

FINAL FOURTH FIVE-YEAR REVIEW

**NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY**

Prepared for:



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List of Acronyms and Abbreviations

µg/L	microgram per liter
1,1,1-TCA	1,1,1-trichloroethane
1,2-DCA	1,2-dichloroethane
1,2-DCE	1,2-dichlorethene
AFFF	Aqueous Film-Forming Foam
ARAR	Applicable or Relevant and Appropriate Requirements
AS/SVE	Air Sparge/Soil Vapor Extraction
B&RE	Brown & Root Environmental
BCSRA	Brownfield and Contaminated Site Remediation Act
BMP	Base Master Plan
CCR	Construction Completion Reports
CEA/WRA	Classification Exception Area/Well Restriction Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminants of Concern
DCA	1,1-dichloroethane
DoD	Department of Defense
DPDO	Defense Property Disposal Office
EPIC	Environmental Photographic Interpretation Center
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERA	Ecological Risk Assessments
ESD	Explanation of Significant Differences
ESQD	Explosive Safety Quantity Distance
FFA	Federal Facility Agreement
FS	Feasibility Study
FWEC	Foster Wheeler Environmental Corporation
FYR	Five-Year Review
GWQS	Ground Water Quality Standard
GWSL	Ground Water Screening Levels
HHRA	Human Health Risk Assessments
HI	Hazard Index
IC	Institutional Controls
IGWQS	Interim Groundwater Quality Standards
IGWSL	Impact to Groundwater Screening Levels
IRA	Interim Remedial Action
J	Estimated
LTM	Long-term monitoring
LUC	Land Use Control
LUC RD	Land Use Control Remedial Designs
MCL	Maximum Contaminant Level

List of Acronyms and Abbreviations (Cont.)

mg/kg	milligrams per kilogram
MIDLANT	Mid-Atlantic
MSC	Military Sealift Command
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NC	Not calculated
ND	Analyte not detected
NE	No federal maximum contaminant level (primary drinking water standard) established for this constituent
NIRIS	Naval Installation Restoration Information Solution
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
NRDCSCC	Non-Residential Direct Contact Soil Cleanup Criteria
NWS	Naval Weapons Station
O&M	Operation and Maintenance
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PQLs	Practical Quantitation Levels
RACR	Remedial Action Completion Report
RAO	Remedial Action Objective
RAR	Remedial Action Report
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDCSCC	Residential Direct Contact Soil Cleanup Criteria
RDCSRS	Residential Direct Contact Soil Remediation Standards
RG	Remedial Goal
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
SI	Site Investigation
Sovereign	Sovereign Consulting
SRS	Soil Remediation Standards
SSL	Soil Screening Levels
TAL	Target Analyte List
TBC	To-Be-Considered

List of Acronyms and Abbreviations (Cont.)

TCDD	dioxin 2,3,7,8-Tetrachlorodibenzo-p-dioxin
TCE	Trichloroethylene
TCL	Target Compound List
TEF	Toxicity Equivalence Factors
TN&A	TN & Associates
TT	Tetra Tech
TT NUS	Tetra Tech NUS
U	Below laboratory reporting limit
UU/UE	Unlimited use/unrestricted exposure
VI	Vapor Intrusion
VITG	Vapor Intrusion Technical Guidance
VOC	Volatile Organic Compound
Weston	Roy F. Weston Inc.

Executive Summary

The Department of the Navy (Navy), through the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic (MIDLANT), conducted this fourth five-year review (FYR) for Naval Weapons Station (NWS) Earle in Colts Neck, New Jersey, required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA §121(c), as amended; and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR).

The report has been prepared in accordance with the U.S. Environmental Protection Agency (EPA) Comprehensive Five-Year Review Guidance and summarizes the evaluation of remedies and remedial actions that resulted in hazardous substances, pollutants, or contaminants remaining at sites above levels which allow for unlimited use and unrestricted exposure (UU/UE), and for which there is a record of decision (ROD) in place. The following table summarizes the sites that require a FYR.

Table ES-1: Five-Year Review Site Summary

Operable Unit	Site Number	Site Name
1	4	Landfill West of "D" Group
	5	Landfill West of Army Barracks
2	19	Paint Chip and Sludge Disposal Site
3	26	Explosive "D" Washout Area (TCE Plume)
4	20	Grit Blasting Area at Building 544
	23	Paint Disposal Area, Building D-5
	27	Projectiles Refurbishing Area
5	13	Defense property Disposal Office Yard
6	3	Landfill SW of "F" Group
	10	Scrap Metal Landfill
7	26	Explosive "D" Washout Area (PCE Plume)
8	1	Former Ordnance Demilitarization Site
9	6	Landfill West of Normandy Road
	15	Sludge Disposal Site
	17	Disposal Site Behind Training Barge

The objective of the FYR is to evaluate the effectiveness of the remedies to determine if they continue to protect human health and the environment in accordance with the requirements set forth in the RODs. This evaluation encompasses a review of various reports and documents pertaining to post-remedy implementation activities, analytical data, and findings. The community was notified about the review process through public notices. On April 4, 2017, a public notice was placed in the Asbury Park Press. A copy of the public notice is included in Appendix B.

Referring to Table ES-2, the results of this FYR (2017) indicate that:

- The remedies at all 15 sites are protective.
- The remedies at Sites 3, 4, 5, 10, 17, 19, 26 (both OU-3 and OU-7) are protective in the short-term

Formal protectiveness statements are provided on the Five-Year Review Summary Form as well as in each respective section of the report.

Table ES-2: Remedy and Protectiveness Summary

Operable Unit	Site Number	Site Name	CERCLA Status	Remedy Components	Remedy in Place?	Remedy Recommendation/ Comments	Remedy Protectiveness
1	4	Landfill West of "D" Group	ROD, 1997	Cap; LUC - Landfill Contents and Groundwater; LTM	Yes*	None	Short Term Protective
	5	Landfill West of Barracks	ROD, 1997	Cap; LUC - Landfill Contents and Groundwater; LTM	Yes*	None	Short Term Protective
2	19	Paint Chip and Sludge Disposal Site	ROD, 1997	Soil and Sediment Excavation; LUC - Groundwater; LTM	Yes	UU/UE pending – Site Closure RACR planned	Short Term Protective
3	26	Explosive "D" Washout Area (TCE Plume)	ROD, 1998	Soil Excavation; AS/SVE; LUC - Groundwater; LTM	Yes*	None	Short Term Protective
4	20	Grit Blasting Area at Building 544	ROD, 1999	LUC - Soil	Yes	UU/UE achieved– Site Closure RACR planned	Protective
	23	Paint Disposal Area, Building D-5	ROD, 1999	LUC - Soil	Yes	UU/UE pending – Site Closure RACR planned	Protective
	27	Projectiles Refurbishing Area	ROD, 1999	LUC - Soil	Yes	UU/UE pending – Site Closure RACR planned	Protective
5	13	Defense Property Disposal Office Yard	ROD, 2004	Cap; Excavation/ Consolidation of Soil and Sediment; LUC - Landfill Contents and Groundwater; Fencing and Signage; LTM	Yes	None	Protective
6	3	Landfill SW of "F" Group	ROD, 2006	Removal of protruding landfill contents; Cap; LUC - Landfill Contents and Groundwater; Fencing; signage, LTM	Yes	None	Short Term Protective
	10	Scrap Metal Landfill	ROD, 2006	Cap; LUC- Landfill Contents and Groundwater; Fencing; signage, LTM	Yes	None	Short Term Protective
7	26	Explosive "D" Washout Area (PCE Plume)	ROD, 2007	LUC - Groundwater; LTM	Yes*	None	Short Term Protective
8	1	Former Ordnance Demilitarization	ROD, 2005	LUC - Groundwater; LTM; Notation in the BMP	Yes	UU/UE achieved – OU Closure RACR concurrence pending	Protective
9	6	Landfill West of Normandy Road	ROD, 2007	LUC - Groundwater; Fencing; LTM	Yes	None	Protective
	15	Sludge Disposal Site	ROD, 2007	LUC - Soil; Fencing and Signage; Soil LTM	Yes	None	Protective
	17	Disposal Site Behind Training Barge	ROD, 2007	LUC - Groundwater; Fencing; LTM	Yes*	None	Short Term Protective

* Sampling/study underway to support CEA determination

Authorizing Signature

By my signature below, I approve the issuance of this Five-Year Review for Naval Weapons Station Earle, Colts Neck, New Jersey.



P.A. Fuller
Captain, U.S. Navy
Commanding Officer


Date

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1.0 Introduction

The Department of the Navy (Navy), through the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic (MIDLANT), is conducting this five-year review (FYR) of the remedial actions implemented at Naval Weapons Station (NWS) Earle in Colts Neck, New Jersey.

EPA ID Number: NJ0170022172

RCRA/HSWA Permit Number: HWP050001

Other ID(s): 07722NVLWP201HW

1.1 Purpose

This is the fourth FYR for NWS Earle, and is a statutory review required because hazardous substances, pollutants, and contaminants remain at each operable unit (OU) above levels that allow for unlimited use/unrestricted exposure (UU/UE). The purpose of this FYR is to evaluate implementation and performance of remedies at 9 OUs comprising 15 sites to determine if they are protective of human health and the environment. The methods, findings, and conclusions of the review are documented in this FYR report. In addition, this report will document any issues identified during the previous FYR (2013) and present the follow-up actions to address them. The Five-Year Review Summary Form for NWS Earle is shown as Table 1-1.

Table 1-1: Five-Year Review Form

Site Identification				
Site Name: Naval Weapons Station Earle				
EPA ID: NJ0170022172				
Region: 2	State: NJ	City/County: Colts Neck/Monmouth		
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," enter Agency name]: NAVFAC Mid-Atlantic				
Author name: Rachel Dunleavy				
Author affiliation: Department of the Navy				
Review period: 2/27/2017 – 2/8/2018				
Date of site inspection: 6/5/2017				
Type of review: Statutory				
Review number: 4				
Triggering action date: 3/25/2013				
Due date (five years after triggering action date): 3/25/2018				

1.2 Authority for Conducting the Five-Year Review

This FYR was conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section §121(c), as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan in Title 40 Code of Federal Regulations §300.430(f)(4)(ii).

Consistent with Executive Order 12580, the Secretary of Defense is responsible for ensuring that FYRs are conducted at federal facility sites under jurisdiction, custody, or control of the Department of Defense (DoD). The Navy is the lead agency responsible for this FYR at NWS Earle, working with the U.S. Environmental Protection Agency (EPA) Region 2 under a Federal Facility Agreement (FFA) signed by all parties on February 1991. The Navy also coordinates the FYR with the New Jersey Department of Environmental Protection (NJDEP).

The 2018 Five-Year Review was performed on behalf of NAVFAC by 3E Consultants, Inc. under Contract Number N40085-16-D-5512. The review began on February 27, 2017. Key participants are shown in Table 1-2.

Table 1-2: Key Participants

Participant	Affiliation	Role
Rachel Dunleavy	NAVFAC Mid-Atlantic	Remedial Project Manager
Scott Fleming	NWS Earle	Remedial Project Manager
Amy Twitty	3E Consultants	FYR Project Manager
Jennifer O'Keefe	3E Consultants (subcontractor)	Licensed Site Remediation Professional
Kyle Eden	3E Consultants	Report preparation and site inspection
Nicole Loos	3E Consultants (subcontractor)	Site inspections

1.3 Previous Five-Year Reviews

The triggering action for the first FYR was initiation of remedial action at OU-1, which began February 8, 1998. The Navy signed the first, second and third FYR reports on February 9, 2004, May 2008, and March 25, 2013, respectively.

1.4 Sites Included in this Five-Year Review

Table 1-3 lists the operable units/sites included in this FYR, which are shown on Figure 1-1.

Table 1-3: Operable Units/Sites Included in this Five-Year Review

Operable Unit (OU)	Site Number	Site Name	Restricted Use?	Proposed/Ongoing Changes?	Type of Review
1	4	Landfill West of "D" Group	Yes - Industrial	None	Statutory
	5	Landfill West of Army Barracks	Yes – Industrial	None	Statutory
2	19	Paint Chip and Sludge Disposal Site	Yes - Industrial	UU/UE pending – Site Closure RACR planned	Statutory
3	26	Explosive "D" Washout Area (TCE Plume)	Yes - Industrial	None	Statutory

Table 1-3: Operable Units/Sites Included in this Five-Year Review

Operable Unit (OU)	Site Number	Site Name	Restricted Use?	Proposed/Ongoing Changes?	Type of Review
4	20	Grit Blasting Area at Building 544	Yes - Industrial	UU/UE achieved – Site Closure RACR planned	Statutory
	23	Paint Disposal Area, Building D-5	Yes - Industrial	UU/UE pending – Site Closure RACR planned	Statutory
	27	Projectiles Refurbishing Area	Yes - Industrial	UU/UE pending – Site Closure RACR planned	Statutory
5	13	Defense property Disposal Office Yard	Yes - Industrial	None	Statutory
6	3	Landfill SW of “F” Group	Yes - Industrial	None	Statutory
	10	Scrap Metal Landfill	Yes - Industrial	None	Statutory
7	26	Explosive “D” Washout Area (PCE Plume)	Yes - Industrial	None	Statutory
8	1	Former Ordnance Demilitarization Site	Yes - Industrial	UU/UE achieved – Site Closure RACR concurrence pending	Statutory
9	6	Landfill West of Normandy Road	Yes - Industrial	None	Statutory
	15	Sludge Disposal Site	Yes - Industrial	None	Statutory
	17	Disposal Site Behind Training Barge	Yes - Industrial	None	Statutory

1.5 Sites Not Included in this Five-Year Review

Although 13 OUs are present at NWS Earle, only 9 are subject of this review as presented above. The following table presents the OUs and associated sites which are excluded from the review and the basis for their exclusion.

Table 1-4: Operable Units/Sites Not Included in this Five-Year Review

Operable Unit (OU)	Site Number	Site Name	Basis for Exclusion
4	14	Defense Property Disposal Office Warehouse (Mercury Spill Area)	No Further Action
	22	Paint Sludge Disposal (Building D-2)	No Further Action
	24	Closed Pistol Range	No Further Action
	25	Closed Pistol Range	No Further Action
	29	PCB Spill Site	No Further Action
8	11	Contract Ordnance Disposal Area	No Further Action
9	12	Battery Acid Spill Site (i.e., Battery Storage Area)	No Further Action
10	7	Landfill South of “P” Barricades	No Further Action
11	9	Landfill Southeast of “P” Barricades	No Further Action
12	41	MSC Van Parking Area (EPIC Site L)	Pre-ROD
13	46	Military Sealift Command Fire Training School (EPIC Site Q)	Pre-ROD

Table 1-4: Operable Units/Sites Not Included in this Five-Year Review

Operable Unit (OU)	Site Number	Site Name	Basis for Exclusion
NA	2	Active Ordnance Demilitarization Site	RCRA Site
	8	Landfill East of Building S-186	No Further Action
	18	Demilitarization Furnace	Closed under RCRA
	21	Baghouse & Cyclone Dust Storage	Closed under RCRA
	28	Waste Oil Tank West of Building C-14	No Further Action
	30	EPIC Site A	No Further Action
	31	EPIC Site B	No Further Action
	32	EPIC Site C	No Further Action
	33	EPIC Site D	No Further Action
	34	EPIC Site E	No Further Action
	35	C-50 Roundhouse Area	No Further Action
	36	EPIC Site G	No Further Action
	37	EPIC Site H	No Further Action
	38	EPIC Site I	No Further Action
	39	EPIC Site J	No Further Action
	40	EPIC Site K	No Further Action
	42	EPIC Site M	No Further Action
	43	EPIC Site N	No Further Action
	44	EPIC Site O	No Further Action
	45	EPIC Site P	No Further Action
	47	Pesticide Shop, Building S-86	No Further Action
	48	Mine Battery Site at West Pond Area	No Further Action
	16	Building C-50 Diesel Fuel Line/EPIC Site F	New Jersey Site Remediation Program Lead—Ongoing

1.6 Facility Overview

NWS Earle is an active Navy facility in Monmouth County, New Jersey, located approximately 47 miles south of New York City. NWS Earle was commissioned as a Naval Ammunition Depot in 1943 with the primary responsibility of furnishing ammunition to the Atlantic Fleet. The current mission of NWS Earle is to operate and maintain a coastal ordnance handling and processing facility supporting Atlantic Fleet, U.S. Coast Guard, and DoD requirements while providing force protection, logistics support, and host services for facility personnel as well as home-ported and visiting ships. An estimated 1,200 people either work or live at NWS Earle. NWS Earle is an active facility and only persons with proper military

clearance may access the base. Navy personnel conduct routine perimeter patrols to ensure that unauthorized activities are not occurring.

The station consists of two areas—the 10,248-acre Main Base (Mainside Area, Figure 1-2), located inland, and the 706-acre Waterfront Area (Figure 1-3). The Mainside Area is in Colts Neck, Howell, and Wall Townships, and Tinton Falls Borough. The surrounding area includes agricultural land, vacant land, and low-density housing. Land use within the Mainside Area consists of offices, workshops, warehouses, residences, recreational space, open space, and undeveloped land. A large undeveloped portion of the Mainside Area is associated with ordnance operations, including storage; this portion of the Base is encumbered by Explosive Safety Quantity Distance (ESQD) arcs. ESQD arcs provide the minimum separation distance for intentional or unintentional detonations of explosive materials and limit land use within the areas. The Mainside Administration and Housing area and the Waterfront Administrative area are outside ESQD arcs, and are used for offices, base support, housing, and recreational facilities. Any future development would be expected to occur in one of these areas unless the development had an ordnance-specific use.

Table 1-5 summarizes information related to each OU/site referenced in this FYR, including current and former uses, sources of contamination, impacted media, and remedy components. Additional details are discussed in the individual sections of the FYR report.

Table 1-5: Contaminant and Selected Remedy Summary

Operable Unit	Site Number	Site Name/ Former Use	Source of Contamination	Impacted Media (Soil, Groundwater, Surface Water, Sediment) or Waste Addressed	Selected Remedy	Remedy in Place?	Current Use
1	4	Landfill West of "D" Group	Domestic and industrial waste	Landfill waste, Groundwater	Cap; LUC — Landfill Contents and Groundwater; LTM	Yes*	Inactive Landfill
	5	Landfill West of Army Barracks	Domestic and industrial waste	Landfill waste, Groundwater	Cap; LUC — Landfill Contents and Groundwater; LTM	Yes*	Inactive Landfill
2	19	Paint Chip and Sludge Disposal Site	Paint chips, sludges, paint slurries, solvent residues	Soil, Sediment, Groundwater	Soil and Sediment Excavation; LUC — Groundwater; LTM	Yes	Vacant
3	26	Explosive "D" Washout Area (TCE Plume)	Spent solvents, wash waters, and overflow discharged to the GB-1 percolation pit/leach system	Soil, Groundwater	Soil Excavation; AS/SVE; LUC — Groundwater; LTM	Yes*	Vacant
4	20	Grit Blasting Area at Building 544	Sand blast grit and paint chips	Soil	LUC — Soil	Yes	Vacant
	23	Paint Disposal Area, Building D-5	Paint wastes	Soil	LUC — Soil	Yes	Vacant
	27	Projectiles Refurbishing Area	Paint chips, oily rags, spent sandblasting shot, paint sludge	Soil	LUC — Soil	Yes	Vacant
5	13	Defense Property Disposal Office Yard	Industrial waste, battery acids	Landfill waste, Soil, Sediment, Groundwater	Cap; Excavation/Consolidation of Soil and Sediment, LUC — Landfill Contents and Groundwater; Fencing and Signage; LTM	Yes	Inactive Landfill
6	3	Landfill SW of "F" Group	Domestic and industrial waste	Landfill waste, Groundwater	Removal of protruding landfill contents; Cap; LUC — Landfill Contents and Groundwater; Fencing; signage, LTM	Yes	Inactive Landfill
	10	Scrap Metal Landfill	Scrap metal	Landfill waste, Groundwater	Cap; LUC — Landfill Contents and Groundwater; Fencing; signage, LTM	Yes	Inactive Landfill

Table 1-5: Contaminant and Selected Remedy Summary

Operable Unit	Site Number	Site Name/ Former Use	Source of Contamination	Impacted Media (Soil, Groundwater, Surface Water, Sediment) or Waste Addressed	Selected Remedy	Remedy in Place?	Current Use
7	26	Explosive "D" Washout Area (PCE Plume)	Spent solvents, wash waters, and overflow discharged to the GB-1 percolation pit/leach system	Groundwater	LUC — Groundwater; LTM	Yes*	Vacant
8	1	Former Ordnance Demilitarization Site	Burning/detonation of ordnance	Groundwater	LUC — Groundwater; LTM; Notation in the BMP	Yes	Vacant
9	6	Landfill West of Normandy Road	Industrial waste (lumber, glass, paper, packing material, paint, solvent)	Groundwater	LUC — Groundwater; Fencing; LTM	Yes	Vacant
	15	Sludge Disposal Site	Bilge sludge	Soil	LUC — Soil; Fencing and Signage; Soil LTM	Yes	Vacant
	17	Disposal Site Behind Training Barge	Construction waste and used equipment	Soil and Groundwater	LUC — Groundwater; Fencing; LTM	Yes*	Southern portion – parking; northern portion – vacant

Notes:

* Sampling/study underway to support CEA/WRA determination

1.7 Document Review

This FYR assessed site-specific documentation including but not limited to prior FYRs, Site Investigation (SI) reports, Remedial Investigation (RI) reports, Records of Decision (ROD), Construction Completion Reports (CCR), Feasibility Studies (FS), Remedial Action Completion Reports (RACR), and Technical Memorandums. The documents included the following information useful to the FYR process such as human health risk assessments (HHRA), ecological risk assessments (ERA), interim and post-ROD remedial actions, selected remedies, contaminants of concern (COC), and ARARs.

To confirm remedies are operational and functioning as intended, land use control remedial designs (LUC RD), classification exception area/well restriction area (CEA/WRA) documentation, annual maintenance and monitoring reports, the NWS Earle Base Master Plan (BMP) and BMP Addendum were reviewed. Additional information sources such as project team meeting minutes, quarterly reports, and regulatory concurrence documents/emails were reviewed for additional information regarding the sites' remedies and/or progress during this FYR period.

1.8 Site Inspection

The FYR site inspections were performed from June 5 through 9, 2017. Inspection findings have been incorporated into each site section discussion. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A. Interviews and input from the following personnel were used to complete the inspection forms; findings have been incorporated into this FYR as applicable.

- Helen Shannon, EPA Region 2
- Erica Bergman, NJDEP
- Scott Fleming, NWS Earle

1.9 Community Involvement

1.9.1 Public Notice and Fact Sheet for Five-Year Review

Public meetings and comment periods are announced via newspaper publication and held by the Navy as needed. Additional meeting and/or distribution of information will be held and arranged if requested by the local community. In recent years, the Navy has received little or no response when Restoration Advisory Board meetings have been announced. A public notice announcing the initiation of this FYR was published in the Asbury Park Press on April 4, 2017. The public notice and an affidavit of publication are provided as Appendix B. At the conclusion of the FYR, a notice will be published in the Asbury Park Press indicating that the final report and a fact sheet summarizing protectiveness findings will be available for the public in the Administrative Record.

1.9.2 Final Five-Year Review

The estimated completion date for the Final Five-Year Review report is March 23, 2018. The report will be placed in the Naval Installation Restoration Information Solution (NIRIS) database and in the Administrative Record File for NWS Earle, which can be found at the following location:

Monmouth County Library – Eastern Branch
1001 Route 35
Shrewsbury, New Jersey 07702
866.941.8188

or the public website at: <http://go.usa.gov/kYQW>

1.10 Applicable or Relevant and Appropriate Requirements, To-Be-Considered Criteria, Site-Specific Action Levels, and Risk Assessment

The FYR process requires evaluation of ARARs originally used in remedy decision-making processes and any new ARARs that may have become applicable since the time of ROD. The process also requires review of any new risk assessment methodologies that may affect the protectiveness of the remedy.

1.10.1 Applicable or Relevant and Appropriate Requirements and To-Be-Considered Criteria

In performing the FYR for compliance with ARARs, only those ARARs and TBC criteria that address the protectiveness of the remedy are reviewed and, if protectiveness is impacted, discussed in the Question B Technical Evaluation.

1.10.1.1 Chemical-Specific ARARs and TBCs

Chemical-specific ARARs are health- or risk-based numerical values or methodologies that result in numerical values representing an acceptable concentration of a chemical that may remain in the environment without causing unacceptable risk. Federal- or state-specific chemical ARARs were used for remedial goals for all sites included in this FYR. No remedial goals were based on site-specific risk-based values. Chemical-specific ARARs and TBCs that are currently in effect are provided below:

- GWQSS – promulgated in New Jersey Administrative Code (N.J.A.C.) Title 7 Chapter 9C (7:9C).
- Soil Remediation Standards (SRS) – promulgated in N.J.A.C. 7:26D (September 2017).
- Maximum Contaminant Levels (MCL)
- Ground Water Screening Levels (GWSL)

Remedial goals are identified for each site in each individual section; goals are compared to current chemical-specific ARARs prior to Question B. Changes in ARARs that affect the protectiveness of the remedy are discussed further in Question B. Upon review of the IRIS Program Multi-Year Agenda (EPA 2015), it is acknowledged that some site COCs are being re-evaluated and clean up values may change and need to be considered in future FYRs.

1.10.1.2 Action-Specific and Location-Specific ARARs

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. Remedies at sites included in this FYR would not be affected by action-specific ARARs, nor would the ARAR changes call their protectiveness into question. Outstanding remedy implementation tasks include LUC RDs and CEA/WRAs; changes to action-specific ARARs would not result in a change in the determination that ICs would be protective.

Location-specific ARARs are restrictions on hazardous substances or the conduct of the response activities solely based on their location in a special geographic area. Response activities are complete. Therefore, changes in location specific ARARs would not affect the protectiveness of the remedy.

1.10.2 Risk Assessment

HHRA evaluations are discussed in the Question B response for each individual site.

Ecological risk assessments were not reevaluated as ecological risk was not determined to be present at unacceptable levels in the RODs or was determined to be eliminated after implementation of the

remedy for the sites included in this FYR. A summary of the reasoning is provided in the Question B response for each site.

1.10.3 Vapor Intrusion

Consistent with OSWER Directive 9200.2-84, current site conditions were evaluated for VI, which is the general term given to migration of VOCs from contaminated soil and groundwater into indoor air spaces of overlying buildings. The third FYR at NWS Earle did not identify occupied buildings immediately proximal to wastes or contaminated groundwater; therefore, no further evaluation of the vapor intrusion pathway was required. A base-level evaluation was performed to confirm that no changes in plume extent or construction of new buildings have occurred to warrant a VI consideration.

For sites with VOC groundwater contamination, the first step of the screening, which was conducted in accordance with the VITG, consisted of a determination as to the presence of buildings within contaminant-specific specified distances of the plume. A distance of 30 feet was used to evaluate sites with petroleum-related VOCs; a distance of 100 feet was used for sites with chlorinated VOCs. If buildings were identified within the specified distances, the second step was to determine if VOC concentrations were present above GWSLs in monitoring wells located 30 or 100 feet from the building. As discussed in the site-specific sections of this report, of the three sites with VOC groundwater contamination (Sites 4, 13, and 26), only one was identified (Site 26) with GWSL exceedances proximal to a structure. However, the structure is unoccupied, and demolition of the building is pending; therefore, no VI concerns are present at NWS Earle.

1.10.4 Emerging Contaminants

The sites included in this FYR were reviewed for the potential presence of emerging contaminants including dioxins/furans, per- and polyfluoroalkyl substances (PFAS), and 1,4-dioxane. A summary of the emerging contaminants and review actions taken is summarized below.

1.10.4.1 Dioxins and Furans

Dioxins and furans or dioxin/furan-like compounds are potentially present where burning/combustion activities have occurred. EPA has reviewed toxicological data and literature on the health effects of dioxin 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and related compounds as a class of emerging contaminants since the Third Five-Year Review.

In February 2012, EPA released the final Reanalysis of Key Issues Related to Dioxin Toxicity. Toxicity data published were integrated into the Integrated Risk Information Systems database. The development of November 2015 EPA Regional Screening Levels for Chemical Contaminants at Superfund Sites criteria updates incorporate the Integrated Risk Information Systems database.

TCDD is one of the most toxic members of the dioxin class of compounds and has a robust toxicological database (EPA February 2012). Therefore, TCDD may be used conservatively as a surrogate compound in cases where unknown mixtures of dioxin-like compounds may have occurred due to historical uses related to former landfills. Recommended toxicity equivalence factors (TEF) methodology for risk assessments involving mixtures of dioxins, furans, and polychlorinated biphenyls (PCB) was published in December 2010. No historical dioxin data were available for review; however, NWS Earle engineering personnel reviewed the base's hazardous inventory database as part of this FYR, and no dioxin-containing materials were identified. In addition, the Environmental Division Director and Hazardous Waste Manager were not aware of any dioxin-containing materials currently or historically at NWS Earle.

1.10.4.2 Per- and Polyfluoroalkyl Substances

PFAS are emerging contaminants commonly associated with aqueous film-forming foam (AFFF) and plating shop applications. The Naval Research Laboratory developed AFFF for firefighting use on Navy ships and submarines; Perfluorooctanoic acids/perfluorooctyl sulfonates were used in AFFF from the 1960s to 2001. A basewide PFAS preliminary assessment is currently being developed and the findings of the PA may result in PFAS investigations at select areas of NWS Earle. The Navy has conducted PFAS investigations at two areas of NWS Earle that are not subject of this review; investigations are ongoing.

1.10.4.3 1,4-Dioxane

1,4-Dioxane was used as a solvent stabilizer, most commonly associated with 1,1,1-trichloroethane (1,1,1-TCA). Therefore, 1,4-dioxane is considered potentially present at sites contaminated with this chlorinated solvent and its daughter compounds (EPA January 2014) and at landfill sites where disposal of solvents potentially containing 1,4-dioxane may have occurred.

Historical data were reviewed for 1,1,1-TCA and 1,1-dichloroethane (DCA) detections. 1,1,1-TCA was identified in trace concentrations (< 5 micrograms per liter [µg/L]) at Site 13—it was encountered in 4 out of 26 samples. 1,1,1-TCA was not retained as a COC and is not monitored in LTM. In the absence of a 1,1,1-TCA/1,1-DCA plume, no further evaluation of 1,4-dioxane is recommended for Site 13.

1.3.5 Climate Change

The impact of climate change and potential effects on site remedies was considered for all sites subject of this review per the decision tree provided in the Region 2 Guidance for Incorporating Climate Change considerations in Five Year Reviews (U.S. EPA 2014). The sites were evaluated for evidence of the following conditions:

- Contaminant release or migration from remedies due to water level rise or flooding.
- Remedy impairment due to water level rise, flooding, storms and/or winds.
- Other site changes that may be related to any of the following climate change impacts:
- Sea level rise
- Increasing frequency of heavy precipitation events
- Increasing intensity of storms (winds/precipitation/storm surge)
- Increasing risk of floods
- Changes in temperature

Groundwater elevation data was reviewed for those sites with ongoing LTM and in no case were elevations statistically different from past elevations. NJDEP's Division of Science, Research, and Environmental Health Environmental Trends Report (NJDEP 2017) was consulted for state-wide sea level, precipitation, storms, floods, and temperature statistics. The report indicated a statistically increasing trend for all events/conditions evaluated. Potential site impacts from the regional climate change metrics have been considered at all sites subject of this review. Although the climate change report noted statistical changes, those changes are not expected to impact site remedies now or in the near future.

1.11 Next Five-Year Review

The next FYR report for NWS Earle is required 5 years from the completion date of this review on March 25, 2023.

1.12 References

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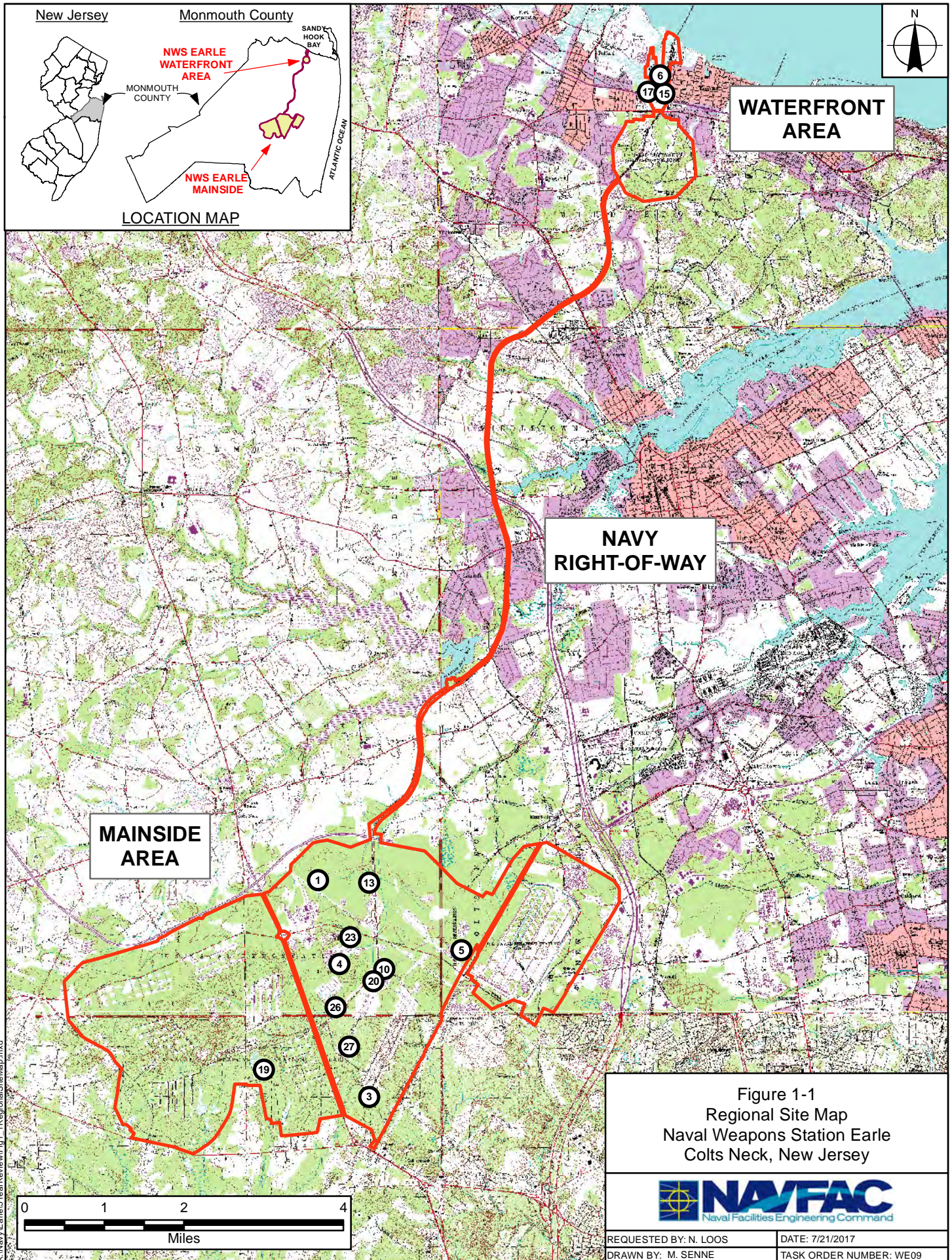
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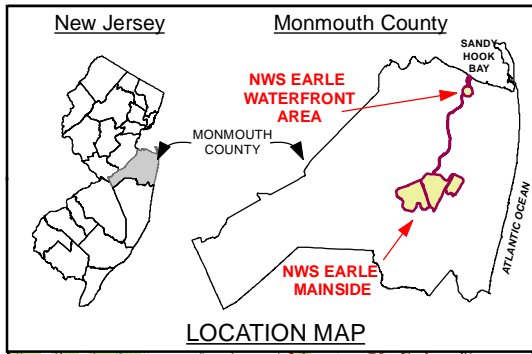
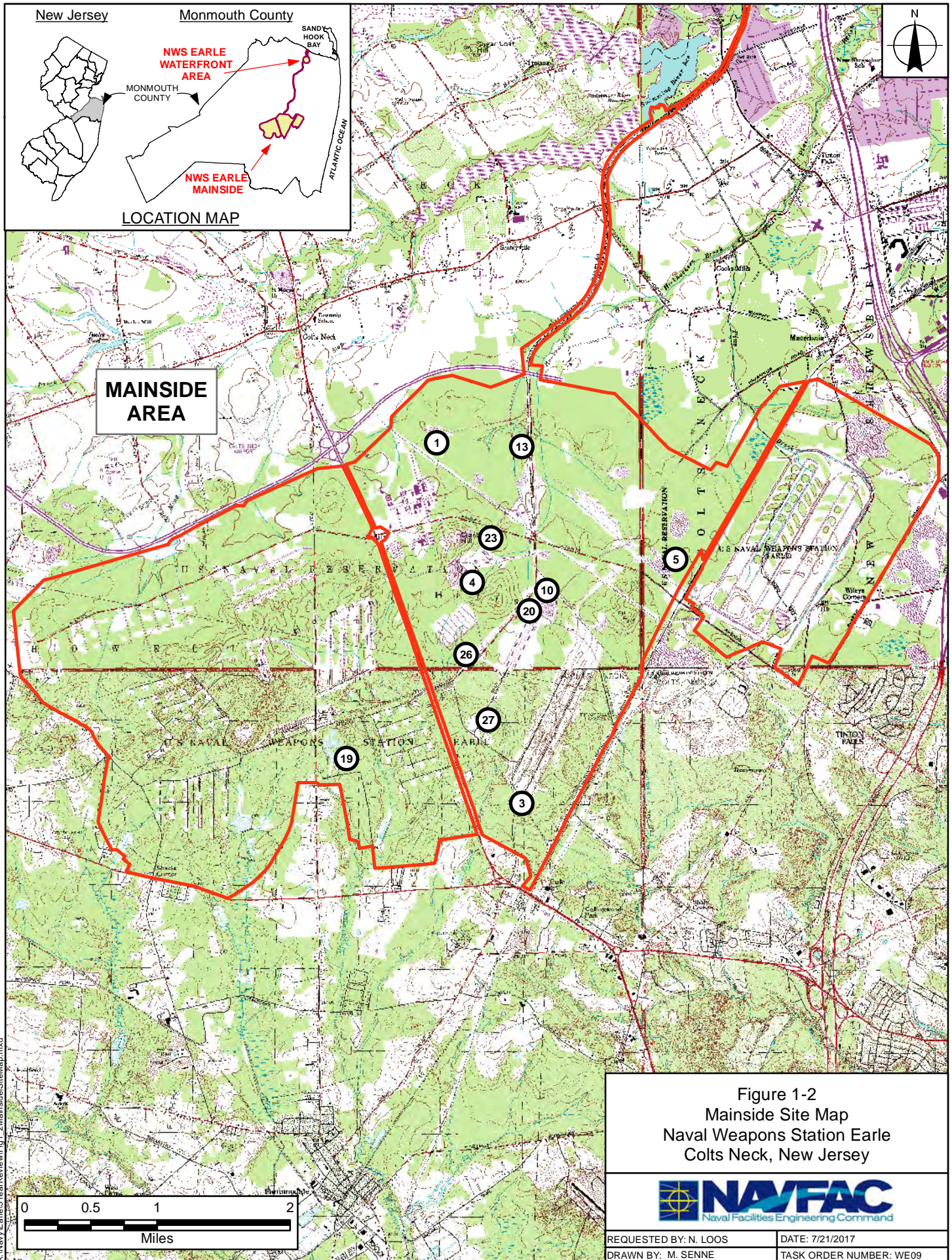


Figure 1-2
Mainside Site Map
Naval Weapons Station Earle
Colts Neck, New Jersey

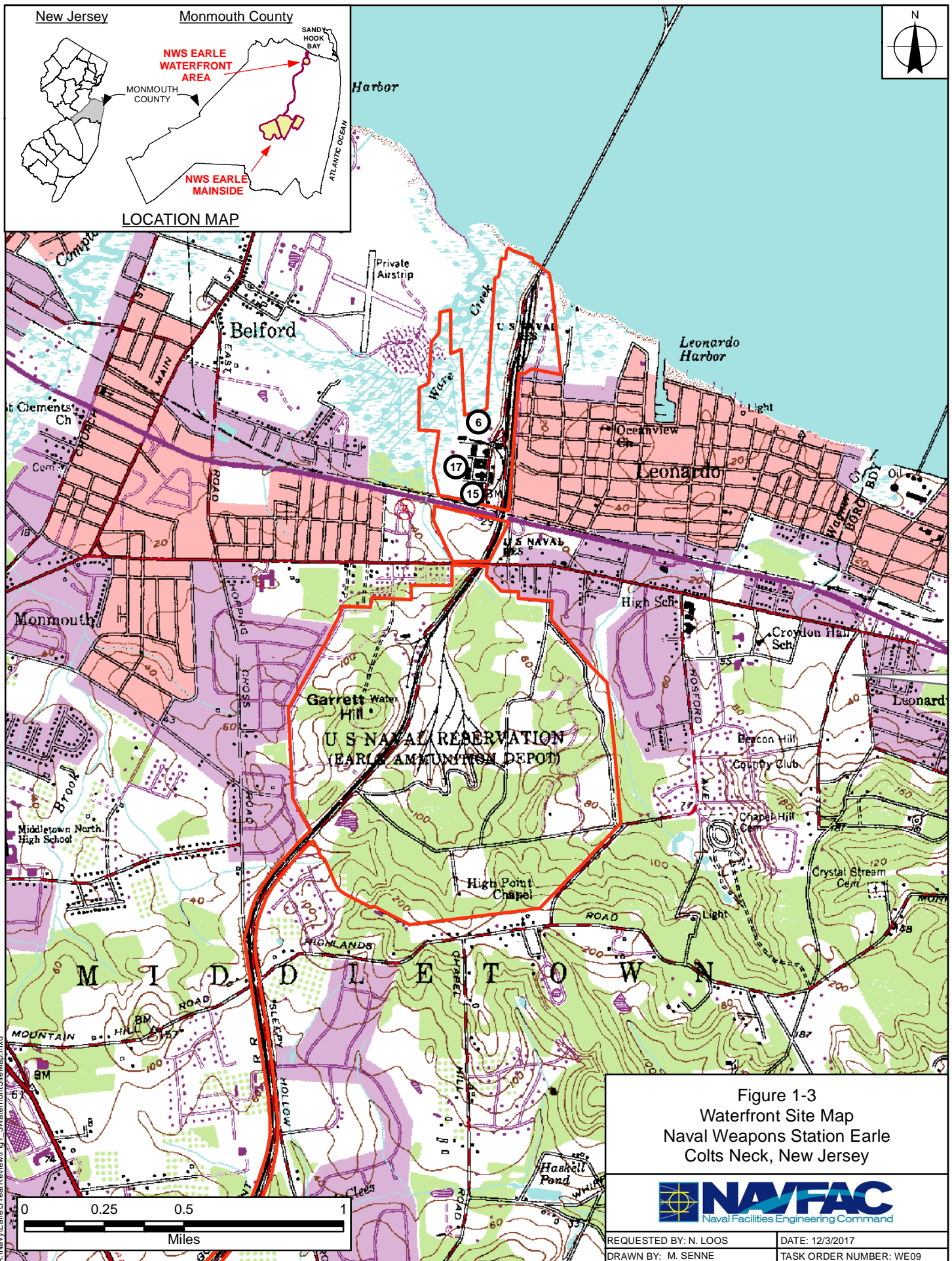


REQUESTED BY: N. LOOS	DATE: 7/21/2017
DRAWN BY: M. SENNE	TASK ORDER NUMBER: WE09

Service Layer Credits: USGS, Keyport/Sandy Hook West/Marlboro/Long Branch West/Farmingdale/Asbury Park quadrangle, New Jersey [map]. Photorevision Date Varies. 1:24,000. 7.5 Minute Series.

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2.0 Operable Unit 1, Site 4 – Landfill West of “D” Group

Site 4 is part of OU 1, comprised of Sites 4 and 5. This section describes activities specific to Site 4.

2.1 Site Background

Site 4 is a former landfill that received approximately 10,200 tons of waste comprising primarily domestic waste and a small amount of industrial waste from 1943 until 1960, and it was subsequently capped in 1998. Wastes at this site were reportedly occasionally burned in trenches and then buried (Brown & Root Environmental [B&RE] 1996).

Site 4 – Landfill West of “D” Group

- Remedy: Capping, institutional controls, and LTM
- Remedy in Place?
 - Engineering Controls are in place
 - CEA has not been established
 - LTM is ongoing
- UU/UE Achieved? — No

2.1.1 Location and Physical Description

Site 4 is located in the central portion of the Mainside Area of NWS Earle and encompasses approximately 5 acres (Figure 1-2). Site 4 is an open area surrounded by woodlands and broad, low-lying wetlands that extend from the eastern edge of the landfill. The site is bordered by Macassar Road to the west and an unpaved road to the north, east, and south, as shown in Figure 2-1.

2.1.2 Land Use

Site 4 is an inactive landfill and is not currently used for any NWS Earle operations. Access to the site is restricted by fencing and signage. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 4.

2.2 Response Action Summary

The RI conducted in 1996 (B&RE 1996) concluded that select metals (aluminum, iron, and manganese) and select VOCs (1,2-dichloroethene [1,2-DCE] and trichloroethylene [TCE]) were detected in groundwater above GWQS.

2.2.1 Interim Remedial Actions

No interim remedial actions (IRA) were taken for Site 4.

2.2.2 Basis for Action

As landfill contents were to remain in place, actions were required to preclude direct contact with landfill waste as well as to minimize future leaching of contaminants to groundwater. A baseline risk assessment was performed as part of the RI (B&RE 1996) to assess potential risks to groundwater, surface water, and sediment.

The HHRA identified potential receptors based on hypothetical future land use (residential, recreational, and industrial). The HHRA concluded that the cancer risk associated with future residential exposure to groundwater at Site 4 was conservatively estimated at 1×10^{-4} , the upper end of the acceptable risk range. This value is primarily attributed to vinyl chloride, which was detected in one sample. The hazard index (HI) for future residential exposure by groundwater exceeded 1.0, primarily due to barium and iron.

The ecological risk assessment concluded that contaminants do not appear to be significantly migrating to nearby surface water and sediment at levels of ecological concern (B&RE 1996).

In addition to the risk drivers described above, TCE, 1,2-DCE, aluminum, iron, and manganese were detected above GWQS.

2.2.3 Selected Remedy

2.2.3.1 Record of Decision

The Record of Decision Operable Unit 1 (OU-1) Sites 4 and 5 (NAVFAC 1997) was signed by the Navy on August 20, 1997, and by EPA on September 25, 1997.

2.2.3.2 Remedial Action Objectives

The following remedial action objectives (RAO) were developed to mitigate existing and future potential threats to public health and the environment.

The overall objective for the remedy at OU-1 Sites 4 and 5 is to protect human health and the environment. The RAO to protect human health is to prevent human exposure to landfilled material and to VOC and metal contamination in groundwater in the area immediately downgradient of the former landfills. Because continued leaching of landfill contaminants may degrade groundwater underlying Sites 4 and 5, the RAOs for protection of the environment are to minimize contaminant migration into groundwater and restoration of the aquifer to the applicable standards (NAVFAC 1997).

In the ROD, Table 1 (page II-18), compared detected analytes against ARARs and TBCs. Table 2-1 below summarizes these analytes and their chemical-specific remedial goals based on the ARARs defined in the ROD.

Table 2-1: Groundwater Quality Regulatory Standards Comparison

Operable Unit 1 – Site 4						
Parameter	ARARs Identified in the ROD (1996)		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Maximum Concentrations ⁽¹⁾ (February 2017) (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Aluminum	NE	200	2,690	NE	200	9,000/187,000 ⁽²⁾
Iron	NE	300	20,900	NE	300	7,200/103,000 ⁽²⁾
Manganese	NE	50	306	NE	50	480/588 ⁽²⁾
Trichloroethene	5	1	55	5	1	0.67 J
Vinyl chloride	2	5	3	2	1	0.4 U

Notes:

(1) Concentrations were obtained from the most recent sampling event in February 2017 as part of the Classification Exemption Area process. Report pending.

(2) Dissolved and total metals results are shown.

2.2.3.3 Selected Remedy

The selected remedy for Site 4 included the following components (NAVFAC 1997):

- Re-grading the landfill and installing a cap to reduce infiltration, promote drainage, limit erosion, and preclude potential contact with the landfill contents
- Establishing CEA/WRA immediately adjacent to the landfills to bar the use of groundwater during the remediation period

- Providing long-term periodic groundwater monitoring

2.2.4 Status of Implementation

2.2.4.1 Engineering Control

Landfill cap construction was completed July 18, 1998, in accordance with the Work Plan for Landfill Caps for Site 4 and Site 5 (Foster Wheeler Environmental Corporation [FWEC] 1997). The landfill cap consists of a passive gas management system, geomembrane, drainage layer, and top layer: Final Report for Remedial Action at Operable Unit 1 (Landfill Sites 4 and 5) (FWEC 1999b).

2.2.4.2 Institutional Control

Land use restrictions have been noted in the BMP and Addendum. Semiannual inspections are completed per the O&M manual and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 2-1 presents the LUC boundary. Groundwater evaluations are ongoing and a CEA/WRA and a LUC RD will be developed if data evaluation determines groundwater impact attributable to a site discharge.

2.2.4.3 Long-Term Monitoring Program

The LTM program was established in 1999. Optimization of the LTM program has occurred periodically; the most recent optimization resulted in reductions in both the analytical suite and sampling frequency as recommended in the Second Five-Year Review (TT NUS 2008). Currently, groundwater monitoring at Site 4 is performed every two years, with samples collected from six wells analyzed for select VOCs (1,2-DCE, TCE, and vinyl chloride) and select total and dissolved metals (aluminum, iron, and manganese). Sampling results from this FYR period are summarized in Section 2.3.4.2.

2.2.4.4 Operations and Maintenance

Operations and maintenance (O&M) inspections at Site 4 are performed semiannually (spring and fall) in accordance with the O&M Manual (FWEC 1999a). Corrective actions, if required, are completed following the inspections. O&M inspections include the following components:

- Landfill cap: Cap is visually inspected semiannually for evidence of erosion, differential settling, coverage of vegetation and evidence of burrowing animals.
- Gas monitoring vents:
 - Three 4-inch polyvinyl chloride gas vents are visually inspected.
 - Gas emissions are monitored once every 5 years.
- Site access ramps: Inspect for potholes, ruts, settlement, soil erosion, vegetative growth, and integrity of the security gates.
- Groundwater monitoring system: Monitoring wells are visually inspected for damage, subsidence, vandalism or blockage.

Semiannual inspection findings performed during this FYR period are summarized in Section 2.3.4.3.

2.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 4:

- The remedy at OU 1, Site 4, is protective in the short-term of human health and the environment. The remedy for Site 4 is capping, institutional controls, and long-term monitoring. The cap is in place and appears to be effective at minimizing infiltration and reducing contaminant migration and prevents direct contact with soil and landfilled materials. No settlement, holes or visual indications of burrowing animals were noted during the most recent O&M inspection. A long-term groundwater monitoring program is being implemented to verify that the cap is performing as designed. Results from the 2010 monitoring event suggest that the cap is performing as intended. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The CEA will place restrictions on use of site groundwater. The implementation of the Site 4 remedy, including capping, fencing and/or signage institutional controls, and long-term monitoring, has reduced or eliminated exposures to the landfill contents and groundwater. The remedy will be protective when the CEA is implemented.
- Because contaminants remain in groundwater at concentrations above GWQS continued groundwater monitoring and reporting is required. Additional FYRs are required because wastes remain on site (Resolution Consultants 2013).

2.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 4. Table 2-2 provides a list of issues and status of the recommendations made for Site 4 in the last FYR.

2.3.2 Completed Since the Last Five-Year Review

The following have been completed since the last FYR.

- Historical groundwater quality data were reviewed by the Navy to evaluate the establishment of a CEA/WRA at Site 4. Technical Memorandum (TT 2013) recommended installation of three additional monitoring wells to delineate the downgradient extent of impact in groundwater.
- In 2017, one shallow well (04GW08) and one new well cluster (shallow/deep, 04GW09 and 04GW10, respectively) were installed downgradient (southeast and northeast) of 04GW05 as shown on Figure 2-2.
- In 2017, two groundwater sampling events were completed. Groundwater monitoring well installation and sampling activities were completed in accordance with the Addendum to O&M Manual (TT 2014).
- A Technical Memorandum is currently being developed to present the 2017 sampling data and to demonstrate that a CEA/WRA is not necessary as VOCs are no longer detected and metals are attributable to natural background. The Draft Technical Memorandum was submitted for regulatory review on January 10, 2018. EPA provided concurrence on February 5, 2018; NJDEP review comments are pending as of the date of this report.

2.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 4.

2.3.4 Data Review

2.3.4.1 Land Use Control Inspection Records

The Navy is currently evaluating the need for a CEA/WRA. Upon completion of a CEA/WRA determination, a LUC RD will be developed. In the interim, the BMP restricts the use of untreated groundwater for purposes other than environmental monitoring and testing. Semiannual inspections are

completed to document that LUCs remain in place and are protective; findings and recommendations from the inspections are included in annual Maintenance and Monitoring Reports. During this FYR period, the BMP has been an effective institutional control, preventing intrusive activities and exposure to waste and/or contaminated groundwater.

Table 2-2: Status of Recommendations from the 2013 Five-Year Review Report

Operable Unit 1 - Site 4				
Issue	Recommendations	Status	Implementation Status Description	Completion Date (if applicable)
Excess vegetation growth	Trees and other vegetation that may limit the effectiveness of the selected remedy will be removed from the swale	Completed	A licensed herbicide applicator was contracted to treat vegetation.	5/31/2016
Site groundwater continues to be detected above cleanup goals	Continue conducting long-term groundwater monitoring	Ongoing	Long-term monitoring of groundwater at select wells continues on a biennial basis.	Not applicable
Access restrictions	Continue enforcement of site access restrictions	Ongoing	NWS Earle is an active military installation. Access to the site is restricted by Base personnel. Fencing and gates surrounding the site are inspected and maintain in good condition.	Not applicable
CEA not established with New Jersey Department of Environmental Protection	Continue the approval process for CEA	Ongoing	Recent sampling events indicate that no VOCs are present and that metals in groundwater are likely due to natural background. A Technical Memorandum which documents that a CEA/WRA is not required was submitted on January 10, 2018.	Not Applicable

2.3.4.2 Long-Term Monitoring Data

Figure 2-2 shows the location of wells at Site 4. Since 2010, routine LTM has been conducted biennially. Analytical results for groundwater monitoring activities were provided in the 2014 Annual Maintenance and Monitoring Report for the Landfill Caps for Sites 3 and 10, Sites 4 and 5, Site 13, and the Long-Term Monitoring for Site 19 (Sovereign 2017a). During this FYR period, all detections of aluminum, iron, and manganese were within historically observed ranges and were generally within the same order of magnitude. Figure 2-2 illustrates the most recent groundwater monitoring results. During the two 2017 sampling events, VOCs were below detection limits confirming VOCs are no longer present.

LTM reports have attributed aluminum and iron in groundwater as naturally occurring and have recommended that metals concentrations in groundwater should be further evaluated to differentiate between background conditions and landfill operations. A Technical Memorandum is being developed to demonstrate that VOCs are no longer present, and metals are found to be attributable to background. As such, LTM may no longer be required. Upon regulatory concurrence, an Explanation of Significant Difference (ESD) will be prepared to remove the CEA/WRA and LTM requirements.

2.3.4.3 Operations and Maintenance Records

In accordance with the O&M manual (FWEC 1999a) quarterly site inspections were conducted in the first two years after landfill cap construction and semiannually thereafter. Review of Site 4 annual maintenance and monitoring reports indicate that communication of maintenance requirements and subsequent repairs and documentation/re-inspection were performed in accordance with the O&M manual. Table 2-3 is a summary of the observations made from 2013 to 2016.

Table 2-3: Landfill Inspection Results Since Last Five-Year Review

Operable Unit 1 - Site 4			
Date	Observation	Corrective Action	Date Completed
5/31/13	No deficiencies	Not applicable	Not applicable
11/4/13	Vegetation noted growing through riprap; gas vent settling monument survey completed	Licensed herbicide application	Spring 2016
5/23/14	Vegetation noted growing through 25% of riprap	Licensed herbicide application	Spring 2016
11/13/14	Vegetation noted growing through 35% of riprap	Licensed herbicide application	Spring 2016
5/22/15	Vegetation noted growing through riprap	Licensed herbicide application	Spring 2016
11/20/15	Vegetation noted growing through riprap; gas vent settling monument survey completed – 11/24/15	Licensed herbicide application	Spring 2016
6/10/16	Minimal growth in riprap	Licensed herbicide application	Spring 2017
11/17/16	Minimal growth in riprap 10-20%; monument survey completed	Licensed herbicide application	Spring 2017

2.3.5 Site Inspection Findings

The FYR inspection was performed on June 6, 2017, as discussed in Section 1.2.2. The site is not currently in use. During the site visit, the site appeared to be well maintained and the remedy is effective. It was noted that one monitoring well needed a padlock; as of the date of this report, the padlock has been replaced. Five-Year Review Site Inspection Checklist forms and associated photos are in Appendix A.

2.4 Technical Assessment

Construction of the landfill cap has eliminated direct contact risks with landfill wastes. Completion of semiannual site inspections, implementation of institutional/engineering controls (via the BMP) to prevent uses inconsistent with land use restrictions, and the LTM groundwater sampling program help ensure that risks associated with exposure to landfill contents or impacted groundwater are effectively mitigated.

The Navy has continued to work toward the establishment of a CEA/WRA through continued groundwater sampling in support of CEA/WRA. However, chlorinated VOCs historically detected above GWQS in groundwater at Site 4 but have not been detected in the two most recent sampling events, and metals in groundwater appear to be resultant of natural background. In addition, no buildings are present within 100 feet of the plume; therefore, no VI concerns exist.

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

Table 2-4 summarizes components of Question A: Technical Evaluation.

Table 2-4: Technical Evaluation – Question A

Operable Unit 1 - Site 4	
Question	Summary
Remedial Action Performance	The cap at Site 4 continues to effectively limit direct exposure to landfill contents and to minimize infiltration and contaminant migration from the site; however, metals concentrations in groundwater remain onsite above GWQS. However, concentrations of aluminum and iron have been attributed to background conditions. Metals concentrations in groundwater should be further evaluated to determine which are attributed to background conditions and which may be attributed to previous landfill operations.
Systems Operation/ Operations and Maintenance	Semiannual landfill cap and associated engineering control inspections indicate that the implemented remedial action is functioning as intended. Furthermore, site inspections have not revealed significant deficiencies affecting protectiveness or large unexpected O&M costs. Implementation of optimization recommendations made in the 2015 Annual Maintenance and Monitoring Report is pending. Review of O&M records suggests additional opportunities for optimization in reducing overall time frame for implementation of corrective actions.
Implementation of Land Use Controls and Institutional/ Engineering Controls	LUCs were required by the ROD: <ul style="list-style-type: none"> BMP is currently used to restrict access to the site, prevent intrusive activity, and avoid exposure to waste and contaminated groundwater A CEA is required by the ROD; as noted in Section 2.2.3.3, a CEA/WRA determination is in progress Upon completion of a CEA/WRA determination, a LUC RD will be developed

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

Table 2-5 summarizes components of the Question B: Technical Evaluation.

Table 2-5: Technical Evaluation– Question B

Operable Unit 1 – Site 4	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Groundwater RGs presented in Table 2-1 were compared to current ARARs. The only screening level that changed was for vinyl chloride; however, sample results have been non-detect for this compound. The RGs remain protective of the site.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	<p>The Site 4 remedy mitigated risks to human health; no unacceptable ecological risks were identified during the RI. Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the landfill cap effectively mitigates direct contact and migration of contaminants. Accordingly, the focus is preventing exposure and enforcing controls over the long term to ensure protectiveness. As long as the landfill cap at Site 4 provides a permanent barrier that prevents exposure to subsurface soil contaminants, the remedy remains protective. Should the future use of this site change (or the cap be removed), reevaluation of risk would be required.</p> <p>Trenching and burning was reported during operation of the landfill. Based on this information emerging contaminants dioxins/furans Section 1.7.4 discusses emerging contaminants and their relation to Naval Weapons Station Earle. As noted in Section 2.2.4.1, landfill wastes were capped in 1998.</p>
Changes in Exposure Pathways	There have been no changes in land use at Site 4 that would result in changes to exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy at Site 4 is progressing to meet the RAOs:</p> <ul style="list-style-type: none"> The landfill cap and the BMP prevent exposure to landfill wastes Additional sampling has been conducted to support a CEA/WRA determination. A Technical Memorandum is being developed to provide the analytical results, which demonstrate that a CEA/WRA may not be necessary as VOCs are no longer present and metals appear to be naturally occurring. As such, LTM may no longer be required. After completion of the CEA/WRA determination, a LUC RD will be established to ensure long-term protectiveness

2.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

2.5 Issues/Recommendations

Table 2-6: Issues/Recommendations that Affect Current or Future Protectiveness				
Operable Unit 1 – Site 4				
Operable Unit 1, Site	Issue Category: Institutional Controls			
	Issue: A CEA/WRA determination should be developed.			
	Recommendation: Present a CEA/WRA Determination Technical Memorandum for concurrence that denotes metals identified in groundwater are not site related.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	06/01/19

2.6 Other Findings

Other FYR findings at Site 4 include:

- Upon completion of a CEA/WRA determination, a LUC RD, which describes the implementation objectives, methods, monitoring, documentation, and certification requirements for any relevant institutional and/or engineering controls, should be developed.
- If a CEA/WRA is determined not to be required, an ESD will be developed.

2.7 Protectiveness Statement

Protectiveness Statement		
<i>Operable Unit:</i> Not Applicable	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
Site 4 Landfill West of "D" Group		
<p><i>Protectiveness Statement:</i> The remedy at OU-1 Site 4 is protective in the short-term of human health and protective in the long-term of the environment. A landfill cap was installed, which reduces infiltration and precludes contact with landfill contents. The BMP prevents intrusive activity and groundwater use at the site. An ongoing O&M program has been established to ensure the landfill cap continues to perform as intended and impacts to groundwater are monitored. However, a CEA/WRA has not yet been implemented. Upon completion of a CEA/WRA determination, Site 4 will be protective of human health in the long-term.</p>		

2.8 References

- Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle. Colts Neck, New Jersey.* July.
- Foster Wheeler Environmental Corporation (FWEC). 1999a. *Operations and Maintenance Manual for the Site 4 and Site 5 Landfills.* March.
- Foster Wheeler Environmental Corporation (FWEC). 1999b. *Final Report for the Closure of Site and Site 5 Landfills.* May.
- Naval Facilities Engineering Command (NAVFAC). 1997. *Record of Decision Operable Unit 1 (OU-1) Sites 4 and 5, Naval Weapons Station Earle, Colts Neck, New Jersey.* August.
- Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck, New Jersey.* March.
- Sovereign Consulting (Sovereign). 2017a. *2014 Annual Maintenance and Monitoring Report for the Landfill Caps Sites 3 and 10, Sites 4 and 5, Site 3, and the Long-Term Monitoring for Site 19.* February.
- Sovereign Consulting (Sovereign). 2017b. *2015 Annual Maintenance and Monitoring Report for the Landfill Caps Sites 3 and 10, Sites 4 and 5, Site 13, and the Long-Term Monitoring for Site 19.* June.
- Tetra Tech NUS (TT NUS). 2008. *Second Five-Year Review Report. Naval Weapons Station Earle Colts Neck, New Jersey.* May.

Tetra Tech (TT). 2013. *Technical Memorandum Evaluation of Long Term Groundwater Quality in Support of Classification Exception Area Determination at Operable Unit 1 (OU 1) Site 4 Landfill West of D Group. NWS Earle NJ.* August.

Tetra Tech (TT). 2014. *Addendum to Maintenance Manual for the Site 4 and Site 5 Landfills Naval Weapons Station Earle. Colts Neck, New Jersey (March 1999).* January.

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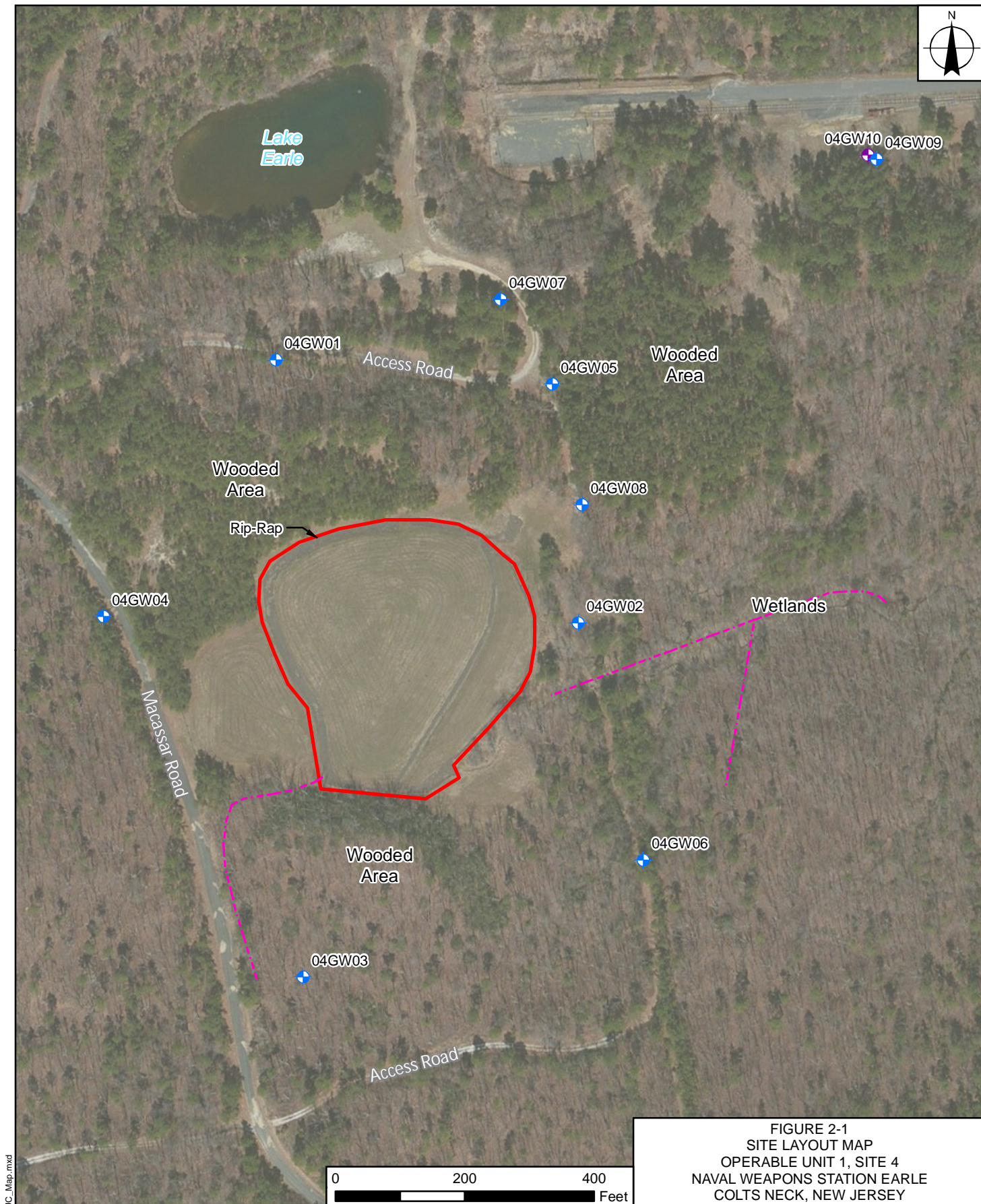


FIGURE 2-1
SITE LAYOUT MAP
OPERABLE UNIT 1, SITE 4
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY




REQUESTED BY: N. LOOS

DATE: 9/13/2017

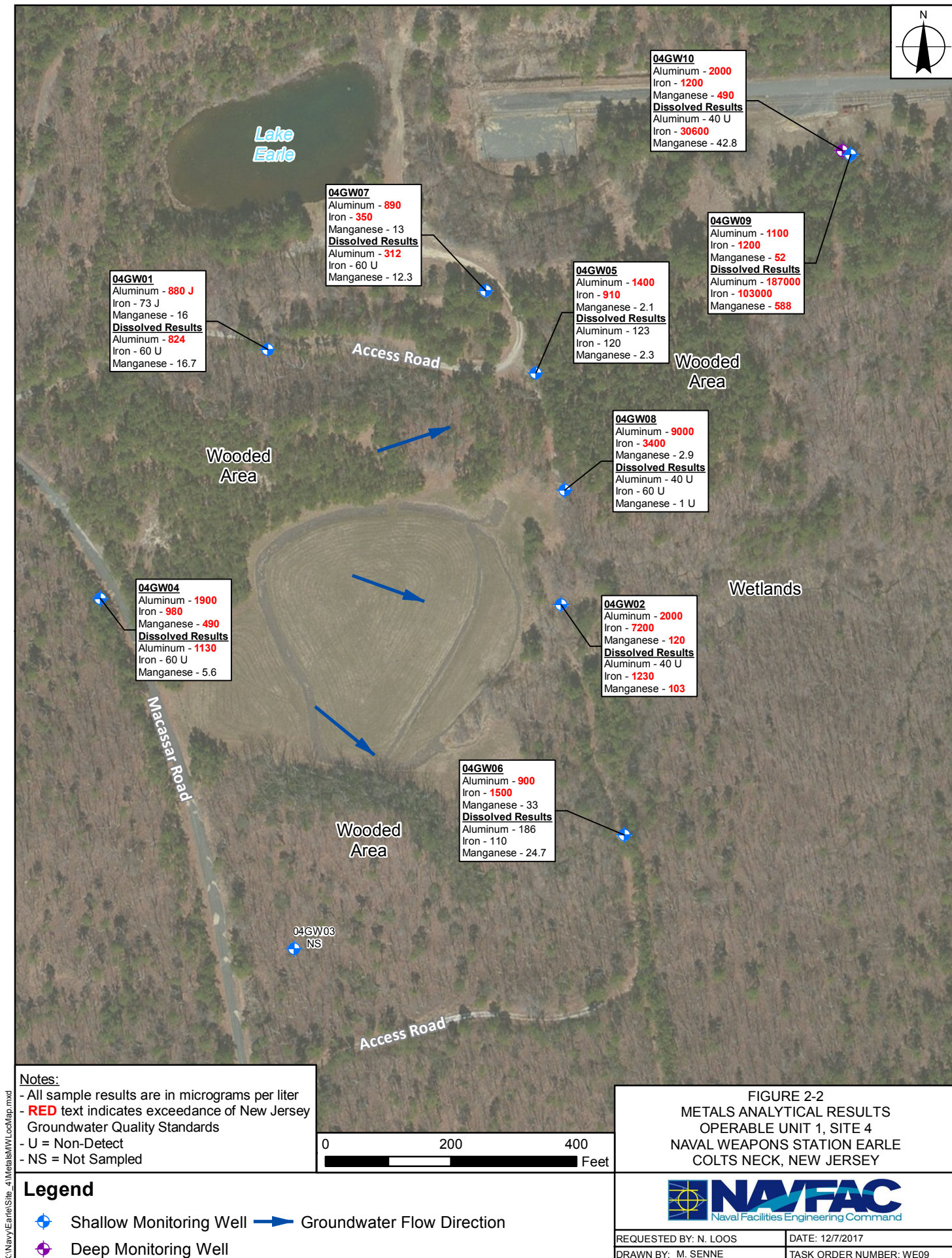
DRAWN BY: M. SENNE

TASK ORDER NUMBER: WE09

Legend

-  Shallow Monitoring Well
-  Deep Monitoring Well
-  Approximate Drainage
-  Land Use Control Boundary

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3.0 Operable Unit 1, Site 5 – Landfill West of Army Barricades

Site 5 is part of OU 1, comprised of Sites 4 and 5. This section describes activities specific to Site 5.

3.1 Site Background

Site 5, a former 13-acre landfill, received approximately 6,600 tons of domestic and industrial wastes from 1968 to 1978 and was subsequently capped in 1998. Waste disposed to the landfill consisted of paper, plastic, construction debris, pesticide and herbicide containers, paint containers, paint thinner, varnish, shellac, acids, alcohols, caustics, and lesser amounts of asbestos (NAVFAC 1997). The eastern portion of Site 5 was also used as a skeet and rifle range, which ceased operation in 1998 (FWEC 1998).

Site 5 – Landfill West of Army Barricades

- Remedy: Capping, institutional controls, and LTM
- Remedy in place?
 - Engineering controls are in place
 - CEA has not been established
 - LTM is ongoing
- UU/UE achieved? — No

3.1.1 Location and Physical Description

Site 5 is located in the eastern portion of the Mainside Area of NWS Earle (Figure 1-2). Access to Site 5 is provided via a dirt road along the northern border of the landfill. The landfill is bordered to the west and north by forested area, to the southwest by railroad tracks and to the east by the former skeet range shot-fall area and rifle range (Figure 3-1).

3.1.2 Land Use

Site 5 is an inactive landfill and is not currently used for any NWS Earle operations. Access to the site is restricted by fencing and signage. According to NWS Earle Public Works Department, there are no plans to change land use at Site 5.

3.2 Response Action Summary

The RI conducted in 1996 (B&RE 1996) concluded that select metals (aluminum, cadmium, iron, manganese, nickel, and thallium) and VOCs (1,2-dichloroethane [1,2-DCA], benzene, chloroform, and TCE) were detected in groundwater above GWQS.

3.2.1 Interim Remedial Actions

No IRAs were taken at Site 5.

3.2.2 Basis for Action

As landfill contents were to remain in place, actions were required to preclude direct contact with waste as well as minimize future leaching of contaminants to groundwater. A baseline HHRA was performed as part of the RI (B&RE 1996) to assess potential risks to groundwater.

The HHRA found that total cancer risk to a future lifetime resident exposed to impacted groundwater was 1.3×10^{-4} . Excess cancer risk was primarily attributed to arsenic and vinyl chloride. Furthermore, the non-carcinogenic hazard index was found to be greater than 1.0 due to iron (B&RE 1996). Non-carcinogenic hazard indices were greater than 1.0 for future children/residents exposed to groundwater (B&RE 1996). The ecological risk assessment concluded that risk to sensitive receptors was low and further study was not warranted (B&RE 1996). In addition to the risk drivers described above, aluminum, cadmium, iron, manganese, nickel, thallium, 1,2-DCA, benzene, chloroform, and TCE were detected above GWQS.

3.2.3 Selected Remedy

3.2.3.1 Record of Decision

The Record of Decision Operable Unit 1 (OU-1) Sites 4 and 5 (NAVFAC 1997) was signed by the Navy on August 20, 1997 and by EPA on September 25, 1997.

3.2.3.2 Remedial Action Objectives

The following RAOs were developed to mitigate existing and future potential threats to public health and the environment:

The overall objective for the remedy at OU-1 Sites 4 and 5 is to protect human health and the environment. The RAO to protect human health is to prevent human exposure to landfilled material and to VOC and metal contamination in groundwater in the area immediately downgradient of the former landfills. Because continued leaching of landfill contaminants may degrade groundwater underlying Sites 4 and 5, the RAOs for protection of the environment are to minimize contaminant migration into groundwater and restoration of the aquifer to the applicable standards (NAVFAC 1997).

In the ROD, Table 3 (page II-24) compared detected analytes against ARARs and TBCs. Table 3-1 summarizes these analytes and their chemical-specific remedial goals based on the ARARs defined in the ROD.

Table 3-1: Groundwater Quality Regulatory Standards Comparison

Operable Unit 1 – Site 5						
Parameter	ARARs Identified in the ROD (1997)		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Maximum Concentrations ^[1] (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Aluminum	NE	200	7,870 J	NE	200	7,010/1,360 ^[2]
Arsenic	50	8	5.3	10	3	15.2/8.5 ^[2]
Cadmium	5	4	7	5	4	3 U/3 U ^[2]
Iron	NE	300	59,200 J	NE	300	44,900/43,200 ^[2]
Manganese	NE	50	171	NE	50	219/209 ^[2]
Nickel	100 ⁽³⁾	100	102 J	100 ^[3]	100	14.7/14.7 ^[2]
Thallium	2	10	6 J	2	2	2 U/2 U
1,2-dichloroethane	5	2	3 J	5	2	0.33 U
Benzene	5	1	3 J	5	1	0.74 J
Chloroform	100	100	22	80	70	0.9 J
Trichloroethene	5	1	4 J	5	1	0.24 U
Vinyl Chloride	2	5	2 J	2	1	0.44 U

Notes:

[1] Metals results obtained from last most recent biennial sampling report, Draft Annual Maintenance and Monitoring Report for the Landfill Caps Sites 3 and 10, Sites 4 and 5, Sites 13 and Long-Term Monitoring for Site 19 (Sovereign 2017b) were collected November 2014. Volatile Organic Compound were last analyzed in 2009; 2009 results are shown.

[2] Total and dissolved metals results shown.

[3] The ROD identified a total lifetime adult health advisory for nickel; this health advisory remains in effect in 2017.

3.2.4 Status of Implementation

3.2.4.1 Engineering Controls

Landfill cap construction was completed July 18, 1998 in accordance with the Work Plan for Landfill Caps for Site 4 and Site 5 (FWEC 1997). The landfill cap consists of a passive gas management system, geomembrane, drainage layer, and top layer. For additional details refer to the Final Report for Remedial Action at Operable Unit 1 (Landfill Sites 4 and 5) (FWEC 1999b).

3.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum. Semiannual inspections are completed per the O&M manual and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 3-1 presents the LUC boundary. Groundwater evaluations are ongoing and a CEA/WRA and a LUC RD will be developed if data evaluation determines groundwater impact is attributable to a site discharge.

3.2.4.3 Long-Term Monitoring Program

The LTM program was established in 1999. The current LTM program, as documented in the O&M Addendum (TT 2014), consists of groundwater sampling every other year with samples collected from 11 wells analyzed for total and dissolved Target Analyte List (TAL) metals. Per the 2008 Second Five Year Review, VOCs were not detected in the 2005 and 2006 sampling events and were recommended to be removed from the sampling program. Sampling results from this FYR period are summarized in Section 3.4.2.2.

3.2.4.4 Operations and Maintenance

O&M inspections at Site 5 are conducted semiannually (fall and spring) in accordance with the O&M Manual (FWEC 1999a). Corrective actions, if required, are completed following the inspections. O&M inspections consist of the following components:

- Landfill cap: Visually inspected semiannually for evidence of erosion, differential settling, coverage of vegetation and evidence of burrowing animals.
- Stormwater drainage system: Inspect stormwater conveyance system for sediment accumulation, subsidence, ponding, obstructions to flow, erosion, and vegetative growth.
- Gas monitoring vents:
 - Inspected for physical damage or obstruction
 - Gas emissions are monitored once every 5 years
- Site access ramps: Inspect for potholes, ruts, settlement, soil erosion, vegetative growth, and integrity of the security gates.
- Groundwater monitoring system: Monitoring wells visually inspected for damage, subsidence, vandalism, or blockage.

Inspection findings performed during this FYR period are summarized in Section 3.4.2.3.

3.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 5:

- The remedy at OU 1, Site 5 is protective in the short-term of human health and the environment. The remedy for Site 5 is capping, institutional controls, and long-term monitoring. The cap is in

place and appears to be effective at minimizing infiltration and reducing contaminant migration and prevents direct contact with soil and landfilled materials. A long-term groundwater monitoring program is being implemented to verify that the cap is performing as designed. Results from the 2009 and 2010 monitoring events suggest that the cap is performing as intended. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The CEA will place restrictions on use of site groundwater. In addition, the various buildings and facilities located in the NWS Earle Mainside area are connected to a public water supply (New Jersey American Water Company) which precludes groundwater exposure. The implementation of the Site 5 remedy, including capping, fencing and/or signage institutional controls, and long-term monitoring, has reduced or eliminated exposures to the landfill contents and groundwater. The remedy will be protective when the CEA is implemented. Because contaminants remain in groundwater at concentrations above GWQS continued groundwater monitoring and reporting is required. Additional Five-year Reviews are required because wastes remain on site (Resolution Consultants 2013).

3.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 5. Table 3-2 provides a list and status of the recommendations that were made for Site 5 in the last FYR.

Table 3-2: Status of Recommendations from the 2013 Five-Year Review Report

Operable Unit 1 – Site 5				
Issue	Recommendations	Status	Implementation Status Description	Completion Date (if applicable)
Access restrictions	Continue restricting access to the site. Continue enforcement of access restrictions.	Ongoing	NWS Earle is an active military installation. Access to the site is restricted by Base personnel. Fencing and gates surrounding the site are inspected and maintain in good condition.	Not applicable
CEA not established with New Jersey Department of Environmental Protection.	Continue the approval process for the CEA.	Ongoing	Recent sampling events indicate that metals in groundwater are likely due to natural background. A Technical Memorandum, which documents that a CEA/WRA is not required, was submitted on January 10, 2018.	Not applicable
Contamination continues to be detected above cleanup goals in groundwater at the site.	Continue to conduct long-term monitoring.	Ongoing	Long-term monitoring is conducted on a biennial basis.	Not applicable

3.3.2 Completed Since the Last Five-Year Review

The following have been completed since the last FYR:

- Historical groundwater quality data were reviewed by the Navy to evaluate establishment of a CEA/WRA at Site 5. The technical memorandum (TT 2013) recommended installation of four additional monitoring wells to delineate the downgradient horizontal and vertical extent of manganese and lead impact in groundwater.
- Four monitoring wells were recommended for installation, however, after review of the conceptual site model, three wells were determined to be sufficient. The new wells were installed at Site 5 in 2017 (Figure 3-2). One shallow well (05MW11) was installed downgradient (north) of 05GW05 in an attempt to delineate manganese exceedances in groundwater. One well pair (05MW09 and 05MW10) was installed downgradient (northeast) of 05GW06 in an attempt to delineate lead exceedances in groundwater.
- In 2017, two groundwater sampling events were completed. Groundwater monitoring well installation and sampling activities were completed in accordance with the Addendum to O&M Manual (TT 2014).
- A Technical Memorandum is currently being developed to present the 2017 sampling data and to demonstrate that a CEA/WRA is not necessary as metals are attributable to natural background. The Draft Technical Memorandum was submitted on January 10, 2018. EPA provided concurrence on February 5, 2018; NJDEP review comments are pending as of the date of this report.

3.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 5.

3.3.4 Data Review

3.3.4.1 Land Use Control Inspection Records

The Navy is currently evaluating the need for a CEA/WRA. Upon completion of a CEA/WRA determination, a LUC RD will be developed. In the interim, the BMP restricts the use of untreated groundwater for purposes other than environmental monitoring and testing. Semiannual inspections are completed to document that LUCs remain in place and are protective; findings and recommendations from the inspections are included in annual Maintenance and Monitoring Reports. During this FYR period, the BMP has been an effective institutional control to prevent intrusive activities and exposure to waste and/or contaminated groundwater.

3.3.4.2 Long-Term Monitoring Data

Figure 3-2 shows the location of wells at Site 5. Since 2010, routine LTM has been conducted biennially. Analytical results for groundwater monitoring activities were provided in the 2014 Annual Maintenance and Monitoring Report for the Landfill Caps for Sites 3 and 10, Sites 4 and 5, Site 13, and the Long-Term Monitoring for Site 19 (Sovereign 2017a).

During this FYR period, aluminum, antimony, arsenic, beryllium, iron, lead, and manganese were measured within historically observed ranges.

Figure 3-2 illustrates the groundwater monitoring results from the most recent LTM event (2014). Annual monitoring reports have attributed metals in groundwater to background concentrations and have recommended that metals concentrations in groundwater should be further evaluated to differentiate between background concentrations and landfill operations (Sovereign 2017a).

A Technical Memorandum is being developed to demonstrate that metals are found to be attributable to background. As such, LTM may no longer be required. Upon regulatory concurrence, an ESD will be prepared to remove the CEA/WRA and LTM requirements.

3.3.4.3 Operations and Maintenance Records

In accordance with the O&M Manual (FWEC 1999a), site inspections were conducted quarterly in the first two years after landfill cap construction, and semiannually thereafter. Review of Site 5 annual maintenance and monitoring reports indicate that the landfill cap is functioning as designed and no significant deficiencies have been noted since the last FYR period. Table 3-3 is a summary of the observations made from 2013 to 2016.

Table 3-3: Landfill Inspection Results Since Last Five-Year Review

Operable Unit 1 - Site 5			
Date	Observation	Corrective Action	Date Completed
5/31/13	No deficiencies	Not applicable	Not applicable
10/31/13	Vegetation noted growing through riprap; gas vent settling monument survey completed	Licensed herbicide application	Spring 2014
5/23/14	Vegetation noted growing through 65% of riprap; tree down in the access road leading to the gate	Licensed herbicide application	Spring 2016
11/13/14	Vegetation noted growing through 70% of riprap	Licensed herbicide application	Spring 2016
5/22/15	Vegetation noted growing through riprap	Licensed herbicide application	Spring 2016
11/20/15	Vegetation noted growing through riprap; gas vent settling monument survey completed – 11/24/15	Licensed herbicide application	Spring 2016
5/19/16	Minimal growth in riprap	Licensed herbicide application	Spring 2017
11/17/16	Vegetation noted growing through 40% of riprap; monument survey completed	Licensed herbicide application	Spring 2017

3.3.5 Site Inspection Findings

The FYR inspection was performed June 6, 2017, as discussed in Section 1.4.2. The site is not currently in use. Furthermore, the landfill cap and access roads appeared to be well maintained; however, several monitoring wells were observed as needing maintenance. The following observations were noted:

- 05GW02, 05GW03, 05GW05, and 05GW07 need well caps and bolts for the manhole lids.
- 05GW06 needs a new well cap, manhole lid, and bolts.
- 05GW06 and 05GW07 were covered by silt runoff.

Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

3.4 Technical Assessment

Construction of the landfill cap has eliminated direct contact risks with landfill waste. Completion of semiannual site inspections, implementation of institutional/engineering controls (via the BMP) prevent

use inconsistent with land use restrictions, and the LTM groundwater sampling program ensures that risks associated with exposure to landfill contents or impacted groundwater are effectively mitigated. The Navy has continued to work toward the establishment of a CEA/WRA through continued groundwater sampling in support of CEA/WRA. However, metals in groundwater appear to be resultant of natural background.

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

Table 3-4 summarizes components of the Question A: Technical Evaluation.

Table 3-4: Technical Evaluation – Question A

Operable Unit 1 – Site 5	
Question	Summary
Remedial Action Performance	The cap at Site 5 continues to effectively limit direct exposure to landfill contents and to minimize infiltration and contaminant migration from the site; however, metals concentrations remain onsite above GWQS. Select metals (aluminum, iron, and manganese) impacts seen in groundwater have been attributed to background conditions (Sovereign 2017a and 2017b). Metals concentrations in groundwater should be further evaluated to determine which are attributed to background conditions and which may be attributed to previous landfill operations. Conclusions of this evaluation should be used to formalize a Contaminant of Concern list for the site.
Systems Operation/ Operations and Maintenance	Semiannual landfill cap and associated engineering control inspections indicate that the implemented remedial action is functioning as intended. Furthermore, site inspections have not revealed significant deficiencies affecting protectiveness or large unexpected O&M costs. Implementation of optimization recommendations made in the 2015 Annual Maintenance and Monitoring Report are pending. Review of O&M records suggests additional opportunities for optimization in reducing overall timeframe for implementation of corrective actions.
Implementation of Land Use Controls and Institutional/ Engineering Controls	LUCs are required by the ROD: <ul style="list-style-type: none"> The BMP is used to restrict access to Site 5, prevent intrusive activity, and avoid exposure to waste and contaminated groundwater. A CEA/WRA is required by the ROD; as noted in Section 3.2.4.2, a CEA/WRA determination is in progress. Upon completion of a CEA/WRA determination, a LUC RD will be developed.

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

Table 3-5 summarizes components of the Question B: Technical Evaluation.

Table 3-5: Technical Evaluation – Question B

Operable Unit 1 – Site 5	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Groundwater quality standards presented in the ROD were compared to current ARARs in Table 3-1. Since the ROD was signed, NJDEP GWQS have decreased for arsenic, thallium, chloroform and vinyl chloride; however, these changes do not affect the protectiveness of the remedy as any subsequent analytical results have been compared to the current standards.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The Site 5 remedy mitigated risks to both human health and the environment. Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the landfill cap effectively mitigates direct contact and migration of

Table 3-5: Technical Evaluation – Question B

Operable Unit 1 – Site 5	
Question	Summary
	contaminants. Accordingly, the focus is preventing exposure and enforcing controls over the long term to ensure protectiveness. As long as the landfill cap at Site 5 provides a permanent barrier that prevents exposure to subsurface soil contaminants and prevents contaminant migration into adjacent wetland areas, the remedy remains protective. Should the future use of this site change or the landfill cap be removed, reevaluation of risk would be required.
Changes in Exposure Pathways	There have been no changes in land use at Site 5 that would result in changes to exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy at Site 5 is progressing to meet the RAOs.</p> <ul style="list-style-type: none"> The landfill cap and the BMP prevent exposure to landfill wastes <p>Additional sampling has been conducted to support a CEA/WRA determination. A Technical Memorandum is being developed to provide the analytical results, which demonstrate that a CEA/WRA may not be necessary as VOCs are no longer present and metals appear to be naturally occurring. As such, LTM may no longer be required. After completion of the CEA/WRA determination, a LUC RD will be established to ensure long-term protectiveness</p>

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

This FYR did not identify other information that could call into question the protectiveness of the remedy.

3.5 Issues/Recommendations

Table 3-6: Issues/Recommendations that Affect Current or Future Protectiveness

Operable Unit 1 – Site 5				
Operable Unit 1, Site 5	Issue Category: Institutional Controls			
	Issue: A CEA/WRA determination should be developed.			
	Recommendation: Present a CEA/WRA Determination Technical Memorandum for concurrence that details metals identified in groundwater are not site related.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	06/01/19

3.6 Other Findings

Other FYR findings at Site 5 include:

- Upon completion of a CEA/WRA determination, a LUC RD, which describes the implementation objectives, methods, monitoring, documentation, and certification requirements for any relevant institutional and/or engineering controls, should be developed.
- If a CEA/WRA is determined not be required, an ESD will be developed.

3.7 Protectiveness Statement

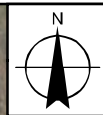
Protectiveness Statement		
Operable Unit: 1	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Site 5 Landfill West of Army Barricades		
<p><i>Protectiveness Statement:</i> The remedy at OU-1 Site 5 is protective in the short-term of human health and protective in the long-term of the environment. A landfill cap was installed which reduces infiltration and precludes contact with landfill contents. The BMP prevents intrusive activity and groundwater use at the site. An ongoing O&M program has been established to ensure the landfill cap continues to perform as intended and impacts to groundwater are monitored. However, a CEA/WRA has not been implemented. Upon completion of a CEA/WRA determination, Site 5 will be protective to human health in the long term.</p>		

3.8 References

- Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle*. July.
- Brown & Root Environmental (BR&E). 1997. *Feasibility Study for Sites 4, 5, 19, and 26 Naval Weapons Station Earle Colts Neck, New Jersey*. July.
- Foster Wheeler Environmental Corporation (FWEC). 1999a. *Operation and Maintenance User Manual Sites 04 and 05 Naval Weapons Station Earle (NWS Earle) Colts Neck, New Jersey*. March.
- Foster Wheeler Environmental Corporation (FWEC). 1997. *Work Plan for Landfill Caps for Site 4 and Site 5 at Naval Weapons Station Earle Colts Neck New Jersey*. December.
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- Foster Wheeler Environmental Corporation (FWEC). 1999b. *Final Report for Remedial Action at Operable Unit 1 (Landfill Sites 4 and 5) at Naval Weapons Station Earle Colts Neck, New Jersey*. May.
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- Tetra Tech (TT). 2014. *Addendum to Operations and Maintenance Manual for Site 4 and Site 5 Landfills Naval Weapons Station Earle Colts Neck, New Jersey (March 1999)*. January.

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Legend

- Shallow Monitoring Well
- Deep Monitoring Well
- Land Use Control Boundary

FIGURE 3-1
SITE LAYOUT MAP
OPERABLE UNIT 1, SITE 5
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



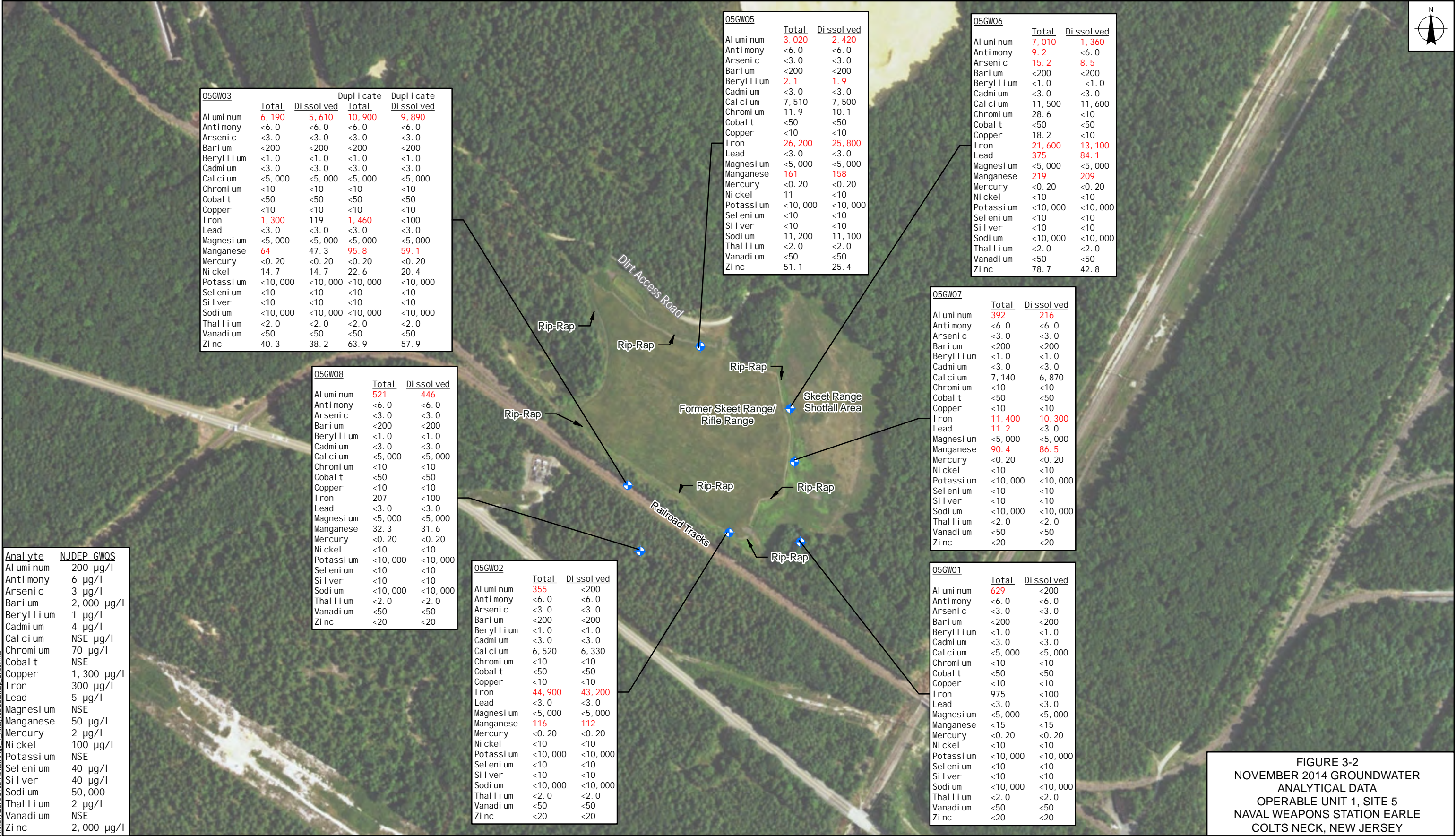
REQUESTED BY: F. BURWELL

DATE: 9/13/2017

DRAWN BY: M. SENNE

TASK ORDER NUMBER: XXXX

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Anal yte	NJDEP GWQS
Al um i num	200 µg/l
Anti mony	6 µg/l
Arseni c	3 µg/l
Bari um	2, 000 µg/l
Beryl li um	1 µg/l
Cadmi um	4 µg/l
Cal ci um	NSE µg/l
Chromi um	70 µg/l
Cobal t	NSE
Copper	1, 300 µg/l
Iron	300 µg/l
Lead	5 µg/l
Magnesi um	NSE
Mangane se	50 µg/l
Mercury	2 µg/l
Ni ckel	100 µg/l
Potassi um	NSE
Seleni um	40 µg/l
Si l ver	40 µg/l
Sodi um	50, 000
Thal li um	2 µg/l
Vanadi um	NSE
Zi nc	2, 000 µg/l

O5GW03	Total	Di ssol ved	Dupl i cate Total	Dupl i cate Di ssol ved
Al um i num	6, 190	5, 610	10, 900	9, 890
Anti mony	<6. 0	<6. 0	<6. 0	<6. 0
Arseni c	<3. 0	<3. 0	<3. 0	<3. 0
Bari um	<200	<200	<200	<200
Beryl li um	<1. 0	<1. 0	<1. 0	<1. 0
Cadmi um	<3. 0	<3. 0	<3. 0	<3. 0
Cal ci um	<5, 000	<5, 000	<5, 000	<5, 000
Chromi um	<10	<10	<10	<10
Cobal t	<50	<50	<50	<50
Copper	<10	<10	<10	<10
Iron	1, 300	119	1, 460	<100
Lead	<3. 0	<3. 0	<3. 0	<3. 0
Magnesi um	<5, 000	<5, 000	<5, 000	<5, 000
Mangane se	64	47. 3	95. 8	59. 1
Mercury	<0. 20	<0. 20	<0. 20	<0. 20
Ni ckel	14. 7	14. 7	22. 6	20. 4
Potassi um	<10, 000	<10, 000	<10, 000	<10, 000
Seleni um	<10	<10	<10	<10
Si l ver	<10	<10	<10	<10
Sodi um	<10, 000	<10, 000	<10, 000	<10, 000
Thal li um	<2. 0	<2. 0	<2. 0	<2. 0
Vanadi um	<50	<50	<50	<50
Zi nc	40. 3	38. 2	63. 9	57. 9

O5GW08	Total	Di ssol ved
Al um i num	521	446
Anti mony	<6. 0	<6. 0
Arseni c	<3. 0	<3. 0
Bari um	<200	<200
Beryl li um	<1. 0	<1. 0
Cadmi um	<3. 0	<3. 0
Cal ci um	<5, 000	<5, 000
Chromi um	<10	<10
Cobal t	<50	<50
Copper	<10	<10
Iron	207	<100
Lead	<3. 0	<3. 0
Magnesi um	<5, 000	<5, 000
Mangane se	32. 3	31. 6
Mercury	<0. 20	<0. 20
Ni ckel	<10	<10
Potassi um	<10, 000	<10, 000
Seleni um	<10	<10
Si l ver	<10	<10
Sodi um	<10, 000	<10, 000
Thal li um	<2. 0	<2. 0
Vanadi um	<50	<50
Zi nc	<20	<20

O5GW02	Total	Di ssol ved
Al um i num	355	<200
Anti mony	<6. 0	<6. 0
Arseni c	<3. 0	<3. 0
Bari um	<200	<200
Beryl li um	<1. 0	<1. 0
Cadmi um	<3. 0	<3. 0
Cal ci um	6, 520	6, 330
Chromi um	<10	<10
Cobal t	<50	<50
Copper	<10	<10
Iron	44, 900	43, 200
Lead	<3. 0	<3. 0
Magnesi um	<5, 000	<5, 000
Mangane se	116	112
Mercury	<0. 20	<0. 20
Ni ckel	<10	<10
Potassi um	<10, 000	<10, 000
Seleni um	<10	<10
Si l ver	<10	<10
Sodi um	<10, 000	<10, 000
Thal li um	<2. 0	<2. 0
Vanadi um	<50	<50
Zi nc	<20	<20

O5GW05	Total	Di ssol ved
Al um i num	3, 020	2, 420
Anti mony	<6. 0	<6. 0
Arseni c	<3. 0	<3. 0
Bari um	<200	<200
Beryl li um	2. 1	1. 9
Cadmi um	<3. 0	<3. 0
Cal ci um	7, 510	7, 500
Chromi um	11. 9	10. 1
Cobal t	<50	<50
Copper	<10	<10
Iron	26, 200	25, 800
Lead	<3. 0	<3. 0
Magnesi um	<5, 000	<5, 000
Mangane se	161	158
Mercury	<0. 20	<0. 20
Ni ckel	11	<10
Potassi um	<10, 000	<10, 000
Seleni um	<10	<10
Si l ver	<10	<10
Sodi um	11, 200	11, 100
Thal li um	<2. 0	<2. 0
Vanadi um	<50	<50
Zi nc	51. 1	25. 4

O5GW06	Total	Di ssol ved
Al um i num	7, 010	1, 360
Anti mony	9. 2	<6. 0
Arseni c	15. 2	8. 5
Bari um	<200	<200
Beryl li um	<1. 0	<1. 0
Cadmi um	<3. 0	<3. 0
Cal ci um	11, 500	11, 600
Chromi um	28. 6	<10
Cobal t	<50	<50
Copper	18. 2	<10
Iron	21, 600	13, 100
Lead	375	84. 1
Magnesi um	<5, 000	<5, 000
Mangane se	219	209
Mercury	<0. 20	<0. 20
Ni ckel	<10	<10
Potassi um	<10, 000	<10, 000
Seleni um	<10	<10
Si l ver	<10	<10
Sodi um	<10, 000	<10, 000
Thal li um	<2. 0	<2. 0
Vanadi um	<50	<50
Zi nc	78. 7	42. 8

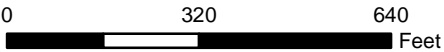
O5GW07	Total	Di ssol ved
Al um i num	392	216
Anti mony	<6. 0	<6. 0
Arseni c	<3. 0	<3. 0
Bari um	<200	<200
Beryl li um	<1. 0	<1. 0
Cadmi um	<3. 0	<3. 0
Cal ci um	7, 140	6, 870
Chromi um	<10	<10
Cobal t	<50	<50
Copper	<10	<10
Iron	11, 400	10, 300
Lead	11. 2	<3. 0
Magnesi um	<5, 000	<5, 000
Mangane se	90. 4	86. 5
Mercury	<0. 20	<0. 20
Ni ckel	<10	<10
Potassi um	<10, 000	<10, 000
Seleni um	<10	<10
Si l ver	<10	<10
Sodi um	<10, 000	<10, 000
Thal li um	<2. 0	<2. 0
Vanadi um	<50	<50
Zi nc	<20	<20

O5GW01	Total	Di ssol ved
Al um i num	629	<200
Anti mony	<6. 0	<6. 0
Arseni c	<3. 0	<3. 0
Bari um	<200	<200
Beryl li um	<1. 0	<1. 0
Cadmi um	<3. 0	<3. 0
Cal ci um	<5, 000	<5, 000
Chromi um	<10	<10
Cobal t	<50	<50
Copper	<10	<10
Iron	975	<100
Lead	<3. 0	<3. 0
Magnesi um	<5, 000	<5, 000
Mangane se	<15	<15
Mercury	<0. 20	<0. 20
Ni ckel	<10	<10
Potassi um	<10, 000	<10, 000
Seleni um	<10	<10
Si l ver	<10	<10
Sodi um	<10, 000	<10, 000
Thal li um	<2. 0	<2. 0
Vanadi um	<50	<50
Zi nc	<20	<20

Notes:
All sample results are in micrograms per liter
Sample either as Total or Dissolved (field filtered)
RED text indicated values exceeding New Jersey Department of Environmental Protection Groundwater Quality Standards
NSE - No Standard Established
µg/L - micrograms per liter

Legend

Shallow Monitoring Well



REQUESTED BY: F. BURWELL DATE: 9/13/2017
DRAWN BY: M. SENNE TASK ORDER NUMBER: WE09

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4.0 Operable Unit 2, Site 19 – Former Paint Chip and Sludge Disposal Area

4.1 Site Background

Site 19 includes the Former Paint Chip and Sludge Disposal Area. Paint chips, paint slurries, solvent residues, and sludges from an ordnance maintenance area were disposed from the early 1940s until the early 1960s in a topographic depression near Building S-34. Paint slurries and solvent residues were also discharged in an open drainage ditch.

Site 19 — Former Paint Chip and Sludge Disposal Area

- Remedy: Excavation/LTM and LUCs/ICs
- Remedy in place? — Yes
 - Excavation - Completed
 - CEA not required
 - LTM - Complete
- UU/UE achieved? — No

4.1.1 Location and Physical Description

OU-2, Site 19 is located on Tulagi Road near former Building S-34 within the Mainside Area of NWS Earle (Figure 1-2). Site 19 is a 300-foot circular area covered with asphalt pavement or gravel and small shrubs. A barricade bisects the circular area. The topographic depression is 50 feet in diameter, immediately south of the barricade, with a depth ranging from 5 to 10 feet (NAVFAC 1997). A drainage ditch extends from the site to the southwest and discharges to a branch of Mingamahone Brook. The site is surrounded by woodlands with a wetlands area. The wetlands and the branch of Mingamahone Brook drain to the south (Figure 4-1).

4.1.2 Land Use

Site 19 is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 19.

4.2 Response Action Summary

RIIs performed from 1993 through 1995 confirmed the presence of elevated concentrations of several metals in site sediments and soils, including cadmium, lead, and zinc. Samples were collected from around and within the 300-foot circular area, the former settling pond, and the drainage ditch. Subsurface investigations identified elevated concentrations of antimony, total chromium, cadmium, lead, and zinc in soil. Tetrachloroethene (PCE) was also detected in low concentrations. Analytical results from groundwater confirmed low concentrations of VOCs, pesticides, and elevated concentrations of metals (B&RE 1996). Surface water results were comparable to background samples (B&RE 1996). Sediment contained elevated concentrations of total chromium along with slightly elevated concentrations of aluminum, iron, manganese, and vanadium. Low concentrations of organics, including polynuclear aromatic hydrocarbons (PAH) and pesticides, were also detected in sediment (B&RE 1996).

4.2.1 Interim Remedial Actions

No IRA activities were performed at Site 19.

4.2.2 Basis for Action

The 1996 HHRA estimated risks associated with future residential exposure to groundwater exceeded the upper bound of the acceptable risk range (10^{-4}) with the primary contributor being arsenic (via ingestion of groundwater; B&RE 1996). Noncarcinogenic HIs exceeded 1.0 for the future industrial and future residential exposure scenarios with the primary contributors being thallium and arsenic (via ingestion of groundwater; B&RE 1996).

The 1996 ecological risk assessment indicated that concentrations of contaminants have migrated to the drainage ditch that leads to a tributary of Mingamahone Brook and adjacent wetlands. Sediment concentrations of lead, chromium, cadmium, and zinc in the surface depression and drainage ditch were well above NJDEP Effects Range Median (ER-M) value per the NJDEP Guidance for Sediment Quality Evaluation (B&RE 1996).

RI activities identified several metals in site groundwater in excess of NJDEP GWQS including aluminum, antimony, arsenic, cadmium, iron, lead, manganese, and thallium. Analytical results for soil samples confirmed concentrations in excess of NJDEP RDCSCC for antimony, cadmium, hexavalent and total chromium, lead, and zinc. Analytical results from sediment samples confirmed concentrations in excess of NJDEP ER-M values for arsenic, total chromium, and lead.

4.2.3 Selected Remedy

4.2.3.1 Record of Decision

The Final OU-2, Site 19 ROD was signed by the Navy on August 20, 1997 and by EPA on September 25, 1997 (NAVFAC 1997).

4.2.3.2 Remedial Action Objectives

The following RAOs were developed to mitigate existing and future potential threats to public health and the environment (NAVFAC 1997):

- The RAO to protect human health is to prevent human exposure to contaminated soils/sediments and to metal contaminants in groundwater in the area immediately downgradient of the former paint chip and sludge disposal area.
- The RAO to protect the environment is to minimize contaminant migration into groundwater and adjacent wetlands and restore the aquifer to the applicable standards.

The ROD compared detected analytes against ARARs and TBCs. Table 4-1 summarizes these analytes and their chemical-specific remedial goals based on the ARARs defined in the ROD.

No RGs for soils/sediments were specified in the Site 19 ROD; however, the ROD did identify the NJDEP RDCSCC, NRDCSCC, and impact to groundwater criteria as TBCs. Sediment removal actions used the March 1991 NJDEP Guidance for Sediment Quality Evaluation using the Effects Range Medium criteria, which post-dated the ROD.

Table 4-1: Groundwater Regulatory Standards Comparison

Operable Unit 2 – Site 19						
Parameter	ARARs and TBCs from 1997 Record of Decision		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Concentrations (November 2015) ^[1] (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Aluminum	NE	200	9610 J	NE	200	12,000
Antimony	6	20	7	6	6	<6.0
Arsenic	50	8	27	10	3	<3.0
Cadmium	5	4	8	5	4	35.1
Iron	NE	300	3040	NE	300	61,300

Table 4-1: Groundwater Regulatory Standards Comparison

Operable Unit 2 – Site 19						
Parameter	ARARs and TBCs from 1997 Record of Decision		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Concentrations (November 2015) ^[1] (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Lead*	15	10	17	15	5	<3.0
Manganese	NE	50	185	NE	50	109
Thallium	2	10	29 J	2	2	<2.0

Notes:

[1] 2015 Draft Annual Maintenance and Monitoring Report for the Landfill Caps Sites 3 and 10, Sites 4 and 5, Site 13, and the Long-Term Monitoring for Site 19

* OLEM Directive 9300-2-167 was considered, however, since the concentrations are non-detect, a site-specific value has not been developed

4.2.3.3 Selected Remedy

The selected remedy for Site 19 included the following components:

- Excavation and offsite disposal of contaminated soils and sediments
- Establishment of CEA immediately adjacent to the former paint chip and sludge disposal area to bar the use of groundwater during the remediation period
- Provision of long-term periodic groundwater monitoring

4.2.4 Status of Implementation

4.2.4.1 Excavation and Offsite Disposal

Excavation of soil and sediment and offsite disposal was completed in 1998. Vegetation and trees in the topographic depression and drainage ditch were removed and disposed offsite. Sediment in the topographic depression (former settling pond) and drainage ditch were excavated to a depth of up to 5 feet. Confirmatory samples were collected from the basin and ditch for TAL inorganics and Target Compound List (TCL) organic compounds. Analysis confirmed removal of impacted soil and sediment in compliance with applicable action criteria. After Navy approval, the basin was backfilled to surrounding grade and paved with asphalt.

4.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum. Semiannual inspections are completed per the O&M manual and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective.

As discussed in Section 4.3.2, the Navy has determined that a CEA/WRA is not required and groundwater LTM is no longer necessary. The determination that a CEA is not required was presented in a Technical Memorandum (TT, 2013). NJDEP provided concurrence with this determination via email dated September 23, 2013. The determination that a CEA and groundwater LTM are no longer necessary was also included in the 2014 Annual Monitoring and Maintenance Report. NJDEP and EPA provided concurrence with this determination during report review and discussion. A Technical Memorandum to memorialize concurrence that a CEA/WRA, LTM, and FYRs are no longer required will be developed.

4.2.4.3 Long-Term Monitoring Program

An LTM program was established in May 2001 and included annual groundwater monitoring from five monitoring wells. Recommendations to discontinue LTM were made in the 2014 Annual Monitoring and Maintenance Report (Sovereign 2017a). NJDEP comment letter (dated December 4, 2015) for review of the 2014 annual report states that long term groundwater monitoring is no longer recommended, and site closure is recommended. EPA provided verbal concurrence at a November 19, 2015, partnering team meeting that no additional LTM or LUCs via CEA are necessary. This determination and regulatory concurrence were documented in the Final 2014 Annual Report. As a result, the groundwater monitoring program was concluded in 2015. Sampling results from this FYR period are summarized in Section 4.3.4.2.

4.2.4.4 Operations and Maintenance

O&M at Site 19 is performed to support LTM on an as-needed basis (e.g., well repairs); there is no O&M requirement associated with the remedy.

4.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 19:

The remedy at OU-2, Site 19 is protective in the short term of human health and the environment. The source of contamination has been removed. The removal action reduced the unacceptable human health risks and threats to ecological receptors in the vicinity of Site 19 by eliminating the contaminant source and preventing further leaching of metals to groundwater. A long-term monitoring program is being implemented to verify that the removal action is performing as designed. The results of the monitoring program suggest that the remedy is performing as planned. Proper implementation of the ICs and O&M will maintain the effectiveness of the remedy into the future. In addition, the various buildings and facilities located in the NWS Earle Mainside area are connected to a public water supply (New Jersey American Water Company), which precludes groundwater exposure. The remedy will be protective when the CEA is implemented.

The Navy, EPA, and NJDEP have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at Site 19. Based on the completed activities and those activities currently ongoing, the intent and goals of the ROD for Site 19 have been met (Resolution Consultants 2013).

4.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 19. Table 4-2 provides a list and status of the recommendations that were made for Site 19 in the last FYR.

4.3.2 Completed Since the Last Five-Year Review

The following have been completed since the last FYR.

- A Technical Memorandum was submitted in March 2013 that addressed NJDEP comments to the draft groundwater CEA documentation for Site 19 (NAVFAC 2013). The memorandum demonstrated the conditions in the single well, 19MW05, were not representative of site conditions and recommended that a CEA as not necessary. In response, NJDEP approved the technical memorandum via email on 25 September 2013, stating:

Based on the low groundwater concentrations of aluminum, lead arsenic and manganese, no CEA is proposed for Site 19. The levels appear to be natural, localized and not extensive. A ground water plume does not exist. The CEA documentation conclusions and recommendations provided appear acceptable. A CEA should not be prepared for the subject site.

- Recommendations to discontinue LTM were made in the 2014 Annual Monitoring and Maintenance Report (Sovereign 2017a). Based on their review of the 2014 annual report, NJDEP stated in their comment letter (dated December 4, 2015) that long term groundwater monitoring is no longer recommended, and site closure is recommended. EPA provided verbal concurrence at the November 19, 2015, partnering team meeting that no additional LTM or LUCs via CEA are necessary. This determination and regulatory concurrence were documented in the Final 2014 Annual Report. EPA has requested a Technical Memorandum be prepared to document that LTM, CEA, and FYRs are no longer required. An OU Closure RACR will be prepared after completion of this Technical Memorandum.

Table 4-2: Status of Recommendations from the 2013 Five-Year Review

Operable Unit 2 – Site 19				
Issue	Recommendations	Status	Implementation Status Description	Completion Date (if applicable)
Extensive cracking of the asphalt cap with extensive weed growth was identified during the site inspection.	Repair cracks in asphalt cap to maintain effectiveness.	Considered But Not Implemented	The asphalt was erroneously reported as a “cap.” A cap is not part of the site remedy. The asphalt that is in place at Site 19 is not part of the remedy and therefore is not needed to maintain the protectiveness of the site.	Not applicable
CEA not established with NJDEP	Continue the approval process for CEA	Completed	A Technical Memorandum (TT, 2013) was produced and in correspondence from NJDEP dated September 25, 2013, and December 4, 2015, the NJDEP indicated that a CEA/WRA is not required. A Technical Memorandum will be prepared to memorialize concurrence that CEA, LTM, and FYRs are no longer required.	To be determined

4.3.3 Site Interview Findings

During the interview, EPA indicated that issues identified in the previous FYR, including the erroneous reporting of cracks in the Site 19 “cap” be addressed in this report. These items are addressed in Section 4.3.2 and Table 4-2. EPA also indicated that sediment and surface water sampling were not a requirement of the ROD. A Technical Memorandum has been prepared and submitted to the NJDEP to demonstrate that metals in sediment are related to background and not resultant of a site discharge. NJDEP concurrence is pending.

4.3.4 Data Review

4.3.4.1 Land Use Control Inspection Records

The Navy has determined that a CEA/WRA and groundwater LTM are no longer required. A Technical Memorandum will be developed to memorialize concurrence that a CEA/WRA, LTM, and FYRs are no longer required. Upon regulatory concurrence, an OU Closure RACR will be developed. In the interim, the BMP restricts the use of untreated groundwater for purposes other than environmental monitoring and testing. Semiannual inspections are completed to document that LUCs remain in place and are protective; finding and recommendations from the inspections are included in annual Maintenance and Monitoring Reports. During this FYR period, BMP has been an effective institutional control, preventing intrusive activities and exposure to waste and/or contaminated groundwater.

4.3.4.2 Long-Term Monitoring Data

Figure 4-2 illustrates the most recent groundwater monitoring results. During this FYR period, all detections of COCs were within historically observed ranges and generally within the same order of magnitude.

4.3.5 Site Inspection Findings

The site inspection was performed on June 5, 2017, as discussed in Section 1.4.2. Site 19 is not in use. All monitoring wells were located and appeared to be in good condition except for 19GW05, which did not have a lock. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

4.4 Technical Assessment

Removal actions eliminated direct contact risks with contaminated soil and sediment and prevented migration to ecological receptors. LUCs were implemented through notation in the BMP, and the LTM groundwater sampling program was implemented. However, the Project Team has determined that a CEA/WRA is no longer necessary as groundwater impact is related to natural background and RI samples were artificially biased high due to turbidity. A Technical Memorandum will be prepared to memorialize concurrence that CEA/WRA, LTM, and FYRs are no longer required. Once the Technical Memorandum is approved, an OU Closure RACR will be prepared.

Although not required by the ROD, surface water and sediment sampling were conducted annually. The U.S. EPA has provided concurrence that continued sampling is not warranted; however, the NJDEP has requested that an evaluation of the dataset be presented in a technical memorandum to determine if the concentrations in sediment are site related. A Draft Technical Memorandum has been submitted for review, which demonstrates that the concentrations in sediment are not site related; NJDEP is reviewing Navy response to comments at the time of this FYR.

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

Table 4-3 summarizes components of the Question A: Technical Evaluation.

Table 4-3: Technical Evaluation – Question A

Operable Unit 2 – Site 19	
Question	Summary
Remedial Action Performance	<p>The RAOs have been achieved for Site 19. The excavation and offsite disposal of contaminated soils and sediments has been completed at Site 19 and remain effective.</p> <p>In 2013, a technical memorandum was submitted to EPA and NJDEP reevaluating the groundwater dataset and documenting that residual metals remain within historically observed ranges and appear to be natural, localized, and not extensive. Discontinuation of LTM and CEA/WRA have been approved by regulators. A technical memorandum will be prepared to memorialize concurrence that CEA/WRA, LTM, and FYRs are no longer required. Once the technical memorandum is approved, an OU Closure RACR will be prepared.</p>
Systems Operation/ Operations and Maintenance	The selected remedy did not include O&M components.
Implementation of Land Use Controls and Institutional/ Engineering Controls	<p>LUCs are required by the ROD:</p> <ul style="list-style-type: none"> - The BMP is used to prevent exposure to contaminated groundwater. - A CEA/WRA to restrict use of groundwater was determined to be unnecessary in 2013 per NJDEP concurrence on the Technical Memorandum (TT, 2013) demonstrating that the low groundwater concentrations of aluminum, lead, arsenic, and manganese, are natural, localized, and not extensive.

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

Table 4-4 summarizes components of the Question B: Technical Evaluation.

Table 4-4: Technical Evaluation – Question B

Operable Unit 2 – Site 19	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3 Groundwater ARARs for the Site are presented in Table 4-1 and were compared to current ARARs. The remedy remains protective for the site.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected as excavation activities have removed the soil contamination from the topographic depression and the drainage ditch (which was also filled in to surrounding grade) thereby eliminating the source and migration pathways. As discussed in Section 4.3.2, based on groundwater concentrations the NWS Earle Project Team has determined a CEA/WRA is no longer required.
Changes in Exposure Pathways	There have been no changes in land use at the site that would result in changes to exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy has met the RAOs:</p> <ul style="list-style-type: none"> • Exposure to contaminated soil/sediment was prevented by removal actions executed in 1998. • Exposure to contaminated groundwater was prevented by annotations to the BMP • Minimization of contaminant migration to groundwater and adjacent wetlands was

Table 4-4: Technical Evaluation – Question B

Operable Unit 2 – Site 19	
Question	Summary
	<p>achieved by source removal actions executed in 1998</p> <p>Aquifer restoration, the final RAO, is no longer required as described in Section 4.3.2. The site no longer requires a CEA/WRA or LTM. Surface water and sediment sampling were not required by the ROD, however, NJDEP has requested an evaluation of the existing dataset to determine if concentrations in sediments are attributable to the site.</p>

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

This FYR did not identify other information that could call into question the protectiveness of the remedy.

4.5 Issues/Recommendations

Table 4-5: Issues/Recommendations that Affect Current or Future Protectiveness				
Operable Unit 2 – Site 19				
Operable Unit 2, Site 19	Issue Category: Institutional Controls			
	Issue: Formal documentation in the Administrative Record that a CEA/WRA is no longer required has not been finalized.			
	Recommendation: A Technical Memorandum is recommended to memorialize concurrence that CEA/WRA, LTM, and FYRs are no longer required.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	06/30/19

4.6 Other Findings

Other findings at Site 19 include:

- Once the Technical Memorandum is approved, an OU Closure RACR will be prepared. Additionally, annotations restricting groundwater use in the BMP should be removed and monitoring wells should be abandoned.

4.7 Protectiveness Statement

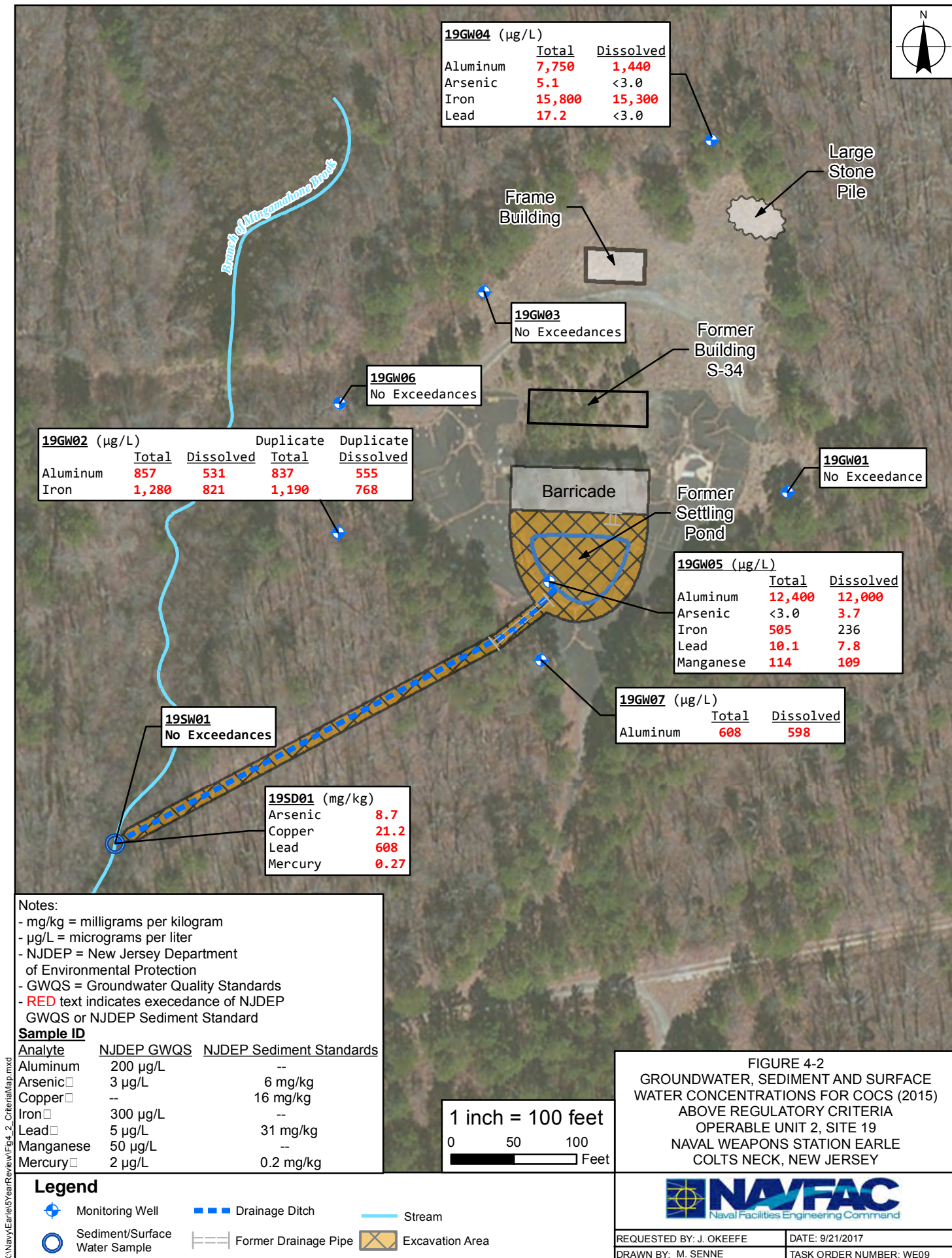
Protectiveness Statement		
Operable Unit: 2	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Site 19 Former Paint Chip and Sludge Disposal Area		
<p>Protectiveness Statement:</p> <p>The remedy at OU-2, Site 19 is protective in the short-term of human health and protective in the long-term of the environment. Source area removal actions eliminated threats to human health associated with direct contact and mitigated threats to the environment associated with migration to groundwater and/or surface water. A CEA/WRA and groundwater LTM have been determined to no longer be required. Upon documentation in the Administrative Record of this determination and regulatory concurrence, Site 19 will be suitable for UU/UE.</p>		

4.8 References

- Brown & Root Environmental (B&RE). *Remedial Investigation Report for Naval Weapons Station Earle Colts Neck, New Jersey*. July 1996.
- Foster Wheeler Environmental Corporation (FWEC). 1998. *Site 19 Close-Out Report*. September.
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5.0 Operable Unit 3, Site 26 – Explosive “D” Washout Area

5.1 Site Background

Site 26 consists of two OUs, OU-3, where TCE and cis-1,2-DCE impact soil and groundwater, and OU-7, where PCE impacts groundwater southwest of the OU-3 groundwater plume. OU-7 is discussed in Section 12. Note that there is redundancy with information presented between OU-3 and OU-7. Where possible, information has been referenced back to OU-3; otherwise, the information has been presented twice for administrative clarity, due to the separate RODs issued for these two OUs.

Site 26, Explosive “D” Washout Area, is located directly adjacent to Building GB-1. Processes that occurred at Site 26 included:

- Ammonium picrate recovery (1960s), which included a hot-water wash of artillery shells followed by treatment of the wash water inside building GB-1 and recovery of the ammonium picrate precipitated for reuse or disposal.
- Reconditioning of munition casings and shells. Spent solvents used during the reconditioning process were possibly disposed to a collection tray or utility sink that drained to the process leaching system.

Site 26 - Explosive “D” Washout Area

- Remedy:
 - Excavate and dispose of the process leach tank and contaminated soils
 - Treat residual soil and groundwater via air sparging and vapor extraction
 - Establish CEA
 - Provide long term periodic groundwater monitoring
- Remedy in Place? — Partial
 - Excavation and disposal complete
 - AS/SVE system operation complete 2004
 - CEA has not been established
 - LTM ongoing
- UU/UE Achieved? — No

5.1.1 Location and Physical Description

Site 26 is located within the ordnance area of the Mainside Area at NWS Earle (Figure 1-2) at the intersection of Macassar Road and Midway Road. Site 26 consisted of Building GB-1, Building GB-2 (demolished in 1998), storage areas, a process leach system (consisting of a cesspool-type leach tank), percolation pit, and septic tank system (used for sanitary waste disposal). Former Building GB-2, located southwest of GB-1, used a similar septic leaching system.

The site is bordered to the west and north by forested land and to the south and east by two sets of railroad tracks (Navy use only), Midway Road, and then forest. The east branch of Mingamahome Brook is approximately 300 yards southwest of Site 26 (Figure 5-1).

5.1.2 Land Use

Site 26 is occupied by Building GB-1, which is vacant and demolition is pending. The site is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 26.

5.2 Response Action Summary

During the RI for Site 26, metals and VOCs were found in subsurface soil and groundwater. Specifically, antimony, barium, TCE, and 1,2-DCE (total) were detected above normal background concentrations in soil but below NJDEP applicable screening levels. Zinc, barium, cadmium, and silver were detected above background concentrations in groundwater; however, only cadmium was retained as a COC. TCE, 1,1-DCE, 1,2-DCE (total), and PCE were detected in groundwater above NJDEP

GWQS. In addition to the soil and groundwater sampling, a soil gas survey was completed that identified elevated levels of TCE near the grease trap and leach tank.

5.2.1 Interim Remedial Action

The grease trap and process leach tank were identified as the likely sources of impacts to groundwater at Site 26 during the soil gas survey. Therefore, following completion of the RI (B&RE 1996) and FS (B&RE 1997), an IRA was conducted in February 1998 prior to the approval of the ROD (NAVFAC 1998), to remove the grease trap, leach tank and associated piping west of Building GB-1. During the IRA, sludge within the grease trap was disposed as hazardous waste following receipt of the Toxic Characteristic Leaching Procedure analysis, which found TCE above EPA's toxicity characteristic limit, 0.5 milligrams per liter.

Furthermore, the sludge contained detections of cis-1,2-DCE, ethylbenzene, methylene chloride, PCE, toluene, TCE, and xylenes. The excavated area was backfilled with sand and pea gravel and then covered with approximately 6 to 8 inches of top soil. Further details of the removal action can be found in the Site 26 Close-Out Report (FWEC 1998). The process leach tank and adjacent contaminated soil removal were conducted as an IRA because they were completed prior to finalization of the ROD; however, they are discussed in the ROD as part of the selected remedy (source control).

5.2.2 Basis for Action

The HHRA found that risks associated with future residential exposure scenarios exceeded the upper bound of the acceptable risk range (10^{-4}). Primary risk drivers included TCE, 1,1-DCE (via groundwater ingestion and inhalation while showering). Non-carcinogenic risk associated with future residential and industrial groundwater exposure scenarios exceeded 1.0 primarily due to TCE and 1,2-DCE (NAVFAC 1998). No significant contaminant migration pathways to the upland habitats northwest of the site exist. Surface water at the site is not expected to flow offsite since the wooded areas adjacent to the site has a greater elevation. Furthermore, groundwater discharge of contaminants to surface water is insignificant since no wetlands or surface water bodies are adjacent to the site (NAVFAC 1998). Groundwater sampling identified aluminum, cadmium, iron, manganese, 1,1-DCE, 1,2-DCE, methylene chloride, PCE, and TCE above NJDEP GWQS.

Ecological risk was determined to be negligible due to the small size of the site. Additionally, the site is currently not suitable habitat as it is gravel covered/paved. In addition, migration pathways to the nearby upland habitats are not present.

5.2.3 Selected Remedy

5.2.3.1 Record of Decision

The Record of Decision Operable Unit 3 (OU-3) Site 26 (NAVFAC 1998) is dated 29 September 1998.

5.2.3.2 Remedial Action Objectives

The following RAOs were developed to mitigate existing and potential future risks to public health and the environment:

- The overall objective for the remedy at OU-3 is to protect human health and the environment. The RAO to protect human health is to prevent human exposure to contaminated groundwater. The RAO for protection of the environment is to mitigate VOC contaminants in the groundwater (NAVFAC 1998).

- Chemical-specific RGs for groundwater were developed for OU-3 Site 26 based on both ARARs and protection of human health (carcinogenic and non-carcinogenic risk) in the ROD, Table 13 of the ROD (page II-64). These analytes and their criteria are presented in Table 5-1.

Table 5-1: Groundwater Quality Regulatory Standards and Remedial Goals Comparison

Operable Unit 3 – Site 26								
Parameter	ARARs Identified in the ROD (1998)		Remedial Goals Identified in the ROD		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Concentrations ^[1] (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	Carcinogenic (1E-06) (µg/L)	Non-Carcinogenic (Hazard Index 0.1) (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Trichloroethene	5	1	3.65	8.45	4,800 ^[2]	5	1	1,820
1,1-Dichloroethene	7	1	0.11	NC	5 ^[2]	7	1	0.5 U
1,2-Dichloroethene (cis/trans)	70 / 100	70 / 100	NC / NC	13.3	2,000	70 / 100	70 / 100	3,140 / 8.2 J
Benzene	5	0.2 ^[3]	NC	NC	11 ^[2]	5	1	0.5 U
Carbon tetrachloride	5	0.4 ^[3]	NC	NC	2 ^[2]	5	1	0.5 U
Tetrachloroethene	5	1	NC	NC	5 ^[2]	5	1	39
Cadmium	5	4	NC	NC	4.4	5	4	NA

Notes:

[1] Current concentrations are based on the results of the Final Supplemental Soil and Groundwater Investigation (Resolution Consultants 2017)

[2] Based on direct push sampling with field GC analysis

[3] Noted NJDEP GWQS assumed to be incorrectly stated in the ROD. The higher of the Practical Quantitation Levels (PQL) and Groundwater Quality Criterion should have been selected. This is likely due to an oversight.

5.2.3.3 Selected Remedy

The selected remedy included the following components:

- Excavate and dispose of the process leach tank and adjacent contaminated soils.
- Treat residual soil and groundwater contamination through AS/SVE to remove the larger portion of solvent compounds present to the physically limiting endpoint, followed by monitored natural attenuation and periodic progress reviews.
- Establish a CEA immediately adjacent to Site 26 to bar the use of groundwater during the remediation period.
- Provide long-term periodic groundwater monitoring.

5.2.4 Status of Implementation

5.2.4.1 Active Remediation

Source removal actions are discussed in Section 5.2.1; details of the removal action can be found in the Site 26 Close-Out Report (FWEC 1998). Following installation of the AS/SVE system in December 2000, the system became operational in January 2001. The AS/SVE system operated 40 hours per week and was shut down in October 2004 due to the diminishing COC concentrations in system effluent. The AS/SVE system infrastructure remains onsite. Mechanical components, assessed in 2012, restarted in test mode but require maintenance and further evaluation; AS and SVE piping, which was above-grade, had been damaged and would require repairs (TT 2012) to re-implement.

5.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum. Biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 5-1 presents the LUC boundary. Groundwater sampling is ongoing to support a CEA/WRA and a LUC RD will be developed following completion of the CEA/WRA.

5.2.4.3 Long-Term Monitoring Program

Since shutting down the AS/SVE system at Site 26, groundwater sampling was conducted between 2004 and 2011 at 15-month intervals and again in 2015. As agreed upon by the project team, an LTM schedule will be established following the planned additional soil removal which is discussed in Section 5.3.2.

5.2.4.4 Operations and Maintenance

No O&M activities were conducted during this FYR period.

5.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for OU-3 Site 26:

The remedy for the OU 3, Site 26 will be protective of human health and the environment. The source of the contamination has been removed thereby reducing the unacceptable human health risks and threats to ecological receptors in the vicinity of Site 26. No additional excavation at Site 26 is required. Implementation of the LUC outlined in the ROD (i.e. implementation of a CEA/WRA) will further reduce or eliminate the exposure pathway to Site 26 groundwater. In addition, the various buildings and facilities at the Mainside area are

connected to a public water supply (New Jersey American Water Company) so there is currently no use of site groundwater.

An AS/SVE system has been installed and was operated from January 2001 through October 2004. A long-term monitoring program is being implemented to verify that the removal action has achieved the OU 3 cleanup goals. Continued monitoring is required.

The recent groundwater sampling results indicate that chlorinated hydrocarbon concentrations in groundwater have generally increased near the building when compared to previous monitoring sample results. The Navy is currently investigating this area and will determine if additional remediation is necessary. The Draft Tier II Sampling and Analysis Plan for the investigation will be submitted no later than May 1, 2013 (Resolution Consultants 2013a).

5.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of OU-3 Site 26. Table 5-2 provides a list and status of the recommendations that were made for OU-3 Site 26 in the last FYR.

Table 5-2: Status of Recommendations from the 2013 Five-Year Review

Operable Unit 3 – Site 26				
Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Groundwater concentrations appear to be rebounding near the onsite building	Investigate rebound in groundwater concentrations near the building.	Completed	Results of the supplemental soil and groundwater investigation were reported in the Final Additional Soil and Groundwater Investigation Report (Resolution Consultants 2017).	4/1/2017
CEA not yet implemented	Continue the approval process for the CEA.	Ongoing	Additional groundwater LTM required to establish the CEA/WRA is planned.	Anticipated for 2020.

5.3.2 Completed Since the Last Five-Year Review

Supplemental soil and groundwater sampling activities, designed to locate any remaining soil source areas further define the extent of the dissolved phased groundwater contaminant plume and assess the rebounding VOC concentrations in groundwater, were completed in late 2015. Results (found in the Final Additional Soil and Groundwater Investigation Report [Resolution Consultants 2017]) include:

- Soil impacts above NJDEP IGWSLs were limited to TCE, cis-1,2-DCE, and methylene chloride. The maximum detections of TCE (0.401 mg/kg) and cis-1,2-DCE (31 mg/kg) exceeded their NJDEP IGWSLs of 0.01 and 0.3 mg/kg, respectively. Methylene chloride was detected at a concentration of 1.57 mg/kg, above its IGWSL of 0.01 mg/kg. These concentrations were detected in the area between the former leach tank and Building GB-1. No health-based standards were exceeded for any constituent. Sampling locations and associated analytical results of the 2015 soil evaluation are depicted on Figure 5-2.
- The greatest TCE and cis-1,2-DCE impacts were detected between 3 and 5 feet below ground surface near the location of the former process leach tank and grease trap.
- The extent of impacted soil remaining at OU-3 Site 26 appears limited to between 3 and 12 feet below ground surface in the area near the former process leach tank and extending approximately

25 feet southwest. This area will be the focus of voluntary remedial actions (excavation) planned for the fall of 2017, removing soil within the 0- to 12-foot interval.

- Impacts to groundwater above GWQS were limited to TCE, cis-1,2-DCE, and PCE (PCE is currently being addressed as OU-7). Maximum concentrations of TCE and cis-1,2-DCE were detected south (downgradient) of the former process leach tank and grease trap. Maximum PCE concentrations are not collocated with TCE and cis-1,2-DCE, which supports the current site conceptual model hypothesizing that PCE contamination is from a source other than the former process leach tank and grease trap (see Section 12 for further discussion of OU-7). Groundwater data are discussed further in Section 5.4.2.1.

The Navy is conducting a voluntary limited soil removal action (fall 2017) at Site 26 in an effort to remove residual TCE and cis-1,2-DCE identified during the supplemental soil and groundwater investigation. The Navy's objective is to expedite the natural attenuation of groundwater by removing residual source material. In addition to soil removal, the Navy has elected to add a biological amendment to the open excavation area prior to backfilling to enhance the degradation of VOCs. Following completion of the removal action, additional groundwater sampling will be conducted. These data will be used to evaluate natural attenuation as the long-term site remedy, and support development of the CEA/WRA. Removal actions and subsequent sampling events will be presented in a summary report.

Discussions with EPA are ongoing regarding the appropriate format in which to document this planned change in remedy.

5.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 26.

5.3.4 Data Review

5.3.4.1 Land Use Control Inspection Records

The Navy is working toward obtaining the necessary data to establish a CEA/WRA; once a CEA/WRA is completed, the Navy plans to complete an LUC RD to memorialize institutional control requirements. In the interim, the BMP restricts the use of untreated groundwater for purposes other than environmental monitoring and testing. During this FYR period, the BMP has been an effective institutional control, preventing intrusive activities and exposure to waste and/or contaminated groundwater.

5.3.4.2 Long-Term Monitoring Data

Groundwater data were compared to maximum concentrations cited in the ROD and concentrations observed following shut-down of the AS/SVE system to gauge current plume status. Results of the 2015 groundwater evaluation are depicted on Figure 5-3. The maximum concentrations of TCE and cis-1,2-DCE cited in the ROD were 4,800 µg/L and 2,000 µg/L, respectively.

Following treatment using AS/SVE, TCE and cis-1,2-DCE concentrations had decreased to 23 and 29 µg/L, respectively. However, at the time of the 2015 sampling event the maximum concentrations of TCE (1,820 µg/L, monitoring well 26AS01) and cis-1,2-DCE (3,140 µg/L, monitoring well 26GW01) had rebounded. Further review of the data, however, indicates the following:

- Concentrations are higher downgradient of the former source area; no GWQS exceedances are currently present in the source area, and horizontal migration is evident based on downgradient concentrations.

- Based on 2015 isoconcentrations and historical plume footprint maps shown in Appendix C the plume has diminished in size.
- The increase in cis-1,2-DCE concentrations supports that PCE/TCE degradation is occurring.

5.3.4.3 Operations and Maintenance Records

No O&M inspections have been conducted during this FYR period.

5.3.5 Site Inspection Findings

The FYR inspection was performed on June 6, 2017, as discussed in Section 1.4.2. Building GB-1 remains vacant except for treatment system equipment. A tree has fallen on and damaged fencing behind the building. Photos of fence line damage are attached to the site inspection forms in Appendix A, however, the fencing is not required by the ROD and is scheduled to be removed. The land use for the site appeared to be unchanged since the last FYR and no evidence was observed of new well installation or extraction, residential, residential-like, or agricultural development or uses.

5.4 Technical Assessment

Operation of the AS/SVE system following removal of the process leach tank was initially effective at removing dissolved phase and residual VOCs. While TCE concentrations have rebounded following the shutdown of the AS/SVE system, increases in cis-1,2-DCE indicate that degradation is ongoing. The pending additional soil removal and emplacement of the biological amendment in the excavation will enhance the natural attenuation of the plume.

The CEA/WRA will be prepared following further evaluation of natural attenuation through monitoring (pending funding) and statistical analysis to determine concentration trends over time. The plume appears to be at steady state and there are no potable receptors; therefore, natural attenuation is a viable strategy. LTM will be established following finalization of the CEA/WRA. After establishment of a CEA/WRA, an LUC RD will be prepared. Discussions with EPA are ongoing regarding the appropriate format in which to document the planned change in remedy.

VI was not considered at OU-3 Site 26 since no occupied buildings are located on the site or within 100 feet of the groundwater contaminant plume. The demolition of Building GB-1 is pending and the site will remain vacant.

5.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 5-3 summarizes components of the Question A: Technical Evaluation.

Table 5-3: Technical Evaluation – Question A

Operable Unit 3 – Site 26	
Question	Summary
Remedial Action Performance	<p>The source removal action and AS/SVE remedy functioned as intended; operations were terminated in 2004 once effluent concentrations reached asymptotic levels. Long-term monitoring and supplemental investigations in 2015 identified rebound in dissolved phase TCE concentrations, plume shrinkage, and increases in cis-1,2-DCE concentrations which suggest ongoing plume degradation. The Navy is planning a voluntary removal action to address residual soil impact in the area of the leach tank to expedite natural attenuation. In addition to the voluntary removal action, a blend of amendments (vegetable oil and mulch) will be added to the excavated area prior to backfilling to further enhance natural biodegradation of volatile organic compounds at Site 26.</p> <p>Following implementation of the soil removal action, periodic groundwater monitoring will</p>

Table 5-3: Technical Evaluation – Question A

Operable Unit 3 – Site 26	
Question	Summary
	be performed, and these data used to develop CEA/WRA and LUC RD documentation for the site.
Systems Operation/ Operations and Maintenance	Not applicable; no O&M is required at Site 26.
Implementation of Land Use Controls and Institutional/ Engineering Controls	<p>LUCs are required by the ROD:</p> <ul style="list-style-type: none"> The BMP is used to restrict access to OU-3 Site 26, prevent intrusive activity, and avoid exposure to contaminated groundwater. The CEA/WRA has not been established at Site 26, but additional data collection will continue following the removal action planned for spring 2019. Upon CEA/WRA implementation, a LUC RD will be developed.

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

Table 5-4 summarizes components of the Question B Technical Evaluation.

Table 5-4: Technical Evaluation – Question B

Operable Unit 3 – Site 26	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be- Considered Criteria	ARARs have been evaluated as described in Section 1.3. Groundwater quality standards presented in Table 5-1 were compared to current ARARs. Since the ROD was signed, no changes to ARARs have occurred.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	<p>The remedy mitigated threats due to human health risk; no ecological threats were identified at Site 26. Two OUs were established at Site 26: OU-3's ROD (1998) identified both risk-based and ARAR based RGs; OU-7's ROD (2007) clarified site RGs using ARARs for all COCs. Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is present as groundwater does not discharge to wetlands or surface water bodies; therefore, no complete exposure pathways are present. Remedial actions which included both an active remedy and LUCs were implemented at Site 26, as discussed in Section 5.2.4. The protectiveness of remedies based on ARARs is not sensitive to risk assessment changes; no additional remedial actions would be implemented today based on changes in the risk assessment.</p> <p>The potential for vapor intrusion was evaluated and was determined not to be an issue at Site 26. No occupied buildings are located on the site or within 100 feet of the groundwater contaminant plume. Demolition of the building is pending.</p>
Changes in Exposure Pathways	<p>There have been no changes in land use at Site 26 that would result in a change in exposure pathways.</p> <p>Cis-1,2-DCE, a degradation product of PCE/TCE, is currently detected within the OU-3 plume; vinyl chloride, also an expected degradation product, was not identified as a COC or detected above GWQS during the initial RI. Review of the site COC list, remedial goals, and associated decision document modifications are necessary to ensure all expected degradation products are captured on the COC list.</p>
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy at Site 26 is progressing to meet the RAOs:</p> <ul style="list-style-type: none"> Although rebound was observed immediately after system shut down, parent material concentrations are lower than pre-remediation conditions. In addition, degradation product compounds are increasing indicating MNA is occurring. The BMP has prevented exposures to groundwater. Long-term protection of human health will be managed by the CEA/WRA and LUC RD.

Notes: [1] Since the ROD, EPA finalized a RfD and RfC and cancer slope factor for TCE; and a RfD was added for both cis 1,2-DCE and trans 1,2-DCE.

5.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

5.5 Issues/Recommendations

Table 5-5: Issues/Recommendations that Affect Current or Future Protectiveness				
Operable Unit 3 – Site 26				
Operable Unit 3, Site 26	Issue Category: Institutional Controls			
	Issue: After sufficient groundwater analytical data and associated MNA evaluations are conducted, a CEA/WRA should be developed and implemented. Click here to enter text.			
	Recommendation: Continue LTM for the purpose of developing CEA/WRA.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	06/01/20

5.6 Other Findings

Other FYR findings at Site 26 include:

- Because of the physical, logistical, and administrative overlap between OU-3 and OU-7, a review of both OUs is recommended to assess the feasibility of closing one OU, merging the two OUs, or managing the OUs administratively as a single unit. This would allow the Navy to streamline several recommendations such as not needing to maintain two separate LTM programs, two separate CEA/WRAs, or two separate LUC RDs at these two sites.
- The following analytes should be reviewed for potential modifications to Site 26 COC lists. These modifications do not affect site protectiveness, as these analytes are not present within the current plume footprint and are discussed here for completeness/optimization purposes.
 - Methylene chloride was detected in subsurface soil during the 2015 investigation activities (Resolution Consultants 2017) as well as in the sludge from the process leach tank during the IRA and in groundwater above NJDEP GWQS. Consideration should be given to adding methylene chloride to the COC list, given historical detections at the site. If methylene chloride is added to the COC list, site remedy modification documents should be updated accordingly.
 - The COC list depicted in Table 5-1 includes cadmium; however, review performed during this FYR indicates cadmium has not been analyzed at Site 26 since the RI, and no documentation exists that provides reasoning for its exclusion from the sampling program. A review of historical cadmium data and the basis for inclusion in the COC list, rationale for elimination from the LTM program, and modifications to the COC list (if appropriate) should be completed.

- The COC list does not include vinyl chloride, a degradation product of PCE/TCE and cis-1,2-DCE. Given that the ultimate objective of the Site 26 is to transition to a natural attenuation remedy, inclusion of vinyl chloride in the COC list should be considered in any modifications to decision documents.
- The groundwater LTM program can be optimized by reducing the analytical sampling program to report only COCs which would include TCE/PCE and all associated daughter products. Currently, a full VOC analytical suite is analyzed.

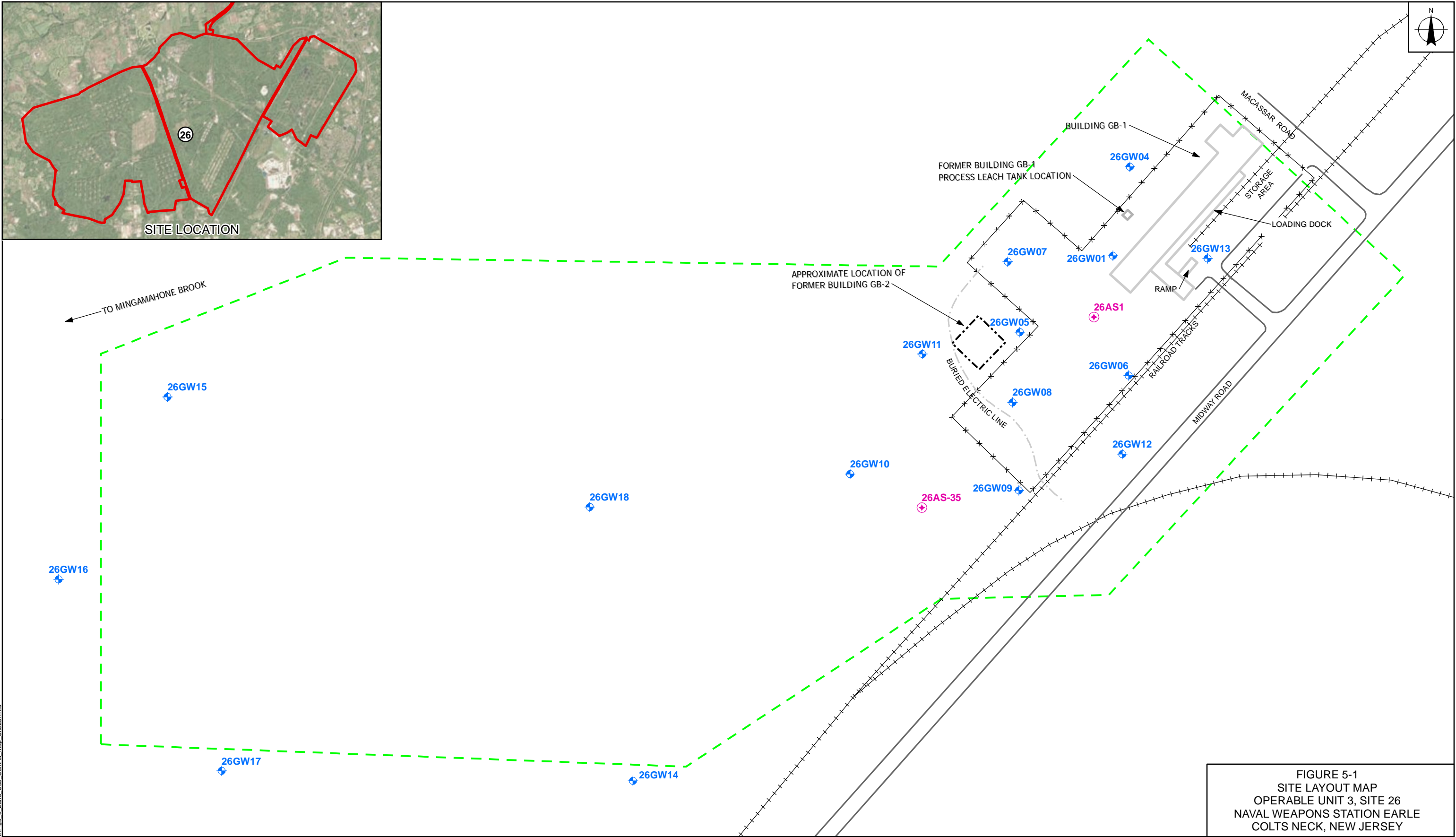
5.7 Protectiveness Statement

Protectiveness Statement		
<i>Operable Unit:</i> 3	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
Site 26 Explosive "D" Washout Area		
<i>Protectiveness Statement:</i> The remedy at OU-3 Site 26 is protective in the short-term of human health and protective in the long-term of the environment. Prior remedial actions (source removal and air sparging/soil vapor extraction removed source materials. The BMP prohibits groundwater use other than environmental testing. However, for the remedy to be protective in the long term to human health, the following actions need to be taken: (1) Establish a CEA and LUC RD and (2) Establish a schedule for periodic groundwater monitoring. These will be completed following voluntary, supplemental removal actions planned by the Navy in the source area.		

5.8 References

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Legend

Monitoring Well Location	Railroad
Air Sparging Well Location	Land Use Control Boundary / Proposed Classification Exception Area
Fence	

0 100 200 Feet

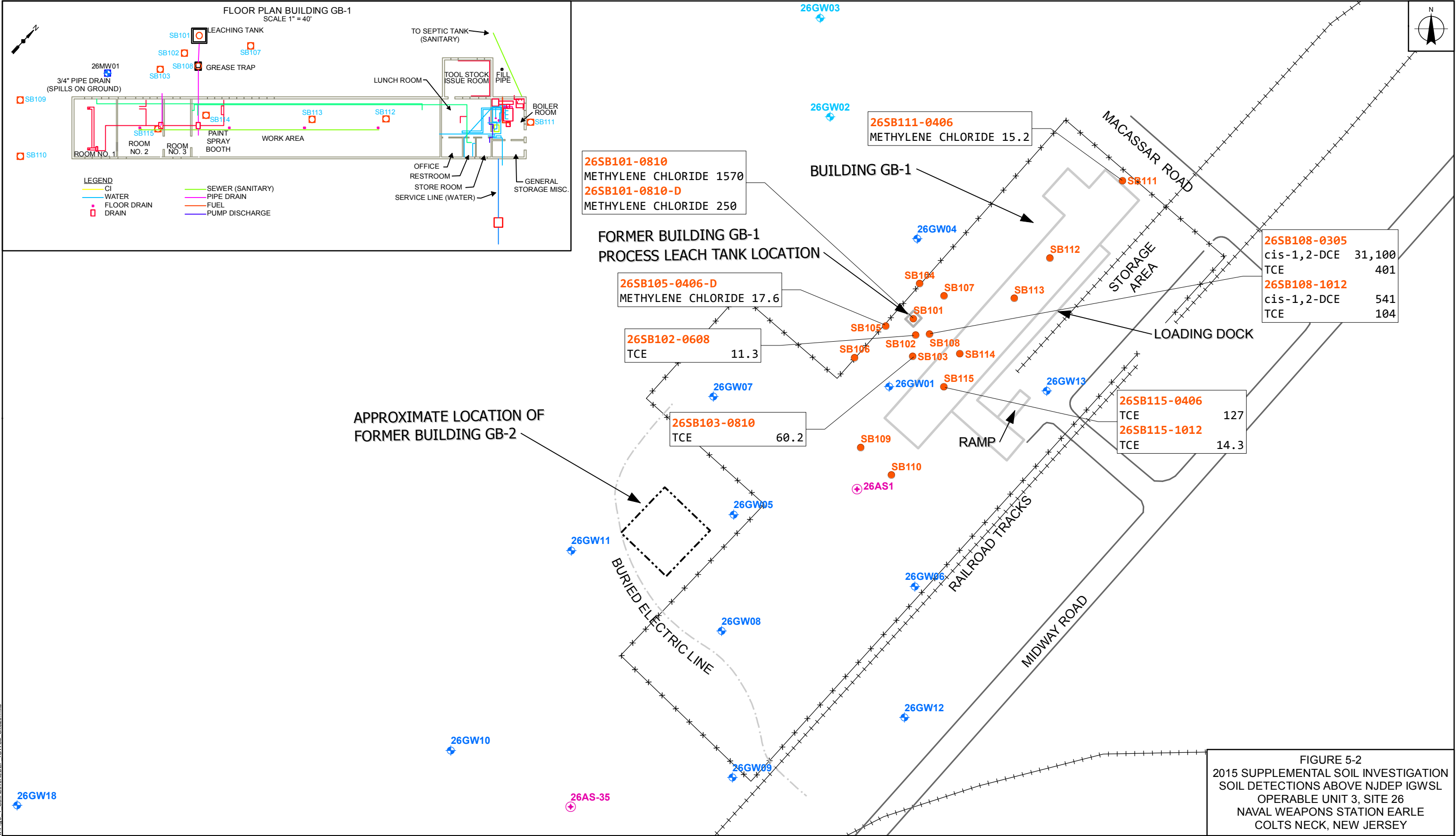
FIGURE 5-1
SITE LAYOUT MAP
OPERABLE UNIT 3, SITE 26
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

NAVFAC
Naval Facilities Engineering Command

REQUESTED BY: F. BURWELL	DATE: 9/13/2017
DRAWN BY: N. RINEHART	TASK ORDER NUMBER: WE02

X:\Nav\Earle\YearReview\Figs 3 Land Use Control Map Site26.mxd

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Legend

- Monitoring Well Location
- Monitoring Well Location (Approximate No Survey Data)
- Air Sparging Well Location
- Soil Boring Location
- Railroad
- Fence

NOTE:

- All sample results are in micrograms per kilogram
- TCE = Trichloroethene
- cis-1,2-DCE = cis-1,2-Dichloroethene
- No exceedance of NJDEP direct contact standards were detected
- NJDEP IGWSL = New Jersey Department of Environmental Protection Impact to Groundwater Screening Level
- Analytical data not provided indicates no exceedances were detected in that boring location

060120

Feet

NAVFAC
Naval Facilities Engineering Command

REQUESTED BY: F. BURWELL
DRAWN BY: N. RINEHART

DATE: 12/7/2017
TASK ORDER NUMBER: WE02

FIGURE 5-2
2015 SUPPLEMENTAL SOIL INVESTIGATION
SOIL DETECTIONS ABOVE NJDEP IGWSL
OPERABLE UNIT 3, SITE 26
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

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6.0 Operable Unit 4, Site 20 – Grit Blasting Area at Building 544

Site 20 is part of OU 4 which comprises multiple sites. This section describes activities specific to Site 20.

6.1 Site Background

Site 20 was formerly used for grit-blasting operations to remove paint from ordnance and the area is currently not used. Spent grit and paint chips were disposed of in an open pile located southwest of Building 544. The open pile accumulated over an area of approximately 10 feet in diameter and was approximately 1 foot in height.

Site 20 – Grit Blasting Area at Building 544

- Remedy: Land use restrictions placed in the BMP
- Remedy in place? — Yes
- UU/UE achieved? — Yes

6.1.1 Location and Physical Description

Site 20 is located in the central portion of the Mainside Area (Figure 1-2). Site 20 is bordered to the west/northwest by Midway Road, to the northeast by a marsh and wetlands, and to the east and southeast by a shallow drainage swale approximately 300 feet in length and 1-foot deep (Figure 6-1) (Resolution Consultants 2013). A septic tank and leach field were located behind Building 544 (Resolution Consultants 2013). In 2010, Building 544 was demolished and the septic tank removed and backfilled.

6.1.2 Land Use

Site 20 is a grass-covered open field and is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 20.

6.2 Response Action Summary

Following the interim removal action described in Section 6.2.1, post-excavation sampling was conducted as part of the Phase II RI. Phase II RI results (BR&E 1996) reported concentrations of beryllium above the RDCSCC, the unrestricted use criteria in effect at the time of sampling, in two of the five samples. As reported in the Phase II RI, an HHRA and a baseline ERA were performed using post-remediation data. No unacceptable risk to human or ecological receptors was identified; however, two post-excavation samples exceeded the RDCSCC for beryllium.

6.2.1 Interim Remedial Actions

In 1994 and 1995, an IRA was performed at Site 20 for contaminated grit and related site media, including contaminated sediments from the drainage ditch (NAVFAC 1999). Stage I removal was performed from November to December 1994, excavating and disposing approximately 300 cubic yards of impacted soils offsite. Post-excavation soil samples contained select metals exceeding the NJDEP RDCSCC in three locations and additional source removal was recommended.

The Stage II removal action in March 1995 and consisted of soil excavation activities at locations where metals above RDCSCC were identified. Stage II excavation was followed closely by the 1995 RI Phase II sampling event, which was focused to collect soil samples that documented the efficacy of the soil removal action. Phase II RI results reported concentrations of beryllium above the RDCSCC in two of the five samples.

6.2.2 Basis for Action

An HHRA was performed post-IRA at Site 20. The risk assessment found that cancer risks for residential and industrial scenarios were within EPA's acceptable risk range (10^{-6} to 10^{-4}) and was driven primarily by arsenic; non-carcinogenic HIs were less than 1. The pre-IRA ERA determined that no additional assessment was necessary due to the minimal terrestrial habitat of ecological value and incomplete migration pathways to the wetlands present to the east and northeast of the site. The pre-ERA also indicated that after source removal, any theoretical migration to the wetlands was mitigated.

The ROD remedy is based solely on the two RDCSCC exceedances for beryllium present in post-excavation samples. Following source removal, an HHRA and ERA were conducted and concluded that no unacceptable risk was present to human or ecological receptors (NAVFAC 1999).

6.2.3 Selected Remedy

6.2.3.1 Record of Decision

The Final OU-4 ROD (Sites 14, 20, 22, 23, 24, 25, 27 and 29) was signed by the Navy on 28 September 1999 and by EPA on 22 September 1999 (NAVFAC 1999).

6.2.3.2 Remedial Action Objectives

No RAOs are listed in the ROD; however, the following statement is included:

Institution controls, with five-year reviews, meet statutory requirements of CERCLA 121 for Sites 20, 23, and 27 which have contaminants remaining at concentrations above NJDEP residential reference criteria, but which do not pose excess risk under current (industrial) land use (NAVFAC 1999).

It should be noted that reference to risk in this statement is solely based on the exceedances of NJDEP's UU/UE ARAR for beryllium (the RDCSCC). The ROD compared detected analytes to ARARs and TBCs; beryllium exceeded NJDEP RDCSCCs. The ARAR was based on carcinogenic and non-carcinogenic departure thresholds of 10^{-6} and 1, respectively, and was applicable to each sample location.

The RDCSCCs and current RDCSRs for beryllium are presented in Table 6-1.

Table 6-1: Remedial Goals for Soil Based on ARARs

Operable Unit 4 – Site 20		
Constituent	NJDEP RDCSCC (mg/kg)	Current NJDEP RDCSRs (mg/kg)
Beryllium	1	16

6.2.3.3 Selected Remedy

Because residential cleanup standards were not achieved for Site 20, the ROD (NAVFAC 1999) indicated a notation was made in the BMP that "further measures would be required before sites 20, 23, and 27 could be considered for unrestricted (residential) use. Sites 20, 23, and 27 will be subject to FYRs. In the event of full or partial transfer of property a review would be conducted to determine the suitability of any parcel for transfer of ownership. Whether or not additional remediation is required, and whether formal restrictive covenants should be included in the transfer document, would be reviewed at that time." No further institutional controls were required by the ROD.

6.2.4 Status of Implementation

6.2.4.1 Institutional Controls

Land use restrictions have been noted in the BMP Addendum. Figure 6-1 presents the LUC boundary. As discussed in subsequent sections, the LUC has been determined to no longer be required. As such, an OU Closure RACR documenting UU/UE will be developed.

6.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 20 pending:

The remedy implemented at OU4, Site 20 is protective of human health and the environment. The remedy for contaminated subsurface soil at Site 20 is ICs. The ICs are in place. Implementation of the IC outlined in the ROD has further reduced or eliminated the exposure pathway to subsurface soil. In addition, the various buildings and facilities at the Mainside area are connected to a public water supply (New Jersey American Water Company), so there is currently no use of site groundwater (Resolution Consultants 2013).

6.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 20. It was noted during the third FYR that the current UU/UE standard (the RDCSRS) for beryllium is 16 mg/kg. Therefore, there are currently no exceedances of surface soil, subsurface soil, or sediment sample concentrations at this site.

6.3.2 Completed Since the Last Five-Year Review

Beryllium exceedances were reevaluated due to the revision of the health-based RDCSCC from 1 mg/kg to the RDCSRS of 16 mg/kg. The revision and promulgation of the RDCSRS resulted from the comparison of the state's soil remediation standards to the EPA Soil Screening Levels ([SSLs] carcinogenic and non-cancer screening levels of 1600 mg/kg and 160 mg/kg, respectively) for beryllium. NJDEP applied a safety factor of 10 to establish a remediation standard that is an order of magnitude more stringent than the EPA SSL.

Based on the re-comparison, the beryllium concentrations in the two post-excavation samples (1.4 mg/kg and 2.7 mg/kg) are now below the RDCSRS of 16 mg/kg and thereby comply with UU/UE standards. These are the only post-excavation samples that contained a contaminant above the most restrictive standard. The Technical Memorandum, Grit Blasting Area, Building 544 (Operable Unit 4, Site 20) — Evaluation of Post-Excavation Data and Documentation for Site Closure (Resolution Consultants 2017) was prepared to memorialize the change in standard and to document that LUCs are no longer required. The EPA and NJDEP concurred on July 12, 2017, and August 21, 2017, respectively. EPA has also indicated in an email dated April 26, 2017, that an ESD is not required.

6.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 20.

6.3.4 Data Review

No data was collected since the last FYR. The beryllium data was reevaluated against current RDCSRS and identified as compliant with its UU/UE standard.

6.3.5 Site Inspection Findings

The FYR inspection was performed June 5, 2017, as discussed in Section 1.4.2. The site is not currently in use and based on recent evaluation, the site is suitable for UU/UE uses. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

6.4 Technical Assessment

LUCs were implemented through notation in the BMP. However, as described in Section 6.3.2, beryllium remaining in onsite soil is no longer above the UU/UE standard.

6.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 6-2 summarizes components of the Question A: Technical Evaluation.

Table 6-2: Technical Evaluation – Question A

Operable Unit 4 – Site 20	
Question	Summary
Remedial Action Performance	LUCs are in place and effectively preclude residential exposures at the site. However, based on updated RDCSRS there are no exceedances of UU/UE standards. As discussed in Section 6.3.2, a technical memorandum which presented the reevaluation of data and requested the removal of the LUC requirement was submitted and concurred upon by the EPA and NJDEP.
Systems Operation/ Operations and Maintenance	The selected remedy did not include operations and maintenance components.
Implementation of Land Use Controls and Institutional/ Engineering Controls	LUCs were required by the ROD and were documented in the BMP. Land use restrictions, the only components of the remedy are no longer required and can be removed from the BMP. A Site Closure RACR will be prepared.

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

Table 6-3 summarizes components of the Question B: Technical Evaluation.

Table 6-3: Technical Evaluation – Question B

Operable Unit 4 – Site 20	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Based on the current standards there are no exceedances for beryllium.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The remedy at Site 20 mitigated risks to human health; no unacceptable ecological risks were identified during the RI (NAVFA 1999) due to limited impact and lack of migration pathways. Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the source has been removed. OU-4's ROD (1999) required LUCs based on an ARAR exceedance for beryllium. In 2008 NJDEP adopted RDCSRS. As a result of the revised standards, the concentrations in the two post-excavation samples are now compliant with unrestricted use standards. The Navy, in partnership with the U.S. EPA and NJDEP, has determined that the site is compliant with ARARs and does not pose a threat to public health, welfare or the environment. Therefore, there is no additional remedial action required for the site, and LUCs are no

Table 6-3: Technical Evaluation – Question B

Operable Unit 4 – Site 20	
Question	Summary
	longer needed. The Navy, in partnership with EPA and NJDEP, has determined that Site 20 does not pose a threat or potential threat to public health, welfare, or the environment; therefore, requirements for institutional controls and future FYRs will be discontinued and Site 20 will be closed.
Changes in Exposure Pathways	There are no changes in exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	The RAOs are met at Site 20 as the soil is now compliant with UU/UE standards.

6.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

6.5 Issues/Recommendations

This FYR did not identify issues that affect protectiveness.

6.6 Other Findings

Other findings for Site 20:

- An OU Closure RACR will be prepared to memorialize UU/UE at Site 20. Upon final regulatory concurrence of the OU Closure RACR, land use restrictions in the BMP should be removed.

6.7 Protectiveness Statement

Protectiveness Statement		
Operable Unit: 4	Protectiveness Determination: Protective	Addendum Due Date (if applicable): Not Applicable
Site 20 Grit Blasting Area at Building 544		
Protectiveness Statement: The remedy at OU-4 Site 20 is protective of human health and the environment.		

6.8 References

Brown & Root Environmental. 1996. *Remedial Investigation Report for Naval Weapons Station Earle*. Colts Neck, New Jersey. July.

Naval Facilities Engineering Command (NAVFAC). 1999. *Record of Decision Operable Unit 4 (OU-4) Sites 14, 20, 22, 23, 24, 25, 27, and 29*. Naval Weapons Station Earle. Colts Neck, New Jersey. August.

Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March.

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Legend

- Drainage Swale
- Limits of Grit Pile Removal
- Wetlands
- Land Use Control Boundary

0 25 50 100
Feet

FIGURE 6-1
SITE LAYOUT MAP
OPERABLE UNIT 4, SITE 20
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



REQUESTED BY: S. Hill

DATE: 9/13/2017

DRAWN BY: M. Senne

TASK ORDER NUMBER: WE02

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7.0 Operable Unit 4, Site 23 – Paint Disposal Area

Site 23 is part of OU 4 comprising multiple sites. This section describes activities specific to Site 23.

7.1 Site Background

Site 23, the paint disposal area near former Building D-5, received paint waste on the ground surface from repainting and stenciling torpedoes, aerial bombs, and other large ordnance from the early 1970s until approximately 1993. The site includes a small area (approximately 200 square feet) on the west side of former Building D-5 (Resolution Consultants 2013) and is currently not used.

Site 23 – Paint Disposal Area, Building D-5

- Remedy: Land use restrictions placed in the BMP
- Remedy in place? —Yes
- UU/UE achieved? — No

7.1.1 Location and Physical Description

Site 23 is located in the northeastern portion of the Mainside section of NWS Earle (Figure 1-2). The D-5 complex is enclosed by a soil berm (natural grade to the north and east, manmade to the south and west) approximately 20 feet high. The site is grassy and partially paved, and overland runoff flows radially across the site into shallow drainage depressions that surround the site on three sides. A small wetland is located northwest of the berm and uphill of the former building, which appears to be the source of a small stream which runs intermittently in the drainage ditch west of the Building D-5 area (NAVFAC 1999).

7.1.2 Land Use

Site 23 is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change land use at Site 23.

7.2 Response Action Summary

The RI conducted in 1995 (B&RE 1996) identified cadmium in two subsurface soil samples slightly exceeding the NJDEP RDCSCC standard of 1.5 mg/kg. Lead, cadmium, chromium, and PAHs were detected at concentrations greater than sediment ecological toxicity threshold values. Both inorganic and organic compounds were detected in groundwater samples above ARARs. Metals that exceeded ARARs in surface water samples were attributed to suspended solids.

7.2.1 Interim Remedial Actions

Based on results of the 1995 RI, a focused IRA addressed specific areas of soil contamination. In December 1996, approximately 86 tons of contaminated soil were removed and disposed offsite.

7.2.2 Basis for Action

Prior to the IRA, the HHRA identified risk to human health above the upper bound of the acceptable risk range (10^{-4}) for both future residential and industrial scenarios for both subsurface soil and groundwater; ERA determined that risks to ecological receptors were low and further study or remediation was unnecessary due to lack of migration pathways. Arsenic was the primary contributor to risk; lead also exceeded acceptable risk model exposure thresholds. Following the IRA, no additional risk assessment was performed, and all additional remedial decisions were based on NJDEP cleanup criteria (NAVFAC 1999). The ROD remedy is based solely on the four thallium RDCSCC exceedances present in post-excavation samples. A full risk assessment was not implemented post-removal action; however, the ROD indicated that the 1996 IRA was effective and documented that there was no unacceptable risk in subsurface soil posed to human health or the environment under current or planned land use after removal action (NAVFAC 1999).

7.2.3 Selected Remedy

7.2.3.1 Record of Decision

The Final OU-4 ROD (Sites 14, 20, 22, 23, 24, 25, 27 and 29) was signed by the Navy on September 28, 1999, and by EPA on September 22, 1999 (NAVFAC 1999).

7.2.3.2 Remedial Action Objectives

No RAOs are listed in the ROD; however, the following statement is included:

Institution controls, with five-year reviews, meet statutory requirements of CERCLA 121 for Sites 20, 23, and 27 which have contaminants remaining at concentrations above NJDEP residential reference criteria, but which do not pose excess risk under current (industrial) land use (NAVFAC 1999).

It should be noted that reference to risk in this statement is solely based on the four exceedances of NJDEP UU/UE ARAR for thallium (the RDCSCC). The ROD compared detected analytes to ARARs and TBCs; thallium exceeded NJDEP RDCSCCs. The ARAR was based on carcinogenic and non-carcinogenic departure thresholds of 10^{-6} and 1, respectively, and was applicable to each sample location. The RDCSCCs and current RDCSRSs for thallium are presented in Table 7-1.

Table 7-1: Remedial Goals for Soil Based on ARARs

Operable Unit 4 - Site 23		
Constituent	NJDEP RDCSCC (mg/kg)	Current NJDEP RDCSRS (mg/kg)
Thallium	2	Not Regulated ^[1]

Notes:

[1] NJDEP thallium value was rescinded in September 2017

7.2.3.3 Selected Remedy

The selected remedy required notation in the BMP that further measures would be required before sites 20, 23, and 27 could be considered for unrestricted (residential) use. Sites 20, 23, and 27 will be subject to FYRs. In the event of full or partial transfer of property, a review would be conducted to determine the suitability of any parcel for transfer of ownership. Whether or not additional remediation is required, and whether formal restrictive covenants should be included in the transfer document, would be reviewed at that time. No further institutional controls were required by the ROD.

7.2.4 Status of Implementation

7.2.4.1 Institutional Controls

Land use restrictions are noted in the BMP Addendum. Figure 7-1 presents the LUC boundary. As discussed in subsequent sections, the LUC has been determined to no longer be required. As such, a Technical Memorandum to document UU/UE is being developed. Upon regulatory concurrence, an ESD and OU Closure RACR will be developed.

7.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 23:

The remedy implemented at OU4, Site 23 is protective of human health and the environment. The remedy for contaminated soil and groundwater at Site 23 is ICs. The ICs are in place. In addition, the various buildings and facilities located in the NWS Earle Mainside area are connected to a public water supply (New Jersey American Water Company), so there is no use of site groundwater via this exposure pathway (Resolution Consultants 2013).

7.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 23 and no issues were reported during the last FYR. Recommendations provided in the Third Five-Year Review Report are listed in Table 7-2.

Table 7-2: Status of Recommendations from the 2013 Five-Year Review Report

Operable Unit 4 – Site 23				
Issue	Recommendations	Status	Implementation Status Description	Completion Date (if applicable)
Excess soil erosion	Perimeter of Site 23 needed regrading to limit overflow from the adjoining wetlands.	Considered But Not Implemented	There was no ecological or human health risk per the ROD, so no action is required.	Not Applicable
Monitoring well not functional	Well MW23-01 needed to be repaired or replaced.	Considered But Not Implemented	Groundwater monitoring no longer required.	Not Applicable
Groundwater Monitoring	Based on results of the November 2010 sampling results, no further groundwater monitoring is recommended at Site 23.	Completed	Based on the sample results and data evaluation, no further action needed for groundwater (TT NUS 2011) and approved by NJDEP 07 February 2013.	2/7/2013
Soil Concentrations	Because contaminants remain at the site at levels that do not allow for unlimited use and unrestricted exposure, future FYRs will be required.	Completed	As described in Section 7.3.1, thallium exceeded updated NJDEP RDCSRS at one location. The exceedance was reevaluated using NJDEP statistical guidance and presented in the Technical Memorandum (Resolution Consultants 2017); NJDEP approved the Navy's statistical approach on February 28, 2017. In September 2017, the NJDEP updated the RDCSRSs and thallium is no longer regulated. A Technical Memorandum has been submitted to document that the site meets UU/UE and concurrence is pending.	7/19/2017/ Pending

7.3.2 Completed Since the Last Five-Year Review

No additional remedial actions have been performed since the last FYR. Thallium exceedances were reevaluated based on the revision of the health-based RDCSCC from 2 mg/kg to the RDCSRS of 5 mg/kg using NJDEP's Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (2012). This guidance provides several options to achieve compliance with applicable NJDEP remediation standards to ensure compliance with risk tolerances protective of human health and the environment. Remedial action is considered complete and compliant with unrestricted use standards if the arithmetic mean concentration of each contaminant is less than or equal to RDCSRS. In this case, the only constituent requiring evaluation was thallium, as no other analytes exceeded the respective RDCSRS. Below lists the compliance averaging results for post-excavation thallium.

Table 7-3: Post-Excavation Thallium Results

Operable Unit 4 – Site 23		
Thallium		
Location	Sample Depth (feet bgs)	Analytical Result
23-CS01	bottom (>2.8)	4.1
23-CS02	bottom (>2.8)	2.8
23-CS03	sidewall (<2.8)	1.7 U
23-CS04	sidewall (<2.8)	9.2
23-CS05	sidewall (<2.8)	3.4
23-CS06	sidewall (<2.8)	1.9 U
23-CS07	sidewall (<2.8)	1.8 U
23-CS08	sidewall (<2.8)	1.7 U
Average		2.44

Notes:

NJDEP thallium value was rescinded in September 2017

The analysis was presented in the Technical Memorandum (Resolution Consultants 2017). The Navy received concurrence regarding the Compliance Averaging technique from NJDEP via email dated February 28, 2017; the EPA concurred that the site met the 2012 ARARs in email correspondence dated July 19, 2017.

An ESD was submitted to document compliance with ARARs and remove LUCs as the site meets UU/UE standards. However, during ESD development, the NJDEP revised its RDCSRs (2017) and thallium is no longer regulated which has supplanted the need to establish compliance via averaging. A revised Technical Memorandum is being developed to document that the site meets UU/UE based on the updated standards. Upon regulatory concurrence, a revised ESD will be submitted and an OU-4 Closure RACR will be developed indicating that Site 23 requires no further action.

7.3.3 Site Interview Findings

FYR interviews were performed as described in Section 1.4.3. EPA and NJDEP personnel had no specific comments for Site 23.

7.3.4 Data Review

No data were collected since the last FYR; however, reevaluation of the soil dataset was conducted, and it has been determined that the site meets UU/UE standards. Groundwater monitoring wells were installed during the RI and were resampled. Groundwater sampling was not required by the ROD; however, sampling was conducted in 2010 to re-evaluate the groundwater conditions in comparison to the RI data. The evaluation was presented in the Groundwater Sampling Report for November 2010 Sampling Event (TT 2011) which concluded that metals in groundwater were naturally occurring and indicated that additional sampling was not warranted. Approval to discontinue groundwater sampling was received by the NJDEP and U.S. EPA in 2013.

7.3.5 Site Inspection Findings

The FYR inspection was performed June 5, 2017, as discussed in Section 1.4.2. The site is not currently in use. The site and access roads appeared to be well maintained. During the site inspection,

23MW01 was observed to have a damaged lid and needed a new lock; however, these repairs may not be necessary if wells are to be abandoned.

Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

7.4 Technical Assessment

LUCs were implemented through notation in the BMP. However, as discussed in Section 7.3.2, thallium has been evaluated and identified compliant with UU/UE standards. A Technical Memorandum was produced (Resolution Consultants, 2016) to document compliance with UU/UE based on compliance averaging. The NJDEP and EPA concurred that LUCs were no longer required based on the 2016 technical memorandum.

An ESD was submitted to document compliance with ARARs and remove LUCs as the site meets UU/UE standards. However, during ESD development, the NJDEP revised its RDCSRs and thallium is no longer regulated. A revised Technical Memorandum is being developed to document that the site meets UU/UE based on the updated standards. Upon regulatory concurrence, an OU-4 RACR will be submitted indicating that Site 23 requires no further action.

7.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 7-4 summarizes components of the Question A: Technical Evaluation.

Table 7-4: Technical Evaluation – Question A

Operable Unit 4 – Site 23	
Question	Summary
Remedial Action Performance	LUCs are in place and effectively preclude residential exposures at the site. As described in Section 7.3.2, based on updated RDCSRs, there are currently no exceedances of surface soil, subsurface soil, or sediment sample concentrations at this site. A technical memorandum and ESD have been prepared to remove LUCs and close Site 23, as it meets UU/UE standards and an OU-4 RACR will be submitted indicating that Site 23 requires no further action.
Systems Operation/ Operations and Maintenance	The selected remedy did not include operations and maintenance components.
Implementation of Land Use Controls and Institutional/ Engineering Controls	LUCs are required by the ROD and were documented in the BMP. After issuance of the Final ESD the Navy will remove land use restrictions from the BMP.

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

Table 7-5 summarizes components of the Question B: Technical Evaluation.

Table 7-5: Technical Evaluation – Question B

Operable Unit 4 – Site 23	
Question	Summary
Changes in Applicable or Relevant and Appropriate	ARARs have been evaluated as described in Section 1.3. Soil RGs presented in the ROD were compared to current ARARs. The NJDEP RDCSRs has been updated and thallium

Table 7-5: Technical Evaluation – Question B

Operable Unit 4 – Site 23	
Question	Summary
Requirements or To-Be-Considered Criteria	is no longer regulated.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The remedy at Site 23 mitigated risks to human health; no unacceptable ecological risks were identified during the RI (NAVFAC 1999). Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because source area has been removed. Thallium was identified as the only COC and is no longer regulated.
Changes in Exposure Pathways	There are no changes in exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	The RAOs are met at Site 23: the BMP has prevented unauthorized land use/exposure at Site 23.

7.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

7.5 Issues/Recommendations

This FYR did not identify issues that affect protectiveness.

7.6 Other Findings

Other FYR findings at Site 23 include:

- Upon U.S. EPA and NJDEP concurrence of the revised Technical Memorandum documenting UU/UE, an ESD and an OU Closure RACR should be developed. Upon approval of the OU Closure RACR, land use restrictions in the BMP should be removed.

7.7 Protectiveness Statement

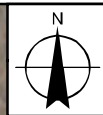
Protectiveness Statement		
Operable Unit: 4	Protectiveness Determination: Protective	Addendum Due Date (if applicable): Not Applicable
Site 23 Paint Disposal Area, Building D-5		
Protectiveness Statement: The remedy at OU-4 Site 23 is protective of human health and the environment.		

7.8 References






Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle*. Colts Neck, New Jersey. July.

- Naval Facilities Engineering Command (NAVFAC). 1999. *Record of Decision Operable Unit 4 (OU-4) Sites 14, 20, 22, 23, 24, 25, 27, and 29*. Naval Weapons Station Earle, Colts Neck, New Jersey. August.
- Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March.
- Resolution Consultants. 2017. *Draft Technical Memorandum Paint Disposal Area, Building D-5 (Operable Unit 4, Site 23) – Evaluation of Post Excavation Data and Potential for Site Closure*. July.
- Tetra Tech NUS (TT NUS). 2011. *Groundwater Sampling Report for November 2010 Sampling Event Site 23 – Paint Disposal Area*. Naval Weapons Station Earle, Colts Neck, New Jersey. February.
- Tetra Tech (TT). 2014. *Final Addendum to the Master Plan for Environmental Restoration Program Sites Land Use Controls NWS Earle NJ*. January.

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Legend

-  Monitoring Well
-  Land Use Control Boundary
-  Demolished Building
-  Drainage Ditch
-  Channelized Stream

0 25 50 75 100
Feet

FIGURE 7-1
SITE LAYOUT MAP
OPERABLE UNIT 4, SITE 23
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



REQUESTED BY: M. Gibson

DATE: 9/13/2017

DRAWN BY: N. Rinehart

TASK ORDER NUMBER: WE02

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8.0 Operable Unit 4, Site 27 – Projectile Refurbishing Area

Site 27 is part of OU 4 comprising multiple sites. This section describes activities specific to Site 27.

8.1 Site Background

Site 27, the projectile refurbishing area including Building E-14 and a small storage locker, was used to refurbish projectiles by shot-blasting, repainting and stenciling. Oil-contaminated rags, paint chips, and spent sandblasting shot were disposed of on the south side of Building E-14. A small (approximately 80 square feet) area near the southeast corner of Building E-14 was covered by red paint sludge (Resolution Consultants 2013). The site is currently not used.

Site 27 – Projectile Refurbishing Area

- Remedy: Land use restrictions placed in the BMP
- Remedy in Place? —Yes
- UU/UE Achieved? — No

8.1.1 Location and Physical Description

Site 27 is located in the Mainside portion of NWS Earle (Figure 1-2). Building E-14 and a small storage locker are present on the site. A railroad siding and a small drainage depression are present on the east side of the site behind the building. The site is primarily grass covered. Overland runoff drains towards the southeast to the shallow depression approximately 15 feet downslope from the former paint sludge area (Resolution Consultants 2013).

8.1.2 Land Use

Site 27 is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change land use at Site 27.

8.2 Response Action Summary

The RI conducted in 1995 (B&RE 1996) identified cadmium in subsurface soil as the only contaminant detected at a concentration greater than the NJDEP RDCSCC.

8.2.1 Interim Remedial Actions

An HHRA identified risk to human health above the upper bound of the acceptable risk range (10^{-4}) for the future residential scenario due to arsenic in soil. The HHRA also concluded that risk was within the acceptable risk range for the industrial use scenario. Non-carcinogenic risk was below the acceptable limit for all use scenarios. ERA concluded that although contaminants were above screening levels, due to the size of the site and lack of habitat due to gravel and paved surfaces, further ecological study was unwarranted but that planned removal actions were appropriate.

Based on the results of the 1995 RI, a focused IRA was performed in December 1996 to address specific areas of soil contamination. Approximately 54 tons of contaminated soil were removed, and post excavation sampling was conducted. Two post excavation sample locations contained concentrations of select metals in excess of RDCSCC as well as NRDCSCC. For this reason, on January 2, 1997, an additional seven 55-gallon drums of lead contaminated soil were excavated from these two locations.

8.2.2 Basis for Action

Per the ROD, risks identified in the pre-remediation HHRA and ERA were addressed by the source removal. The pre-IRA ERA determined that as the site is gravel and/or paved and in the vicinity of buildings minimal habitat was present and no migration pathways to nearby receptors were present.

However, select post-excavation sample locations exceeded NJDEP RDCSCCs for arsenic, beryllium, cadmium, copper, antimony, selenium, and thallium. For this reason, the ROD required LUCs to prevent future residential use.

8.2.3 Selected Remedy

8.2.3.1 Record of Decision

The Final OU-4 ROD (Sites 14, 20, 22, 23, 24, 25, 27 and 29) was signed by the Navy on 28 September 1999 and by the EPA on 22 September 1999 (NAVFAC 1999).

8.2.3.2 Remedial Action Objectives

No RAOs are listed in the ROD; however, the following statement is included:

Institution controls, with five-year reviews, meet statutory requirements of CERCLA 121 for Sites 20, 23, and 27 which have contaminants remaining at concentrations above NJDEP residential reference criteria, but which do not pose excess risk under current (industrial) land use (NAVFAC 1999).

It should be noted that reference to risk in this statement is solely based on the exceedances of NJDEP UU/UE ARAR. The ROD compared detected analytes to ARARs and TBCs; several constituents exceeded NJDEP RDCSCCs. The ARAR was based on carcinogenic and non-carcinogenic departure thresholds of 10^{-6} and 1, respectively, and was applicable to each sample location.

Presented in Table 8-1 are the RDCSCCs and current RDCSRs for constituents remaining at Site 27 after the IRA that exceeded their respective RDCSCCs.

Table 8-1: Remedial Goals for Soil Based on ARARs

Operable Unit 4 – Site 27				Sample Depth (feet)
Constituent	NJDEP RDCSCC from ROD (mg/kg)	Current NJDEP RDCSRs (mg/kg)	Maximum Onsite Concentration (mg/kg)	
Antimony	14	31	15.5	1
Arsenic	20	19	69.7	2
Beryllium	1	16	2.84	1
Cadmium	1	78	61.7	1
Copper	600	3100	416	1
Selenium	63	390	82.9	1
Thallium	2	Not Regulated ^[1]	73.2	1

Notes:

^[1] NJDEP thallium value was rescinded in September 2017

It should be noted that the post excavation analytical data table presented in the ROD (ROD Table 46, page D-82), erroneously includes samples 27-CS04 and 27-CS05 which were subject of a removal action in 1997. This is noted due to the fact that these locations would represent maximum onsite concentrations of some of the COCs listed above. The table above does not include any sample results from these locations as they are no longer present at the site.

8.2.3.3 Selected Remedy

Because residential cleanup standards were not achieved for Site 27, the ROD (NAVFAC 1999) indicated a notation should be made in the BMP that “further measures would be required before sites 20, 23, and 27 could be considered for unrestricted (residential) use. Sites 20, 23, and 27 will be subject to FYRs. In the event of full or partial transfer of property a review would be conducted to determine the suitability of any parcel for transfer of ownership. Whether or not additional remediation is required, and whether formal restrictive covenants should be included in the transfer document, would be reviewed at that time.”

No further institutional controls were required by the ROD.

8.2.4 Status of Implementation

8.2.4.1 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum. Figure 8-1 presents the LUC boundary. As discussed in subsequent sections, the LUC has been determined to no longer be required. As such, a Technical Memorandum to document UU/UE has been developed. Upon regulatory concurrence, an ESD and OU Closure RACR will be developed.

8.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 27:

The remedy implemented at Site 27 is protective of human health and the environment. The remedy for contaminated subsurface soil at Site 27 is ICs. The ICs are in place. Exposure to Site 27 constituents has been minimized due to implementation of the IC outlined in the 1999 ROD that has further reduced or eliminated the exposure pathway to contaminated subsurface soil (Resolution Consultants 2013).

8.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 27 and no issues were reported during the last FYR.

8.3.2 Completed Since the Last Five-Year Review

The Navy developed a LUC RD as discussed in Section 8.2.4.2. Regulatory review of this document is pending. However, based on recent changes to RDCSRs, a Technical Memorandum was produced demonstrating that soil concentrations are compliant with the RDCSRs and the site is suitable for UU/UE. Concurrence on the Technical Memorandum has been received from the NJDEP via email dated November 30, 2017. U.S. EPA concurrence is pending.

8.3.3 Site Interview Findings

The FYR interviews were performed as described in Section 1.4.3. EPA and NJDEP personnel had no specific comments for Site 27.

8.3.4 Data Review

No data were collected since the last FYR. The BMP has been an effective institutional control to prevent intrusive activities at Site 27.

8.3.5 Site Inspection Findings

The FYR inspection was performed June 6, 2017, as discussed in Section 1.4.2. The site is not currently in use, and during the site visit there was no evidence of new well installation or extraction, residential, residential-like, or agricultural development/uses. The site and access roads appeared to be well maintained. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

8.4 Technical Assessment

LUCs were implemented through notation in the BMP. In addition to the notation in the BMP, a LUC RD was submitted for regulatory approval in June 2017. As previously mentioned, a Technical Memorandum demonstrating that the site is suitable for UU/UE was submitted. NJDEP concurrence has been received and U.S. EPA concurrence is expected. Upon concurrence, the LUC RD will not be necessary.

8.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 8-2 summarizes components of the Question A: Technical Evaluation.

Table 8-2: Technical Evaluation – Question A

Operable Unit 4 – Site 27	
Question	Summary
Remedial Action Performance	LUCs are in place and effectively preclude residential exposures at the site.
Systems Operation/ Operations and Maintenance	The selected remedy did not include operations and maintenance components.
Implementation of Land Use Controls and Institutional/ Engineering Controls	LUCs are required by the ROD and were documented in the BMP. The LUC RD has been submitted to regulatory agencies to memorialize LUC implementation and monitoring procedures, including certification submittals to the NJDEP once every two years.

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

Table 8-3 summarizes components of the Question B: Technical Evaluation.

Table 8-3: Technical Evaluation – Question B

Operable Unit 4 – Site 27	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Soil RGs presented in the ROD (RDCSCC) were compared to current RDCSRs. Arsenic in subsurface soil remains above its respective RDCSRs. However, the data was evaluated using the NJDEP's Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (2012) and found to be compliant with UU/UE standards. This evaluation was presented in a technical memorandum and NJDEP concurrence has been received. U.S. EPA concurrence is expected.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The remedy at Site 27 mitigated risks to human health; further ecological study was unwarranted given the site size, limiting significant receptor use, and lack of aquatic or significant terrestrial habitat onsite (NAVFAC 1999). In addition, the site is paved and/or gravel-covered and in the vicinity of buildings. According to the OU-4 ROD (TT NUS 1999),

Table 8-3: Technical Evaluation – Question B

Operable Unit 4 – Site 27	
Question	Summary
	post-excavation confirmatory samples indicated subsurface soil concentrations of metals in exceedance of NJDEP standards but have been re-evaluated as stated previously and found to be compliant with UU/UE standards.
Changes in Exposure Pathways	There are no changes in exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	The RAOs are met at Site 27; the BMP has prevented unauthorized land use/exposure at Site 27.

8.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

8.5 Issues/Recommendations

This FYR did not identify issues that affect protectiveness.

8.6 Other Findings

Post-excavation analytical data presented in Table 8-1 indicate only arsenic is present above current standards.

- A Technical Memorandum to document UU/UE is being developed. The Technical Memorandum documents that multiple constituents (Table 8-1) were identified in the ROD but would not be considered COCs based on current RDCSRs, including antimony, beryllium, cadmium, copper, thallium and selenium. arsenic data were evaluated via NJDEP's Compliance Averaging technique (NJDEP 2012) and determined to be compliant with UU/UE standards. NJDEP has provided concurrence on the Technical Memorandum and U.S EPA concurrence is pending.
- Upon U.S. EPA concurrence of the Technical Memorandum, an ESD and an OU Closure RACR should be prepared.

8.7 Protectiveness Statement

Protectiveness Statement		
Operable Unit: OU-4	Protectiveness Determination: Protective	Addendum Due Date (if applicable): Not Applicable
Site 27 Projectile Refurbishing Area		
Protectiveness Statement: The remedy at OU-4 Site 27 is protective of human health and the environment.		

8.8 References

Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle. Colts Neck, New Jersey.* July.

Department of Defense/United States Environmental Protection Agency (DoD/EPA). 2006. Joint Guidance on Streamlined Site Closeout and National Priorities List (NPL) Deletion Process for DoD Facilities. January.

Foster Wheeler Environmental Corporation (FWEC). 1997. *Removal Actions at Sites 22, 23, 27, Naval Weapons Station Earle, Colts Neck, New Jersey*. February.

Naval Facilities Engineering Command (NAVFAC). 1999. *Record of Decision Operable Unit 4 (OU-4) Sites 14, 20, 22, 23, 24, 25, 27, and 29. Naval Weapons Station Earle. Colts Neck, New Jersey*. August.

Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March.

Resolution Consultants. 2017. Draft Final. 2017. *Land Use Control Remedial Design. Operable Unit 4. Site 27 – Projectile Refurbishing Area. Naval Weapons Station Earle, Colts Neck, New Jersey*. June.

Tetra Tech (TT). 2014. *Final Addendum to the Master Plan for Environmental Restoration Program Sites Land Use Controls NWS Earle NJ*. January.



Legend

- Drainage Ditch
- Land Use Control Boundary

0 35 70
Feet

FIGURE 8-1
SITE LAYOUT MAP
OPERABLE UNIT 4, SITE 27
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



REQUESTED BY: S. HILL

DATE: 9/13/2017

DRAWN BY: M. SENNE

TASK ORDER NUMBER: WE02

Service Layer Credits: Google Earth Pro Image - Dated 9/6/2013

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9.0 Operable Unit 5, Site 13 – Former Defense Property Disposal Office Yard Landfill

9.1 Site Background

OU-5, Site 13, the Former Defense Property Disposal Office (DPDO) Landfill, is an area of landfill material near the rail classification yards. The inactive landfill covers approximately 1.7 acres, with total landfill volume estimated at 4,000 cubic yards.

The Former DPDO Landfill operation time frame is unknown and reportedly included storage of scrap metals and batteries as well as the burial of cars, trucks, electronic equipment, clothing and shoes, sheet metal, furniture, scrap metal, and batteries (NAVFAC 2004). Additionally, batteries were broken open at the site for lead recovery and acid was drained onto the ground.

Site 13 — Former DPDO Landfill

- Remedy: Excavation, LTM and LUCs/ICs
- Remedy in Place? — Yes
 - Limited excavation and landfill cap in place
 - Fencing and posting of warning signs in place
 - CEA – Approved
 - LUC RD — Complete
 - LTM – Ongoing
- UU/UE Achieved? — No

9.1.1 Location and Physical Description

Site 13 is located in the Mainside area of NWS Earle within OU-5 (Figure 1-2). The site is bordered by undeveloped wooded areas/wetlands to the north and west, and railroad tracks to the east. The Navy DPDO yard borders the south portion of the landfill; they are separated by a chain link fence (Figure 9-1).

9.1.2 Land Use

Site 13 is an inactive landfill and is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 13.

9.2 Response Action Summary

The SI/RI activities conducted from 1994 through 1998 (Weston 1994; B&RE 1996; B&RE 1998) identified exposed wastes and contaminated sediment, surface water, and groundwater.

9.2.1 Interim Remedial Actions

A limited IRA was performed in 1997, which consisted of the partial removal of exposed landfill debris by NWS Earle Public Works Department employees (NAVFAC 2004).

9.2.2 Basis for Action

As landfill contents were to remain in place, actions were required to preclude direct contact with waste as well as to prevent future leaching of contaminants to groundwater.

The HHRA concluded that the cancer risk associated with future residential and future industrial exposure scenarios exceeded the acceptable upper end of the target risk range (10^{-4}). Arsenic (via ingestion and dermal contact with groundwater) and vinyl chloride (via ingestion and inhalation) were the principal contributors to carcinogenic risk. Hazard indices for industrial exposure by groundwater exceeded 1.0, primarily due to arsenic and iron. Hazard indices for residential exposure by groundwater exceeded 1.0, primarily due to antimony, arsenic, cadmium, and iron. The risk from sediment and surface water to the hypothetical recreational receptor was evaluated and below acceptable risk ranges and below a hazard quotient of 1.

The RI identified select metals (arsenic, cadmium, chromium, iron, and lead) and VOCs (cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride) in groundwater above NJDEP GWQS. In addition, metals (antimony, lead, mercury, and silver), and organic pesticides (alpha-chlordane and endrin aldehyde) were detected in site-related sediment samples above the sediment ecological toxicity threshold values.

The ERA concluded that hazard quotient values for inorganics in both surface water and sediment were indicative of low potential risk, with the exception of silver in both media. No organics were detected in surface waters, and hazard quotients for organics, including pesticides, in sediment were indicative of low potential risk, except for PCBs. Overland runoff appears to be the dominant migration pathway from Site 13 to the wetlands and stream; however, it does not appear that silver is migrating or that PCBs have the potential to migrate to habitats downstream in Hockhockson Brook (NAVFAC 2004).

9.2.3 Selected Remedy

9.2.3.1 Record of Decision

The Final OU-5, Site 13 ROD was signed by the Navy on August 11, 2004 and by EPA on 9 September 2004 (NAVFAC 2004).

9.2.3.2 Remedial Action Objectives

The following RAOs were developed to mitigate existing and future potential threats to public health and the environment (NAVFAC 2004):

- The RAO at Site 13 to protect human health is to prevent contact with landfilled material and to prevent exposure to metals and VOC contamination in groundwater until groundwater is restored.
- The Remedial Design for Land Use Controls includes restrictions to prohibit digging into or disturbing the cover system or contents of the landfill, residential development at the site, or use of groundwater from beneath the site, other than for environmental monitoring and testing, without Navy approval.
- The RAO for protection of the environment is to prevent potential contact with landfill contents and minimize contaminant migration into the adjacent wetlands.

Several analytes were identified as exceeding ARARs in the ROD including EPA MCLs and NJDEP GWQS. Table 9-1 summarizes the maximum concentration of analytes and chemical-specific remedial goals based in comparison to ARARs and includes current analyte concentrations as of November 2015.

Table 9-1 summarizes these analytes and their chemical-specific remedial goals based on the ARARs defined in the ROD.

Table 9-1: Groundwater Quality Regulatory Standards Comparison

Operable Unit 5 – Site 13						
Parameter	ARARs Identified in the ROD (2004) ^[1]		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Concentrations (November 2015) ^[2] (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
cis-1,2-Dichloroethene	70	10	120*	70	70	62.3
trans-1,2-Dichloroethene	100	100	120*	100	100	2.8
Trichloroethene	5	1	180	5	1	3.2
Tetrachloroethene	5	0.4	70	5	0.4	0.40 U
Vinyl chloride	2	0.08	11	2	0.08	25.8
Antimony	6	2	9.7	6	6	6.0 U
Arsenic	10	0.02	39.2	10	3	7.7
Cadmium	5	4	63.9	5	4	36.1
Chromium (total)	100	100	296	100	70	163
Iron	NE	300	57,900	NE	300	65,000
Lead**	15	5	18.8	15	5	3.0 U

Notes:

[1] The ROD did not identify numeric remedial goals but cited MCLs and GWQS within the remedial action objective, and Table 7 (page II-34) and the Comparative Analysis of Alternatives (page II-38) specifically cite GWQS and MCLs.

[2] 2015 Draft Annual Maintenance and Monitoring Report for the Landfill Caps Sites 3 and 10, Sites 4 and 5, Site 13, and the Long-Term Monitoring for Site 19

* Value reported in the ROD is 1,2-dichloroethene (total)

** OLEM Directive 9300-2-167 was considered, however, since the concentrations are non-detect, a site specific value has not been developed.

9.2.3.3 Selected Remedy

The selected remedy for Site 13 included the following components:

- Excavate soils and sediments located in landfill erosion areas that may have been impacted by the landfill and place in area to be capped. Prepare site for installation of the cap (clearing, grubbing, grading, compaction, etc.)
- Install a low-permeability cover system that complies with federal and state regulatory requirements to reduce infiltration, promote drainage, limit erosion, and preclude potential contact with the landfill contents over all former landfill areas of the site.
- Erect a chain-link-type fence around the landfill cap with appropriate warning signs to limit access, restrict potential human contact with contaminated materials, and protect the integrity of the cover.
- Implement LUCs (including annotations to the BMP, LUC RD, and CEA) to maintain integrity of the current or future remedial system (e.g., landfill cap), to prohibit groundwater use, prevent residential development of the site, and limit future use to prevent disturbance of the landfill cover system or direct contact with contaminated media, such as landfill contents and groundwater.

- Establish a CEA pursuant to N.J.A.C. 7:9-6 to prohibit use of untreated groundwater as drinking water.
- Conduct long-term, periodic groundwater monitoring to assess contaminant status and potential threats to human health and the environment.
- Since wastes will be left in place, review site conditions and risk every five years.

9.2.4 Status of Implementation

9.2.4.1 Engineering Controls

Landfill cap construction was completed by TN&A in October 2005 in accordance with the Final RAWP (TN&A 2005a). Excavation and backfill of the soil and sediments from the small drainage ditch and wetland area adjacent to the landfill was also conducted (TN&A 2005b). A multi-layer/composite cap was installed over the consolidated materials, and wetlands restoration was performed as part of site restoration (Resolution Consultants 2016). In addition to the landfill cap and excavation, fencing and posting of warning signs on the perimeter of the landfill were installed (TN&A 2005b).

9.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum. Semiannual inspections are completed to document that LUCs remain in place and are protective. Figure 9-1 presents the LUC boundary. The final CEA/WRA documentation has been approved by NJDEP. Confirmation of NJDEP approval was documented in correspondence dated June 5, 2017. Confirmation that the geodetic datum has been received and accepted to the NJDEP's CEA/WRA database was provided in correspondence dated July 17, 2017.

9.2.4.3 Long-Term Monitoring Program

The LTM program was established in 2006. Currently, groundwater monitoring at Site 13 is performed annually with samples collected from eight monitoring wells analyzed for select VOCs (cis-1,2-dichloroethene, trans-1,2-dichloroethene, trichloroethene, tetrachloroethene, and vinyl chloride) and metals (antimony, arsenic, cadmium, chromium [total], iron, and lead). Sampling results from this FYR period are summarized in Section 9.4.2.2.

9.2.4.4 Operations and Maintenance

Semiannual (spring and fall) O&M inspections at Site 13 are performed in accordance with the O&M Manual (TT 2008).

O&M inspections include the following components:

- Landfill cap: Cap is visually inspected semiannually for evidence of erosion, differential settling, coverage of vegetation, and evidence of burrowing animals.
- Gas monitoring vents: Three 4-inch polyvinyl chloride gas vents are visually inspected.
- Gas emissions are monitored once every 5 years.
- Site access ramps: Inspected for potholes, ruts, settlement, soil erosion, vegetative growth, and integrity of the security gates.
- Groundwater monitoring system: Monitoring wells are visually inspected for damage, subsidence, vandalism, or blockage.

Semiannual inspection findings performed during this FYR period are summarized in Section 9.4.2.3.

9.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 13:

The remedy at OU 5, Site 13 is protective in the short-term of human health and the environment. The remedy for Site 13 is capping, ICs, fencing and signage, and long-term groundwater monitoring. The cap is in place and appears to be effective at reducing infiltration, promoting drainage, limiting erosion, and precluding potential contact with the landfill contents. A long-term groundwater monitoring program is being implemented to verify that the cap is performing as designed. Results from the 2011 annual monitoring event suggest that the cap is performing as intended. Proper implementation of all ICs and O&M will maintain the effectiveness of the remedy into the future. The ICs, through the pending CEA, will place restrictions on use of site groundwater.

Exposure to Site 13 constituents has been minimized due to placement of the RCRA-type cap system over the landfilled waste materials. In addition, the various buildings and facilities located in the NWS Earle Mainside area are connected to a public water supply (New Jersey American Water Company) which precludes groundwater exposure. Therefore, exposure to groundwater contaminants via the drinking water pathway has been minimized. Implementation of the LUCs outlined in the ROD further reduces or eliminates the exposure pathway to buried waste materials and groundwater. The remedy will be protective when the CEA is implemented (Resolution Consultants 2013).

9.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 13. Table 9-2 provides a list and status of the recommendations that were made for Site 13 in the last FYR.

9.3.2 Completed Since the Last Five-Year Review

The following have been completed since the last FYR.

- The final CEA/WRA documentation (TT 2013), which formally documents the areal and vertical extent of groundwater that does not meet GWQSSs, was submitted to NJDEP in June 2013 (TT 2013). The CEA was approved by NJDEP. A formal approval letter has not been provided; however written documentation of NJDEP approval was confirmed in correspondence dated June 5, 2017. The associated geospatial files were resubmitted by the Navy in July 2017.
- In 2013, all wetland mitigation evaluation data and photographs were submitted to NJDEP for review and concurrence that the mitigation project was successful and that no additional monitoring was required. NJDEP conducted a site visit and concluded that, although some invasive species had encroached on the mitigation area, the mitigation was a success and no additional maintenance was warranted in the mitigation area. Neither a Wetland Mitigation Project Completion of Construction Report nor a Final Mitigation Monitoring Report were required by NJDEP. In correspondence dated February 21, 2014, NJDEP concluded that all wetland mitigation permit conditions have been satisfied.

Table 9-2: Status of Recommendations from the Five-Year Review Report

Operable Unit 5 – Site 13				
Issue	Recommendations	Status	Implementation Status Description	Completion Date (if applicable)
The slope on the western side of the landfill needs to be stabilized to address minor erosion of the cap.	Stabilize the slope on the western side of the landfill.	Considered but not implemented	The 2016 site inspection did not identify any erosion issues, and maintenance reports from this FYR period did not document any deficiencies with the cap (Sovereign 2017a, Sovereign 2017b).	November 17, 2016
13MW04 and 13MW05 locks are missing.	Replace lock on monitoring wells 13MW04 and 13MW05.	Completed	Well lock was replaced.	March 31, 2013
CEA not established with NJDEP.	Continue the approval process for CEA.	Completed	The final CEA/WRA documentation was submitted to NJDEP in September 2013. The CEA/WRA was approved by NJDEP. A formal approval letter has not been provided; however written documentation of NJDEP approval was confirmed in correspondence dated June 5, 2017.	June 2017

9.3.3 Site Interview Findings

NJDEP personnel had no specific comments for Site 13. EPA indicated they would like the status of the CEA/WRA for Site 13 to be included in the FYR report.

9.3.4 Data Review

9.3.4.1 Land Use Control Inspection Records

The LUC RD for soil and groundwater at Site 13 was finalized in April 2004. The LUC RD and associated fencing/warning signs are supported by annotations to the BMP, which has been an effective institutional control in preventing intrusive activities at Site 13. A CEA/WRA was prepared and has been approved by NJDEP; the approval letter is pending. As described in Section 9.3.2, the Navy is currently facilitating implementation. In addition, biennial certifications for the CEA/WRA will be submitted to the NJDEP.

9.3.4.2 Long-Term Monitoring Data

Figure 9-2 illustrates the most recent (2015) groundwater monitoring results. During this FYR period, TCE, vinyl chloride, arsenic, cadmium, chromium, iron, and lead were detected above their respective NJDEP GWQS; however, concentrations were within historically observed ranges and were generally within the same order of magnitude as previous events. The 2014 monitoring and maintenance report (Sovereign 2017a) submitted recommended that TCE be removed from the analytical suite for Site 13; the recommendation was approved for all wells with the exception of 13MW15.

9.3.4.3 Operations and Maintenance Records

In accordance with the O&M manual (TT 2008), site inspections were conducted quarterly in the first two years after landfill cap construction, and semiannually thereafter. Review of Site 13 annual maintenance and monitoring reports indicate that communication of maintenance requirements and subsequent repairs and documentation/re-inspection were performed in accordance with the O&M manual. Below is a summary of the observations made from 2013 to 2016 (Table 9-3).

Table 9-3: Landfill Inspection Results Since Last Five-Year Review

Operable Unit 5 – Site 13			
Date	Observation	Corrective Action	Date Completed
5/31/13	No deficiencies	Not Applicable	Not Applicable
10/29/13	Vegetation noted growing through rip rap; settling monument survey completed	Licensed herbicide application	Spring 2016
5/23/14	Vegetation noted growing through 30% of rip rap	Licensed herbicide application	Spring 2016
11/13/14	Vegetation noted growing through 40% of rip rap; settling monument survey completed	Licensed herbicide application	Spring 2016
5/22/15	Vegetation noted growing through rip rap	Licensed herbicide application	Spring 2016
11/20/15	Vegetation noted growing through rip rap; settling monument survey completed	Licensed herbicide application	Spring 2016
6/10/16	Vegetation noted growing through 30% of rip rap;	Licensed herbicide application	Spring 2017
11/17/16	Vegetation noted growing through 30% of rip rap; settling monument survey completed	Licensed herbicide application	Spring 2017

9.3.5 Site Inspection Findings

The site inspection was performed on June 6, 2017, as discussed in Section 1.4.2. Site 13 is a capped landfill that is covered with grass. The site was not in use and no evidence of land use inconsistent with land use restrictions was observed. During the site inspection, the cap and associated drainage swales were inspected. In general, the cap system appeared to be in good condition and working as intended. The fence and warning signs were in place.

Issues noted during the inspection include:

- The cable fence that runs on the north, east, and west side of the site showed signs of broken cables.
- Monitoring well 13MW08 needs a replacement lock.

Fence and well maintenance items were immediately noted by the Navy's O&M contractor for implementation. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

9.4 Technical Assessment

Consolidation of contaminated sediments within the landfill perimeter and installation of a landfill multi-layer/composite cap eliminated direct contact risks with contaminated soil and sediment. Implementation of institutional/engineering controls (via the BMP, LUC RD, and CEA/WRA), fencing, and signage prevent groundwater use and disturbance of the multi-layer/composite cap. The LTM groundwater sampling program ensures that risks associated with impacted groundwater are effectively mitigated. In addition, no buildings are present within 100 feet of the plume; therefore, no VI concerns exist.

9.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 9-4 summarizes components of the Question A: Technical Evaluation.

Table 9-4: Technical Evaluation – Question A

Operable Unit 5 – Site 13	
Question	Summary
Remedial Action Performance	Consolidation of contaminated soils/sediments and construction of the multi-layer/composite cap has been effective at eliminating direct contact and migration pathways. Based on recent monitoring results, concentrations of target metals in the groundwater samples collected at Site 13 remain above NJDEP GWQS but are within historically observed ranges.
Systems Operation/ Operations and Maintenance	Semiannual landfill cap and associated engineering control inspections indicate that the implemented remedial action is functioning as intended. Furthermore, site inspections have not revealed significant deficiencies affecting protectiveness or large unexpected O&M costs. Implementation of optimization recommendations made in the 2015 Annual Maintenance and Monitoring Report are pending. Review of O&M records suggests additional opportunities for optimization in reducing overall timeframe for implementation of corrective actions.
Implementation of Land Use Controls and Institutional/ Engineering Controls	<p>LUCs were required by the ROD:</p> <ul style="list-style-type: none"> • The BMP is currently used to restrict access to the site, to prevent intrusive activity, and to prevent exposure to waste and contaminated groundwater • A LUC RD has been completed at this site • A CEA/WRA has been completed for this site. <p>Biennial certifications for the CEA/WRA will be submitted to the NJDEP.</p>

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

Table 9-5 summarizes components of the Question B: Technical Evaluation.

Table 9-5: Technical Evaluation – Question B

Operable Unit 5 – Site 13	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Groundwater ARARs for the site are presented in Table 9-1 and were compared to current ARARs. The remedy remains protective for the site.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The Site 13 remedy mitigated risks to both human health and the environment. Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the exposure pathways have been mitigated via sediment removal and consolidation under the cap mitigating migration and direct contact. Changes in toxicity, risk assessment methods, exposure models, and cleanup levels have no effect on remedy protectiveness given that the remedial actions (multi-layer/composite cap, fencing, and LUCs) prevent complete exposure pathways. As long as the multi-layer/composite cap at Site 13 provides a permanent barrier that prevents exposure to subsurface soil contaminants and prevents contaminant migration into adjacent wetland areas, the remedy remains protective. Should the future use of this site change (e.g., or the cap, fencing, or LUC be removed), reevaluation of risk would be required.
Changes in Exposure Pathways	There have been no changes in land use at the site that would result in changes to exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy at Site 13 meets the RAOs.</p> <ul style="list-style-type: none"> • The multi-layer/composite cap and LUCs (LUC RD, CEA/WRA, and the BMP) prevent exposure to landfill wastes and contaminated groundwater • Restrictions to disturb the landfill, prevent residential development, or groundwater use are in place • The multi-layer/composite cap prevents direct contact with wastes and minimizes migration of contaminants into adjacent wetlands

9.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

9.5 Issues/Recommendations

This FYR did not identify issues that affect current or future protectiveness.

9.6 Other Findings

Other findings for Site 13 include:

- Portions of the cable fence on the north, east, and west side of the site have broken cables.
- The CEA/WRA was approved by NJDEP; however, a formal approval letter has not been provided.

9.7 Protectiveness Statement

Protectiveness Statement		
Operable Unit: 5	Protectiveness Determination: Protective	Addendum Due Date (if applicable): Not Applicable
Site 13 Former Defense Property DPDO Landfill		
Protectiveness Statement: The remedy at OU-5 Site 13 is protective of human health and the environment because contaminated soils/sediment have been consolidated, the multi-layer/composite cap has been installed, fencing has been erected, signage has been placed at the site, and LUCs (the LUC RD, the CEA, and annotations to the BMP) are in place.		






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Legend

-  Monitoring Well
-  Approximate Landfill Boundary
-  Railroad
-  Channelized Stream
-  Land Use Control Boundary

1 inch = 120 feet

0 60 120 Feet

FIGURE 9-1
SITE LAYOUT MAP
OPERABLE UNIT 5, SITE 13
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



REQUESTED BY: F. Burwell

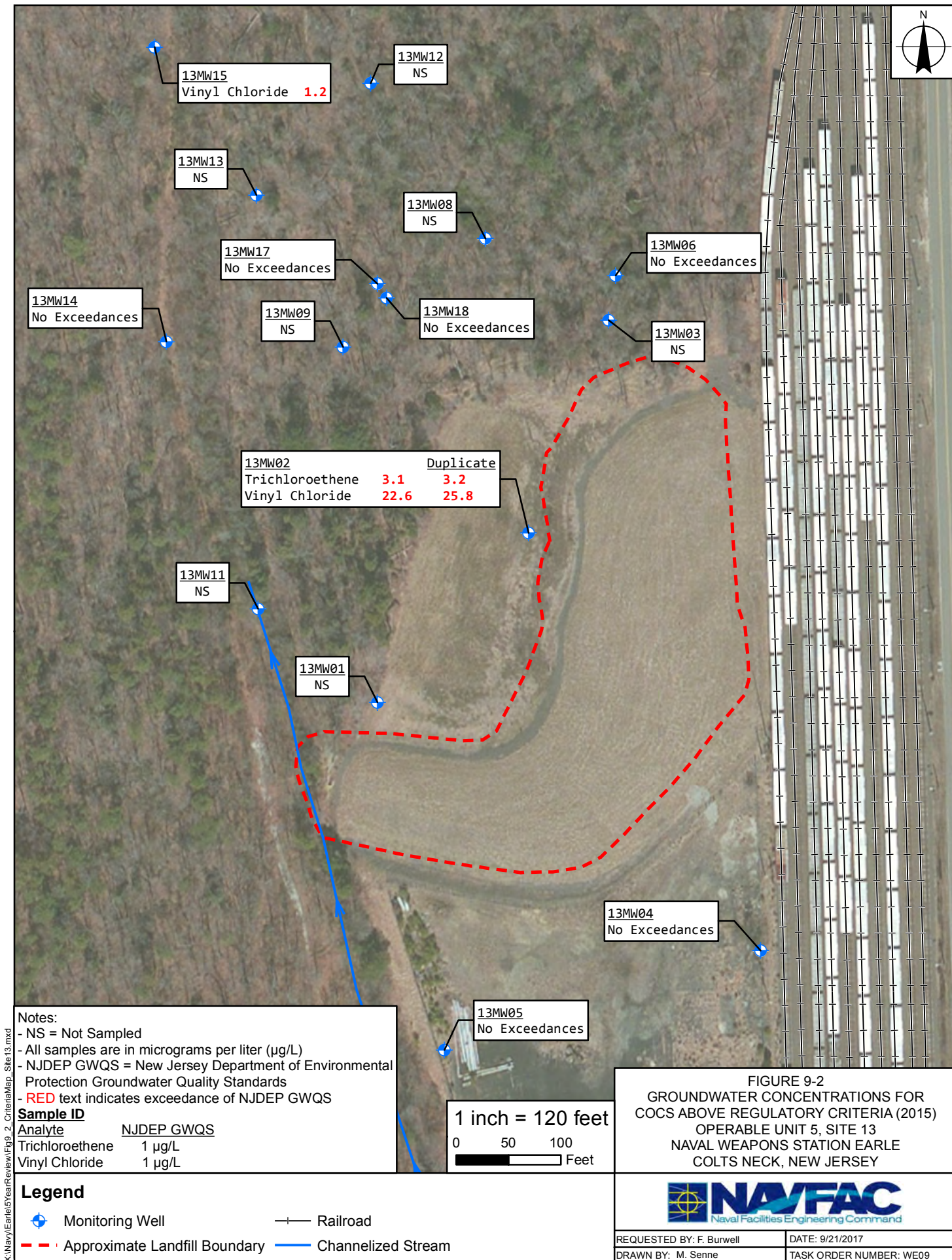
DATE: 9/22/2017

DRAWN BY: M. Senne

TASK ORDER NUMBER: WE09

Basemap Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Data Source: Tetra Tech Nus, Inc.

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10.0 Operable Unit 6, Site 3 – Landfill Southwest of “F” Group

Site 3 is part of OU 6 which comprises Sites 3 and 10. This section describes activities specific to Site 3.

10.1 Site Background

Site 3 includes the 5-acre Landfill Southwest of “F” Group (Figure 10-1). Site 3 was used from 1960 to 1968 for the disposal of domestic and industrial wastes. Industrial wastes reportedly disposed at Site 3 consisted of paints and paint thinners, solvents, varnishes, shellac, acids, alcohols, caustics, pesticide containers and rinse water, wood, and lesser amounts of asbestos. Records indicate that the industrial wastes consist of a small portion of the approximate 4,800 tons of domestic and industrial waste in the landfill (B&RE 1996).

Site 3 – Landfill Southwest of “F” Group

- Remedy: Landfill Cap, LTM and LUCs/ICs
- Remedy in Place? — Yes
 - Landfill Cap - Complete
 - Fencing and posting of warning signs - Complete
 - CEA - No longer required
 - LTM – Ongoing
 - Site O&M – Ongoing
 - LUC RD - Complete
- UU/UE Achieved? — No

10.1.1 Location and Physical Description

Site 3 is located on the southeast side of the NWS Earle Mainside, west of the “F” Group bunkers and Fire Rescue Road 126 (Figures 1-2 and 10-1). The Site 3 landfill is an open grassy area surrounded by woodlands, enclosed with a cable-type fence and warning signs to restrict access. A small forested wetland is located directly southeast of the former landfill site. The ground surface is relatively flat, and stormwater runoff from the majority of the site flows toward the wetland.

10.1.2 Land Use

Site 3 is an inactive landfill and is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 3.

10.2 Response Action Summary

The SI/RI activities conducted from 1986 through 1998 (Weston 1986; Weston 1993; B&RE 1996; B&RE 1998) identified metals in groundwater.

10.2.1 Interim Remedial Actions

No IRA activities were performed at Site 3.

10.2.2 Basis for Taking Action

As landfill contents were to remain in place, actions were required to preclude direct contact with waste as well as to prevent future leaching of contaminants to groundwater. The HHRA concluded that the cancer risk associated with future residential and future industrial exposure scenarios did not exceed the upper end of EPA’s target risk range (10^{-4}). Hazard indices associated with the future residential groundwater exposure scenario exceeded 1.0, the cutoff point below which adverse noncarcinogenic effects are not expected to occur, primarily due to arsenic (NAVFAC 2006). The 1998 RI Addendum (B&RE 1998) indicated that contaminants may be migrating from the former landfill the wetland via overland runoff/erosion. However, the RI concluded that impacts appear to be minor and potential ecological risks to receptors appear to be insignificant. No remedial actions based on ecological receptors were recommended (NAVFAC 2006).

In addition to the risk drivers described above, aluminum, antimony, arsenic, cadmium, and iron were detected above NJDEP GWQS.

10.2.3 Selected Remedy

10.2.3.1 Record of Decision

The Record of Decision OU-6, Site 3 and Site 10 was signed by the Navy on August 6, 2006 and by the EPA on August 15, 2006 (NAVFAC 2006).

10.2.3.2 Remedial Action Objectives

The following RAOs were developed to mitigate existing and future potential threats to public health and the environment (NAVFAC 2006):

- The RAO at Site 3 to protect human health is to prevent human exposure to landfilled material and metal contamination in groundwater in the area immediately downgradient of the former landfill. The RD for LUCs includes restrictions to prohibit digging into or disturbing the cover system or landfill contents, residential development at the site, or use of groundwater from beneath the site, other than for environmental monitoring and testing, without Navy approval.
- The RAO for protection of the environment is to prevent potential contact with landfill contents and minimize contaminant migration into the adjacent wetlands.

Several analytes were presented in the ROD as exceeding ARARs. Table 10-1 shows the maximum concentration in comparison to ARARs and current analyte concentrations as of November 2015.

Table 10-1: Groundwater Quality Regulatory Standards Comparison

Parameter	Operable Unit 6 – Site 3					
	ARARs ^[1]		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Concentrations (November 2015) (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Aluminum	NE	200	7930	NE	200	9380
Antimony	6	20	*	6	6	269
Arsenic	10	8	15.1	10	3	6.4
Cadmium	5	4	11.7	5	4	22.5
Iron	NE	300	7090	NE	300	28,800

Notes:

[1] The ROD did not identify numeric remedial goals but cited MCLs and GWQS within the comparative analysis of alternatives (page II-67).

* Not analyzed in ROD

10.2.3.3 Selected Remedy

The selected remedy for the Site 3 includes the following components (NAVFAC 2006):

- Remove protruding landfill materials.
- Place/compact extra soil cover, grade, and vegetate to limit infiltration (contaminant leaching to groundwater), erosion, and potential contact with landfill contents and to promote drainage.
- Erect a cable-type fence with appropriate warning signs around the landfill cap to limit access to the site to preclude excessive vehicular traffic, to restrict human contact with contaminated landfill materials, and to protect the integrity of the soil cover.

- Implement LUCs (including annotations to the BMP, LUC RD, and CEA) to maintain the integrity of current or any future remedial system (e.g., landfill cap), to prohibit groundwater use, prevent residential development of the site, and limit future use of the site to prevent disturbance of the landfill cover system or direct contact with contaminated media, such as landfill contents and groundwater.
- Establish a CEA pursuant to N.J.A.C. 7:9-6 to prohibit use of untreated groundwater as drinking water.
- Conduct long-term, periodic groundwater monitoring to assess contaminant status and potential threats to human health and the environment. Since wastes will be left in place, site conditions and risks will be reviewed every five years.

10.2.4 Status of Implementation

10.2.4.1 Engineering Controls

A low-permeability cover construction was completed by FWEC in June 2003 in accordance with the Final Remedial Action Work Plan for Remedial Action at OU-6 (Sites 3 and 10) (FWEC 2002). Construction included the removal of protruding landfill materials, placement of 30 inches of soil cover material (graded and compacted for positive drainage), 6 inches of topsoil to promote vegetation, and culverts and drainage structures.

In addition to the landfill cover, fencing and posting of warning signs on the perimeter of the landfill were installed (FWEC 2003a). Other components of the remedial action include long-term groundwater monitoring, O&M, and establishment of a CEA/WRA for the site (FWEC 2003b).

10.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum. Semiannual inspections are completed per the O&M manual and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 10-1 presents the LUC boundary.

The ROD required implementation of a CEA/WRA for Site 3. However, an evaluation of the groundwater data was conducted and presented in a Technical Memorandum (TT, 2013) demonstrating that the low groundwater concentrations of select metals are naturally occurring and a CEA/WRA is no longer required. NJDEP provided concurrence with the Technical Memorandum recommendations that a CEA/WRA is not required and should not be prepared. See Section 10.3.2 for additional details.

10.2.4.3 Long-Term Monitoring Program

The LTM program for Site 3 was established in 2003. The annual sampling schedule was recommended to be reduced to a biennial schedule in the 2014 Maintenance and Monitoring Report (Sovereign, 2015). The NJDEP and U.S. EPA provided review and concurrence with the final 2014 Maintenance and Monitoring report. Currently, groundwater monitoring at Site 3 is performed biennially and samples are collected from 12 monitoring wells. Optimization recommendations are presented in each LTM report, as warranted. Sampling results from this FYR period are summarized in Section 10.4.2.2.

10.2.4.4 Operations and Maintenance

Site 3 O&M inspections are semiannual (spring and fall) in accordance with the O&M Manual (FWEC 2003b). O&M inspections include the following components:

- Landfill cover: The cover is visually inspected semiannually for evidence of erosion, differential settling, coverage of vegetation, and evidence of burrowing animals.
- Site access ramps: Ramps are inspected for potholes, ruts, settlement, soil erosion, vegetative growth, and integrity of the security gates.
- Groundwater monitoring system/monitoring wells: Wells are visually inspected for damage, subsidence, vandalism, or blockage.

Semiannual inspection findings performed during this FYR period are summarized in Section 11.4.2.3.

10.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 3:

The remedy at OU 6, Site 3 is protective of human health and the environment. The remedy for Site 3 is capping, ICs, and long-term monitoring. The cap is in place and reduces infiltration, promotes drainage, limits erosion, and prevents potential contact with the landfill contents. A long-term groundwater monitoring program is being implemented to verify that the cap is performing as designed. Results from the 2010 annual monitoring event suggest that the cap is performing as intended. Proper implementation of the ICs and O&M will maintain the effectiveness of the remedy into the future.

The ICs, through the CEA, place restrictions on use of site groundwater. In addition, the various buildings and facilities located in the NWS Earle Mainside area are connected to a public water supply (New Jersey American Water Company) so there is currently no use of site groundwater. Therefore, exposure to groundwater contaminants via the drinking water pathway has been minimized (Resolution Consultants 2013).

10.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 3. Table 10-2 provides a list and status of the recommendations that were made for Site 3 in the last FYR.

Table 10-2: Status of Recommendations from the 2013 Five-Year Review Report

Operable Unit 6 – Site 3				
Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Erosion within a drainage swale and headwall damage	Repair of the drainage swales and headwall	Considered but not implemented	The semiannual did not identify any erosion issues, and maintenance reports from this FYR period did not document any deficiencies or erosion (Sovereign 2017a, Sovereign 2017b).	November 17, 2016
Silt fence from construction activity still in place	Remove silt fence	Completed	Silt fence is no longer present.	June 6, 2017
MW03-09 lock missing	Replace lock on monitoring well MW03-09	Completed	MW03-09 has a well lock.	June 6, 2017
CEA not established with New Jersey Department of Environmental Protection	Continue the approval process for CEA	Completed	A Technical Memorandum (TT, 2013) demonstrating that the low groundwater concentrations of select metals are naturally occurring and a CEA/WRA is no longer required was submitted and the NJDEP concurred via email dated February 17, 2017.	February 17, 2017

10.3.2 Completed Since the Last Five-Year Review

The following have occurred since the last FYR:

- Analytical results for select metals, which are the only COCs in groundwater, have fluctuated over time (in some cases by orders of magnitude and, conversely, to below GWQS) (Sovereign 2017a, Sovereign 2017b).
- A Technical Memorandum (TT, 2013) demonstrating that the low groundwater concentrations of select metals are naturally occurring and a CEA/WRA is no longer required was submitted. NJDEP provided concurrence with the Technical Memorandum recommendations.

10.3.3 Site Interview Findings

NJDEP personnel had no specific comments for Site 3. EPA indicated they would like the status of the CEA/WRA for Site 3 to be included in the FYR report.

10.3.4 Data Review

10.3.4.1 Land Use Control Inspection Records

The LUC RD for soil and groundwater at Site 3 was finalized in July 2005. The LUC RD and associated fencing/warning signs are supported by annotations to the BMP and Addendum, which has been an effective institutional control in preventing intrusive activities at Site 13. Semiannual inspections are completed to document that LUCs remain in place and are protective; findings and recommendations from the inspections are included in annual Maintenance and Monitoring Reports. As previously stated, a CEA/WRA is no longer required.

10.3.4.2 Long-Term Monitoring Data

Figure 10-2 illustrates the location of wells in the active monitoring program as well as the most recent groundwater monitoring results.

As discussed in Section 10.3.2, COC concentrations have fluctuated over time, in some cases by orders of magnitude. Review of the dataset has indicated that the metals appear to be naturally occurring and not the result of a site discharge; NJDEP has concurred (via email dated February 17, 2017) and is not requiring a CEA/WRA.

10.3.4.3 Operations and Maintenance Records

In accordance with the O&M manual (FWEC 2003b) site inspections were conducted quarterly in the first two years after landfill cap construction, and semiannually thereafter. Review of Site 3 annual maintenance and monitoring reports indicate that communication of maintenance requirements and subsequent repairs and documentation/re inspection were performed in accordance with the O&M manual. Below is a summary of the observations made from 2013 to 2016 (Table 10-3).

Table 10-3: Landfill Inspection Results Since Last Five-Year Review

Operable Unit 6 - Site 3			
Date	Observation	Corrective Action	Date Completed
5/31/13	No deficiencies	Not Applicable	Not Applicable
10/30/13	Vegetation noted growing through riprap; Settling monument survey completed	Licensed herbicide application	Spring 2016
5/23/14	Vegetation noted growing through 70% of riprap; Four to five large trees were down on the north side of the landfill but not on the landfill	Licensed herbicide application	Spring 2016

Table 10-3: Landfill Inspection Results Since Last Five-Year Review

Operable Unit 6 - Site 3			
Date	Observation	Corrective Action	Date Completed
	cap		
11/13/14	Vegetation noted growing through 70% of riprap; Four to five large trees were down on the north side of the landfill but not on the landfill cap	Licensed herbicide application	Spring 2016
5/22/15	Vegetation noted growing through riprap	Licensed herbicide application	Spring 2016
11/20/15	Vegetation noted growing through riprap; Monument survey completed – 11/24/15	Licensed herbicide application	Spring 2016
6/10/16	Noticeable vegetation growth in riprap 50% coverage.	Licensed herbicide application	Spring 2017
11/17/16	Minimal growth in riprap 30-40%; Monument survey completed – 11/17/16	Licensed herbicide application	Spring 2017

10.3.5 Site Inspection Findings

The site inspection was performed on June 6, 2017, as discussed in Section 1.4.2. In general, the landfill cover appeared to be in good condition and working as intended with the exception of the drainage swale on the south portion of the landfill, where part of the drainage liner was exposed in the riprap (Figure 10-1). Cable fence and warning signs surrounding the landfill were inspected and appeared to be in good condition. Exceptions are noted below.

The following observations were noted throughout Site 3:

- Ponding water and dead vegetation throughout the riprap, suggesting that while herbicide treatments have been applied to kill vegetation in the swales, root structures may have been left to trap sediment, restricting drainage.
- An approximately 30-foot-long, 1-foot-wide strip of dead grass on the western portion of the landfill cap appears isolated and could be related to maintenance (herbicide treatments, mowing, etc.).
- Broken cables were noted on a portion of the fence on the south side of the site where a tree had fallen.
- Monitoring wells 03GW05 and 03GW10 need replacement locks.

Fence and well maintenance issues were immediately noted by the Navy's O&M contractor for implementation. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

10.4 Technical Assessment

Consolidation of contaminated sediments within the landfill perimeter and installation of a landfill cover system eliminated direct contact risks with contaminated soil and sediment. Implementation of institutional/engineering controls (via the BMP and LUC RD), fencing, and signage prevent groundwater use and disturbance of the landfill cover. NJDEP has determined that a CEA/WRA (originally required in the ROD) is no longer necessary and as such, groundwater LTM is not required. An ESD will be developed to remove the CEA/WRA and LTM from the site remedy.

VI was not considered at Site 3 since no VOCs are present in groundwater. However, drainage and drainage liner issues observed during the FYR site inspection could affect infiltration through the landfill. These maintenance issues, if left unresolved, could affect remedy performance over the long term.

10.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 10-4 summarizes components of the Question A: Technical Evaluation.

Table 10-4: Technical Evaluation – Question A

Operable Unit 6 – Site 3	
Question	Summary
Remedial Action Performance	The soil cover at Site 3 continues to effectively limit direct exposure to landfill contents and, overall, minimize infiltration and contaminant migration from the site. The FYR site inspection identified drainage and drainage liner issues which could, over the long term, affect infiltration and require maintenance actions. Engineering controls (fencing and signage) prevent access to the site, thus preventing damage to the cover. Metals in groundwater have been determined to be naturally occurring (unrelated to site activities), and NJDEP has concurred that a CEA/WRA is not required; modifications to site remedy documents are required to remove requirements for both the CEA/WRA and LTM.
Systems Operation/ Operations and Maintenance	Semiannual inspections of the landfill cap and associated engineering controls indicate that the implemented remedial action is functioning as intended. However, drainage and drainage liner issues observed during the FYR site inspection could affect infiltration through the landfill. These maintenance issues, if left unresolved, could affect remedy performance over the long term. Drainage issues within the riprap swales need to be evaluated, to determine what maintenance needs to occur. Additionally, exposed drainage liner materials on the south side of the landfill within the riprap need to be re-covered. Landfill maintenance protocols should be evaluated and updated following both repairs.
Implementation of Land Use Controls and Institutional/ Engineering Controls	LUCs were required by the ROD: <ul style="list-style-type: none"> The BMP is currently used to restrict access to the site, prevent intrusive activity, and limit exposure to waste and contaminated groundwater. An LUC RD has been completed at this site. NJDEP determined in 2017 that a CEA/WRA is not required (see Section 10.3.2). Modification of remedy documents is required to remove the CEA/WRA requirement.

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

Table 10-5 summarizes components of the Question B: Technical Evaluation.

Table 10-5: Technical Evaluation – Question B

Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1. 3. Groundwater ARARs for the site are presented in Table 10-1 and were compared to current ARARs. The remedy remains protective for the site.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The remedy mitigated risks to human health; no unacceptable ecological risks were identified during the RI (B&RE 1996). Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the exposure pathways have been mitigated via the soil cover. The maintenance of the landfill cap and the consolidation of sediment within the cap effectively reduces migration and direct contact exposure to ecological receptors. As long as the landfill cap and fencing at Site 3 provide a permanent barrier to prevent human and ecological exposure to landfilled material and LUCs prevent human exposure to groundwater contaminants, the remedy remains protective. If future use of this site changes (e.g., cap, fencing, or LUCs removed), reevaluation of risk would be required.
Changes in Exposure Pathways	There have been no changes in land use at the site that would cause changes to exposure pathways.
Expected Progress towards Meeting Remedial Action	The remedy at Site 3 meets RAOs: <ul style="list-style-type: none"> The landfill cover and LUCs (LUC RD and the BMP) prevent exposure to landfill wastes and contaminated groundwater

Table 10-5: Technical Evaluation – Question B

Question	Summary
Objectives	<ul style="list-style-type: none"> The landfill cover prevents direct contact with wastes and minimizes migration of contaminants into adjacent wetlands NJDEP has concurred that a CEA/WRA is not required at the site; as discussed in Section 10.3.2. Modification of remedy documents will be required to remove the CEA/WRA requirement.

10.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

10.5 Issues/Recommendations

Table 10-6: Issues/Recommendations that Affect Current or Future Protectiveness

Operable Unit 6 – Site 3				
Operable Unit 6, Site 3	Issue Category: Institutional Controls			
	Issue: A CEA/WRA is required per the ROD. A CEA/WRA has been determined to no longer be required; however formal documentation of this determination has not been developed for the Administrative Record.			
	Recommendation: An ESD is recommended to memorialize concurrence that CEA/WRA, and as such, groundwater LTM, is no longer a required component of the remedy.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	03/30/19

10.6 Other Findings

Other findings for Site 3 include:

- Ponding water and dead vegetation was observed throughout the riprap at the site. In addition, a portion of drainage liner in the riprap on the south side of the landfill was exposed during the 2017 site inspection.
- A portion of the cable fence on the south side of the site was damaged where a tree had fallen.

10.7 Protectiveness Statement

Protectiveness Statement		
<i>Operable Unit:</i> OU-6	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
Site 3 Landfill Southwest of “F” Group		
<i>Protectiveness Statement:</i> The remedy at OU-6 Site 3 is protective in the short-term of human health and protective in the long-term of the environment because components of the remedy have been installed which preclude exposure. The BMP prevents intrusive activity and groundwater use at the site. A CEA/WRA has been determined to no longer be required. Upon documentation in the Administrative Record of this determination and regulatory concurrence, Site 3 will be protective of human health in the long term.		

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- Sovereign Consulting (Sovereign). 2017a. *2014 Annual Maintenance and Monitoring Report for the Landfill Caps Sites 3 and 10, Sites 4 and 5, Site 3, and the Long-Term Monitoring for Site 19*. February.
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- Tetra Tech (TT). 2005. *Final Remedial Design for Land Use Controls for Sites 3 and 10 (OU 6) NWS Earle - Colts Neck, New Jersey*. July.
- Tetra Tech (TT). 2014. *Addendum to the Master Plan for the Environmental Restoration Program Sites: Land Use Controls Naval Weapons Station Earle Colts Neck, New Jersey*. January.

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1 inch = 100 feet
0 50 100
Feet

FIGURE 10-1
SITE LOCATION MAP
OPERABLE UNIT 6, SITE 3
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

Legend

- Monitoring Well
- Approximate Landfill Boundary/
Land Use Control Boundary
- Channelized Stream
- Wetland



REQUESTED BY: F. Burwell

DATE: 9/21/2017

DRAWN BY: M. Senne

TASK ORDER NUMBER: WE09

Basemap Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Data Source: Tetra Tech Nus, Inc.

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03GW06				
	Total	Dissolved	Duplicate Total	Duplicate Dissolved
Aluminum	2,680	<200	2,200	<200
Cadmium	4.9	<3.0	5.2	<3.0
Iron	4,170	<100	3,530	<100

03GW03		
	Total	Dissolved
Aluminum	71,800a	NS
Antimony	269b	NS
Arsenic	83.4b	NS
Iron	120,000	NS

03GW02
NS

03GW07
NS

03GW11		
	Total	Dissolved
Aluminum	1,730,000	2,230
Iron	7,610,000	8,030

03GW10
NS

03GW05		
	Total	Dissolved
Aluminum	494	387
Arsenic	3.7	3.8
Cadmium	201	22.5
Iron	11,900	10,300

03GW01		
	Total	Dissolved
Aluminum	24,700a	1,270
Iron	26,200a	2,820

03GW09
NS

03GW12		
	Total	Dissolved
Aluminum	62,500a	9,380
Arsenic	23.3b	6.4
Iron	1,190,000	28,800

03GW08		
	Total	Dissolved
Aluminum	8,700	492
Iron	15,400	184

03GW04
NS

Notes:
- All samples are in micrograms per liter (µg/L)
- NS = Not Sampled
- a = Elevated sample detection limit due to difficult sample matrix
- b = Elevated detection limit due to dilution required for high interfering element.
- NJDEP GWQS = New Jersey Department of Environmental Protection Groundwater Quality Standards
- RED text indicates exceedance of NJDEP GWQS

Sample ID	NJDEP GWQS
Aluminum	1 µg/L
Antimony	6 µg/L
Arsenic	1 µg/L
Cadmium	4.0 µg/L
Iron	300 µg/L

1 inch = 100 feet
0 50 100 Feet

FIGURE 10-2
GROUNDWATER CONCENTRATIONS FOR
COCS ABOVE REGULATORY CRITERIA (2015)
OPERABLE UNIT 6, SITE 3
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

- Legend**
- Monitoring Well
 - Approximate Landfill Boundary
 - Channelized Stream
 - Wetland



REQUESTED BY: F. Burwell
DATE: 9/21/2017
DRAWN BY: M. Senne
TASK ORDER NUMBER: WE09

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11.0 Operable Unit 6, Site 10 – Former Scrap Metal Landfill

Site 10 is part of OU 6 which comprises Sites 3 and 10. This section describes activities specific to Site 10.

11.1 Site Background

Operable Unit 6, Site 10 is a 2-acre former scrap metal landfill that was used from 1953 to 1965 for the disposal of demilitarized munitions, spent munition cases, and spent grit and paint chips from the ammunition rework operations. Only certified-inert materials (no energetic potential remaining, mainly aluminum and steel containers) were reported to have been disposed at Site 10 (NAVFAC 2006). An estimated 65,000 cubic yards of material, including cover material, was disposed at the site.

Site 10 — Former Scrap Metal Landfill

- Remedy: Landfill Cap, LTM and LUCs/ICs
- Remedy in Place? — Yes
 - Landfill Cap - Complete
 - Fencing and posting of warning signs - Complete
 - CEA - No longer required
 - LUC RD - Complete
 - LTM – Ongoing
 - Site O&M - Ongoing
- UU/UE Achieved? — No

11.1.1 Location and Physical Description

Site 10 is located in the central part of NWS Earle Mainside, east of Midway Road and north of Munda Road (Figure 1-2). The former landfill is an open grassy area enclosed with a cable-type fence and warning signs to restrict access. The site is bordered by woodlands to the north and west, railroad tracks to the east, and Munda Road to the south (Figure 11-1). The ground surface is relatively flat, and stormwater runoff from the majority of the site flows toward the railroad tracks.

11.1.2 Land Use

Site 10 is an inactive landfill and is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change site use.

11.2 Response Action Summary

The SI/RI activities conducted from 1986 through 1996 (Weston 1986; Weston 1993; B&RE 1996) identified metals in groundwater. The 1993 RI (Weston 1993) indicated that sediment samples contained low concentrations of SVOCs. However, it was considered likely that the SVOCs were associated with runoff from the adjacent railroad bed located to the east of the site.

11.2.1 Interim Remedial Actions

No IRA activities were performed at Site 10.

11.2.2 Basis for Taking Action

Since landfill contents remain in place, actions were required to preclude direct contact with waste and prevent future leaching of contaminants to groundwater. A baseline HHRA was performed as part of the RI (B&RE 1996) and concluded that the cancer risk associated with future residential exposure to groundwater at Site 10 was estimated at 7×10^{-5} , within the EPA guideline acceptable risk range of 10^{-6} to 10^{-4} . The cancer risk associated with the future industrial groundwater exposure scenario was within the mid-range of the target acceptable risk range. The noncarcinogenic HIs associated with the future industrial and future residential groundwater exposure scenarios were below 1.0 (NAVFAC 2006).

The ERA concluded that risks to ecological receptors at Site 10 and contaminant contributions to the Hockhockson Brook watershed appear insignificant, and further study or remediation at the site based on ecological concerns was considered unwarranted. However, since landfill cover material was heavily

eroded, an additional landfill cover was recommended to prevent further erosion and runoff, expedite ecological succession, and increase vegetation cover on the landfill (B&RE 1996, NAVFAC 2006).

RI activities concluded that select metals (aluminum, iron, and manganese) were detected in groundwater above NJDEP GWQS.

11.2.3 Selected Remedy

11.2.3.1 Record of Decision

The Final OU-6, Site 10 ROD was signed by the Navy on August 6, 2006 and by EPA on August 15, 2016 (NAVFAC 2006).

11.2.3.2 Remedial Action Objectives

The following RAOs were developed to protect human health and the environment (NAVFAC 2006):

- The RAO at Site 10 to protect human health is to prevent human exposure to landfilled material. The RD for LUCs includes restrictions to prohibit digging into or disturbing the cover system or contents of the landfill, residential development at the site, or use of groundwater from beneath the site, other than for environmental monitoring and testing, without Navy approval.
- The RAO for protection of the environment is to prevent potential contact with landfill contents.

Several analytes were presented in the ROD as exceeding ARARs. Table 11-1 summarizes the maximum concentration in comparison to ARARs and current analyte concentrations as of November 2015.

Table 11-1: Groundwater Quality Regulatory Standards Comparison

Parameter	Operable Unit 6 – Site 10					
	ARARs ^[1]		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		Current Concentrations (November 2015) ^[2] (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Aluminum	NE	200	*	NE	200	1,520
Iron	NE	300	16,600	NE	300	393
Manganese	NE	50	144	NE	50	16.2

Notes:

[1] The ROD did not identify numeric remedial goals but cited MCLs and GWQS within the comparative analysis of alternatives (page II-67).

[2] 2015 Draft Annual Maintenance and Monitoring Report for the Landfill Caps Sites 3 and 10, Sites 4 and 5, Site 13, and the Long-Term Monitoring for Site 19

* Not analyzed in ROD

11.2.3.3 Selected Remedy

The selected remedy for the Landfill at Site 10 included the following components (NAVFAC 2006):

- Grade the landfill area and place a RCRA-type cap system to prevent potential human and animal contact with landfill materials and reduce infiltration of surface water. The RCRA-type cap system would be installed over all former landfill areas.
- Perform cap O&M and annual status reporting for 30 years.

- Erect a cable-type fence with appropriate warning signs around the landfill cap to limit access to the site to preclude excessive vehicular traffic, to restrict human contact with contaminated landfill materials, and to protect the integrity of the soil cover.
- Implement LUCs (including annotations to the BMP, LUC RD, and CEA) to maintain integrity of the current or any future remedial system (e.g., landfill cap), prohibit groundwater use, prevent residential development of the site, and limit future use of the site to prevent disturbance of the RCRA cap or direct contact with contaminated media, such as landfill contents and groundwater.
- Establishment of a CEA pursuant to N.J.A.C. 7:9-6 to prohibit use of untreated groundwater as drinking water.
- Conduct long-term, periodic groundwater monitoring to assess contaminant status and potential threats to human health and the environment. Since wastes will be left in place, site conditions and risks will be reviewed every five years.

11.2.4 Status of Implementation

11.2.4.1 Engineering Controls

Landfill cap construction was completed by FWEC in May 2003 in accordance with the Final Remedial Action Work Plan for Remedial Action at OU-6 (Sites 3 and 10) (FWEC 2002). The landfill cap construction included 12-inch gas management sand layer, 60-mil HDPE textured geomembrane liner, 12-inch sand drainage layer, 8-ounce geotextile fabric between the drainage layer and the cover soil material, 12 inches of cover soil material, 6 inches of topsoil to promote vegetation, and construction of culverts and drainage structures to maintain positive stormwater discharge.

In addition to the landfill cap, fencing and warning signs were installed on the perimeter of the landfill.

11.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum. Semiannual inspections are completed per the O&M manual and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 11-1 presents the LUC boundary.

The ROD (NAVFAC 2006) required implementation of a CEA/WRA. However, an evaluation of the groundwater data demonstrating that concentrations were naturally occurring was presented in a Technical Memorandum (TT, 2013). The NJDEP provided concurrence with the Technical Memorandum recommendations that a CEA/WRA is no longer required. See Section 11.3.2 for additional details.

11.2.4.3 Long-Term Monitoring Program

The LTM program was established in 2003. The annual sampling schedule was requested to be changed to a biennial schedule in the 2014 Maintenance and Monitoring Report (Sovereign, 2015). The NJDEP and U.S. EPA provided review and concurrence with the final 2014 Maintenance and Monitoring report. Currently, groundwater monitoring at Site 10 is performed biennially and samples are collected from four monitoring wells. All samples are analyzed for select metals (aluminum, iron, and manganese); optimization recommendations are presented in each LTM report, as warranted. Sampling results from this FYR period are summarized in Section 11.4.2.2.

11.2.4.4 Operations and Maintenance

O&M inspections at Site 10 are performed semi-annually (spring and fall) in accordance with the O&M Manual (Foster Wheeler 2003b); optimization recommendations are presented in each annual maintenance and monitoring report, as warranted.

O&M inspections include the following components:

- Landfill Cap: The cap is visually inspected for evidence of erosion, differential settling, coverage of vegetation and evidence of burrowing animals
- Gas Monitoring Vents: Five 4-inch Polyvinyl Chloride gas vents are visually inspected.
- Gas emissions are monitored once every 5 years.
- Site access ramps: Ramps are inspected for potholes, ruts, settlement, soil erosion, vegetative growth, and integrity of the security gates
- Groundwater Monitoring System: Monitoring wells are visually inspected for damage, subsidence, vandalism or blockage.

Semiannual inspection findings performed during this FYR period are summarized in Section 11.4.2.3.

11.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 6:

The remedy at OU 6, Site 10 is protective in the short-term of human health and the environment. The remedy for Site 10 is capping, ICs, and long-term monitoring. The RCRA-type cap system is in place and prevents potential human and animal contact with landfilled materials and reduces infiltration of surface water. A long-term groundwater monitoring program is being implemented to verify that the cap is performing as designed. Results from the 2010 annual monitoring event suggest that the cap is performing as intended. Proper implementation of the ICs and O&M will maintain the effectiveness of the remedy into the future. The ICs, through the CEA, will place restrictions on use of site groundwater. Exposure to Site 10 constituents have been minimized due to placement of the RCRA-type cap system over the landfilled waste materials. In addition, the various buildings and facilities at the Mainside area are connected to a public water supply (New Jersey American Water Company) so there is currently no use of Site 10 groundwater. Implementation of the LUCs outlined in the ROD further reduces or eliminates the exposure pathway to buried waste materials and groundwater. The remedy will be protective when the CEA is implemented (Resolution Consultants 2013).

11.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 10. Table 11-2 provides a list and status of recommendations that were made for Site 10 in the last FYR.

11.3.2 Completed Since the Last Five-Year Review

The following have been completed since the last FYR.

- A Technical Memorandum (TT, 2013) demonstrating that the low groundwater concentrations of select metals are naturally occurring and a CEA/WRA is no longer required was submitted and approved by NJDEP.

Table 11-2: Status of Recommendations from the 2013 Five-Year Review Report

Operable Unit 6 – Site 10				
Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Depressions found on the landfill cap.	Repair depressions found on the landfill cap.	Considered but not implemented	The semiannual site inspection did not identify any erosion issues.	November 17, 2016
10MW-04 lock missing	Replace lock on monitoring well 10MW-04	Completed	The well lock was present during the FYR site visit.	June 6, 2017
CEA not established with NJDEP	Continue the approval process for CEA	Completed	A Technical Memorandum (TT, 2013) demonstrating that the low groundwater concentrations of select metals are naturally occurring and a CEA/WRA is no longer required was submitted and the NJDEP concurred via email dated February 17, 2017.	February 17, 2017

11.3.3 Site Interview Findings

NJDEP personnel had no specific comments for Site 10. EPA indicated they would like the status of the CEA/WRA for Site 10 to be included in the FYR report.

11.3.4 Data Review

11.3.4.1 Land Use Control Inspection Records

The LUC RD for soil and groundwater at Site 10 was finalized in July 2005. Fence and sign integrity are inspected on a semiannual basis in conjunction with the landfill cap inspection. Semiannual inspections are completed to document that LUCs remain in place and are protective; findings and recommendations from the inspections are included in annual Maintenance and Monitoring Reports. As previously stated, a CEA/WRA is no longer required.

11.3.4.2 Long-Term Monitoring Data

Figure 11-2 illustrates the location of monitoring wells in the active monitoring program as well as the most recent groundwater monitoring results.

As discussed in Section 11.3.2, while COC concentrations have fluctuated over time, they are generally within historically observed ranges and within the same order of magnitude. Review of the 2014 dataset has indicated that the metals appear to be naturally occurring and not the result of a site discharge; NJDEP has concurred (via email dated February 17, 2017) and is not requiring a CEA/WRA.

11.3.4.3 Operations and Maintenance Records

In accordance with the O&M manual (FWEC 2003) site inspections were conducted quarterly in the first two years after landfill cap construction, and semiannually thereafter. Review of Site 10 annual maintenance and monitoring reports indicate that communication of maintenance requirements and subsequent repairs and documentation/re-inspection were performed in accordance with the O&M manual. Table 11-3 is a summary of the observations made from 2013 to 2016.

Table 11-3: Landfill Results Since Last Five-Year Review

Operable Unit 6 – Site 10			
Date	Observation	Corrective Action	Date Completed
5/31/13	No deficiencies	Not Applicable	Not Applicable
10/30/13	Vegetation noted growing through riprap; settling monument survey completed	Licensed herbicide application	Spring 2016
5/23/14	Vegetation noted growing through 80% of riprap; Four to five large trees were down on the north side of the landfill but not on the landfill cap	Licensed herbicide application	Spring 2016
11/13/14	Vegetation noted growing through 80% of riprap; Four to five large trees were down on the north side of the landfill but not on the landfill cap	Licensed herbicide application	Spring 2016
5/22/15	Vegetation noted growing through riprap	Licensed herbicide application	Spring 2016

Table 11-3: Landfill Results Since Last Five-Year Review

Operable Unit 6 – Site 10			
Date	Observation	Corrective Action	Date Completed
11/20/15	Vegetation noted growing through riprap; settling monument survey completed	Licensed herbicide application	Spring 2016
6/10/16	Noticeable vegetation growth in riprap 30% coverage.	Licensed herbicide application	Spring 2017
11/17/16	Minimal growth in riprap 10-20%; monument survey completed	Licensed herbicide application	Spring 2017

11.3.5 Site Inspection Findings

The site inspection was performed on June 6, 2017, as discussed in Section 1.4.2. During the site inspection, the cap and associated drainage swales were observed to be in good condition and working as intended. In addition, the cable fence and warning signs surrounding the landfill were inspected and appeared to be in good condition. The gravel access road for the landfill was inspected and was covered with grass. All monitoring wells were located and appeared to be in good condition. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

11.4 Technical Assessment

Completion of the cap eliminated direct contact risks with contaminated soil and landfill wastes. Implementation of institutional/engineering controls (via the BMP and LUC RD), fencing, and signage prevent uses restricted by the LUC. NJDEP has determined that a CEA/WRA (originally required in the ROD) is no longer necessary and, as such, groundwater LTM is not required. An ESD will be developed to remove the CEA/WRA and, if applicable, LTM from the site remedy.

VI was not considered at Site 10 since no VOCs are present in groundwater.

11.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 11-4 summarizes components of the Question A: Technical Evaluation.

Table 11-4: Technical Evaluation – Question A

Question	Summary
Remedial Action Performance	The RCRA-type cap at Site 10 continues to effectively limit direct exposure to landfill contents and minimize infiltration and contaminant migration from the site. Metals in groundwater have been determined to be naturally occurring (unrelated to site activities), and NJDEP has concurred that a CEA/WRA is not required; modifications to site remedy documents are required to remove requirements for both the CEA/WRA and LTM.
Systems Operation/ Operations and Maintenance	Semiannual landfill cap and associated engineering control inspections indicate that the implemented remedial action is functioning as intended. Furthermore, site inspections have not revealed significant deficiencies affecting protectiveness or large unexpected O&M costs. Review of O&M records suggests additional opportunities for optimization in reducing overall timeframe for implementation of corrective actions.
Implementation of Land Use Controls and Institutional/	LUCs were required by the ROD: <ul style="list-style-type: none"> The BMP is currently used to restrict access to the site, prevent intrusive activity, and avoid

Table 11-4: Technical Evaluation – Question A

Question	Summary
Engineering Controls	<p>exposure to waste and contaminated groundwater</p> <ul style="list-style-type: none"> • An LUC RD has been completed at this site • NJDEP determined in 2017 that a CEA/WRA will not be required, as discussed in Section 11.3.2. Modification of remedy documents will be required to remove the CEA/WRA requirement.

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

Table 11-5 summarizes components of the Question B: Technical Evaluation.

Table 11-1: Technical Evaluation – Question B

Operable Unit 6 – Site 10	
Question	Summary
Changes in ARARs or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Groundwater RGs presented in Table 11-1 were compared to current ARARs. The remedy remains protective for the site.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	<p>The Site 10 remedy mitigated risks to human health; no unacceptable ecological risks were identified during the RI (B&RE 1996). Changes in toxicity have no effect on remedy protectiveness because the remedy focuses on preventing exposure to contaminated soil using engineering controls (e.g., RCRA-type cap). The RCRA-type cap, fencing, and LUCs effectively mitigate corresponding risks, so the focus is preventing exposure and enforcing controls over the long term to ensure protectiveness. As long as the RCRA-type cap at Site 10 provides a permanent barrier that prevents exposure to landfilled material, and the LUCs prevent human exposure to groundwater contamination, the remedy remains protective. Should the future use of this site change (e.g., or the RCRA-type cap, fencing or LUCs be removed), reevaluation of risk would be required.</p> <p>Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the exposure pathways have been mitigated.</p>
Changes in Exposure Pathways	There have been no changes in land use at the site that would result in changes to exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy at Site 10 meets RAOs:</p> <ul style="list-style-type: none"> • The landfill cap and LUCs (LUC RD and the BMP) prevent exposure to landfill wastes and contaminated groundwater • The landfill cap prevents direct contact with wastes and minimizes migration of contaminants into adjacent wetlands • NJDEP has concurred that a CEA/WRA is not required at the site; as discussed in Section 11.3.2. Modification of remedy documents will be required to remove the CEA/WRA requirement.

11.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

11.5 Issues/Recommendations

Table 11-6: Issues/Recommendations that Affect Current or Future Protectiveness

Operable Unit 6 – Site 10				
Operable Unit 6, Site 10	Issue Category: Institutional Controls			
	Issue: A CEA/WRA is required per the ROD. A CEA/WRA has been determined to no longer be required per NJDEP concurrence with 2013 Technical Memorandum; however formal documentation of this determination has not been developed for the Administrative Record.			
	Recommendation: An ESD is recommended to memorialize concurrence that CEA/WRA, and as such, groundwater LTM, is no longer required.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	03/30/19

11.6 Other Findings

No other findings were noted for Site 10.

11.7 Protectiveness Statement

Protectiveness Statement		
<i>Operable Unit:</i> 6	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
Site 10 Former Scrap Metal Landfill		
<i>Protectiveness Statement:</i> The remedy at OU-6 Site 10 is protective in the short-term of human health and protective in the long-term of the environment because components of the remedy have been installed which preclude exposure. The BMP prevents intrusive activity and groundwater use at the site. A CEA/WRA has been determined to no longer be required. Upon documentation in the Administrative Record of this determination and regulatory concurrence, Site 10 will be protective of human health in the long term.		

11.8 References

- Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle. Colts Neck, New Jersey.* July.
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- Roy F. Weston Inc. (Weston). 1993. *Remedial Investigation/Feasibility Study for 11 sites at NWS Earle, Colts Neck, NJ*. September.
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- Tetra Tech (TT). 2014. *Addendum to the Master Plan for the Environmental Restoration Program Sites: Land Use Controls Naval Weapons Station Earle Colts Neck, New Jersey*. January.

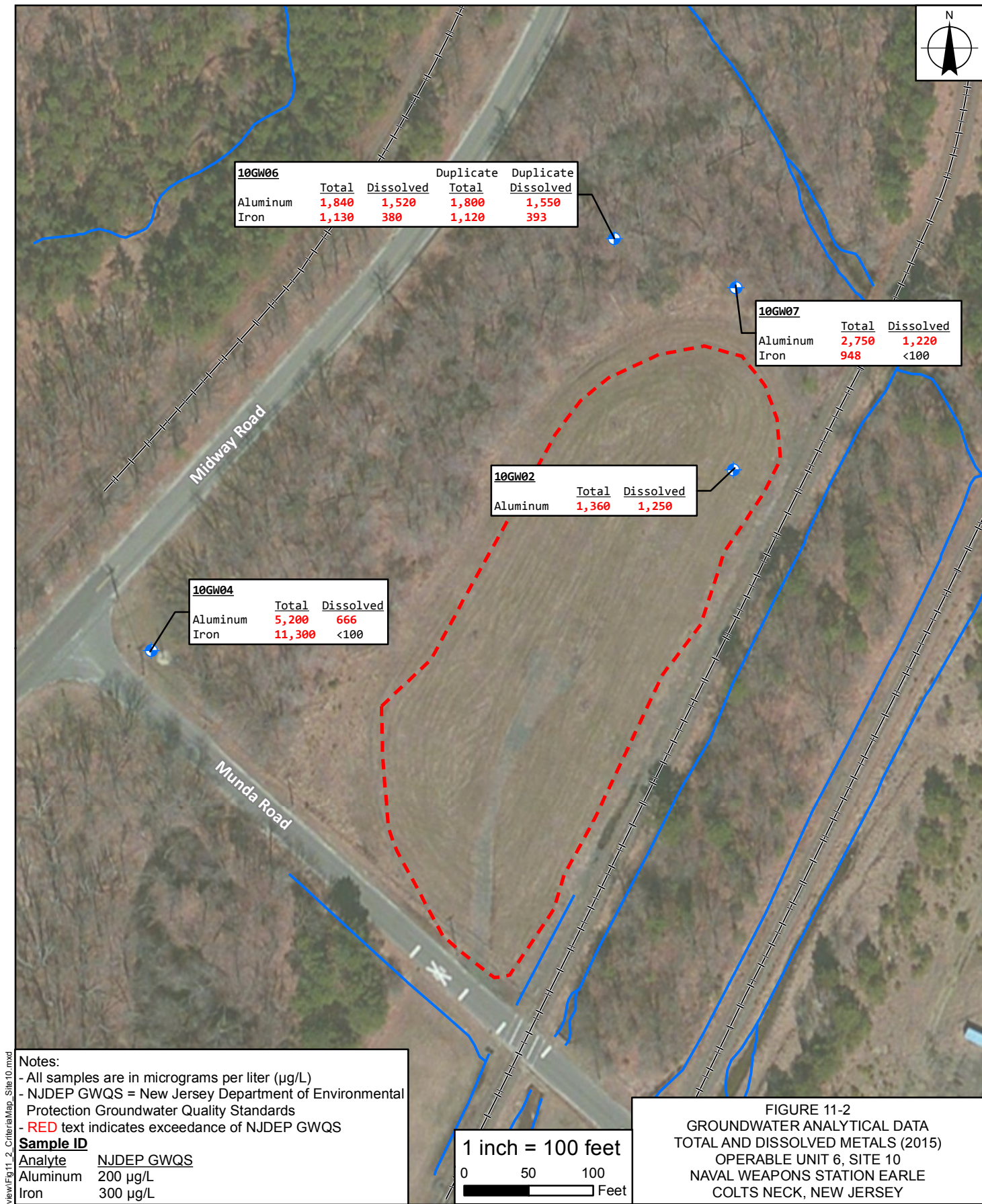


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<p>Legend</p> <ul style="list-style-type: none"> + Monitoring Well — Approximate Landfill Boundary/ Land Use Control Boundary - - - Railroad — Channelized Stream 	<p>1 inch = 100 feet</p> <div style="display: flex; align-items: center; justify-content: center;"> <div style="width: 100px; height: 10px; background: linear-gradient(to right, black 50%, white 50%); border: 1px solid black; margin: 0 5px;"></div> <div style="display: flex; flex-direction: column; align-items: center; margin: 0 5px;"> <div style="width: 10px; height: 10px; background: white; border: 1px solid black; margin-bottom: 2px;"></div> <div style="width: 10px; height: 10px; background: white; border: 1px solid black; margin-bottom: 2px;"></div> <div style="width: 10px; height: 10px; background: white; border: 1px solid black;"></div> </div> </div> <p>0 50 100 Feet</p>	<p align="center"> FIGURE 11-1 SITE LAYOUT MAP OPERABLE UNIT 6, SITE 10 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY </p> <div style="text-align: center;"> <p>NAVFAC Naval Facilities Engineering Command</p> </div> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="width: 50%; font-size: 0.8em;">REQUESTED BY: F. Burwell</td> <td style="width: 50%; font-size: 0.8em;">DATE: 9/21/2017</td> </tr> <tr> <td style="font-size: 0.8em;">DRAWN BY: M. Senne</td> <td style="font-size: 0.8em;">TASK ORDER NUMBER: WE09</td> </tr> </table>	REQUESTED BY: F. Burwell	DATE: 9/21/2017	DRAWN BY: M. Senne	TASK ORDER NUMBER: WE09
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Basemap Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Data Source: Tetra Tech Nus, Inc.

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Notes:

- All samples are in micrograms per liter (µg/L)
- NJDEP GWQS = New Jersey Department of Environmental Protection Groundwater Quality Standards
- **RED** text indicates exceedance of NJDEP GWQS

Sample ID

Analyte	NJDEP GWQS
Aluminum	200 µg/L
Iron	300 µg/L

FIGURE 11-2
GROUNDWATER ANALYTICAL DATA
TOTAL AND DISSOLVED METALS (2015)
OPERABLE UNIT 6, SITE 10
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

Legend

Monitoring Well Railroad

Approximate Landfill Boundary Channelized Stream

NAVFAC
Naval Facilities Engineering Command

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12.0 Operable Unit 7, Site 26 – Site 26 PCE Plume

12.1 Site Background

Site 26 consists of two OUs: OU-3, where TCE and cis-1,2-DCE impact soil and groundwater; and OU-7, where PCE impacts groundwater southwest of the OU-3 groundwater plume. OU-3 is discussed in Section 5.

Note that there is redundancy with information presented between OU-3 and OU-7. Where possible, information has been referenced back to OU-3; otherwise, the information has been presented twice for administrative clarity, due to the separate RODs issued for these two OUs.

A description of Site 26, its history, and current land use can be found in Section 5.1.

Site 26 — PCE Plume

- Remedy:
 - Incorporate LUCs into the BMP
 - Establish CEA
 - Conduct periodic long-term groundwater monitoring
 - Establish LUC RD
- Remedy in Place? — Partial
 - LUCs established in the BMP
 - CEA not established
 - Periodic groundwater monitoring schedule not established
 - LUC RD has been established
- UU/UE Achieved? — No

12.2 Response Action Summary

The response action summary for Site 26 was presented in Section 5.2. During the RI for Site 26, metals and VOCs were found in subsurface soil and groundwater.

Prior to implementation of an AS/SVE system for OU-3 at Site 26, additional groundwater plume delineation efforts were necessary to complete the remedial system design. During delineation efforts, PCE was detected at concentrations greater than the NJDEP GWQS in an area that covered approximately 10 acres extending to the southwest of the TCE and cis-1,2-DCE plume associated with OU-3 (FWEC 2001) (e.g., outside of the OU-3 plume footprint). Based on the extent of the newly identified PCE groundwater plume, it was hypothesized that there was a source of PCE distinct from the source of TCE in groundwater. The secondary source was suspected to be the septic tank system and associated leach field at Building GB-2; however, PCE was not present during a 1999 soil investigation in that area (FWEC 2001). Following the 1999 soil investigation it was hypothesized that the PCE source had since depleted.

Following the discovery of the PCE-only groundwater plume and suspicion of former PCE source area (since depleted), the new OU-7 was recorded.

12.2.1 Interim Remedial Actions

No interim remedial actions were taken at OU-7.

12.2.2 Basis for Taking Action

The HHRA and ERA for Site 26 are described in Section 5.2.2. No additional risk assessment was performed for OU-7.

12.2.3 Selected Remedy

12.2.3.1 Record of Decision

The Record of Decision Site 26 PCE Plume Operable Unit 7 (OU 7) (NAVFAC 2007) was signed by the Navy February 26, 2007 and EPA on August 14, 2007.

12.2.3.2 Remedial Action Objectives

The following RAOs were developed to mitigate existing and future potential threats to public health and the environment:

The overall objective for the remedy at OU-7 is to protect human health and the environment. Based on the baseline human health risk assessment, the ecological risk assessment and the RI results, RAOs were developed to address environmental media status at the Site 26 PCE plume (OU 7) (NAVFAC 2007).

- **Protection of Human Health RAO**

- Prevent potential human exposure to organic contaminants in groundwater.

- **Protection of the Environment RAO**

- Mitigate migration of the organic contaminants in groundwater.
- *Restoration* of groundwater aquifer quality.

These RAOs will be met when the PCE within the Site 26 groundwater plume has been removed or reduced in concentration to below the PRG. The PRG for PCE is 1 µg/L.

Chemical-specific RGs were developed for OU-7 Site 26 based on ARARs as defined in the ROD. These analytes and their criteria are presented in Table 12-1.

Table 12-1: Groundwater Quality Regulatory Standards and Remedial Goals Comparison

Operable Unit 6 – Site 10							
Contaminants of Concern	ARARs Identified in the ROD (2007)		Selected Remedial Goal (µg/L)	Maximum Concentration Shown in the RI (µg/L)	Current ARARs		Current Concentrations ^[1] (µg/L)
	EPA MCL (µg/L)	NJDEP GWQS (µg/L)			EPA MCL (µg/L)	NJDEP GWQS (µg/L)	
Trichloroethene	5	1	1	4,800 ^[2]	5	1	1,820
1,1-Dichloroethene	7	1	1	5 ^[2]	7	1	0.5 U
1,2-Dichloroethene (cis/trans)	70/100	70 / 100	70 / 100	2,000	70 / 100	70 / 100	3,140 / 8.2 J
Benzene	5	1	1	11 ⁽²⁾	5	1	0.5 U
Carbon tetrachloride	5	1	1	2 ⁽²⁾	5	1	0.5 U
Tetrachloroethene	5	1	1	5 ⁽²⁾	5	1	39
Cadmium	5	4	4	4.4	5	4	NA

Notes:

[1] Current concentrations are based on the results of the Final Supplemental Soil and Groundwater Investigation (Resolution Consultants 2017)

[2] Based on direct push sampling with field GC analysis

12.2.3.3 Selected Remedy

The selected remedy includes the following components:

- LUCs will be implemented by the Navy according to DoD guidelines as set forth in the document entitled “Principles and Procedures for Specifying, Monitoring and Enforcement of LUCs and Other Post-ROD Actions” as agreed between EPA and the DoD. LUCs will be incorporated into the BMP to limit future uses of the groundwater as drinking water. Use of the aquifer beneath the Site 26 for purposes other than environmental monitoring and testing without Navy approval, will be prohibited, until groundwater is found to meet Federal MCLs and NJ GWQS.
- A CEA pursuant to N.J.A.C 7:9-6 will be established to provide the state official notice that the constituent standards will not be met for a specified duration anticipated not to exceed 10 years (unless MCLs and GWQS are not met) and to ensure that use of groundwater in the affected area is prohibited. The Navy is responsible for implementing, maintaining, reporting on, and enforcing the LUCs described in the ROD in accordance with the BMP, as well as maintaining the integrity of any current or future remedial or monitoring system such as monitoring wells. LUCs will be maintained until the contaminant concentrations in groundwater are reduced to levels that allow unrestricted use and exposure.

The LUC objectives are:

- Maintain the integrity of the monitoring wells included in the current or future monitoring system.
- Except for environmental monitoring, prevent access or use of untreated groundwater until cleanup levels are met.
- These objectives will be implemented through mechanisms such as groundwater use restrictions amended to the BMP, establishment of the NJDEP-compliant CEA, and performance of a site review every five years.
- Long-term periodic groundwater monitoring will be conducted to assess contaminant status and potential threats to human health and the environment. Since the selected remedy is not expected to completely remove the contaminants from groundwater during the AS/SVE treatment period, periodic groundwater monitoring and reporting according to the requirements of the CEA will continue until at least two consecutive periods result in concentrations below MCLs and GWQS. Site conditions and risks will be reviewed every five years as required by CERCLA.

The ROD required preparation of a LUC RD as the land use component of the RD.

12.2.4 Status of Implementation

12.2.4.1 Monitored Natural Attenuation

No active remediation system is associated with OU-7 at Site 26. However, due to the proximity of the AS/SVE system associated with OU-3, OU-7 benefited from its operation between 2001 and 2004; the AS/SVE system is described in Section 5.2.4.1. The remedy for OU-7 is MNA.

12.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 5-1 presents the LUC boundary. The Navy continues to work toward a CEA/WRA through continued monitoring and data evaluations. The CEA/WRA and associated monitoring requirements will also be included in a LUC RD.

12.2.4.3 Long-Term Monitoring Program

LTM has been conducted on the same schedule as OU-3 and will resume after the OU-3 soil removal and biological amendment is complete in OU-3.

12.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for OU-7 Site 26:

The remedy for the OU 7, Site 26, will be protective of human health and the environment. The source of the contamination at Site 26 has been removed thereby reducing the unacceptable human health risks and threats to ecological receptors in the vicinity of Site 26. No additional excavation at Site 26 is required. Long-term monitoring is being conducted for the OU 3 portion of Site 26. Implementation of LUCs outlined in the ROD will further reduce or eliminate the exposure pathway to Site 26 groundwater. The ICs, through the CEA, will place restrictions on use of site groundwater. In addition, the various buildings and facilities at the Mainside area are connected to a public water supply (New Jersey American Water Company) so there is currently no use of site groundwater.

The recent groundwater sampling results indicate that chlorinated hydrocarbon concentrations in groundwater have generally increased near the building when compared to previous monitoring sample results. The Navy is currently investigating this area and will determine if additional remediation is necessary (Resolution Consultants 2013).

12.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of OU-7 Site 26. Table 12-2 provides a list and status of the recommendations that were made for OU-7 Site 26 in the last FYR.

Table 12-2: Status of Recommendations from the 2013 Five-Year Review

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Monitoring Well Locks	Missing locks on monitoring wells 26GW04 and 26GW06 will be replaced.	Completed	No well-related issues were identified during the site inspection for Site 26.	6/9/2017
Well Labels	Unlabeled wells observed during the site inspection will be labeled	Completed	No well-related issues were identified during the site inspection for Site 26.	6/9/2017
Concentration Rebound	Evaluate rebound in groundwater concentrations near the building	Completed	Results of the supplemental soil and groundwater investigation were reported in the Final Additional Soil and Groundwater Investigation Report (Resolution Consultants 2017). As a result, the Navy plans to conduct additional soil removal and augment backfill to stimulate bioremediation in the aquifer.	4/30/2017

Table 12-2: Status of Recommendations from the 2013 Five-Year Review

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
CEA/WRA	Continue approval process for the CEA/WRA	Ongoing	Efforts to establish the CEA/WRA are ongoing at OU-7 Site 26. Additional groundwater monitoring events are necessary to successfully execute the CEA/WRA for OU-7 Site 26. Once the required monitoring events have been completed, documentation to establish a CEA/WRA will be provided to NJDEP.	Anticipated for 2020

12.3.2 Completed Since the Last Five-Year Review

A supplemental soil and groundwater sampling event was completed at Site 26 in 2015 as summarized in Section 5.3.2. PCE was detected at concentrations greater than NJDEP GWQS at one monitoring well located approximately 400 feet southwest of the former process leach tank associated with building GB-1.

12.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 26.

12.3.4 Data Review

12.3.4.1 Land Use Control Records

No LUC inspections were completed for OU-7; however, as required by the LUC RD, the BMP restricts the use of untreated groundwater for purposes other than environmental monitoring and testing from any area within the LUC (see Figure 5-1). Personnel at NWS Earle utilize the LUC boundary when reviewing construction plans to ensure that any activity is consistent with the site's land use restrictions. During this FYR period, the BMP has been an effective institutional control for preventing intrusive activities and exposure to waste and/or contaminated groundwater.

The Navy continues to work toward establishment of a CEA/WRA at Site 26.

12.3.4.2 Long-Term Monitoring Data

Routine LTM at OU-7 Site 26 has been conducted on the same schedule and using the same wells as the LTM for OU-3. Groundwater data were compared to historical information to gauge current plume status.

The 2015 groundwater evaluation identified PCE at concentrations greater than NJDEP GWQS at one well, 26GW10 (39 µg/L), located approximately 400 feet southwest of the former process leach tank associated with building GB-1.¹ Compared to historical groundwater sampling results, 2015 PCE concentrations in 26GW10 suggest post AS/SVE rebound conditions, comparable to what was discussed for TCE at OU-3. The following observations identified for OU-3 also apply to OU-7:

- Given the absence of PCE GWQS exceedances in other monitoring wells, the PCE plume footprint has shrunk relative to the plume presented in the ROD.

¹ Complete analytical results can be found in the Final Additional Soil and Groundwater Investigation Report (Resolution Consultants 2017).

- The increase in cis-1,2-DCE concentrations supports that PCE/TCE degradation is occurring.

12.3.5 Site Inspection Findings

See Section 5.4.3.

12.4 Technical Assessment

Based on review of the analytical data, MNA is occurring. The CEA/WRA will be prepared following further evaluation of natural attenuation through monitoring and statistical analysis to determine concentration trends over time. The plume appears to be at steady state and there are no potable receptors; therefore, natural attenuation is a viable strategy.

VI is not a concern at OU-7 Site 26 since no occupied buildings are located on the site or within 100 feet of the groundwater contaminant plume. The demolition of Building GB-1 is pending and the site will remain vacant.

12.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 12-3 summarizes components of the Question A: Technical Evaluation.

Table 12-3: Technical Evaluation – Question A

Operable Unit 7 – Site 26		
Question		Summary
Remedial Performance	Action	Section 5.5.1 evaluates the OU-3 remedy, including source removal and AS/SVE, which addressed the plumes at OU-3 and OU-7. The OU-7 remedy included LUCs and LTM. A LUC RD has been implemented at the site; however, a CEA/WRA will be implemented pending demonstration of natural attenuation. LTM has been performed historically under OU-3.
Systems Operation/Operations and Maintenance		Not applicable; no O&M is required at Site 26.
Implementation of Land Use Controls and Institutional/Engineering Controls		<p>LUCs are required by the ROD:</p> <ul style="list-style-type: none"> • An LUC RD has been established for OU-7. • The BMP is used to restrict access to OU-7 Site 26, prevent intrusive activity, and avoid exposure to contaminated groundwater. • The CEA/WRA has not been established at Site 26, but additional data collection will continue following the removal action planned for fall 2017.

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

Table 12-4 summarizes components of the Question B: Technical Evaluation.

Table 12-4: Technical Evaluation – Question B

Operable Unit 7 – Site 26	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	Groundwater quality standards presented in the Record of Decision were compared to current ARARs in Table 12-1. Since the ROD was signed no changes to ARARs have occurred.
Changes in Toxicity, Risk Assessment	The remedy mitigated threats due to human health risk; no ecological threats were identified at Site 26. Although screening and/or toxicity reference values considered during the development of

Table 12-4: Technical Evaluation – Question B

Operable Unit 7 – Site 26	
Question	Summary
Methods, and Cleanup Levels	the ecological risk assessment may have been revised, no unacceptable ecological risk is present as no complete exposure pathways to environmental receptors are present as groundwater does not discharge to wetlands or surface water bodies; therefore, no complete exposure pathways are present. Two OUs were established at Site 26: OU-3's ROD (1998) identified both risk-based and ARAR based RGs; OU-7's ROD (2007) clarified site RGs using ARARs for all COCs. Additional administrative clarification regarding combining and managing these two OUs will be identified as an issue for Site 26. Changes in toxicity factors since the original risk assessment may result in an overall increase or decrease in risk if this risk assessment were performed today; however, changes in toxicity factors for these COCs would not affect the overall protectiveness of the remedy. ^[1] The protectiveness of remedies based on ARARs is not sensitive to risk assessment changes; no additional remedial actions would be implemented today based on changes in the risk assessment. The potential for vapor intrusion was evaluated and was determined not to be an issue at Site 26. No occupied buildings are located on the site or within 100 feet of the groundwater contaminant plume.
Changes in Exposure Pathways	There have been no changes in land use at Site 26 that would result in a change in exposure pathways. Cis-1,2-DCE, a degradation product of PCE/TCE is currently detected within the OU-3 plume; vinyl chloride, an expected degradation product, was not identified as a COC or detected above GWQS during the initial RI. Review of the site COC list, remedial goals, and associated decision document modifications are necessary to ensure all expected degradation products are captured on the COC list.
Expected Progress towards Meeting Remedial Action Objectives	The remedy at Site 26 is progressing to meet the RAOs: <ul style="list-style-type: none"> • Source removal actions and AS/SVE have mitigated VOC concentrations in groundwater • The BMP has prevented exposures to groundwater • A LUC RD is in place to control long-term exposures at the site • Once natural attenuation has been assessed onsite, a CEA/WRA will be developed to complete the institutional controls component of the remedy

Notes:

- [1] Since the ROD, USEPA finalized a RfD and RfC and cancer slope factor for TCE; and a RfD was added for both cis 1,2-DCE and trans 1,2-DCE.

12.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

12.5 Issues/Recommendations

Table 12-5: Issues/Recommendations that Affect Current or Future Protectiveness

Operable Unit 7 – Site 26				
Operable Unit 7, Site 26	Issue Category: Institutional Controls			
	Issue: After sufficient groundwater analytical data and associated MNA evaluations are conducted, a CEA/WRA should be developed and implemented.			
	Recommendation: Continue LTM for the purpose of developing CEA/WRA			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	06/02/2020

12.6 Other Findings

The following was found as potential area for optimization at OU-7 Site 26 during the FYR process:

- Because of the physical, logistical, and administrative overlap between OU-3 and OU-7, a review of both OUs is recommended to assess the feasibility of closing one OU, merging the two OUs, or managing the OUs administratively as a single unit. This would allow the Navy to streamline several recommendations such as not needing to maintain two separate LTM programs, two separate CEA/WRAs, or two separate LUC RDs at these two sites.
- The ROD RAOs and description of the selected remedy identify PCE as the focus of OU-7. However, the COC list established in the ROD and summarized in Table 12-1 contains six additional analytes. As part of the streamlined review for OU-3 and OU-7 the COC list should be reviewed and unified.

12.7 Protectiveness Statement

Protectiveness Statement		
<i>Operable Unit:</i> 7	<i>Protectiveness Determination:</i> Short-term Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
Site 26 PCE Plume		
<i>Protectiveness Statement:</i> The remedy at OU-7 Site 26 is currently protective in the short term of human health and protective in the long-term of the environment. Land use controls described in the BMP prohibit the use of groundwater for purposes other than environmental testing; however, a CEA/WRA needs to be established to ensure protectiveness of human health in the long term.		

12.8 References

- Foster Wheeler Environmental Corporation (FWEC). 2001. *Groundwater Plume Delineation for Air Sparge/Soil Vapor Extraction Design and PCE Sentinel Well Placement*. March.
- Naval Facilities Engineering Command (NAVFAC). 2007. *Record of Decision Site 26 PCE Plume Operable Unit 7 (OU 7)*. January.
- Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March
- Resolution Consultants. 2017. *Final Additional Soil and Groundwater Investigation Report Naval Weapons Station Earle Colts Neck, New Jersey Operable Unit 3 Site 26 – Explosive “D” Washout Area*. April.
- Tetra Tech (TT). 2007. *Final Remedial Design for Land Use Controls for Site 26 PCE Plume Operable Unit 7 (OU 7) NWS Earle - Colts Neck, New Jersey*. January.

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13.0 Operable Unit 8, Site 1— Ordnance Demilitarization Site

13.1 Site Background

Site 1 is a 6-acre open field that was used for burning/detonating ordnance material between 1943 and 1975. During site abandonment, the area was plowed, and a layer of diesel-soaked hay was burned onsite to remove residual ordnance material. This procedure was carried out three separate times. In the early 1990s, a U.S. Army communications station and tower were located near the center of the site but have since been removed (TT NUS 2004).

Site 1 — Former Ordnance Demilitarization Site

- Remedy: Land Use Controls/LTM
- Remedy in Place? — Yes
 - LUCs implemented
 - CEA submitted but no longer required
 - LTM completed
 - Site Closure RACR submitted
- UU/UE Achieved? — Yes

13.1.1 Location and Physical Description

Site 1, located in the north-central portion of the NWS Earle Mainside Area (Figure 1-2), is bordered by Macassar Road to the east, a railroad spur to the north, and an 8- to 10-foot-high soil berm to the south and west (Figure 13-1). Adjacent to Macassar Road is a paved bike path running along the eastern site border. No drainage swales, streams, or wetlands are located on site (NAVFAC 2017).

Groundwater monitoring wells are present onsite but have not been sampled since 2011. Approval to discontinue groundwater sampling was received in 2013.

13.1.2 Land Use

Currently, Site 1 is an open grass field and is not currently used for any NWS Earle operations. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 1.

13.2 Response Action Summary

The SI/RI activities conducted from 1986 through 1996 (Weston 1986; Weston 1993; B&RE 1996) identified inorganics in groundwater.

13.2.1 Interim Remedial Actions

No IRA activities were performed at Site 1.

13.2.2 Basis for Taking Action

The baseline HHRA performed in 1995 concluded that cancer risks associated with subsurface soil and groundwater consumption under both the future resident and future industrial scenario above the upper bound of the acceptable risk range (10^{-4}). The principal contributor to risk was arsenic (NAVFAC 2004). Non-carcinogenic risk exceeded 1 for both scenarios; arsenic and iron were the primary drivers. Although no unacceptable risk was identified for soil, one soil location contained arsenic above RDCSRs.

13.2.3 Selected Remedy

13.2.3.1 Record of Decision

The Final OU-8 Site 1 ROD was signed by the EPA and Navy on January 19, 2005 (NAVFAC 2004).

13.2.3.2 Remedial Action Objectives

The following RAOs were developed to mitigate existing and future potential threats to public health and the environment:

The overall remedial action objective for Site 1 is to protect human health and the environment. The RAO for human health is to prevent potential human exposure to metals in groundwater until groundwater is restored to comply with MCLs and NJ GWQSs. A Remedial Design (RD) for LUCs will be prepared to ensure groundwater beneath Site 1 is not used, other than for environmental monitoring and testing, without Navy approval (NAVFAC 2004).

Table 13-1 summarizes these analytes and their chemical-specific remedial goals based on the ARARs defined in the ROD.

Table 13-1: Groundwater Quality Regulatory Standards Comparison

Parameter	Operable Unit 8 – Site 1					
	ARARs Identified in the ROD ^[1]		Maximum Concentration Shown in the ROD (µg/L)	Current ARARs		2011 Concentrations (µg/L)
	EPA MCLs (µg/L)	NJDEP GWQS (µg/L)		EPA MCLs (µg/L)	NJDEP GWQS (µg/L)	
Arsenic	10	3	22.7	10	3	0.5 U
Chromium	100	70	148	100	70	1.06 J
Iron	NE	300	23,350	NE	300	76.4 J

Notes:

[1] The ROD did not identify numeric remedial goals but cited MCLs and GWQS within the remedial action objective.

[2] Maximum concentration based on samples biased high due to sample turbidity

13.2.3.3 Selected Remedy

The selected remedy for Site 1 included the following components (NAVFAC 2004):

- Establishment of a LUC in the form of a CEA to provide interim protection by prohibiting use of groundwater until MCLs and GWQS are achieved.
- Establishment of LUCs, via notation in the BMP to restrict the use of groundwater and to note that one soil location contained a concentration of arsenic above its RDCSRS.
- Provision of long-term periodic groundwater monitoring to evaluate the migration of contaminants from the site, evaluate potential impacts to downgradient areas, and determine whether additional remedial actions are necessary.

13.2.4 Status of Implementation

As described in the following sections, the RAOs have been achieved for Site 1. While several wells had attained GWQS, fluctuations in the dataset continued to occur with sporadic exceedances. Through a reevaluation of groundwater data, it was determined that the fluctuations were the result of high sample turbidity and not site-related.

13.2.4.1 Institutional Controls

Land use restrictions were noted in the BMP and Addendum. A Technical Memorandum (Resolution Consultants, 2017) was submitted that demonstrated that soil at the site is compliant with UU/UE. Preliminary comments have been received and concurrence is expected.

As discussed in subsequent sections, a 2011 Groundwater Sampling report was developed to document results of the LTM sampling events. As presented in the June 2011 report, fluctuations in groundwater contaminants of concern (arsenic, chromium, and iron) were the result of high sample turbidity and were not site-related (TT 2011). The NJDEP and U.S. EPA provided concurrence with the Technical Memorandum and indicated that LTM and a CEA/WRA were no longer required via emails dated February 7, 2013, and August 9, 2016, respectively.

13.2.4.2 Long-Term Monitoring Program

Following establishment of the LTM program in 2009, four onsite monitoring wells and two background wells were sampled and analyzed for arsenic, chromium, and iron. The last LTM event occurred in 2011. Due to high groundwater turbidities noted in the 1996 RI, total and filtered groundwater samples were collected in each of the LTM events to determine if the elevated concentrations were related only to turbidity. Groundwater concentrations from the 2011 sampling event are illustrated on Figure 13-2.

As previously stated in section 13.2.4.1, groundwater contaminants were determined to be naturally occurring and as a result, LTM at Site 1 terminated in 2013. EPA requested a technical memorandum summarizing overall site data in support of removing groundwater monitoring requirements. In 2014 a technical memorandum was submitted to EPA (Resolution Consultants 2014) and concurrence to discontinue groundwater monitoring was received via email in 2016 (EPA 2016). EPA also indicated via email dated December 22, 2016 that an ESD is not required.

13.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for OU-8, Site 1:

The remedy at OU8, Site 1 is protective of human health and the environment. NJDEP determined that no CEA/WRA is required for this site (Resolution Consultants 2013).

In 2014, a technical memorandum was submitted to EPA and NJDEP, reevaluating the groundwater dataset and demonstrating that the fluctuations in groundwater contaminants of concern (arsenic, chromium, and iron) were the result of high sample turbidity and were not site-related and therefore, the RAOs have been achieved. A Site Closure OU-8 RACR was submitted on April 2017 and is currently being reviewed by regulators (NAVFAC 2017).

13.3.1 Status of Issues and Recommendations from the Last Five-Year Review

Recommendations from the last FYR and status are provided in Table 13-2.

Table 13-2: Status of Recommendations from the 2013 Five-Year Review

Operable Unit 8 - Site 1			
Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Cease long-term groundwater monitoring activities because the August 2010 and February 2011 sampling events indicate that elevated levels of metals in groundwater samples are the result of high turbidity and are not site-related.	Completed	The last LTM event performed in 2011. LTM ceased in 2013. Site Closure RACR Submitted for approval April 2017.	2013

Operable Unit 8 - Site 1			
Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Since contaminants remain at the site that do not allow for UU/UE, future FYRs will be required.	Completed	Although no longer required the Fourth Five-Year Report is in progress as the no further action OU-8 RACR is under review.	Pending

13.3.2 Completed Since the Last Five-Year Review

Recommendations to cease LTM were made during the last FYR period. During this FYR period, the following actions have occurred, moving to site closure:

- Technical Memorandum: Former Ordnance Demilitarization Site (Operable Unit 8, Site 1) — Evaluation of Long Term Monitoring Requirement and Potential for Site Closure (Resolution Consultants 2014) was submitted, documenting both site background and rationale for closure. NJDEP and EPA concurred in emails dated February 7, 2013 and August 9, 2016, respectively, with the basis for closure, and indicated that the CEA/WRA and LTM were no longer required since COC concentrations were below the NJDEP GWQS (EPA 2016).
- The OU-8 Closure RACR was submitted in April 2017. The RACR concludes that Site 1 does not pose a threat to human health or the environment; LUCs and LTM are no longer required; and future FYRs will be discontinued (NAVFAC 2017). U.S. EPA provided review comments on April 24, 2017. The NJDEP review comments received October 2, 2017 requested a technical memorandum prior to RACR approval to demonstrate that site soil meets UU/UE standards.
- Per NJDEP request, a Technical Memorandum (Resolution Consultants 2017) was prepared demonstrating that the onsite soil is now compliant with UU/UE. NJDEP concurrence was received on January 5, 2018. U.S. EPA comments were addressed, and a draft final was submitted January 17, 2018; concurrence is expected.

13.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 1.

13.3.4 Data Review

No data were collected since the last FYR. No sampling was performed, and LUC recordkeeping is not required. The BMP has been an effective institutional control in preventing intrusive activities at Site 1.

As noted in Section 13.2.4, the notations in the BMP will be removed once the RACR is approved by EPA and NJDEP.

13.3.5 Site Inspection Findings

The FYR inspection was performed on June 6, 2017, as discussed in Section 1.4.2. All monitoring wells were located and appeared to be in good condition. The land use for the site appeared to be unchanged since the last FYR. Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

13.4 Technical Assessment

As discussed in Section 13.2.4, Site 1 meets UU/UE use and a Site Closure RACR has been submitted to EPA and NJDEP; LUCs will be removed and the site will be closed following approval of the RACR.

13.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 13-3 summarizes components of the Question A: Technical Evaluation.

Table 13-3: Technical Evaluation – Question A

Operable Unit 8 – Site 1	
Question	Summary
Remedial Action Performance	The RAOs have been achieved for Site 1. While several wells had attained GWQS, fluctuations in the dataset continued to occur with sporadic exceedances. In 2011, a technical memorandum was submitted to the EPA and NJDEP, reevaluating the groundwater dataset and demonstrating that the fluctuations in groundwater contaminants of concern (arsenic, chromium, and iron) were the result of high sample turbidity and were not site related. During this FYR period, additional regulatory concurrence on the site has been achieved, and a RACR was submitted in 2017. Regulatory approval of the RACR is pending.
Systems Operation/ Operations and Maintenance	The selected remedy did not include operations and maintenance components.
Implementation of Land Use Controls and Institutional/ Engineering Controls	<p>LUCs are required by the ROD:</p> <ul style="list-style-type: none"> - The BMP is used to prevent exposure to contaminated groundwater. - A CEA/WRA is in place to restrict use of groundwater. <p>A LUC RD was also prepared for Site 1 and is in place to memorialize LUC implementation procedures. A LUC RD was not required by the ROD.</p> <p>In 2011, site data were reevaluated, and it was determined (based on the high sample turbidity) that the COCs were not site related and that groundwater LTM was no longer necessary. Concurrence was received from the NJDEP that a CEA/WRA is no longer required. A Site Closure RACR has been submitted to regulatory agencies to indicate the site requires no further action. Once the RACR is approved, LUCs will be removed.</p>

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

Table 13-4 summarizes components of the Question B Technical Evaluation.

Table 13-4: Technical Evaluation – Question B

Operable Unit 8 – Site 1	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	There have been no changes to ARARs since last FYR.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The Site 1 remedy mitigated risks to human health; no unacceptable ecological risks were identified during the RI (B&RE 1998). Changes in toxicity, risk assessment methods, exposure models, and cleanup levels have no effect on remedy protectiveness because the RAOs defined in the ROD (NAVFAC 2004) are ARAR-based as opposed to site-specific risk-based remedial goals generated using risk assessment findings. Therefore, the protectiveness of remedies based on ARARs are not sensitive

Operable Unit 8 – Site 1	
Question	Summary
	<p>to risk assessment changes. The remedy focused on preventing human exposure to metals at concentrations greater than GWQS, MCLs, and RDCSRSSs. An OU Closure RACR has been submitted to the regulators stating the CEA and notation in the BMP are no longer required.</p> <p>Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because of the lack of migration pathways to surrounding upland habits and the limited terrestrial habitat present on the site.</p>
Changes in Exposure Pathways	There were no changes to exposure pathways that could affect the protectiveness of the remedy.
Expected Progress towards Meeting Remedial Action Objectives	<p>The RAO has been met at Site 1: the BMP and CEA/WRA have prevented unauthorized exposure to contaminated groundwater at Site 1.</p> <p>A Site Closure RACR has been submitted, concluding that Site 1 does not pose a threat to human health or the environment; LUCs and LTM are no longer required; and future FYRs can be discontinued (NAVFAC 2017).</p>

13.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

13.5 Issues/Recommendations

This FYR did not identify issues that affect protectiveness.

13.6 Other Findings

Other findings at Site 1 include:

- A Technical Memorandum (Resolution Consultants 2017) demonstrating that soil at the site meets UU/UE should be finalized. Concurrence is expected.
- Once the Technical Memorandum and OU Closure RACR are approved, LUCs (e.g., notations to the BMP and the CEA/WRA) should be removed and monitoring wells can be abandoned.

13.7 Protectiveness Statement

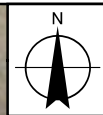
Protectiveness Statement		
Operable Unit: 8	Protectiveness Determination: Protective	Addendum Due Date (if applicable): Not Applicable
Site 1 Former Ordnance Demilitarization Site		
Protectiveness Statement: The remedy implemented at OU-8, Site 1 Former Ordnance Demilitarization Site is protective of human health and the environment		

13.8 References

Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle, Colts Neck, New Jersey*. July.

- Brown & Root Environmental (B&RE). 1998. *Remedial Investigation Addendum Report for Naval Weapons Station Earle, Colts Neck, New Jersey*. January.
- Naval Facilities Engineering Command (NAVFAC). 2004. *Record of Decision Sites 1 and 11 Operable Unit 8 (OU8), Naval Weapons Station Earle, Colts Neck, New Jersey*. September.
- Naval Facilities Engineering Command (NAVFAC). 2017. Draft Remedial Action Completion Report Operable Unit 8, Site 1 — Former Ordnance Demilitarization Site & Site 11 – Contract Ordnance Disposal Area Naval Weapons Station Earle, Colts Neck, New Jersey. April.
- New Jersey Department of Environmental Protection (NJDEP). 2013. Earle NWS: Site 1 GW Sampling, Site 23 GW Sampling and Site 19 CEA Documentation. (Email). February.
- New Jersey Department of Environmental Protection (NJDEP). 2016. Concurrence with Responses to Site 1 Technical Memorandum. (Email). 9 August.
- Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March.
- Resolution Consultants. 2014. *Technical Memorandum Former Ordnance Demilitarization Site (Operable Unit 8, site 1) – Evaluation of Long Term Monitoring Requirement and Potential for Site Closure*. October.
- Roy F. Weston Inc. (Weston). 1986. *Confirmation Study to determine Existence and Possible Migration of Specific Chemicals In Situ, Naval Weapons Station Earle, Colts Neck, New Jersey*. December.
- Roy F. Weston Inc. (Weston). 1993. Installation Restoration Program Remedial Investigation/ Feasibility Study for 11 Sites at NWS Earle, Colts Neck, New Jersey. September.
- Roy F. Weston Inc. (Weston). 1994. *Installation Restoration Program Site Investigation for 16 Sites at NWS Earle, Colts Neck, New Jersey*. January.
- Tetra Tech (TT). 2003. *Feasibility Study for Sites 1 and 11 (OU 8), Naval Weapons Station Earle, Colts Neck, New Jersey*. March.
- Tetra Tech (TT). 2004. *Remedial Design for Land Use Controls, Ordnance Demilitarization Site (Site 1), Operable Unit 8 (OU8), Naval Weapons Station Earle, Colts Neck, New Jersey*. June.
- Tetra Tech (TT). 2005. *Classification Exception Area Documentation for Site 1 Ordnance Demilitarization Site (OU8), Naval Weapons Station Earle, Colts Neck, New Jersey*. September.
- Tetra Tech (TT). 2011. *Groundwater Sampling Report August 2010 and February 2011 Sampling Events for Site 1 Ordnance Demilitarization Site NWS Earle NJ*. June.
- U.S. Environmental Protection Agency (EPA). 1991. *Federal Facility Agreement Under CERCLA 120, In the Matter of the US Department of the Navy, Naval Weapons Station Earle, Colt's Neck, New Jersey*. February.
- U.S. Environmental Protection Agency (EPA). 2016. RE: letter (Email). August.

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Legend

- Monitoring Well
- Berm
- Land Use Control Boundary
- Previous Burn Trench

1 inch = 100 feet

0 50 100
Feet

FIGURE 13-1
SITE LAYOUT MAP
OPERABLE UNIT 8, SITE 1
NAVAL WEAPONS STATION EARLE
COLTS NECKS, NEW JERSEY



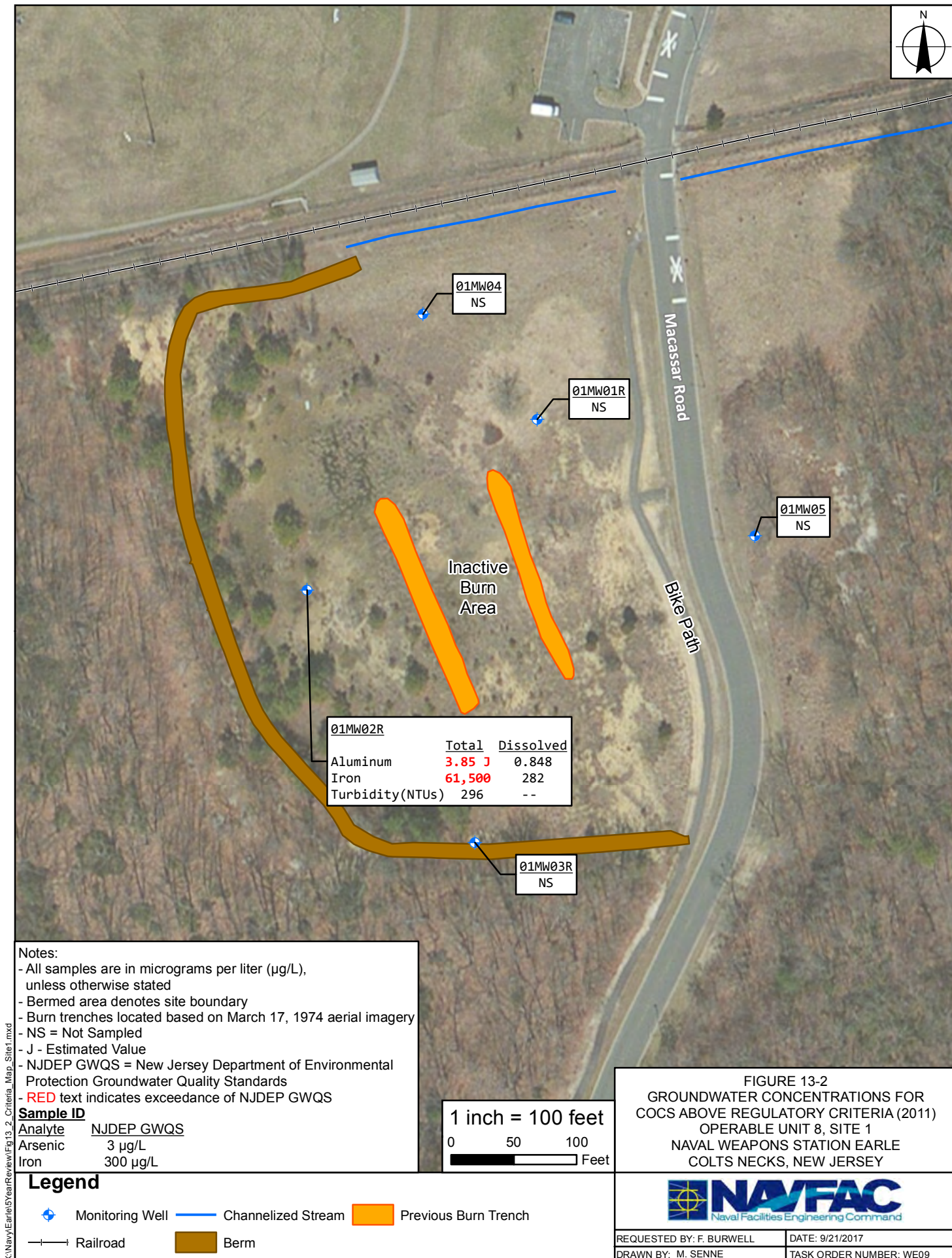
REQUESTED BY: F. BURWELL

DATE: 9/21/2017

DRAWN BY: M. SENNE

TASK ORDER NUMBER: WE09

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14.0 Operable Unit 9, Site 6 – Landfill West of Normandy Road

14.1 Site Background

Operable Unit 9, Site 6 is the Landfill West of Normandy Road. This landfill was used from 1943 to 1965 to dispose of refuse consisting of dunnage lumber, glass, paper, packing material, paint and solvents from the Waterfront area. Wastes were reportedly burned before being covered. An estimated 2,500 tons of waste was deposited annually at the landfill (NAVFAC 2007). Per the Site Analysis Earle Ammunition Depot: Waterfront Area Middletown Township, New Jersey (EPA 1991), also referred to as the Environmental Photographic Interpretation Center (EPIC) Study, waste was burned prior to disposal and the activity was described as a dump-and-cover method of disposal.

Site 6 — Landfill West of Normandy Road

- Remedy: LUCs/LTM
- Remedy in Place? — Yes
 - LUCs are in place
 - LUC RD completed 2005
 - CEA— Approved
 - LTM in 2011 and 2012
- UU/UE Achieved? — No

14.1.1 Location and Physical Description

Site 6 occupies four acres west of Normandy Road in the Waterfront area (Figure 1-3). The landfill area may have been part of a salt marsh before disposal began. Currently, most of the landfill surface is grass-covered or covered by Building R23 (Figure 14-1). Grass is periodically mowed on sections where land is unpaved. A few mature trees exist within the landfill area. Stormwater runoff drains toward the salt marsh and eventually into Sandy Hook Bay.

14.1.2 Land Use

Building R23 is currently used as a fitness center.

14.2 Response Action Summary

SIs and RIs completed between 1992 and 1997 (Weston 1994; B&RE 1996; B&RE 1998) and subsequent landfill stabilization work that included wetland delineation identified sediment metals, PAHs, pesticides, and VOCs; surface water metals, and groundwater metals and pesticides.

14.2.1 Interim Remedial Actions

No IRA activities were performed at Site 6.

14.2.2 Basis for Taking Action

As landfill contents were to remain in place, actions were required to preclude direct contact with landfill waste as well as to minimize future leaching of contaminants to groundwater. A baseline risk assessment was performed as part of the RI (B&RE 1996) to assess potential risks to groundwater, surface water, and sediment. Potential receptors considered for this site were future industrial, residential, and recreational receptors. A baseline HHRA was performed as part of the RI (B&RE 1996) that concluded the cancer risk under both the future residential and industrial exposure scenarios exceeded the upper bound of EPA's target risk range (10^{-4}). The primary contaminant contributing to the risk was arsenic, via ingestion and dermal contact of groundwater. HIs for future residential exposure by groundwater exceeded 1.0, primarily due to arsenic.

The ERA concluded that the impact of contaminants from Site 6 on the adjacent marsh was minimal; ecological risks to the marsh from Navy-related areas were deemed to be insignificant, and remedial actions due to ecological concerns were unwarranted (NAVFAC 2007).

Several metals in site groundwater were found in excess of NJDEP GWQS including aluminum, arsenic, cadmium, chromium, iron, and manganese (NAVFAC 2007).

14.2.3 Selected Remedy

14.2.3.1 Record of Decision

The Final OU-9 Site 6 ROD was signed by both the Navy and by the EPA on September 28, 2007 (NAVFAC 2007).

14.2.3.2 Remedial Action Objectives

The following RAOs were developed to protect human health and the environment:

- Prevent potential human exposure to metals in groundwater at concentrations above GWQS and/or MCLs (NAVFAC 2007).

Based on the outcome of the ERA, the ROD stated that no RAO for protection of the environment was necessary. Chemical-specific RGs for groundwater were developed for OU-9 Site 6 based on ARARs and background criteria. These analytes and their criteria are presented in Table 14-1.

Table 14-1: Groundwater Quality Regulatory Standards and Remedial Goals Comparison

Operable Unit 9 – Site 6						
Parameter	ROD-Specified RG and Basis ^[1]		Maximum Concentration Shown in the 2007 ROD ^[2]	Current ARARs		2012 Maximum Concentrations (µg/L)
	RG (µg/L)	Basis (µg/L)		MCLs (µg/L)	NJDEP GWQS (µg/L)	
Aluminum	2,090	Background	1,320	NE	200	78.2
Arsenic	8	GWQS	26.8	10	3	24.4
Cadmium	7	Background	7.0	5	4	0.5 U
Chromium	100	GWQS	1.2	100	70	1.51 J
Iron	95,200	Background	95,200	NE	300	60,900
Manganese	3,040	Background	1,820	NE	50	514

Notes:

[1] RGs obtained from the ROD (NAVFAC 2007), Table 29.

[2] Maximum concentrations obtained from the ROD (NAVFAC 2007), Table 4.

14.2.3.3 Selected Remedy

The selected remedy for Site 6 included the following components (NAVFAC 2007):

- Implement LUCs (including notations to the BMP, LUC RD, and CEA) to maintain integrity of the current or any future remedial system (e.g., landfill cover), prohibit groundwater use, and prevent residential development of the site.
- Establish a CEA pursuant to N.J.A.C. 7:9-6 to prohibit use of untreated groundwater as drinking water.
- Conduct long-term, periodic groundwater monitoring to assess contaminant status and potential threats to human health and the environment.
- Implement fencing (either maintaining existing or replacing with new).
- Since wastes will be left in place, review site conditions and risk every five years.

14.2.4 Status of Implementation

14.2.4.1 Engineering Controls

Fencing is in place pursuant to the ROD requirement; see Section 14.4.3 for details about current conditions.

14.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP Addendum and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 14-1 presents the LUC boundary. Per email correspondence dated September 25, 2013, the CEA was approved by NJDEP pending the submittal of GIS coordinates of the CEA boundary; the geodetic datum associated with the CEA was submitted to NJDEP on July 14, 2017, for upload into their CEA database and confirmed as received/accepted via email dated July 14, 2017.

14.2.4.3 Long-Term Monitoring Program

Groundwater sampling was conducted in November and December 2011 as well as in May 2012 (TT 2013). In each sampling round, the four site monitoring wells were sampled and analyzed for the COCs established in the ROD (aluminum, arsenic, cadmium, chromium, iron, and manganese). Sampling results are summarized in section 14.4.2.2. Groundwater sampling was not performed from 2012 to 2017. Revised sampling work plans were developed in 2017 and annual sampling was completed in January 2018.

14.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 6:

The remedy at OU 9, Site 6 is protective in the short-term of human health and the environment. As outlined in the September 2007 ROD the remedy for Site 6 is ICs and long-term monitoring. LUCs for soil have been implemented as outlined in the ROD and have eliminated the exposure pathway to buried waste materials and constituents. The Waterfront Area facilities are connected to a public water supply (New Jersey American Water Company); therefore, the exposure pathway to impacted groundwater is incomplete for facility personnel. The proposed CEA will eliminate the potential exposure pathway for ingestion of impacted groundwater by restricting the installation of wells in the impacted area. The remedy will be protective when the CEA is implemented (Resolution Consultants 2013).

14.3.1 Status of Issues and Recommendations from the Last Five-Year Review

No issues or recommendations affecting protectiveness were identified.

14.3.2 Completed Since the Last Five-Year Review

- The Final Groundwater Sampling Report December 2011 and May 2012 Sampling Events for Site 6 Landfill West of Normandy Road and Site 17 Disposal Site Behind Training Barge NWS Earle NJ was submitted to the Navy in November 2013 (TT 2013).
- CEA/WRA support documentation was provided as Appendix E of the November 2013 sampling report. Per email correspondence dated September 25, 2013, the CEA/WRA was approved by NJDEP pending submittal of GIS coordinates of the CEA/WRA boundary. The geodetic datum associated with the CEA/WRA was submitted to NJDEP on July 14, 2017 for inclusion into NJDEP's database and has been accepted.

14.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 6.

14.3.4 Data Review

14.3.4.1 Land Use Control Inspection Records

The LUC RD for groundwater at Site 6 was finalized in June 2005. The LUC RD restricts residential development on the site, and access to the site for purposes other than environmental monitoring and testing (TT NUS 2005). The LUC RD does require preparation of an annual monitoring report for Site 6; annual reports have not been prepared during this FYR period.

14.3.4.2 Long-Term Monitoring Data

No data was collected during this FYR period. Data was collected in 2011/2012 and were submitted to EPA and NJDEP in the November 2013 groundwater sampling report (TT 2013). The analytical results indicate that arsenic, iron, and manganese remain at concentrations above the NJDEP GWQS in one or more of the Site 6 monitoring wells, as shown in Figure 14-2.

14.3.5 Site Inspection Findings

The FYR inspection was performed on June 5, 2017, as discussed in Section 1.4.2. During the site visit, both Site 6 and Building R23 appeared to be vacant and not in use. The land use for the site appeared to be unchanged since the last FYR. All monitoring wells were located and appeared to be in good condition. Issues noted during the site inspection include:

- Fencing along the north side of landfill perimeter is covered by dense vegetation growth. Fence maintenance issues were transmitted to the Navy's O&M contractor, for implementation.

Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

14.4 Technical Assessment

Implementation of institutional/engineering controls (via the BMP, LUC RD, and CEA/WRA), fencing, and signage prevent groundwater use and disturbance of the landfill cover. LTM was last performed in 2012; sampling was not performed during this FYR period. VI was not considered at Site 6 since VOCs are not present in groundwater.

14.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 14-2 summarizes components of the Question A: Technical Evaluation.

Table 14-2: Technical Evaluation – Question A

Operable Unit 9 – Site 6	
Question	Summary
Remedial Action Performance	<p>LUCs and the perimeter fence limit site access and prevent disturbance of the landfill. However, the FYR site inspection (Section 14.4.5) identified maintenance issues, including dense vegetation growing through the fencing.</p> <p>Long-term monitoring had not been conducted since 2012. The last sampling events (2011/2012) indicated that arsenic, iron, and manganese remain above NJDEP GWQS.</p>
Systems Operation/ Operations and Maintenance	The selected remedy did not include operations and maintenance components. However, as noted in Section 14.4.3, maintenance is required at Site 6.
Implementation of Land Use Controls and Institutional/ Engineering Controls	<p>LUCs were required by the ROD:</p> <ul style="list-style-type: none"> The BMP is currently used to restrict access to the site, to prevent intrusive activity, and to prevent exposure to waste and contaminated groundwater. A LUC RD has been completed at this site. A CEA/WRA has been completed for this site.

Table 14-2: Technical Evaluation – Question A

Operable Unit 9 – Site 6	
Question	Summary

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

Table 14-3 summarizes components of the Question B: Technical Evaluation.

Table 14-3: Technical Evaluation – Question B

Operable Unit 9 – Site 6	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Groundwater RGs presented in Table 14-1 were compared to current ARARs. The remedy remains protective for the site.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	<p>The Site 6 remedy mitigated risks to human health; no unacceptable ecological risks were identified during the RI (B&RE 1996). Changes in toxicity, risk assessment methods, exposure models, and cleanup levels have no effect on remedy protectiveness because the RAOs defined in the ROD (NAVFAC 2007) are ARAR-based as opposed to site-specific, risk-based remedial goals generated using risk assessment findings. The protectiveness of remedies based on ARARs are therefore not sensitive to risk assessment changes. The remedy focuses on preventing exposure to metals at concentrations greater than GWQS and/or MCLs in groundwater via LUCs, landfill cover, and fencing effectively mitigate corresponding risks. As long as the LUCs, landfill cover, and fencing at Site 6 prevent human exposure to contaminated groundwater, the remedy remains protective. If future use of this site changed (e.g., LUCs, cover, or fencing removed), reevaluation of risk would be required.</p> <p>Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the exposure pathways have been mitigated via the cap which reduces migration to groundwater and direct contact.</p>
Changes in Exposure Pathways	<p>There were no changes to exposure pathways that could affect the protectiveness of the remedy.</p> <p>Burning was reported during operation of the landfill. Based on this information emerging contaminants dioxins/furans Section 1.7.4 discusses emerging contaminants and their relation to NWS Earle.</p>
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy at Site 6 meets RAOs:</p> <ul style="list-style-type: none"> The LUCs (LUC RD, CEA/WRA, and the BMP) prevent disturbance of the landfill and exposure to contaminated groundwater

14.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

14.5 Issues/Recommendations

This FYR did not identify issues that affect protectiveness.

14.6 Other Findings

Annual long-term groundwater monitoring was conducted in January 2018. Development of the draft annual monitoring report is underway as of the time of this FYR.

14.7 Protectiveness Statement

Protectiveness Statement		
Operable Unit: 9	Protectiveness Determination: Protective	Addendum Due Date (if applicable): Not Applicable
Site 6 Landfill West of Normandy Road		
Protectiveness Statement: The remedy at OU-9 Site 6 is protective in the long-term of human health and the environment.		

14.8 References

- Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle, Colts Neck, New Jersey*. July.
- Brown & Root Environmental (B&RE). 1998. *Remedial Investigation Addendum Report for Naval Weapons Station Earle*. January.
- NAVFAC. 2007. *Record of Decision, Sites 6, 12, 15, and 17, Operable Unit 9 (OU 9) Naval Weapons Station Earle, Colts Neck, New Jersey*. September.
- Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March.
- Roy F. Weston Inc. (Weston). 1994. *Installation Restoration Program Site Investigation for 16 Sites at NWS Earle, Colts Neck, New Jersey*. January.
- Tetra Tech (TT). 2005. *Remedial Design for Land Use Controls Sites 6, 12, 15 and 17 Operable Unit 9 (OU 9), Naval Weapons Station Earle, Colts Neck, New Jersey*. June.
- Tetra Tech (TT). 2013. *Groundwater Classification Exception Area Documentation for Site 6 - Landfill West of Normandy Road Naval Weapons Station Earle Colts Neck, New Jersey*. November.
- U.S. Environmental Protection Agency (EPA). 1991. *Site Analysis Earle Ammunition Depot: Waterfront Area Middletown Township, New Jersey*. November.



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Legend

- ◆ Monitoring Well
- Land Use Control Boundary (Soil)
- Channelized Stream
- Site 6 Location

1 inch = 100 feet

0 50 100
Feet

FIGURE 14-1
SITE LAYOUT MAP
OPERABLE UNIT 9, SITE 6
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



REQUESTED BY: F. Burwell

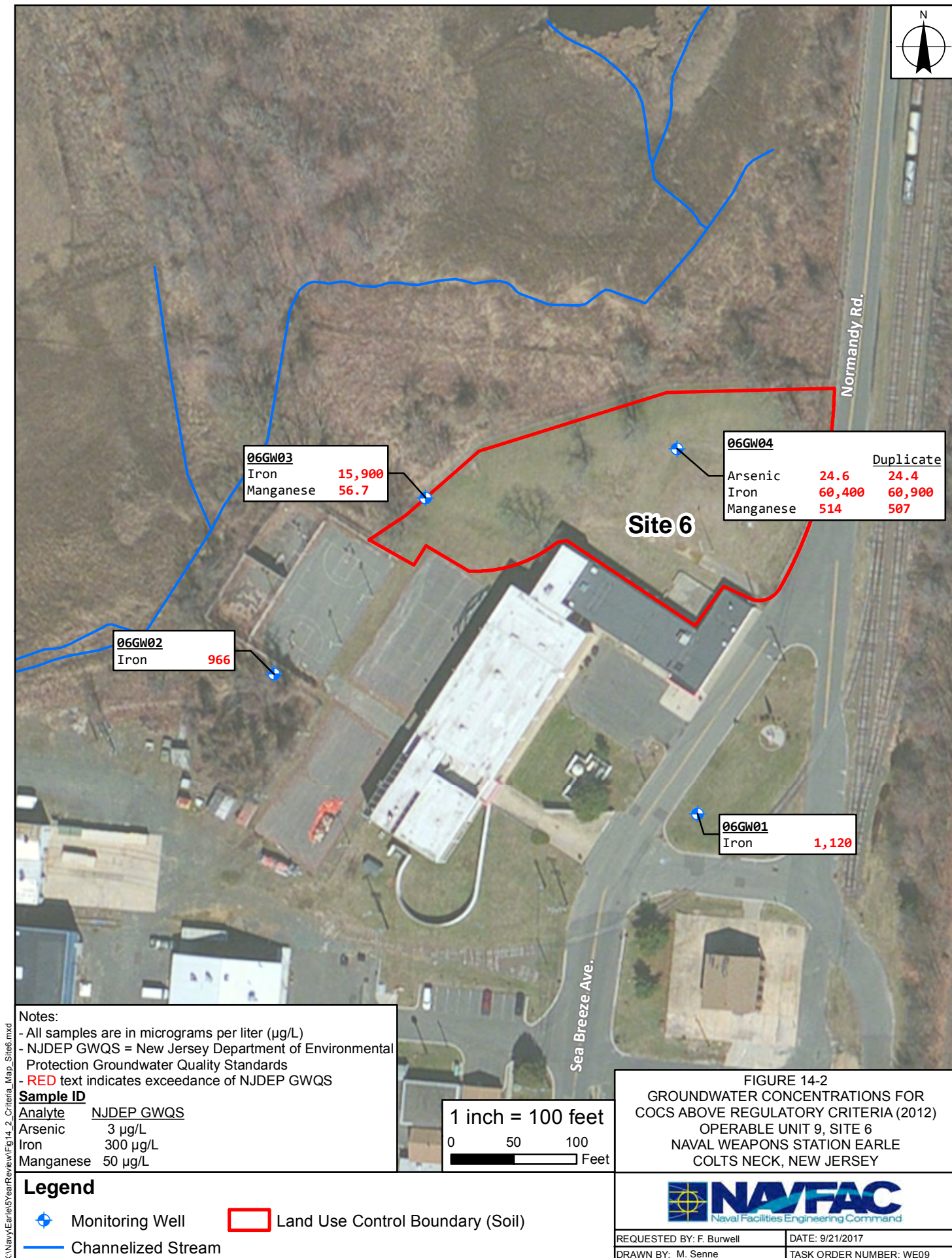
DATE: 9/21/2017

DRAWN BY: M. Senne

TASK ORDER NUMBER: WE09

Basemap Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Data Source: Tetra Tech Nus, Inc.

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15.0 Operable Unit 9, Site 15 – Sludge Disposal Site

15.1 Site Background

In the early 1970s, Site 15 was used for disposal of an unknown amount of oily bilge sludge. Exact amounts and exact location are unknown, but it is estimated that over 5,000 gallons of sludge, which may have ranged from one percent to 25 percent oil, may have been disposed at the site (NAVFAC 2007).

Site 15 —Sludge Disposal Site

- Remedy: LUCs/Fencing/LTM
- Remedy in Place? — Yes
 - LUCs are in place
 - Fencing in place
 - LTM - pending funding
- UU/UE Achieved? — No

15.1.1 Location and Physical Description

Site 15 is located at the Waterfront Area adjacent to Highway 36 (Figures 1-3 and 15-1) and has a double-fenced security buffer zone (NAVFAC 2007). The Former Sludge Disposal Site occupies approximately 1 acre along a former railroad embankment near the main entrance to the Waterfront area. A small drainage swale runs along the northern side of the site and along Highway 36, and surface water from the site and adjacent paved parking area as well as runoff from the highway flow toward this swale. This swale only contains water after precipitation.

15.1.2 Land Use

Site 15 was a wetland area adjacent to a railroad track. The railroad track was decommissioned and is no longer in use. According to NWS Earle Public Works Department, there are no plans to change the land use at Site 15. Fencing around the perimeter of the site limits site access.

15.2 Response Action Summary

The 1993 and 1995 RI activities identified several metals in soil, groundwater, sediment, and surface water at Site 15 (Weston 1993; B&RE 1996). Surface water and sediment concentrations were low and did not present a risk to human or ecological receptors. Groundwater was not retained as a viable pathway due to elevated turbidities/high suspended solids content (NAVFAC 2007).

15.2.1 Interim Remedial Actions

No IRA activities were performed for Site 15.

15.2.2 Basis for Taking Action

Risks at Site 15 evaluated soil, sediment, and surface water exposures; groundwater was not evaluated as noted in Section 15.2. The HHRA concluded that the cancer risk associated with future residential exposure scenarios were within EPA's acceptable risk range (10^{-6} to 10^{-4}). The primary contaminant contributing to the risk was arsenic, via ingestion and dermal contact with surface and subsurface soils. HIs for future residential exposure exceeded 1.0 based on ingestion, dermal, and inhalation of dusts (NAVFAC 2007).

The ERA identified low potential risk at Site 15; contaminant concentrations generally were low, below background, and/or had corresponding low hazard quotients. Because Site 15 was small and the contaminant source was not discrete, the ERA recommended no further investigations, and no remediation based on ecological concerns (NAVFAC 2007).

RI activities confirmed the presence of arsenic and cadmium in site soils above NJDEP RDCSCC (B&RE 1996). RI activities confirmed the presence of elevated concentrations of several metals in groundwater in excess of NJDEP GWQS, including arsenic, barium, beryllium, chromium, lead, nickel, and silver (Weston 1993).

15.2.3 Selected Remedy

15.2.3.1 Record of Decision

The Final OU-9 Site 6 ROD for Sites 6, 12, 15, and 17 was signed by the Navy and by EPA in September 2007 (NAVFAC 2007).

15.2.3.2 Remedial Action Objectives

The following RAO was developed to protect human health and the environment:

- Prevent potential human exposure to metals at concentrations greater than NJDEP cleanup criteria in surface and subsurface soils (NAVFAC 2007).

Based on the outcome of the ERA, the ROD stated that no RAO for protection of the environment was necessary. Chemical-specific RGs for soil were developed for OU-9 Site 15 based on ARARs. These analytes and their criteria are presented in Table 15-1.

Table 15-1: Regulatory Standards and Remedial Goals Comparison

Operable Unit 9 – Site 15			
Parameter	ROD-Specified RG and Basis ^[1] NJDEP RDCSCC (TBCs) (mg/kg)	Maximum Concentration Shown in the 2007 ROD ^[2] (mg/kg)	Current ARARs NJDEP RDCSRS (mg/kg)
Arsenic	20	19.2 (surface soil) 20.5 (subsurface soil)	19
Cadmium	1	3.4	78

Notes:

[1] RGs obtained from the ROD (NAVFAC 2007), Table 29.

[2] Maximum concentrations obtained from the ROD (NAVFAC 2007), Tables 6, 8, and 10

15.2.3.3 Selected Remedy

The selected remedy for the Site 15 included the following components (NAVFAC 2007):

- Implement LUCs (notation in the BMP) to maintain the integrity of the current or any future remedial system, to disturbance of Site 15 soil, and to prevent residential development of the site.
- Conduct long-term, periodic soil monitoring to assess contaminant status and potential threats to human health and the environment.
- Implement fencing (either maintain existing or replace with new).
- Since contamination will be left in place, review site conditions and risk every five years.

15.2.4 Status of Implementation

Site 15 LUCs are in place. RI data at Site 15 were reevaluated in the 2011 Letter Regarding a Change of the Proposed Preliminary Remediation Goal for Cadmium (TT NUS 2011) and identified that the only COC in soil above current ARARs is arsenic; regulatory approval is still pending. No soil sampling (as required by the ROD) has been performed to date. A technical memorandum will be developed to assert that periodic soil sampling is not a standard protocol in environmental remediation and would not provide value to the progress of the site.

15.2.4.1 Engineering Controls

To address ROD requirements, additional fencing was installed at Site 15 (NAVFAC 2007).

15.2.4.2 Institutional Controls

Land use restrictions have been noted in the BMP and Addendum and biennial certifications are submitted to the NJDEP documenting that the LUCs remain in place and are protective. Figure 15-1 presents the LUC boundary.

15.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 15:

The remedy at OU 9, Site 15 is protective of human health and the environment. As outlined in the September 2007 ROD the remedy for Site 15 is ICs and long-term monitoring which are implemented (Resolution Consultants 2013).

15.3.1 Status of Issues and Recommendations from the Last Five-Year Review

This is the fourth FYR of Site 15. Table 15-2 provides the status of recommendations made for Site 6 in the last FYR.

Table 15-2: Status of Issues and Recommendations from the Last Five-Year Review

Operable Unit 9 – Site 15			
Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Enact LUCs outlined in the OU 9 Remedial Design for Land Use Controls (TT NUS 2006)	Ongoing	The LUCs are being implemented (see Section 15.11.6).	October 2006
Conduct LTM and FYRs in accordance with the ROD.	Ongoing	FYRs are in progress. LTM as proposed in the ROD has not been conducted. However, the Navy is currently preparing an O&M manual and SAP for soil monitoring at Site 15.	2013

15.3.2 Completed Since the Last Five-Year Review

An O&M manual for Site 15, including a soil sampling plan and health and safety plan, is currently being prepared.

15.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 15.

15.3.4 Data Review

15.3.4.1 Land Use Control Inspection Records

The LUC RD for groundwater at Site 15 was finalized in June 2005. The LUC RD restricts residential development on the site, and access to the site for purposes other than environmental monitoring and testing (TT NUS 2005).

The LUC RD does require preparation of an annual monitoring report for Site 15; annual reports have not been prepared during this FYR period.

15.3.5 Site Inspection Findings

The FYR inspection was performed on June 5, 2017, as discussed in Section 1.4.2. The area appeared to be abandoned and not in use. Land use appeared to be unchanged since the last FYR. Issues noted during the site inspection include:

- Fencing along the northeast section of the site showed some damage; fence maintenance issues were transmitted to the Navy's O&M contractor for implementation.

Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

15.4 Technical Assessment

Implementation of institutional/engineering controls (via the BMP and LUC RD) and fencing prevent access to contaminated soil. Soil LTM has not been implemented as required by the ROD; however, an O&M manual for Site 15, including a soil sampling plan and health and safety plan, is currently being prepared.

15.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 15-3 summarizes components of the Question A: Technical Evaluation.

Table 15-3: Technical Evaluation – Question A

Operable Unit 9 – Site 15	
Question	Summary
Remedial Action Performance	LUCs and the perimeter fence have been implemented by the Navy to secure the area preventing residential direct contact exposures; the FYR site inspection (Section 15.4.5) identified maintenance issues, including fencing damage. Long-term monitoring for soil has not been conducted per the ROD. RI data at Site 15 were reevaluated in the 2011 Letter Regarding a Change of the Proposed Preliminary Remediation Goal for Cadmium (TT NUS 2011) and identified that the only COC in soil above current ARARs is arsenic; regulatory approval is still pending.
Systems Operation/ Operations and Maintenance	The selected remedy did not include operations and maintenance components. However, as noted in Section 15.4.3, maintenance is required at Site 15.
Implementation of Land Use Controls and Institutional/ Engineering Controls	LUCs were required by the ROD: <ul style="list-style-type: none"> • The BMP is currently used to restrict access to the site, to prevent intrusive activity, and to prevent exposure to contaminated soil. • An LUC RD has been completed at this site.

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

Table 15-4: Technical Evaluation — Question B

Operable Unit 9 – Site 15	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	There have been no changes to ARARs since last FYR. The Third Five-Year Review reevaluated site COCs against current ARARs; arsenic is currently the only COC above RDCSRS.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	The Site 15 remedy mitigated risks to human health; no unacceptable ecological risks were identified during the RI (B&RE 1996). Changes in toxicity, risk assessment methods, exposure models, and cleanup levels have no effect on remedy protectiveness because the RAOs defined in the ROD (TT 2007) are ARAR-based as opposed to site-specific risk-based remedial goals generated using risk assessment findings. Therefore, the protectiveness of remedies based on ARARs are not sensitive to risk assessment changes; a revision in ARARs since the 2007 OU-9 ROD affect direct exposure ARARs for cadmium. The remedy focuses on preventing human exposure to metals at concentrations greater than NJDEP cleanup criteria in surface and subsurface soils via LUCs and fencing that effectively mitigate corresponding risks. As long as the LUCs and

Table 15-4: Technical Evaluation — Question B

Operable Unit 9 – Site 15	
Question	Summary
	fencing at Site 15 are enforced to prevent human exposure to contaminated soil, the remedy remains protective. Should the future use of this site change (e.g., LUCs or fencing removed), reevaluation of risk would be required. Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because of the limited habitat due to the small size of the site and the fact that excellent habitat exists in the surrounding area. In addition, no migration pathways to habitat are present.
Changes in Exposure Pathways	There were no changes to exposure pathways that would affect the protectiveness of the remedy.
Expected Progress towards Meeting Remedial Action Objectives	The remedy at Site 15 meets RAOs: <ul style="list-style-type: none"> The LUCs (LUC RD and the BMP) prevent disturbance of contaminated soil and access to Site 15

15.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

15.5 Issues/Recommendations

This FYR did not identify issues that affect protectiveness.

15.6 Other Findings

A technical memorandum should be prepared to document the following:

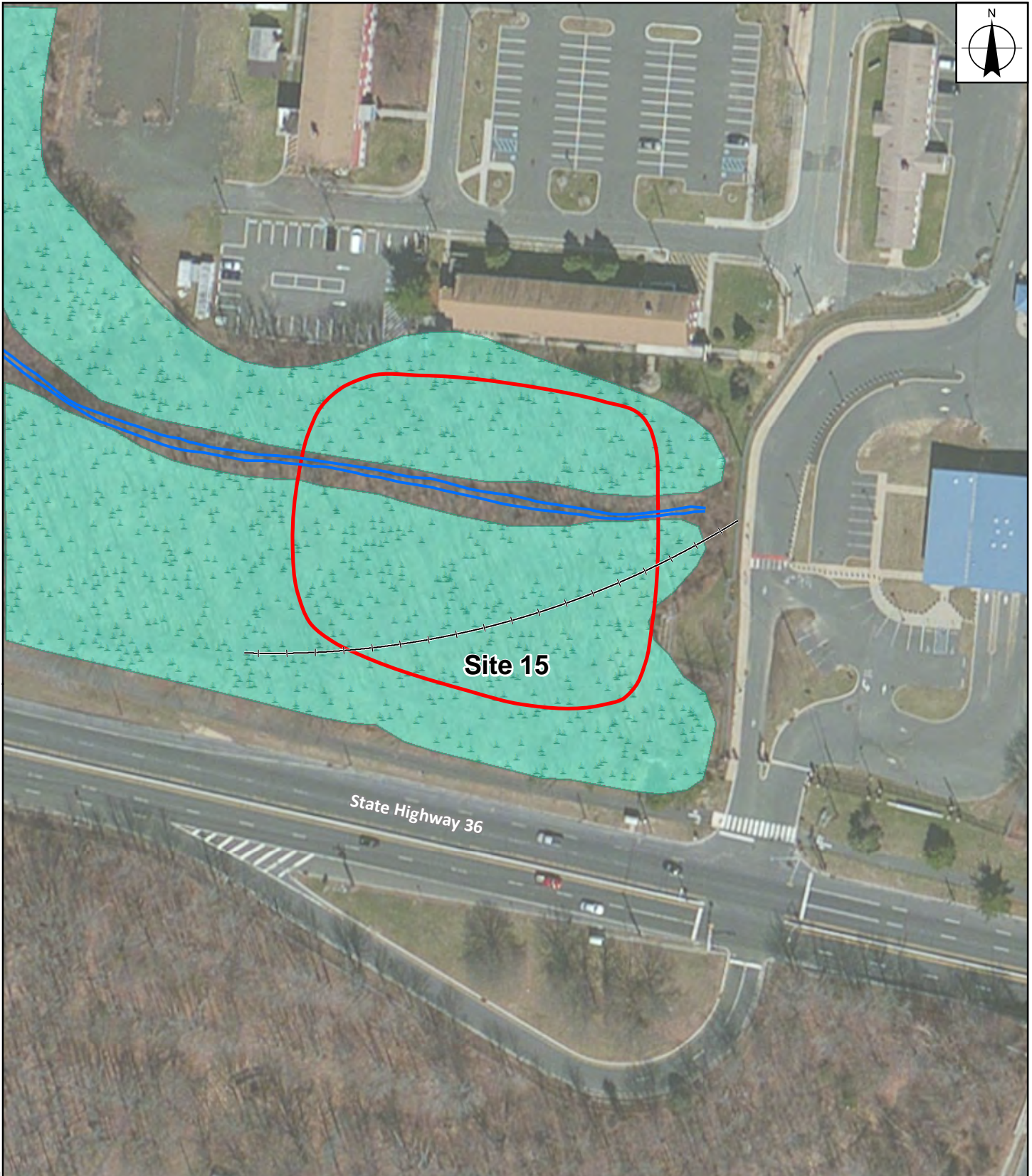
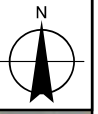
- Per the ROD, the site had two COCs, arsenic and cadmium. Cadmium is compliant with UU/UE standards and is no longer of concern. Due to the low levels of arsenic reported, it is recommended that the arsenic dataset be evaluated using NJDEP's Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (2012) as the dataset average may prove to be compliant with UU/UE standards.
- As periodic soil sampling is not a standard remedial approach, nor would the information be useful in making future determinations, it is recommended that the request to remove this requirement be included in the technical memorandum.
- Upon concurrence of the technical memorandum, an ESD will be prepared to document the change in cadmium standards, the removal of all components of the remedy, and Site 15's overall compliance with UU/UE.

15.7 Protectiveness Statement

Protectiveness Statement		
<i>Operable Unit:</i> 9	<i>Protectiveness Determination:</i> Protective	<i>Addendum Due Date (if applicable):</i> Not Applicable
Site 15 Sludge Disposal Site		
<i>Protectiveness Statement:</i> The remedy implemented at Site 15 Sludge Disposal Site is protective of human health and the environment.		

15.8 References

- Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle, Colts Neck, New Jersey*. July.
- NAVFAC, 2007. *Record of Decision, Sites 6, 12, 15, and 17, Operable Unit 9 (OU 9) Naval Weapons Station Earle, Colts Neck, New Jersey*. September.
- Resolution Consultants. 2013. *Site Management Plan 2014 through 2018, Naval Weapons Station Earle, New Jersey*. December.
- Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March.
- Roy F. Weston Inc. (Weston). 1993. *Installation Restoration Program Remedial Investigation/ Feasibility Study for 11 Sites at NWS Earle, Colts Neck, New Jersey*. September.
- Tetra Tech (TT). 2005. *Remedial Design for Land Use Controls Sites 6, 12, 15 and 17 Operable Unit 9 (OU 9), Naval Weapons Station Earle, Colts Neck, New Jersey*. June.
- Tetra Tech (TT). 2007. *Feasibility Study for Sites 6, 12, 15 and 17 (OU 9), Naval Weapons Station Earle, Colts Neck, New Jersey*. March.
- Tetra Tech NUS (TT NUS). 2011. *Change of Proposed Remediation Goad (PRG) for Cadmium at Site 15, Sludge Disposal Area (Operable Unit 9) Naval Weapons Station (NWS) Earle Colts neck, New Jersey. (Email)*. September.



Legend

- Former Railroad Embankment
- Channelized Stream
- Site 15 Location/Land Use Control Boundary
- Wetlands

1 inch = 100 feet

0 50 100
Feet

FIGURE 15-1
SITE LAYOUT MAP
OPERABLE UNIT 9, SITE 15
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



REQUESTED BY: F. Burwell

DATE: 9/21/2017

DRAWN BY: M. Senne

TASK ORDER NUMBER: WE09

Basemap Source: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Data Source: Tetra Tech Nus, Inc.

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16.0 Operable Unit 9, Site 17 – Disposal Site Behind Training Barge

16.1 Site Background

Site 17 was reportedly used to dispose of wood, heavy equipment, empty paint cans, and construction debris. Disposal at Site 17 occurred during the early 1940s (NAVFAC 2007).

16.1.1 Location and Physical Description

Site 17 occupies 3 acres in the Waterfront area, adjacent to a tidal marsh in the Ware Creek drainage basin. The face of the disposal area is 10 to 15 feet higher in elevation than the marsh area and is heavily vegetated. No slope stabilization was performed at the disposal area, but grading, topsoil cover placement, and seeding was conducted on the flat portion of the site (TT NUS 2005). The Navy installed a wooden barricade to prevent any future deposition of soils or debris on the sloped area of Site 17.

Currently, the southern portion of the disposal area is covered with hard-packed gravel and is currently used as a parking area for Waterfront personnel. The northern portion is covered with heavy grass and borders a vegetated marsh area (NAVFAC 2007). Overland flow drains toward the salt marsh north and west of the site. The salt marsh discharges to the Sandy Hook Bay via several tributary streams (Figure 1-3).

16.1.2 Land Use

As noted above, a portion of Site 17 is used for parking. According to NWS Earle Public Works Department, there are no plans to change the land use at the site.

16.2 Response Action Summary

The 1995-1996 RI activities included sampling and analysis of sediment, surface soil, surface water and groundwater. Analytical results confirmed the presence of arsenic and cadmium in site groundwater; no soil, sediment, or surface water results exceeded background concentrations.

16.2.1 Interim Remedial Actions

No IRA activities were performed at Site 17.

16.2.2 Basis for Taking Action

The baseline HHRA concluded risks associated with future residential exposure to groundwater were at the upper end of EPA's acceptable risk range (10^{-6} to 10^{-4}); arsenic is the primary contributor to site risk, via ingestion of groundwater. Estimates for non-carcinogenic risk associated with a future residential (groundwater) exposure scenario exceeded 1.0; arsenic is the primary driver for non-carcinogenic risk (NAVFAC 2007).

The ecological risk assessment found impacts of contaminants from Site 17 on the surrounding marsh to be insignificant, and were not associated with disposal-related releases. Remedial action based on ecological risk concerns or additional, more focused ecological studies are therefore unwarranted (NAVFAC 2007).

Analytical results confirmed the presence of arsenic and cadmium in site groundwater in excess of NJDEP GWQS (B&RE 1996).

Site 17 — Disposal Site Behind Training Barge

Remedy: LUCs/ LTM

- Remedy in Place? — No
 - Fencing in place;
 - CEA pending additional evaluation
 - LTM ongoing
- UU/UE Achieved? — No

16.2.3 Selected Remedy

16.2.3.1 Record of Decision

The Final OU-9 Site 17 ROD was signed by the Navy and by EPA in September 2007 (NAVFAC 2007).

16.2.3.2 Remedial Action Objectives

The following RAOs were developed to protect human health and the environment:

- Prevent potential human exposure to metals in groundwater at concentrations above GWQS and/or MCLs (NAVFAC 2007).

Based on the outcome of the ERA, the ROD stated that no RAO for protection of the environment was necessary. Chemical-specific RGs for groundwater were developed for OU-9 Site 17 based on ARARs and background criteria. These analytes and their criteria are presented in Table 16-1.

Table 16-1: Groundwater Quality Regulatory Standards and Remedial Goals Comparison

Operable Unit 9 – Site 17						
Parameter	ROD-Specified RG and Basis ^[1]		Maximum Concentration Shown in the 2007 ROD ^[2] (µg/L)	Current ARARs		2016 Concentrations (µg/L)
	RG (µg/L)	Basis		MCLs (µg/L)	NJDEP GWQS (µg/L)	
Arsenic	8	GWQS	19.7	10	3	7.74
Cadmium	7	Background	8.3	5	4	0.5 U

Notes:

Source: TT NUS 2007

[1] RGs obtained from the ROD (NAVFAC 2007), Table 29.

[2] Maximum concentrations obtained from the ROD (NAVFAC 2007), Table 4.

16.2.3.3 Selected Remedy

The selected remedy for Site 17 included the following components (NAVFAC 2007):

- Implement LUCs (including annotations to the BMP, LUC RD, and CEA) to maintain integrity of the current or any future remedial system (e.g., landfill cover), prohibit groundwater use, and prevent residential development of the site.
- Establish a CEA pursuant to N.J.A.C. 7:9-6 to prohibit use of untreated groundwater as drinking water.
- Conduct long-term, periodic groundwater monitoring to assess contaminant status and potential threats to human health and the environment.
- Implement fencing (either via maintaining existing or replacing with new fencing).
- Since wastes will be left in place, review site conditions and risk every five years.

16.2.4 Status of Implementation

16.2.4.1 Engineering Controls

As noted during the site inspection, fencing is in place at Site 17; see Section 16.4.3 for additional details about current conditions

16.2.4.2 Land Use Controls

Land use restrictions have been noted in the BMP Addendum. Figure 16-1 presents the LUC boundary. The ROD also required a CEA to restrict groundwater use until concentrations of arsenic and cadmium were below their respective GWQS. However, NJDEP, in correspondence dated May 12, 2016, has suggested that the only remaining COC, arsenic, is likely naturally occurring and appears to be very closely related to sample turbidity. NJDEP also indicated that after further evaluation of arsenic in groundwater, a CEA/WRA may not be required (NJDEP 2016). See Section 16.3.2 for further details.

16.2.4.3 Long-Term Monitoring Program

The LTM program was established in May 2011. Samples have been analyzed for arsenic and cadmium. Sampling results are summarized in section 16.4.2.2.

16.3 Progress Since the Last Five-Year Review

The Third Five-Year Review made the following protectiveness statement for Site 17:

- The remedy at OU-9, Site 17 is protective in the short-term of human health and the environment. As outlined in the September 2007 ROD the remedy for Site 17 is ICs and long-term monitoring. Currently, the northern portion of Site 17 is bounded on the east by fencing; to the north and west is a thickly vegetated marsh area and to the south is a heavily wooded area. The southern portion of the landfill surface at Site 17 is fenced and utilized as a parking area for Waterfront personnel. The Waterfront Area facilities are connected to a public water supply (New Jersey American Water Company); therefore, the exposure pathway to impacted groundwater is incomplete for facility personnel. The proposed CEA/WRA will eliminate the potential exposure pathway for ingestion of impacted groundwater by restricting the installation of wells in the impacted area. The remedy will be protective when the CEA/WRA is implemented (Resolution Consultants 2013).

16.3.1 Status of Issues and Recommendations from the Last Five-Year Review

Recommendations from the last FYR and status are provided in Table 16-2:

Table 16-2: Status of Recommendations from the 2013 Five-Year Review

Operable Unit 9 – Site 17			
Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Implement the LUCs by establishing the CEA for groundwater, as outlined in the OU- 9 LUC RD (TT NUS 2006).	Ongoing	The LUC RD has been implemented; however, per 2016 correspondence with NJDEP, the CEA/WRA may no longer be warranted; see Section 16.3.2 for additional discussion.	Pending
Conduct LTM and FYRs in accordance with the ROD.	Ongoing	FYRs are in progress. LTM was last reported in 2015.	Pending

16.3.2 Completed Since the Last Five-Year Review

The following have been completed since the last FYR.

- In April 2009, the EPA and NJDEP determined additional sampling was needed to provide current groundwater conditions and determine if a CEA/WRA was necessary. Two rounds of groundwater sampling for arsenic and cadmium were performed in November 2011 and May 2012. The groundwater sampling report for December 2011 and May 2012 events was submitted (TT NUS 2013).

- The Addendum to the Final SAP for Groundwater Sampling at Site 6 – Landfill West of Normandy Road and Site 17 – Disposal Site Behind Training Barge (TT 2014) submitted in September 2014.
- Two new wells were installed and two additional semiannual groundwater sampling events were performed in 2014 and 2015 and reported in the Groundwater Sampling Report (TT 2016). Arsenic was detected above GWQSs in 17MW04 and 17MW05 in 2014 and in 17MW05 and 17MW07 in 2015.
- NJDEP has opined that arsenic in groundwater is likely naturally occurring (e.g., due to turbidity) and suggested reevaluation to determine if a CEA/WRA is warranted (NJDEP 2016).

16.3.3 Site Interview Findings

EPA and NJDEP personnel had no specific comments for Site 17.

16.3.4 Data Review

16.3.4.1 Land Use Control Inspection Records

The LUC RD for soil and groundwater at Site 17 was finalized in June 2005. The LUC RD restricts residential development on the site, and access to the site for purposes other than environmental monitoring and testing (TT NUS 2005). The LUC RD does require preparation of an annual monitoring report for Site 17. Biennial certifications are submitted to the NJDEP documenting that the soil LUC remains in place and are protective.

As discussed in subsequent sections, an evaluation of the groundwater dataset will be conducted to determine if a CEA/WRA is warranted.

16.3.4.2 Long-Term Monitoring Data

During this FYR period, the analytical results for the 2011 and 2012 groundwater monitoring activities were provided in the Final Groundwater Sampling Report (TT 2013). The analytical results indicated arsenic was detected at concentrations above the RGs in one or more of the Site 17 monitoring wells; cadmium was below GWQS. The report recommended further delineation of the horizontal extent of arsenic with the installation of two new monitoring wells and performance of two additional semiannual groundwater sampling events.

The 2014 and 2015 well installation activities and groundwater sampling events were documented in the Draft Groundwater Sampling Report (TT 2016). The average arsenic concentration is marginally above the NJDEP GWQS and well below the EPA MCL. Figures 16-2 and 16-3 present the analytical results from the 2014 and 2015 sampling events, respectively. Upon review of the Draft Groundwater Sampling Report, NJDEP stated that the arsenic concentrations appear to be very closely related to sample turbidity and are naturally occurring (NJDEP 2016). NJDEP does not recommend a CEA/WRA for naturally occurring arsenic and recommends additional evaluation/documentation (NJDEP 2016). Sampling will be conducted using methodology to reduce sample turbidity; the dataset and evaluation will be presented in a groundwater report.

16.3.5 Site Inspection Findings

The FYR inspection was performed on June 5, 2017, as discussed in Section 1.4.2. The land use for the site appeared to be unchanged since the last FYR. Five out of the six monitoring wells were located and appeared to be in good condition. Issues noted during the site inspection include:

- Monitoring well 17MW04 could not be accessed.
- An approximate 1 to 1.5-foot gap along the bottom of the fencing near monitoring well 17MW03 was observed; however, there was no evidence of trespassing; fence maintenance issues were transmitted to the Navy's O&M contractor for implementation.

Five-Year Review Site Inspection Checklist forms and associated photographs are in Appendix A.

16.4 Technical Assessment

Implementation of institutional/engineering controls (via the BMP and LUC RD) and fencing prevent groundwater use and disturbance of the disposal area. NJDEP review of the 2015 Groundwater Sampling Report comments indicate that a CEA/WRA may not be warranted as the arsenic appears to be naturally occurring and related to sample turbidity. Additional sampling will be conducted to reduce sample turbidity and an evaluation of the dataset will be presented in a groundwater sampling report. The requirement for a CEA/WRA will be determined after the additional evaluation is presented. VI was not considered at Site 17 since no VOCs are present in groundwater.

16.4.1 Question A (Is the Remedy Functioning as Intended by the Decision Documents?)

Table 16-3 summarizes components of the Question A: Technical Evaluation.

Table 16-3: Technical Evaluation – Question A

Operable Unit 9 – Site 17	
Question	Summary
Remedial Action Performance	<p>LUCs and the perimeter fencing limit site access and prevent disturbance of the disposal area.</p> <p>Long-term monitoring is ongoing. Arsenic is the only constituent remaining above GWQS; cadmium was removed from the ARARs after the 2011-2012 sampling event reported no RG exceedances. NJDEP has observed that concentrations of arsenic in the groundwater samples collected at Site 17 appear to be related to turbidity and may be naturally occurring and recommends further evaluation to determine if a CEA/WRA is warranted (NJDEP 2016).</p>
Systems Operation/ Operations and Maintenance	The selected remedy did not include operations and maintenance components.
Implementation of Land Use Controls and Institutional/ Engineering Controls	<p>LUCs were required by the ROD:</p> <ul style="list-style-type: none"> • The BMP is currently used to restrict access to the site, to prevent intrusive activity, and to prevent exposure to waste and contaminated groundwater. • An LUC RD has been completed at this site. • A CEA/WRA has not been completed for this site, and NJDEP has recommended further evaluation to determine if one is warranted. <p>NJDEP has requested biennial certification submittals for the LUC RD.</p>

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

Table 16-4 summarizes components of the Question B Technical Evaluation.

Table 16-4: Technical Evaluation – Question B

Operable Unit 9 – Site 17	
Question	Summary
Changes in Applicable or Relevant and Appropriate Requirements or To-Be-Considered Criteria	ARARs have been evaluated as described in Section 1.3. Groundwater RGs presented in Table 16-1 were compared to current ARARs. The remedy remains protective for the site.
Changes in Toxicity, Risk Assessment Methods, and Cleanup Levels	<p>The Site 17 remedy mitigated risks to human health; no unacceptable ecological risks were identified during the RI (B&RE 1996). Changes in toxicity, risk assessment methods, exposure models, and cleanup levels have no effect on remedy protectiveness because the RAOs defined in the ROD (NAVFAC 2007) are ARAR-based as opposed to site-specific risk-based remedial goals generated using risk assessment findings. Therefore, the protectiveness of remedies based on ARARs are not sensitive to risk assessment changes.</p> <p>The remedy focuses on preventing human exposure to metals at concentrations greater than GWQS and/or MCLs in groundwater via LUCs, preventing disturbance of the disposal area, and fencing that effectively mitigate corresponding risks. As long as the LUCs are enforced, the disposal area is not disturbed, and fencing is maintained to prevent human exposure to contaminated groundwater, the remedy remains protective. Should the future use of this site change (e.g., LUCs, cover, or fencing be removed), reevaluation of risk would be required.</p> <p>Although screening and/or toxicity reference values considered during the development of the ecological risk assessment may have been revised, no unacceptable ecological risk is expected because the groundwater impact is below grade and has also been found to be likely naturally occurring.</p>
Changes in Exposure Pathways	There have been no changes in land use at the site that would result in changes to exposure pathways.
Expected Progress towards Meeting Remedial Action Objectives	<p>The remedy at Site 17 meets RAOs:</p> <ul style="list-style-type: none"> The LUCs (LUC RD and the BMP) prevent disturbance of the disposal area and exposure to contaminated groundwater NJDEP has indicated a CEA/WRA may not be needed at the site; further evaluation of groundwater data is required

16.4.3 Question C (Has any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?)

This FYR did not identify other information that could call into question the protectiveness of the remedy.

16.5 Issues/Recommendations

Table 16-5: Issues/Recommendations that Affect Current or Future Protectiveness				
Operable Unit 9 – Site 17				
Operable Unit 9, Site 17	Issue Category: Institutional Controls			
	Issue: A CEA/WRA determination should be developed.			
	Recommendation: Conduct additional groundwater sampling. Develop sampling report for concurrence that concentrations identified in groundwater are not site related.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Navy	EPA/State	06/30/19

16.6 Other Findings

Other findings for Site 17 include:

- Upon concurrence of the groundwater sampling report, an ESD should be prepared to document the removal of the CEA/LTM requirement.
- There is a gap at the bottom of perimeter fencing as detailed in inspection findings. Repairs to the fence should be conducted.
- Review of site documentation indicates Site 17 is referenced inconsistently in historical documents as both a landfill and a disposal area. However, the ROD RAOs do not address any objectives relative to waste left in place. The ROD does require LUCs for maintaining the cover (see the LUC RD objectives and requirement 5 [TT NUS 2005]). Formal site records are that it is a disposal area; no landfilling occurred at this site.
 - Future site descriptions should refer to the site as a disposal area and not a landfill.

16.7 Protectiveness Statement

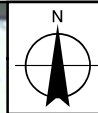
Protectiveness Statement		
Operable Unit: 9	Protectiveness Determination: Short-term Protective	Addendum Due Date (if applicable): Not Applicable
Site 17 Former Landfill		
Protectiveness Statement: The remedy at OU-9 Site 17 is protective in the short-term of human health and protective in the long-term of the environment. The BMP prevents intrusive activity and groundwater use at the site. However, a CEA/WRA has not yet been implemented. If determined to be warranted, a CEA/WRA will be established in order to be protective of human health in the long-term.		

16.8 References

- Brown & Root Environmental (B&RE). 1996. *Remedial Investigation Report for Naval Weapons Station Earle, Colts Neck, New Jersey*. July.
- NAVFAC, 2007. *Record of Decision, Sites 6, 12, 15, and 17, Operable Unit 9 (OU 9) Naval Weapons Station Earle, Colts Neck, New Jersey*. September.
- New Jersey Department of Environmental Protection (NJDEP). 2016. *Memorandum Earle Naval Weapons Station Superfund Site, colts Neck, New Jersey Groundwater Sampling Report; September 2014 and April 2015 Sampling Events Site 17 – Disposal Site behind Training Barge*. May.
- Resolution Consultants. 2013. *Third Five-Year Review Report, Naval Weapons Station Earle, Colts Neck New Jersey*. March.
- Tetra Tech (TT). 2005. *Remedial Design for Land Use Controls Sites 6, 12, 15 and 17 Operable Unit 9 (OU 9), Naval Weapons Station Earle, Colts Neck, New Jersey*. June.
- Tetra Tech (TT), 2013. *Groundwater Sampling Report, December 2011 and May 2012 Sampling Events, Site 6 - Landfill West of Normandy Road and Site 17 - Disposal Site behind Training Barge, Naval Weapons Station Earle, Colts Neck, New Jersey*. November.

Tetra Tech (TT). 2014. *Addendum to the Final Sampling and Analysis Plan for Groundwater Sampling at Site 6 - Landfill West of Normandy Road and Site 17 – Disposal Site behind Training Barge, Naval Weapons Station Earle, Colts Neck, New Jersey*. September.

Tetra Tech (TT). 2016. *Draft Groundwater Sampling Report, September 2014 and April 2015 Sampling Events, Site 17 - Disposal Site Behind Training Barge, Naval Weapons Station Earle, Colts Neck, New Jersey*. February.



1 inch = 100 feet
0 50 100
Feet

FIGURE 16-1
SITE LAYOUT MAP
OPERABLE UNIT 9, SITE 17
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

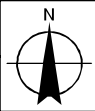


REQUESTED BY: F. Burwell	DATE: 9/21/2017
DRAWN BY: M. Senne	TASK ORDER NUMBER: WE09

Legend

- | | |
|-------------------------------|--------------------|
| Monitoring Well | Railroad |
| Land Use Control Boundary | Channelized Stream |
| Approximate Landfill Boundary | |

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Notes:
- All samples are in micrograms per liter (µg/L)
- NS = Not Sampled
- NJDEP GWQS = New Jersey Department of Environmental Protection Groundwater Quality Standards
- **RED** text indicates exceedance of NJDEP GWQS

Sample ID	NJDEP GWQS
Arsenic	3 µg/L

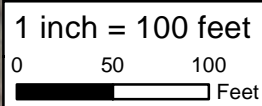


FIGURE 16-2
GROUNDWATER CONCENTRATIONS ABOVE
PROJECT ACTION LIMITS - SEPTEMBER 2014
OPERABLE UNIT 9, SITE 17
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

- Legend**
- Monitoring Well
 - Approximate Landfill Boundary
 - Railroad
 - Channelized Stream



REQUESTED BY: F. Burwell	DATE: 9/26/2017
DRAWN BY: M. Senne	TASK ORDER NUMBER: WE09

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17MW07		Di ssol ved	Di ssol ved
	<u>Inorgani cs</u>	<u>Inorgani cs</u>	<u>Inorgani cs (Dupli cate)</u>
Arseni c	7.74	4.99	5.48

17MW04
No Exceedances

17MW03
No Exceedances

17MW01
No Exceedances

17MW06
No Exceedances

17MW02
NS

17MW05	<u>Inorgani cs</u>
Arseni c	3.70

Notes:

- All samples are in micrograms per liter (µg/L)
- NS = Not Sampled
- NJDEP GWQS = New Jersey Department of Environmental Protection Groundwater Quality Standards
- **RED** text indicates exceedance of NJDEP GWQS

Sample ID

Analyte	NJDEP GWQS
Arsenic	3 µg/L

1 inch = 100 feet

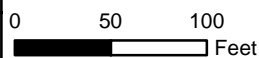


FIGURE 16-3
GROUNDWATER CONCENTRATIONS ABOVE
PROJECT ACTION LIMITS - APRIL 2015
OPERABLE UNIT 9, SITE 17
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY



REQUESTED BY: F. Burwell

DATE: 9/26/2017

DRAWN BY: M. Senne

TASK ORDER NUMBER: WE09

Legend



Monitoring Well



Railroad



Approximate Landfill Boundary



Channelized Stream

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Appendix A
Five-Year Review Site Inspection Checklists

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Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 1 Site 4	Date of inspection: 6/6/17
Location and Region: New Jersey Region 2	EPA ID:
Agency, office, or company leading the five-year review: EnSafe	Weather/temperature: Cloudy, Light Rain, 56 °F
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <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 checked="" 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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
<div style="display: flex; justify-content: space-between;"> <div>1. O&M site manager <u>Scott Fleming</u></div> <div><u>NWS Earle Env. Dept</u></div> <div><u>6/6/17</u></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div>Name</div> <div>Title</div> <div>Date</div> </div> <p>Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	
<div style="display: flex; justify-content: space-between;"> <div>2. O&M staff <u>Doug Thompson</u></div> <div><u>O&M Contractor</u></div> <div><u>6/6/17</u></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div>Name</div> <div>Title</div> <div>Date</div> </div> <p>Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input checked="" type="checkbox"/> O&M manual <input checked="" type="checkbox"/> As-built drawings <input checked="" type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> Readily available <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 checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input checked="" 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 checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
7.	Groundwater Monitoring Records Remarks _____	<input checked="" type="checkbox"/> Readily available	<input checked="" 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 checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A

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 checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Contractor for Federal Facility <input type="checkbox"/> Other _____ 																																																												
2.	O&M Cost Records <input type="checkbox"/> Readily available <input type="checkbox"/> Up to date <input checked="" 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-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 20%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;"></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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> </table>	From _____	To _____					Date	Date	Total cost			<input type="checkbox"/> Breakdown attached	From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date	Total cost				From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date	Total cost				From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date	Total cost				From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date	Total cost			
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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 checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks _____ <u>Access gate to drive onto landfill is locked</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>Signs labeling landfill around perimeter</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 (e.g., self-reporting, drive by) <u>Self reporting</u>		
	Frequency <u>Annual</u>		
	Responsible party/agency <u>DoD</u>		
	Contact <u>Scott Fleming</u>		
	Name	Title	Date Phone no.
	Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input 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 		
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 type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
	Remarks <u>Service road to landfill has very large potholes</u> 		

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 _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Erosion not evident	
4.	Holes Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> Holes not evident	
5.	Vegetative Cover <input checked="" type="checkbox"/> Grass <input checked="" 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>Several small (1-2 foot diameter) spots of distressed vegetation, appear to be deer bedding</u> _____		
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> N/A Remarks _____ _____		
7.	Bulges Areal extent _____ Height _____ 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 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 Areal extent_____ Remarks_____	<input checked="" type="checkbox"/> No evidence of slope instability
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 checked="" type="checkbox"/> N/A or okay
2.	Bench Breached Remarks_____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
3.	Bench Overtopped Remarks_____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
C. Letdown Channels <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> 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_____ Remarks_____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of settlement Depth_____
2.	Material Degradation Material type_____ Remarks_____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of degradation Areal extent_____
3.	Erosion Areal extent_____ Remarks_____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of erosion Depth_____

4.	Undercutting <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____
5.	Obstructions Type _____ <input checked="" type="checkbox"/> No obstructions <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____ _____
6.	Excessive Vegetative Growth Type _____ <input checked="" type="checkbox"/> No evidence of excessive growth <input checked="" type="checkbox"/> Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent _____ Remarks _____ <u>Vegetation in ditch has been recently sprayed – all remaining vegetation dead</u> _____
D. Cover Penetrations <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Gas Vents <input type="checkbox"/> Active <input checked="" type="checkbox"/> Passive <input type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" 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"/> 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 _____ _____
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 _____ <u>Wells are outside of landfill</u> _____
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 checked="" type="checkbox"/> Routinely surveyed <input 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 (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 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 <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 checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input checked="" 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 checked="" type="checkbox"/> Vegetation does not impede flow		
	Areal extent_____	Type_____	
	Remarks <u>Vegetation in ditch has been recently sprayed – all remaining vegetation dead</u> _____		
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
	Areal extent_____	Depth_____	
	Remarks_____		
4.	Discharge Structure	<input checked="" 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 type="checkbox"/> Applicable <input checked="" 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)☐ Properly secured/locked☒ Functioning☒ Routinely sampled☒ Good condition☒ All required wells located☐ Needs Maintenance☐ N/ARemarks 04MW07 needs a new lock, new wells need ID tags**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.).

The remedy appears to be effective. Minor well maintenance recommended.

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.

Drainage swales and landfill cover have been well maintained. Access road to landfill requires maintenance (pothole repair). Well 04MW07 requires a new padlock.

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
D. Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>



View looking east across Site 4 Landfill from main cap gate.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 1 Site 5	Date of inspection: 6/7/17
Location and Region: New Jersey Region 2	EPA ID:
Agency, office, or company leading the five-year review: EnSafe	Weather/temperature: Partly Sunny 55 °F
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 checked="" 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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>NWS Earle Env. Dept</u> <u>6/6/17</u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____	
2. O&M staff <u>Doug Thompson</u> <u>O&M Contractor</u> <u>6/6/17</u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____	

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

[illegible]

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input checked="" type="checkbox"/> O&M manual <input checked="" type="checkbox"/> As-built drawings <input checked="" type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> Readily available <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 checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input 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 checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A
7.	Groundwater Monitoring Records Remarks _____	<input checked="" type="checkbox"/> Readily available	<input checked="" 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 checked="" type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date	<input type="checkbox"/> N/A

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 (e.g., self-reporting, drive by) <u>self reporting</u> Frequency <u>Annual</u> Responsible party/agency <u>DoD</u> Contact <u>Scott Fleming</u>		
	<div style="display: flex; justify-content: space-between;"> Name Title Date Phone no. </div>		
	Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident
5.	Vegetative Cover <input checked="" type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established <input checked="" 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 checked="" type="checkbox"/> N/A Remarks _____		
7.	Bulges Areal extent _____ Height _____ 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 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 Areal extent _____ Remarks _____	<input checked="" type="checkbox"/> No evidence of slope instability
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 checked="" type="checkbox"/> N/A or okay
2.	Bench Breached Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
3.	Bench Overtopped Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A or okay
C. Letdown Channels <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> 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 checked="" type="checkbox"/> No evidence of settlement
2.	Material Degradation Material type _____ Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of degradation
3.	Erosion Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of erosion

4.	Undercutting <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____
5.	Obstructions Type _____ <input checked="" type="checkbox"/> No obstructions <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____ _____
6.	Excessive Vegetative Growth Type _____ <input checked="" 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 checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Gas Vents <input type="checkbox"/> Active <input checked="" type="checkbox"/> Passive <input type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" 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"/> 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 _____ _____
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 checked="" type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>05MW02, 05MW03, 05MW05 and 05MW07 need j-plugs and bolts for lid, 05MW06 missing j-plug and lid. 05MW06 and 05MW07 are covered in silt run-off from skeet range mound.</u>
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 checked="" type="checkbox"/> Routinely surveyed <input 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 (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 checked="" type="checkbox"/> N/A		
1.	Outlet Pipes Inspected <input type="checkbox"/> Functioning <input checked="" type="checkbox"/> N/A Remarks _____ _____	
2.	Outlet Rock Inspected <input type="checkbox"/> Functioning <input checked="" 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 checked="" 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 checked="" type="checkbox"/> N/A Remarks _____ _____	
4.	Dam <input type="checkbox"/> Functioning <input checked="" 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 checked="" type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input checked="" 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 checked="" type="checkbox"/> Vegetation does not impede flow		
	Areal extent_____	Type_____	
	Remarks_____		
3.	Erosion	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
	Areal extent_____	Depth_____	
	Remarks_____		
4.	Discharge Structure	<input checked="" 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 type="checkbox"/> Applicable <input checked="" 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 checked="" 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 checked="" type="checkbox"/> Functioning <input checked="" type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input checked="" type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks <u>05MW02, 05MW03, 05MW05 and 05MW07 need j-plugs and bolts for lid, 05MW06 missing j-plug and lid. 05MW06 and 05MW07 are covered in silt run-off from skeet range mound.</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.). <u>The remedy appears to be effective.</u> 			
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. <u>The landfill cap and access roads are well maintained. Monitoring wells need repairs: 05MW02, 05MW03, 05MW05 and 05MW07 need j-plugs and bolts for lid, 05MW06 missing j-plug and lid. 05MW06 and 05MW07 are covered in silt run-off from skeet range mound – suggest converting to stick-up wells.</u> 			

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



View looking south across Site 5 Landfill from northern cap gate.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 2 Site 19	Date of inspection: 5 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 68 °F
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input checked="" type="checkbox"/> <u>Institutional controls</u> <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 checked="" type="checkbox"/> <u>Monitored natural attenuation</u> <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> 1. O&M site manager <u>Scott Fleming</u> <div style="text-align: center;">Name</div> </div> <div style="width: 30%;"> <u>Environmental Engineer</u> <div style="text-align: center;">Title</div> </div> <div style="width: 20%;"> <u>6 June 2017</u> <div style="text-align: center;">Date</div> </div> </div> <p>Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> <u>at office</u> <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p>	
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> 2. O&M staff <u>Doug Thompson</u> <div style="text-align: center;">Name</div> </div> <div style="width: 30%;"> <u>O&M Manager</u> <div style="text-align: center;">Title</div> </div> <div style="width: 20%;"> <u>6 June 2017</u> <div style="text-align: center;">Date</div> </div> </div> <p>Interviewed <input checked="" type="checkbox"/> <u>at site</u> <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p>	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input type="checkbox"/> Readily available <input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u> <input type="checkbox"/> <u>N/A</u>
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
3.	O&M and OSHA Training Records Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u>	<input checked="" type="checkbox"/> <u>Up to date</u> <input type="checkbox"/> <u>N/A</u>
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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
7.	Groundwater Monitoring Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</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 (e.g., self-reporting, drive by) _____ Frequency _____ Responsible party/agency _____ Contact _____ <div style="display: flex; justify-content: space-between; margin-top: 10px;"> Name Title Date Phone no. </div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 <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 <input type="checkbox"/> Slides Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 Material type _____ Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation
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 <input checked="" type="checkbox"/> 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"/> 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 <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 <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 <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 (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 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 <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"/> <u>N/A</u>
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"/> <u>Applicable</u> <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>	
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 checked="" 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"/> <u>N/A</u>	
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 checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

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 compromised in the future.</p> <p><u>None noted.</u> _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <p><u>None noted.</u> _____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>	



South portion of Site 19 facing to the northeast



North portion of Site 19 facing to the west

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 3 Site 26	Date of inspection: 6/5/17
Location and Region: New Jersey Region 2	EPA ID:
Agency, office, or company leading the five-year review: EnSafe	Weather/temperature: Cloudy 64 °F
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>Removal action completed in 1997, AS/SVE system ran between 2001 and 2004, planned soil removal and addition of soil amendment in the future</u> </div> <div style="width: 50%;"> <input checked="" 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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>NWS Earle Env Dept</u> <u>6/6/17</u> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____	
2. O&M staff <u>Doug Thompson</u> <u>O&M Contractor</u> <u>6/6/17</u> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date </div> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____	

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____

Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached			

[illegible]

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input checked="" type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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
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"/> Contractor for State <input type="checkbox"/> PRP in-house <input type="checkbox"/> Contractor for PRP <input checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Contractor for Federal Facility <input type="checkbox"/> Other _____ 																																																												
2.	O&M Cost Records <input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Up to date <input checked="" 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: 20%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;"></td> <td style="width: 20%;"></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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></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> <td></td> <td></td> </tr> </table>	From _____	To _____					Date	Date	Total cost			<input type="checkbox"/> Breakdown attached	From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date	Total cost				From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date	Total cost				From _____	To _____				<input type="checkbox"/> Breakdown attached	Date	Date	Total cost				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: _____ _____ _____ _____ _____ 																																																												
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>Fence damaged by downed tree in rear of building, hole in fence at north western corner.</u> <u>Gate was open at time of inspection.</u>																																																												
B. Other Access Restrictions																																																													
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A Remarks _____ _____																																																												

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 (e.g., self-reporting, drive by) <u>Self reporting</u> Frequency <u>Annual</u> Responsible party/agency <u>DoD</u> Contact <u>Scott Fleming</u> _____ <div style="display: flex; justify-content: space-between; width: 100%;"> Name Title Date Phone no. </div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks <u>Driveway and concrete are very cracked with grass growing through and over top</u> _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 <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 type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 Material type _____ Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation
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 <input checked="" type="checkbox"/> 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"/> 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 <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 <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 <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 (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 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 <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 type="checkbox"/> Applicable <input checked="" 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 <u>System still in place although not in use. If system would ever be used again, would need significant repairs.</u>		
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 <u>System still in place although not in use. If system would ever be used again, building would need repairs.</u>		
6.	Monitoring Wells (pump and treatment remedy) <input checked="" 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>All site wells were properly locked. Most ID tags are illegible or missing.</u>		
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)
☒ Properly secured/locked ☒ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
 Remarks All site wells were properly locked. Most ID tags are illegible or missing

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.).

The remedy appears to be effective.

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.

Fencing needs repair where downed tree has fallen in the rear of the building & in the northwest corner. Fencing damage is not considered a protectiveness issue as fencing is not part of the ROD-prescribed remedy, nor is there any surface-soil risk at the site.

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



View facing northeast of former treatment system and site building at Site 26.



View facing south of hole in corner of Site 26 fence.



View facing northwest of tree down on Site 26 fence.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 4 Site 20	Date of inspection: 6/5/17
Location and Region: New Jersey Region 2	EPA ID:
Agency, office, or company leading the five-year review: EnSafe	Weather/temperature: Cloudy 64 °F
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 type="checkbox"/> Other _____ </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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>NWS Earle Env Dept</u> <u>6/6/17</u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" 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.			
	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

4.	Other interviews (optional) <input type="checkbox"/> Report attached.			

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<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 checked="" type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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 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 type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" 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"/> Contractor for State <input type="checkbox"/> PRP in-house <input type="checkbox"/> Contractor for PRP <input checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Contractor for Federal Facility <input type="checkbox"/> Other _____ 																																																																								
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-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 20%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 20%;"></td> <td style="width: 10%; 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 colspan="4"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td></td> <td style="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 colspan="4"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td></td> <td style="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 colspan="4"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td></td> <td style="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 colspan="4"></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td></td> <td></td> <td></td> <td style="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 colspan="4"></td> </tr> </table>			From _____	To _____					<input type="checkbox"/> Breakdown attached	Date	Date	Total cost					From _____	To _____					<input type="checkbox"/> Breakdown attached	Date	Date	Total cost					From _____	To _____					<input type="checkbox"/> Breakdown attached	Date	Date	Total cost					From _____	To _____					<input type="checkbox"/> Breakdown attached	Date	Date	Total cost					From _____	To _____					<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 checked="" type="checkbox"/> N/A Remarks _____ _____ 																																																																								
B. Other Access Restrictions																																																																									
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A Remarks _____ _____ 																																																																								

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 (e.g., self-reporting, drive by) <u>self-reporting</u>		
	Frequency <u>Annual</u>		
	Responsible party/agency <u>DoD</u>		
	Contact <u>Scott Fleming</u>		
	Name	Title	Date Phone no.
	Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input 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 		
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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Roads adequate <input checked="" type="checkbox"/> N/A
	Remarks 		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 <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 <input type="checkbox"/> Slides Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Depth _____

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 <input checked="" type="checkbox"/> 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"/> 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 <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 <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 <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 (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 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 <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 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 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 checked="" 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.). _____ <p>The remedy appears to be effective.</p> _____ _____ _____ _____ _____ _____ _____ _____ _____			
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
<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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



View looking southeast across Site 20 from Midway Road.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 4 Site 23	Date of inspection: 6/5/17
Location and Region: New Jersey Region 2	EPA ID:
Agency, office, or company leading the five-year review: EnSafe	Weather/temperature: Cloudy 64 °F
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 type="checkbox"/> Other _____ </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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>NWS Earle Env Dept</u> <u>6/6/17</u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" 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 _____ _____	

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

[illegible]

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<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 checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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 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

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 (e.g., self-reporting, drive by) <u>Self reporting</u> Frequency <u>Annual</u> Responsible party/agency <u>DoD</u> Contact <u>Scott Fleming</u>		
	<div style="display: flex; justify-content: space-between;"> Name Title Date Phone no. </div>		
	Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 checked="" 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 <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 <input checked="" type="checkbox"/> 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 Material type _____ Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation
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 <input checked="" type="checkbox"/> 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"/> 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 <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 <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 <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 (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 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 <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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" 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)
- ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☒ 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.).

The remedy appears to be effective.

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.

Monitoring well 23MW03 was completely covered by moss and water during inspection. A metal detector would be needed to locate. 23MW01 lid is damaged and lock is missing. If these wells will be needed in the future, repairs should be performed.

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



View facing north of Site 23.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 4 Site 27	Date of inspection: 6/6/17
Location and Region: New Jersey Region 2	EPA ID:
Agency, office, or company leading the five-year review: EnSafe	Weather/temperature: Raining 56 °F
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 type="checkbox"/> Other _____ </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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
<div style="display: flex; justify-content: space-between;"> <div>1. O&M site manager _____</div> <div>_____</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between; margin-top: -10px;"> <div style="text-align: center;">Name</div> <div style="text-align: center;">Title</div> <div style="text-align: center;">Date</div> </div> <div style="margin-top: 10px;"> Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ </div> <div style="margin-top: 5px;"> Problems, suggestions; <input type="checkbox"/> Report attached _____ </div>	
<div style="display: flex; justify-content: space-between;"> <div>2. O&M staff _____</div> <div>_____</div> <div>_____</div> <div>_____</div> </div> <div style="display: flex; justify-content: space-between; margin-top: -10px;"> <div style="text-align: center;">Name</div> <div style="text-align: center;">Title</div> <div style="text-align: center;">Date</div> </div> <div style="margin-top: 10px;"> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ </div> <div style="margin-top: 5px;"> Problems, suggestions; <input type="checkbox"/> Report attached _____ </div>	

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.			
	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

	Agency _____			
	Contact _____			
	Name _____ Title _____ Date _____ Phone no. _____			
	Problems; suggestions; <input type="checkbox"/> Report attached _____			

4.	Other interviews (optional) <input type="checkbox"/> Report attached.			

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<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 checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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
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 type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" 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

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 (e.g., self-reporting, drive by) <u>Self reporting</u> Frequency <u>Annual</u> Responsible party/agency <u>DoD</u> Contact <u>Scott Fleming</u>		
	<div style="display: flex; justify-content: space-between;"> Name Title Date Phone no. </div>		
	Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 <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 <input type="checkbox"/> Slides Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Depth _____

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 <input checked="" type="checkbox"/> 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"/> 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 <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 <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 <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 (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 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 <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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" 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)☐ Properly secured/locked☐ Functioning☐ Routinely sampled☐ Good condition☐ All required wells located☐ Needs Maintenance☒ N/ARemarks _____
_____**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.).

The remedy appears to be effective.

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
<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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



View facing south of Site 27.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 5 Site 13	Date of inspection: 6 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 69 °F
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><input checked="" type="checkbox"/> Landfill cover/containment</p> <p><input checked="" type="checkbox"/> Access controls</p> <p><input checked="" type="checkbox"/> Institutional controls</p> <p><input type="checkbox"/> Groundwater pump and treatment</p> <p><input type="checkbox"/> Surface water collection and treatment</p> <p><input type="checkbox"/> Other _____</p> </div> <div style="width: 45%;"> <p><input checked="" type="checkbox"/> Monitored natural attenuation</p> <p><input type="checkbox"/> Groundwater containment</p> <p><input type="checkbox"/> Vertical barrier walls</p> </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>Environmental Engineer</u> <u>6 June 2017</u> <div style="display: flex; justify-content: space-between; margin-top: -10px;"> Name Title Date </div> <p>Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	
2. O&M staff <u>Doug Thompson</u> <u>O&M Manager</u> <u>6 June 2017</u> <div style="display: flex; justify-content: space-between; margin-top: -10px;"> Name Title Date </div> <p>Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> <u>Up to date</u> <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> <u>N/A</u>
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> <u>Up to date</u> <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> <u>N/A</u>
3.	O&M and OSHA Training Records Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u>	<input checked="" type="checkbox"/> <u>Up to date</u> <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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
7.	Groundwater Monitoring Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</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 (e.g., self-reporting, drive by) _____ Frequency _____ Responsible party/agency _____ Contact _____ <div style="display: flex; justify-content: space-between; margin-top: 10px;"> Name Title Date Phone no. </div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input 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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Settlement not evident</u>
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input checked="" type="checkbox"/> <u>Cracking not evident</u>
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Erosion not evident</u>
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Holes not evident</u>
5.	Vegetative Cover <input checked="" type="checkbox"/> <u>Grass</u> <input checked="" type="checkbox"/> <u>Cover properly established</u> <input checked="" type="checkbox"/> <u>No signs of stress</u> <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> <u>N/A</u> Remarks _____		
7.	Bulges Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<input checked="" type="checkbox"/> <u>Bulges not evident</u>

8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____	■ 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 Areal extent _____ Remarks _____	■ No evidence of slope instability
B. Benches <input type="checkbox"/> Applicable ■ 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 <input type="checkbox"/> 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 Areal extent _____ Depth _____ Remarks _____	■ No evidence of settlement
2.	Material Degradation <input type="checkbox"/> Location shown on site map Material type _____ Areal extent _____ Remarks _____	■ No evidence of degradation
3.	Erosion <input type="checkbox"/> Location shown on site map Areal extent _____ Depth _____ Remarks _____	■ No evidence of erosion

4.	Undercutting <input type="checkbox"/> Location shown on site map ■ No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____
5.	Obstructions Type _____ ■ No obstructions <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____ _____
6.	Excessive Vegetative Growth Type <u>Grass/Weeds</u> <input type="checkbox"/> No evidence of excessive growth ■ Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent <u>40-50%</u> Remarks _____ <u>Dead vegetation/vegetation was noted in the rip rap surrounding the landfill.</u>
D. Cover Penetrations <input type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Gas Vents <input type="checkbox"/> Active ■ <input type="checkbox"/> Passive <input type="checkbox"/> Properly secured/locked ■ Functioning ■ Routinely sampled ■ 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"/> 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 ■ 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 ■ 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 ■ N/A Remarks _____ _____
5.	Settlement Monuments <input type="checkbox"/> Located ■ Routinely surveyed <input type="checkbox"/> N/A Remarks _____ _____

E. Gas Collection and Treatment <input type="checkbox"/> <input checked="" type="checkbox"/> <u>N/A</u>		
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 checked="" type="checkbox"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>Applicable</u> <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>	
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"/> <u>N/A</u>	
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 checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

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 compromised in the future.</p> <p><u>None noted.</u></p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <p><u>None noted.</u></p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



Site 13 landfill cap facing north



Site 13 landfill cap facing west



Damaged cable fence at Site 13



Damaged cable fence at Site 13



Vegetation growing in rip rap at Site 13

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 6 Site 3	Date of inspection: 6 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 69 °F
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><input checked="" type="checkbox"/> Landfill cover/containment</p> <p><input checked="" type="checkbox"/> Access controls</p> <p><input checked="" type="checkbox"/> Institutional controls</p> <p><input type="checkbox"/> Groundwater pump and treatment</p> <p><input type="checkbox"/> Surface water collection and treatment</p> <p><input type="checkbox"/> Other _____</p> </div> <div style="width: 45%;"> <p><input checked="" type="checkbox"/> Monitored natural attenuation</p> <p><input type="checkbox"/> Groundwater containment</p> <p><input type="checkbox"/> Vertical barrier walls</p> </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
<div style="display: flex; justify-content: space-between;"> <div>1. O&M site manager <u>Scott Fleming</u></div> <div><u>Environmental Engineer</u></div> <div><u>6 June 2017</u></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div>Name</div> <div>Title</div> <div>Date</div> </div> <p>Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	
<div style="display: flex; justify-content: space-between;"> <div>2. O&M staff <u>Doug Thompson</u></div> <div><u>O&M Manager</u></div> <div><u>6 June 2017</u></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div>Name</div> <div>Title</div> <div>Date</div> </div> <p>Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> <u>Up to date</u> <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> <u>N/A</u>
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> <u>Up to date</u> <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> <u>N/A</u>
3.	O&M and OSHA Training Records Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u>	<input checked="" type="checkbox"/> <u>Up to date</u> <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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
7.	Groundwater Monitoring Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>

C. Institutional Controls (ICs)			
1.	Implementation and enforcement		
	Site conditions imply ICs not properly implemented	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <u>No</u> <input type="checkbox"/> N/A
	Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <u>No</u> <input type="checkbox"/> N/A
	Type of monitoring (e.g., self-reporting, drive by) _____		
	Frequency _____		
	Responsible party/agency _____		
	Contact _____		
	Name	Title	Date Phone no.
	Reporting is up-to-date	<input checked="" type="checkbox"/> <u>Yes</u>	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input checked="" type="checkbox"/> <u>Yes</u>	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> <u>Yes</u>	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> <u>No</u> <input type="checkbox"/> N/A
	Other problems or suggestions: <input type="checkbox"/> Report attached		

2.	Adequacy	<input checked="" type="checkbox"/> <u>ICs are adequate</u>	<input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A
	Remarks _____		

D. General			
1.	Vandalism/trespassing	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> <u>No vandalism evident</u>
	Remarks _____		

2.	Land use changes on site	<input checked="" type="checkbox"/> <u>N/A</u>	
	Remarks _____		

3.	Land use changes off site	<input checked="" type="checkbox"/> <u>N/A</u>	
	Remarks _____		

VI. GENERAL SITE CONDITIONS			
A. Roads			
	<input checked="" type="checkbox"/> <u>Applicable</u>	<input type="checkbox"/> N/A	
1.	Roads damaged	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> <u>Roads adequate</u> <input type="checkbox"/> N/A
	Remarks _____		
	Some vegetation is beginning to grow through the gravel road. _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input checked="" type="checkbox"/> <u>Applicable</u> <input type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Settlement not evident</u>
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> <u>Cracking not evident</u>
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Erosion not evident</u>
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Holes not evident</u>
5.	Vegetative Cover <input checked="" type="checkbox"/> <u>Grass</u> <input checked="" type="checkbox"/> <u>Cover properly established</u> <input type="checkbox"/> No signs of stress <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____ <u>Strip of dead vegetation noted on the west side of the landfill cap approximately 1-2-ft wide and 30-ft long. Could possibly be from herbicide treatment that had been conducted at the site.</u>		
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> <u>N/A</u> Remarks _____		
7.	Bulges Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<input checked="" type="checkbox"/> <u>Bulges not evident</u>

8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____	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 Areal extent _____ Remarks _____	No evidence of slope instability
B. Benches <input type="checkbox"/> Applicable 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 Applicable <input type="checkbox"/> 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 Areal extent _____ Depth _____ Remarks _____	No evidence of settlement
2.	Material Degradation <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Material type__liner_____ Areal extent _____ Remarks _____ <u>Part of liner was found to be exposed in the southern portion of the rip rap that surrounds the landfill.</u>	
3.	Erosion <input type="checkbox"/> Location shown on site map Areal extent _____ Depth _____ Remarks _____	No evidence of erosion

4.	Undercutting <input type="checkbox"/> Location shown on site map ■ No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____
5.	Obstructions Type _____ ■ No obstructions <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____ _____
6.	Excessive Vegetative Growth Type <u>Grass/Weeds</u> <input type="checkbox"/> No evidence of excessive growth ■ Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent <u>40-50%</u> Remarks _____ <u>Dead vegetation/vegetation was noted in the rip rap surrounding the landfill.</u>
D. Cover Penetrations ■ Applicable <input type="checkbox"/> 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 ■ 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 ■ N/A Remarks _____ _____
3.	Monitoring Wells (within surface area of landfill) ■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ 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 ■ N/A Remarks _____ _____
5.	Settlement Monuments <input type="checkbox"/> Located ■ Routinely surveyed <input type="checkbox"/> N/A Remarks _____ _____

E. Gas Collection and Treatment <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>		
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 checked="" type="checkbox"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>Applicable</u> <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>	
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"/> <u>N/A</u>	
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 checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

D. Monitored Natural Attenuation1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☒ **Functioning** ☒ **Routinely sampled** ☒ **Good condition**
☐ **All required wells located** ☐ Needs Maintenance ☐ N/A

Remarks _____

Monitoring wells 03MW05 and 03MW10 need a replacement locks. _____

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
<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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



Site 3 landfill cover facing east



Site 3 landfill cover facing west



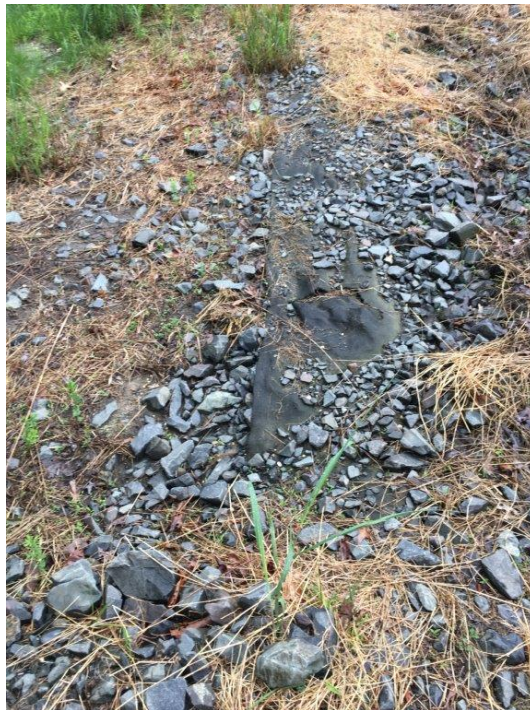
Fallen tree on south portion of cable fence at Site 3



Riprap liner found to be exposed in the southern portion of the rip rap



Strip of dead vegetation on the west side of the Site 3 landfill cover



Area of dead vegetation on the southern portion of the rip rap

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 6 Site 10	Date of inspection: 5 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 69 °F
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><input checked="" type="checkbox"/> Landfill cover/containment</p> <p><input checked="" type="checkbox"/> Access controls</p> <p><input checked="" type="checkbox"/> Institutional controls</p> <p><input type="checkbox"/> Groundwater pump and treatment</p> <p><input type="checkbox"/> Surface water collection and treatment</p> <p><input type="checkbox"/> Other _____</p> </div> <div style="width: 45%;"> <p><input checked="" type="checkbox"/> Monitored natural attenuation</p> <p><input type="checkbox"/> Groundwater containment</p> <p><input type="checkbox"/> Vertical barrier walls</p> </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
<div style="display: flex; justify-content: space-between;"> <div>1. O&M site manager <u>Scott Fleming</u></div> <div><u>Environmental Engineer</u></div> <div><u>6 June 2017</u></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div>Name</div> <div>Title</div> <div>Date</div> </div> <p>Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	
<div style="display: flex; justify-content: space-between;"> <div>2. O&M staff <u>Doug Thompson</u></div> <div><u>O&M Manager</u></div> <div><u>6 June 2017</u></div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div>Name</div> <div>Title</div> <div>Date</div> </div> <p>Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____</p> <p>Problems, suggestions; <input type="checkbox"/> Report attached _____</p> <p>_____</p>	

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

[illegible]

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> <u>Up to date</u> <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> <u>N/A</u>
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u> <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> <u>Up to date</u> <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input checked="" type="checkbox"/> <u>N/A</u>
3.	O&M and OSHA Training Records Remarks _____	<input checked="" type="checkbox"/> <u>Readily available</u>	<input checked="" type="checkbox"/> <u>Up to date</u> <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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
7.	Groundwater Monitoring Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</u>
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"/> <u>N/A</u> <input checked="" type="checkbox"/> <u>N/A</u>
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" type="checkbox"/> <u>N/A</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 (e.g., self-reporting, drive by) _____		
	Frequency _____		
	Responsible party/agency _____		
	Contact _____		
	Name	Title	Date Phone no.
	Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input 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 _____		

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 type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
	Remarks _____		
	Vegetation has over grown approximately 70% of the gravel road.		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input checked="" type="checkbox"/> <u>Applicable</u> <input type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Settlement not evident</u>
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> <u>Cracking not evident</u>
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Erosion not evident</u>
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input checked="" type="checkbox"/> <u>Holes not evident</u>
5.	Vegetative Cover <input type="checkbox"/> Grass <input checked="" type="checkbox"/> <u>Cover properly established</u> <input checked="" type="checkbox"/> <u>No signs of stress</u> <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> <u>N/A</u> Remarks _____		
7.	Bulges Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<input checked="" type="checkbox"/> <u>Bulges not evident</u>

8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____	■ 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 Areal extent _____ Remarks _____	■ No evidence of slope instability
B. Benches <input type="checkbox"/> Applicable ■ 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 ■ Applicable <input type="checkbox"/> 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 Areal extent _____ Depth _____ Remarks _____	■ No evidence of settlement
2.	Material Degradation <input type="checkbox"/> Location shown on site map Material type _____ Areal extent _____ Remarks _____	■ No evidence of degradation
3.	Erosion <input type="checkbox"/> Location shown on site map Areal extent _____ Depth _____ Remarks _____	■ No evidence of erosion

4.	Undercutting <input type="checkbox"/> Location shown on site map ■ No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____
5.	Obstructions Type _____ ■ No obstructions <input type="checkbox"/> Location shown on site map Areal extent _____ Size _____ Remarks _____ _____
6.	Excessive Vegetative Growth Type <u>Grass/Weeds</u> <input type="checkbox"/> No evidence of excessive growth ■ Vegetation in channels does not obstruct flow <input type="checkbox"/> Location shown on site map Areal extent <u>40-50%</u> Remarks _____ <u>Dead vegetation/ was noted in the rip rap surrounding the landfill.</u>
D. Cover Penetrations ■ Applicable <input type="checkbox"/> N/A	
1.	Gas Vents <input type="checkbox"/> Active <input type="checkbox"/> Passive ■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ 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"/> 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 ■ N/A Remarks _____ _____
3.	Monitoring Wells (within surface area of landfill) ■ Properly secured/locked ■ Functioning ■ Routinely sampled ■ 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 ■ N/A Remarks _____ _____
5.	Settlement Monuments <input type="checkbox"/> Located ■ Routinely surveyed <input type="checkbox"/> N/A Remarks _____ _____

E. Gas Collection and Treatment <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>		
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 checked="" type="checkbox"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>N/A</u>		
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"/> <u>Applicable</u> <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>	
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"/> <u>N/A</u>	
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 checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
- ☒ **Properly secured/locked**
☒ **Functioning**
☒ **Routinely sampled**
☒ **Good condition**
- ☒ **All required wells located**
☐ Needs Maintenance
 ☐ 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.).

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
<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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



Site 10 landfill cap facing west



Site 10 landfill cap facing east



Site 10 gravel road with vegetation growing through gravel.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 7 Site 26	Date of inspection: 6/5/17
Location and Region: New Jersey Region 2	EPA ID:
Agency, office, or company leading the five-year review: EnSafe	Weather/temperature: Cloudy 64 °F
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <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 type="checkbox"/> Other _____ </div> <div style="width: 45%;"> <input checked="" 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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
<div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> 1. O&M site manager <u>Scott Fleming</u> <u>NWS Earle Env. Dept</u> <u>6/6/17</u> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> Name Title Date </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> Problems, suggestions; <input type="checkbox"/> Report attached _____ </div>	
<div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> 2. O&M staff <u>Doug Thompson</u> <u>O&M Contractor</u> <u>6/6/17</u> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> Name Title Date </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> Interviewed <input checked="" type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ </div> <div style="display: flex; justify-content: space-between; margin-bottom: 5px;"> Problems, suggestions; <input type="checkbox"/> Report attached _____ </div>	

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____
 Contact _____

Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached			

[illegible]

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input checked="" type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input checked="" type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	<input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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
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"/> 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

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 (e.g., self-reporting, drive by) <u>Self reporting</u>		
	Frequency <u>Annual</u>		
	Responsible party/agency <u>DoD</u>		
	Contact <u>Scott Fleming</u>		
	Name	Title	Date Phone no.
	Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
	Remarks <u>Driveway and concrete are very cracked with grass growing through and over top</u> _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 <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 type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Depth _____

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 <input checked="" type="checkbox"/> 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"/> 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 <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 <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 <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 (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 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 <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 type="checkbox"/> Applicable <input checked="" 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 checked="" 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>All site wells were properly locked. Most ID tags are illegible or missing</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.). <u>The remedy appears to be effective.</u>			
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. <u>Fencing needs repair where downed tree has fallen in the rear of the building & in the northwest corner. Fencing damage is not considered a protectiveness issue as fencing is not part of the ROD-prescribed remedy, nor is there any surface-soil risk at the site.</u>			

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
D. Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>



View facing northeast of former treatment system and site building at Site 26.



View facing south of hole in corner of Site 26 fence.



View facing northwest of tree down on Site 26 fence.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 8 Site 1	Date of inspection: 6 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 65 °F
Remedy Includes: (Check all that apply) <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input checked="" type="checkbox"/> <u>Institutional controls</u> <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 checked="" type="checkbox"/> <u>Monitored natural attenuation</u> <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </div> </div>	
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>Environmental Engineer</u> <u>6 June 2017</u> <div style="display: flex; justify-content: space-between; font-size: small;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" type="checkbox"/> <u>at office</u> <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; font-size: small;"> 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 _____ _____	

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<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	■ <u>N/A</u> ■ <u>N/A</u> ■ <u>N/A</u>
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date	■ <u>N/A</u> ■ <u>N/A</u>
3.	O&M and OSHA Training Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	■ <u>N/A</u>
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	■ <u>N/A</u> ■ <u>N/A</u> ■ <u>N/A</u> ■ <u>N/A</u>
5.	Gas Generation Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	■ <u>N/A</u>
6.	Settlement Monument Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	■ <u>N/A</u>
7.	Groundwater Monitoring Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	■ <u>N/A</u>
8.	Leachate Extraction Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	■ <u>N/A</u>
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	■ <u>N/A</u> ■ <u>N/A</u>
10.	Daily Access/Security Logs Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	■ <u>N/A</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 (e.g., self-reporting, drive by) _____ Frequency _____ Responsible party/agency _____ Contact _____ <div style="display: flex; justify-content: space-between; margin-top: 10px;"> Name Title Date Phone no. </div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____		
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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 checked="" type="checkbox"/> N/A Remarks _____		
7.	Bulges Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 <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 type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Depth _____

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 <input checked="" type="checkbox"/> 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"/> 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 <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 <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 <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 (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 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 <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"/> <u>N/A</u>
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"/> <u>Applicable</u> <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> <u>N/A</u>	
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"/> <u>N/A</u>	
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 checked="" type="checkbox"/> Is routinely submitted on time <input checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input checked="" 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)
- ☒ **Properly secured/locked**
☒ **Functioning**
☐ Routinely sampled
 ☒ **Good condition**
- ☒ **All required wells located**
☐ Needs Maintenance
 ☐ 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.).

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
<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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



Vegetation at Site 1



Vegetation at Site 1

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 9 Site 6	Date of inspection: 5 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 69 °F
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 checked="" 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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>Environmental Engineer</u> <u>6 June 2017</u> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" 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-top: 5px;"> 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.			
Agency _____ Contact _____				
	Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached _____ _____				
Agency _____ Contact _____				
	Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached _____ _____				
Agency _____ Contact _____				
	Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached _____ _____				
Agency _____ Contact _____				
	Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached _____ _____				
4.	Other interviews (optional) <input type="checkbox"/> Report attached.			

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<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 checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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
3.	O&M and OSHA Training Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" 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"/> Contractor for State <input type="checkbox"/> PRP in-house <input type="checkbox"/> Contractor for PRP <input checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Contractor for Federal Facility <input type="checkbox"/> Other _____																																										
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-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 30%;"></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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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		From _____	To _____		<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From _____	To _____		<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From _____	To _____		<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From _____	To _____		<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 checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks _____ <u>Fence located on the north side of the landfill has vegetation growing along and through the fence.</u>																																										
B. Other Access Restrictions																																											
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A Remarks _____ _____																																										

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 (e.g., self-reporting, drive by) _____		
	Frequency _____		
	Responsible party/agency _____		
	Contact _____		
	Name	Title	Date Phone no.
	Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No <input 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 _____		

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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged	<input type="checkbox"/> Location shown on site map	<input 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 _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident
5.	Vegetative Cover <input checked="" type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established <input checked="" type="checkbox"/> No signs of stress <input checked="" type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____ <u>4 trees were noted at the site.</u>		
6.	Alternative Cover (armored rock, concrete, etc.) <input checked="" type="checkbox"/> N/A Remarks _____ _____		
7.	Bulges Areal extent _____ Height _____ 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 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 Areal extent _____ Remarks _____	<input checked="" type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Depth _____

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 checked="" type="checkbox"/> Applicable <input type="checkbox"/> 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 checked="" type="checkbox"/> 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 checked="" type="checkbox"/> N/A Remarks _____ _____
3.	Monitoring Wells (within surface area of landfill) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" 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 <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 (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 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 <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 type="checkbox"/> Applicable <input checked="" 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 absorbers <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 checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



Site 6 facing east



Site 6 facing south



Vegetation growing through Site 6 fence



Underground vault/structure at Site 6

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 9 Site 15	Date of inspection: 5 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 69 °F
Remedy Includes: (Check all that apply) <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;"> <input 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: 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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>Environmental Engineer</u> <u>6 June 2017</u> <div style="display: flex; justify-content: space-between; margin-left: 100px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" 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 _____ _____	

Agency _____
 Contact _____

Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached			

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached _____

Agency _____		_____		_____	
Contact _____		_____		_____	
Name		Title		Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached					

[illegible]

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<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 checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A <input checked="" type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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
3.	O&M and OSHA Training Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" 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 type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input checked="" 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"/> Contractor for State <input type="checkbox"/> PRP in-house <input type="checkbox"/> Contractor for PRP <input checked="" type="checkbox"/> Federal Facility in-house <input type="checkbox"/> Contractor for Federal Facility <input type="checkbox"/> Other _____																																										
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-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 30%;"></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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="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		From _____	To _____		<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From _____	To _____		<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From _____	To _____		<input type="checkbox"/> Breakdown attached	Date	Date	Total cost		From _____	To _____		<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 checked="" type="checkbox"/> Gates secured <input type="checkbox"/> N/A Remarks _____ <u>Fence located on the east side of the site is damaged from a fallen tree.</u>																																										
B. Other Access Restrictions																																											
1.	Signs and other security measures <input type="checkbox"/> Location shown on site map <input checked="" type="checkbox"/> N/A Remarks _____ _____																																										

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 (e.g., self-reporting, drive by) _____ Frequency _____ Responsible party/agency _____ Contact _____ <div style="display: flex; justify-content: space-between; margin-top: 5px;"> Name Title Date Phone no. </div> Reporting is up-to-date <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Reports are verified by the lead agency <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Specific requirements in deed or decision documents have been met <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A Violations have been reported <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input 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 _____ _____ _____			
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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A				
1.	Roads damaged <input type="checkbox"/> Location shown on site map <input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A Remarks _____ _____			

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Settlement not evident
2.	Cracks Lengths _____ Remarks _____	<input type="checkbox"/> Location shown on site map Widths _____ Depths _____	<input type="checkbox"/> Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<input type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map Depth _____	<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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map Height _____	<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 <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 type="checkbox"/> No evidence of slope instability
B. Benches <input type="checkbox"/> Applicable <input 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 <input type="checkbox"/> 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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Depth _____

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 <input type="checkbox"/> 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"/> 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 <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 <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 <input 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 (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 <input type="checkbox"/> 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 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 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"/> <u>N/A</u>
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 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 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 absorbers <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		

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



Site 15 facing west



Damaged fence at Site 15

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OU 9 Site 17	Date of inspection: 5 June 2017
Location and Region: EPA Region 2	EPA ID:
Agency, office, or company leading the five-year review: MSE Group, LLC	Weather/temperature: Cloudy, 69 °F
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 checked="" 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 type="checkbox"/> Site map attached	
II. INTERVIEWS (Check all that apply)	
1. O&M site manager <u>Scott Fleming</u> <u>Environmental Engineer</u> <u>6 June 2017</u> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input checked="" 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-top: 5px;"> 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 _____ _____	

Agency _____
 Contact _____

Name	Title	Date	Phone no.
Problems; suggestions; <input type="checkbox"/> Report attached _____			

Agency _____
 Contact _____
 Name _____ Title _____ Date _____ Phone no. _____
 Problems; suggestions; ☐ Report attached

[illegible]

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____	<input checked="" type="checkbox"/> Readily available <input checked="" type="checkbox"/> Readily available <input checked="" 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"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan 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
3.	O&M and OSHA Training Records Remarks _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" 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

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 (e.g., self-reporting, drive by) _____		
	Frequency _____		
	Responsible party/agency _____		
	Contact _____		
	Name	Title	Date Phone no.
	Reporting is up-to-date	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No <input 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 checked="" type="checkbox"/> No <input 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 _____		

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 type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	Roads damaged	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
	Remarks _____		

B. Other Site Conditions			
Remarks _____ _____ _____ _____ _____			
VII. LANDFILL COVERS ■ Applicable □ 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 _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Erosion not evident
4.	Holes Areal extent _____ Depth _____ Remarks _____	<input type="checkbox"/> Location shown on site map	<input checked="" type="checkbox"/> Holes not evident
5.	Vegetative Cover <input type="checkbox"/> Grass <input checked="" type="checkbox"/> Cover properly established <input type="checkbox"/> Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		<input checked="" type="checkbox"/> No signs of stress
6.	Alternative Cover (armored rock, concrete, etc.) ■ N/A Remarks _____		
7.	Bulges Areal extent _____ Height _____ 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 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 Areal extent _____ Remarks _____	<input checked="" type="checkbox"/> No evidence of slope instability
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 <input checked="" type="checkbox"/> 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 _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement Depth _____
2.	Material Degradation Material type _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation Areal extent _____
3.	Erosion Areal extent _____ Remarks _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion Depth _____

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 checked="" type="checkbox"/> Applicable <input type="checkbox"/> 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 checked="" type="checkbox"/> 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 checked="" type="checkbox"/> N/A Remarks _____ _____
3.	Monitoring Wells (within surface area of landfill) <input checked="" type="checkbox"/> Properly secured/locked <input checked="" type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input checked="" 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 <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 (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 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 <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 type="checkbox"/> Applicable <input checked="" 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 absorbers <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 checked="" type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input checked="" type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

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 compromised in the future.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	
D.	Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	



Site 17 facing south



Site 17 facing north



Gap in bottom of fence noted near monitoring well 17MW03 at site 17

Appendix B
Public Notice

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A GANNETT COMPANY
ASBURY PARK PRESS | **APP.com**

Agency:

MSE GROUP
MSE GROUP
2608 S. 86TH STREET SUITE C
TAMPA, FL 33619
ATTN: Amy Twitty

Client:

MSE GROUP
2608 S. 86TH STREET SUITE C,
TAMPA, FL 33619

Acct No: 8135042716MSEG

Acct:8135042716MSEG

Order #	Advertisement/Description	# Col x # Lines	Rate Per Line	Cost
0002039548	Public Notification Quote UNITEDSTATESTHEUNITEDSTATESNAVYANNOUN CESNOTICETOCONDUCTFOURTHEFIVEYEARREVIE	2 col x 42 lines	\$0.75	\$46.20
		Affidavit of Publication Charge	1	\$35.00
		Tearsheet Charge	0	\$0.00
		Net Total Due:		0.00

Run Dates: 04/04/17

Check #: _____

Date: _____

CERTIFICATION BY RECEIVING AGENCY
I, HAVING KNOWLEDGE OF THE FACTS, CERTIFY AND DECLARE THAT THE
GOODS HAVE BEEN RECEIVED OR THE SERVICES RENDERED AND ARE IN
COMPLIANCE WITH THE SPECIFICATIONS OR OTHER REQUIREMENTS, AND SAID
CERTIFICATION IS BASED ON SIGNED DELIVERY SLIPS OR OTHER REASONABLE
PROCEDURES OR VERIFIABLE INFORMATION.

SIGNATURE: _____

TITLE: _____ DATE: _____

CERTIFICATION BY APPROVAL OFFICIAL
I CERTIFY AND DECLARE THAT THIS BILL OR INVOICE IS CORRECT, AND THAT
SUFFICIENT FUNDS ARE AVAILABLE TO SATISFY THIS CLAIM. THE PAYMENT
SHALL BE CHARGEABLE TO:

APPROPRIATION ACCOUNT(S) AND AMOUNTS CHARGED: P.O. #

SIGNATURE: _____

TITLE: _____ DATE: _____

CLAIMANT'S CERTIFICATION AND DECLARATION:

I DO SOLEMNLY DECLARE AND CERTIFY UNDER THE PENALTIES OF THE LAW THAT THIS BILL OR INVOICE IS CORRECT IN ALL ITS PARTICULARS; THAT THE
GOODS HAVE BEEN FURNISHED OR SERVICES HAVE BEEN RENDERED AS STATED HEREIN; THAT NO BONUS HAS BEEN GIVEN OR RECEIVED BY ANY PERSON OR
PERSONS WITHIN THE KNOWLEDGE OF THIS CLAIMANT IN CONNECTION WITH THE ABOVE CLAIM; THAT THE AMOUNT HEREIN STATED IS JUSTLY DUE AND OWING;
AND THAT THE AMOUNT CHARGED IS A REASONABLE ONE.

Date: 04/04/2017

Federal ID #: 061032273

Signature: _____

Official Position: Clerk

Kindly return a copy of this bill with your payment so that we can assure you proper credit.

Asbury Park Press
New Jersey Press Media Solutions
P.O. Box 677599
Dallas, TX 75267-7599

AFFIDAVIT OF PUBLICATION

Publisher's Fee \$46.20 Affidavit \$35.00

State of New Jersey } SS.
Monmouth/Ocean Counties

Personally appeared

Diana Figueroa


Of the **Asbury Park Press**, a newspaper printed in Freehold, New Jersey and published in Neptune, in said County and State, and of general circulation in said county, who being duly sworn, depose and saith that the advertisement of which the annexed is a true copy, has been published in the said newspaper 1 times, once in each issue as follows:

04/04/17 A.D 2017

Diana J's

Ad Number: 0002039548

Melanie Caltz
Sworn and subscribed before me, this 4 day of April, 2017



UNITED STATES

The United States Navy
Announces
NOTICE TO CONDUCT
Fourth Five-Year Review
NAVAL WEAPONS STATION EARLE
COLTS NECK, NJ

The United States Navy (Navy) in coordination with the U.S. Environmental Protection Agency (EPA) and the New Jersey Department of Environmental Protection (NJDEP) will initiate the Fourth Five-Year Review Report for Environmental Restoration (ER) activities at Naval Weapons Station (NWS) Earle.

This report will be prepared by the Navy as part of the Environmental Restoration Program (ERP) for the Department of the Navy (DoN), following EPA guidelines under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Navy will conduct the five-year review with the evaluation of pending, completed, and ongoing remedial actions implemented at ER sites at NWS Earle. This five-year review report will include the 15 ER sites where site-related contaminants remain at levels above those that would allow for unrestricted use.

Navy and CERCLA guidelines call for this ERP review every 5 years to ensure protection of human and ecological communities in the area. The Fourth Five-Year Review Report will be completed by March 2018.

For more information regarding Naval Facilities Engineering Command Mid-Atlantic (NAVFAC MIDLANT) work, please contact Mr. Todd Lyman, the NAVFAC MIDLANT Public Affairs Officer, at todd.lyman@navy.mil or contact Ms. Rachel Dunleavy, NAVFAC MIDLANT, at rachel.dunleavy@navy.mil.

Mailing address: Commanding Officer, Naval Facilities
Engineering Command Mid-Atlantic
Attn: Public Affairs
9324 Virginia Ave. Rm. 302
Norfolk, VA 23511

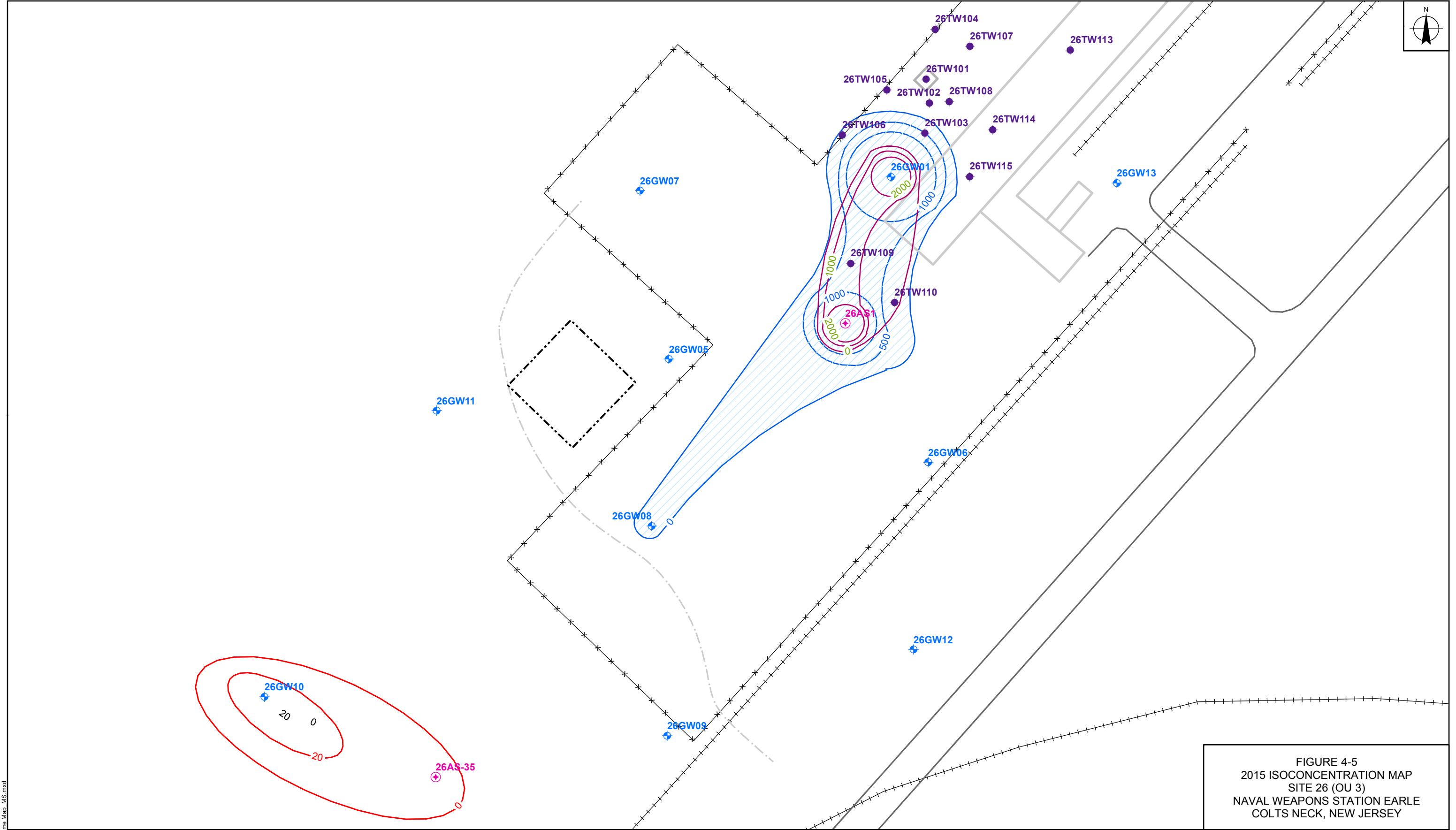
(\$47.30)

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Appendix C
Groundwater Plume Maps

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Legend

- TEMPORARY WELL LOCATION
- MONITORING WELL LOCATION
- MONITORING WELL LOCATION
- AIR SPARGING WELL LOCATION
- Fence
- Railroad
- TCE Plume (µg/L)
- PCE Plume (µg/L) (OU 7)

NOTES:
 µg/L - MICROGRAMS PER LITER
 J - ESTIMATED VALUE

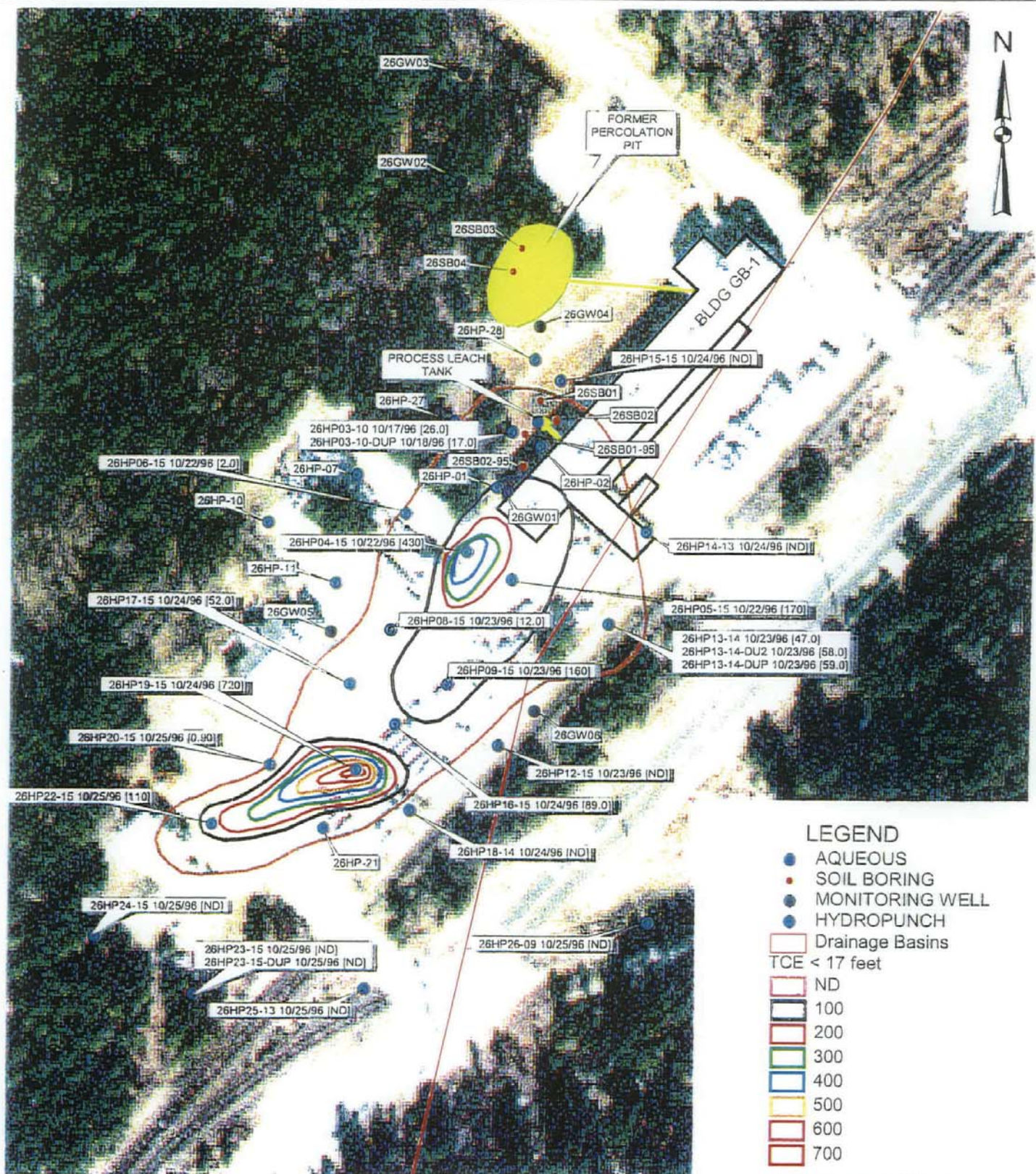
0 100 Feet

FIGURE 4-5
 2015 ISOCONCENTRATION MAP
 SITE 26 (OU 3)
 NAVAL WEAPONS STATION EARLE
 COLTS NECK, NEW JERSEY

NAVFAC
 Naval Facilities Engineering Command

REQUESTED BY: J. O'KEEFE	DATE: 12/14/2017
DRAWN BY: M. SENNE	TASK ORDER NUMBER: WE09

X:\NavFac\Earle\Site 26\Plume Map MS.mxd



80 0 80 160 Feet

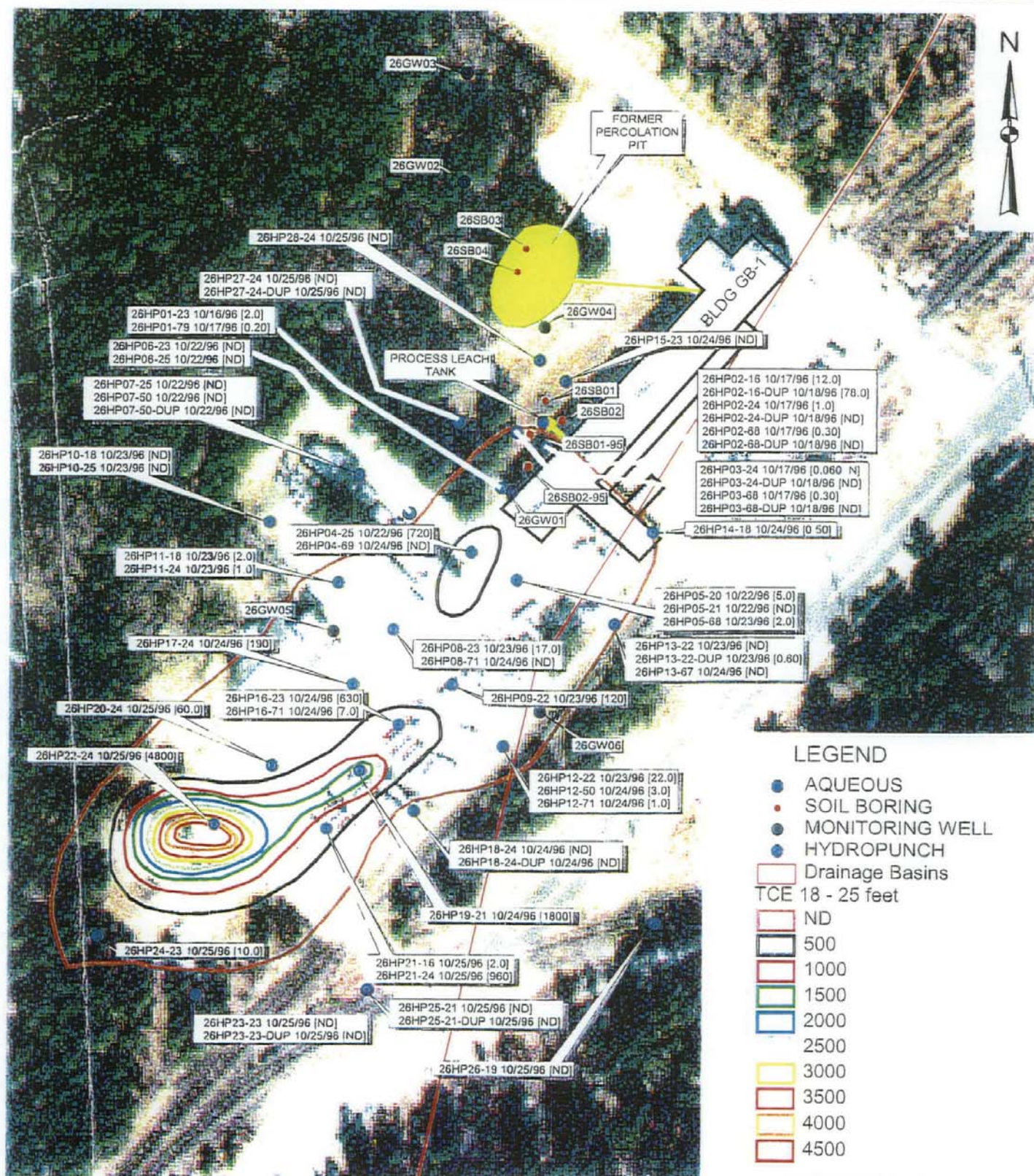
Source: Brown & Root, 1997 FS Report

U.S. Navy RAC
NWS - Earle, Colts Neck, N.J.

Figure 3
1996 TCE Groundwater Plume
(Less than 17 feet depth)



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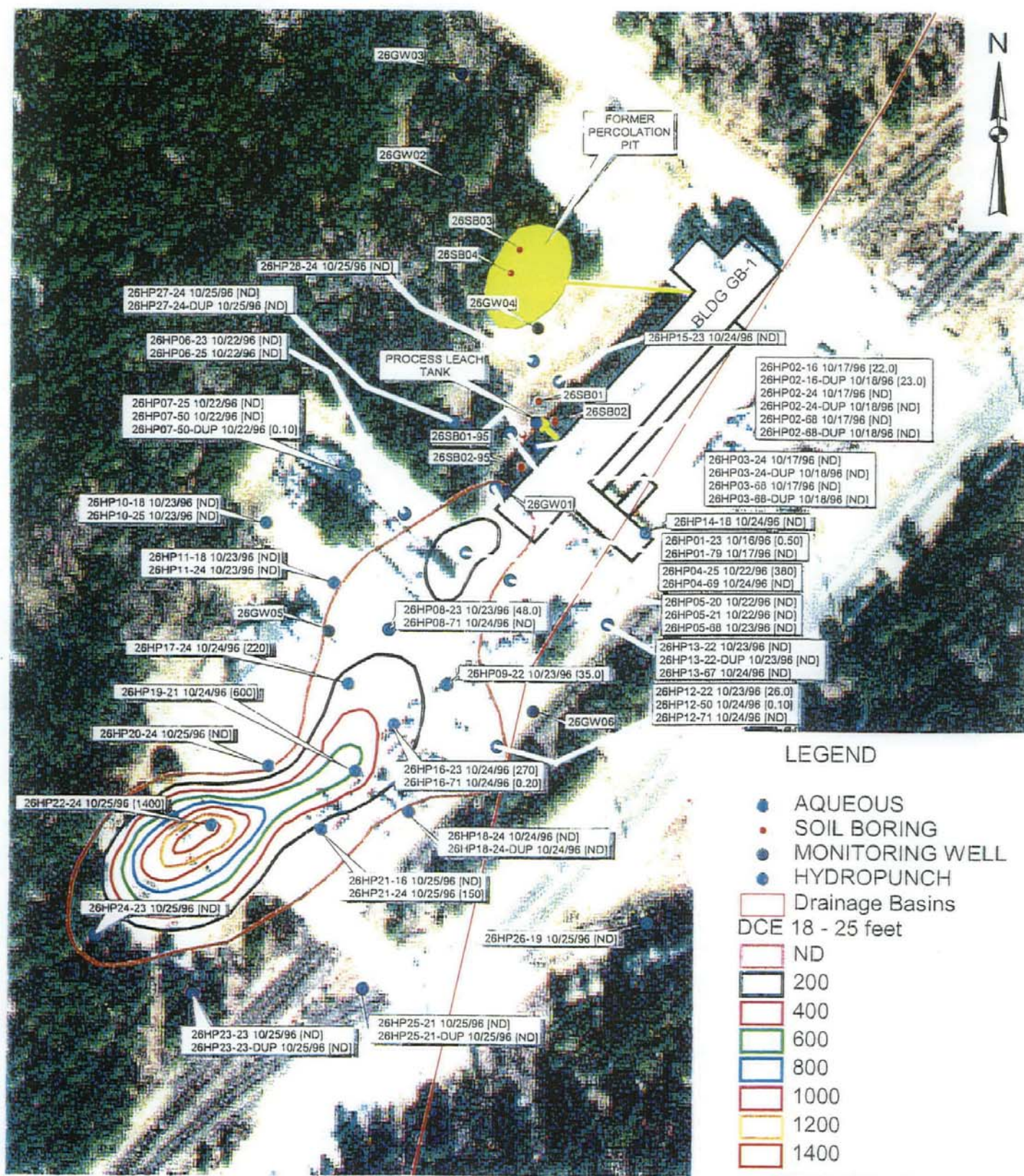


U.S. Navy RAC
NWS - Earle, Colts Neck, N.J.

Figure 4
1996 TCE Groundwater Plume
(17 to 25 feet depth)

Source: Brown & Root, 1997 FS Report

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U.S. Navy RAC
NWS - Earle, Colts Neck, N.J.

Figure 6
1996 TCE Groundwater Plume
(17 to 35 feet depth)

80 0 80 160 Feet

Source: Brown & Root, 1997 FS Report

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