected. The FAFB ERP has review/approval authority for any planned future intrusive work at each this site to ensure established LUCs are maintained.

All components of the remedial action appear to be in good condition and operating as intended. The final site visit ended at approximately 0930 on 26 April 2023.

C.4 ACTIONS

All information obtained from these multiple site visits will be incorporated into the Fairchild AFB Fifth Five Year Review report.

Site Visit Photos



LF002 Access Gate



LF002 Treatment Plant North Side



LF002 SVE System Components



LFO02 Groundwater Extraction and Treatment System



LF002 South End View to North



LF002 Central Wellfield



LF001 Monitoring Wells – View to East



LF001 View South Showing Frost Heave and Shallow Animal Burrows

Note: Photography not permitted at SS018 and SS026



FT004 North View



FT004 East View



FT004 Control Shed Interior



FT004 Monitoring Well



WP003 Former Groundwater Treatment Building



WP003 Lagoons, Bird Netting and Control Structures Looking West



WP003 Ditch Weir



WP003 Outlet Culverts



WP003 South View



Site T016 Near Water Tower



Site T017 in Field to Right of Current Fire Training Tower



ST006 View North



ST006 East Side Containment, Fencing and Monitoring Wells



ST006 East Side Wide View



ST006 East Half of South Side, View North



SS009 View West



SS009 View East





SS009 Site Monitoring Wells



Site ST010 in Foreground and TU503 in Background



SD031 View West



FT032 in Foreground, DP024 in Background – View Southwest



DP022 West End View East



DP022 Coal Fragments on Surface – View East



DP022 Embankment Coal Fragments – View West



DP024 View South



DP012 View North



DP012 View Northwest



DP012 View West



DP013 View West



DP013 Scrap Metal Burial Area



DP013 East Side View North – Scrap Metal and Valve Burial Pits Area



DP013 View West Showing Scrap Metal and Valve Burial Pits Area



SS039 East End View South



SS039 East End View West



SS039 Monitoring Well – East Housing Area



WP036 Lagoon and Drying Bed – View Northwest



WP036 Northwest Corner View Southeast



WP036 Drying Beds



WP036 Drying Beds Wide View East



RW011 Former 5,000 Gallon UST Site – View Southeast



RW011 Former 1,000 Gallon UST Site Locked Gate



RW011 Former 1,000 Gallon UST Site East Side Fence Damage



RW011 Former 1,000 Gallon UST Site Enclosure



RW011 Former 1,000 Gallon UST Site Monitoring Well (at Center)



RW011 Trench Site Enclosure – View East



RW011 Trench Site Storage Drum



RW011 Radioactive Waste Sign Detail



Site TU502 View South



DP064 View West



DP064 View South Toward ST006



Sites TS626 to the Left and TS929 to the Right – View North



Site TS929 View East

APPENDIX D

PUBLIC NOTIFICATION AND INTERVIEW RECORDS SITE

Initial Public Notice



C4 • FRIDAY • MARCH 24, 2023 THE SPOKESMAN-REVIEW

DEATH NOTICES

FAUNCE, Alan D. (Age 78) Passed away March 7, 2023
Kramer Funeral Home, Pullman, WA

FRISON, Ruth (Age 81) Passed away March 8, 2023
Heritage Funeral & Cremation, Spokane, WA

HAMNER, Carol I. (Age 93) Passed away March 4, 2023
Glenney Funeral Chapel, Chewelah, WA

McCLELLAN, Eugene (Gene) (Age 79) Passed away March 9, 2023
Bell & Dodd Funeral Home, Spokane, WA

Death Notices are published as a complimentary service of The Spokesman-Review. Look to the following obituaries or call the funeral home for further details.

OBITUARY NOTICES

HANSEN, Larry Charles "Chuck"

Larry Charles "Chuck" Hansen, 72, of Kellogg, ID, passed away on March 11, 2023, at Shoshone Medical Center in Kellogg, ID. Larry was born on August 3, 1950, in Kellogg, ID, a son of the late Lawrence and Geneva Hansen.

Larry graduated from Kellogg High School and then North Idaho Junior College with a degree in Auto Body Repair in 1971. He worked as a miner for and retired from Hecla Mining in the Silver Valley as well as later working for mines in California, Nevada, Washington, and Michigan's Upper Peninsula. He enjoyed sharing stories of his time as a miner as well as collecting antiques including old Zippo lighters and vintage timepieces. He loved watching baseball and attending games when he could and was a huge Chicago Cubs fan. Larry also got much enjoyment from feeding the deer on his property.

Larry rarely complimented about much except the weather or politics however, when he did complain, it was quite serious, often with a call to the Better Business Bureau or through letters to various politicians. In his later years, he was fond of his routines and rarely missed the nightly news on Channel 6 at 5:00 PM. He was an early bird, up at 4:00 AM each day and his daily goal was to stay awake to make it through Jeopardy at 7:30 PM. He also enjoyed his outings to play bingo in Osburn and Wallace. He kept track of silver prices, gas prices, and beat prices late into his life and was a wealth of information about local history, mining, and local history. We will miss his stories and updates.

In addition to his parents, he was preceded in death by a brother, Tom Hansen.

Survivors include his three daughters, Tricia Hansen (John) of Spokane Valley, WA, Tiffany Hansen of Newport, WA, and Rhonda Mathews, in Kansas; his son; Jonathan Hansen (Ashley) of Eugene, OR; a sister, Linda (Ken) Lonn of Kellogg, ID; a brother, Elvin Hansen of Post Falls, ID; 6 grandchildren and several nieces and nephews in the area. Many thanks to his friend, Wayne, for cheering on him late in life and his lifelong friend, Bob Allen.

Funeral services will be held on Thursday, March 16, 2023, at 10:00 PM at Shoshone Funeral Services, 106 S. Main St., Kellogg, ID. Friends and family may gather at the funeral home beginning at 4:00 PM until service time for a period of visitation. At Larry's request cremation will follow the services and his ere will be interred on Saturday, March 18, 2023, at 11:00 AM at Greenwood Cemetery in Kellogg. Donations may be made in Larry's name to The National Cancer Institute, Building 31, Room 11A-16, 9000 Rockville Pike, Bethesda, MD 20892, or contact them via email: NCIinfo@nih.gov.

Memories of Larry and messages of condolence may be shared with his family online at www.shoshonefuneralservice.com. Shoshone Funeral Services, Kellogg, is assisting the Hansen family with arrangements.

VISINTAINER, John E. November 12, 1943- March 6, 2023 (Age 79)

John entered his final resting place on March 6, 2023. He was 1 of 8 children born to Benjamin "Benny" and Margaret "Peggy" Visintainer of Spokane Valley. He attended Saint Paul's Parish and then West Valley High School. He worked for Inland Empire Paper and later went on to construction, at Iron Workers Local 14. He enjoyed working on cars, collecting and restoring antiques, fishing, horses, and the outdoors.

John has joined his parents, his brother, Ralph, and his sister, Jean, among many friends and family. John was a son, a dad, an uncle, and a cousin to many. He is survived by his brothers and sisters, Jean, Dolores, Jerry (Sylvia), Mike, and Sally, as well as his 3 children, Christina (Walter), Jason (Caroline), and Jennifer (Tom). John had 3 grandchildren: Josh (Kim), Al (Danielle), Michaela, and 1 great-grandson, Zander.

The Funeral Mass will be held at St. Joseph Catholic Church in Otis Orchards, WA, on Wednesday, March 15 at 11:00 a.m., followed by the Graveside Committal at St. Joseph's Catholic Cemetery 17825 E. Trent Ave., Spokane Valley, WA. Beginning at 1:00 p.m. a light, luncheon reception will take place at Hennessey Valley Funeral Home 13115 E. Pines Rd., Spokane Valley, WA.

The family requests donations are made to St. Joseph Catholic Church 4521 N. Arden Rd., Otis Orchards, WA 99027.

"I press on toward the goal for the prize of the upward call of God in Christ Jesus" 2 John 1:8.

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Obituaries are part of the services offered by the **Funeral Homes or Crematories.** They will be able to assist you.

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COMMUNITY NOTICES

ANNOUNCEMENTS

PUBLIC NOTICE
THE UNITED STATES AIR FORCE WANTS TO HEAR FROM YOU ABOUT THE FAIRCHILD AIR FORCE BASE SUPERFUND CLEANUP

The United States Air Force (USAF) has started the latest of our periodic reviews of the cleanup for the Fairchild Air Force Base (AFB) Superfund site near Spokane in Spokane County, WA. We will use this review to see if the cleanup plan for the site continues to protect human health and the environment, and whether the cleanup is working as designed. Federal law requires review of Superfund site cleanup plans every five years if:

- a cleanup takes more than five years to complete; or
- hazardous waste is still on-site.

The USAF completed the Fourth Five Year Review for Fairchild AFB in 2019 and found the cleanup was meeting its goals.

What is included in the Review?

This new 2023 review includes:

- an inspection of the site and technologies used for the cleanup;
- a review of site data and maintenance records; and
- a review of any new laws or requirements that could affect the cleanup.

The USAF Would Like to Hear from You!

We would like to interview community members about how you think the site cleanup is going. If you want to learn more about the site and/or be interviewed. Please call Megan Riccobono, or Fairchild AFB Public Affairs before March 31, 2023.

- Megan Riccobono, Remedial Project Manager, AFCEC/CZOM Fairchild AFB: 509-247-2455, megan.riccobono.1@us.af.mil

Or

- Fairchild AFB Public Affairs, 509-247-5705, 92arw.pa@us.af.mil

Where Can I Learn More?

Visit the USAF Administrative Record (AR) at the following webpage: https://ar.cfpm-cloud.af.mil/ for more information. Scroll to the bottom of the page and click on "Continue to site", then select "Active", scroll down the Installation List, and click on Fairchild Air Force Base to search for documents. The USAF has also set up an information repository with paper copies of key documents and reports used in the cleanup at the following location:

Spokane Falls Community College Library
West 3410 Fort George Wright Drive
Spokane, WA 99224
Phone (509) 533-3835
Hours: 7:15 a.m. to 5:00 p.m., Mon. – Thurs.
7:15 a.m. to 3:00 p.m., Fri.
Please call for current hours of operation

The USAF will complete the Five-Year Review report no later than September 30, 2023. When complete the USAF will post a copy on the site's webpage and send a copy to the information repositories listed above.

Site Background

Fairchild AFB generated hazardous waste throughout its seven-decade history as an aircraft maintenance and refueling station. Most of the waste generated for recycling or disposal was fuel oil, machine oil, or solvents. In March 1989, Fairchild AFB was listed on the United State Environmental Protection Agency EPA (USEPA) National Priorities List (NPL). In 1990, Fairchild AFB, USEPA, and the Washington Department of Ecology signed a Federal Facility Agreement, which along with specific decision documents for individual operable units (OUs), continues to govern the ongoing cleanups.

SENIOR HOUSING RE
BRAND NEW RENTAL UNITS FOR 55+ COMMUNITY IN SPOKANE VALLEY - HALF OFF FIRST MONTH RENT! Spokane Valley Villa's is a maintenance free and gated rental community for those that are 55+ in the Spokane Valley! We have listed over units opening up in April and continuing throughout the spring/summer. We have both three bedroom units, each with attached garages. Every unit has vaulted ceilings, quartz countertops and LVP flooring throughout the entire unit. Rent ranges from $2,300 to $2,4 Call (509) 315-9519 or email spokevalleyvilla@gmail.com for more information.
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THE SPOKESMAN-REVIEW
SINCE 1883
EMPLOYMENT OPPORTUNITIES

BUSINESS REPORTER
Position: Business Reporter
Status: Full-time, Non-exempt
Salary: $42,000-$47,000/yr.
Hours: Monday – Friday, 9-6
Location: Spokane, WA
About this role: The Spokesman-Review is a family-owned newspaper where your talent will come to the fore in reporting on the mom-and-pops that are the heart of small business as well as tech startups and entrepreneurs that garner seed funding from around the globe. Our staff's coverage of a dynamic and ever diversifying Spokane-area economy runs the gamut from small to big business. Our next business reporter will have demonstrated ability in source development and beat coverage. You'll also be a deft storyteller with a knack for conveying an issue's impact on the average citizen or consumer. One of the state's largest utilities is based in Spokane and the city is a health care hub that not only boasts several hospitals, but also private and publicly traded companies involved in groundbreaking research. Homebuyers and -sellers look to our coverage of one of America's hottest real estate markets of the past two years, while our stories provide insight into development of a growing metropolitan area and a downtown skyline dotted with cranes.
What you'll contribute to our team: Bachelor's Degree in Journalism. Two – three years of experience in reporting. Valid driver's license. Proficient in use of a computer and smartphone, including use of Newsgate and Django content management systems. Demonstrate ability to create hyperlinks, attach photos, understand SEO and Key Performance Indicators. Ability to use a smartphone to files stories and multimedia from the field and to stay current with news events. Demonstrate social media skills on Twitter, Facebook, and any emerging social media networks to both promote and enhance your journalism. Ability to work in adverse conditions and unusual schedules when news breaks. Must understand and uphold the standards, ethics, and mission of journalism at The Spokesman-Review on all platforms. Premium on organizational skills, able to meet changing deadlines, deal with multiple stories at once, keep supervisors abreast of developments, and work with other staff members on stories. Read The Spokesman-Review, both in print and online, and stay current with all relative news sources. Maintain a high degree of professionalism in representing The Spokesman-Review, always striving for fairness and accuracy.

HEALTH REPORTER
Position: Health Reporter
Status: Full time, Non-exempt
Salary: $42,000-$47,000/yr.
Hours: Monday – Friday, 9-6
Location: Spokane, WA
About this role: The Spokesman-Review is hiring a health care reporter. If you have several years of journalism experience with the clips and references to showcase excellent reporting and writing skills, consider applying for this job. The successful applicant should expect to write stories ranging from medical research and drug trials to insurance fights, patient profiles and public health funding. The Spokane area has five major hospitals, a VA medical center and a Shriner's Hospital for children, making it a medical hub for patients needing care for hundreds of miles in all directions. The city is also home to two medical schools training doctors to fan out across the West with a special emphasis on small towns. This job is for an enterprising and investigative reporter who writes in-depth stories for the daily front page and Sunday edition.
What you'll contribute to our team: Bachelor's degree from four-year college or university or equivalent demonstrated work experience. Preferred concentration in advertising, or digital marketing. Two or more years active experience in advertising and/or digital marketing desired. Ability to function in a cross function, self-directed team environment. Ability to function under varying degrees of pressure. Ability to assume a leadership role with the customer and team. Must be a creative thinker and problem solver. Ability to meet with customers virtually or in the field (face to face). Regular attendance is a condition of employment. Excellent verbal and presentation skills. Intermediate level using Microsoft Office Products including Word for Windows, Excel, Power Point and Outlook. Entry to Intermediate level using virtual meeting platforms such as Teams or Zoom.
What we offer: Bachelor's Degree in Journalism. Two – three years of experience in reporting. Valid driver's license. Proficient in use of a computer and smartphone, including use of Newsgate and Django content management systems. Demonstrate ability to create hyperlinks, attach photos, understand SEO and Key Performance Indicators. Ability to use a smartphone to files stories and multimedia from the field and to stay current with news events. Demonstrate social media skills on Twitter, Facebook, and any emerging social media networks to both promote and enhance your journalism. Ability to work in adverse conditions and unusual schedules when news breaks. Must understand and uphold the standards, ethics, and mission of journalism at The Spokesman-Review on all platforms. Premium on organizational skills, able to meet changing deadlines, deal with multiple stories at once, keep supervisors abreast of developments, and work with other staff members on stories. Read The Spokesman-Review, both in print and online, and stay current with all relative news sources. Maintain a high degree of professionalism in representing The Spokesman-Review, always striving for fairness and accuracy.

EDUCATION REPORTER
Position: Education Reporter
Status: Full-time, Non-exempt
Salary: $42,000-$47,000/yr.
Hours: Monday – Friday, 9-6
Location: Spokane, WA
About this role: The Spokesman-Review is seeking an experienced journalist to report on children and education. Spokane County has more than 70,000 students attending its K-12 public schools. The successful candidate for this beat will have the clips and references exemplifying great reporting and writing skills. They will turn a variety of stories that explore the next generation's promise and challenges and ensure readers their tax dollars are wisely spent by continuing the newspaper's legacy of watchdog and investigative reporting. Our education reporter will be a member of a dynamic and aggressive reporting team led by seasoned editors with decades of experience. Expect to be an important contributor to the daily front page while finding in-depth stories for the Sunday edition.
What you'll contribute to our team: Bachelor's Degree in Journalism. Two – three years of experience in reporting. Valid driver's license. Proficient in use of a computer and smartphone, including use of Newsgate and Django content management systems. Demonstrate ability to create hyperlinks, attach photos, understand SEO and Key Performance Indicators. Ability to use a smartphone to files stories and multimedia from the field and to stay current with news events. Demonstrate social media skills on Twitter, Facebook, and any emerging social media networks to both promote and enhance your journalism. Ability to work in adverse conditions and unusual schedules when news breaks. Must understand and uphold the standards, ethics, and mission of journalism at The Spokesman-Review on all platforms. Premium on organizational skills, able to meet changing deadlines, deal with multiple stories at once, keep supervisors abreast of developments, and work with other staff members on stories. Read The Spokesman-Review, both in print and online, and stay current with all relative news sources. Maintain a high degree of professionalism in representing The Spokesman-Review, always striving for fairness and accuracy.
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Final Public Notice

(Reserved)

Five-Year Review Interview Record				
Site:	Fairchild Air Force Base:		**EPA ID No:**	WA9571924647
Interview Questionnaire Date: 6/12/2023				
(Fill in the components below, one line per person if multiple persons are providing responses)				
Name	**Organization**	**Title**	**Telephone**	**Email**
Jacob Bradley	Bay West	Geologist and Operator	509-589-4367	Jacob.v.bradley@gmail.com

(Record responses to the questions below)

1) What is your overall impression of the project?

The project has been very successful in achieving Performance Objectives and working with Air Force and Regulators to overcome challenges and achieve common goals.

2) Is the remedy functioning as expected? How well is the remedy performing? Are there any major concerns?

LF002: The LF002 remedy is functioning as expected, however, the treatment system is 30 years old this year and has passed its life expectancy and its best period of functionality.
FT004: Yes, it is functioning as expected. Concerns for this site is PFAS which is being investigated under a different contract
WP003: Yes, it is functioning as expected. COCs continue to trend downward. Concerns for this site is PFAS which is being investigated under a different contract
DP022: No concerns with remedy
DP024: No concerns with remedy
DP012: No concerns with remedy
DP013: No concerns with remedy
SS039: Yes, it is functioning as expected, injections are having the desired impact. Concern for this site is the size of the plume and its expanse across base.

3) What does the monitoring data show? Are there any trends that show contaminant levels are decreasing?

LF002: Yes, the contaminant levels have decreased to a point that there is currently a trial shutdown of the system at LF002 to monitor natural attenuation of the contaminants of concern.
FT004: NA
WP003: The data shows that concentrations are decreasing. There is a halo of elevated levels around the ponds found at WP003 due to the natural occurring degradation within the ponds.
DP022: NA
DP024: NA
DP012: NA
DP013: NA
SS039: The data shows that concentrations are decreasing. The injections are effective at reducing the COCs on site

4) Is there a continuous O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities.

LF002: There was a continued weekly presence at LF002 for maintenance and operation that was preformed weekly until January 2023. Currently there is at least a monthly presence at the LF002 treatment system to maintain the facility and quarterly and the landfill caps.
FT004: Not a continuous presence**,** Annual LUCs
WP003: Inspections during quarterly sampling events by on site supervisor.
DP022: Not a continuous presence**,** Annual LUCs
DP024: Not a continuous presence**,** Annual LUCs
DP012: Not a continuous presence**,** Annual LUCs
DP013: Not a continuous presence**,** Annual LUCs
SS039: Inspections made during RAO activities throughout the year by field staff but there is not a continuous O&M presence.

5) Have there been any significant changes in the O&M requirements, maintenance schedules, or sampling routines in the last five years? If so, do they affect protectiveness of the remedy? Please describe changes and impacts.

LF002: Yes. The LF002 system is on a trial shutdown for 2023, which affects O&M, maintenance schedules, and sampling routines. The system is being evaluated to see if the contaminants of concern will naturally attenuate without running the pump and treat system.
FT004: NA
WP003: An injection pilot study occurred in the last 5 years and sampling efforts have increased to monitoring the effectiveness of the injections. Does not affect the protectiveness of the remedy.
DP022: NA
DP024: NA
DP012: NA
DP013: NA
SS039: NA

6) Have there been unexpected O&M difficulties at the site in the last five years? If so, please give details.

LF002: There have been several unexpected O&M difficulties. First, in January 2019 old wiring shorted out a pressure gauge that monitors the water flow at the top of one of the stripper towers. Both towers had to have their wiring replaced from the gauge back into the building. Second, the heater that is associated with the pressure gauge was not working in 2020 and the gauge froze and broke for tower 301. The gauge had to be replaced and the switch and heater also had to be replaced. Finally, in 2023 it was discovered during monthly maintenance checks that the same gauge was broken again.
FT004: NA
WP003: NA
DP022: NA
DP024: NA
DP012: NA
DP013: NA
SS039: NA

7) Have there been any changes to address known soil cap maintenance issues (burrowing animals, gate signage) at the site in the last five years? If so, please give details.

LF002: The burrowing animals, marmots, and mice, have their burrows filled in during the quarterly cap inspections by the inspector. There is also currently a USDA employee tasked with trapping and/or killing a marmot on the property. The gate and sign at the entrance to LF002 has not been an issue during the past 5 years.
FT004: NA
WP003: NA
DP022: No issues were noted during the Annual LUC inspections
DP024: No issues were noted during the Annual LUC inspections
DP012: No issues were noted during the Annual LUC inspections
DP013: No issues were noted during the Annual LUC inspections
SS039: NA

8) Have there been opportunities to optimize O&M or sampling efforts? Please describe changes and resultant or desired cost savings or improved efficiency.

LF002: The treatment system is currently on a trial shut down for the year of 2023 pending sampling contingencies. This shutdown has a large cost savings for labor to the project. Additionally, the cost savings for electricity is significant as none of the extraction well pumps or treatment pumps are running during this time.
FT004: No sampling currently
WP003: Sampling has adjusted over the last 5 years to accommodate evaluation of pilot study injections. The resultant changes long term will be reduction in sampling in the site well network.
DP022: No sampling currently
DP024: No sampling currently
DP012: No sampling currently
DP013: No sampling currently
SS039: Sampling has adjusted around various injection events to monitor the effectiveness of the remedy on the COCs.

9) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the protectiveness of the remedy?

LF002: I am not aware currently of any changes that impact the protectiveness of the remedy for the listed COCs
FT004: Same as above
WP003: Same as above
DP022: Same as above
DP024: Same as above
DP012: Same as above
DP013: Same as above
SS039: Same as above

10) Has there been any changes in the adjacent properties within the last five years? Changes such as large excavations, trenching, demolition, or well installation?

LF002: There has been a change in the use of the property directly north of the LF002 site. Several vacuum trucks and other vehicles have dumped loads in an excavated area to the north of the site. The property to the northwest of the site has also undergone changes as it has been leveled and prepared for a building project.
FT004: No changes
WP003: No changes
DP022: No changes
DP024: No changes
DP012: No changes
DP013: No changes
SS039: Off base to the north, there are plot of land in a subdivision that are privately owned. Unsure of what that land has in store for the future usage.

11) Do you have any comments, suggestions, or recommendations regarding the project?

I do not have any suggestions or recommendation at this time.

Five-Year Review Interview Record				
Site:	Fairchild Air Force Base		**EPA ID No:**	WA9571924647
Interview Questionnaire Date: 5/16/2023				
(Fill in the components below, one line per person if multiple persons are providing responses)				
Name	**Organization**	**Title**	**Telephone**	**Email**
John Hancock	RAB	Community Member	509-244-4422	John.hank@me.com
John Hancock	Resident & well owner	Resident near Fairchild	509-244-4422	John.hank@me.com
John Hancock	West Plains Water Coalition	Founder	509-244-4422	hancock@westplainswater.org

(Record responses to the questions below)

1) What is your role in the project (e.g., property owner, groundwater user, drinking water provider, impacted adjacent property, consultant, community member)?

See above. The Coalition was founded in Feb 2023 to represent the collective needs and experiences of West Plains persons, both in and beyond the FAFB test zone. I've lived in Deep Creek Canyon since 2007, but aware of groundwater pollution only since 2018.

2) What is your overall impression of the project?

RAB is not fulfilling its general duties of 2-way communications with the public. It neither speaks nor listens to nearby persons or organizations, except in discussion of chemistry and engineering. That's not what I think Superfund requires of the EPA oversight of this project.

3) What effects have site operations had on the surrounding community?

Multi-generational cancers, livestock and pet deaths, orchards dying from lack of irrigation.

4) Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

Air Force Engineering is a project of water, wells, pumps, filters, and tests. It's a heartless and clueless approach to affected persons. This is a public health crisis being managed by water engineers. Air Force engineering mistreats the persons receiving well tests and filter systems.

5) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

No comment.

6) Do you feel well informed about the site's activities and progress?

Not at all, in spite of my own persistence and vigor in asking. As a RAB member, I should not have to use public information requests to get information.

LF002(SW-8) - Craig Road Landfill (OU1): Spokane County did a TCE study during its property transfer of Raceway Park to the Kalispel Tribe of Indians. Your official record should at least reference that study. Perhaps is has value to you. Don't ignore it, please.

One of my gripes is that the AF doesn't seem to care about studies is doesn't undertake. That's not fair to us neighbors, to reject the importance of data which affects us. Ineffective collaboration with federal, state, and local agencies slows down progress, and allows finger-pointing blame shifting.

7) Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

Define who the PIO is and make them available.
Perform public relations in the general society sense, not as a minimum-level of what's required. For instance, notification "to the community" has been done by mail only to persons in the Test Zone, excluding everyone else as strategy, to contain the bad news and mask the inaction.

8) Do you have any comments, suggestions, or recommendations regarding the project?

Get serious about transparency
Speak plain English to the public, not science and engineering
Loosen up the agenda for RAB member participation. Respond to the interests of the RAB members.

Additional Site-Specific Questions

[If needed]

Five-Year Review Interview Record			
Site:	Fairchild Air Force Base	**EPA ID No:**	WA9571924647

Interview Questionnaire

Date: June 1, 2023

(Fill in the components below, one line per person if multiple persons are providing responses)

Name	Organization	Title	Telephone	Email
Jon Welge	Tetra Tech	Senior Environmental Scientist	(509) 263-5737	Jon.welge@tetratech.com

(Record responses to the questions below)

1) What is your role in the project (e.g., property owner, groundwater user, drinking water provider, impacted adjacent property, consultant)?

Area environmental consultant, Restoration Advisory Board Member and Co-Chair

2) What is your overall impression of the project?

Cleanup/management of Fairchild's approximately 60 PBR sites is ongoing. Progress is ongoing and commendable. Management of PFAS contaminants and concerns is a much more difficult and challenging situation due to widespread PFAS contaminants in area groundwater, the length of time human exposure has occurred, the concentrations of PFAS found in human blood, and the lack of resources for local citizens to determine their risk. Glad to discuss.

However, what has been lacking with respect to the Five-Year Review sites is just how these sites have contributed or are contributing to PFAS. We suspect such contribution has been significant (Craig Road, Old Base Landfill, FT-1, etc.)

3) How do you interact with the Superfund Project Manager regarding concerns with the cleanup?

I interact with the Superfund Project Manager primarily through the Restoration Advisory Board (RAB). The SPM is present, but AFCEC personnel provide regular status updates for each of the Fairchild AFB cleanup sites. The updates are presented quarterly to biannually to the RAB and the general public. AFCEC presents well, does good work! Local on-base and regional personnel are doing a lot of valiant work, but they need help (especially with PFAS questions).

4) Do you have evidence or prior knowledge that a public or private well, water system, or aquifer has been designated contaminated by any government or health agency? Please describe.

Yes. I have knowledge suggesting there are numerous public and private wells in the vicinity of the base that are contaminated. Wells northernly and easterly from the base are contaminated with PFAS, and wells immediately north of the base are also contaminated with TCE. Perhaps hundreds of monitoring wells on base are contaminated. There are several aquifers within the area and portions of each aquifer are likely contaminated.

5) Is the cleanup functioning as expected and how well is it performing?

Mixed bag. Cleanup of typical base-related contaminants such as petroleum products and Trichloroethylene (TCE) is ongoing and greatly appreciated (such as SS-39). Advancement of the distal TCE plume northward is disappointing. For LF002, the GETS shutdown may be justifiable, but will ongoing sampling demonstrate the need to turn the system back on? From what I understand, cleanup of PFAS contamination in groundwater is limited if not absent currently, and that's not acceptable to the community. Also, it appears only limited residential well sampling is completed north of the base, and the decision of whether to sample is reportedly based upon whether a community member's property falls inside arbitrary boundary lines drawn on a local map.

An examination of ongoing treatment processes should be completed to see if such treatment can be easily adjusted to include PFAS contaminants. For example, the Air Force may find it beneficial to treat groundwater from LF002 should the ongoing treatment process be shown to help reduce PFAS concentrations in local groundwater.

6) Are you aware of any changes in Federal/State/County/Local laws and regulations that may impact the recovery of the existing contamination or how the cleanup will be conducted?

Absolutely. There are multiple changes/additions proposed for the regulations governing PFAS contaminants, as well as 6PPD and PCB contaminants. Of primary concern is the US EPA's proposed ultra-low cleanup level of 0 to just 4 parts per trillion (ppt) for PFAS. If the proposed 4 ppt maximum contaminant level becomes promulgated, the West Plains and Airway Heights areas may require significant cleanup. However, I question how administrable a 4 ppt PFAS cleanup concentration is when similar concentrations can be found in the Spokane River, the Spokane Valley / Rathdrum Prairie Aquifer, and even as far away as Antarctica. PFAS is literally everywhere. It didn't all come from Fairchild.

7) What effects have site operations had on the surrounding community?

With respect to PFAS, the effects site operations had on the community are generally not well understood. ASTDR completed blood and urine sampling of folks in the community several years ago and found significant concentrations of PFAS chemicals. However, it remains unknown the degree to which "site operations" have affected the community versus "other operations" nearby. There are other sources of PFAS contamination in the area, many of which remain uncharacterized. It appears significant additional soil and groundwater characterization will be required to demonstrate which PFAS sources in the vicinity have most profoundly impacted the community.

8) Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

With respect to PFAS, broadly it appears citizens of the West Plains community and the City of Airway Heights are not happy with PFAS contamination and cleanup. About 60 households north of the base have received GAC filtration at their wells.
However, dozens or possibly hundreds more are using groundwater with significant PFAS concentrations. The community is greatly concerned with PFAS contaminants in its water. It is likely affecting housing prices, it's reportedly affecting the ability of locals to farm and raise livestock, and it is likely impacting the public health. These concerns impact relationships with the base – although widely the community very much appreciates the base. Fire departments locally are in a similar situation. It's a difficult situation.

9) Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, please give details.

No.

10) Do you feel well informed about the site's activities and progress?

Not completely. It would behoove the Air Force to complete monthly mailers, something like that, which updates status of characterization and provides ongoing outreach. Also, having a telephone hotline locally would be excellent.

11) Do you have any comments, suggestions, or recommendations regarding the project?

Yes. Here are some thoughts/suggestions regarding community needs:

a. *A fund should be established to empower local citizens to get their water tested for free. Whether the base or local government pays for testing, that's negotiable.*
b. *Should significant PFAS levels be found during free well testing, local citizens should be able to receive free blood tests and a health checkup.*
c. *Additional characterization should be completed of soil and groundwater in the community to determine sources.*
d. *Removal and changeout of all PFAS AFFF fire suppression systems should be completed in the effort to convert to fluorene-free foam. Proper cleaning of those systems prior to converting to fluorene free foam is of vital importance.*
e. *Remedial (cleanup) work such as soil washing, thermal desorption, and implementation of groundwater pump and treat systems is an excellent idea. Glad to provide additional details.*
f. *Effective and careful messaging of what's going on to clean the community is paramount.*
g. *Provide a hotline to a person on base who can give the latest news to the community.*

I'd say at minimum, the first two points above should be completed immediately and without regard to implementation of the upcoming EPA proposed 4 ppt MCL in drinking water. Characterization efforts in the vicinity are also important and should remain ongoing. The proposed MCL will likely significantly impact characterization and treatment plans. If the pMCL is considered 0 to 4 ppt, this may negatively impact characterization and treatment efforts because at those levels, PFAS can be found nearly everywhere, and it can hardly be removed to just 4 ppt. It would be best if the EPA can present a more defensible and functional pMCL. Feel free to contact me anytime. Glad to help!

Additional Site-Specific Questions
[If needed]

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APPENDIX E

DATA REVIEW

The following is a review of the data collected in conjunction with the remedial actions during the last five years. Data relevant to remedy performance and progress towards meeting RAOs will be discussed in this section, including data trends to evaluate whether RAOs and associated cleanup levels established in the ROD are likely to be achieved, data relevant to support engineering performance, and data related to the site-specific groundwater remedy completion strategy. Each well concentrations and trends were plotted by well groups in a performance model, as depicted in Figure E-1. These trends were statistically evaluated using the Mann-Kendall test, a method widely used for identifying significant trend in data series.

E.1 BASEWIDE

E.1.1 Facility-wide Land Use Controls (Institutional Controls)

1.0 WORK CLEARANCE SYSTEM

In accordance with Fairchild AFB Instruction 32-1001, the Fairchild AFB103 Form (AFB103) Base Civil Engineer Work Clearance Request is required for any agency that must trench, hand dig, place an object into the ground, interrupt utilities, or accomplish work that will affect vehicular or aircraft traffic flow. This includes all required work, utility outages, disruptions of aircraft/vehicular traffic flow, or excavation of greater than six inches. This form shall be completed for work performed within the Base boundary and signed by the 92nd Civil Engineering Squadron (92nd CES) Commander. The Work Clearance System prevents access to, or the use of, contaminated soil, sediment, and groundwater for restricted uses until CULs are met, and maintains the integrity of current monitoring systems.

2.0 INSTALLATION DEVELOPMENT PLAN

The Installation Development Plan (IDP) is a long-range planning tool that designates current and future land uses. It also provides a framework for selecting the locations of future facilities needed to carry out the Base mission. The IDP should describe the specific LUCs for each site, the reasons for the controls, and the areas where the controls are applied. For a LUC to remain protected, Base personnel must have access to information concerning its existence, purpose, and maintenance requirements. The IDP provides the important information to ensure that LUC management takes place and that the presence of the LUCs is effectively communicated.

3.0 BASE CIVIL ENGINEER WORK REQUESTS

The Fairchild Air Force Form 332 (AF332) Base Civil Engineer Work Request must be submitted and approved before the start of any construction project at Fairchild AFB. One step in the approval process for this form is a comparison of the construction site with all constraints that are described in the IDP. The AF332 serves as the document for communicating any construction constraints to the appropriate offices. Any constraints at a given site result in the disapproval of the form unless the requester makes appropriate modifications to the construction plans.

4.0 ENVIRONMENTAL IMPACT ANALYSIS PROCESS

Environmental Impact Analysis Process (EIAP) is conducted pursuant to the National Environmental Policy Act of 1969 (NEPA) and Executive Order (E.O.) 12114, as promulgated for the USAF in 32 Code

of Federal Regulations 989 et seq to assess the potential environmental impact of any Federal action initiated by or involving Fairchild AFB. An Air Force Form 813 (AF813) initiates the EIAP. Both AF332 and excavation permits are subject to evaluation under the EIAP. The proponent of a proposed action is required to submit the AF332 or an excavation permit with the AF813 so that the appropriate environmental analysis of the proposed action and alternatives to the proposed action is accomplished prior to any construction activities. The EIAP ensures that proposed construction sites consider the potential constraints related to ERP sites described in the IDP and known to the Air Force Civil Engineer Center (AFCEC) Environmental Restoration Installation Support Team (IST). The EIAP also ensures that all environmental impacts, regardless of geographical location, are thoroughly and systematically analyzed and mitigated where necessary. EIAP ensures the incorporation of specific procedures and guidelines designed to rigorously evaluate environmental implications, devise necessary mitigation strategies, and maintain strict compliance with all applicable environmental regulations, thereby upholding the principles of environmental security and sustainability as fundamental elements of defense acquisition and planning.

E.1.2 Procedures to Implement Off-Base LUCs

1.0 STATE AND LOCAL INFORMATION SHARING

The USAF's role in administering state and local agency information sharing is to continually communicate with these agencies regarding the water quality monitoring data that the USAF produces through its long-term operations and monitoring programs. This communication includes the residential well monitoring program and efforts to regularly solicit information from these agencies on the status of any new water supply systems proposed for the area or modifications of existing systems that may affect the quality or movement of groundwater affected by the contaminant plume. Such information communication will be conducted on an annual basis, at minimum, or as necessary depending on changing site conditions. The following describes the state and local agencies that will participate in information sharing:

2.0 WASHINGTON DEPARTMENT OF HEALTH (WDOH) DRINKING WATER PROGRAM

The WDOH Drinking Water Program helps protect public water supply systems that provide drinking water to more than 5.5 million Washington state residents. The USAF will provide information to the Source Water Protection Program. The Source Water Protection Program will communicate the information to public and planning agencies, and the information will be used to assist municipalities in developing Wellhead Protection Plans and citing public water supply wells. The information will also help the Source Water Protection Program in determine the sampling frequency of public water supply wells. Information sharing with WDOH will help prevent drilling of new wells in the known area of contaminated groundwater and prevent use of contaminated groundwater until CULs are met.

3.0 SPOKANE REGIONAL HEALTH DISTRICT (SRHD) ENVIRONMENTAL HEALTH PROGRAM

The SRHD provides assistance to private well owners inquiring about water quality, odor, taste, and contaminants. Environmental Health Specialists inspect new drinking water wells in Spokane County to ensure that they meet construction standards and that old or unused wells are taken out of service. The information provided by the USAF will be used by the SRHD to advise private well owners of the environmental hazards. Information sharing with SRHD will help prevent the drilling of new wells in the

known area of contaminated groundwater and prevent use of contaminated groundwater until CULs are met.

4.0 THE CITY OF AIRWAY HEIGHTS (CAWH) PLANNING DEPARTMENT

The CAWH Planning Department grants permit to landowners for various improvements to their properties that may include intrusive activities. Information provided to the CAWH Planning Department will be used to inform the public about potential groundwater and soil vapor hazards near the contaminant plume. Information sharing with CAWH Planning Department will help prevent drilling of new wells in the known area of contaminated groundwater, prevent use of contaminated groundwater, maintain the integrity of the existing monitoring well system, and prevent the potential vapor intrusion associated with contaminated soils and groundwater until CULs are met.

5.0 THE CITY OF AIRWAY HEIGHTS PUBLIC WORKS WATER DIVISIONS

The CAWH Public Works Department provides quality water, environmental, and street services. Information provided to the CAWH Public Works Department will help inform the CAWH on public water supply well citing. Information sharing with CAWH Public Works Department will help prevent drilling of new wells in the known area of contaminated groundwater and prevent use of contaminated groundwater until CULs are met.

6.0 PUBLIC NOTICE AND OUTREACH

Fairchild AFB will provide periodic information sharing on an annual basis, at minimum, or as necessary to inform the general public in and around Fairchild AFB of off-base conditions. Public notice and outreach will help prevent drilling of new wells in the known area of contaminated groundwater and prevent use of contaminated groundwater until CULs are met. The following media will be used for public notice and outreach; however, other media may be used as they become available:

6.1 THE SPOKESMAN-REVIEW NEWSPAPER

An advertisement will be placed in The Spokesman-Review describing the status of the off-site plume and potential hazards associated with the plume.

6.2 ANNUAL RESTORATION ADVISORY BOARD (RAB) MEETINGS

The RAB is a forum for exchanging information and partnership among citizens, Fairchild AFB, the USEPA, and the state of Washington. RAB meetings will offer an opportunity to present information on the status of the off-site plume and for communities to provide input to the cleanup process.

6.3 ANNUAL NOTICE TO PROPERTY OWNERS

A notice will be mailed to landowners within the LUC boundary in the form of a fact sheet. The fact sheet will contain information on the status of the off-site plume and potential hazards associated with the plume.

6.4 SPOKANE COUNTRY WELL DRILLER CONTACT

To inform well drillers of the potential hazards associated with installing wells in the off-base contaminant plume, a factsheet will be mailed to all well drilling companies located in Spokane County with drillers licensed in the state of Washington on an annual basis. Information sharing with Spokane County well drillers will help prevent the drilling of new wells in the known area of contaminated groundwater.

7.0 OFF-BASE LAND USE CONTROL MONITORING

To ensure LUC mechanisms are effective at achieving LUC objectives, an annual inspection will be performed that will include annual drive-by visits to observe properties within the LUC boundary for land use changes, review of available aerial photography for land use changes, and a search of the WDOE Well Log mapping application to identify newly installed wells, if any. Results of the annual inspections will be documented and reported in an Annual Report on the Status of Land Use Controls. This report will be provided to the USEPA and WDOE.

E.2 OU-1 – LF002 (SW-8) – CRAIG ROAD LANDFILL

For LF002, four of the five Remedial Action Objectives (RAOs) within the ROD have been achieved with the exception of RAO 2. These RAOs are:

1. **To prevent consumption by area residents of groundwater exceeding federal Maximum Contaminant Levels.**

2. **To restore contaminated groundwater in the upper aquifer (Basalt A) to levels that are safe for drinking.**

3. **To prevent further migration of contaminated groundwater across the site boundary and to the lower aquifer (Basalt B).**

4. **To minimize the migration of contaminants from the fill material to the groundwater.**

5. **To prevent exposure to contaminants within subsurface soil and debris.**

Groundwater elevation and groundwater capture zone maps were developed using measured groundwater elevations from the annual Remedial Action Operations Report from 2018 to 2022. The groundwater elevations as well as the TCE plume maps indicate that the Groundwater Extraction and Treatment System (GETS) was effective during the last five-year period at containing the North Disposal Area (NDA) and South Disposal Area (SDA) TCE plumes. The drawdown is primarily controlled by EW-05 in the NDA and EW-14 in the SDA.

E.2.1 Soil

Although there was no direct sampling of soil during the last FYR period, due to the historical use of this site as a 39-acre unlined, closed, general-purpose landfill, the vadose zone is known to have been contaminated with TCE. In addition, TCE breakdown products such as cis-1,2-dichloroethene and vinyl chloride have been detected in the groundwater. At the time of the Remedial Investigation (RI) in 1993, the

alluvium was saturated. However, since operation of the GETS (Section 2.1.5), capping of the NDA and SDA, and decommissioning of the nearby wastewater treatment plant, the alluvium has essentially been dewatered and wells completed in the alluvium are typically dry.

The following is a summary of the 2022 vapor phase TCE removal by area:

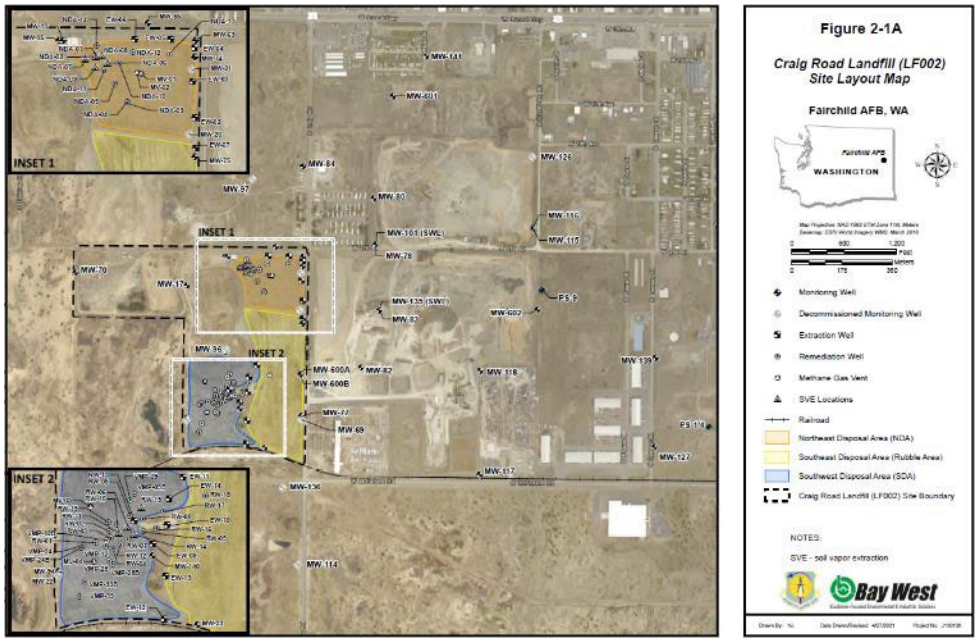
- The 2022 annual TCE removal for the NDA SVE was 3.6 lbs. Almost all this amount was removed during the third quarter when groundwater elevations were low and before freezing conditions forced a seasonal system shutdown in the winter months. The mass removal was a decrease of 27% from last year's 4.93 lbs
- Because of meager vapor yields in observed 2021 (0.9 lbs for the year), the SDA-SVE system was no longer providing effective removal and therefore was not re-activated in 2022; and
- Since RA-O began in 1995, the total TCE mass removal by SVE has been 170.4 lbs in the NDA and 177.8 lbs in the SDA.

E.2.2 Groundwater

The objective of the LF002 RAOs is to achieve the remediation monitoring endpoints at all wells before the optimal target date of 30 September 2021 (OES ICR (Bay West 2021). This date was selected to provide adequate time to complete a Remedial Action Completion Report (RACR) and document Response Complete (RC) before September 2024. A marginal target date of 30 September 2022 was also selected to represent the latest possible date and still potentially achieve the RACR before September 2024. In total, 53 wells (Figure E-1) at LF002 have data with four readings or more during the past FYR period and were evaluated for trend analysis, unless the data for the wells fell below the CULs or detection limit. The performance of individual wells was evaluated to determine if t the TCE or Cr trends would be able to meet their respective CULs.

For the purpose of prioritizing remedial and monitoring activities and simplifying the graphical representation of the performance model, the well in the monitoring program were categorized into groups. They key factors for assigning these groups was the four-event average concentrations of TCE or Cr. Wells with average TCE concentrations exceeding the PAL were divided into six groups labeled from A through F. Group A consisted of wells with the highest average TCE concentrations, while Group F included those with the lowest averages. In addition, four "miscellaneous wells" with low TCE levels, were also evaluated during this period to determine if there was any trends or indication of a potential increase. Wells with Cr concentrations above the CUL were assigned to a Cr group, and wells with elevated cis-1,2-diclorethene were also evaluated for trend analysis.

Figure E-1: Craig Road Landfill Site Map and well locations



E.2.2.1 Performance Concentration Trends

The concentrations and trends for each well (by well group) are plotted in the performance model as shown on Figures E-2, E-3, E-4, E-5 through E-10. Conclusions based on these data (as presented in the 2020 Annual RA-O Report, Bay West, 2021b) for TCE, VC, and Cr are provided in the sections below.

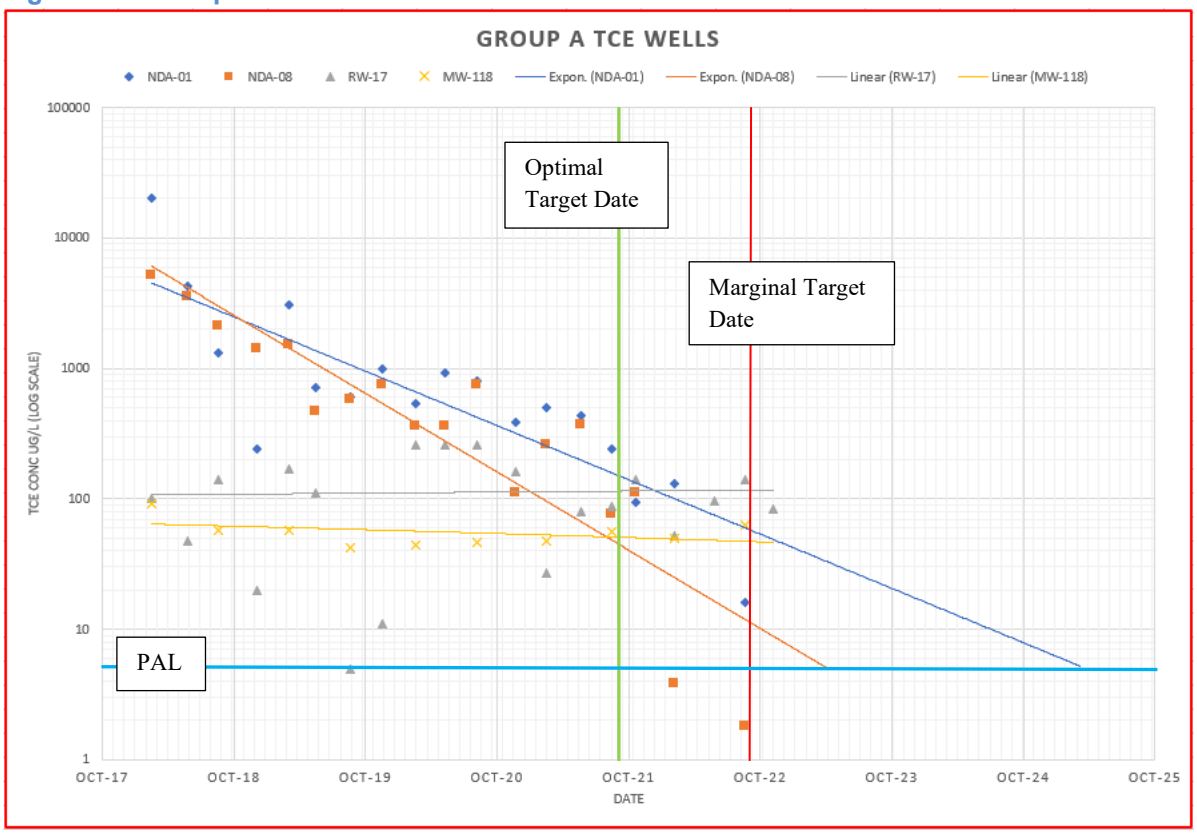
E.2.2.2 TCE

Of the 54 wells originally included in the monitoring program for volatile organic compounds, 31 wells were evaluated for their trends. Wells originally included in the monitoring program were not evaluated for trends if the TCE concentration was at or near the detection limit. Of the original groups (A-F) of wells evaluated in previous Annual Reports, only eleven wells had trends that project either the optimal (September 2021) or marginal target (September 2022) completion dates. However, there was one well, NDA-14, that exhibited trends suggesting that TCE concentrations stayed below the CULs. This trend became more pronounced when data from additional miscellaneous wells, each providing at least four unique data points, were included in the trend plot analysis. Relatively low TCE concentrations are those wells that exhibit just above the PAL (5 to 25 micrograms per liter [µg/L]). In total, there are 24 out of the 31 wells evaluated that fit the category as having "relatively low" values of TCE by the end of this FYR at or at the end of 2022. No wells ended this FYR period with TCE values above 100 µg/L). The highest TCE value was at 83 µg/L for well RW-17 on 12/2/2022. Performance group wells and trend discussions are as follows.

E.2.2.2.1 Group A Wells

As can be seen in the Figure E-2, none of the wells have reached the PAL or CUL prior to the marginal target date. Two of these wells (NDA-08 and NDA-01) are on a trend to reach this goal in the near future (NDA-08 by 2032, and NDA-01 by 2035). Under current conditions, RW-17 and MW-118 are not showing trends approaching the CULs. MW-118 is 2,540 feet northeast of the identified TCE source area in the SDA. The nearest monitoring wells upgradient of MW-118 prior to the data gap investigation (DGI) is MW-82, which is 1,340 feet to the west of MW-118, and MW-83, which is 1,360 feet to the northeast of MW-118. Only one well, MW-602, has been drilled down-gradient of this plume. However, this down-gradient well is also located within a paleochannel and was not installed to full depth of the channel and may not adequately represent the down-gradient extent of the plume. When MW-118 was first sampled in 1991 as part of the LF002 RI, TCE was detected at a concentration of 450 µg/L. The TCE concentration has slowly decreased, and a concentration of 63 µg/L was reported in September 2022. The TCE concentrations in MW-118 are anomalous given that TCE concentrations in monitoring wells closer to LF002 (MW-81, MW-82, and MW-83) at the time of the RI were considerably less than at MW-118, and concentrations at the closer wells subsequently dropped to below the CUL after initiation of the GETS. However, it is possible MW-118 is impacted by a detached contaminant plume from the LF002 site. MW-118 is beyond the reach of the active remedial actions. It is possible TCE concentrations in this well may decrease by natural attenuation alone to less than PAL sometime between 2024 to 2029. RW-17 ended the FYR period with a TCE concentration of 83 µg/L in December 2022. Concentrations appear to fluctuate at this well, but on average, the TCE trend is stable with an average concentration of 100 µg/L.

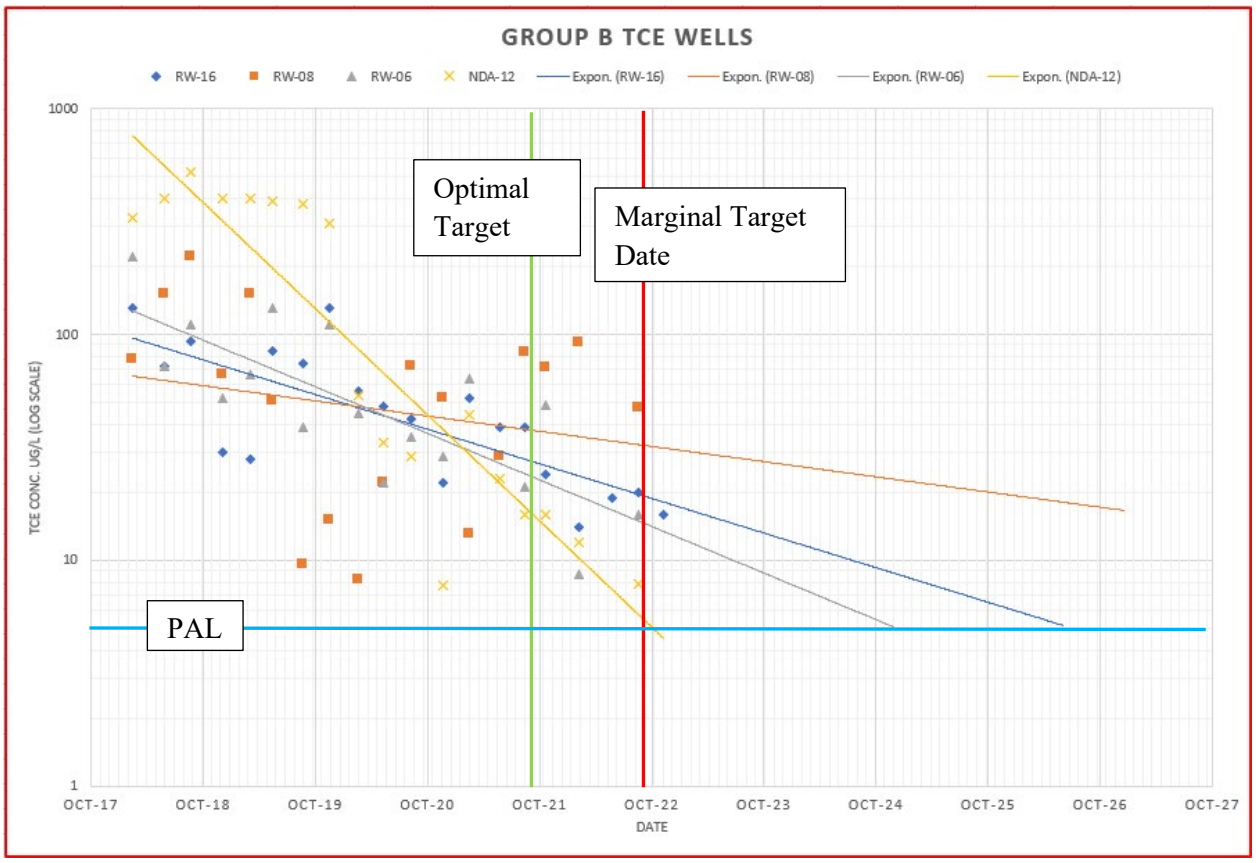
Figure E-2: Group A wells TCE trends



E.2.2.2.2 Group B Wells

All Group B wells exhibit a decreasing TCE concentration trend. Well NDA-12 has a trend that reached the CUL by the marginal target date. RW-06 is projected to reach this level by the end of 2024; RW-16 will reach it by 2026; and RW-08 will reach it sometime beyond 2028.

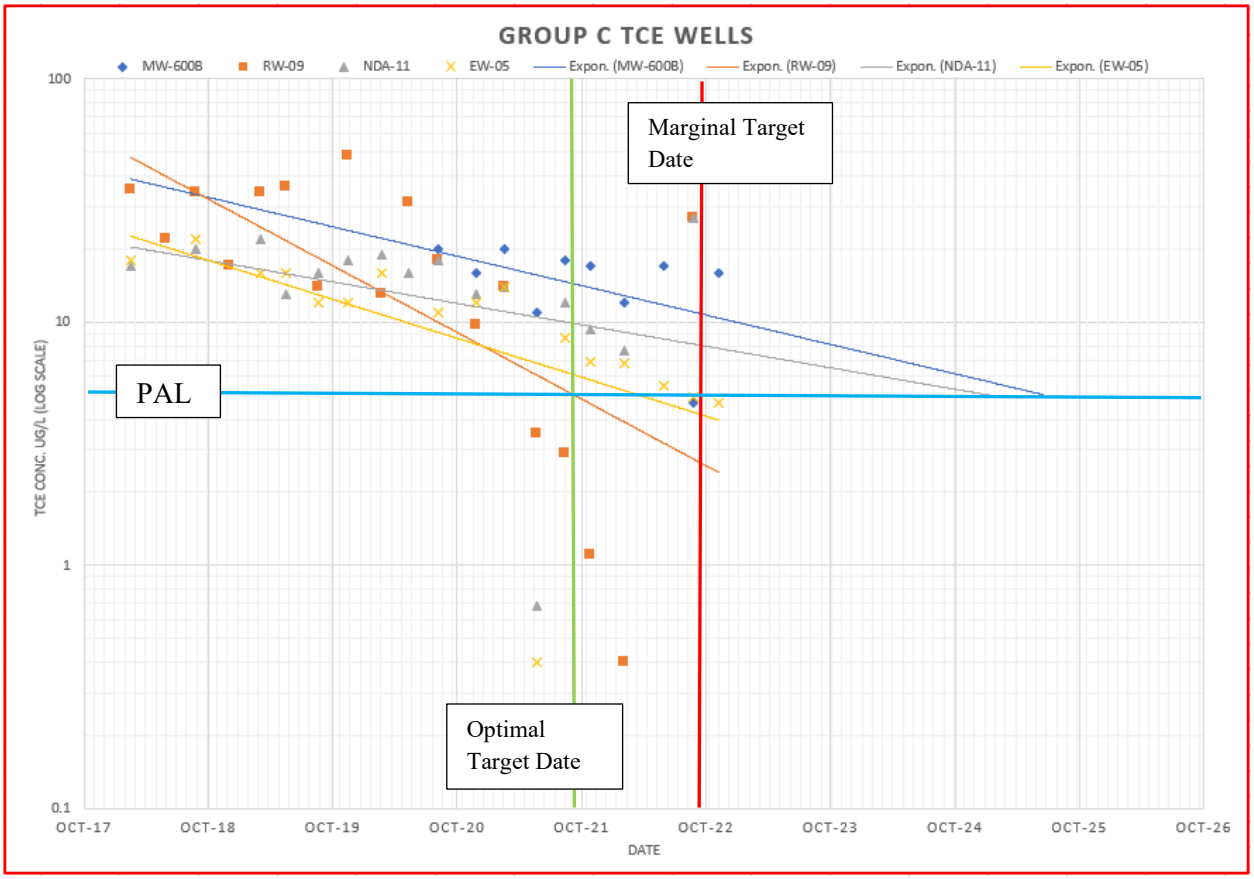
Figure E-3: Group B wells TCE trends



E.2.2.2.3 Group C Wells

All the wells in Group C exhibit a decreasing TCE concentration trend. Wells EW-05 and RW-09 have a trend that reached the CUL prior to the marginal target date. However, it should be noted that the last recorded value of RW-09 was 27 µg/L in September 2022. Both MW-600B and NDA-11 are expected to have reached the PAL by the end of 2025.

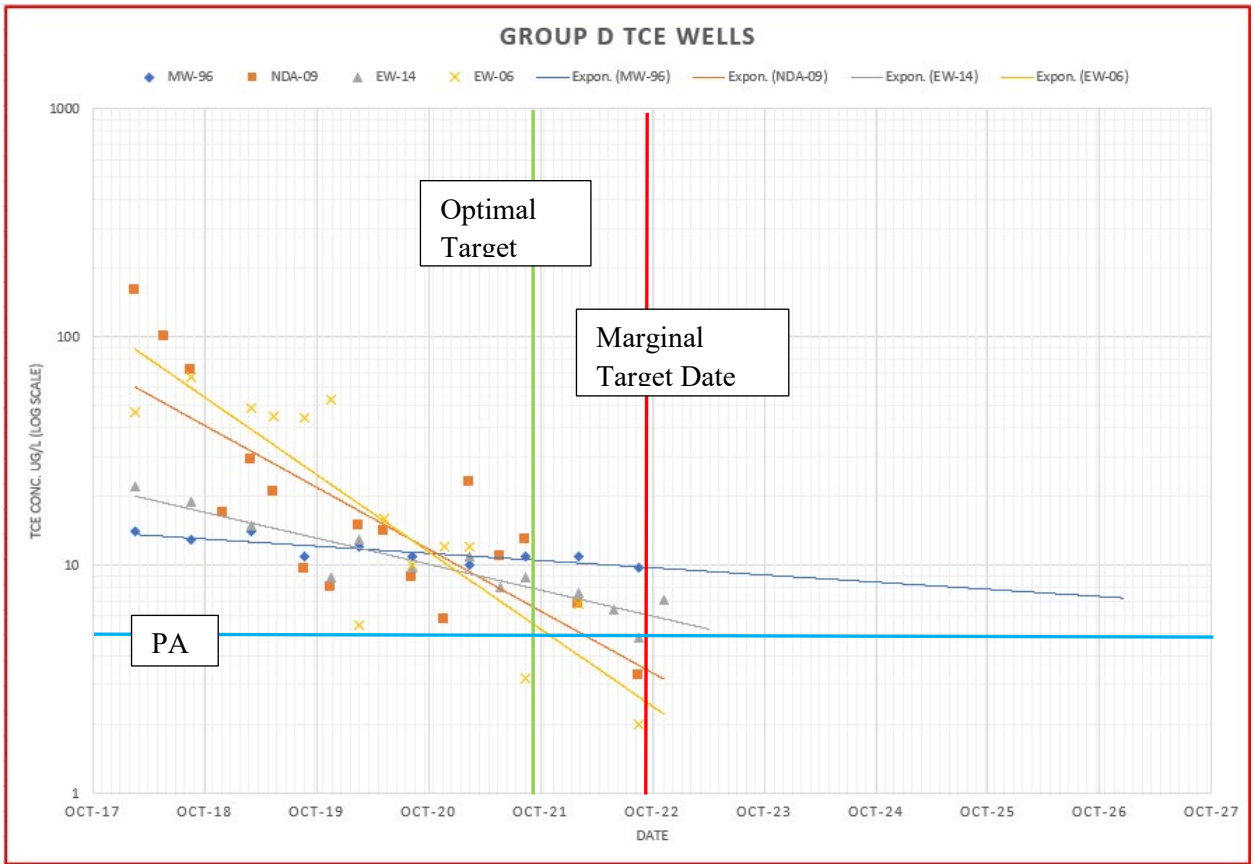
Figure E-4: Group C wells TCE trends



E.2.2.2.4 Group D Wells

All the wells in the Group D exhibit a decreasing TCE concentration trend. NDA-09, EW-14, and EW-06, have reached or are close to reaching the PAL by the marginal target date. The trend for MW-96, albeit decreasing, is expected to continue its decline beyond 2027, with current concentrations of TCE.close to 10 µg/L. It should be noted that while EW-14 is generally following this downward trend and is approaching the PAL, the most recent data point from Figure E-5 indicates a level higher than anticipated post-marginal target dates, contrasting with the prior tend of decreasing concentrations.

Figure E-5: Group D wells TCE trends



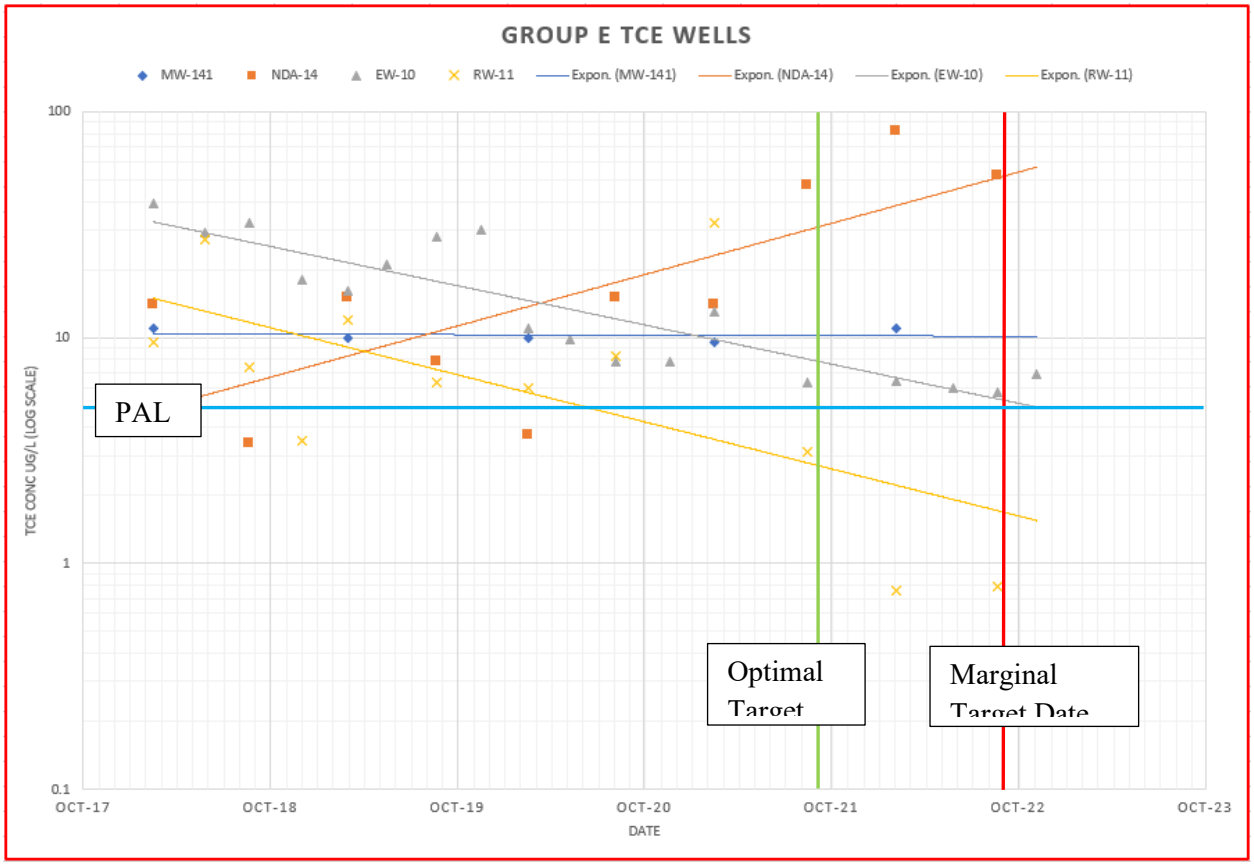
E.2.2.2.5 Group E Wells

Two of Group E wells (EW-10 and RW-11) have exhibited a downward trend and are below or close to the PAL levels by the marginal target date.

One well, MW-141, appears to be stable and not increasing or decreasing. It should be noted that this well precludes achieving PAL levels no matter the remedial actions taken onsite. This well is beyond the reach of the active remedial actions and is projected to decrease by natural attenuation to less than the PAL by 2029. Currently, the TCE levels in this well are at or close to 10 µg/L. Well MW-601 is upgradient and has TCE values less than what is seen in MW-141. There is not a downgradient well to define this plume as it is approaching a buried paleochannel. The exact location of this paleochannel has also not been defined.

Well NDA-14 shows an increasing trend for TCE concentrations with the last value in the FYR period of 52 µg/L. This well is also close to NDA-01 which had the highest TCE concentrations in this FYR but has now been showing a downward trend.

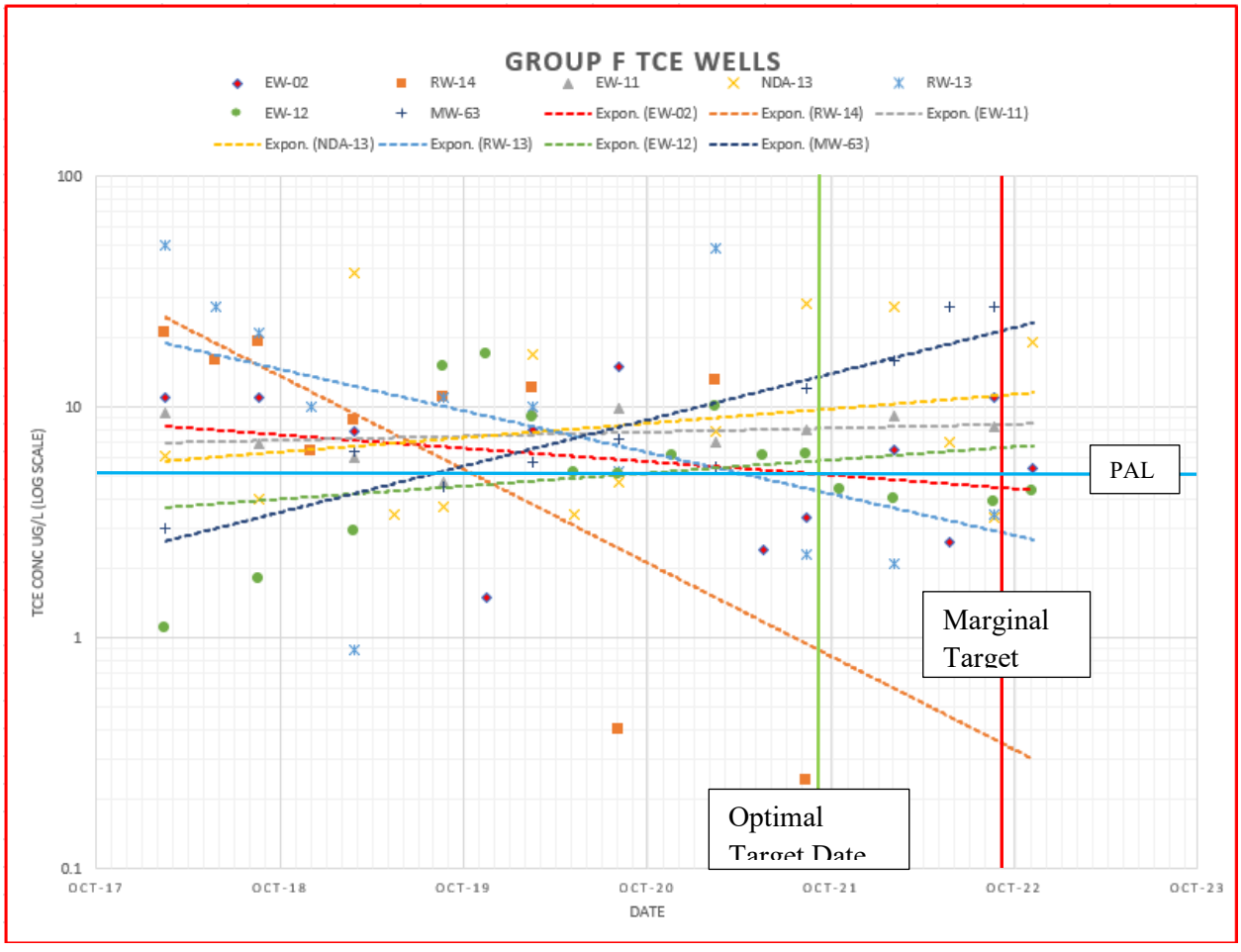
Figure E-6: Group E wells TCE trends



E.2.2.2.6 Group F Wells

Three wells (RW-14, RW-13, and EW-02) in this group have achieved trend levels below the CUL before the marginal target date. However, well NDA-13, EW-11, and particularly EW-12 did not meet the CUL by this benchmark. Specifically, well EW-12, located approximately 15 feet from the south (upgradient) margin of the SDA, exhibited a peak in TCE concentrations exceeding the CUL in September 2019, marking the first exceedance since 2007. Following this peak, a notable decrease in TCE levels occurred, with measurements below the CUL. The well has been inactive for extraction since 2017, and the TCE source remains unidentified, though its upgradient position points to a possible off-site source. Subsequent to the observed peak, the frequency sampling at EW-12 was increased to quarterly to monitor the trend, which has confirmed a reduction in TCE levels to below the CUL since the fourth quarter of 2021. TCE concentrations in the other wells, NDA-13, EW-11, and EW-12, appear stable, with levels around 10 µg/L or less, whereas MW-63 shows an upward trend with recent concentrations reaching 27 µg/L. .

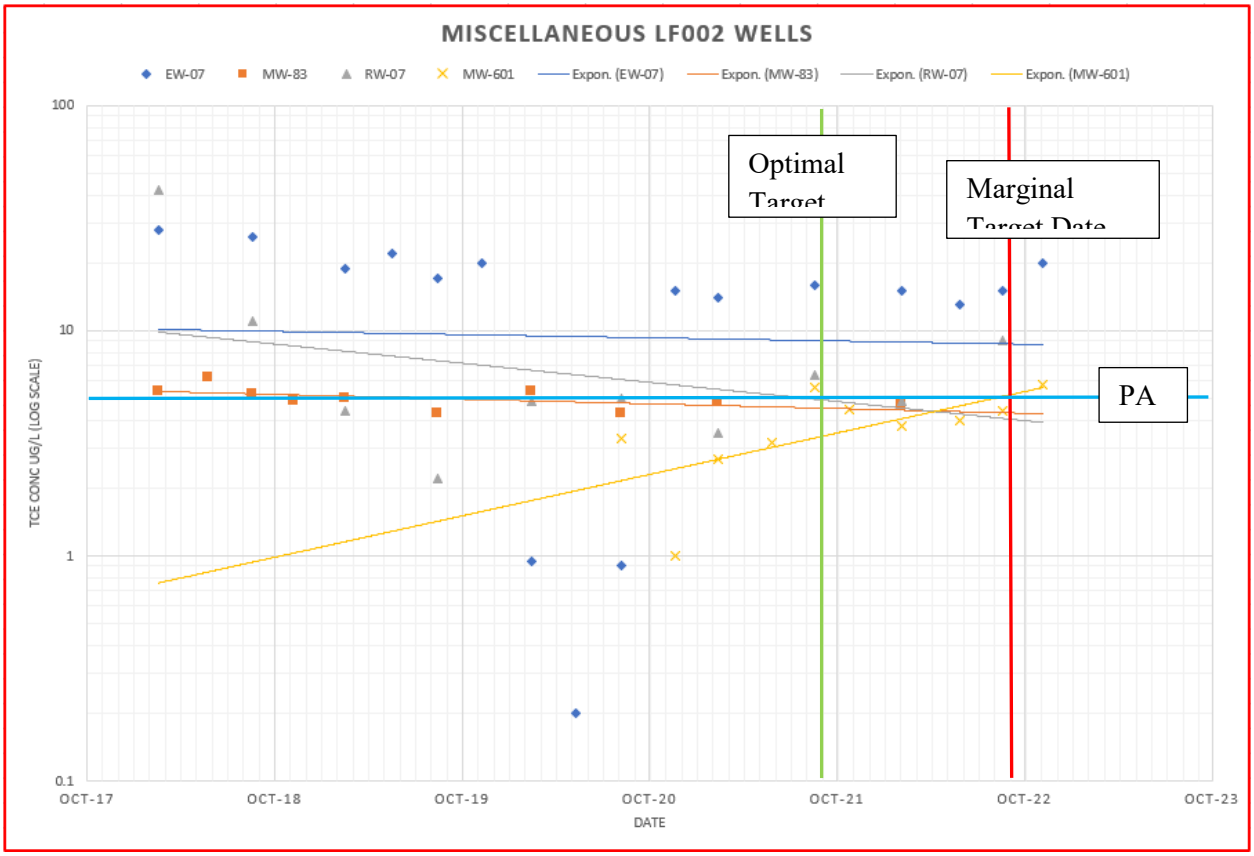
Figure E-7: Group F wells TCE trends



E.2.2.2.7 Miscellaneous Wells

The additional wells in this group contain sufficient TCE concentration data above detection limits to be plotted for trend analysis. MW-83, RW-07, and MW-601 were below the CUL prior to the marginal target date. However, MW-601 had an upward trend that exceeded the CUL at the end of this FYR period. This well is upgradient of well MW-141 that appears to define a detached TCE plume. MW-83 is considered a sentinel well for the SDA GETS due to its location downgradient (east) of the extraction well capture zones. TCE concentrations in MW-83 demonstrate slightly decreasing trends close to the CUL. No discernable trend was noted for well EW-07, however three consecutive low value outliers in 2020 appears to have skewed the data downwards. Overall, EW-07 TCE concentration is relatively low and is below 25 µg/L.

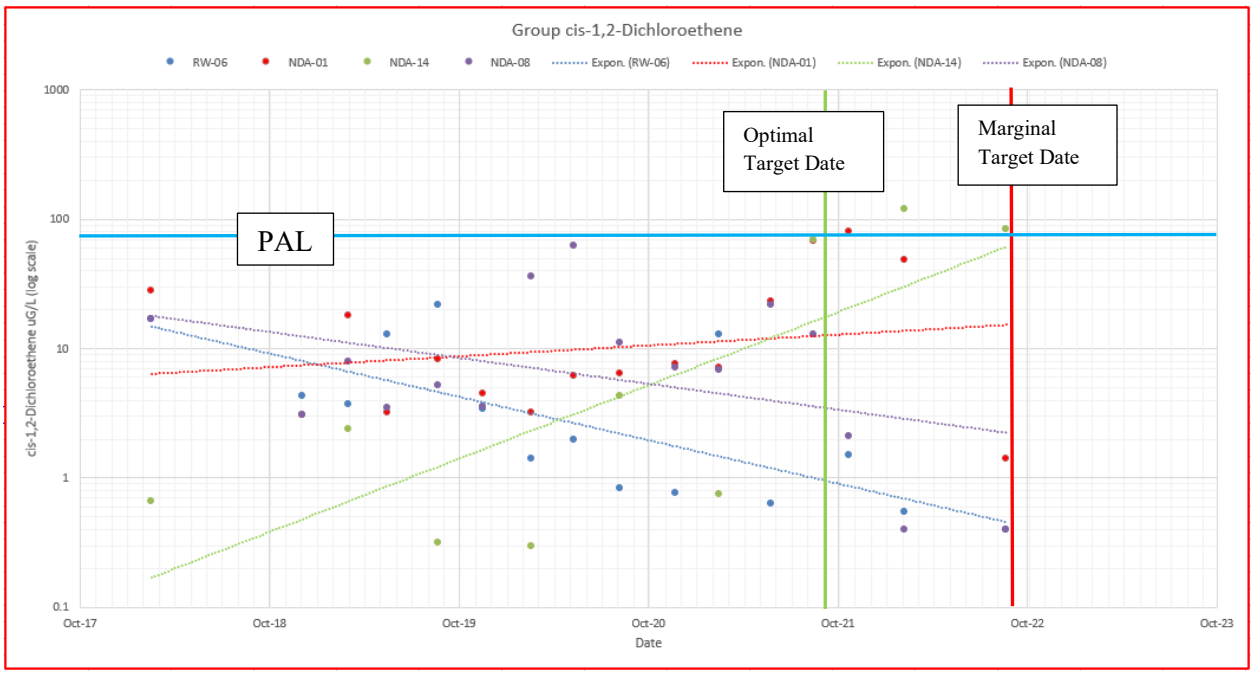
Figure E-8: Miscellaneous wells TCE trend



E.2.2.3 cis-1,2-Dichloroethene Wells

Groundwater concentrations in all the wells were below the MCL of 70 µg/L with the exception of well NDA-14. cis-1,2-Dichloroethene concentrations in well NDA-14 appear to be increasing with the most recent value of 84 µg/L occurring in September of 2022. This is somewhat expected as cis-1,2-dichloroethene is a breakdown product of TCE and the TCE values in this well (Group E) appear to be increasing.

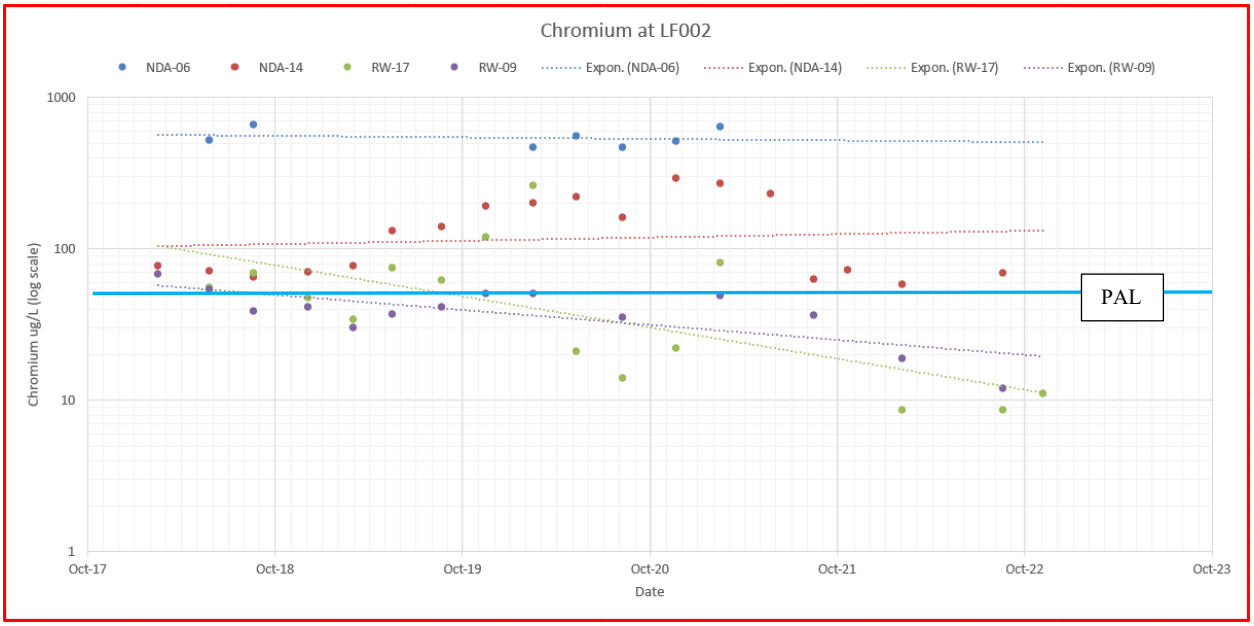
Figure E-9: Group cis-1,2-Dichloroethence wells trend



E.2.2.4 Chromium Wells

Cr was incidentally mobilized by the ISCO injections in 2011 and 2012. Of the 21 wells originally included in the monitoring program for Cr, 17 have met the remediation criteria and two (RW-09 and RW-17) are now in the watch group (wells with average Cr concentrations below the CUL but have not yet met all the remediation monitoring endpoint criteria) UFP-QAPP Addendum I Site LF002 (Bay West 2018). Only two wells (NDA-06 and NDA-14) remain above the CUL (50 µg/L) with values of 640 and 69 µg/L, respectively. To date neither of these two wells demonstrate either stability or a decreasing trend. Groundwater data for Cr also appears to be lacking in the Annual Reports for NDA-06 since March 2021.

Figure E-10: Group Chromium wells trend



E.2.2.5 Vinyl Chloride

At the end of this review period there were no wells with average VC concentrations above the detection limit (0.20 µg/L). It was noted that the PAL or detection limit for most of this FYR review period was 0.20 µg/L. However, data collected from September through December 2022 had a detection limit increase to 1.0 µg/L. At the beginning of the FYR review period, wells NDA-01, NDA-08, and NDA-12 reported VC concentrations above the detection limits, but concentrations decreased to the detection limits after June 2021.

E.2.3 DISCUSSION OF FUTURE PERFORMANCE

A trial shutdown of the active remediation systems at LF002 was proposed in the 2021 Annual RA-O Report. Per discussion with the USEPA on 12 December 2022, and proposed monitoring schedule and reactivation criteria presented in USAF correspondence dated 22 December 2022, the USEPA concurred with a trial shutdown. The trial systems shutdown was planned for January 2023.

Groundwater levels at the site are subject to seasonal fluctuations of several feet. However, groundwater levels remained relatively stable in 2022 and as such, there was no seasonal TCE pulse observed. When the groundwater table rises seasonally, it comes in contact with the TCE mass that remains in the unsaturated zone. Historical groundwater elevation data demonstrated groundwater elevations in 2022 remained very low all year. The groundwater levels in the NDA ranged from approximately 8 to 16 feet below absolute mean sea level (amsl) median and the SDA ranged from 20 to 21 feet below amsl median. The groundwater elevations in the SDA were some of the lowest on record. Typically, groundwater elevations seasonally rise in the spring or summer in response to precipitation patterns, but there was no seasonal rise observed in 2022.

Since the recent groundwater levels have remained low, the TCE values recorded for the site may not be representative of the potential TCE that could be mobilized in the future. Thus, the trial shutdown of the system will need to be monitored closely to determine the relationship between groundwater levels and TCE concentration. Any recommendation to permanently suspend or deactivate the GETS must account for these seasonal fluctuations, and to determine if the currently observed trends reflect the observed lowering of groundwater levels.

E.3 OU-1

The following is a summary of the data collected in conjunction with the remedial actions during the last five years. Further description of the data, figures, and trends can be found in Appendix C. Data relevant to remedy performance and progress towards meeting RAOs is summarized in this section, including data trends to evaluate whether RAOs and associated cleanup levels established in the ROD are likely to be achieved, data relevant to support engineering performance, and data related to the site-specific groundwater remedy completion strategy.

Since groundwater level monitoring began in 1990 there has been a relatively large fluctuations at LF002. The total range of groundwater fluctuation was 36 feet in the NDA and up to 38 feet in the SDA. On average, groundwater elevations have decreased. The data showing this fluctuation was in the Draft 2022 Annual Remedial Action Operations Report. In addition to seasonal groundwater fluctuations, groundwater changes are also directly related to operation of the Groundwater Extraction and Treatment System (GETS). The date ranges are divided up into the following operational periods: Pre-GETS, Continuous GETS, Cycled GETS, Limited GETS, and Resumed GETS. In addition, periodical shutdowns of the GETS due to cold weather influencing the instrumentation contributed to the fluctuations.

Groundwater levels in 2022 remained very low all year. The groundwater levels in the NDA ranged from approximately 8 to 16 feet below absolute mean sea level (amsl) median and the SDA ranged from 20 to 21 feet below amsl median. The groundwater levels in the SDA were some of the lowest on record. Typically, groundwater levels seasonally rise in the spring or summer in response to precipitation patterns, but there essentially was no seasonal rise observed in 2022. When the groundwater table rises seasonally, it comes in contact with the TCE mass that remains in the unsaturated zone. Because the groundwater levels remained relatively stable in 2022, there was no seasonal TCE pulse observed.

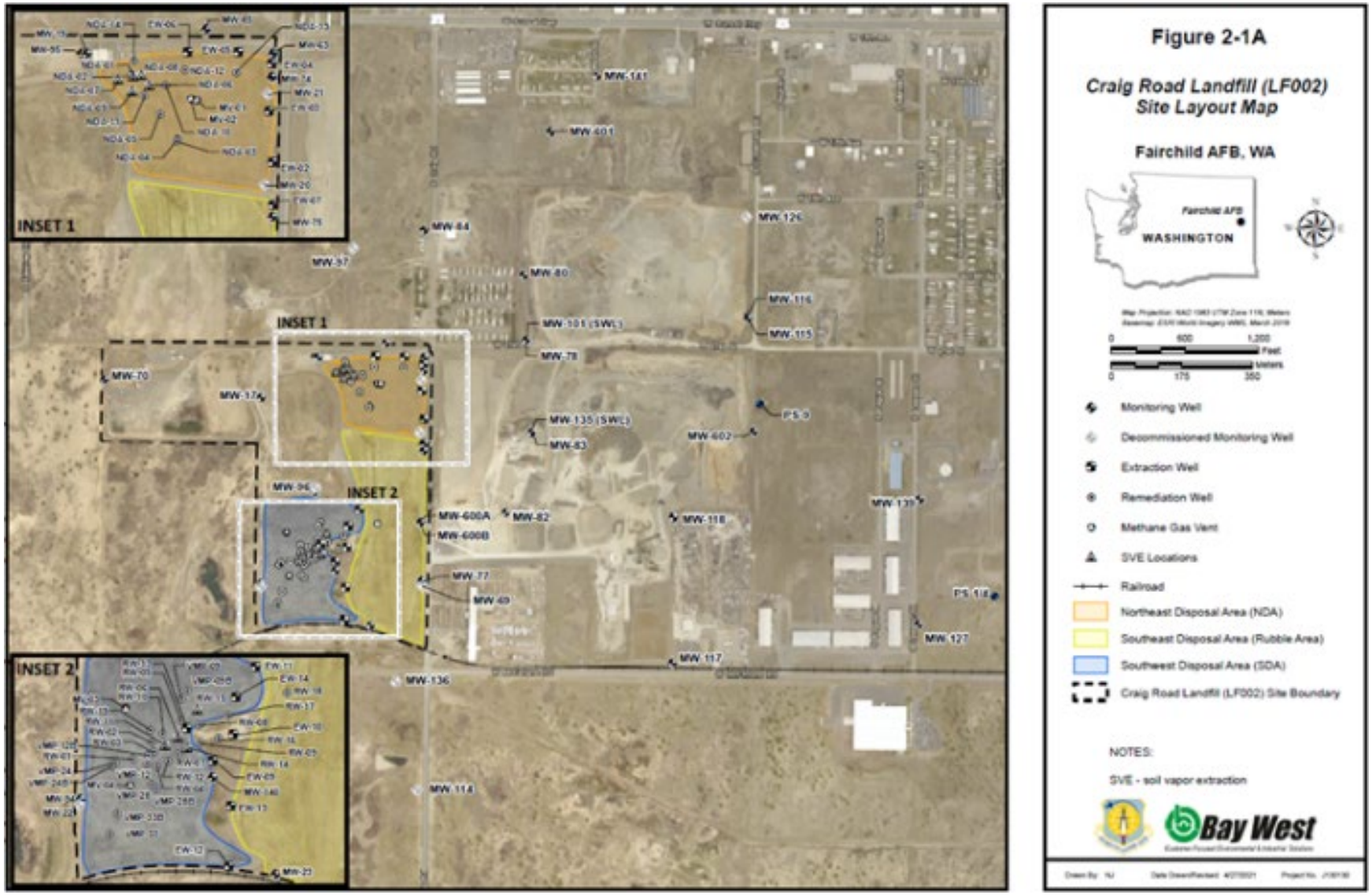
For LF002, four of the five Remedial Action Objectives (RAOs) within the ROD have been achieved. The second (#2) RAO, to restore contaminated groundwater in the upper aquifer (Basalt A) to levels that are safe for use as drinking water, has not yet been achieved.

Not all RAOs have been met but progress via active remediation by operation of the GETS and SVE systems and by passive remediation by natural attenuation is occurring. The clean-up goal for groundwater is to decrease COC concentrations below their respective state or Federal standards (TCE concentrations to less than 5 µg/L, cis-1,2-Dichloroethene to less than 70 µg/L (based on the PAL per the UFP-QAPP Addendum II), vinyl chloride to less than 0.2 µg/L, and chromium to less than 50 µg/L).

The objective of the LF002 RAO was to achieve the remediation monitoring endpoints at all wells before the optimal target date of 30 September 2021, as stated in the 2018 UFP-QAPP Addendum-I. This date was selected to provide adequate time to complete a Remedial Action Completion Report (RACR) and document RC before September 2024. A marginal target date of 30 September 2022 was also selected to represent the latest possible date and still potentially achieve the RACR before September 2024.

In total, 53 wells at LF002 have data with at least four readings during the past FYR period and were evaluated for trend analysis, unless the data for the wells fell below the CULs or detection limit. The performance of individual wells was evaluated to determine if the TCE or Cr trends would be able to meet their respective cleanup levels. Wells were segregated into six groups (A through F) based on their concentrations and to better graphically display the temporal trends (Appendix C). In addition, four "miscellaneous wells" with low TCE levels, were also evaluated during this review period to determine if there were any trends or indication of a potential increase. Wells with Cr concentrations above the cleanup level were assigned to a Cr group, and wells with elevated cis-1,2-diclorethene were also evaluated for trend analysis.

Figure E-11:. LF002 Monitoring Wells



Source: Bay West. April 2021. Final Record of Decision Amendment, Operable Unit 1 LF002 Craig Road Landfill..

Group A wells: All of the wells within this group exceed the TCE CUL and have not met RAO #2.

- NDA-01: This has a decreasing trend but may reach CUL in 2025.
- NDA-08: This has a decreasing trend but may reach CUL in 2023.
- RW-17: This well is not showing trends approaching the CULs.
- MW-118: This well is not showing trends approaching the CULs. Since 1991, TCE concentrations have been slowly decreasing. This orphan plume is beyond the reach of the active remedial actions. Currently, it continues to migrate away from the site.

Group B wells: All of the wells within this group exceed the PAL and have not met RAO #2.

- RW-16: This well has a decreasing trend but may reach the CUL in 2026.
- RW-08: This well has a decreasing trend but may reach the CUL sometime beyond 2028.
- RW-06: This well has a decreasing trend and is projected to reach the CUL by the end of 2024.
- NDA-12: This well has a decreasing trend and is the only well in this group with a trend to reach the PAL by the marginal target date.

Group C wells: Two of the wells within this group exceed the PAL and have not met RAO #2. Two of the wells have met them.

- MW-600B: This well has an exceedance but with a decreasing trend and may reach the PAL by 2025.
- RW-09: This well has a decreasing trend that reached the PAL prior to the marginal target date. However, it should be noted that the last recorded value of RW-09 was 27 µg/L on 9/15/2022.
- NDA-11: This well has an exceedance but with a decreasing trend and may reach the PAL by 2025.
- EW-05: This well has a decreasing trend that reached the PAL prior to the marginal target date.

Group D wells: Two of the wells within this group exceed the PAL and have not met RAO #2. Two of the wells have met them.

- MW-96: MW-96 has a decreasing trend that extends exceeding the PAL out past 2027. However, the concentrations of TCE are currently close to 10 µg/L.
- NDA-09: This well has a decreasing trend that reached the PAL prior to the marginal target date.
- EW-14: This well has a decreasing trend. It should reach the PAL by 2023. Currently the levels of TCE are only slightly above the PAL.
- EW-06: This well has a decreasing trend that reached the PAL prior to the marginal target date.

Group E wells: Two of the wells within this group exceed the PAL and have not met RAO #2. Two of the wells in this group have met the RAOs.

- MW-141: This well appears to be stable and not increasing or decreasing. It should be noted that this well precludes achieving PAL levels no matter the remedial actions taken onsite. This orphan plume is beyond the reach of the active remedial actions and was projected to decrease by natural attenuation to less than the PAL by 2029. Currently, it continues to migrate away from the site.

- NDA-14: Well NDA-14 shows an increasing trend for TCE concentrations with the last value in the FYR period of 52 µg/L.
- EW-10: This well has a downward trend and is below or close to the PAL levels by the marginal target date.
- RW-11: This well has a downward trend and is below the PAL prior to the marginal target date.

Group F well: Three of the wells in this group are below the PAL and have met RAO #2. Four wells in this group exceed the RAOs.

- EW-2, RW-14, and RW-13 all have decreasing trends and are below the PAL prior to the marginal target date.
- NDA-13, EW-11, and EW-12 did not achieve PAL levels before the marginal target date. The concentration trends appear to be stable with TCE levels of approximately 10 µg/L or less.
- MW-63: This well shows and increasing trend and is above the PAL level by the marginal target date with the last two samples both resulting in concentrations of 27 µg/L.

Miscellaneous wells: Three of the wells in this group are below or close to the PAL and have met RAO#2 or the RAOs. One well exceeds the PAL and does not meet the RAOs.

- MW-83, RW-07, and MW-601: These wells were below the PAL prior to the marginal target date. However, MW-601 does had an upward TCE trend that exceeded the PAL level after the marginal target date at the end of this FYR period.
- EW-07: No trend was observed in this well. The overall TCE concentration remains above 10 µg/L.

Cis-1,2-Dichloroethene wells: Three wells in this group are below or close to the PAL (70 µg/L) and have met RAO#2.

- RW-06, NDA-01, and NDA-08: These wells show decreasing or stable trends.
- NDA-14: This well shows an increasing trend for cis-1,2-dichloroethene with the last value in the FYR period of 84 µg/L.

Chromium wells: Two of the wells within this group exceed the PAL (50 µg/L) and have not met RAO #2. Two of the wells in this group have met the RAOs.

- RW-17 and RW-09: Both of these wells have decreasing Cr trends and are below the PAL by the marginal target date.
- NDA-06 and NDA-14: Neither of these two wells demonstrate a stable or decreasing trend.

E.3.1 Sustainability

The Climate Impacts Group at the University of Washington (2023) projects significant climatic changes for Spokane County. While extreme precipitation events are anticipated to become more frequent, increasing by 8 percent over the next 30 years, the total annual precipitation in the county is also expected

to rise by 7.6 percent. This increase in precipitation is a key indicator of the overall water availability for both human activities and natural ecosystems.

Conversely, a stark decrease is forecasted for the snowpack levels by April 1st in Spokane County, with projections showing a reduction of up to 92 percent within the next three decades. This decrease in snowpack is critical as it signifies the reduction of naturally stored water that is released during the melt season, impacting the water supply to streams, soils, and reservoirs. Moreover, the average maximum temperatures during the summer months (June to August) are projected to climb by 3.8 degrees Fahrenheit in the same period, leading to an anticipated increase in annual high fire danger days by five. Such changes point to a heightened wildfire risk, which could lead to substantial damage to infrastructure, interruptions to business operations, and adverse effects on public health and safety.

When the groundwater rises seasonally, it comes in contact with the TCE mass that remains in the unsaturated zone. Since the recent groundwater levels have remained low, the TCE values recorded for the site may not be representative of the potential TCE that could be mobilized in the future. Thus, the trial shutdown of the system will need to be monitored closely to determine the relationship between groundwater levels and TCE concentration. Any recommendation to permanently suspend or deactivate the GETS must account for these seasonal fluctuations, and to determine if the currently observed trends reflect the observed lowering of groundwater levels.

E.4 OU-5

The following is a review of the data for the SS039 plume collected in conjunction with the remedial actions during the last five years. Data relevant to remedy performance and progress towards meeting RAOs are discussed in this section, including the state of TCE and CTC hot spot contamination at SS039, and data trends to evaluate whether remedial action objectives and associated cleanup levels established in the Interim ROD are likely to be achieved, data relevant to support engineering performance, and data related to the site-specific groundwater remedy completion strategy. Prior remediation work at the site included ISCO and enhanced in situ bioremediation (EISB) activities. Although not all reports for use in this FYR were available during part of the time of this review, relevant reports include:

- FINAL SS039 Interim Remedial Design Addendum
- Draft SS039 Interim Remedial Design Addendum 2: Polishing Injection
- FINAL SS039 Interim Injection Completion Report – Second Injection Event
- FINAL SS039 OFF-BASE DATA GAPS INVESTIGATION UNIFORM FEDERAL POLICY – QUALITY ASSURANCE PROJECT PLAN ADDENDUM
- Final SS039 Construction Completion Report
- Final SS039 2020 Annual Groundwater Monitoring Report
- Final SS039 2021 Annual Groundwater & Q4 Performance Monitoring Report (Tables F-1 and F-2)

The TCE and CTC plumes at SS039 consists of three main parts:

- Proximal Plume: The most upgradient portion of SS039 and the location of the primary TCE source. Hotspots #1 through #4 are located within the Proximal Plume.

- Central Plume: The central section of SS039 that includes flightline operations areas.
- Distal Plume: The downgradient portion of SS039 and the location of a TCE and CTC source. Hotspot #5 is located in the Distal Plume.

Hotspot #1 is the primary source of the Proximal Plume where releases of TCE have formed a relatively thin plume core (TCE greater than 250 µg/L) that runs approximately 2,400 feet from the source, and an overall TCE plume that has migrated approximately 5,900 feet. It appears the hotspots previously identified as Hotspots #2, #3, and #4 are not individual source areas; rather, these are areas of elevated TCE concentrations located within the plume core. There may actually be two separate sources at Hotspot #1, one south and another west of former Building 1060, based on a recently discovered competent basalt ridge that appears to separate this area into two potential source areas. These two sources have co-mingled to form a single plume at Hotspot #1 and #2.

The Remedial Action Objectives (RAOs) IROD are:

1. Prevent exposure via ingestion, inhalation, and dermal contact to groundwater impacted by SS039 chemicals of concern (COCs) exceeding MCLs.
2. Prevent plume expansion and contaminant migration beyond the current limits of the plume. This RAO applies from the initiation of action until groundwater cleanup throughout the plume is demonstrated.
3. Restore SS039 groundwater to its expected maximum beneficial uses where practicable and within a reasonable timeframe.

To meet these objectives, an initial ISCO using sodium permanganate injections in the proximal plume where TCE is present in high concentrations (Hotspot #1 through #4) and enhanced in situ bioremediation (EISB) using Newman Zone® 55 liquid solution and a 50/50 mixture of TCA-20 and SDC-9 microbe cultures in the distal plume where TCE and CTC is present (Hotspot #5) was used.

To assess the effectiveness of the amendments, the reduction of Site COC concentrations (TCE within Hotspots #1 through #4, and TCE and CTC within Hotspot #5) are shown below with a comparison of the current Hotspots during this FYR to the pre-injection conditions. Due to the addition of ISCO and EISB activities at the site during multiple events within this FYR, it would not be appropriate to evaluate the TCE and CTC concentrations with a Mann-Kendall trend analysis. Initial conditions have changed within this FYR, so conditions may not represent an overall trend.

E.4.1 Groundwater: Hotspot #1

Data Analysis to determine the effectiveness of past treatment used four performance monitoring wells:

MW-201, MW-253, MW-361, MW-367

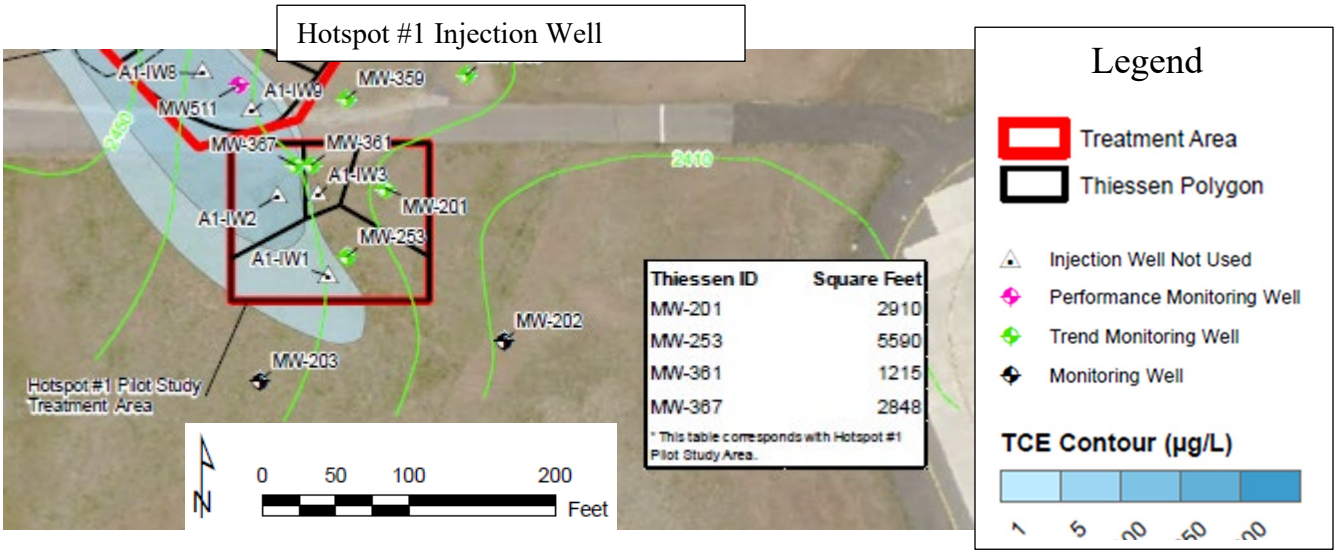


Figure E-12: Hotspot #1 Injection Well

Prior to 2018, a pilot study using sodium permanganate solution injected into three wells (A1-IW1, A1IW2, and A1-IW3) was performed in Hotspot #1 in November 2010. Rebound in TCE concentrations was observed after 12 months, and continued rebound was observed after 24 months. Despite the rebound in concentrations, additional ISCO injections were recommended for full scale implementation. Additional ISCO injections were completed in the three Hotspot #1 wells (A1-IW1, A1-IW2, and A1-IW3) during August 2013.

Wells MW-201, MW-361, and MW-367 were showing rebound by November 2017. An additional injection was completed at the Hotspot #1 Pilot Study Treatment Area (A1-IW2 and A1-IW3) in July 2018 during this FYR period. Since that time, performance monitoring wells MW-361 and MW-367 have shown a rebound with TCE concentrations exceeding the MCL during May 2022 with values of 480 and 900 µg/L respectively. Hotspot #1 may require further injections due to this rebound and should continue to be monitored so RAO #3 can be met and restore SS039 groundwater to its expected maximum beneficial use.

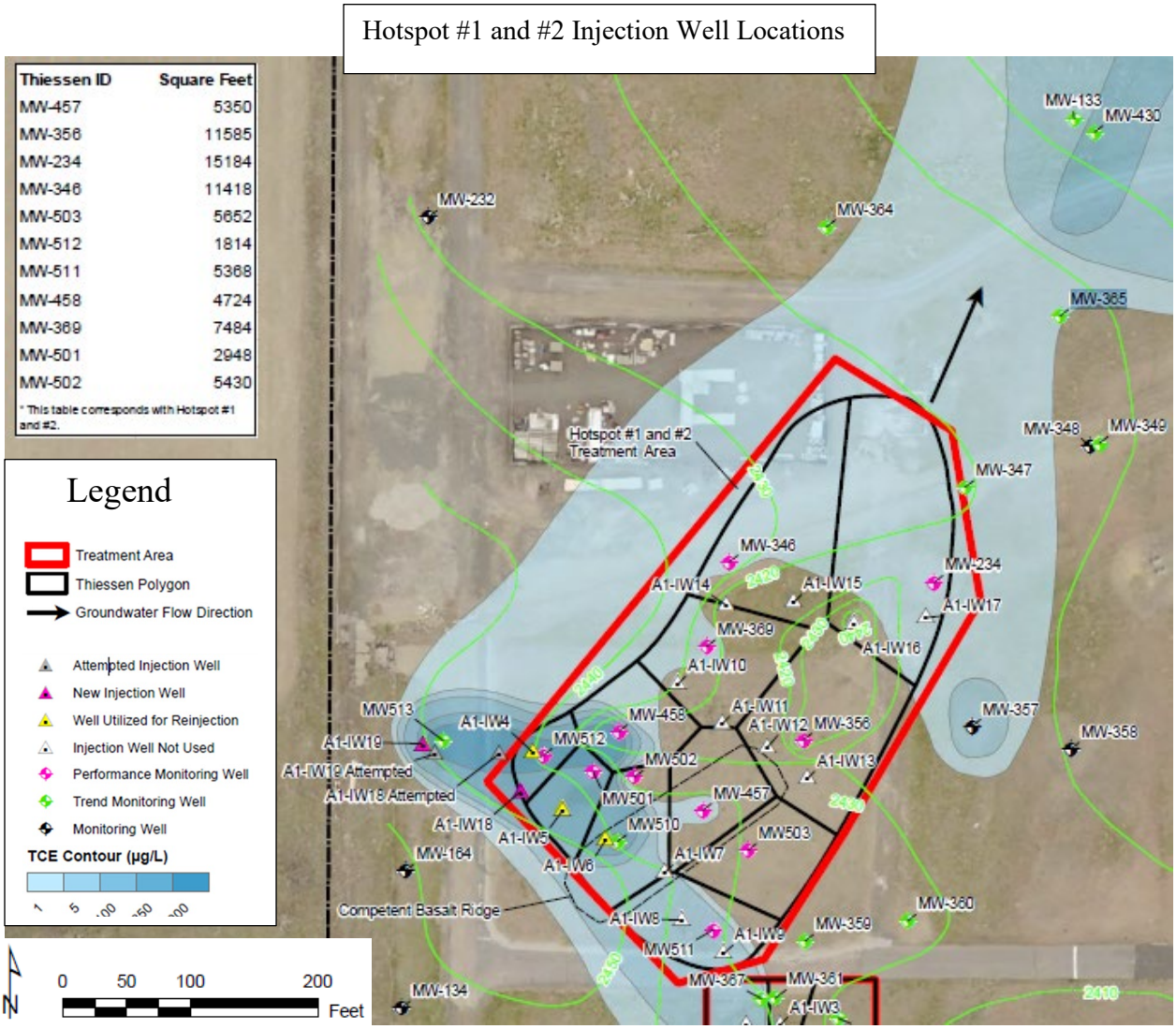
E.4.2 Groundwater: Hotspot #1 and #2

Data analysis to determine the effectiveness of past treatment used the following performance monitoring wells evaluated in three groups:

Group #1: MW-512; MW-513; MW-501; MW-510; MW-458
Group #2: MW-511; MW-502; MW-503
Group #3: MW-234; MW-346; MW-356; MW-369; MW-457

Additional wells downgradient and side gradient were also evaluated for treatment performance:
MW-347; MW-348; MW-349; MW-357; MW-364; MW-365

Figure E-13: Hotspot #1 and #2 Injection Well Locations



ISCO injections of sodium permanganate for Hotspot #1 and #2 were completed in 14 injection wells (A1-IW4 through A1-IW17) between May and July 2018. Additional ISCO injections were completed Hotspot #1 and #2 between July and September 2021.

The Group #1 wells were all trending higher by the end of 2019 and 2020. Since the additional polishing injections in 2021, the hotspot has proven responsive, and concentrations are now below the MCLs. However, due to the history of rebound in this location this area should continue to be monitored for two to three years after injection.

The Group #2 wells were responsive to the initial injections of sodium permanganate. MW-511 had a period in November 2020 where the TCE concentration rebounded to 46 µg/L. However, since that time, and after the additional ISCO injections, the concentration has decreased below the MCL.

Group #3 wells responded similarly to the injection of sodium permanganate in 2018 with two exceptions. TCE concentrations in well MW-234 increased to 80 µg/L in the fourth quarter of 2021, and increased up to 750 µg/L in well MW-369 during the fourth quarter of 2020. Concentrations in both of these wells have since decreased to below the MCL as of May of 2022.

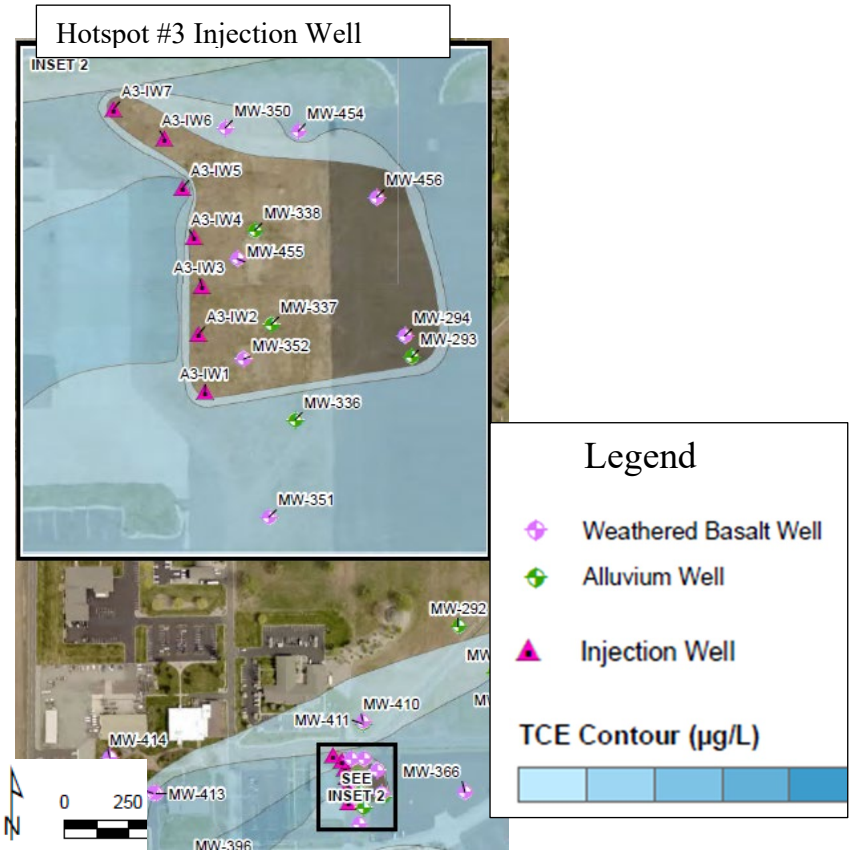
The downgradient and side gradient monitoring wells MW-347, MW-349, MW-364, MW-365 have shown reduced TCE concentrations and stabilized below the MCL since the ISCO injections in 2018. MW-348 did not have enough data points during this FYR period to determine a recent trend since only two values were recorded. However, there was one point during the fourth quarter of 2019 where the value of TCE in MW-348 increased to 25 µg/L. Concentrations in well MW-357 have decreased since the initial ISCO injections, but the overall concentration has remained relatively stable and above the MCL during this FYR period. MW-357 reported a high value of 18 µg/L during the fourth quarter of 2020.

E.4.3 Groundwater: Hotspot #3

Data Analysis to determine the effectiveness of past treatment used six performance monitoring wells. All of these are wells that are screened within the weathered basalt.

MW-294; MW-350; MW-352; MW-454; MW-455, MW-456

Figure E-14: Hotspot #3 and Injection Well Locations



Initial ISCO injections were completed in seven Hotspot #3 injection wells in two phases over 8 days, during August 2013. The seven existing injection wells (A3-IW1 through A3-IW7) previously used for 2013 pilot studies were again used for injections in July 2018.

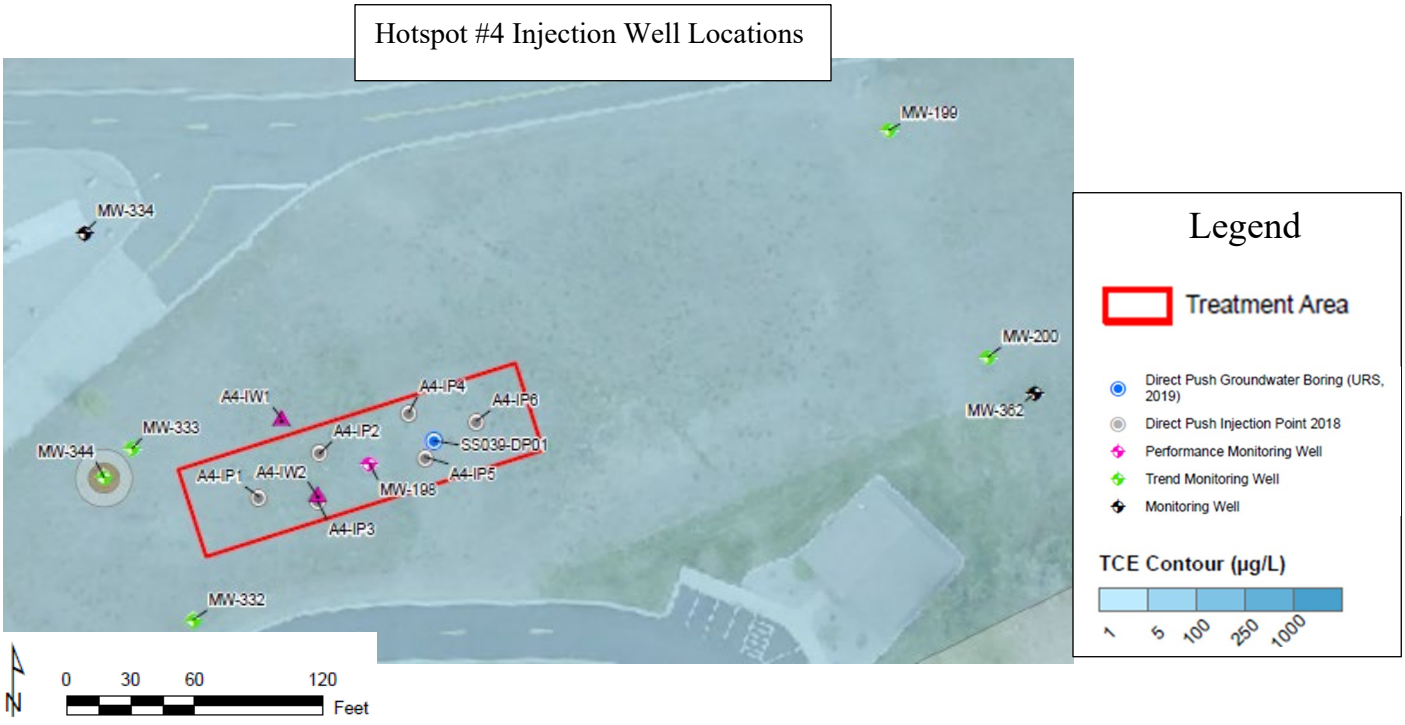
MW-294, MW-350, MW-352, and MW-456 were responsive to the ISCO injections and concentrations are now below the MCL. MW-454 appears stable with concentrations above the MCL during this FYR period with the highest concentrations at 51 µg/L during the third quarter of 2019. MW-455 was responding positively and concentrations were below the MCL after the injections. However, the TCE concentration in this well has recently rebounded with the highest value of 15 µg/L reported during May of 2022.

E.4.4 Groundwater: Hotspot #4

Data analysis to determine the effectiveness of past treatment used six performance monitoring wells.

MW-198; MW-344; MW-333; MW-332; MW-199; MW-200

Figure E-15: Hotspot #4 Injection Well Locations



Hotspot #4 had ISCO injections using temporary injection points over a four-day period in November 2018. Additional ISCO injections were conducted during July of 2021.

MW-198 is the closest, down gradient performance monitoring well to the ISCO injections and is expected to show the greatest degree of response. However, the data indicates there was no large reduction in TCE concentration in this well post-injections. The TCE concentrations remain at or slightly above 100 µg/L during this FYR review period. Upgradient wells MW-333 and MW-332 showed little to no response from the addition of the amendments. The highest TCE concentrations during this FYR period for MW-333 was 69 µg/L during the fourth quarter of 2021: and 30 µg/L in the fourth quarter of 2019 for MW-332. MW-344 appeared to respond to the 2018 amendment injections as the TCE concentrations dropped to detection levels during the second quarter of 2019. However, rebound appears to begin in the fourth quarter of 2021 and TCE concentrations of 41 µg/L were reported in May 2022. Downgradient performance monitoring wells MW-199 and MW-200 are outside the influence of the ISCO injections but do show an overall reduction in TCE concentrations over time. In May 2022 TCE concentrations at or slightly above MCLs were reported; and potentially represents an overall degradation of TCE at the site.

Hotspot #4 will require further injections since TCE concentrations remain high or are rebounding after treatment in the wells near or upgradient of MW-198.

E.4.5 Hotspot #5

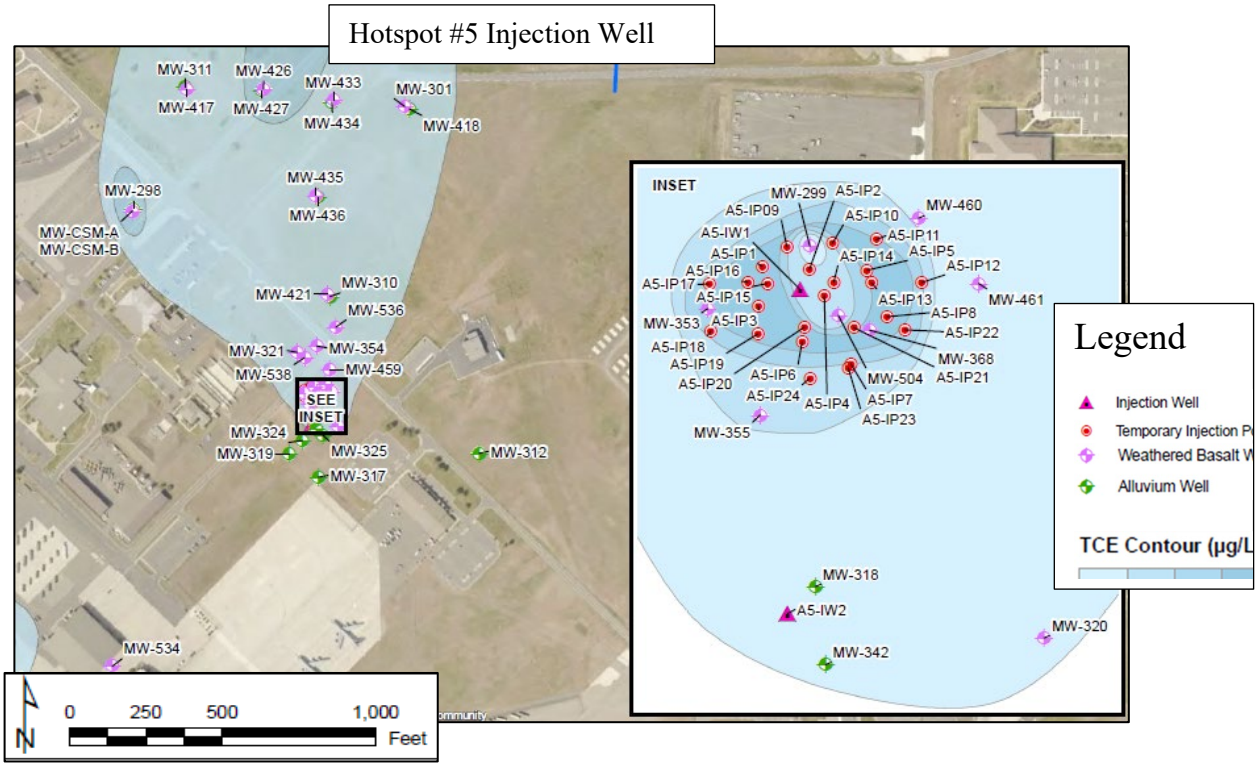
Hotspot #5 is the primary source of the Distal Plume. The Distal Plume is a combined TCE and CTC plume present in both alluvium and weathered basalt. There is also evidence the Distal Plume may have migrated beyond the base boundary as TCE has historically been detected above the MCL at RAW-14 in 2012 and 2013.

Main Hotspot #5 TCE Levels

Data analysis to determine the effectiveness of past treatment at Hotspot #5 used the following performance monitoring wells evaluated in two groups for the main TCE plume:

Group #1: MW-299; MW-368; MW-504; MW-353; MW-355; MW-460
Group #2 (TCE tail): MW-298; MW-426; MW-427

Figure E-16: Hotspot #5 Injection Well Locations



Hotspot #5 had multiple injections to reduce both TCE and CTC contamination at the site. There was an initial injection of a dilute (3 percent) emulsified vegetable oil (EVO) into two wells (A5-IW1 and A5-IW2) between October and November 2010. EISB injections were also completed in November 2018. Finally, there were additional injections at Hotspot #5 with ISCO between July and August 2021.

Four of the six wells evaluated in Group #1 ended the FYR period with TCE concentrations exceeding the MCL of 5 µg/L. The maximum TCE concentration at the end of this period was 56 µg/L at MW-368.

Within the main source area of the plume, MW-299 TCE concentrations had peaked at the beginning of this FYR period but have since decreased below the MCL except for a slight rise above MCL during the fourth quarter of 2021. The concentrations decreased to non-detect by May 2022. MW-368 reported high concentrations of 800 and 860 µg/L TCE in the fourth quarters of 2018 and 2019, respectively. The concentrations decreased by an order of magnitude to 56 µg/L as of May 2022 but are still above the MCL. Additional treatment may be needed at this location and depth achieve the MCL. MW-353 showed a similar concentration trend to MW-368 where the values were high prior to the fourth quarter of 2021 but have since decreased to 27 µg/L as of May 2022. MW-504 reported a peak TCE concentration of 38 µg/L in the first quarter of 2019 and appeared to be trending downwards. However, by the fourth quarter of 2021 the TCE concentration in MW-504 peaked again at 62 µg/L and was reported at 45 µg/L in May 2022. MW-355 does not appear to be within the influence of any of the injections. The average TCE concentration in this well appears to about 20 µg/L with the highest value of 28 µg/L for the reporting period noted in May 2022. MW-460 TCE concentrations were below the MCL during the entire FYR period.

For Group #2 wells MW-298, MW-426, and MW-427 located to the west of the main Hotspot #5, an insufficient amount of data was available during the FYR period to determine any recent trends. MW-426 reported TCE levels at 78 µg/L during the fourth quarter of 2021.

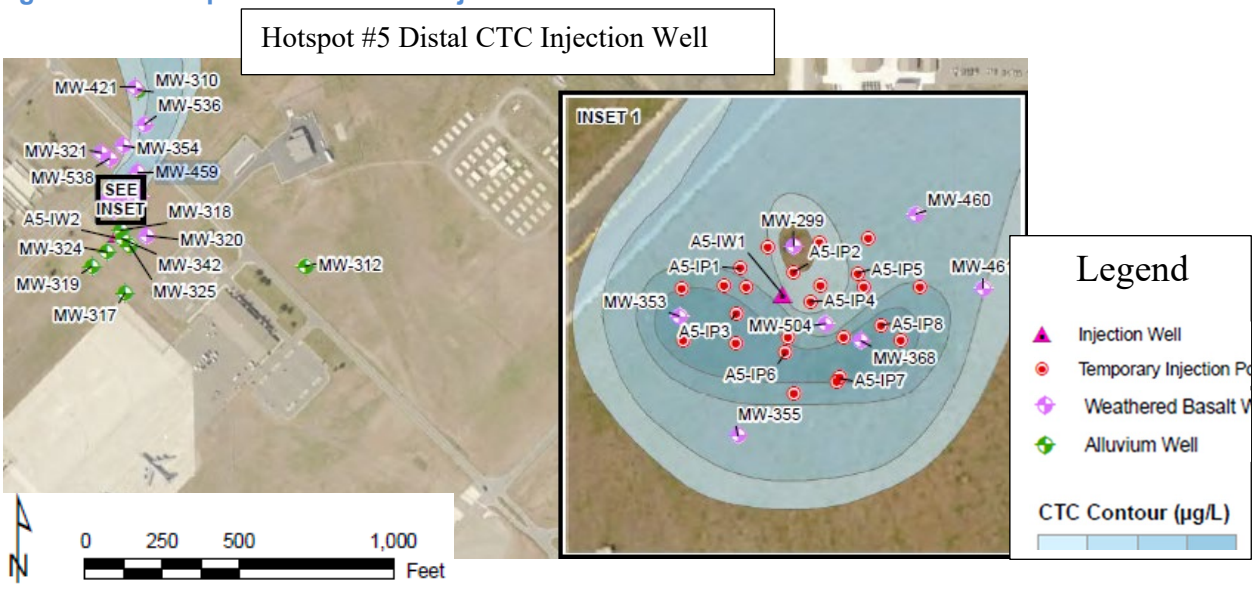
Main Hotspot #5 CTC Levels

Data analysis to determine the effectiveness of past treatment at Hotspot #5 used the following performance monitoring wells for the main CTC plume:

MW-299; MW-368; MW-504; MW-353; MW-355; MW-460; MW-461

CTC exceeded the MCL of 5 µg/L in four of the seven wells at the end of this FYR period. The maximum CTC concentration was 47 µg/L at MW-504.

Figure E-17 Hotspot #5 Distal CTC Injection Well Locations



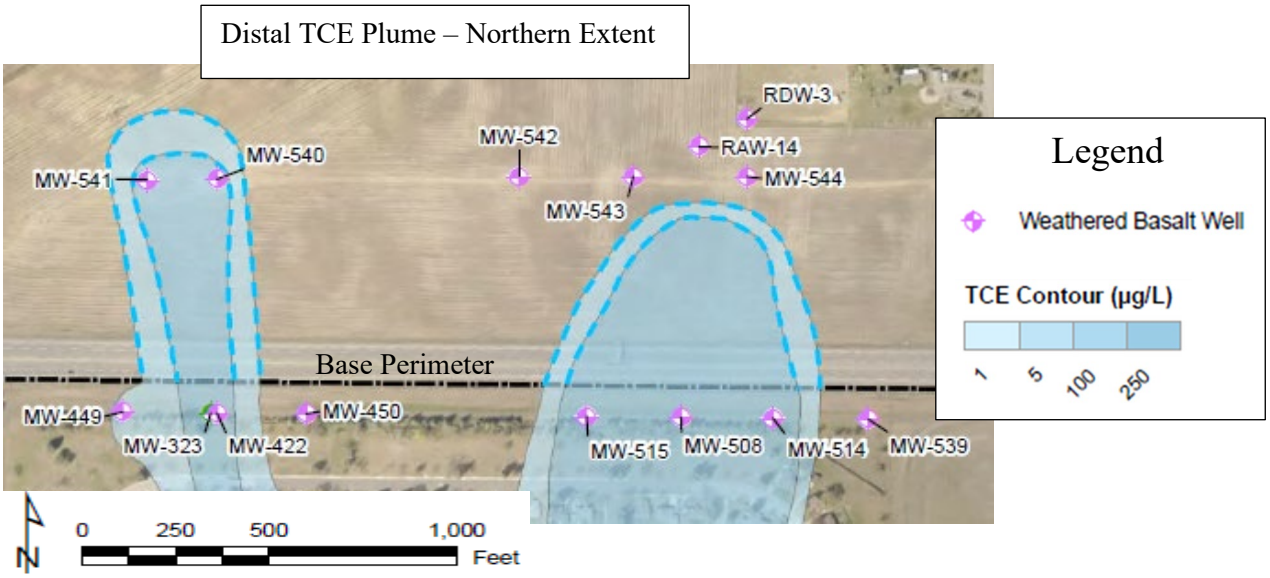
MW-299 CTC concentrations responded quickly to injections. The CTC concentration during the fourth quarter of 2018 was 520 µg/L. By the second quarter of 2019, the CTC concentrations were below the MCL and reached non-detect concentrations by the fourth quarter of 2019. MW-368 and MW-353 both responded similarly to treatment; at the fourth quarter of 2018, the CTC concentrations were 1,400 and 360 µg/L respectively. They remained high and above the MCL until the fourth quarter of 2021, at which point they dropped to non-detect levels. The CTC concentration in MW-504 had two peaks during this FYR review period: 45 µg/L in the first quarter of 2019, and 97 µg/L in the fourth quarter of 2021. Concentrations have since decreased to 47 µg/L as of May 2022. The CTC concentrations in MW-355 appear consistent and ended this FYR period with a concentration of 39 µg/L. MW-460 and MW-461 both appear to have relatively low and stable CTC concentrations slightly exceeding the MCL, with the exception of MW-461 where the concentration peaked at 28 µg/L as of May 2022.

Distal Plume NW Extent

The downgradient and northwest branch of the TCE plume defined by wells:

MW-540, MW-541; MW-449; MW-450; MW-422

Figure E-18 Distal TCE Plume, Northern Extent



The TCE concentration at MW-540 (13 µg/L) and MW-541 (7 µg/L) exceeded the step-out criteria of 5 µg/L by the fourth quarter of 2021. Therefore, the extent of the TCE plume in the northwestern downgradient area of the Distal Plume is not fully delineated. TCE concentrations in MW-449 and MW-450 are below the MCL or non-detect. MW-422 TCE concentrations appear to be stable at just above 7 µg/L.

Distal Plume NE Extent

The downgradient and northeast branch of the TCE plume defined by wells:

MW-515; MW-508; MW-514; MW-539; RAW-14; MW-542; MW-543; MW-544

Wells MW-515, MW-508, and MW-514 appear to have stable TCE concentration trends with maximum concentrations of 10 µg/L recorded in both MW-515 and MW-514. RAW-14 is an agricultural well located 5,200 feet north of Hot Spot #5. This well, and wells MW-542, MW-543, and MW-544 have TCE concentrations below the MCL or at non-detect. Thus, the northeastern and eastern extent of the TCE Plume in this vicinity is delineated.

Overall, due to the unstable levels of TCE and CTC concentrations and exceedances of the MCLs, the core area or source of the Hotspot #5 Distal Plume requires additional injections to lower the TCE and CTC concentrations to below the MCLs.

E.4.6 Sustainability

Spokane County is expected to increase in temperatures with increased wildfire risk while annual precipitation is expected to decrease along with decreasing snowpack according to the University of Washington's *Climate Impacts Group Database* (University of Washington 2023).

Extreme precipitation for Spokane County is expected to increase by 8 percent in the next 30 years and the annual precipitation for the county is expected to increase by 7.6 percent. The change in total annual precipitation is an indicator of the overall change in the amount of water available for human uses and ecosystems. In contrast, reduced snowpack by April 1st for Spokane County is expected to decrease by 92 percent over the next 30 years as this is an indicator for the amount of stored water that becomes available during the melt season. The reduced snowpack indicates less stored water will be available to supply streams, soil, and reservoirs during the melt season. In addition, changes in average summer (June to August) maximum temperatures are expected to increase by 3.8 degrees Fahrenheit (within the same time period) and the annual high fire danger days are expected to increase by 5 days which indicates greater potential for wildfire danger to damaged infrastructure, interrupt businesses and affect public health and well-being.

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APPENDIX F

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED FOR OU-1, OU-2, OU-3, AND OU-5 SITES

Section 121 (d)(2)(A) of Comprehensive Environmental Response, Compensation, and Liability Act specifies that Superfund remedial actions must meet any Federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Comprehensive Environmental Response, Compensation, and Liability Act site.

ARARs were evaluated to determine if there were any changes, and if so, did the changes affect the protectiveness of the remedy. Each action- or location-specific ARAR and any change to the applicable standard or criterion are discussed below.

There have been no changes to the action- or location-specific ARARs that impact the protectiveness of the remedy during the review period. There have been no revisions to laws or regulations that affect the protectiveness of the remedy. The following action- or location-specific ARARs have not changed in the past five years, and therefore do not affect protectiveness:

- Safe Drinking Water Act of 1974 (Public Law 93-523, as amended; 42 USC 300f et. Seq.) Underground Injection Control Program (40 CFR 144 and 146)
- Water Pollution Control Chapter 90.48 RCW, as amended); Underground Injection Control Program; Chapter 173-218 WAC for Underground Injection Control Well Classification (WAC 173-218-040)
- Water Well Construction Act of 1971 (Chapter 18.104 RCW, as amended); Minimum Standards for Construction and Maintenance of Well (WAC 173-160-161, 171, 181, 400, 430, 440, 450, 460)
- Washington Clean Air Act (Chapter 70.94 RCW, as amended): General Regulations for Air Pollution Sources, Chapter 173-400 WAC
- Washington Clean Air Act (Chapter 70.94 RCW, as amended): Controls for New Sources of Toxic Air Pollutants, Chapter 173-460 WAC
- Hazardous Waste Management Act of 1976 (Chapter 70.105 RCW, as amended) Dangerous Waste Regulations (WAC 173-303-070, 073, 077, 120, 140, 170, 200)
- **APPROPRIATE** Waste Management for Non-hazardous Waste (40 CFR Parts 239-259, RCRA Subtitle D)
- Identification and Listing of a Hazardous Waste (40 CFR Part 261, Subpart B, RCRA Subtitle C)
- Runoff Management (WAC 173-340-370(4))
- Protection and Confirmation Monitoring (WAC 173-340-410)
- EPA Regional Screening Levels (40 CFR 300.430(d)(1)
- MTCA Soil Cleanup Levels for Unrestricted Land Use (WAC 173-340-740)
- MTCA Point of Compliance for Soil (WAC 173-340-740(6))
- Standards for Waste Generators and Transporters (40 CFR Parts 262 and 263, RCRA Subtitle C)
- Land Disposal Restrictions (40 CFR Parts 267 and 268, Subtitle C)
- National Ambient Air Quality (40 CFR Part 50)

Chemical-specific ARARs for groundwater and soil cleanup levels for all Operable Units are discussed in **Appendix G**.

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Section 121 (d)(2)(A) of Comprehensive Environmental Response, Compensation, and Liability Act specifies that Superfund remedial actions must meet any Federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a Comprehensive Environmental Response, Compensation, and Liability Act site.

ARARs were evaluated to determine if there were any changes, and if so, did the changes affect the protectiveness of the remedy. Each action- or location-specific ARAR and any change to the applicable standard or criterion are discussed below.

There have been no changes to the action- or location-specific ARARs that impact the protectiveness of the remedy during the review period. There have been no revisions to laws or regulations that affect the protectiveness of the remedy. The following action- or location-specific ARARs have not changed in the past five years, and therefore do not affect protectiveness:

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- Water Pollution Control Chapter 90.48 RCW, as amended); Underground Injection Control Program; Chapter 173-218 WAC for Underground Injection Control Well Classification (WAC 173-218-040)
- Water Well Construction Act of 1971 (Chapter 18.104 RCW, as amended); Minimum Standards for Construction and Maintenance of Well (WAC 173-160-161, 171, 181, 400, 430, 440, 450, 460)
- Washington Clean Air Act (Chapter 70.94 RCW, as amended): General Regulations for Air Pollution Sources, Chapter 173-400 WAC
- Washington Clean Air Act (Chapter 70.94 RCW, as amended): Controls for New Sources of Toxic Air Pollutants, Chapter 173-460 WAC
- Hazardous Waste Management Act of 1976 (Chapter 70.105 RCW, as amended) Dangerous Waste Regulations (WAC 173-303-070, 073, 077, 120, 140, 170, 200)
- **APPROPRIATE** Waste Management for Non-hazardous Waste (40 CFR Parts 239-259, RCRA Subtitle D)
- Identification and Listing of a Hazardous Waste (40 CFR Part 261, Subpart B, RCRA Subtitle C)
- Runoff Management (WAC 173-340-370(4))
- Protection and Confirmation Monitoring (WAC 173-340-410)
- EPA Regional Screening Levels (40 CFR 300.430(d)(1)
- MTCA Soil Cleanup Levels for Unrestricted Land Use (WAC 173-340-740)
- MTCA Point of Compliance for Soil (WAC 173-340-740(6))
- Standards for Waste Generators and Transporters (40 CFR Parts 262 and 263, RCRA Subtitle C)
- Land Disposal Restrictions (40 CFR Parts 267 and 268, Subtitle C)
- National Ambient Air Quality (40 CFR Part 50)

Chemical-specific ARARs for groundwater and soil cleanup levels for all Operable Units are discussed in **Appendix G**.

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APPENDIX G

ASSESSMENT OF CHEMICAL-SPECIFIC ASSUMPTIONS

Chemical-specific ARARs, as identified in the following decision documents for Operable Units 1, 2, 3, and 5, are provided below for soil and groundwater in **Tables G-1** to **G-4**:

- Final Record of Decision, Craig Road Landfill, Fairchild Air Force Base, Washington (USAF, 1993a)
- Final Record of Decision Amendment, Craig Road Landfill, Fairchild Air Force Base, Washington (USAF, 2021)
- Final, Record of Decision, On-Base Priority One Operable Units, Fairchild AFB (USAF 1993b)
- Final ESD, Operable Unit 2 (USAF 2019)
- Final Record of Decision for Priority Two Sites at Fairchild AFB (USAF 1995a)
- Final ESD, Operable Unit 3 (USAF 2019)

EPA selected groundwater and soil cleanup levels reflecting residential land use for Operable Units (OUs) 1, 2, 3, and 5. Numerical cleanup levels identified in the Records of Decision (RODs), ROD Amendments, and Explanation of Significant Differences are based on Federal Maximum Contaminant Levels (MCLs) and Washington State Department of Ecology Model Toxic Control Act (MTCA) Cleanup Levels for soil and groundwater in the decision documents. For OU-8, numerical cleanup levels are based on values determined to be protective for ecological receptors.

To evaluate if changes in toxicity values may impact the protectiveness of the CULs identified in the decision documents, toxicity values used to develop the November 2022 EPA Regional Screening Levels were evaluated. The 2012 EPA RSLs were used as comparison point as these values were included in the evaluation as part of the Fourth Five-Year review.

Changes have occurred to some toxicity values since the final decision documents were signed for each Operable Unit (**Tables G-1** to **G-4**). However, the cleanup values for the contaminants of concern (COCs) identified in the decision documents reflect the current federal MCLs and state MTCA CULs, and are protective of human health. Changes in toxicity values for chemicals of potential concern (COPCs) became less stringent for multiple COPCs, such as the carcinogenic polycyclic aromatic hydrocarbons.

The toxicity value evaluation for OUs 1, 2, 3, and 5 is presented in **Table G-5**.

Table G-1. Summary of Chemical Specific ARARs for Operable Unit 1 – Craig Road Landfill

Contaminant	Current ARARs: Federal MCL; 40 CFR part 141 (Washington Method A GW CUL; WAC Table 720-1)	Changes Toxicity Values Since Fourth Five-Year Review (USAF 2019)	1993 ROD CUL	Comments
Arsenic	10 µg/L (5 µg/L)	No change		
Benzene	5 µg/L (5 µg/L)	No change		
Bis(2-ethylhexylphthalate)	6 µg/L	No change		
1,1-Dichloroethene	7 µg/L	No change		
cis-1,2-Dichloroethene	70 µg/L	No change		*Cis*-1,2-DCE was detected in groundwater at concentrations exceeding the Federal MCL.
trans-1,2-Dichloroethene	100 µg/L	No change		
Chromium (total)	100 µg/L (50 µg/L)	No change		The ROD amendment added "chromium" as a COC. Toxicity values for vinyl chloride have not changed since the ROD Amendment.
Chromium (VI)[1]	50 µg/L (50 µg/L)	No change		Groundwater monitoring results indicate that chromium (VI) has been mobilized via ISCO injections at OU-1.
Tetrachloroethene	5 µg/L (5 µg/L)	No change		
Trichloroethene	5 µg/L (5 µg/L)	No change	5 µg/L	The 1993 ROD CUL was based on the Federal MCL. Toxicity values have not changed since the Fourth FYR.
Vinyl chloride[1]	2 µg/L (0.2 µg/L)	No change		The ROD Amendment added vinyl chloride as a COC with MTCA-A CUL as the cleanup level. Toxicity values for vinyl chloride have not changed since the ROD Amendment.

[1]Final Record of Decision Amendment: Operable Unit 1, April 1, 2021, includes chromium and vinyl chloride as OU-1 COCs.

Bolded chemicals represent chemicals identified as contaminants of concern in a ROD, ROD Amendment, or Explanation of Significant Differences. Unbolded chemicals represent chemicals detected in site media.

ARAR – applicable or relevant and appropriate requirements
CUL – Cleanup level
ROD – record of decision
µg/L = micrograms per liter

Table G-2. Summary of Chemical Specific ARARs for Operable Unit 2 – Priority One Sites

Contaminant	ARARs: Federal MCL; 40 CFR part 141 (Washington Method A Soil or GW CUL; WAC Table 720-1)	Changes in Toxicity Values Since Fourth Five-Year Review (USAF 2019)	2019a Final ESD	1993 ROD CULs	Comments
Arsenic	10 µg/L (5 µg/L)	No change			Arsenic has been detected in groundwater at site WP003 at concentrations exceeding the Federal MCL.
Benzene	5 µg/L (5 µg/L)	No change	0.03 mg/kg (soil, FT004)	GW, 5 µg/L Soil, 0.5 mg/kg	Because benzene-contaminated soils were identified as a source of groundwater contamination at FT004, a MTCA Method B soil CUL of 0.5 mg/kg was developed for benzene in the OU-2 ROD. This value was updated to the current MTCA-A CUL in the 2019 ESD.
Cadmium	(2 mg/kg)			2 mg/kg	
1,1-Dichloroethene	7 µg/L	No change			
cis-1,2-Dichloroethene	70 µg/L	No change			
trans-1,2-Dichloroethene	100 µg/L	No change			
Ethylbenzene	700 µg/L (700 µg/L)	No change			
Polycyclic Aromatic Hydrocarbons	0.2 µg/L (0.1 µg/L) Based on benzo(a)pyrene	No change			
Trichloroethene	5 µg/L (5 µg/L)	No change		5 µg/L	The OU-2 ROD cleanup level was based on the Federal MCL. The cleanup level is consistent current MTCA Method A groundwater CUL.
TPH- Diesel	NA (500 µg/L)		2,000 mg/kg (soil, FT004)	1,000 µg/L	Soil cleanup levels were not established in the OU-2 ROD for TPH-D. The 2019 ESD establishes a new soil CUL of 2,000 mg/kg for soil at FT004. The value is consistent with the current MTCA Method A CUL. The OU-2 ROD established a groundwater cleanup level of 1,000 ug/L under MTCA Method A for SS018 and SS026. The 2019 ESD establishes a new TPH-D cleanup level for groundwater of 500 ug/L based on the MTCA Method A CUL.
TPH- Gasoline	NA (1,000 µg/L; if benzene detected in groundwater)		30 mg/kg (soil, FT004)		Soil cleanup levels were not established in the OU-2 ROD for TPH-G. The 2019 ESD establishes a new soil cleanup value of 30 mg/kg at FT004 based on the current MTCA Method A CUL.
Vinyl chloride	2 µg/L (0.2 µg/L)	No change			Vinyl chloride has been detected in groundwater at site WP003 at concentrations exceeding the Federal MCL.

Contaminant	ARARs: Federal MCL; 40 CFR part 141 (Washington Method A Soil or GW CUL; WAC Table 720-1)	Changes in Toxicity Values Since Fourth Five-Year Review (USAF 2019)	2019a Final ESD	1993 ROD CULs	Comments
Xylenes	(9 mg/kg)	No change			Soil cleanup levels were not established in the OU-2 ROD for xylenes. The 2019 ESD establishes a new soil cleanup level of 9 mg/kg for soil at FT004 based on the current MTCA Method A CUL.

References:
Final, Record of Decision, On-Base Priority One Operable Units, Fairchild AFB (USAF 1993b); Final ESD, Operable Unit 2 (USAF 2019); and USEPA Regional Screening Levels, accessed November 2022
Bolded chemicals represent chemicals identified as contaminants of concern in a ROD, ROD Amendment, or Explanation of Significant Differences. Unbolded chemicals represent chemicals detected in site media.

Acronyms:
ARAR – applicable or relevant and appropriate requirements
ROD – record of decision
µg/L = micrograms per liter
mg/kg = milligrams per kilogram

Table G-3. Summary of Chemical-Specific ARARs for Operable Unit 3 - Priority Two Sites

Contaminant	ARARs: Federal Drinking Water Standards; 40 CFR part 141 (Washington Method A GW CUL; WAC Table 720-1)	Toxicity Value Changes Since Fourth Five-Year Review (USAF 2019)	2019 ESD	1995 ROD	Comments
Arsenic	10 µg/L (5 µg/L)	No change			
Benzene	5 µg/L (5 µg/L)	No change		5 µg/L	
Ethylbenzene	700 µg/L (700 µg/L)	No change			
Naphthalene	(160 µg/L)	No change			A 2016 post-ROD investigation identified naphthalene in soil at concentrations exceeding the MTCA Method CUL (5 mg/kg).
Polycyclic Aromatic Hydrocarbons	0.2 µg/L (0.1 µg/L) Based on benzo(a)pyrene	No change			A 2016 post-ROD investigation identified cPAH compounds in soil at concentrations exceeding the MTCA Method A CUL.
Trichloroethene	5 µg/L (5 µg/L)	No change	0.03 mg/kg (soil, SD031)	GW, 5 µg/L SD031 soil, 91 mg/kg	The 1995 OU-3 ROD established the cleanup level for TCE in soil based on MTCA Method B CUL. The 2019 ESD establishes the current MTCA Method A CUL (0.03 mg/kg) for soil (protection of groundwater) at SD031 as the cleanup level.
TPH- Diesel	NA (500 µg/L)	Change in MTCA Method A Unrestricted Land Use Soil Cleanup Level	2000 mg/kg (SD031)	200 mg/kg 1,000 µg/L	The 1995 OU-3 ROD established the cleanup level for TPH-D in soil based on the MTCA Method A CUL. The 2019 ESD establishes a new soil cleanup level of 2,000 mg/kg for soil at SD031 based on the current MTCA Method A CUL. The OU-3 ROD established a groundwater cleanup level of 1,000 µg/L under MTCA Method A. The current MTCA Method A CUL for TPH-D is 500 µg/L. Sites ST006, SS009, ST010, OT017, and FT032 are currently being transferred to WDOE VCP.
TPH- Gasoline	NA (1,000 µg/L; 800 µg/L; if benzene detected in groundwater				
Vinyl chloride	2 µg/L (0.2 µg/L)	No change			
Xylenes	10,000 µg/L (1,000 µg/L)	No change			

References:
Final, Record of Decision for Priority Two Sites at Fairchild AFB (USAF 1995a); Final ESD, Operable Unit 3 (USAF 2019); and USEPA Regional Screening Level Table, accessed November 2022
Bolded chemicals represent chemicals identified as contaminants of concern in a ROD, ROD Amendment, or Explanation of Significant Differences. Unbolded chemicals represent chemicals detected in site media.

Acronyms:
ARAR – applicable or relevant and appropriate requirements

CUL – Cleanup level
ROD – record of decision
ESD – explanation of significant differences
µg/L = micrograms per liter
mg/kg = milligrams per kilogram

Table G-4. Summary of Chemical-Specific ARARS for Operable Unit 5 - TCE Orphan Plumes

Contaminant	ARARs: Federal Drinking Water Standards; 40 CFR part 141 (Washington Method A GW CUL; WAC Table 720-1)	USEPA RSL and Toxicity Reference Values	2011 Interim ROD	Comments
		Changes Since Fourth Five-Year Review (USAF 2019)	Based on Federal Drinking Water Standards	
Carbon Tetrachloride	5 µg/L (5 µg/L)	No change	5 µg/L	Federal Drinking Water standards are selected as the Preliminary Cleanup Goals
Chloroform	80 µg/L; as total trihalomethanes	No change	80 µg/L	
1,1-Dichloroethene	7 µg/L	No change	7 µg/L	
Tetrachloroethene	5 µg/L (5 µg/L)	No change	5 µg/L	
Trichloroethene	5 µg/L (5 µg/L)	No change	5 µg/L	

References:
Interim Record of Decision, OU-5, Site SS-39, TCE Orphan Plume (USAF 2011); USEPA Regional Screening Level Table, accessed November 2022
Bolded chemicals represent chemicals identified as contaminants of concern in a ROD, ROD Amendment, or Explanation of Significant Differences. Unbolded chemicals represent chemicals detected in site media.
Acronyms:
ARAR – applicable or relevant and appropriate requirements
ROD – record of decision
µg/L = micrograms per liter

Table G-5. Toxicity Factor Evaluation for Operable Units 1, 2, 3, and 5

Chemical	Ingestion Exposure								Inhalation Exposure[a]							
	Chronic Oral Reference Dose (RFD_o)				Oral Slope Factor (Sf_o)				Chronic Inhalation Reference Concentration (RfC)				Inhalation Unit Risk (IUR)			
	mg/kg-day				$(mg/kg\text{-}day)^{-1}$				mg/m^3				$(mg/m^3)^{-1}$			
	Nov 2012 values	Ref	Nov 2022 values	Ref	Nov 2012 values	Ref	Nov 2022 values	Ref	Nov 2012 values	Ref	Nov 2022 values	Ref	Nov 2012 values	Ref	Nov 2022 values	Ref
Volatiles																
Benzene	4.0E-03	I	4.0E-03	I	5.5E-02	I	5.5E-02	I	3.0E-02	I	3.0E-02	I	8.0E-06	I	8.0E-06	I
Carbon Tetrachloride	4.0E-03	I	4.0E-03	I	7.0E-02	I	7.0E-02	I	1.0E-01	I	1.0E-01	I	6.0E-06	I	6.0E-06	I
Chlorobenzene	2.0E-02	I	2.0E-02	I	none		none		5.0E-02	P	5.0E-02	I	none		none	
Chloroform	1.0E-02	I	1.0E-02	I	3.1E-02	C	3.1E-02	C	9.8E-02	A	9.8E-02	A	2.3E-05	I	2.3E-05	I
1,1-Dichloroethene	5.0E-02	I	5.0E-02	I	none		none		2.0E-01	I	2.0E-01	I	none		none	
cis-1,2-Dichloroethene	2.0E-03	I	2.0E-03	I	none		none		none		none		none		none	
trans-1,2-Dichloroethene	2.0E-02	I	2.0E-02	I	none		none		6.0E-02	P	6.0E-02	P	none		none	
Ethylbenzene	1.0E-01	I	1.0E-01	I	1.1E-02	C	1.1E-02	C	1.0E+00	I	1.0E+00	I	2.5E-06	C	2.5E-06	C
Isopropylbenzene	1.0E-02	I	1.0E-02	I	none		none		4.0E-01	I	4.0E-01	I	none		none	
Methylene chloride	6.0E-03	I	6.0E-03	I	2.0E-03	I	2.0E-03	I	6.0E-01	I	6.0E-01	I	1.0E-08	I	1.0E-08	I
Tetrachloroethene	6.0E-03	I	6.0E-03	I	2.1E-03	I	2.1E-03	I	4.0E-02	I	4.0E-02	I	2.6E-07	I	2.6E-07	
Toluene	8.0E-02	I	8.0E-02	I	none		none		5.0E+00	I	5.0E+00	I	none		none	
Trichloroethene	5.0E-04	I	5.0E-04	I	4.6E-02	I	4.6E-02	I	2.0E-03	I	2.0E-03	I	4.1E-06	I	4.1E-06	I
1,2,4-trimethylbenzene	none		1.0E-02	I	none		none		6.0E-03	P	6.0E-03	I	none		none	
Vinyl chloride	3.0E-03	I	3.0E-03	I	7.2E-01	I	7.2E-01	I	1.0E-01	I	1.0E-01	I	4.4E-06	I	4.4E-06	I
Xylenes	2.0E-02	I	2.0E-02	I	none		none		1.0E-01	I	1.0E-01	I	none		none	
Metals																
Arsenic	3.0E-04	I	3.0E-04	I	1.5E+00	I	1.5E+00	I	1.5E-05	C	1.5E-05	I	4.3E-03	I	4.3E-03	I
Chromium (VI)	3.0E-03	I	3.0E-03	I	5.0E-01	J	5.0E-01	C	1.0E-04	I	1.0E-04	I	8.4E-02	S	8.4E-02	S
Manganese	2.4E-02	S	2.4E-02	S	none		none		5.0E-05	I	5.0E-05	I	none		none	
Semi-volatiles/Petroleum/PAHs																
Bis(2-ethylhexyl) phthalate	2.0E-02	I	2.0E-02	I	1.4E-02	I	1.4E-02		none		none		2.4E-06	C	2.4E-06	C
Benzo(a) anthracene	none		none		7.3E-01	E	1.0E-01	I	none		none		1.1E-04	C	6.0E-06	E
Benzo(a)pyrene	none		3.0E-04	I	7.3E+00	I	1.0E+00	I	none		2.0E-06	I	1.1E-03	C	6.0E-04	I

Chemical	Ingestion Exposure								Inhalation Exposure[a]							
	Chronic Oral Reference Dose (RFD_o)				Oral Slope Factor (Sf_o)				Chronic Inhalation Reference Concentration (RfC)				Inhalation Unit Risk (IUR)			
	mg/kg-day				$(mg/kg\text{-}day)^{-1}$				mg/m^3				$(mg/m^3)^{-1}$			
	Nov 2012 values	Ref	Nov 2022 values	Ref	Nov 2012 values	Ref	Nov 2022 values	Ref	Nov 2012 values	Ref	Nov 2022 values	Ref	Nov 2012 values	Ref	Nov 2022 values	Ref
Benzo(b) fluoranthene	none		none		7.3E-01	E	1.0E-01	E	none		none		1.1E-04	C	6.0E-05	E
Benzo(k) fluoranthene	none		none		7.3E-02	E	1.0E-02	E	none		none		1.1E-04	C	6.0E-06	E
Chrysene	none		none		7.3E-03	E	1.0E-03	E	none		none		1.1E-05	C	6.0E-07	E
Dibenz(a,h) anthracene	none		none		7.3E+00	E	1.0E+00	E	none		none		1.2E-03	C	6.0E-04	E
Indeno(1,2,3-cd) pyrene	none		none		7.3E+00	E	1.0E+00	E	none		none		1.1E-04	C	6.0E-04	E
Methylnaphthalene, 1-	7.0E-02	A	7.0E-02	A	2.9E-02	P	2.9E-02	P	none		none		none		none	
Methylnaphthalene, 2-	4.0E-03	I	4.0E-03	I	none		none		none		none		none		none	
Naphthalene	2.0E-02	I	2.0E-02	I	none		none		3.0E-03	I	3.0E-03	I	3.4E-05	C	3.4E-05	C

Notes:

This table references toxicity values from Tier 1 (EPA's IRIS), Tier 2 (EPA's PPRTV), and Tier 3 sources (Other Toxicity Values, e.g., CalEPA, HEAST, ASTDR, etc.). USAF and EPA both follow the OSWER Directive 9285.7-53, which recommends hierarchy for use of the tired toxicity values and understands that Tier 3 values may not have the same level of peer review and rigorous development as compared to Tier 1 and Tier 2 values. Therefore, any potential changes for the individual OUs were evaluated only based on the use of Tier 1 and Tier 2 values. All Tier values as presented in the November 2012 and the November 2022 EPA RSL tables are included for completeness.

Yellow shading = current value exists while there was no corresponding November 2012 value.

Green shading = current value is less stringent than the corresponding November 2012 value (decrease in cancer potency or increase in non-cancer reference value).

[a] inhalation values listed for non-volatile compounds (metals) are only applicable to dust inhalation are not appropriate for groundwater.

Acronyms:

ASTDR - Agency for Toxic Substances and Disease Registry
HEAST - Health Effects Assessment Summary Table
IRIS - Integrated Risk Information System IUR - Inhalation Unit Risk
mg/m^3 - milligrams per cubic meter
mg/kg-day - milligrams per kilogram per day
$\mu g/m^3$ - micrograms per cubic meter
PPRTV - Provisional Peer Reviewed Toxicity Values
RSL - regional screening level
RfC - Inhalation Reference Concentration
RfDo - Oral Reference Dose
Sfo - Oral Slope Factor

References:

A - ASTDR Minimal Risk Levels 2017
C - CalEPA
E - OEHHA Chronic Reference Exposure Levels 2016
I - IRIS, June 2022 update
J- Value determined by New Jersey Department of Environmental Protection as listed in the Nov 2012 EPA RSL table
S - value qualified by footnotes in Section 5 of the Users Guide for 2022 EPA RSL Table
P – PPRTV

APPENDIX H

EPA PROTECTIVENESS STATEMENT

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3188

SUPERFUND &
EMERGENCY
MANAGEMENT DIVISION

March 26, 2024

Ms. Megan M. Riccobono
Remedial Project Manager
AFCEC/CZOM Fairchild AFB
100 West Ent Street, Building 2450
Fairchild AFB, Washington 99011

Dear Ms. Riccobono:

Thank you for sending the Revised Draft Final Fifth Five Year (FYR) Review for Multiple Sites at Fairchild Air Force Base, dated January 2024. The U.S. Environmental Protection Agency (EPA) received the response to our initial comments after the statuary deadline of September 20, 2023. The EPA made an independent protectiveness determination on September 19, 2023 based on the July 2023 Draft Report and provided our findings to the Air Force. The EPA does not concur with the Air Force's protectiveness determination at Operational Unit (OU)-2 and OU-3 due to the presence of Per- and Polyfluoroalkyl Substances (PFAS) in groundwater at these sites. The letter is attached as a reference and outlines the EPA's findings and recommendations.

The EPA reviewed the response to comments and does not concur with the Air Force's decision not to include recommendations related to PFAS in the FYR at existing OUs where PFAS is present. More information can be found in the EPA's independent protectiveness determination. Additionally, milestone dates should be provided in the FYR for the Air Force's recommendations at OU-1, OU-2, and OU-5. The EPA concurs with the remaining Air Force responses and revisions to the FYR. The EPA received the response after the statutory deadline of September 20, 2023. As such, the EPA is not pursuing the resolution of these comments.

The next FYR is due September 20, 2028. Please submit the draft FYR report at least sixth months in advance of the statutory deadline so that there is adequate time for the EPA provide comments to the Air Force, and to allow follow-up discussions and revisions. The EPA's goal is to be able to work with the Air Force to come to a resolution on issues, recommendations, and protectiveness determinations before the statutory deadline.

If you have any questions, feel free to contact me at satira.jaclyn@epa.gov or 206-553-1423.

Sincerely
Jaclyn Satira

Jaclyn Satira
Remedial Project Manager
US EPA R10 SEMD

cc: Jason Cook, WA Department of Ecology, RPM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 155
Seattle, WA 98101-3188

SUPERFUND &
EMERGENCY
MANAGEMENT DIVISION

September 19, 2023

Colonel Chesley L. Dycus
Commander
92d Air Refueling Wing Fairchild AFB
1 E. Bong St., Building 2285
Fairchild AFB, Washington 99011

Dear Colonel Dycus,

The U. S. Environmental Protection Agency Region 10 (EPA) has reviewed the draft Fifth Five-Year Review (FYR) Report for select Operable Units (OU) associated with Fairchild US Air Force Base Superfund Site, Washington. The conclusions in this letter are based on the unsigned draft FYR Report which is dated July 2023. It is EPA policy to make a protectiveness determination at federal facilities by the statutory due date. The Fairchild FYR due date is September 20, 2023. EPA received the draft FYR Report on July 17, 2023. Submitting the Report two months prior to the statutory deadline does not allow enough time for EPA and United States Air Force (USAF) to discuss and reach resolution on issues, recommendations, and protectiveness determinations before the statutory deadline.

The EPA reviewed the draft FYR Report for technical adequacy, accuracy, and consistency with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan (NCP), and EPA guidance. The draft report provides a summary of the status and protectiveness for OUs for which Records of Decision (RODs) have been issued and are not considered No Further Action. It also identifies actions to be taken that ensure protectiveness of the selected remedies and on-going remedial actions, and documents a schedule for completion of the recommended actions at the respective OU.

The following are the EPA's protectiveness determinations for these OUs and the overall site protectiveness that will be reported to Congress in EPA's annual report. Also included are additional recommendations and follow-up actions necessary to address issues raised in the draft FYR Report that affect or could affect protectiveness. Each OU is discussed below, with reference to the corresponding numeric OU designations assigned in EPA's Superfund Enterprise Management System database.

As discussed throughout this process, it remains the Air Force's responsibility to respond to EPA comments and complete the FYR in a timely fashion.

OU1-LF002 Craig Road Landfill

EPA concurs with the Air Force protectiveness determination of short-term protective for OU1. The remedy for OU1 is short-term protective through the implementation of institutional controls (ICs). There is not enough monitoring data to determine if groundwater will achieve the remedial action objective (RAO) for groundwater in a reasonable time frame. Furthermore, OU1 is being assessed for possible PFAS presence. Even if PFAS is detected, there are ICs in place at OU1 to prevent drinking

water exposures. To be protective of human health and the environment in the long-term, the following actions need to be taken:

- There needs to be continued monitoring of downgradient sentinel wells for the contaminants of concern (COC) to determine if the concentrations are increasing. The due date for this recommendation is March 30, 2024.
- Additional monitoring wells should be added to delineate the plume and define the paleochannel. The due date for this recommendation is March 30, 2025. Appendix E states: "There is not a downgradient well to define this plume as it is approaching a buried paleochannel. The exact location of this paleochannel has also not been defined."
- PFAS can impact the efficacity of remedies like in-situ chemical oxidation (ISCO) and granular activated carbon treatment systems, both of which are part of the OU1 remedy. It is recommended that samples collected and analyzed for PFAS before and after treatment. The due date for this recommendation is June 30, 2024.

OU2-Priority One Sites
EPA does not concur with the Air Force's protectiveness determination of short-term protective for OU2. EPA is making an independent finding of deferring protectiveness for OU2. Only one protectiveness statement should be made per OU and priority one sites should be evaluated together.

The USAF is monitoring residential drinking water wells and providing alternative sources of water for households with concentrations over 70 parts per trillion (ppt) of PFOA/PFOS combined related to the groundwater plume at OU2 Subsite FT004, former fire training area. The EPA rescinded its 2019 memorandum "Interim Recommendations to Address Groundwater Contaminated with Perfluorooctanoic Acid and Perfluorooctanesulfonate" in August 2023 and EPA recommends practitioners use the Risk Assessment Guidance for Superfund (RAGS) to screen actual or potential sources of drinking water for PFOA and PFOS, develop risk-based preliminary remediation goals and establish final cleanup levels. OU subsite WP003, wastewater lagoons, has confirmed PFAS concentrations in the surface water and sediment. Protectiveness is deferred until a risk assessment for PFAS in OU2 is conducted. At this time OU2 subsite FT004 should continue to be evaluated in the FYR. EPA agrees that existing RAOs have been met, but the presence of PFAS prevents the site from achieving unlimited use/unrestricted exposure (UU/UE).

EPA does concur that the facility-wide ICs are in place that prevent exposures to the COCs in the ROD, or that off-base residential wells are below MCLs for COCs.

To be protective of human health and the environment in the long-term, the following actions need to be taken:

- EPA concurs with the recommendation to complete the proposed plan and ROD for OU2 subsite WP003 to address the TCE plume and add arsenic and vinyl chloride as COCs. The due date for this recommendation is June 30, 2024.
- To be protective of human health, EPA recommends conducting a risk assessment to screen actual or potential sources of drinking water for PFAS, develop risk-based preliminary remediation goals, and provide impacted residents with alternative sources of water. The due date for this recommendation is March 30, 2025.

OU3- Priority Two Sites

EPA does not agree with the Air Force'sprotectiveness determination of protective for the OU3. EPA is making an independent finding of short-term protective. Exposure to COCs is currently prevented through the use of facility-wide ICs, however OU3 subsites FT032 and DP024 have confirmed PFAS impacts to soil and groundwater from the calibration area PFAS site, RS003P. To be protective of human health and the environment in the long-term, the following actions need to be taken:

- EPA concurs that facility-wide ICs should be clarified through an update of the Installation Development Plan and Comprehensive Planning Platform. The due date for this recommendation is December 30, 2024.
- PFAS contamination should be delineated at FT032 and DP024 to determine if additional ICs specific to OU3 are needed. The due date for this recommendation is December 30, 2024.

OU5- SS039 Orphan TCE Plumes

EPA concurs with the Air Force's protectiveness determination of short-term protective for OU5 SS039. There are no known drinking water exposures above the MCL for TCE. PFAS has been found in soil and groundwater at SS039 at the two plane crash locations, RS001P and SS008P. There are no known impacts to drinking water therefore short-term protective is appropriate. For the remedy to be protective of human health and the environment in the long term the following actions should be taken:

- EPA concurs with the recommendation to install additional monitoring wells in the north area of the plume to delineate the TCE plume and update ICs as necessary. The due date for this recommendation is December 30, 2024.
- EPA concurs with the recommendation to install additional monitoring wells to delineate the distal TCE plume. The boundary of concentrations above the MCLs should be delineated and ICs added to be protective of human health. The due date for this recommendation is December 30, 2024.
- Groundwater should be sampled for PFAS to delineate the extent of the plume. The due date for this recommendation is March 30, 2025.

OU8- RW011 and WP036

EPA agrees with Air Force's protectiveness determination of Will Be Protective for OU8. Removal of contaminated lagoon sediments, Imhoff tank sludge, and contaminated soil exceeding ecological cleanup levels will reduce the risk to human health and the environment. PFAS is being investigated at WP0036. The presence of PFAS could impact future protectiveness determinations.

- Groundwater should be sampled for PFAS to delineate the extent of the plume. The due date for this recommendation is March 30, 2025.

EPA and the Air Force do not agree on all protectiveness statements in the draft Fairchild FYR Report. Below is a table summarizing the protectiveness determinations.

Operable Unit Name	USAF Draft Protectiveness Determination	EPA Protectiveness Determination
OU-1	Short-term Protective	Short-tTerm Protective
OU-2	Short-term Protective	Protectiveness Deferred
OU-3	Protective	Short-term Protective
OU-5	Short-term Protective	Short-term Protective
OU-8	Will be Protective	Will be Protective

EPA agrees with all the recommendations identified in the Draft FYR and has additional recommendations. The table below summarizes both the Air Force and EPA recommendations.

Summary of Recommendations			
OU1	**Recommendation:**	Continued monitoring of down-gradient sentinel wells for the COCs to determine if the concentrations are increasing.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	EPA	3/30/2024
OU1	**Recommendation:**	Install additional monitoring wells to delineate the plume and define the paleochannel.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	EPA	3/30/2025
OU1	**Recommendation:**	Sample for PFAS before and after ISCO and GAC treatments.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	EPA	6/30/2024
OU2	**Recommendation:**	Complete the proposed plan and ROD for OU2 subsite WP003 to address the TCE plume and add arsenic and vinyl chloride as COCs.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	AF	6/30/2024

Summary of Recommendations			
OU2	**Recommendation:**	Conduct a risk assessment to screen actual or potential sources of drinking water for PFAS, develop risk-based preliminary remediation goals, and provide impacted residents with alternative sources of water.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	EPA	3/30/2025
OU3	**Recommendation:**	Facility-wide ICs should be clarified through an update of the Installation Development Plan and Comprehensive Planning Platform.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	AF	12/30/2024
OU3	**Recommendation:**	PFAS contamination should be delineated at FT032 and DP024 to determine if additional OU3 specific ICs are needed.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	EPA	12/30/2024
OU5	**Recommendation:**	Install additional monitoring wells in the north area of the plume to delineate the TCE plume and update ICs as necessary.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	AF	12/30/2024
OU5	**Recommendation:**	Install additional monitoring wells to delineate the distal TCE plume. The boundary of concentrations above MCL should be delineated and ICs added to be protective of human health.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	AF	12/30/2024
OU5	**Recommendation:**	Groundwater should be sampled for PFAS to delineate the extent of the plume.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**

Summary of Recommendations			
Air Force	EPA	EPA	3/30/2025
OU8	**Recommendation:**	Groundwater should be sampled for PFAS to delineate the extent of the plume.	
Party Responsible	**Oversight Party**	**Recommendation made by**	**Milestone Date**
Air Force	EPA	EPA	3/30/2025

The August 1, 2011, Program Priorities memorandum also calls for a summary of the EPA Superfund Sitewide Environmental Indicator Status for Sites undergoing Five-Year Reviews. The Environmental Indicators for the Fairchild AFB are posted on the EPA website Superfund Human Exposure Dashboard (https://www.epa.gov/superfund/superfund-human-exposure-dashboard.)

The Sitewide Human Health Exposure Indicator status will be changed to "Insufficient Data to Determine Human Exposure Control Status". Due to the uncertainty regarding the nature and extent of PFAS contamination in groundwater migrating to offsite residential drinking water wells, EPA cannot draw conclusions as to whether human exposures are under control.

The Superfund Sitewide Contaminated Groundwater Migration indicator status remain "Insufficient data to determine contaminated groundwater migration control status". Due to the uncertainty regarding the nature and extent of PFAS contamination in groundwater sitewide, EPA cannot draw conclusions as to whether groundwater poses an unacceptable risk to human health and the environment.

The due date for the next FYR is September 20, 2028. It is my expectation that our staff will determine a timeline that would ensure EPA receives the draft report with adequate time to provide comments to the Air Force, and to allow follow-up discussions and revision of the next draft FYR Report. Our goal is to be able to work with the Air Force to come to a resolution on issues, recommendations, and protectiveness determinations before the statutory deadline.

If you have any questions, feel free to contact the Remedial Project Manager, Jaclyn Satira, at saitra.jaclyn@epa.gov or 206-553-1426.

Sincerely,
CALVIN TERADA

Digitally signed by CALVIN TERADA
Date: 2023.09.19 07:36:53 -07'00'

Calvin J. Terada
Director

cc: Megan M. Riccobono
Remedial Project Manager, Fairchild AFB

Jason Cook
Remedial Project Manager, WA Department of Ecology

Kira Lynch
Remedial Program Manager US EPA Region 10