

BRAC Program Management Office East
Philadelphia, Pennsylvania

Final
Third Five-Year Review Report

Former Naval Air Station Joint Reserve Base Willow Grove
Horsham Township, Pennsylvania

September 2023

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**FINAL
THIRD FIVE-YEAR REVIEW REPORT
FORMER NAVAL AIR STATION JOINT RESERVE BASE WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Department of the Navy
BRAC Program Management Office East
4911 South Broad Street
Philadelphia, Pennsylvania 19112-1303**

SEPTEMBER 2023



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AUTHORIZING SIGNATURE

By my signature below, I approve the issuance of this Third Five-Year Review Report for Former NASJRB Willow Grove, Horsham Township, Pennsylvania.

HARRIS.JONATHA
N.IAN.1598285906

Digitally signed by
HARRIS.JONATHAN.IAN.15982859
06
Date: 2023.09.20 13:21:17 -04'00'

JONATHAN HARRIS
BRAC ENVIRONMENTAL COORDINATOR
BRAC PMO EAST

DATE

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Acronyms and Abbreviations

ANG	Air National Guard
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of concern
DCA	Dichloroethane
DCE	Dichloroethene
DDD	Dichlorodiphenyldichloroethane
DDT	Dichloro-diphenyl-trichloroethane
EA	EA Engineering, Science, and Technology, Inc.
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
FYR	Five-Year Review
HHRA	Human health risk assessment
HLRA	Horsham Land Redevelopment Authority
IRP	Installation Restoration Program
LTM	Long-term monitoring
LUC	Land use control
MCL	Maximum contaminant level
mg/kg	Milligram per kilogram
MNA	Monitored natural attenuation
MSC	Medium Specific Concentration
NASJRB	Naval Air Station Joint Reserve Base
NAVFAC	Naval Facilities Engineering Systems Command

NAVSEA	Naval Sea Systems Command
NFA	No further action
O&M	Operations and maintenance
OM&M	Operations, maintenance, and monitoring
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PEC	Probable effects concentration
PFAS	Per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
PHA	Provisional health advisory
PRG	Preliminary remediation goal
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAO	Remedial action objective
RD	Remedial design
RG	Remediation goal
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
TCA	Trichloroethane

TCDD	Tetrachlorodibenzo-dioxin
TCE	Trichloroethene
TCRA	Time-Critical Removal Action
UU/UE	Unlimited use and unrestricted exposure
VOC	Volatile organic compound

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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 FYR Reports such as this one. In addition, FYR Reports identify issues found during the review that impact the protectiveness of remedies, if any, and document recommendations to address them.

The Navy is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121 and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 Code of Federal Regulations Section 300.430(f)(4)(ii), and considering United States Environmental Protection Agency (EPA) policy.

This is the third FYR for the former Naval Air Station Joint Reserve Base (NASJRB) Willow Grove Superfund Site. The initial triggering event for FYRs at NASJRB Willow Grove was the date of EPA's signature on the Interim Record of Decision (ROD) for Operable Unit (OU) 3 – Site 1 Groundwater. The triggering action for this third statutory review was September 20, 2018, the signature date of the Second FYR Report. FYRs are conducted because hazardous substances, pollutants, or contaminants remain at the facility in excess of levels that allow for unlimited use and unrestricted exposure (UU/UE).

Former NASJRB Willow Grove consists of 12 OUs, and three of these OUs (OUs 2, 6, and 11) are addressed in this FYR (see Figures 1-1 and 1-2). OU 2 includes groundwater at Site 5 – Fire Training Area; OU 6 includes soil at Site 3 – Ninth Street Landfill; and OU 11 includes soil at Site 12 – South Landfill. Table 1-1 provides a list of NASJRB Willow Grove sites and their status in the Navy's Installation Restoration Program (IRP). OU 3, Site 1 soil and groundwater, was transferred to the Air National Guard (ANG) and will be evaluated by the ANG in a separate FYR Report.

Facility Background

The former NASJRB Willow Grove FYR was led by Naval Facilities Engineering Systems Command (NAVFAC). Other participants included EPA and Pennsylvania Department of Environmental Protection (PADEP). The review began on November 2, 2022, and only data available prior to this date were assessed as part of the FYR.

Table 1-1: Former NASJRB Willow Grove IRP Sites

Site No.	OU	Site Name	Status	Included in FYR? (Y/N)
1	1	Privet Road – Soil	NFA ROD/ANG	N
	3	Privet Road – Groundwater	Interim ROD/ANG	N
2	5	Antenna Field Landfill – Soil	No Action ROD	N
	9	Antenna Field Landfill – Groundwater	No Action ROD	N
3	6	Ninth Street Landfill – Soil	ROD	Y
	10	Ninth Street Landfill – Groundwater	No Action ROD	N
4	-	North End Landfill	Consensus Agreement for No Action	N
5	2	Fire Training Area – Groundwater	ROD	Y
	4	Fire Training Area – Soil	NFA ROD	N
6	-	Abandoned Rifle Range 1	Consensus Agreement for No Action	N
7	-	Abandoned Rifle Range 2	Consensus Agreement for No Action	N
8	-	Building 118 Abandoned Fuel Tank	NFA Agreement	N
9	-	Steam Plant Building 6 Tank Overfill	NFA Agreement/ANG	N
10	-	Navy Fuel Farm	NFA/ANG	N
11	-	Aircraft Parking Apron	NFA/ANG	N
12	11	South Landfill	ROD (soil only)	Y
Basewide	12	Basewide groundwater investigation for PFAS	RI	N

ANG Transferred to Air National Guard.
NFA No further action determination approved.
RI Remedial Investigation in progress.
ROD Record of Decision signed.
PFAS Per- and polyfluoroalkyl substances.

Former NASJRB Willow Grove (formerly Willow Grove Naval Air and Air Reserve Station) is located in Horsham Township, Pennsylvania, approximately 20 miles north of Philadelphia (see Figure 1-1). NASJRB Willow Grove occupies approximately 900 of 1,100 acres maintained by the United States Department of Defense at the property. Biddle ANG Base (formerly United States Air Force Air Reserve Station) occupies approximately 200 acres of adjacent land to the northeast. Former NASJRB Willow Grove is generally bounded by State Route 611 to the east, State Route 463 to the southwest, and Keith Valley Road to the north.

The primary mission of the former NASJRB Willow Grove was to provide support for operations involving aviation training activities and to train Navy reservists. In 2005, NASJRB Willow Grove was designated for closure under the authority of the Defense

Base Realignment and Closure (BRAC) Act of 1990 and was officially disestablished on March 30, 2011. The facility was transferred to Navy BRAC Project Management Office Northeast and entered caretaker status in September 2011. Decisions regarding the future use of land at the former base are coordinated by the Horsham Land Redevelopment Authority (HLRA). On March 21, 2012, HLRA officially approved the NASJRB Willow Grove Redevelopment Plan (RKG, 2012a) and Homeless Assistance Submission (RKG, 2012b), which identify the most appropriate uses for the redevelopment of the property declared surplus by the Navy in 2010.

Land use in the area surrounding the former NASJRB Willow Grove is mixed. The surrounding area is predominantly residential, with a mix of commercial and light industrial use concentrated along Pennsylvania Route 611 (Easton Road) to the east and State Route 463 (Horsham Road) to the west.

Per- and Polyfluoroalkyl Substances

Per- and polyfluoroalkyl substances (PFAS), a class of “emerging contaminants,” were detected in groundwater at and near the former NASJRB Willow Grove installation. The Navy is addressing PFAS under OU 12. A base-wide groundwater Remedial Investigation (RI) for OU 12 is ongoing, and OU 12 will be included in subsequent FYR Reports after the ROD for this OU is signed. The RI includes evaluation of PFAS in soil, groundwater, surface, water, and sediment and completion of human health and ecological risk assessments.

In 2014, PFAS, including perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), were detected at concentrations greater than the EPA health advisory (PHA) levels (in effect at that time) in groundwater on and around the base. In June 2014, the Navy conducted a Time-Critical Removal Action (TCRA) to provide alternate water supplies to affected residents, to provide treatment at Horsham Water and Sewer Authority supply wells with PFOA or PFOS concentrations at or greater than the PHA levels, and to extend public water to locations with private wells with PFOA or PFOS concentrations at or greater than the PHA levels. An Action Memorandum describing the TCRA was completed in 2015 (NAVFAC, 2015). The Action Memorandum was later amended to incorporate the 2016 health advisory levels as the action levels. The Navy initiated two additional TCRAs in 2017 to provide municipal connections to affected private drinking water wells (NAVFAC, 2017b) and to install and operate filtration systems for the Horsham Water and Sewer Authority supply (NAVFAC, 2017a). On January 14, 2023, PADEP established maximum contaminant levels (MCLs) for PFOA and PFOS (14 and 18 ng/L, respectively) and subsequently the Navy began re-evaluating existing PFAS data from private drinking water wells to determine locations in the established sampling area where concentrations of either PFOA or PFOS exceed

PADEP MCLs but are less than EPA's 2016 health advisory levels used in previous evaluations. It is anticipated that the Navy will provide alternative drinking water for residents at these locations.

A Preliminary Assessment to identify potential PFAS sources was completed in 2016 and documented in the *Evaluation of Potential Sources of Perfluorinated Compounds* (NAVFAC, 2016). Based on the results of the Preliminary Assessment and previous PFAS sampling at the facility, Phase I of a multi-phase basewide RI for PFAS in groundwater, surface water, sediment, and soil was performed between 2014 and 2018, as documented in the *Remedial Investigation Report, Per and Polyfluoroalkyl Substances Investigation Activities* (Resolution, 2019). The Phase I RI characterized site conditions and evaluated the nature and extent of the contamination and associated risks posed to human and/or environmental receptors. A Phase II RI was initiated in 2019 to fill identified data gaps and to provide the information needed to evaluate and select appropriate remedial alternatives. On-base Phase II RI activities include soil, soil pore water, surface water, sediment, and groundwater sampling; water level gauging; monitoring well installation; borehole geophysical logging; and packer testing. In addition, Phase II will include surface water and sediment toxicity testing and development of site-specific soil and plant bioaccumulation factors to support ecological and human health risk assessments.

Additionally, the Navy has been evaluating potential additional CERCLA removal actions to mitigate PFAS impacts to drinking water sources. Under the OU 12 RI, a groundwater extraction and treatment pilot test near former aircraft maintenance Hangar 680 has been operating since 2020 and a groundwater extraction and treatment pilot test near OU 2, Site 5 began operation in January 2022. Both pilot tests are being conducted at locations where maximum PFOA and PFOS concentrations were detected during the Phase I RI to evaluate the effectiveness of PFAS treatment technologies.

Detailed information about previous and planned on-base and off-base PFAS-related activities is provided in the *Draft Site Management Plan, Fiscal Year 2022*, and documents referenced therein (NAVFAC, 2022).

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Former Naval Air Station Joint Reserve Base Willow Grove		
EPA ID: PAD987277837		
Region: 3	State: PA	City/County: Horsham Township/Montgomery County
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: U.S. Department of the Navy		
Author name (Federal or State Project Manager): Jonathan Harris, U.S. Navy, BRAC Program Management Office East		
Author affiliation: U.S. Navy, Naval Facilities Engineering Systems Command, BRAC Program Management Office East		
Review period: November 2022 to January 2023		
Date of site inspection: September 28, 2022		
Type of review: Statutory		
Review number: 3		
Triggering action date: 9/20/2018		
Due date (five years after triggering action date): 9/20/2023		

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
None				
Issues/Recommendations Identified in the Five-Year Review:				
OU 6, Site 3	Issue Category: Institutional Controls			
	Issue: Land use controls (LUCs) have not yet been implemented as required by the ROD.			
	Recommendation: Finalize the LUC Remedial Design (RD).			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023
OU 6, Site 3	Issue Category: Monitoring			
	Issue: The Long-Term Monitoring (LTM) Plan, as required by the ROD, has not yet been completed.			
	Recommendation: Finalize the LTM Plan.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023
OU 2, Site 5	Issue Category: Monitoring			
	Issue: The downgradient natural attenuation monitoring portion of the remedy has not yet been implemented.			
	Recommendation: Finalize the LTM Sampling and Analysis Plan (SAP) to document monitored natural attenuation (MNA) requirements.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	12/29/2023

OU 2, Site 5	Issue Category: Other			
	Issue: Evaluation of locations with potential exposures to PFAS in drinking water at concentrations exceeding PADEP MCLs has been completed, but alternative drinking water sources have not yet been provided at all affected locations.			
	Recommendation: It is anticipated that the Navy will provide alternative drinking water as part of a removal action. In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan at Section 300.415(j), 40 C.F.R. § 300.415(j), the Navy shall attain applicable or relevant and appropriate requirements to the extent practicable considering the exigencies of the situation during a removal action, including potentially the PADEP MCLs at 25 Pa. Code § 109.202.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	9/30/2024
OU 11, Site 12	Issue Category: Institutional Controls			
	Issue: LUCs have not yet been implemented as required by the ROD.			
	Recommendation: Finalize the LUC RD.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023
OU 11, Site 12	Issue Category: Monitoring			
	Issue: The LTM Plan, as required by the ROD, has not yet been completed.			
	Recommendation: Finalize the LTM Plan.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023
Protectiveness Statements				
Operable Unit: OU 6		Protectiveness Determination: Short-term Protective		
Protectiveness Statement: The remedy at OU 6, Site 3 is currently protective of human health and the environment because the physical construction of the remedy is complete and no exposure is occurring. However, for the remedy to be protective in the long term, the following actions need to be taken: implementation of LUCs and LTM.				

<i>Operable Unit:</i> OU 2	<i>Protectiveness Determination:</i> Protectiveness Deferred
<p><i>Protectiveness Statement:</i></p> <p>The implemented components of the remedy for VOCs in groundwater at the Fire Training Area (OU 2, Site 5) are functioning as intended. Exposure pathways are being controlled by the implementation of groundwater use restrictions through LUCs, and periodic groundwater monitoring is being conducted in the source area in conjunction with the in situ bioremediation component of the remedy. However, for the remedy to be protective in the long term, the downgradient natural attenuation monitoring component of the remedy must be implemented as required by the ROD.</p> <p>In addition, PFAS have been detected within and downgradient of Site 5 and therefore a protectiveness determination cannot be made at this time (per EPA OSWER Memorandum 9200.2-111) until PFAS drinking water exposures are addressed. It is anticipated that the Navy will provide alternative drinking water as part of a removal action. In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan at Section 300.415(j), 40 C.F.R. § 300.415(j), the Navy shall attain applicable or relevant and appropriate requirements to the extent practicable considering the exigencies of the situation during a removal action, including potentially the PADEP MCLs at 25 Pa. Code § 109.202. The removal action will take approximately 12 months to complete, at which time a protectiveness determination will be made.</p>	
<i>Operable Unit:</i> OU 11	<i>Protectiveness Determination:</i> Short-term Protective
<p><i>Protectiveness Statement:</i></p> <p>The remedy for OU 11, Site 12 currently protective of human health and the environment because the physical construction of the remedy is complete and no exposure is occurring. However, for the remedy to be protective in the long term, the following actions need to be taken: implementation of LUCs and LTM.</p>	

2.0 Site 3, Operable Unit 6

Site 3 – Ninth Street Landfill, comprising OU 6 (soil) and OU 10 (groundwater), is located immediately north of Ninth Street along the western boundary of former NASJRB Willow Grove (Figures 1-2 and 2-1). The landfill was used as an alternate disposal area following phaseout of the Antenna Field Landfill/South Landfill in 1960. The Ninth Street landfill was operational from 1960 until its official closure in 1967. Wastes reportedly disposed of in the landfill include trichloroethene (TCE), paint wastes, asbestos, polychlorinated biphenyl (PCB) fluids, general refuse, metal scrap, sewage sludge, and industrial pretreatment plant sludge. The landfill method consisted of burning the refuse and burying the residue in trenches. After the landfill's closure, a salvage yard was established over a large portion of the landfill to handle empty drums, discarded equipment, and transformers containing PCBs. Investigation at Site 3 was conducted in two areas, the Landfill Area in the west-central portion of the site, and the Hangar Area to the east (see Figure 2-1).

The Ninth Street Landfill is located in an undeveloped area between Ninth Street and Privet Road. The ground surface is well vegetated with a mixture of grass and woody vegetation, and slopes northwestward toward the base perimeter road, a wetland area, and an intermittent stream. Former recreational facilities, including a pavilion and baseball field, are located within or immediately adjacent to the site. Based on the approved land use plan for former NASJRB Willow Grove, the planned future use of the Site 3 area is for open space, a public golf course, and an office park.

2.1 Response Action Summary

2.1.1 Basis for Taking Action

A human health risk assessment (HHRA) for Site 3 was performed as part of the RI to evaluate risks to current and future human receptors potentially exposed to groundwater, surface soil, total (surface and subsurface) soil, surface water, and sediment (Tetra Tech, 2011d). The receptors evaluated included current and future recreational receptors, future residents, future construction workers, and current and future industrial workers. Potential exposure routes included ingestion, dermal contact, and inhalation. Soil risks were evaluated separately for surface soil (0 to 2 feet below ground surface) and total soil (combined surface and subsurface soil) and in the hangar and landfill areas. Groundwater was evaluated on a site-wide basis.

For hangar area total soil (surface and subsurface), unacceptable risks were identified for residential exposures. The primary risk drivers were benzo(a)anthracene,

benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. No unacceptable risks were identified for any other receptors exposed to hangar area total soil or for any receptors for hangar area surface soil.

For landfill area surface soil, unacceptable risks were identified for residential and recreational exposure. The primary risk drivers were total 2,3,7,8-tetrachlorodibenzo-dioxin (TCDD) equivalents, chromium, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene and dieldrin. For total soil in the landfill area, risks were unacceptable for residential and recreational exposures. Primary risk drivers were 2,3,7,8-TCDD equivalents, naphthalene, 4,4'-dichloro-diphenyl-trichloroethane (DDT), 4,4'-dichlorodiphenyldichloroethane (DDD), Aroclor-1248, ethylbenzene, aluminum, antimony, chromium, copper, iron, lead, manganese, dieldrin, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Risks for other receptors exposed to landfill area surface and total soil were acceptable.

No site-related unacceptable risks were estimated for groundwater during the HHRA. Although the estimated risk for residential exposure to groundwater from Site 3 exceeded EPA's target risk range, concentrations of the primary risk driver, arsenic, were determined to be the result of naturally occurring conditions. Tetrachloroethene (PCE) was initially identified as a groundwater chemical of concern (COC) because the concentration at one Site 3 well exceeded the Maximum Contaminant Level (MCL); however, it was later determined that remediation for PCE was not required because there is no discernible plume to treat, as confirmed during subsequent sampling (NAVFAC, 2021a).

No unacceptable risks were identified during the HHRA for any receptor exposed to surface water or sediment at Site 3.

An ecological risk assessment (ERA) was also conducted as part of the Site 3 RI. Results indicated that mercury in soil might pose risks to herbivorous and insectivorous mammals with small home ranges in a few areas and that bioaccumulative chemicals in sediment and surface waters pose minor risks via the food chain. The results of the ERA indicated that any remedy to address human health would also reduce potential ecological risk originating from Site 3 soil contamination and that no further action (NFA) was warranted or recommended for Site 3 to be protective of the environment. However, based on additional data evaluation during the Feasibility Study, it was determined that polycyclic aromatic hydrocarbon (PAH) concentrations in sediment at two locations in an intermittent channel downstream of the retention basin exceed the probable effects concentration (PEC), which is a consensus-based derived screening

level for benthic invertebrates at which toxic effects are expected to occur. Although separate remedial action was not required for sediment, EPA requested that these PEC exceedances be addressed during drainage improvements associated with Site 3 remedial actions.

Because Site 3 was identified in the NASJRB Willow Grove Historical Radiological Assessment as a site where radiologically contaminated materials potentially may exist (NAVSEA, 2013), further evaluation was recommended. Additional activities included a radiological investigation/scoping survey that consisted of soil sampling, gamma walkover surveys, static counts, and gamma exposure rate measurements in radiological survey units identified as potentially impacted. Results indicated no risk associated with radioactivity in undisturbed surface soils (0 to 6 inches below ground surface) at the site; however, subsurface soils were not evaluated for radiological parameters (NAVFAC, 2021a).

2.1.2 Response Actions

The ROD for OU 6 (soil) and OU 10 (groundwater) at Site 3 was signed by the Navy and EPA in 2021 (NAVFAC, 2021a). No action is required for OU 10, Site 3 groundwater; therefore, OU 10 was not evaluated as part of the FYR. Remedial action objectives (RAOs) were established for soil in the landfill area, soil in the hangar area, and sediment at Site 3.

The RAOs for soil in the Site 3 Landfill Area are to:

- Prevent contact with surface, and subsurface soil contaminated with COCs at concentrations greater than remediation goals (RGs) and prevent contact with landfill waste materials present within the Landfill Area.
- Prevent degradation of groundwater quality by mitigating potential contaminant migration from buried landfill wastes and contaminated soils into groundwater.

The RAO for soil in the Site 3 Hangar Area is to mitigate potential human health risks associated with contaminated soils in the Hangar Area by excavating contaminated soils and consolidating them under the landfill.

The RAO for Site 3 sediment is to improve the drainage channel of the recreational basin and minimize contact by ecological receptors to concentrations of PAHs in sediment greater than the ecological PEC of 22.8 milligrams per kilogram (mg/kg).

No RAO was developed to address potential unacceptable ecological risk from mercury in soil because, as discussed in the ROD, it was determined that remedial action to address unacceptable human health risks would also reduce this potential risk.

Table 2-1 list the soil COCs and RGs for soil in the landfill and hangar areas. As stated above, there are no groundwater COCs because no remedial action is required for groundwater at Site 3 (OU 10).

Table 2-1: OU 6, Site 3 COCs and Remediation Goals

COC	RG (mg/kg)	Basis
Landfill Area Total Soil		
Total 2,3,7,8-TCDD equivalents	1.7×10^{-5}	Risk-based PRG
Antimony	8.4	Risk-based PRG
Total chromium	37	Risk-based PRG
Chromium VI	4.0	Risk-based PRG
Copper	2,000	Risk-based PRG
Iron	17,000	Risk-based PRG
Lead	400	OSWER screening level ⁽¹⁾
Manganese	642	Background
4,4'-DDD	0.95	Risk-based PRG
4,4'-DDT	11	Risk-based PRG
Total PCBs	1.4	Risk-based PRG
Dieldrin	0.2	Risk-based PRG
Benzo(a)anthracene	6.0	Pennsylvania MSC
Benzo(a)pyrene	0.58	Pennsylvania MSC
Benzo(b)fluoranthene	3.5	Pennsylvania MSC
Benzo(k)fluoranthene	4.0	Pennsylvania MSC
Dibenz(a,h)anthracene	0.69	Risk-based PRG
Indeno(1,2,3-cd)pyrene	3.5	Pennsylvania MSC
Hangar Area Total Soil		
Benzo(a)anthracene	6	Pennsylvania MSC
Benzo(a)pyrene	0.58	Pennsylvania MSC
Benzo(b)fluoranthene	3.5	Pennsylvania MSC
Dibenz(a,h)anthracene	1	Pennsylvania MSC
Indeno(1,2,3-cd)pyrene	3.5	Pennsylvania MSC

- 1 OSWER (Office of Solid Waste and Emergency Response) Directive #9355.4-12, residential screening level (EPA, 1994).
 MSC Medium Specific Concentration for Residential Exposure, Pennsylvania Land Recycling and Environmental Remediation Standards Act.
 PRG Site-specific risk-based preliminary remediation goal developed during the Site 3 Feasibility Study (Tetra Tech, 2019).

The selected remedy for Site 3 soil and sediment (OU 6) includes limited soil and sediment removal, construction of a soil cover over the landfill, consolidation of excavated soil and sediment under the landfill cover, LUCs, LTM. The major components of the remedy are summarized as follows:

- Removal of contaminated soils at the baseball field and hangar area hot spots outside the cover area, placement under the landfill cover, and confirmatory sampling to ensure removal of all soils exceeding RGs.
- Construction of a soil cover over the landfill waste materials to eliminate potential exposure of human and ecological receptors to buried wastes and reduce precipitation infiltration into the landfill.
- Selective sediment removal within the intermittent drainage channel downstream of the retention basin as part of drainage improvements. Sediment with concentrations of PAHs greater than the ecological PEC of 22.8 mg/kg will be excavated and placed within the soil cover area.
- Implementation of LUCs including deed restrictions to prevent damage of or intrusion into the cover system and to prevent disturbance of subsurface soils beneath the survey units established during the radiological investigation. These prohibited activities include construction on, excavation of, or breaching of the soil cap.
- Installation of a fence or other barrier around the perimeter of the landfill to limit vehicular access to the cover area.
- Implementation of LTM to assess contaminant status and site conditions.

2.1.3 Status of Implementation

After the Site 3 ROD was signed in September 2021, a wetlands delineation was performed in October 2021 to locate the boundaries of wetland and/or stream resources in the Site 3 areas to minimize impacts from remedial activities. The Aquatic Resources Report documenting the delineation results was finalized in June 2022 (Tetra Tech, 2022c).

The final Site 3 Remedial Action Work Plan was submitted in February 2022 (Aptim, 2022a), clearing work began in February 2022, and remedial action construction began in March 2022. Construction activities, including soil excavation and consolidation, cover construction, fence installation, and sediment removal, were completed in November 2022. The draft Remedial Action Completion Report (RACR) documenting the

completion of these activities was submitted in May 2023 (Aptim, 2023a) and is expected to be finalized in Fiscal Year 2024.

The Sampling and Analysis Plan (SAP) for LTM at Site 3 is scheduled for completion in Fiscal Year 2023. LTM will consist of annual collection and analysis of groundwater samples to verify that contaminants are not leaching from landfill waste materials and associated soil and migrating to groundwater at concentrations resulting in unacceptable risk. Annual groundwater sampling in accordance with the Site 3 LTM SAP will begin after finalization of the RACR.

LUC implementation actions, including monitoring and enforcement requirements, will be provided in a LUC Remedial Design (RD) prepared by the Navy as the LUC component of the overall RD. The draft LUC RD will be submitted in September 2023 and the final LUC RD for Site 3 is scheduled for submission in November 2023. Figure 2-1 shows the proposed LUC boundary for Site 3. Annual LUC inspections will be conducted to verify that LUCs are properly implemented and that the LUC objectives are being met. LUC objectives, as documented in the internal draft LUC RD for Site 3 are summarized in Table 2-2.

Table 2-2: Summary of OU 6, Site 3 Land Use Controls

Media, engineered controls, and areas that do not support UU/UE based on current conditions	LUCs Needed	LUCs Called for in the Decision Documents	LUC Objective	Title of LUC Instrument Implemented and Date
Soil	Yes	Yes	Prevent damage of or intrusion into the soil cover system	<i>Internal Draft Land Use Control Remedial Design, Operable Unit 6, Site 3 – Ninth Street Landfill</i> May 2022
			Prevent disturbance of subsurface soils beneath the survey units established during the radiological investigation.	

2.1.4 System Operations/Operation & Maintenance

Operations and maintenance (O&M) activities at OU 6, Site 3 will be conducted in accordance with the LUC RD and LTM SAP to support the permanence and performance of the soil cover.

2.2 Progress Since the Last Review

This is the first FYR for Site 3 because the ROD had not been signed when the previous FYR was completed in 2018.

2.3 Five-Year Review Process

2.3.1 Community Notification, Involvement, and Site Interviews

Notice of the beginning of the FYR process was provided to the NASJRB Willow Grove Restoration Advisory Board (RAB) on May 15, 2022, via email. A public notice was also published in *The Intelligencer* on September 21, 2022, announcing the initiation of the FYR process and inviting the public to submit comments (see Appendix B). No public comments were received in response to the public notice. A second public notice will be published announcing the completion of the FYR and the availability of the Third FYR Report at the Horsham Township Library, 435 Babylon Road, Horsham, Pennsylvania, and the NASJRB Willow Grove Administrative Record at:

<https://administrative-records.navfac.navy.mil/?PXMQQUXGO3UY6G47WO>

Interview questionnaires were emailed to key community members, including health officials, town planning personnel, and fire department chief officers. Completed questionnaires are provided in Appendix C.

2.3.2 Data Review

No LTM data have been collected for Site 3.

2.3.3 Site Inspection

The inspection of the site was conducted on September 28, 2022, by Tetra Tech. The OU 6 remedy has not yet been fully implemented; therefore, remedy protectiveness issues cannot yet be evaluated. FYR inspection checklists and photographs are included in Appendix D.

2.4 Technical Assessment

2.4.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

The remedy for OU 6, Site 3 soil, has not been fully implemented but is expected to function as intended upon completion. Although LUC and LTM documentation has not yet been completed, physical construction of the remedy has been completed, and no exposure to remaining contaminated soil is occurring at this time. Expected progress toward meeting the RAOs will be assessed during the next FYR.

To date, contaminated soil with COC concentrations greater than RGs in the baseball field and hangar area hot spots outside the cover area has been excavated and consolidated under the landfill soil cover. Sediment with concentrations of PAHs greater than the ecological PEC of 22.8 mg/kg was also excavated and placed in the soil cover area. A cover consisting of an 18-inch clay layer and 6 inches of topsoil was constructed over the landfill, and a fence was installed surrounding the perimeter of the landfill soil cover. Potential exposures of human and ecological receptors to contaminated soil or landfill waste materials have been eliminated through excavation and cover construction. The landfill cover will reduce precipitation infiltration into the landfill and mitigate potential contaminant migration from buried landfill wastes and contaminated soil to groundwater.

LUCs will be implemented to prevent damage of or intrusion into the soil cover system and to prevent disturbance of subsurface soils beneath the survey units established during the radiological investigation. In accordance with the LUC RD for Site 3, annual visual inspections will be conducted to verify that the required controls have been implemented and are being properly maintained.

2.4.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

There have been no changes in physical conditions, exposure pathways, or land use that would affect the protectiveness of the OU 6, Site 3 remedy when implemented. The exposure assumptions, cleanup levels, toxicity data, and RAOs for the site used at the time of remedy selection are still valid.

2.4.3 Question C: Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No additional information has come to light that could call into question the protectiveness of the remedy. There are no newly identified human health or ecological risks, and there have been no impacts from weather-related events or natural disasters.

2.5 Issues and Recommendations

OU 6, Site 3	Issue Category: Institutional Controls			
	Issue: LUCs have not yet been implemented as required by the ROD.			
	Recommendation: Finalize the LUC RD.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023
OU 6, Site 3	Issue Category: Monitoring			
	Issue: The LTM Plan, as required by the ROD, has not yet been completed.			
	Recommendation: Finalize the LTM Plan.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023

2.6 Protectiveness Statement

OU	Protectiveness Determination	Protectiveness Statement
6	Short-term Protective	The remedy at OU 6, Site 3 is currently protective of human health and the environment because the physical construction of the remedy is complete and no exposure is occurring. However, for the remedy to be protective in the long term, the following actions need to be taken: implementation of LUCs and LTM.

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3.0 Site 5, Operable Unit 2

Site 5, the Fire Training Area is located in the south-central portion of NASJRB Willow Grove, approximately midway between Runway Juliet and State Route 463 (see Figures 1-2 and 3-1). The site is located immediately south of Taxiway Juliet and covers an irregularly shaped area of approximately 1.25 acres. The training area was used from 1942 to 1975 for large-scale fire training exercises, which included the disposal and burning of flammable liquid wastes generated by the Naval Air Station. Wastes, including solvents, paint chemicals, xylenes, toluene, and various petroleum compounds, were consumed at the rate of up to 4,000 or more gallons per year in these fire training exercises. The area was also reportedly used to store drums of these flammable materials during the periods between burning exercises.

Site 5 is primarily covered by grasses, with some woody and brushy vegetation present in the southern portion of the area. The burn area consisted of a "burning ring" section of a partially buried steel tank, open at the top with an intact bottom below the surrounding grade, located in the south-central portion of the site (Tetra Tech, 2002). Based on the approved land reuse plan for former NASJRB Willow Grove, the area including and surrounding Site 5 is proposed for future use as open space, a portion of a golf course, and office space.

3.1 Response Action Summary

3.1.1 Basis for Taking Action

A baseline HHRA and a screening-level ecological risk assessment for site groundwater were conducted as part of the Phase II RI (Tetra Tech, 2002). An update of the HHRA was conducted in 2007 to evaluate changes in risk assessment methodology, particularly regarding exposure assessment calculations and significant changes to toxicity criteria for multiple compounds (Tetra Tech, 2007a).

Potential exposure routes for groundwater include ingestion, dermal contact, and inhalation. Potential receptors evaluated by the initial HHRA included future excavation workers (for inhalation exposure only) and future residents. In the updated HHRA, only risk estimates for future residents were recalculated because only residential risks were unacceptable in the initial HHRA.

For Site 5 groundwater, unacceptable risks were identified for future residents due to exposure to volatile organic compounds (VOCs) (primarily PCE) via ingestion, dermal contact, and inhalation.

Vapor intrusion risks for OU 2, Site 5, were determined to be acceptable based on the Johnson and Ettinger model that was applicable when the risk assessment was performed for evaluating vapor intrusion exposure. However, EPA guidance for evaluating risks from vapor intrusion has since been updated, thereby creating uncertainty about potential vapor intrusion risks. As discussed below, it was determined that this uncertainty would be addressed by implementing vapor intrusion-related LUCs at Site 5. Currently, there are no occupied buildings within the Site 5 LUC boundary.

An ecological risk screening was performed as part of the Site 5 RI to characterize potential risks from site-related contaminants to potential ecological receptors that inhabit the site (Tetra Tech, 2002). For Site 5 groundwater, the assessment concluded that there are no complete exposure pathways to ecological receptors because the Site 5 groundwater VOC plume does not discharge to the surface anywhere in the vicinity of the site, nor does it interact with any surface water bodies.

3.1.2 Response Actions

Pre-ROD Actions

Soil

Based on the *Action Memorandum for Site 5 – Fire Training Area Soil Removal* (Tetra Tech, 2005), a soil removal action was conducted at Site 5 in 2005 and 2006 to address PAH hot spots in an area of the site where additional perimeter security fencing was being installed. The *Site 5 RI Addendum 6 for Soil* included post-excavation residual risk calculations approved by EPA and the final closeout (construction completion) report (Tetra Tech, 2007b). Post-excavation risks for soil at Site 5 were acceptable for all receptors evaluated. The OU 4 ROD signed by the Navy and EPA in 2007 documented the NFA decision for Site 5 soil (OU 4) (NAVFAC, 2007). Because no further remedial action is required for OU 4, only OU 2, Site 5 groundwater, was evaluated as part of this FYR.

Groundwater

A groundwater bioremediation pilot study at Site 5 began in 2009 in accordance with the *Pilot Study SAP for Site 5 Groundwater (OU 2)* (Tetra Tech, 2008c) to evaluate the effectiveness of several different electron donors in remediating the groundwater of Site 5. Biostimulation injection and groundwater recirculation events, including those that were conducted in 2009 and 2010, included groundwater extraction, the addition of chemical amendments, and the reinjection of groundwater. Evaluation of most post-injection monitoring parameters indicated that remediation had been successful: VOCs

had degraded, secondary products were generated, and oxidation-reduction potential and dissolved oxygen readings were favorable. However, after the first biostimulation event in 2010, the bacterial population was found insufficient for degrading vinyl chloride. Later in 2010, two more bioaugmentation events were conducted during which appropriate biological stocks, including bacteria capable of degrading vinyl chloride, were injected into the aquifer. The *Pilot Test Report for Site 5 Groundwater (OU 2)* documented that bioremediation was an effective strategy for destroying Site 5 groundwater COCs through anaerobic reductive dechlorination and that the Site 5 groundwater recirculation system was very effective at distributing biostimulation amendments throughout the remediation cell (Tetra Tech, 2011b). To maintain conditions favorable for anaerobic degradation of chlorinated VOCs for an extended period, a fourth biostimulation event was completed in 2011 using LactOil instead of the original substrate of sodium lactate. The objective of the switch to a slow-release substrate was to create favorable long-term conditions without requiring frequent amendment injection and recirculation. The pilot test was considered successful because there were significant reductions in VOC concentrations in source area groundwater.

Site 5 ROD

The ROD for OU 2, Site 5 groundwater was signed in 2012 (NAVFAC, 2012). The RAOs for OU 2, as documented in the ROD, are as follows:

- Prevent potential human exposures to contaminated groundwater
- Restore concentrations of COCs in groundwater to MCLs
- Prevent further degradation of groundwater

COCs and RGs for OU 2 are summarized in Table 3-1.

Table 3-1: OU 2, Site 5 Groundwater COCs and Remediation Goals

COC	RG (µg/L)	Basis
1,1,1-Trichloroethane (TCA)	200	MCL
1,1,2-TCA	5	MCL
1,1-Dichloroethane (DCA)	31	MSC
1,1-Dichloroethene (DCE)	7	MCL
1,2-DCA	5	MCL
cis-1,2-DCE	70	MCL
1,4-Dioxane	6.4	MSC
Benzene	5	MCL
PCE	5	MCL
TCE	5	MCL
Vinyl chloride	2	MCL

MCL – Federal Maximum Contaminant Level.

MSC – Pennsylvania Medium Specific Concentration for Groundwater, Residential Used Aquifers.

The Selected Remedy for OU 2 is source area in-situ anaerobic bioremediation combined with MNA for remediation of VOC-contaminated groundwater, MNA for the diffuse portion of the plume, and LTM and LUCs to prevent human contact with groundwater until COC concentrations decrease to levels that allow for UU/UE. The major components of the selected remedy for OU 2, Site 5 groundwater are summarized as follows:

- In-situ anaerobic bioremediation of contaminated groundwater (expansion and continuation of the pilot test) within the source area until VOC concentrations meet established cleanup levels.
- MNA of the groundwater plume downgradient of the source area.
- Long-term groundwater monitoring until the plume has attenuated to concentrations that meet established cleanup levels.
- Implementation of LUCs to prohibit the use of untreated OU 2 groundwater and to mitigate the potential for vapor intrusion from the subsurface into future structures until contaminants in groundwater are at levels that allow for UU/UE. The use of treated water must be approved by the Navy, EPA, and PADEP.

3.1.3 Status of Implementation

A RACR, completed in September 2014, documents the remedial actions completed for Site 5 Groundwater (Tetra Tech, 2014b). The Operating Properly and Successfully Evaluation Report, demonstrating that the OU 2, Site 5 remedy was operating properly and successfully, was finalized in May 2015 (Tetra Tech, 2015a). The OM&M Plan was also finalized in May 2015 (Tetra Tech, 2015b).

In-Situ Bioremediation

The remedy selected for Site 5 groundwater (OU 2) was initiated in July 2013. Implementation of the in-situ bioremediation component of the OU 2 remedy consisted largely of continuing operation of the successful pilot test treatment system, with additional injection and monitoring wells installed after the ROD to optimize system operations. The in-situ bioremediation system consists of a groundwater recirculation and treatment system and a shallow injection well system.

Periodic biostimulation events consisting of the injection of an organic substrate are performed to maintain the geochemical conditions necessary for efficient bioremediation of site COCs. The in-situ anaerobic bioremediation portion of the remedy ensures that a large portion of the site's most highly impacted groundwater is targeted and adequately addressed. The VOCs in Site 5 source area groundwater are being reduced over time via bioremediation, while at the same time, the co-located halogenated

compounds (chlorinated VOCs) are being remediated via dechlorination. The in-situ anaerobic bioremediation of groundwater at Site 5 is not designed to treat the entire plume but is targeted to destroy VOCs in the source area; therefore, concentrations in the overall plume are expected to decrease over time via natural process and as a result of reducing or eliminating the concentrations in the source area.

Long-Term Monitoring and Natural Attenuation

The overall objectives of the groundwater monitoring program are to:

- Evaluate and maintain the proper geochemical conditions within the source area.
- Assess the effectiveness and rate of bioremediation in the source area.
- Evaluate the effectiveness and rate of attenuation of VOCs in the source area and the immediate downgradient segment of the plume.
- Confirm that remediation is complete when VOC COC concentrations (including 1,4-dioxane) throughout the entire extent of the plume are reduced to levels equal to or less than RGs.

Groundwater conditions in the source area are currently being monitored to evaluate whether VOC concentrations are being adequately reduced through in-situ bioremediation and/or natural processes. To achieve this objective, the LTM program is designed to determine trends in contaminant concentrations over time and to verify contaminant reduction in the source area. The segment of the groundwater plume located downgradient of the source area will not immediately be impacted by bioremediation. This segment of the plume will attenuate under natural physical, chemical, and biological processes as the targeted source area of the plume is removed through bioremediation. After the source area has been remediated, concentrations of COCs in the downgradient portion of the dissolved-phase plume will be monitored separately to establish that contaminant concentrations naturally attenuate and eventually reach RGs in that area. After source area treatment has been completed, the Project Team (Navy, EPA, PADEP) will develop a plan to implement the MNA portion of the remedy for the entire plume and downgradient wells (Tetra Tech, 2016).

The current Site 5 LTM program includes annual performance monitoring and quarterly process (post-injection) monitoring after biostimulation events in accordance with the final OM&M Plan (Tetra Tech, 2015b) and LTM SAP (Tetra Tech, 2016). The monitoring program includes 20 monitoring wells, and the COCs and bioremediation indicator parameters analyzed at individual wells vary. Post-injection monitoring (also called process monitoring) is used primarily to determine the schedule for future

biostimulation and/or bioaugmentation events and to evaluate the need to modify amendment dosage, injection volumes/durations, recirculation rates, and other operational parameters. Post-injection monitoring events occur approximately quarterly after each biostimulation event. They include the collection of samples from each well in the injection area to verify that groundwater conditions necessary for efficient bioremediation are maintained. The schedule and monitoring parameters for these events are adjusted based on previous post-injection monitoring event results. In general, monitoring equipment and field test kits are used to analyze post-injection monitoring samples for the field parameters temperature, pH, turbidity, specific conductivity, oxidation-reduction potential, and dissolved oxygen. Performance monitoring is used primarily to evaluate changes in VOC and degradation/transformation concentrations and to determine if performance standards have been achieved. Annual performance monitoring includes fixed-base analysis for VOCs including 1,4 dioxane, dissolved gases, metabolic fatty acids, total organic carbon, and quantitative polymerase chain reaction and genes. Field test kits are also used to analyze annual samples for alkalinity, ferrous iron, and hydrogen sulfide. Performance monitoring began in 2016 and has continued annually since that time. The most recent event evaluated as part of this FYR was conducted in May 2022.

Land Use Controls

LUCs were implemented for OU 2 in accordance with the 2013 LUC RD (Tetra Tech, 2013a) to prevent use of untreated groundwater and to prevent unapproved use of treated groundwater and to prevent unacceptable human exposure to volatile vapors potentially migrating from contaminated groundwater to the indoor air of current and future structures at the site. The Site 5 groundwater LUC boundary is shown on Figure 3-1. Annual physical inspections are conducted to confirm the continued implementation of LUCs and compliance with LUC performance objectives described in the LUC RD. Table 3-2 lists the OU 2 LUC performance objectives.

The requirement for LUCs associated with vapor intrusion was based on uncertainty in risk estimates for vapor intrusion (see Section 3.1.1). These LUCs require that future buildings are constructed to mitigate the potential for vapor intrusion of VOCs from the subsurface into the buildings and require existing buildings to be equipped with a system to mitigate the potential intrusion of VOCs from the subsurface into the structure or be subject to a vapor intrusion investigation that documents that an unacceptable risk to future occupants is not present at that structure.

Table 3-2: Summary of OU 2, Site 5 Land Use Controls

Media, engineered controls, and areas that do not support UU/UE based on current conditions	LUCs Needed	LUCs Called for in the Decision Documents	LUC Objective	Title of LUC Instrument Implemented and Date
Groundwater	Yes	Yes	Prohibit the use of untreated groundwater and mitigate the potential for vapor intrusion from the subsurface into future structures until contaminants in groundwater are at levels that allow for UU/UE. Require that existing buildings install a system to mitigate the potential intrusion of VOCs from the subsurface into the structure or be subject to a vapor intrusion investigation that documents that an unacceptable risk to future occupants is not present at that structure. The Navy, EPA, and PADEP must approve the use of treated groundwater.	<i>Land Use Control Remedial Design for Site 5 – Former Fire Training Area</i> May 2013

3.1.4 System Operations/Operation & Maintenance

O&M activities for the in-situ bioremediation system at OU 2, Site 5, are conducted in accordance with the OM&M Plan (Tetra Tech, 2015b), and routine and non-routine O&M activities completed during each year of operation are summarized in Annual Remedial Action Operations and LTM Reports. In 2021 and 2022, additional system evaluations were conducted to address injection well fouling and associated “daylighting” of injected materials and to make minor repairs to the system. Summaries of these evaluations and repairs are provided in the Year 7 Remedial Action Operations and LTM Report (Tetra Tech, 2022f). In March 2022, the in-situ bioremediation system was comprehensively inspected, including mechanical components, extraction/injection well setup, and recirculation well configuration. One of the reasons for this inspection was to determine whether injected biochemical reagents could bypass wells with maximum chlorinated VOC concentrations (05MW21 and 05MW22). Based on the inspection results, several modifications were made to the system in April 2022 to address the identified issues. A detailed summary of these investigations and implemented and recommended follow-up system modifications are provided in the Year 7 Annual Report and the draft *Technical Memorandum – Modifications Implemented and Recommended Changes for Continued Operation of the In-Situ Anaerobic Bioremediation System* (Tetra Tech, 2022e). These documents also detail the recommendation to discontinue the use of LactOil as the electron donor and to

begin using WilClear, a more soluble electron donor substrate with a similar ability to create a reducing environment for biodegradation. The recommended change is expected to result in less clogging and fouling that has been observed in the injection wells (based on the complete solubility of WilClear in water) and within the process piping and instrumentation, which would allow injections to progress uninterrupted and reduce downtime, and is expected to more efficiently reduce the overall cleanup time of the site-related VOCs.

3.2 Progress Since the Last Review

When the Second FYR Report was prepared, a basewide RI of PFOA and PFOS in groundwater was ongoing. The final September 2018 FYR Report recommended completion of the RI of PFOA and PFOS and select additional PFAS. The RI results were to be used to update the Site 5 risk assessment and remedy protectiveness based on available EPA tiered toxicity values and the state of the science on ecological risk assessment at the time the RI was completed. Based on this information, the protectiveness determination for OU 2, Site 5 was determined to be Protectiveness Deferred. EPA concurred on September 27, 2018, stating that:

Although the implemented remedy for volatile organic compounds (VOCs) is functioning as intended, a protectiveness determination cannot be made until further information regarding the emerging contaminants PFAS is obtained. The implemented remedy is currently protective of human health and the environment, with respect to the contaminants addressed, mainly VOCs. These emerging contaminants are being addressed through a Remedial Investigation (RI). It is anticipated it will take approximately 24 months to complete the RI, at which time a protectiveness determination for this OU will be made.

Table 3-3 provides the protectiveness determination and statement for OU 2 from the last FYR.

The PFAS RI referenced in the 2018 protectiveness statement for OU 2, Site 5 is ongoing and being conducted under OU 12, Basewide PFAS. Although historical fire training activities at Site 5 may be sources of PFAS, these contaminants are being addressed under OU 12. The OU 12 RI includes evaluation of PFAS in soil, groundwater, surface water, and sediment and completion of human health and ecological risk assessments across the facility. Any additional remedial actions required to address PFAS, as determined via the CERCLA process for OU 12, including any PFAS-related actions within the Site 5 boundary, will be part of a future OU 12 remedy.

OU 12 will be reviewed in future FYR Reports after a ROD is signed for the OU.
Table 3-4 provides a summary of the status of recommendations from the 2018 FYR.

Table 3-3: OU 2, Site 5 Protectiveness Determination/Statement from the 2018 FYR

OU	Protectiveness Determination	Protectiveness Statement
2	Protectiveness Deferred	Although the implemented remedy for VOCs is functioning as intended, a protectiveness determination cannot be made at this time (per USEPA OSWER Memorandum 9200.2-111) until further information regarding the emerging contaminants PFOA and PFOS is obtained. These emerging contaminants are being addressed in a Basewide Remedial Investigation. It is anticipated that these actions will take approximately 18 months to complete, at which time a protectiveness determination of these emerging contaminants will be made. The implemented remedy at Site 5 Fire Training Area Groundwater (OU 2) is currently protective of human health and the environment, with respect to the contaminants addressed, mainly chlorinated VOCs.

Table 3-4: Status of Recommendations from the 2018 FYR

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	Evaluation of emerging contaminants PFOA and PFOS in groundwater (Basewide) is ongoing.	Complete RI of PFOA, PFOS, and select additional PFAS. Use RI results to update risk assessment and remedy protectiveness.	Ongoing	The PFAS RI is ongoing under OU 12, Basewide PFAS. Any remedial actions required to address PFAS, as determined via the CERCLA process for OU 12, including any PFAS-related actions for groundwater within the Site 5 boundary, will be part of a future OU 12 remedy.	NA

3.3 Five-Year Review Process

3.3.1 Community Notification, Involvement, and Site Interviews

Notice of the beginning of the FYR process was provided to the NASJRB Willow Grove RAB on May 15, 2022, via email. A public notice was also published in *The Intelligencer* on September 21, 2022, announcing the initiation of the FYR process and inviting the public to submit comments (see Appendix B). No public comments were received in response to the public notice. A second public notice will be published

announcing the completion of the FYR and the availability of the Third FYR Report at the Horsham Township Library, 435 Babylon Road, Horsham, Pennsylvania, and the NASJRB Willow Grove Administrative Record at:

<https://administrative-records.navfac.navy.mil/?PXMQQUXGO3UY6G47WO>

Interview questionnaires were emailed to key community members, including health officials, town planning personnel, and fire department chief officers. Completed questionnaires are provided in Appendix C.

3.3.2 Data Review

Figure 3-2 shows monitoring and extraction well locations included in the Site 5 LTM program. Annual Remedial Action Operations and LTM Reports provide detailed information about annual bioremediation system O&M activities, performance and post-injection monitoring sampling and analysis and data evaluation, and observations from the annual LUC inspection. The following paragraphs summarize conclusions based on the evaluation of monitoring data collected at Site 5.

Significant reductions in concentrations of parent compounds (1,1,1-TCA, TCE, and PCE) and other VOCs have been observed in Site 5 groundwater since the pilot test and first bioaugmentation and biostimulation events in 2009. Figure 3-2, which presents pre-remedial total VOC contours based on 2008 data and total VOC contours based on 2022 data, illustrates the degree to which bioremediation has decreased the extent of the groundwater plume at Site 5. Increased levels of vinyl chloride, which are indicative of ongoing biodegradation, have been observed in some wells within the source and treatment areas. Vinyl chloride levels are now beginning to plateau or decrease in some wells. The presence of vinyl chloride-degrading bacteria and reductase genes suggests that further reductions in concentrations of this compound will likely occur in the future. Vinyl chloride concentrations in several wells downgradient of the source area have remained stable or increased over the past several sampling events, indicating that the degradation of parent compounds is continuing; however, this could also indicate that the reductive dechlorination process is not fully progressing through the final stage of complete vinyl chloride degradation, potentially due to sub-optimal groundwater total organic carbon concentrations and inefficient contact of the injectate at key locations where higher TCE concentrations appear to be persisting. Concentrations of vinyl chloride and dissolved gases (indicators of vinyl chloride degradation) will be closely monitored to confirm that complete reductive dechlorination is being achieved. Other allied geochemical data and factors such as total organic carbon concentrations and the type and quantity of carbon substrate have been reviewed. As discussed in Section 3.1.4, current modifications in recirculation and

injection patterns and carbon substrate type and quantities have been engineered and recommended. These improvements were initiated in 2023, and an enhancement in overall biodegradation in the groundwater is expected and is currently being evaluated via groundwater sampling data.

Most of the wells included in the Site 5 LTM program show decreasing trends of VOC concentrations. VOC concentrations in many of these wells are less than RGs; however, several of the wells in the center of the source area, particularly wells 05MW21 and 05MW22, have VOC concentrations greater than other wells in the source area and downgradient of the treatment area. TCE concentrations in two key wells in the source area (05MW21 and 05MW22) have either plateaued, fluctuated, or marginally increased (particularly in 2021 and 2022), although concentrations are less than 100 µg/L and still significantly less than maximum detected concentrations. TCE is one of the major parent VOCs in groundwater, and its persistence, plateauing, or slight increase in the source area during recent LTM events was one of the main reasons for additional system evaluations performed in 2021 and 2022 along with subsequent modifications. The modifications in injection operations are expected to increase biodegradation at key locations and reduce TCE concentrations in this area more rapidly in the upcoming years.

Based on post-injection monitoring results, biostimulation events have resulted in maintaining the environment required to support the bacterial population. Data from the 2022 LTM event indicate that there is a suitable presence of the appropriate bacterial populations that could carry out the complete reductive dechlorination process, provided anaerobic conditions are maintained and sufficient carbon substrate is optimally distributed and present in the groundwater. However, low or decreasing concentrations of volatile fatty acids and dissolved gases (methane in particular) in key areas within the treatment and source area wells indicate that increased amounts and frequent injections of carbon substrate may be required to maintain a healthy and robust microbial environment moving forward.

The recommended change from LactOil to WilClear (see Section 3.1.4) and reconfiguration of the recirculation process are expected to alleviate some of the injectability and accumulation issues and lack of response in injection wells observed in more recent years. The resolution to prevent daylighting is to continue monitoring to determine if additional adjustments are needed for the system's operation and to troubleshoot as required. Conditions will continue to be monitored under the LTM program to evaluate whether additional adjustments are required.

As stated in the ROD, the selected remedy was anticipated to take 15 years for RGs to be achieved (NAVFAC, 2012). To date, 7 years of LTM have been completed. The

projected timeframe to attain RGs has been preliminarily estimated based on COC data collected in key source area wells such as 05MW21 over the past few years of remedy implementation. In addition, typical degradation rates encountered in the literature, as well as Tetra Tech's experience with similar contaminants and remediation technologies, were also reviewed and employed. Because TCE is the prime target contaminant at this site, it was used as a guiding parameter for remedial timeframe determination. A second compound, 1,1-DCE (a hydrolytic breakdown product of 1,1,1-TCA), is also present at concentrations exceeding its RG in two source wells but is likely to follow the same reductive pattern as TCE over time with continued treatment. Based on typical literature-based degradation rates and industry protocol documents for TCE and 1,1-DCE at enhanced bioremediation sites, as well as the degradation pattern observed in groundwater at this site, it is tentatively estimated that RGs in groundwater could be attained within a period of approximately 5 to 7 years, following implementing of modifications and enhancements to the remediation system and protocol (see Section 3.1.4). Active remedial timeframes will be further examined following future annual groundwater sampling events, and completion of the recommended enhancements. The results of monitoring and associated degradation rates will be evaluated further in future LTM reports.

Results of the data evaluation indicate that no changes to the sampling strategy or monitoring well network should be made at this time. However, a larger scale sampling event was completed in April 2023 to confirm the current plume morphology, as shown on Figure 3-2, and potential optimization of the monitoring program will be evaluated following collection of these data. Data from the April 2023, event are currently being evaluated and will be used to elucidate the extent and morphology of the current plume and provide a new baseline of data to aid in clarification of the frequency and extent of future sampling and remediation events. The LTM SAP for Site 5 will be updated based on the results of the evaluation of April 2023 data to include parameters and wells to be used to evaluate successful reduction of TCE via MNA. Results will also be used to ensure that the current LUC boundary is protective based on the updated plume conditions.

3.3.3 Site Inspection

The inspection of the site was conducted on September 28, 2022, by Tetra Tech. The purpose of the inspection was to assess the protectiveness of the remedy. No issues impacting the protectiveness of the OU 2, Site 5, remedy were identified during the inspection. FYR inspection checklists and photographs are included in Appendix D.

3.4 Technical Assessment

This section summarizes responses to Questions A, B, and C for Site 5.

3.4.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

The results of the FYR indicate that the implemented components of the OU 2, Site 5, remedy are functioning as intended by the ROD and there are no deficiencies or early indicators of potential remedy failure. In-situ anaerobic bioremediation is being conducted in accordance with the OM&M Plan, and post-injection and performance monitoring are ongoing to evaluate the progress of source area treatment activities. Implementation of the LTM program to monitor natural attenuation in the downgradient plume will begin after source area treatment is completed. LUCs have been implemented in accordance with the OU 2, Site 5 LUC RD to prevent uncontrolled exposure to contaminated groundwater and to prevent unacceptable vapor intrusion risks. The remedial actions that have been completed are being implemented as designed and include measures that prevent exposure. Although recent operational issues with the in-situ bioremediation system have been identified (see Section 3.1.4), solutions have been formulated and have been implemented or are being evaluated for implementation, and LTM data will be used to verify the effectiveness of the solutions. The protectiveness of the remedy is not impacted by these issues because LUCs prevent exposure associated with unacceptable risks. The OU 2, Site 5 remedial actions that have been completed (in-situ bioremediation and implementation of LUCs) are operating as designed and indicate progress toward meeting the RAOs. Evaluation of data from the April 2023 sampling event is being used to prepare an LTM SAP to document MNA requirements to complete the downgradient natural attenuation monitoring component of the remedy.

3.4.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

There have been no changes in physical conditions, exposure pathways, or land use that would affect the protectiveness of the OU 2, Site 5 remedy. The exposure assumptions, cleanup levels, toxicity data, and RAOs for the site used at the time of the remedy selection are still valid. As discussed in Section 3.2, PFAS at OU 2, Site 5 are being investigated and will be addressed as part of OU 12. However, PFAS are present in Site 5 groundwater in excess of levels that are protective for potable water use, and although PFAS contamination in groundwater is being investigated as a separate OU, this affects this FYR for the following reasons: (1) VOC and PFAS contamination are co-

located; (2) more time will be needed to discern sources; (3) groundwater is migrating off site potentially leading to exposures; and (4) the added risk of this emerging contaminant has not been fully evaluated. Additional risks from PFAS in Site 5 groundwater will be evaluated in the OU 12 PFAS RI.

3.4.3 Question C: Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No additional information has come to light that could call into question the protectiveness of the remedy. There are no newly identified human health or ecological risks, and there have been no impacts from human activities, weather-related events, or natural disasters.

As a result of the effects of climate change, storm events have been increasing in magnitude with time. The Navy conducts annual LUC inspections that would identify any storm-related impacts that might impact protectiveness. If any such impacts are identified, the Navy will address the impacts as required to ensure continued protectiveness.

3.5 Issues and Recommendations

OU 2, Site 5	Issue Category: Monitoring			
	Issue: The downgradient natural attenuation monitoring portion of the remedy has not yet been implemented.			
	Recommendation: Finalize the LTM SAP to document MNA requirements.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	12/29/2023
OU 2, Site 5	Issue Category: Other			
	Issue: Evaluation of locations with potential exposures to PFAS in drinking water at concentrations exceeding PADEP MCLs has been completed, but alternative drinking water sources have not yet been provided at all affected locations.			
	Recommendation: It is anticipated that the Navy will provide alternative drinking water as part of a removal action. In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan at Section 300.415(j), 40 C.F.R. § 300.415(j), the Navy shall attain applicable or relevant and appropriate requirements to the extent practicable considering the exigencies of the situation during a removal action, including potentially the PADEP MCLs at 25 Pa. Code § 109.202			

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	9/30/2024

3.6 Protectiveness Statement

OU	Protectiveness Determination	Protectiveness Statement
2	Protectiveness Deferred	<p>The implemented components of the remedy for VOCs in groundwater at the Fire Training Area (OU 2, Site 5) are functioning as intended. Exposure pathways are being controlled by the implementation of groundwater use restrictions through LUCs, and periodic groundwater monitoring is being conducted in the source area in conjunction with the in situ bioremediation component of the remedy. However, for the remedy to be protective in the long term, the downgradient natural attenuation monitoring component of the remedy must be implemented as required by the ROD.</p> <p>In addition, PFAS have been detected within and downgradient of Site 5 and therefore a protectiveness determination cannot be made at this time (per EPA OSWER Memorandum 9200.2-111) until PFAS drinking water exposures are addressed. It is anticipated that the Navy will provide alternative drinking water as part of a removal action. In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan at Section 300.415(j), 40 C.F.R. § 300.415(j), the Navy shall attain applicable or relevant and appropriate requirements (to the extent practicable considering the exigencies of the situation during a removal action, including potentially the PADEP MCLs at 25 Pa. Code § 109.202. The removal action will take approximately 12 months to complete, at which time a protectiveness determination will be made.</p>

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4.0 Site 12, Operable Unit 11

Site 12, the South Landfill, occupies approximately 11 acres of an undeveloped area southwest of Runway Juliet in the southern portion of the base, immediately northeast of Site 2 – Antenna Field Landfill (see Figures 1-2 and 4-1). Site 12 consists of what is believed to be the historical landfill that was previously investigated as Site 2, because Site 2 investigations failed to find significant buried waste. Between 1948 and 1960, the landfill was the principal disposal area for solid waste generated by the facility. Landfill activities consisted of trench excavation with subsequent burning and burial of waste material disposed of within the trenches. Wastes reportedly disposed of in the landfill include general refuse, paint wastes, sewage and industrial pretreatment plant sludges, TCE, and carbon tetrachloride.

Investigations completed at the site have identified approximately nine distinct waste/debris burial trenches comprising a 1.5-acre subset of the total site area. The southwestern boundary of Site 12 is a drainage ditch that separates Site 12 from Site 2. A storm sewer outfall empties into an unnamed stream approximately 100 feet north (upstream) of the confluence of the drainage ditch and stream, which is near the southern corner of Site 12 (see Figure 4-1). The unnamed creek flows off base and enters Pennypack Creek approximately 3,000 feet from the former base boundary. Based on the approved land reuse plan for former NASJRB Willow Grove, planned future land use in the area encompassing and surrounding Site 12 is as a mixed-use pedestrian-oriented “Town Center” that will include retail, office, entertainment, and residential spaces.

4.1 Response Action Summary

The 2021 ROD for OU 11, Site 12 did not include a selected remedy for groundwater, which will be addressed in a separate ROD (NAVFAC, 2021b). Therefore, Site 12 groundwater was not evaluated as part of this FYR.

4.1.1 Basis for Taking Action

An HHRA and screening-level ecological risk assessment were conducted as part of the Phase II RI (Tetra Tech, 2014a). The HHRA for Site 12 was performed to characterize potential risks to human receptors exposed to surface soil, total (surface and subsurface) soil, surface water, and sediment. Receptors evaluated included current and future recreational users, future residents, future construction

workers, and current and future industrial workers. Potential exposure routes included ingestion, dermal contact, and inhalation.

For Site 12 surface soil, unacceptable risks were identified for residential exposure. The primary site-related risk drivers were chromium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. No unacceptable risks were identified for any other receptors exposed to Site 12 surface soil. For Site 12 total soil (combined surface and subsurface soil), unacceptable risks were identified for residential, recreational, industrial, and construction worker exposures. Primary risk drivers included 2,3,7,8-TCDD equivalents, arsenic, chromium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Risks for other receptors evaluated in the HHRA for exposure to Site 12 total soil were acceptable.

For surface water at Site 12, estimated risks exceeded acceptable levels for recreational receptors based predominantly on concentrations of chromium, dieldrin, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene. However, based on further evaluation of surface water data related to factors such as filtered compared to unfiltered concentrations for PAHs (concentrations are likely due to suspended solids and dissolved concentrations) and uncertainty regarding whether concentrations of some chemicals of potential concern are related to the former landfill, no COCs were identified for Site 12 surface water (NAVFAC, 2021b). No unacceptable site-related risks were identified during the HHRA for exposure to sediment at Site 12.

A screening-level ecological risk assessment was conducted as part of the RI for Site 12 to characterize potential risks from site-related contaminants in surface soil, surface water, and sediment to potential ecological receptors, including terrestrial invertebrates, terrestrial plants, aquatic and benthic organisms living in sediment, birds, and mammals that consume terrestrial invertebrates and plants, and birds and mammals that consume aquatic/benthic organisms.

Chemicals in surface soil posing the greatest potential risks to invertebrates and/or plants were copper, zinc, selenium, lead, and PAHs. Copper-related potential risks to soil invertebrates and plants are limited to a small area where concentrations exceeded invertebrate and plant ecological screening values. PAH concentrations were elevated in some surface soil samples and posed potential risks to soil invertebrates at several locations. Food-chain modeling results for soil indicate potential risks to small mammals with small home ranges from mercury and PAH concentrations in a few localized areas of the site. However, because these risks would be limited to a few

individuals, it was determined that no remedial action is required to address the risks. Bioaccumulative chemicals of potential concern in sediment and surface water were determined to pose only minor risks via the food chain.

Chemicals in sediment posing the greatest potential risks to benthic receptors were PAHs. Three sediment samples collected downgradient of Outfall 2 (which discharges to an unnamed stream near the southern corner of the site) had PAH concentrations greater than the PEC of 22.8 mg/kg. It is unclear whether these elevated PAH sediment concentrations are the result of landfill wastes or migration from a source upstream of the landfill via the stormwater outfall. Potential risks to benthic invertebrates from other chemicals of potential concern are minor or uncertain because of sediment concentrations between the threshold effects concentration and the PEC. Based on potential concerns that PAH concentrations in sediment greater than the PEC may be impacting ecological receptors, it was determined that remedial action was required to address benthic invertebrates. Although the PEC is not a conservative screening level, it is deemed appropriate in this instance because the site does not contain high-quality habitat and is likely impacted by general stormwater runoff from paved areas.

Conclusions regarding potential ecological risks for surface water are unclear because of compounding factors such as filtered compared to unfiltered concentrations for organics and uncertainty regarding whether concentrations of some chemicals are related to the former landfill. Concentrations of most surface water chemicals of potential concern were greatest in two samples collected in stagnant water with high turbidity. PAHs were not detected downstream of these samples, suggesting that PAHs in surface water are not significantly migrating off site to downstream locations. Based on these results, it was determined that no remedial action is required for surface water to address ecological risks.

Because Site 12 was identified in the NASJRB Willow Grove Historical Radiological Assessment as a site where radiologically contaminated materials potentially may exist (NAVSEA, 2013), further evaluation was recommended. Additional activities included a radiological investigation/scoping survey that consisted of soil sampling, gamma walkover surveys, and gamma static counts in radiological survey units identified as potentially impacted. Results indicated no risk associated with radioactivity in undisturbed surface soils (0 to 6 inches) at the site; however, subsurface soils were not evaluated for radiological parameters (NAVFAC, 2021b).

4.1.2 Response Actions

Prior to the Site 12 ROD, portions of Site 12 were investigated in 1997 as part of the RI for Site 2 – Antenna Field Landfill, which is adjacent to Site 12 to the southwest. After

completion of Phase II RI fieldwork, EPA requested that the Navy investigate various features identified adjacent to Site 2 by the Environmental and Photographic Interpretation Center. During field reconnaissance in this area, which was between Site 2 and Site 5 and subsequently designated as Site Screening Area 12, the Navy discovered debris and several drums abandoned on the ground surface between Site 2 and Site 5 and subsequently designated the area as Site Screening Area 12. In 2003, these drums and associated debris were removed from the site (NAVFAC, 2021b).

The ROD for OU 11, Site 12 soil was signed by the Navy in September 2021 and by EPA in October 2021. As stated above, groundwater at Site 12 will be addressed in a separate ROD. The RAOs for Site 12 soil, surface water, and sediment, as documented in the ROD, are to:

- Prevent contact with surface soil, and subsurface soil contaminated with COCs at concentrations greater than RGs and prevent contact with landfill waste materials present within the landfill area.
- Reduce the potential erosion of contaminated surface soils and transport of contaminants to surface water.
- Prevent further degradation of groundwater quality by reducing potential contaminant migration from buried landfill wastes and contaminated soils into groundwater.
- Improve site drainage and minimize contact by ecological receptors to concentrations of PAHs in sediment greater than the PEC.

Tables 4-1 and 4-2 list Site 12 COCs and RGs for total soil and surface soil, respectively.

Table 4-1: OU 11, Site 12 Total Soil COCs and Remediation Goals

COC	Remediation Goal (mg/kg)	Rationale For Remediation Goal
Total 2,3,7,8-TCDD equivalents	5×10^{-5}	Risk-based PRG
Arsenic	6.8	Risk-based PRG
Chromium ⁽¹⁾	33.6	Risk-based PRG
Benzo(a)anthracene	0.4	Risk-based PRG
Benzo(a)pyrene	0.394	Background
Benzo(b)fluoranthene	0.4	Risk-based PRG
Benzo(k)fluoranthene	4.0	Risk-based PRG
Dibenz(a,h)anthracene	0.32	Risk-based PRG
Indeno(1,2,3-cd)pyrene	0.4	Risk-based PRG

¹ The chromium RG applies to total chromium levels and assumes that less than 12.2 percent of chromium is the hexavalent species.

Table 4-2: OU 11, Site 12 Surface Soil COCs and Remediation Goals

COC	Remediation Goal (mg/kg)	Rationale For Remediation Goal
Chromium ⁽¹⁾	33.6	Risk-based PRG
Copper	70	Ecological PRG ⁽²⁾
Lead	120	Ecological PRG ⁽²⁾
Selenium	0.52	Ecological PRG ⁽²⁾
Zinc	120	Ecological PRG ⁽²⁾
Anthracene	2.5	Ecological PRG ⁽²⁾
Benzo(a)anthracene	0.4	Risk-based PRG
Benzo(a)pyrene	0.394	Background
Benzo(b)fluoranthene	0.507	Background
Benzo(k)fluoranthene	4.0	Risk-based PRG
Dibenz(a,h)anthracene	0.32	Risk-based PRG
Indeno(1,2,3-cd)pyrene	0.4	Risk-based PRG

- 1 The chromium RG applies to total chromium levels and assumes less than 12.2 percent of chromium is the hexavalent species.
- 2 Ecological PRGs were developed based on EPA ecological soil screening levels. However, these screening levels are not designed to be used as cleanup levels. A post-remediation evaluation was conducted and has confirmed that site-wide 95-percent upper confidence limits of ecological COC mean concentrations are less than their respective RGs. The associated final report is expected to be submitted in September 2023.

The selected remedy for OU 11, Site 12 consists of limited soil and sediment removal with on-site consolidation, soil cover, LUCs, and LTM. The major components of the remedy are summarized as follows:

- Removal of contaminated soils from hot spots located outside of the cover areas and placement under one of two soil cover systems.
- Construction of two soil covers to prevent exposure of human and ecological receptors to contaminated soils and landfill waste materials, prevent erosion and migration of COCs from the surface of Site 12, and reduce infiltration of precipitation into the landfill.
- Removal of sediment with concentrations of PAHs greater than the ecological PEC of 22.8 mg/kg during drainage improvements and transport to the capping area for on-site consolidation.
- Implementation of LUCs to prevent damage of or intrusion into the soil cover system, to mitigate the potential direct exposure to landfill contents (via ingestion, dermal contact, and inhalation), and to prevent disturbance of subsurface soils beneath the survey units established during the radiological investigation.

Prohibited activities include construction on, excavation of, or breaching of the soil covers.

- Installation of security fencing with signage to deter vehicular access into the LUC areas to protect the integrity of the soil cover systems.
- Implementation of long-term periodic monitoring to assess the remedy's effectiveness and potential threats to human health and the environment.

4.1.3 Status of Implementation

After the OU 11, Site 12 ROD was signed, a wetlands delineation was performed in October 2021 to locate the boundaries of wetland and/or stream resources in the areas of Sites 3 and 12 to minimize impacts from the selected remedy. The internal draft Aquatic Resources Report documenting the delineation results was submitted for Navy review in March 2022 and finalized in June 2022 (Tetra Tech, 2022c).

The final Site 12 Remedial Action Work Plan was submitted in February 2022 (Aptim, 2022b), clearing work began in February 2022, and remedial action construction began in March 2022. Construction activities, including soil and sediment excavation, consolidation and cover construction, and fence installation, were completed in November 2022. A draft RACR documenting the completion of these activities was submitted in May 2023 (Aptim, 2023b) and is expected to be finalized in Fiscal Year 2024.

The SAP for LTM at Site 12 is scheduled for completion in Fiscal Year 2024. Periodic LTM will be conducted to assess the effectiveness of remedy and changes in contaminant status and to determine whether additional response actions are warranted. The first LTM event will be scheduled after finalization of the RACR.

LUC implementation actions, including monitoring and enforcement requirements, will be provided in a LUC RD prepared by the Navy as the LUC component of the overall RD. The draft LUC RD was submitted on August 4, 2023, and the final LUC RD for Site 12 is expected to be finalized in Fiscal Year 2024. Figure 4-1 shows the proposed LUC boundaries for Site 12. Annual LUC inspections will be conducted to verify that LUCs are being properly implemented and that the LUC objectives are being met. LUC objectives, as documented in the internal draft LUC RD for Site 12 are summarized in Table 4-3.

4.1.4 System Operations/Operation & Maintenance

O&M activities for OU 11, Site 12 soil will be conducted in accordance with the LUC RD and LTM SAP to support the permanence and performance of the soil covers.

Table 4-3: Summary of OU 11, Site 12 Land Use Controls

Media, engineered controls, and areas that do not support UU/UE based on current conditions	LUCs Needed	LUCs Called for in the Decision Documents	LUC Objective	Title of LUC Instrument Implemented and Date
Soil	Yes	Yes	Prevent damage of or intrusion into the soil cover systems	<i>Internal Draft Land Use Control Remedial Design, Operable Unit 11, Site 12 – South Landfill, June 2022</i>
			Prevent disturbance of subsurface soils beneath the survey units established during the radiological investigation	

4.2 Progress Since the Last Review

This is the first FYR for Site 12 because the ROD had not been signed when the previous FYR was completed in 2018.

4.3 Five-Year Review Process

4.3.1 Community Notification, Involvement, and Site Interviews

Notice of the beginning of the FYR process was provided to the NASJRB Willow Grove RAB on May 15, 2022, via email. A public notice was also published in *The Intelligencer* on September 21, 2022, announcing the initiation of the FYR process and inviting the public to submit comments (see Appendix B). No public comments were received in response to the public notice. A second public notice will be published announcing the completion of the FYR and the availability of the Third FYR Report at the Horsham Township Library, 435 Babylon Road, Horsham, Pennsylvania, and the NASJRB Willow Grove Administrative Record at:

<https://administrative-records.navfac.navy.mil/?PXMQQUXGO3UY6G47WO>

Interview questionnaires were emailed to key community members, including health officials, town planning personnel, and fire department chief officers. Completed questionnaires are provided in Appendix C.

4.3.2 Data Review

No LTM data have been collected for Site 12.

4.3.3 Site Inspection

The inspection of the site was conducted on September 28, 2022, by Tetra Tech. The OU 11 remedy has not yet been fully implemented; therefore, remedy protectiveness issues cannot yet be evaluated. FYR inspection checklists and photographs are included in Appendix D.

4.4 Technical Assessment

This section provides the summary of responses to Questions A, B, and C for Site 12.

4.4.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

The remedy for OU 11, Site 12 soil has not been fully implemented but is expected to function as intended upon completion. Although LUC and LTM documentation has not yet been completed, physical construction of the remedy has been completed, and no exposure to remaining contaminated soil is occurring at this time. Expected progress toward meeting the RAOs will be assessed during the next FYR.

To date, contaminated soil with COC concentrations greater than RGs at the hot spots located outside of the soil cover areas have been excavated and consolidated under the landfill soil covers. Sediment with concentrations of PAHs greater than the ecological PEC of 22.8 mg/kg has been excavated and placed within the cover area. Two landfill covers that consist of an 18-inch clay layer and 6 inches of topsoil have been constructed, and fences were installed surrounding the perimeter of the eastern and western landfill covers. Potential exposures of human and ecological receptors to contaminated soil or landfill waste materials have been eliminated through excavation and cover construction. Landfill covers will reduce precipitation infiltration into the landfill areas and mitigate potential contaminant migration from buried landfill wastes and contaminated soil to groundwater. Potential erosion of contaminated surface soil and transport of contaminants to surface water have been prevented by excavation, soil cover installation, and erosion controls.

LUCs will be implemented to prevent damage of or intrusion into the soil covers and to prevent disturbance of subsurface soils beneath the survey units established during the radiological investigation. In accordance with the LUC RD for Site 12, annual visual inspections will be conducted to verify that the required controls have been implemented and are being properly maintained.

4.4.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives Used at the Time of the Remedy Selection Still Valid?

There have been no changes in physical conditions, exposure pathways, or land use that would affect the protectiveness of the OU 11, Site 12 soil remedy when implemented. The exposure assumptions, cleanup levels, toxicity data, and RAOs for the site used at the time of the remedy selection are still valid.

4.4.3 Question C: Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No additional information has come to light that could call into question the protectiveness of the remedy. There are no newly identified human health or ecological risks, and there have been no impacts from weather-related events or natural disasters.

4.5 Issues and Recommendations

OU 11, Site 12	Issue Category: Institutional Controls			
	Issue: LUCs have not yet been implemented as required by the ROD.			
	Recommendation: Finalize the LUC RD.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023
OU 11, Site 12	Issue Category: Monitoring			
	Issue: The LTM Plan, as required by the ROD, has not yet been completed.			
	Recommendation: Finalize the LTM Plan.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Federal Facility Navy	EPA/State	11/30/2023

4.6 Protectiveness Statement

OU	Protectiveness Determination	Protectiveness Statement
11	Short-term Protective	The remedy at OU 6 is currently protective of human health and the environment because the physical construction of the remedy is complete and no exposure is occurring. However, for the remedy to be protective in the long term, the following actions need to be taken: implementation of LUCs and LTM.

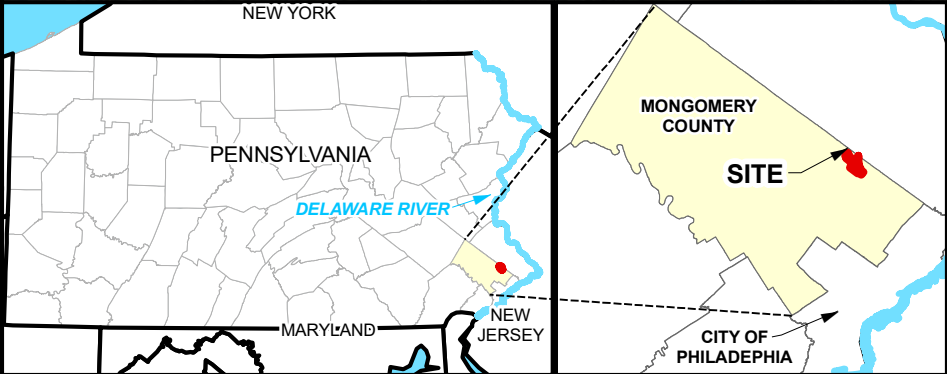
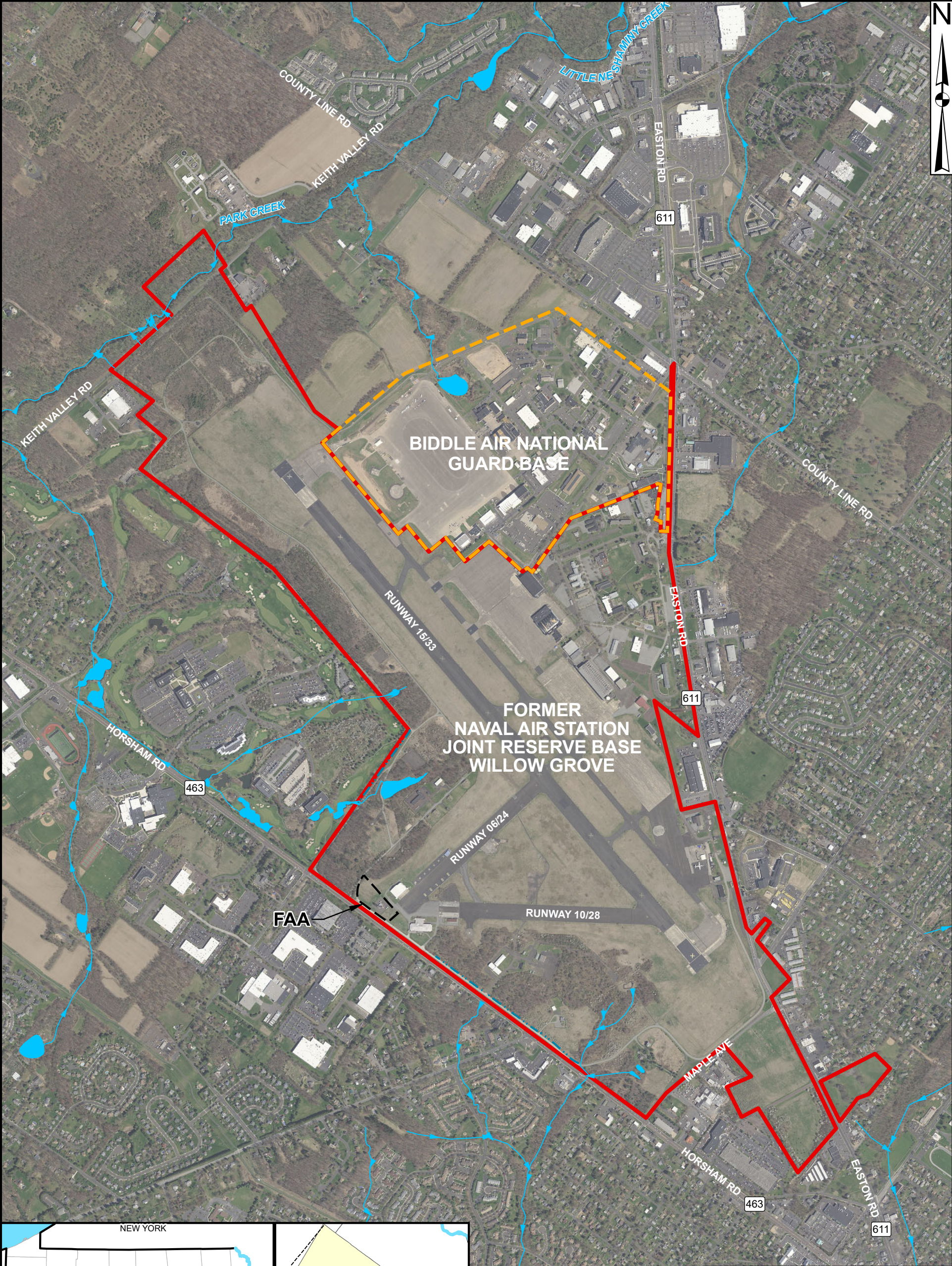
5.0 Next Review

This report represents the third FYR conducted for former NASJRB Willow Grove. The next FYR will be required within 5 years of the signature date of this review, September 2028.

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FIGURES

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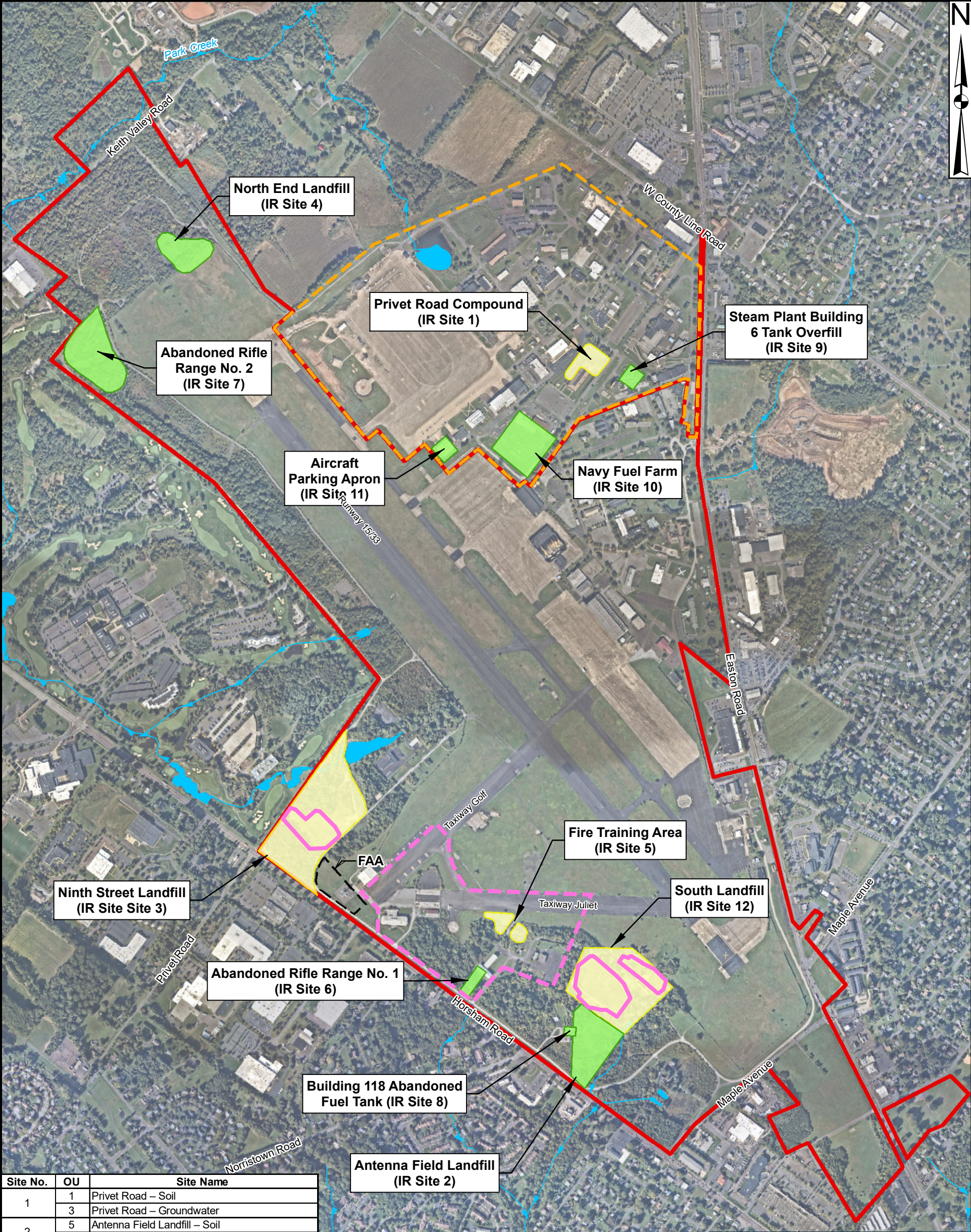
LEGEND		
	INTERMITTENT STREAM	
	STREAM	
	FAA EASEMENT	
	BIDDLE AIR NATIONAL GUARD BASE	
	FORMER NASJRB WILLOW GROVE	

FACILITY LOCATION MAP
FORMER NASJRB WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA



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Site No.	OU	Site Name
1	1	Privet Road – Soil
	3	Privet Road – Groundwater
2	5	Antenna Field Landfill – Soil
	9	Antenna Field Landfill – Groundwater
3	6	Ninth Street Landfill – Soil
	10	Ninth Street Landfill – Groundwater
4	-	North End Landfill
5	2	Fire Training Area – Groundwater
	4	Fire Training Area – Soil
6	-	Abandoned Rifle Range 1
7	-	Abandoned Rifle Range 2
8	-	Building 118 Abandoned Fuel Tank
9	-	Steam Plant Building 6 Tank Overfill
10	-	Navy Fuel Farm
11	-	Aircraft Parking Apron
12	11	South Landfill
Basewide	12	Basewide groundwater investigation for PFAS

Legend

Stream

Completed IR Site

Active IR Site

Groundwater Land Use Control Area

Soil Land Use Control Area

FAA Easement

Biddle Air National Guard Base

Former NASJRB Willow Grove

NAVFAC
Naval Facilities Engineering Systems Command

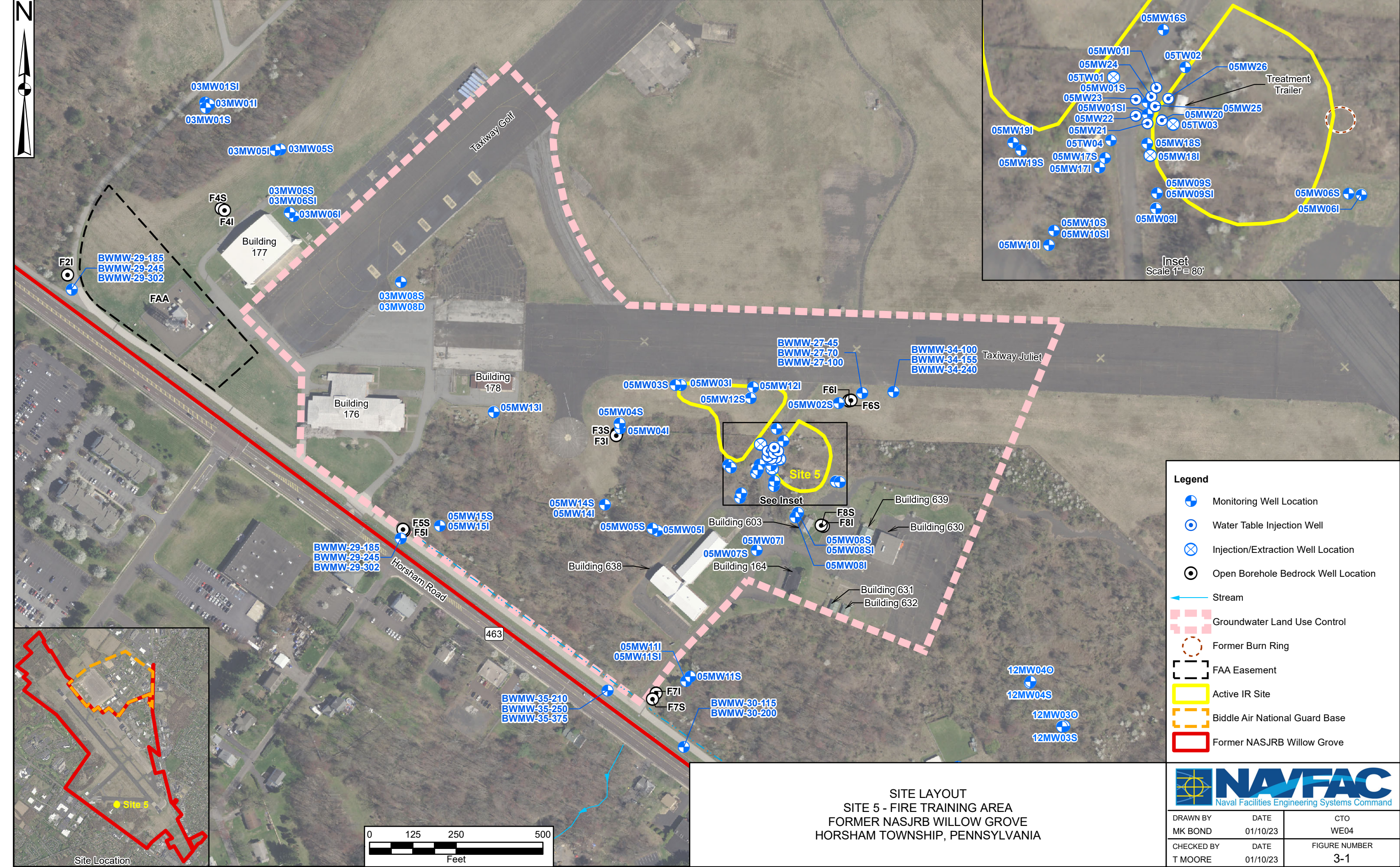
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LOCATIONS OF INSTALLATION RESTORATION SITES
FORMER NASJRB WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA

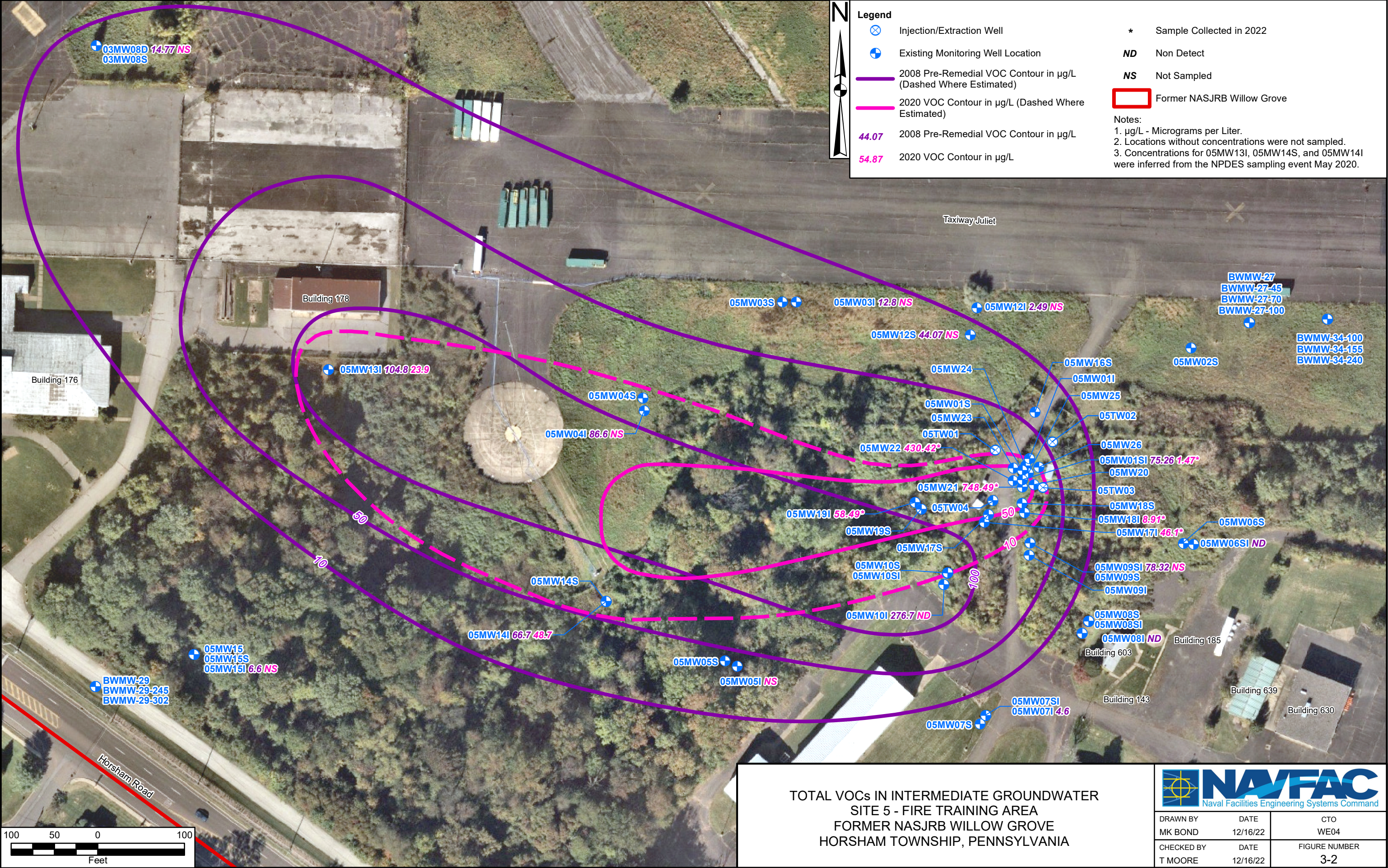
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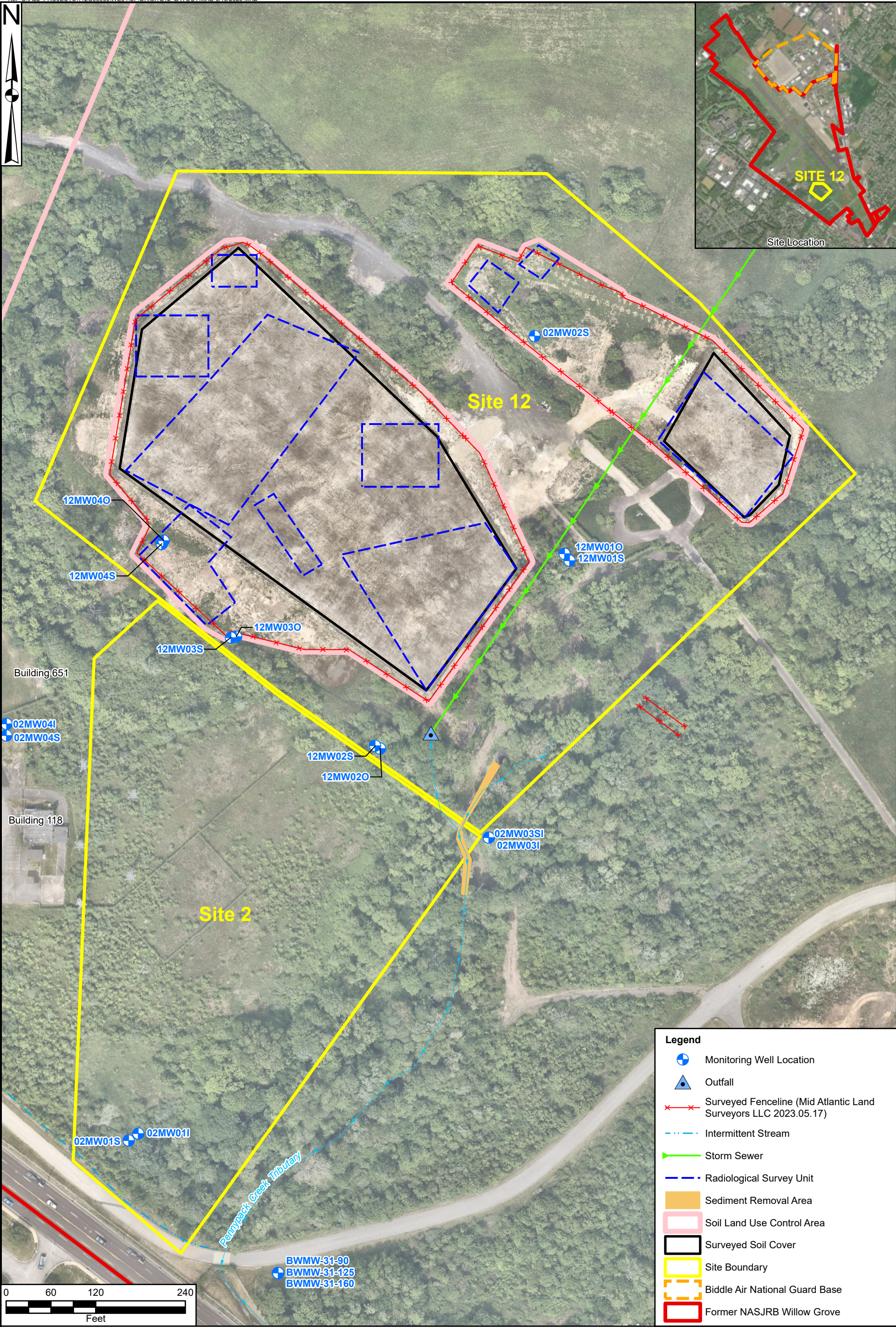


TOTAL VOCs IN INTERMEDIATE GROUNDWATER
SITE 5 - FIRE TRAINING AREA
FORMER NASJRB WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA



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SITE LAYOUT
SITE 12 - SOUTH LANDFILL
FORMER NASJRB WILLOW GROVE
HORSHAM TOWNSHIP, PENNSYLVANIA



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APPENDIX A

REFERENCE LIST

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Aptim (Aptim Federal Services, LLC), 2022a. *Final Remedial Action Work Plan, Site 3 Landfill Cap, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania*. February 18.

Aptim, 2022b. *Final Remedial Action Work Plan, Site 12 Landfill Cap, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania*. February 18.

Aptim, 2023a. *Draft Remedial Action Completion Report, Site 3 Landfill Cap, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania*. May.

Aptim, 2023b. *Draft Remedial Action Completion Report, Site 12 Landfill Cap, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania*. May.

ATSDR (Agency for Toxic Substances and Disease Registry), 2012. *Toxicological Profiles*. Center for Disease Control. Atlanta Georgia. Accessed December 12, 2022. <http://www.atsdr.cdc.gov/toxprofiles/index.asp#bookmark05>.

B&RE (Brown & Root Environmental), 1998. *Phase II Remedial Investigation Report for NAS JRB Willow Grove, Pennsylvania*. April.

Cal EPA (California Office of Environmental Health Hazard Assessment), 2012. Online toxicity database. Accessed December 12, 2022. <http://www.oehha.ca.gov/risk/chemicalDB/index.asp>.

DoD (Department of Defense), 2014. *Manual 4715.20 Updated – Five-Year Review Procedure*. June.

EA (EA Engineering, Science, and Technology, Inc.), 1990. *Final Report: Site Inspection Studies at NAS Willow Grove, Horsham Township, Pennsylvania*. May 6.

EA, 1991. *Plan of Action for Extended Site Inspections and Remedial Investigations at NAS Willow Grove, Horsham Township, Pennsylvania*. August.

EA, 1992. *Final Report: Extended Site Inspection at NASJRB Willow Grove*. January.

EA, 1996. *Final Pilot Study Report - Product Recovery Pilot System, Navy Fuel Farm (Site 10)*. November.

EA, 2001. *Final System Performance Report, Vacuum Enhanced LNAPL and Ground-water Recovery and Treatment System, January 2000 through December 2000, Site 10, Navy Fuel Farm, NAS JRB Willow Grove*. June.

EA, 2003. *Final, IR Site 10 Soil Letter Report to Support No Further Investigation at this Time, NAS JRB Willow Grove - Navy Fuel Farm*. December.

EA, 2004a. *Final PADEP Act 2 Final Report, Soil Sampling Efforts, Installation Restoration Program Site 11, NAS JRB Willow Grove*. March.

EA, 2004b. *Final Report, Request for No Further Action, Installation Restoration (IR) Program Site 10 Ground Water, NASJRB Willow Grove*. September.

EA, 2004c. *Final PADEP Act 2 Report, Soil Sampling Efforts, Installation Restoration Program Site 11, NAS JRB Willow Grove*. March.

EPA (U.S. Environmental Protection Agency), 1994. *Memorandum: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*, Office of Solid Waste and Emergency Response Directive # 9355.4-12. August.

EPA, 2001. *Comprehensive Five-Year Review Guidance*. June.

EPA, 2005. *Federal Facilities Agreement for Naval Air Station Joint Reserve Base Willow Grove*. June.

EPA, 2018. *Concurrence Regarding Final Second Five Year Review NAS Willow Grove Pennsylvania*. September 27.

EPA, Navy, and PADEP (Pennsylvania Department of Environmental Protection), 2005. *Federal Facility Agreement under CERCLA Section 120*, Naval Air Station Joint Reserve Base Willow Grove, Pennsylvania, Administrative Docket Number CERC-03-2005-0038FF. May 24.

Halliburton NUS (Halliburton NUS Corporation), 1993. *Remedial Investigation Report. NAS JRB Willow Grove*. February.

NAVFAC (Naval Facilities Engineering Systems Command), 2007. *Record of Decision, Site 5 Soil, Operable Unit 4 (OU 4)*, NAS JRB Willow Grove. September.

NAVFAC, 2012. *Record of Decision for Site 5 Groundwater (OU 2)*, NAS JRB Willow Grove. September.

NAVFAC, 2013. *Final Five-Year Review for Former NAS JRB Willow Grove, Horsham, Pennsylvania*. September.

NAVFAC, 2015. *Time-Critical Removal Action Memorandum, Perfluorinated Compounds in Groundwater*, Naval Air Station Joint Reserve Base, Willow Grove, PA. NPL Site ID PAD987277837. September 29.

NAVFAC, 2016. *Evaluation of Potential Sources of Perfluorinated Compounds at the Former Naval Air Station Joint Reserve Base, Willow Grove Pennsylvania*. March.

NAVFAC, 2017a. *Time-Critical Removal Action, Municipal Drinking Water Well Filtration for PFOA and PFOS exceeding Lifetime Health Advisories, Naval Air Station Joint Reserve Base, Willow Grove, PA*. NPL Site ID #PAD987277837. September 29.

NAVFAC, 2017b. *Time-Critical Removal Action, Municipal Connections for Private Drinking Water Wells Exceeding PFOA and PFOS Lifetime Health Advisories, Naval Air Station Joint Reserve Base, Willow Grove, PA*. NPL Site ID #PAD987277837. September 27.

NAVFAC, 2018. *Final Second Five-Year Review, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania*. September.

NAVFAC, 2021a. *Final Record of Decision, Site 3 – Ninth Street Landfill Operable Unit 6 (Soil) and Operable Unit 10 (Groundwater)*. Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, PA. September.

NAVFAC, 2021b. *Record of Decision, Site 12 – South Landfill Operable Unit 11, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, PA*. October.

NAVFAC, 2022. *Draft Site Management Plan, Fiscal Year 2022*. Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania. June.

NAVSEA (Naval Sea Systems Command), 2013. *Final Historical Radiological Assessment History of the Use of General Radioactive Materials from 1942 to 2011*. Naval Air Station Joint Reserve Base Willow Grove, Willow Grove, Pennsylvania. July.

NEESA (Naval Energy and Environmental Support Activity), 1986. *Initial Assessment Study of NASJRB Willow Grove*. February.

PADEP (Pennsylvania Department of Environmental Protection), 2021. *Land Recycling Program, Statewide Health Standards, Table 1 - Medium Specific Concentrations (MSCs) for Organic Regulated Substances in Groundwater*. PADEP Revised November 20, 2021; accessed December 12, 2022.

https://files.dep.state.pa.us/EnvironmentalCleanupBrownfields/LandRecyclingProgram/LandRecyclingProgramPortalFiles/GuidanceTechTools/VaporIntrusion/November_2021/Table%201.pdf

PADEP, 2016. Revisions to 25 Pa. Code Chapter 250, Administration of the Land Recycling Program (Act 2 cleanup standards). August 27.
<http://www.dep.pa.gov/Business/Land/LandRecycling/Standards-Guidance-Procedures/Pages/Statewide-Health-Standards.aspx>

Resolution (Resolution Consultants, Inc.), 2019. *Final Remedial Investigation Report Per and Polyfluoralkyl Substances Investigation Activities*, NASJRB Willow Grove, PA. September 20.

RKG (RKG Associates, Inc.), 2012a. *NAS-JRB Willow Grove Redevelopment Plan*. March.

RKG, 2012b. *NAS-JRB Willow Grove Homeless Assistance Submission*. March.

RMC (Resource Management Concepts, Incorporated), 2003. *Antenna Field Landfill Site Soil Characterization and Drum Removal, Willow Grove, Pennsylvania*. July.

Tetra Tech, 2002. *Remedial Investigation Report for Site 5 - Fire Training Area, NAS JRB Willow Grove*. February.

Tetra Tech, 2004. *Site 5 RI Addendum 1, PAH Confirmation Sampling and Analysis Addendum Remedial Investigation Report for Site 5 - Fire Training Area Soil, NAS JRB Willow Grove*. October.

Tetra Tech, 2005. *Action Memorandum for Site 5 - Fire Training Area Soil Removal Action, NAS JRB Willow Grove*. August.

Tetra Tech, 2006a. *Site 5 RI Addendum 2, Soil Investigation for Volatile Organic Compound Soil to Groundwater Impact for Site 5 - Fire Training Area, NAS JRB Willow Grove*. March.

Tetra Tech, 2006b. *Site 5 RI Addendum 4, Technical Memorandum of Risk Assessment Evaluation for Site 5 - Fire Training Area Soil (OU 4), NAS JRB Willow Grove*. July.

Tetra Tech, 2006c. *Site 5 RI Addendum 5, Remedial Investigation Addendum Report for Site 5 - Fire Training Area Groundwater (OU 2), NAS JRB Willow Grove*. September.

Tetra Tech, 2007a. *Site 5 RI Addendum 3, Technical Memorandum of Risk Assessment Evaluation for Site 5 - Fire Training Area Groundwater (OU 2), NAS JRB Willow Grove*. February.

Tetra Tech, 2007b. *Site 5 RI Addendum 6, Remedial Investigation Report for Site 5 - Fire Training Area Soil (OU 4), NAS JRB Willow Grove*. June.

Tetra Tech, 2007c. *Proposed Remedial Action Plan for Site 5 Soil (OU 4), NAS JRB Willow Grove.* June.

Tetra Tech, 2008a. *Record of Consensus Agreement No Action Decision for Site 6 - Abandoned Rifle Range No. 1, NAS JRB Willow Grove.* January.

Tetra Tech, 2008b. *Record of Consensus Agreement No Action Decision for Site 7 - Abandoned Rifle Range No. 2, NAS JRB Willow Grove.* September.

Tetra Tech, 2008c. *Sampling and Analysis Plan for Pilot Study, Site 5 - Fire Training Area, Groundwater (OU 2), NAS JRB Willow Grove.* October.

Tetra Tech, 2008d. *Feasibility Study for Site 5 - Fire Training Area, Groundwater (OU 2), NAS JRB Willow Grove.* November.

Tetra Tech, 2009a. *Test Pit Investigation Report for Site 4 - North End Landfill, NAS JRB Willow Grove.* January.

Tetra Tech, 2009b. *Record of Consensus Agreement No Action Decision for Site 4 - North End Landfill, NAS JRB Willow Grove.* February.

Tetra Tech, 2009c. *Remedial Investigation Report for Site 2 - Antenna Field Landfill, NAS JRB Willow Grove.* April.

Tetra Tech, 2009d. *Remedial Investigation Report Addendum for Site 2 - Antenna Field Landfill, NAS JRB Willow Grove.* June.

Tetra Tech, 2009e. *Site 2 Groundwater Confirmation Sampling Report, Antenna Field Landfill, NAS JRB Willow Grove.* June.

Tetra Tech, 2009f. *Proposed Plan for Site 2 Soil (OU 5) and Groundwater (OU 9), NAS JRB Willow Grove.* July.

Tetra Tech, 2010a. *Record of Decision, Site 2 Soil (OU 5) and Groundwater (OU 9), NAS JRB Willow Grove.* February.

Tetra Tech, 2010b. *Remedial Design for Land Use Controls for Site 1 Groundwater (OU 3), NAS JRB Willow Grove.* August.

Tetra Tech, 2011a. *Site 12 Phase I Remedial Investigation Data Report, NAS JRB Willow Grove.* January.

Tetra Tech, 2011b. *Pilot Test Report for Site 5 Groundwater (OU 2), NAS JRB Willow Grove.* May.

Tetra Tech, 2011c. *Proposed Remedial Action Plan for Site 5 Groundwater (OU 2)*, NAS JRB Willow Grove. June.

Tetra Tech, 2011d. *Remedial Investigation Report for Site 3 – Ninth Street Landfill*, NAS JRB Willow Grove. October.

Tetra Tech, 2012. *Status Report for the Bioremediation of Site 5, Former NAS JRB Willow Grove*. December.

Tetra Tech, 2013a. *Remedial Design for Land Use Controls for Site 5 Groundwater (OU 2)*, NAS JRB Willow Grove. May.

Tetra Tech, 2013b. *Remedial Design for Installation of Additional Injection Wells at the Source Area Bioremediation for Site 5 Groundwater (OU 2)*, Former NAS JRB Willow Grove. May.

Tetra Tech, 2014a. *Final Phase II Remedial Investigation Report for Site 12 – South Landfill*. Naval Air Station Joint Reserve Base (NAS JRB) Willow Grove. February.

Tetra Tech, 2014b. *Remedial Action Completion Report for Site 5 – Fire Training Area Groundwater (OU2)*, Naval Air Station Joint Reserve Base (NAS JRB) Willow Grove. September.

Tetra Tech, 2015a. *Final Operating Properly and Successfully Evaluation Report, Site 5 - Fire Training Area Groundwater (OU 2)*. May.

Tetra Tech, 2015b. *Final In-Situ Bioremediation Operation, Maintenance & Monitoring Plan for Site 5 - Fire Training Area Groundwater (OU 2)*. May.

Tetra Tech, 2016. *Sampling and Analysis Plan for Long-Term Monitoring at Site 5 – Fire Training Area Groundwater (OU2)*. July.

Tetra Tech, 2017a. *Final Annual Remedial Action Operation and Long-Term Monitoring Report – Year 1, Site 5- Fire Training Area Groundwater, (Operable Unit 2)*. December.

Tetra Tech, 2017b. *Scoping Survey Reports – IR Sites 1, 3 and 12, NAS JRB Willow Grove*. March.

Tetra Tech, 2017c. *Annual Remedial Action Operation and Long-Term Monitoring Report – Year 2, Site 5 – Fire Training Area Groundwater, (Operable Unit 2)*. September.

Tetra Tech, 2019. *Final Feasibility Study, Site 3 – Ninth Street Landfill*, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township. August.

Tetra Tech, 2022a. *Draft Annual Remedial Action Operations and Long-Term Monitoring Report – Year 6, Site 5 – Fire Training Area Groundwater (Operable Unit 2)*. Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township. January.

Tetra Tech, 2022b. *Internal Draft Land Use Control Remedial Design, Operable Unit 6, Site 3 – Ninth Street Landfill*, Former Naval Air Station Joint Reserve Base Willow Grove Horsham Township, Pennsylvania. May.

Tetra Tech, 2022c. *Final Aquatic Resource Report for the Willow Grove Remedial Action Work Plan, Site 3 – North Landfill and Site 12 – Ninth Street Landfill*. Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township. June.

Tetra Tech, 2022d. *Internal Draft Land Use Control Remedial Design, Operable Unit 11, Site 12 – South Landfill*, Former Naval Air Station Joint Reserve Base Willow Grove Horsham Township, Pennsylvania. June.

Tetra Tech, 2022e. *Draft Technical Memorandum – Modifications Implemented and Recommended Changes for Continued Operation of the In-Situ Anaerobic Bioremediation System – Site 5 (Former FTA – OU 2)*, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania.

Tetra Tech, 2022f. *Draft Annual Remedial Action Operations and Long-Term Monitoring Report - Year 7, Site 5 - Fire Training Area Groundwater (Operable Unit 2)*, Former Naval Air Station Joint Reserve Base Willow Grove, Horsham Township, Pennsylvania. December.

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APPENDIX B
PUBLIC NOTICE

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New restaurants, stores coming to Oxford Valley Mall

Peg Quann
Bucks County Courier Times
USA TODAY NETWORK

The long empty Bally’s fitness center site will be transformed, bringing redevelopment to another parcel around the Oxford Valley Mall on the busy Route 1 corridor in Bucks County.

Middletown supervisors approved plans for two restaurants and two retail stores on the site of the gym and a nearby parcel at the entrance to Oxford Valley Mall on Monday. They also gave the OK for a drive-thru for the Dunkin’ location at Maple Avenue and Old Lincoln Highway.

The board voted 4-0 to give preliminary and final development approval for an eat-in restaurant and retail store on the site at 130 Middletown Boulevard where the Bally’s once stood, and for another retail store and drive-through restaurant at the entrance to the mall at 2340 Lincoln Highway.

A third building, which is leased to Pearl Vision and Mattress Warehouse will remain on the site and those leases will continue, said Justin Geonnotti, engineer for the developer, Mark Rusben.

Ed Murphy, attorney for the developer, said the eat-in restaurant would have 5,600 square feet and have outdoor space as well as indoor dining. The other restaurant could offer drive-thru service. Tenants have not been identified yet for either restaurant or the attached retail stores.

“There are multiple tenants who have expressed interest,” Murphy told the supervisors, but negotiations for leases are not finalized. He said he hoped the development could be built in the next year with tenants moving into the buildings in early 2024.

Sidewalks would be included in the development and a pedestrian crossing light is planned for Middletown Boulevard to connect the stores and restaurants to the apartment buildings, which will ultimately include some 600 units, under construction at the mall. Some 600 plantings would also be added to landscape the site.

The supervisors also approved the drive-thru addition to the Dunkin’ restaurant on a triangular piece of land at the corner of Maple Avenue and Old Lincoln Highway. The developer, M Property, purchased an additional residential lot to the back of the property and received a variance to allow a portion of the lot

to be used for the restaurant addition without having the lot rezoned for commercial use.

The drive-thru will consist of three lanes — the first being for a kiosk station where customers can place an order, a second drive-thru for customers who ordered their doughnuts and beverages using a mobile app and a third pass-by lane.

Supervisor Dana Kane asked about how many cars would be stacked in the drive-thru lanes. David Shafkowitz, attorney for the developer, said there would be room for about 10 to 12 vehicles in the drive-thru and another four or more in a turn in lane off Maple Avenue.

Nearby Maple Avenue residents Joyce Martindell and her daughter, Donna Lorenz, said they were concerned about the speeding traffic on Maple Avenue.

“I’m against the drive-thru. I think this is dangerous,” Martindell said.

But Philip Wursta, who serves as the township’s traffic engineer, said “there is significant buffering” for vehicles turning into the site.

Township Supervisor Chairman Mike Ksiazek said the site still needs to receive PennDOT approval for the traffic plan.



The Tullytown Wawa opened last year but does not have liquor sales. The one in nearby Falls will have those sales. NANCY ROKOS/SPECIAL TO THE BUCKS COUNTY COURIER TIMES

Beer and wine coming to new Falls Wawa on Lincoln Highway

Damon C. Williams
Bucks County Courier Times
USA TODAY NETWORK

Motorists and shoppers will be able to pick up wine, beer and other alcoholic beverages at the Wawa under construction at 530 Lincoln Highway in Falls Township, scheduled to open in the first quarter of 2023.

The Falls supervisors voted Monday night in favor of an inter-municipal liquor license transfer, allowing customers to purchase up to 192 ounces of beer or up to 3,000 milliliters of wine per transaction.

Although most Wawa’s operate 24 hours a day, liquor sales at this location will be from 7 a.m. to 2 a.m. Monday to Saturday, and from 7 a.m. to 2 a.m. on Sunday. Wine sales will stop at 11 p.m. every day, according to the township.

The new store would have five cooler doors, as well as beer and wine on the shelves and would have a seating area for up to 30 customers at a time, according to a news release.

Ellen Freeman, a lawyer with Flaherty & O’Hara, a nationwide law firm which provides legal services and counsel to clients in the beverage alcohol industry, said Wawa operates 15 stores in the Pennsylvania that sell liquor.

“Wawa is very familiar with the process, they’ve been able to trouble-shoot it over the years, and they know it’s a very sensitive sell and (Wawa) wants to make sure they do that in the safest manner possible, certainly to keep the municipality safe and keep their reputation to a very high standard,” Freeman said. “The way they do that is to make sure they have the safety policies and procedures in place so there’s no gray area.”

Freeman said this

new Wawa will have a “100% carding policy” using a card-scanning transaction device that will also verify the purchaser’s identity and age. Freeman also said there won’t be advertisements for liquor throughout the store, and seating will be limited to the area where liquor is being sold.

“(Wawa) is not promoting on-premises consumption,” said Freeman, “but legally they do have to allow it, so they do put a maximum-drink policy in place and there’s signage to that effect in the seating area.”

That policy, Freeman said, allows purchasers to consume two 12-ounce cans or bottles of beer, one 8-ounce glass of wine, sold in single packets. Purchasers will not be able to buy a bottle of wine and consume it on-site.

Fall Supervisor Vice-Chairman Jeffrey Boraski, who cast the lone vote against the resolution authorizing the liquor license transfer, took Wawa to task for apparently adding liquor sales to the development, long after supervisors approved the project.

“When Wawa came in and first made this proposal, I wasn’t overly excited about the Wawa being there, but I got on board with the plan and approved the Wawa, but I just wished they would have told us about the liquor license (then),” Boraski said in a news release. “I don’t like them coming back to us after we’ve already approved that business.”



Bucks to honor vets, first responders with free weddings

Intelligencer Staff

Bucks County will host its second “Vows and Veterans” wedding service and bridal reception for veterans and first responders Nov. 10.

Couples that include at least one veteran or first responder are invited to apply for a marriage license between now and Nov. 6 to qualify to participate in the free wedding ceremony and reception. And the first five couples who sign up for the free wedding will receive a free night at HollyHedge Estate in Solebury.

The event is organized by Linda Bobrin, Bucks County Register of Wills and Clerk of Orphans’ Court and will take place in the courtyard of the Bucks County Courthouse Administration Building in Doylestown from noon to 2 p.m. Former Under Secretary of the Army Patrick Murphy will officiate at the marriages, to be followed with a reception.

A marriage renewal ceremony for veteran and first-responder couples will also take place. Couples may invite family and friends to attend.

“We’ll have cake, catering and music,” said Rachel Landsberg, spokeswoman for the Register of Wills and Orphans’ Court.

“Vows and Veterans is part of the Bucks County Clerk of Orphans’ Court’s successful Weddings for Heroes program. Ms. Bobrin intends to continue to hold Vows and Veterans annually in November and Vows and Valentines in February,” Landsberg added.

Interested couples should email emarrige@buckscounty.org



Newly weds Eric Cline, left, and Cara Melchione kisses after taking their vows during the Vows and Valentine's ceremony at Bucks County court building in Doylestown on Feb. 14. NUR B. ADAM/BUCKS COUNTY COURIER TIMES

and begin a marriage license application. Bucks County marriage applications are accepted online and can be started at the following link: <https://propublic.buckscountyonline.org/psi3/marriagelicense>. The Bucks County Clerk of Orphan’s Court gives a \$20 discount on marriage licenses to veterans and first-responders in honor of their service to the community.

Weddings for Heroes is made possible entirely through donations from local businesses and individuals. Many of the businesses offer their services either free or at a discounted rate.

Participating local vendors include: Bird of Paradise Florist, Courtney Kanig Photography,

Doylestown Wedding Studio/Cortineo Creative, Fleurish Floral Design by Bucks-Mont Party Rental, HollyHedge Estate, James Best Videography, Mervin Toussaint Jazz Band, and The Novel Baker.

To contribute funds or services, or for more information on the Weddings for Heroes program, please email Rachel Landsberg at ralandsberg@buckscounty.org. Checks can be made out to “Weddings for Heroes” and mailed to the Bucks County Register of Wills and Clerk of Orphans’ Court at 55 E. Court Street, 6th Floor, Doylestown, PA 18901. As part of the effort to raise funds for this wedding, the Bucks County Clerk of

Orphans’ Court will be holding bake sale fundraising events at the Administrative Building Oct. 11 and Nov. 1.

PUBLIC NOTICE
Former Naval Air Station Joint Reserve Base Willow Grove
Horsham, Pennsylvania
Third Five Year Review

The Naval Facilities Engineering Systems Command Base Realignment and Closure Office (NAVFAC BRAC PMO), in cooperation with the United States Environmental Protection Agency (EPA) and Pennsylvania Department of Environmental Protection (PADEP), has begun the third five-year review of the remedies implemented at Former Naval Air Station Joint Reserve Base (NASJRB) Willow Grove, Horsham, Pennsylvania. The purpose of the five-year review is to ensure that the selected remedies are effectively protecting public health and the environment. The five-year review process is mandated under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (also known as Superfund) for sites where the selected remedial actions result in contaminants remaining above levels that allow for unlimited use and unrestricted exposure.

NAVFAC BRAC PMO will conduct interviews, review reports, and assess site conditions to evaluate if the remedies remain protective of human health and the environment. Public participation is encouraged and welcomed. If you are interested in participating in the interview process, please contact the BRAC Environmental Coordinator (contact information below) by October 30, 2022. The third five-year review will be completed by September 24, 2023, and will focus on the following Operable Units (OUs) where remedial actions have been implemented:

- OU-2: Site 5 - Fire Training Area Groundwater.
- OU-6: Site 3 – Ninth Street Landfill Soil.
- OU-11: Site 12 – South Landfill Soil

FOR MORE INFORMATION

If you have any questions or wish to discuss the project, please contact the following:
NAVFAC BRAC PMO: Dawn DeFreitas, BRAC Environmental Coordinator, (215) 897-4900, or email dawn.m.defreitas.civ@us.navy.mil
NAVFAC BRAC PMO installation website and Administrative Record:
<https://www.bracpmo.navy.mil/BRAC-Bases/Northeast/Former-Naval-Air-Station-Joint-Reserve-Base-Willow-Grove/>

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APPENDIX C
INTERVIEW RECORDS

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INTERVIEW QUESTIONS Former Naval Air Station Joint Reserve Base Willow Grove THIRD FIVE-YEAR REVIEW

Please use other side for additional comments.

1. What is your overall impression of the program, including remedial actions conducted or planned at the Base?

We note that this is the third five-year review. The following are the previous five-year reviews:

- The Navy prepared the first five-year review in 2013 addressed land use controls for groundwater at the Privet Road Landfill, identified as Site 1 / OU-3.
- The Air National Guard prepared a second five year review that addressed Site 1 / OU-3.
- The Navy prepared a second five year review in 2018 that addressed land use controls for groundwater at the former Fire Training Area, identified Site 5 / OU-2.

It is unclear from the request which of the above sites is included in the current third five-year review.

We note that groundwater at both Site 1 and Site 5 (OU-3 and OU-2, respectively) have been complicated due to the presence of PFAS. PFAS in groundwater is considered a separate operable unit, OU-12, and is not yet subject to Land Use Controls.

At this time our general impression is that remedies at Sites 1 and 5 have been successful with respect to controlling non-PFAS related contaminants. However, PFAS investigations are ongoing and time-consuming.

2. What impacts, if any, have Navy's environmental cleanup activities had on the surrounding communities? Are you aware of any community concerns?

There has been little to no impact of non-PFAS related compounds from Sites 1 and 5 on the surrounding communities. The Navy has funded treatment systems in HWSA public supply wells and is currently performing pilot tests for groundwater containment/treatment systems that address PFAS in these areas, as well as other areas of the base. We are aware that the community has had health concerns about PFAS in drinking water.

3. Are you aware of any complaints, incidents, unusual activities (vandalism, trespassing), or emergency responses by local authorities at any of the active environmental sites?

No.

4. Does the program and/or site remedies affect the day-to-day base operations? If so, how?

Unknown.



5. Are Land Use Controls (LUCs) and their objectives clear to appropriate base personnel and are the LUCs functioning as intended? If not, what recommendations would you make to increase awareness?

Unknown.

6. Do you feel well informed about the environmental cleanup activities and progress?

Yes.

7. Do you have any comments, suggestions, or recommendations regarding the program and/or site remedies?

We recommend that the program continue to recognize that treatment of HWSA public water supply wells is an interim remedy and does not address remediation of the source water. We support continued progress to long term solutions to address impacts to soil, groundwater, surface water and sediments.

Name: Tina O'Rourke

Title: Business Manager

Organization/Community: Horsham Water & Sewer Authority

**Please return to: Ralinda Miller, Tetra Tech
e-mail: ralinda.miller@tetrattech.com
or call 412-921-8995**

APPENDIX D
FYR INSPECTION FORMS AND PHOTOGRAPHS

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Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 3 (OU6) Soil	Date of inspection: September 28, 2022
Location and Region: Former NASJRB Willow Grove, PA	EPA ID: PAD987277837
Agency, office, or company leading the five-year review: Navy BRAC PMO East	Weather/temperature: High of 69, partly sunny
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ </div> <div style="width: 45%;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____	
2. O&M staff _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____	
3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.	
4. Other interviews (optional) <input type="checkbox"/> Report attached.	
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)	
1. O&M Documents <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 30%;"> <input checked="" type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs </div> <div style="width: 30%;"> <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available </div> <div style="width: 30%;"> <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date </div> <div style="width: 10%;"> <input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A </div> </div> Remarks <u>Documents are stored within the treatment building trailer.</u>	
2. Site-Specific Health and Safety Plan <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Contingency plan/emergency response plan <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A Remarks _____	

3.	O&M and OSHA Training Records	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
Remarks _____				
<hr/>				
4.	Permits and Service Agreements			
	<input type="checkbox"/> Air discharge permit	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Effluent discharge	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Waste disposal, POTW	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Other permits _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
Remarks _____				
<hr/>				
5.	Gas Generation Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
Remarks _____				
<hr/>				
6.	Settlement Monument Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
Remarks _____				
<hr/>				
7.	Groundwater Monitoring Records	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
Remarks <u>Files are in the trailer as well as on the administrative record.</u>				
<hr/>				
8.	Leachate Extraction Records	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
Remarks _____				
<hr/>				
9.	Discharge Compliance Records			
	<input type="checkbox"/> Air	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Water (effluent)	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
Remarks _____				
<hr/>				
10.	Daily Access/Security Logs	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
Remarks _____				
<hr/>				
IV. O&M COSTS				
1.	O&M Organization			
	<input type="checkbox"/> State in-house	<input type="checkbox"/> Contractor for State		
	<input type="checkbox"/> PRP in-house	<input type="checkbox"/> Contractor for PRP		
	<input type="checkbox"/> Federal Facility in-house	<input checked="" type="checkbox"/> Contractor for Federal Facility		
	<input type="checkbox"/> Other _____			
<hr/>				

2.	O&M Cost Records <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate _____ <input type="checkbox"/> Breakdown attached <div style="text-align: center;">Total annual cost by year for review period if available</div> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> </table> <table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 30%;"></td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> <td></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> </table>	From _____	To _____					Date	Date	Total cost			<input type="checkbox"/> Breakdown attached	From _____	To _____					Date	Date	Total cost			<input type="checkbox"/> Breakdown attached	From _____	To _____					Date	Date	Total cost			<input type="checkbox"/> Breakdown attached	From _____	To _____					Date	Date	Total cost			<input type="checkbox"/> Breakdown attached	From _____	To _____					Date	Date	Total cost			<input type="checkbox"/> Breakdown attached
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3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: <u>Construction of the Site 3 landfill soil cover was completed in September 2022; therefore, O&M costs are not available.</u> _____ _____ _____ _____																																																												
V. ACCESS AND INSTITUTIONAL CONTROLS x Applicable <input type="checkbox"/> N/A																																																													
A. Fencing																																																													
1.	Fencing damaged <input type="checkbox"/> Location shown on site map x Gates secured <input type="checkbox"/> N/A Remarks <u>The landfill has a fence surrounding it, and there are secured gates to provide access.</u> _____ _____																																																												
B. Other Access Restrictions																																																													
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A Remarks <u>There is no signage; however, the Navy will be providing signage.</u> _____ _____																																																												
C. Institutional Controls (ICs)																																																													

1.	Implementation and enforcement Site conditions imply ICs not properly implemented <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Site conditions imply ICs not being fully enforced <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Type of monitoring (<i>e.g.</i> , self-reporting, drive by) <u>Self-reporting, drive by</u> Frequency <u>Monthly</u> Responsible party/agency <u>Navy Caretaker Office</u> Contact <u>Marty Schy</u> <u>Navy Caretaker Office</u> <u>9/28/22</u> <u>215-293-4888</u> <div style="text-align: center; margin-top: -10px;"> Name Title Date Phone no. </div>
	Reporting is up-to-date <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Reports are verified by the lead agency <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Other problems or suggestions: <input type="checkbox"/> Report attached <u>A soil cover has been constructed to prevent exposure of human and ecological receptors to contaminated soils and landfill waste materials, prevent erosion and migration of COCs from the surface, and reduce the infiltration of precipitation into the landfill. L UC RD will be implemented to prevent activities that would damage or disturb subsurface soils these include construction on, excavation of, or breaching of the soil covers.</u>
2.	Adequacy <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A Remarks <u>No evidence of disruption of the cap or subsurface.</u> _____ _____
D. General	
1.	Vandalism/trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident Remarks _____ _____
2.	Land use changes on site <input checked="" type="checkbox"/> N/A Remarks _____ _____
3.	Land use changes off site <input checked="" type="checkbox"/> N/A Remarks _____ _____
VI. GENERAL SITE CONDITIONS	
A. Roads <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ _____
B. Other Site Conditions	
Remarks _____ _____	

VII. LANDFILL COVERS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks <u>Stone and additional vegetation will be added to reduce the erosion occurring on the cap.</u>	<input checked="" type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident
5.	Vegetative Cover <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____	<input checked="" type="checkbox"/> Grass <input type="checkbox"/> Cover properly established	<input type="checkbox"/> No signs of stress
6.	Alternative Cover (armored rock, concrete, etc.) Remarks _____	<input checked="" type="checkbox"/> N/A	
7.	Bulges Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Bulges not evident
8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____	<input checked="" type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Location shown on site map	Areal extent _____ Areal extent _____ Areal extent _____ Areal extent _____
9.	Slope Instability Areal extent _____ Remarks _____	<input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> No evidence of slope instability

B. Benches <input type="checkbox"/> Applicable x N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	Flows Bypass Bench Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
2.	Bench Breached Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
3.	Bench Overtopped Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
C. Letdown Channels <input type="checkbox"/> Applicable x N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement
2.	Material Degradation <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Material type _____ Areal extent _____ Remarks _____ _____	
3.	Erosion Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion
4.	Undercutting <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____	
5.	Obstructions Type _____ <input type="checkbox"/> No obstructions <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____ _____	
6.	Excessive Vegetative Growth Type _____ <input type="checkbox"/> No evidence of excessive growth <input type="checkbox"/> Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____ _____	

D. Cover Penetrations <input type="checkbox"/> Applicable x N/A			
1.	Gas Vents	<input type="checkbox"/> Active <input type="checkbox"/> Passive	
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance
	x N/A		
	Remarks _____		
2.	Gas Monitoring Probes		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____		
3.	Monitoring Wells (within surface area of landfill)		
	<input type="checkbox"/> Properly secured/locked	x <input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____		
4.	Leachate Extraction Wells		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance x N/A
	Remarks _____		
5.	Settlement Monuments	<input type="checkbox"/> Located	<input type="checkbox"/> Routinely surveyed x N/A
	Remarks _____		
E. Gas Collection and Treatment <input type="checkbox"/> Applicable x N/A			
1.	Gas Treatment Facilities		
	<input type="checkbox"/> Flaring	<input type="checkbox"/> Thermal destruction	<input type="checkbox"/> Collection for reuse
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	
	Remarks _____		
2.	Gas Collection Wells, Manifolds and Piping		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	
	Remarks _____		
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	Remarks _____		
F. Cover Drainage Layer <input type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1.	Outlet Pipes Inspected	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks _____		

2.	Outlet Rock Inspected	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
Remarks_____			
G. Detention/Sedimentation Ponds <input type="checkbox"/> Applicable x N/A			
1.	Siltation Areal extent_____	Depth_____	<input type="checkbox"/> N/A
<input type="checkbox"/> Siltation not evident			
Remarks_____			
2.	Erosion Areal extent_____	Depth_____	
<input type="checkbox"/> Erosion not evident			
Remarks_____			
3.	Outlet Works	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
Remarks_____			
4.	Dam	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
Remarks_____			
H. Retaining Walls <input type="checkbox"/> Applicable x N/A			
1.	Deformations	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
Horizontal displacement_____		Vertical displacement_____	
Rotational displacement_____			
Remarks_____			
2.	Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
Remarks_____			
I. Perimeter Ditches/Off-Site Discharge <input type="checkbox"/> Applicable x N/A			
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
Areal extent_____		Depth_____	
Remarks_____			
2.	Vegetative Growth	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
<input type="checkbox"/> Vegetation does not impede flow			
Areal extent_____		Type_____	
Remarks_____			
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
Areal extent_____		Depth_____	
Remarks_____			

4.	Discharge Structure	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
Remarks _____			
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Settlement	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
Areal extent _____ Depth _____			
Remarks _____			
2.	Performance Monitoring Type of monitoring _____		
<input type="checkbox"/> Performance not monitored			
Frequency _____ <input type="checkbox"/> Evidence of breaching			
Head differential _____			
Remarks _____			
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1.	Pumps, Wellhead Plumbing, and Electrical		
<input type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A			
Remarks _____			
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances		
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance			
Remarks _____			
3.	Spare Parts and Equipment		
<input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided			
Remarks _____			
B. Surface Water Collection Structures, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Collection Structures, Pumps, and Electrical		
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance			
Remarks _____			
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances		
<input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance			
Remarks _____			
3.	Spare Parts and Equipment		
<input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided			
Remarks _____			

C. Treatment System		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters _____ <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks _____ _____		
2.	Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
3.	Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
4.	Discharge Structure and Appurtenances <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
5.	Treatment Building(s) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks _____ _____		
6.	Monitoring Wells (pump and treatment remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____		
D. Monitoring Data			
1.	Monitoring Data <input type="checkbox"/> Is routinely submitted on time <input type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		
D. Monitored Natural Attenuation			

1.	Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>Groundwater is not being monitored at this time. The ROD is only in place for soils.</u>
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <hr/> <hr/>	
B.	Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <hr/> <hr/>	
C.	Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. <hr/> <hr/>	
D.	Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <hr/>	

**Photographic Documentation
Site 3 – Soil (OU 6)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image (1)

Description:

View facing Northwest
standing from access road.



Photo: Image (13)

Description:

View facing Northwest
standing at the Southwest
corner of cap.



**Photographic Documentation
Site 3 – Soil (OU 6)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image (11)

Description:

View facing Northwest
standing at edge of area
with erosion issue.



Photo: Image (15)

Description:

View facing west standing
in area that needs
additional erosion control.



**Photographic Documentation
Site 3 – Soil (OU 6)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image

Description:

View facing to the southeast standing in the western area that needs additional erosion control.



Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 5 (OU2) Groundwater	Date of inspection: September 28, 2022
Location and Region: Former NASJRB Willow Grove, PA	EPA ID: PAD987277837
Agency, office, or company leading the five-year review: Navy BRAC PMO East	Weather/temperature: High of 69, partly sunny
Remedy Includes: (Check all that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input checked="" type="checkbox"/> Other <u>In-situ anaerobic bioremediation of contaminated groundwater, land use controls, and groundwater monitoring.</u> </div> <div style="width: 50%;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager _____ <div style="display: flex; justify-content: space-between; width: 80%; margin: 0 auto;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____	
2. O&M staff _____ <div style="display: flex; justify-content: space-between; width: 80%; margin: 0 auto;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____	
3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. _____	
4. Other interviews (optional) <input type="checkbox"/> Report attached.	
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)	
1. O&M Documents <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div> <input checked="" type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____ </div> <div> <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A </div> </div>	

2.	Site-Specific Health and Safety Plan <input checked="" type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A
3.	O&M and OSHA Training Records Remarks _____	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
4.	Permits and Service Agreements <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits _____ Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
7.	Groundwater Monitoring Records Remarks _____	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
9.	Discharge Compliance Records <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
IV. O&M COSTS				
1.	O&M Organization <input type="checkbox"/> State in-house <input type="checkbox"/> PRP in-house <input type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Other _____	<input type="checkbox"/> Contractor for State <input type="checkbox"/> Contractor for PRP <input checked="" type="checkbox"/> Contractor for Federal Facility		

2.	O&M Cost Records <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate _____ <input type="checkbox"/> Breakdown attached																																								
Total annual cost by year for review period if available																																									
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">From <u>June 2017</u></td> <td style="width: 20%;">To <u>June 2018</u></td> <td style="width: 20%; text-align: right;"><u>\$110,000</u></td> <td style="width: 40%;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From <u>June 2018</u></td> <td>To <u>June 2019</u></td> <td style="text-align: right;"><u>\$60,000</u></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From <u>June 2019</u></td> <td>To <u>June 2020</u></td> <td style="text-align: right;"><u>\$43,000</u></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From <u>June 2020</u></td> <td>To <u>June 2021</u></td> <td style="text-align: right;"><u>\$84,500</u></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From <u>June 2021</u></td> <td>To <u>June 2022</u></td> <td style="text-align: right;"><u>\$93,000</u></td> <td><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> </table>		From <u>June 2017</u>	To <u>June 2018</u>	<u>\$110,000</u>	<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From <u>June 2018</u>	To <u>June 2019</u>	<u>\$60,000</u>	<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From <u>June 2019</u>	To <u>June 2020</u>	<u>\$43,000</u>	<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From <u>June 2020</u>	To <u>June 2021</u>	<u>\$84,500</u>	<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From <u>June 2021</u>	To <u>June 2022</u>	<u>\$93,000</u>	<input type="checkbox"/> Breakdown attached	Date	Date	Total cost	
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Date	Date	Total cost																																							
3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____																																								
V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A																																									
A. Fencing																																									
1.	Fencing damaged <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks <u>Facility is fenced; however, no fencing around Site 5.</u> _____ _____																																								
B. Other Access Restrictions																																									
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A Remarks <u>No signage, but facility is under Navy Caretaker status.</u> _____ _____																																								
C. Institutional Controls (ICs)																																									
1.	Implementation and enforcement Site conditions imply ICs not properly implemented <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Site conditions imply ICs not being fully enforced <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Type of monitoring (<i>e.g.</i> , self-reporting, drive by) <u>Self-reporting, drive by</u> Frequency <u>Monthly</u> Responsible party/agency <u>Navy Caretaker Office</u> Contact <u>Marty Schy</u> <u>Navy Caretaker Office</u> <u>9/28/22</u> <u>215-293-4888</u> <div style="display: flex; justify-content: space-around; font-size: small;"> Name Title Date Phone no. </div> Reporting is up-to-date <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Reports are verified by the lead agency <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A																																								

Violations have been reported <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
Other problems or suggestions: <input type="checkbox"/> Report attached	
2.	Adequacy <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A Remarks <u>No evidence of groundwater use or occupancy of buildings.</u> _____ _____
D. General	
1.	Vandalism/trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident Remarks _____ _____
2.	Land use changes on site <input checked="" type="checkbox"/> N/A Remarks _____ _____
3.	Land use changes off site <input checked="" type="checkbox"/> N/A Remarks _____ _____
VI. GENERAL SITE CONDITIONS	
A. Roads <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ _____
B. Other Site Conditions	
Remarks <u>Majority of Site 5 is open space primarily covered by grasses with some woody brush. All buildings in vicinity of Site 5 are unoccupied.</u> _____	
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
A. Landfill Surface	
1.	Settlement (Low spots) <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Settlement not evident Areal extent _____ Depth _____ Remarks _____ _____
2.	Cracks <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Cracking not evident Lengths _____ Widths _____ Depths _____ Remarks _____ _____
3.	Erosion <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Erosion not evident Areal extent _____ Depth _____ Remarks _____ _____

4.	Holes Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Holes not evident	
5.	Vegetative Cover <input type="checkbox"/> Grass <input type="checkbox"/> Cover properly established <input type="checkbox"/> No signs of stress <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____ _____		
6.	Alternative Cover (armored rock, concrete, etc.) <input type="checkbox"/> N/A Remarks _____ _____		
7.	Bulges Areal extent _____ Height _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Bulges not evident	
8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____ _____	<input type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____	
9.	Slope Instability <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of slope instability Areal extent _____ Remarks _____ _____		
B. Benches <input type="checkbox"/> Applicable x N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	Flows Bypass Bench Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay	
2.	Bench Breached Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay	
3.	Bench Overtopped Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay	
C. Letdown Channels <input type="checkbox"/> Applicable x N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			

1.	Settlement	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of settlement
	Areal extent _____	Depth _____	
	Remarks _____		
2.	Material Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of degradation
	Material type _____	Areal extent _____	
	Remarks _____		
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of erosion
	Areal extent _____	Depth _____	
	Remarks _____		
4.	Undercutting	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of undercutting
	Areal extent _____	Depth _____	
	Remarks _____		
5.	Obstructions	Type _____	<input type="checkbox"/> No obstructions
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Size _____		
	Remarks _____		
6.	Excessive Vegetative Growth	Type _____	
	<input type="checkbox"/> No evidence of excessive growth		
	<input type="checkbox"/> Vegetation in channels does not obstruct flow		
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Remarks _____		
D. Cover Penetrations <input type="checkbox"/> Applicable x N/A			
1.	Gas Vents	<input type="checkbox"/> Active <input type="checkbox"/> Passive	
	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs Maintenance	
	<input type="checkbox"/> N/A		
	Remarks _____		
2.	Gas Monitoring Probes	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	<input type="checkbox"/> Evidence of leakage at penetration		
	Remarks _____		
3.	Monitoring Wells (within surface area of landfill)	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning	<input type="checkbox"/> Needs Maintenance	<input type="checkbox"/> N/A
	<input type="checkbox"/> Evidence of leakage at penetration		
	Remarks _____		

4.	Leachate Extraction Wells <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____
5.	Settlement Monuments <input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed <input type="checkbox"/> N/A Remarks _____ _____
E. Gas Collection and Treatment <input type="checkbox"/> Applicable x N/A	
1.	Gas Treatment Facilities <input type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
2.	Gas Collection Wells, Manifolds and Piping <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Gas Monitoring Facilities (<i>e.g.</i> , gas monitoring of adjacent homes or buildings) <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____
F. Cover Drainage Layer <input type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Outlet Pipes Inspected <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____ _____
2.	Outlet Rock Inspected <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____ _____
G. Detention/Sedimentation Ponds <input type="checkbox"/> Applicable x N/A	
1.	Siltation Areal extent _____ Depth _____ <input type="checkbox"/> N/A <input type="checkbox"/> Siltation not evident Remarks _____ _____
2.	Erosion Areal extent _____ Depth _____ <input type="checkbox"/> Erosion not evident Remarks _____ _____
3.	Outlet Works <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____ _____

4.	Dam	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
Remarks _____			
H. Retaining Walls <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Deformations	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
Horizontal displacement _____		Vertical displacement _____	
Rotational displacement _____			
Remarks _____			
2.	Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
Remarks _____			
I. Perimeter Ditches/Off-Site Discharge <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
Areal extent _____		Depth _____	
Remarks _____			
2.	Vegetative Growth	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
<input type="checkbox"/> Vegetation does not impede flow			
Areal extent _____		Type _____	
Remarks _____			
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
Areal extent _____		Depth _____	
Remarks _____			
4.	Discharge Structure	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
Remarks _____			
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Settlement	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
Areal extent _____		Depth _____	
Remarks _____			
2.	Performance Monitoring	Type of monitoring _____	
<input type="checkbox"/> Performance not monitored			
Frequency _____		<input type="checkbox"/> Evidence of breaching	
Head differential _____			
Remarks _____			

IX. GROUNDWATER/SURFACE WATER REMEDIES <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Pumps, Wellhead Plumbing, and Electrical <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____ _____
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____
B. Surface Water Collection Structures, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Collection Structures, Pumps, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____
C. Treatment System <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input checked="" type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters _____ <input checked="" type="checkbox"/> Additive (<i>e.g.</i> , chelation agent, flocculent) <u>LactOil, sodium bicarbonate</u> _____ <input type="checkbox"/> Others _____ <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input checked="" type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks _____ _____

2.	Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____			
3.	Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks _____ _____			
4.	Discharge Structure and Appurtenances <input checked="" type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____			
5.	Treatment Building(s) <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input checked="" type="checkbox"/> Chemicals and equipment properly stored Remarks <u>Treatment trailer in good condition.</u> _____			
6.	Monitoring Wells (pump and treatment remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____			
D. Monitoring Data				
1.	Monitoring Data <input checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality			
2.	Monitoring data suggests: <input type="checkbox"/> Groundwater plume is effectively contained <input checked="" type="checkbox"/> Contaminant concentrations are declining			
D. Monitored Natural Attenuation				
1.	Monitoring Wells (natural attenuation remedy) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input checked="" type="checkbox"/> Good condition <input checked="" type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____			
X. OTHER REMEDIES				
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.				
XI. OVERALL OBSERVATIONS				
A. Implementation of the Remedy				
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <u>The remedy has been constructed and implemented in accordance with the ROD and RD. The remedy</u>				

	<u>is functioning as designed. The goal of the treatment system is to maintain conditions favorable for anaerobic degradation of chlorinated VOCs. Performance monitoring indicates that degradation of parent VOCs is occurring.</u>
B.	Adequacy of O&M
	<p>Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>O&M is ongoing. Annual performance monitoring and quarterly post-injection monitoring data are used to evaluate when addition of amendments (LactOil and sodium bicarbonate) is required. Routine O&M including repair/replacement of pumps, piping, and electrical components is conducted. Monitoring data confirm that the remedy is operating as intended.</u></p>
C.	Early Indicators of Potential Remedy Problems
	<p>Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be</p> <p>_____</p>
D.	Opportunities for Optimization
	<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <p>_____</p> <p>_____</p>

**Photographic Documentation
Site 5 – Groundwater (OU 2)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image (1)

Description:

View facing southeast of the treatment trailer and surrounding areas of Site 5.



Photo: Image (2)

Description:

View facing southeast of the treatment trailer and surrounding area of Site 5.



Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Site 12 (OU11) Soil	Date of inspection: September 28, 2022
Location and Region: Former NASJRB Willow Grove, PA	EPA ID: PAD987277837
Agency, office, or company leading the five-year review: Navy BRAC PMO East	Weather/temperature: High of 69, partly sunny
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> Landfill cover/containment <input checked="" type="checkbox"/> Access controls <input checked="" type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ </div> <div style="width: 45%;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____	
2. O&M staff _____ <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____	
3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.	
4. Other interviews (optional) <input type="checkbox"/> Report attached.	
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)	
1. O&M Documents <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 40%;"> <input checked="" type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs </div> <div style="width: 60%;"> <div style="display: flex; justify-content: space-between;"> <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input type="checkbox"/> N/A </div> <div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> N/A </div> </div> </div> Remarks <u>Documents are stored within the treatment building trailer.</u>	

2.	Site-Specific Health and Safety Plan <input checked="" type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A
3.	O&M and OSHA Training Records Remarks _____	<input checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
4.	Permits and Service Agreements <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits _____ Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
7.	Groundwater Monitoring Records Remarks <u>Files are located in the trailer as well as located in the administrative record.</u>	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
9.	Discharge Compliance Records <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
IV. O&M COSTS				
1.	O&M Organization <input type="checkbox"/> State in-house <input type="checkbox"/> PRP in-house <input type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Other _____	<input type="checkbox"/> Contractor for State <input type="checkbox"/> Contractor for PRP <input checked="" type="checkbox"/> Contractor for Federal Facility		

2.	O&M Cost Records <input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input type="checkbox"/> Funding mechanism/agreement in place Original O&M cost estimate _____ <input type="checkbox"/> Breakdown attached								
Total annual cost by year for review period if available									
<table style="width: 100%; border: none;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 20%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 40%; text-align: right;"><input type="checkbox"/> Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> </table>		From _____	To _____		<input type="checkbox"/> Breakdown attached	Date	Date	Total cost	
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From _____	To _____		<input type="checkbox"/> Breakdown attached						
Date	Date	Total cost							

3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: <u>Construction of the Site 12 landfill cap was completed in September 2022; therefore, O&M costs are not available.</u>
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V. ACCESS AND INSTITUTIONAL CONTROLS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A

	A. Fencing
1.	Fencing damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks <u>The landfill has a fence surrounding it, and there are secured gates to provide access.</u>

	B. Other Access Restrictions
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A Remarks <u>There is no signage; however, the Navy will be providing signage</u>

	C. Institutional Controls (ICs)
1.	Implementation and enforcement Site conditions imply ICs not properly implemented <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Site conditions imply ICs not being fully enforced <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A Type of monitoring (<i>e.g.</i> , self-reporting, drive by) <u>Self-reporting, drive by</u> Frequency <u>Monthly</u> Responsible party/agency <u>Navy Caretaker Office</u> Contact <u>Marty Schy</u> <u>Navy Caretaker Office</u> <u>9/28/22</u> <u>215-293-4888</u> <div style="display: flex; justify-content: space-between; margin-top: -10px;"> Name Title Date Phone no. </div> Reporting is up-to-date <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Reports are verified by the lead agency <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A

	Violations have been reported <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A Other problems or suggestions: <input type="checkbox"/> Report attached <u>Two soil covers have been constructed to prevent exposure of human and ecological receptors to contaminated soils and landfill waste materials, prevent erosion and migration of COCs from the surface, and reduce infiltration of precipitation into the landfill. LUCs will be implemented to prevent activities that would damage or disturb subsurface soils these include construction on, excavation of, or breaching of the soil covers.</u>
2.	Adequacy <input checked="" type="checkbox"/> ICs are adequate <input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A Remarks <u>No evidence of disruption of the cap or subsurface.</u>
D. General	
1.	Vandalism/trespassing <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No vandalism evident Remarks _____
2.	Land use changes on site <input checked="" type="checkbox"/> N/A Remarks _____
3.	Land use changes off site <input checked="" type="checkbox"/> N/A Remarks _____
VI. GENERAL SITE CONDITIONS	
A. Roads <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____
B. Other Site Conditions	
Remarks _____	
VII. LANDFILL COVERS <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Landfill Surface	
1.	Settlement (Low spots) <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Settlement not evident Areal extent _____ Depth _____ Remarks _____
2.	Cracks <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Cracking not evident Lengths _____ Widths _____ Depths _____ Remarks _____

3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> Holes not evident
5.	Vegetative Cover <input checked="" type="checkbox"/> Grass <input type="checkbox"/> Cover properly established <input type="checkbox"/> No signs of stress <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks <u>Additional seeding for erosional control will be added to several areas of Site 12.</u>		
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> N/A Remarks _____		
7.	Bulges Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<input checked="" type="checkbox"/> Bulges not evident
8.	Wet Areas/Water Damage <input checked="" type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Wet areas <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Ponding <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Seeps <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Soft subgrade <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____		
9.	Slope Instability <input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of slope instability Areal extent _____ Remarks _____		
B. Benches <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	Flows Bypass Bench Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
2.	Bench Breached Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
3.	Bench Overtopped Remarks _____	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay

C. Letdown Channels <input type="checkbox"/> Applicable x N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Areal extent _____ Depth _____ Remarks _____ _____	
2.	Material Degradation <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Material type _____ Areal extent _____ Remarks _____ _____	
3.	Erosion <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Areal extent _____ Depth _____ Remarks _____ _____	
4.	Undercutting <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____	
5.	Obstructions Type _____ <input type="checkbox"/> No obstructions <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____ _____	
6.	Excessive Vegetative Growth Type _____ <input type="checkbox"/> No evidence of excessive growth <input type="checkbox"/> Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____ _____	
D. Cover Penetrations <input type="checkbox"/> Applicable x N/A		
1.	Gas Vents <input type="checkbox"/> Active <input type="checkbox"/> Passive <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance x N/A Remarks _____ _____	
2.	Gas Monitoring Probes <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance x N/A Remarks _____ _____	

3.	Monitoring Wells (within surface area of landfill)	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A	Remarks _____ _____
4.	Leachate Extraction Wells	<input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> Evidence of leakage at penetration <input type="checkbox"/> Needs Maintenance <input checked="" type="checkbox"/> N/A	Remarks _____ _____
5.	Settlement Monuments	<input type="checkbox"/> Located <input type="checkbox"/> Routinely surveyed <input checked="" type="checkbox"/> N/A	Remarks _____ _____
E. Gas Collection and Treatment <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Gas Treatment Facilities	<input type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance	Remarks _____ _____
2.	Gas Collection Wells, Manifolds and Piping	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance	Remarks _____ _____
3.	Gas Monitoring Facilities (<i>e.g.</i> , gas monitoring of adjacent homes or buildings)	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A	Remarks _____ _____
F. Cover Drainage Layer <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Outlet Pipes Inspected	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A	Remarks _____ _____
2.	Outlet Rock Inspected	<input type="checkbox"/> Functioning <input type="checkbox"/> N/A	Remarks _____ _____
G. Detention/Sedimentation Ponds <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Siltation Areal extent _____ Depth _____	<input type="checkbox"/> N/A	Remarks _____ _____

2.	Erosion	Areal extent_____	Depth_____
	<input type="checkbox"/> Erosion not evident		
	Remarks_____		
3.	Outlet Works	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks_____		
4.	Dam	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks_____		
H. Retaining Walls <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Deformations	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
	Horizontal displacement_____	Vertical displacement_____	
	Rotational displacement_____		
	Remarks_____		
2.	Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
	Remarks_____		
I. Perimeter Ditches/Off-Site Discharge <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
	Areal extent_____	Depth_____	
	Remarks_____		
2.	Vegetative Growth	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
	<input type="checkbox"/> Vegetation does not impede flow		
	Areal extent_____	Type_____	
	Remarks_____		
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
	Areal extent_____	Depth_____	
	Remarks_____		
4.	Discharge Structure	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks_____		
VIII. VERTICAL BARRIER WALLS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Settlement	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
	Areal extent_____	Depth_____	
	Remarks_____		

2.	Performance Monitoring Type of monitoring _____ <input type="checkbox"/> Performance not monitored Frequency _____ <input type="checkbox"/> Evidence of breaching Head differential _____ Remarks _____ _____
IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Pumps, Wellhead Plumbing, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____ _____
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____
B. Surface Water Collection Structures, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
1.	Collection Structures, Pumps, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____
C. Treatment System <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	

1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters _____ <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks _____ _____
2.	Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks _____ _____
4.	Discharge Structure and Appurtenances <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
5.	Treatment Building(s) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks _____ _____
6.	Monitoring Wells (pump and treatment remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____
D. Monitoring Data	
1.	Monitoring Data x Is routinely submitted on time x Is of acceptable quality
2.	Monitoring data suggests: x Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining
D. Monitored Natural Attenuation	

1.	Monitoring Wells (natural attenuation remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>Groundwater is not being monitored at this time. The ROD is only in place for soils, and a future groundwater ROD will be submitted.</u>
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	Implementation of the Remedy
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). 	
B.	Adequacy of O&M
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. 	
C.	Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. 	
D.	Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. 	

**Photographic Documentation
Site 12 – Soil (OU 11)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image (1)

Description:

View facing southwest of the entrance area.



Photo: Image (2)

Description:

View facing southwest of the entrance area long the fencing.



**Photographic Documentation
Site 12 – Soil (OU 11)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image (3)

Description:

View facing southwest of the area near 12MW04 cluster. Additional seeding to occur in back area (bare spots).



Photo: Image (4)

Description:

View facing northeast of the area across the access road.



**Photographic Documentation
Site 12 – Soil (OU 11)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image (5)

Description:

View facing to the southwest of the southwest portion of the site from the fence.



Photo: Image (7)

Description:

View facing southwest for the southwest portion of the Site. Area that is to be reseeded following final completion activities.



**Photographic Documentation
Site 12 – Soil (OU 11)
Former Naval Air Station Joint Reserve Base
Willow Grove, Pennsylvania**



Photo: Image (8)

Description:

View facing northwest on the southwest portion of the site with the area to be reseeded to the west.



Photo: Image (12)

Description:

View facing east on the northeast portion of the site.

