



**DEPARTMENT OF THE AIR FORCE**  
**AIR FORCE CIVIL ENGINEER CENTER**  
**INSTALLATION RESTORATION PROGRAM**  
**JOINT BASE MCGUIRE-DIX-LAKEHURST, NJ 08641**

23 January 2020

Mr. James Richman  
Remediation Program Manager (AFCEC/CZO)  
787 CES/CEIE  
2403 Vandenberg Avenue  
Joint Base McGuire-Dix-Lakehurst, NJ 08641

Ms. Carla Struble  
USEPA, Region 2  
290 Broadway – 18<sup>th</sup> Floor  
New York, NY 10007-1866

Re: Final Proposed Plan for McGuire Operable Unit 1 (OU1) Sites, January 2020, for the Performance Based Remediation (PBR) Contract, Joint Base McGuire-Dix-Lakehurst (JB MDL), NJ

Dear Ms. Struble:

Attached please find the Final Proposed Plan for McGuire OU1, January 2020 (3 hard copies, 4 CDs) for the PBR contract at JB MDL.

If you have any questions, please contact King Mak at (609) 754-3323.

Sincerely,

A handwritten signature in black ink, appearing to read "James Richman".

JAMES RICHMAN  
Remediation Program Manager

Attachment:

1. Final Proposed Plan for McGuire OU1, January 2020 (3 hard copies, 4 CDs)

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Cc:

Haiyesh Shah, NJDEP (1 CD)  
Michael Tamn, RAB C-Chair (1 CD)  
Susan Trussell, USACE Tulsa (1 CD)  
Russ Cason, AFCEC CZR (1 CD)  
Mike Powers, TechLaw (1 CD)  
King Mak, JB MDL (2 hard copies, 3 CDs)  
Branwen Ellis, New Jersey Pinelands Commission (1 CD)



# Final Proposed Plan for McGuire-Operable Unit (Sites LF003, LF004, ST007)

## Joint Base McGuire-Dix-Lakehurst, New Jersey

January 2020



**Proposed Plan for  
McGuire – Operable Unit 1  
(Sites LF003, LF004, and ST007)**



**JOINT BASE MCGUIRE-DIX-LAKEHURST, NEW JERSEY**

**Department of the Air Force**

***Air Force Announces Proposed Plan***

This **Proposed Plan** identifies the Preferred Alternative for cleaning up the contaminated soil and **groundwater** at three sites at Joint Base McGuire-Dix-Lakehurst (JB MDL) located within Operable Unit 1 (OU1) – Sites LF003, LF004 (two soil-capped landfills), and ST007 (a former Defense Reutilization and Marketing Office Storage Facility located within LF003) – and provides the rationale for this preference. In addition, this Proposed Plan summarizes other cleanup alternatives evaluated for use at the sites. This document is issued by the Department of the Air Force (USAF), the lead agency for site activities, and the United States Environmental Protection Agency (USEPA), the support agency. The USAF and the USEPA will jointly select a final remedy for the sites after reviewing and considering all information submitted during the 30-day public comment period. At **National Priorities List (NPL)** facilities, USEPA must co-select remedies; therefore, the USAF will consult with the New Jersey Department of Environmental Protection (NJDEP) and obtain USEPA concurrence. The USAF, in consultation with the USEPA, may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan. *(Note: Words/acronyms shown in bold lettering are defined in the Glossary.)*

**MARK YOUR CALENDARS**

**PUBLIC COMMENT PERIOD:**

10 February 2020 – 10 March 2020

The USAF will accept written comments on the Proposed Plan during the public comment period. Comment letters must be postmarked by 10 March 2020 and should be submitted to:

James Richman  
Remediation Program Manager  
787 CES/CEIE  
2403 Vandenberg Avenue  
Joint Base McGuire-Dix-Lakehurst, NJ 08641  
Email: james.richman.1@us.af.mil  
Fax: (609) 754-2267

To request an extension, send a request in writing to James Richman by 5:00 p.m. on 10 March 2020.

**PUBLIC MEETING:**

13 February 2020

The USAF will provide the opportunity for and if requested a public meeting to explain the Proposed Plan and all of the alternatives presented in the OU1 (LF003, LF004, and ST007) Focused Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at Edward Holloway Senior Citizen and Community Center, Cookstown, NJ, 6:00 PM .

**For more information, see the Administrative Record at the following locations:**

Burlington County Library  
5 Pioneer Boulevard  
Westampton, NJ 08060  
(609) 267-9660  
Hours:  
Sun, 1 p.m. – 5 p.m.  
Mon, 9 a.m. – 9 p.m.  
Tues – Fri, 10 a.m. – 9 p.m.  
Sat, 9 a.m. – 5 p.m.

**For more information, see the Administrative Record** online at <http://afcec.publicadmin-record.us.af.mil/>

The USAF is issuing this Proposed Plan as part of its public participation responsibilities under Section 117 (a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)**, 42 USC § 9617(a) and Section 300.430 (f)(3) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**. This Proposed Plan summarizes information that can be found in greater detail in the **Remedial Investigation (RI) Report** and **Focused Feasibility Study (FFS)** and other documents contained in the **Administrative Record** file for these sites. The Administrative Record is available online at <http://afcec.publicadmin-record.us.af.mil/>.

The USAF and the USEPA encourage the public to review these documents to gain a more comprehensive understanding of the sites and remedial activities that have been conducted at the sites.

### ***Site History and Background***

JB MDL is an active military facility located in Burlington and Ocean Counties, and is approximately 20 miles southeast of Trenton, New Jersey (**Figure 1**). OU1 is located in the northern portion of JB MDL-McGuire and is entirely within the New Jersey Pinelands. (*Note: Figures and Tables are included at the end of the document following the glossary.*)

OU1 consists of three sites: LF003, LF004, and ST007. Site ST007 is collocated with LF003. LF003 is bounded to the north by North Run Creek, a shallow, multi-channel stream associated with the North Run Corridor, a flood plain. Landfill LF004 is located approximately 2,000 feet (ft) east of LF003/ST007 and is bounded to the south by the North Run Creek. These sites are discussed below.

#### **Landfill No. 2 (Site LF003)**

Landfill LF003 was operated as a mixed waste landfill for JB MDL-McGuire between

1950 until possibly the early 1960s. The landfill is approximately 21.5 acres in total area, and the total site area is estimated to be 43 acres (based on the inclusion of groundwater contamination and groundwater monitoring wells, as well as the estimated area of the landfill). The terrain of LF003 is essentially flat; however, there is an escarpment along the northern boundary of the site that drops approximately 30 ft to the banks of the North Run Creek. The landscape along the upper edge of the northern escarpment is heavily wooded. The southern edge of LF003 runs parallel to Wrightstown-Cookstown Road (**Figure 2**).

During its operation, a wide range of waste materials associated with JB MDL-McGuire operations were deposited in the landfill, which is estimated to hold approximately 400,000 cubic yards (cy) of waste. Though most of the waste deposited in the landfill is similar in nature to municipal waste, historical evidence suggests that drums containing liquid waste (possibly used motor oil, fuel, and solvents) were dumped and burned during the operational life of the landfill.

The landfill was closed and covered after operations ceased at the site. Exposed waste material was removed from LF003, and the landfill was leveled with a cover of sandy soil. The RI (CB&I Federal Services [CB&I] 2014) evaluated historical drilling logs and determined that much of the landfill has a soil cover greater than 2 ft thick. The observed landfill cover thickness varied from a minimum of 2 ft to a maximum of 12 ft, with an average thickness of approximately 7.4 ft.

Natural Resource eligible sites were not identified at OU1, with the exception of the western section of LF003 (Moeller et al. 1995). Natural Resource eligible sites are historic properties that may be significant to

the Nation's heritage and may be preserved for future generations of Americans. The western section of LF003 along the south and north sides of North Run Creek contains two recently identified archaeological sites (**Figure 2**). The site on the south side of North Run Creek, which includes a stone foundation and late 19<sup>th</sup> to early 20<sup>th</sup> century artifacts visible on the ground surface, appears to be eroding from beneath the existing landfill cap. There is also potential for prehistoric archaeological sites along the unsurveyed margins of LF003 where the landfill cap has eroded to the original ground surface.

The former McGuire Skeet Range (Site TS-875) was used from 1943 to 1959 and is collocated with LF003; however, this site is being addressed as part of Operable Unit 9 – Military Munitions Response Program. This Site is currently within the RI phase and will be addressed under separate documentation.

During a site walk in 2015, seven items were identified as **Material Potentially Presenting an Explosive Hazard (MPPEH)**. The MPPEH were empty artillery shell casings (four M346 106 millimeter [mm] and three M1 105 mm recoilless rifle cartridge cases) and were found on the ground surface along the eastern portion of LF003 and there is no evidence that they were part of the landfilled wastes. These items were evaluated by the USAF 87<sup>th</sup> Explosive Ordnance Disposal (EOD) flight and were determined to be **Material Documented as an Explosive Hazard (MDEH)**. Therefore, these items were removed and disposed of off-site. An inspection of the North Run Corridor was conducted in March 2016 while surface visibility was improved because leafy vegetation was dormant for the winter. During the March 2016 inspection, two additional recoilless rifle cartridge cases were identified in a location similar to the first

discovery. These items were also determined to be MDEH by the 87<sup>th</sup> EOD flight. The items were removed and disposed of off-site. These findings were documented in the EOD incident report, which is included in Attachment 1 of the FFS (Arcadis 2019). A second inspection was performed in May 2018 to observe portions of LF003 that were not previously inspected during earlier reconnaissance. This inspection was conducted by an unexploded ordnance technician assisted with detection equipment. No other items constituting MPPEH were found during either supplemental inspection.

During site investigation activities performed from 17 June 2019 – 28 June 2019, an additional recoilless rifle cartridge case was identified in a similar location to the previous discoveries. The item was lodged beneath a utility pole that had been discarded on-site, partially obscuring it from view. This item was determined to be MDEH and therefore removed by the 87<sup>th</sup> EOD flight and disposed of.

As these MDEH were determined to be dumped on the site, they are classified as **Discarded Military Munitions (DMM)**. The discovery of these DMM items was an isolated incident and was not indicative of (1) broader dumping of DMM at LF003 or (2) disposal of DMM entrained within the landfill waste. This assertion is supported by the following lines of evidence:

- There is no historical documentation indicating that military munitions were discarded at this landfill;
- The majority of the landfill is maintained by periodic mowing. These items were discovered in the unmaintained portions of the site within the North Run Corridor;
- The items were discovered on the ground surface and some items were in an upright

position, suggesting that they were left in-place after the landfill cap was installed; and

- These items were not partially buried, nor did they appear to be exposed from the existing landfill cover due to erosion of the cap or by frost heaving.

While these items constitute a military-specific waste, they are a “low-hazard” waste based upon their inert nature, limited distribution, and isolated occurrence. There is no evidence of high-hazard, military-specific waste disposal (e.g., chemical warfare agents or munitions) at LF003, which would preclude the use of the **landfill presumptive remedy** (i.e., presumptive remedies are preferred technologies for common categories of sites. In the case of landfills, the presumptive remedy is containment using soil covers, impermeable covers, etc.).

The investigations detailed in **Table 1** have been performed to delineate and characterize the waste at LF003, identify potential discharge points, and evaluate ways to eliminate exposure pathways of **contaminants of concern (COCs)**.

### **Landfill No. 3 (Site LF004)**

LF004 operated as a landfill in 1956 and 1957. General municipal-type refuse and drums of chemicals, scrap-materials, and coal ash were reportedly buried in eight discreet burial pits with a total area of waste of approximately 2.5 acres. It is estimated that up to 110,000 cy of waste material may be buried. There is no evidence of high-hazard, military-specific waste (e.g., chemical warfare agents or munitions), which would preclude the use of the presumptive remedy. The site has an overall size of an estimated 6.5 acres and consists of the waste pits and groundwater contamination (**Figure 3**).

The landfill was closed and covered after operations ceased at the site. The composition and thickness of any final cover material is not documented, although Weston (1984) reported that the site is covered with sandy soil. The RI (CB&I 2014) evaluated historical drilling logs and determined the estimated depth of the soil cover to be 1 to 2 ft thick; however, limited spatial data are available.

LF004 abuts the northern property boundary of JB MDL and is bounded by North Run Creek to the south. LF004 is bisected by the Defense Access Highway (Burlington County Route 680), which was built sometime after 1963. It is speculated the waste material within the road right-of-way was removed and disposed of off-site to allow for construction of a stable roadbed for the highway; however, there is no documentation of any removal actions. LF004 currently supports a mature forest.

Although there has been no discovery of MPPEH at LF004, nor has there been any indication that MPPEH may be discovered at LF004; in April 2018, the LF004 site was proactively inspected to assess whether there may be MPPEH items. This inspection was conducted by an unexploded ordnance technician. No items constituting MPPEH were found during the inspection.

The investigations detailed in **Table 1** have been performed to delineate and characterize the waste at LF004, identify potential discharge points, and evaluate ways to eliminate exposure pathways of COCs.

### **Former Defense Reutilization and Marketing Office Storage Facility (Site ST007)**

ST007 is located north of Wrightstown-Cookstown Road and is collocated with LF003 (**Figure 2**). ST007 is approximately 4

acres in area. ST007 was used as a material and hazardous waste storage facility from 1960 until 1998. Materials stored on the site resulted in contamination consisting of aromatic and chlorinated **volatile organic compounds (VOCs)** and **semi-volatile organic compounds (SVOCs)** consisting primarily of **polycyclic aromatic hydrocarbons (PAHs)**, pesticides, and **polychlorinated biphenyls (PCBs)**.

Since LF003 and ST007 are co-located, each site's contribution to contamination of groundwater has been comingled. Therefore, groundwater at LF003 and ST007 has been evaluated as one area regarding nature and extent. Groundwater is evaluated under LF003-only, and therefore soil is the only media of concern at ST007.

The Draft Interim Remedial Action Report (URS 1999) documented the excavation of PCB-contaminated soil and site restoration at ST007. Approximately 1,630 tons of hazardous and 9,670 tons of non-hazardous soil were excavated and disposed of off-site. After the removal action, it was confirmed that no PCB concentrations at the site exceeded the New Jersey Department of Environmental Protection (NJDEP) Residential Direct Contact Soil Cleanup Criteria of 0.49 milligram per kilogram (mg/kg) (i.e., the previous NJDEP residential soil cleanup standards which have been replaced by the Residential Direct Contact Soil Remediation Standard [RDCSRS]).

However, samples collected during the 2007 RI indicated PCB contamination exceeding the NJDEP Residential Direct Contact Soil Cleanup Criteria in soil outside the Interim Remedial Action footprint. An Engineering Evaluation/Cost Analysis at ST007 was prepared in 2010 (Shaw 2010) and determined that excavation and off-site disposal of the PCB-contaminated soil was

the best alternative for the removal of soils with PCB concentrations above the Toxic Substances Control Act (TSCA) unrestricted use criteria of 1 mg/kg.

A Non-Time Critical Removal Action (USAF 2011) was conducted at ST007 in 2011 to remove soils with PCB concentrations above the TSCA unrestricted use criteria of 1 mg/kg. Concentrations of PCBs remained above the NJDEP RDCSRS of 0.2 mg/kg at ST007.

Groundwater, surface water, and sediment samples were collected at ST007 as part of the Phase I RI and analyzed for PCBs. Results of this sampling indicated that all locations were non-detect for PCBs in groundwater, surface water, and sediment.

The investigations detailed in **Table 1** have been performed to delineate and characterize the waste at ST007, identify potential discharge points, and evaluate ways to eliminate exposure pathways of COCs.

### **Regulatory History**

The sites are participating in the Defense Environmental Restoration Program, a specially funded program established by the Department of Defense to identify, investigate, and clean up the hazardous contaminants at military and other Department of Defense facilities. Because JB MDL is an active federal facility, environmental activities at the base conform to the requirements specific to projects performed under the CERCLA and the NCP.

The USEPA added JB MDL-McGuire to the NPL on October 22, 1999, due to the presence of several chemicals in soil, surface water, and groundwater. On September 10, 2009, the USAF signed a Federal Facilities Agreement with the USEPA Region 2 to ensure that the environmental impacts

associated with past and present activities at JB MDL-McGuire, including OU1, are investigated and remediated, as necessary, to protect public health, welfare, and the environment.

In June 2015, a dispute resolution agreement (USEPA 2014a, 2014b, 2015) between the USEPA and the USAF required that the more stringent Class I Pinelands Standards (Class I-PL; **New Jersey Administrative Code (N.J.A.C.) 7:9C-1.5(d)2**) be used as **Applicable or Relevant and Appropriate Requirements (ARARs)** (USEPA 2015). ARARs are federal or state environmental standards, requirements, criteria, or limitations that a **remedial action** must meet. Specifically, the following Pineland Standards are applicable to groundwater and surface water at sites LF003 and LF004:

- N.J.A.C. 7:9C-1.5(d)2. Class I-PL (Pinelands)
- N.J.A.C. 7:9C-1.7(b)2. Groundwater Quality Criteria for Class I-PL (Protection Area)
- N.J.A.C. 7:26D-2.2(a)2. Minimum groundwater remediation standards for Class I-PL groundwater.
- N.J.A.C. 7:9B-1.14(b). Surface Water Quality Criteria for Pinelands Waters.

The dispute resolution agreement is located in the Administrative Record online at <http://afcec.puplicadmin-record.us.af.mil/Search.aspx>.

The Class I-PL groundwater standards are non-degradation standards applicable to all groundwater in the surficial aquifer made up of the Cohansey and Kirkwood Formations beneath the Pinelands Preservation and Protection Areas. The Class I-PL standards are the higher of the NJDEP **Practical Quantitation Limits (PQLs)** and the

NJDEP-approved **Background Threshold Values** for the applicable area. JB MDL-McGuire is located entirely within the Pinelands Protection Area; however, the property north of the JB MDL boundary is not located within the Pinelands Protection Area and is therefore not subject to the Class I-PL standards.

JB MDL has completed a base-wide background study for naturally occurring (i.e., metals) and anthropogenic (i.e., PAHs and pesticides) contaminants (BEM Systems Inc. 2013). The use of the McGuire Basewide Background Study (BEM Systems, Inc. 2013) is appropriate.

Groundwater located off-base, and therefore not within the Pinelands Protection Area, or groundwater in the Vincentown formation (i.e., deep wells) is not regulated by the Class I-PLs, but rather the applicable health-based standards. The health-based standards at Sites LF003, LF004, and ST007 are the more stringent of the federal and state standards. The following are applicable health-based criteria:

- Groundwater
  - Federal Maximum Contaminant Levels (40 Code of Federal Regulations [CFR] 141(G) 141.61 and 141.62; 40 CFR 141(F) 141.50 and 141.51)
  - NJDEP Safe Drinking Water Regulations (N.J.A.C. 7:10-5.2)
  - NJDEP Groundwater Quality Standards Class II-A (N.J.A.C. 7:9C-1.7(c))
- Surface Water
  - NJDEP Surface Water Quality Standards (N.J.A.C. 7:9B-1.14(c) and (d))

- Soil
  - NJDEP Residential Direct Contact Soil Remediation Standards (N.J.A.C. 7:26D-4.2)
  - TSCA (40 CFR 761) unrestricted use

### ***Site Characteristics***

Several environmental investigations were conducted at OU1 to characterize **groundwater**, surface water, soil, sediment, and the landfill extent and to evaluate **contaminants of potential concern (COPCs)**. The RI Reports and the FFS identified the COCs based on current conditions of the sites that will be addressed through remedial action. The following sections discuss the natural conditions at OU1 (i.e., geology, hydrogeology, and regional surface hydrology), the nature and extent of contamination, and the fate and transport of contamination.

### **Geology**

The soils beneath OU1 are made up of the Cohansey Sand, Kirkwood Formation, and Vincentown Formation. The shallowest stratigraphic unit at OU1 is the Cohansey Sand. Underlying the Cohansey Sand is the Kirkwood Formation. These two units form the uppermost aquifer system where groundwater occurs under unconfined conditions. Both the Cohansey Sand and Kirkwood Formation are generally sandy and approximately 50 ft thick. The Vincentown Formation underlies the Kirkwood-Cohansey formation and is up to 50 ft thick in the JB MDL area, and approximately 20 to 30 ft thick in the OU1 vicinity.

The Hornerstown Sand lies beneath the Vincentown Formation and forms a confining layer in the JB MDL area that separates the shallow aquifer from deeper aquifers. The Hornerstown formation occurs approximately 70 ft below grade at OU1.

### **Hydrogeology**

The Cohansey and Kirkwood Formations form the shallow aquifer at OU1. These two formations are hydraulically connected at OU1 forming a single surficial aquifer. The Vincentown Formation forms the deep aquifer at OU1; however, the aquifer is hydraulically connected to the surficial aquifer.

At LF003, the water table ranges from 24 ft below ground surface (bgs) at the higher surface elevations near Wrightstown-Cookstown Road and declines moving north to 1.5 ft bgs around North Run Creek; however, the topographical elevation decreases substantially at the North Run escarpment. Groundwater elevations observed in wells on the south and north sides of North Run Creek indicate groundwater flow is toward the North Run Creek and discharging to the surface water (i.e., flowing northeast). There are upward vertical gradients as groundwater approaches North Run Creek, indicating that groundwater at LF003 is discharging to surface water. Approximately 75 percent of the buried waste within LF003 is in direct contact with groundwater.

The water table at LF004 ranges from 5 ft bgs near the North Run Creek to 19 ft bgs north of the Defense Access Highway. Groundwater flow at LF004 is southeast toward North Run Creek. The buried waste at LF004 extends minimally into the groundwater.

### **Regional Surface Water Hydrology**

Most of the precipitation at JB MDL infiltrates to groundwater. Shallow groundwater in the northern part of JB MDL (where OU1 is located) discharges to the North Run of Crosswicks Creek, and ultimately westward to the Delaware River.

Locally, the predominant surface water feature at OU1 is the North Run Creek, which is bordered by a forested/shrub wetland. The North Run Creek, located along the northern border of LF003 and the southern border of LF004, flows to the east in a meandering multi-channel system and resides within the North Run Corridor. Based on the topography at OU1, the surface water that does not infiltrate is expected to flow overland and discharge to North Run Creek. Surface flow in North Run Creek is typically shallow with an estimated maximum baseline-flow depth of less than 1.5 ft, based on observations during site walks.

### **Nature and Extent of Contamination**

The following sections discuss the selection of groundwater and surface water COCs, the source materials associated with contamination, and the impacted media.

The identification and selection of COCs and the media they impact are discussed below. The COCs were established with help from the results of the **human health risk assessment (HHRA)** that was completed during the RI (CB&I 2014) and the process for selection of COCs, as detailed within the following paragraphs. The HHRA is further discussed under the *Summary of Site Risks* section below. In addition to the COCs identified by the HHRA, COCs are also identified based upon comparison with very specific federal or state promulgated standards. The nature and extent of contamination presented is limited to contaminants identified as (1) health-based COCs and/or (2) non-degradation COCs identified in the Final FFS (Arcadis 2019).

#### *Selection of COCs in Groundwater:*

The two categories of COCs identified for groundwater are: (1) health-based, which are based on either a formal risk assessment process or exceedances of the more stringent

of the federal or non-zero maximum contaminant level goals or maximum contaminant levels; and (2) non-degradation, which are based on exceedances of chemical-specific ARARs developed to preserve groundwater quality in its natural state within the Pinelands National Reserve.

Non-degradation COCs are chemicals included during the remedy selection process because they exceed New Jersey regulatory non-degradation groundwater quality standards, which are CERCLA ARARs. In accordance with Section 121(d)(2) of CERCLA (42 United States Code section 9621(d)(2)), on-site remedial actions addressing CERCLA hazardous substances, pollutants and contaminants that will remain on site must comply with federal and more stringent state standards, requirements, criteria, and limitations that are applicable or relevant and appropriate to the release of such hazardous substance, pollutant, and contaminant. JB MDL-McGuire is located within the Protection Area of the Pinelands National Preserve, for which the State of New Jersey has established more stringent (non-degradation) standards than apply for areas outside the Pinelands National Preserve. Therefore, if the state non-degradation groundwater quality standard is exceeded in the Protection Area for a chemical, then such chemical is identified as a non-degradation COC.

Section 7:9C-1.7(b)2 of the N.J.A.C. states that the groundwater quality criteria for the Protection Area of the Pinelands National Reserve shall be the background water quality. Section 7:9C-1.4 of the N.J.A.C. defines background water quality as the concentration of the contaminant in the groundwater that exists directly upgradient from the area in question, or the PQL, which means the lowest concentration of a contaminant that can be reliably achieved

among laboratories within specified limits of precision and accuracy during routine laboratory operating conditions.

Selection of COCs in Surface Water:

Similar to groundwater, health-based and non-degradation COCs are also identified for surface water. The HHRA determined that there are no human risks or hazards due to surface water exposure for current and future non-residents/workers and future (hypothetical) residents.

Because groundwater discharges into surface water, the health-based COCs that were identified for groundwater are then also retained for inclusion as surface water COCs. In addition, the non-degradation COCs that were identified for groundwater are also retained as surface water COCs. The surface water is classified as PL, and therefore the non-degradation standards apply to all surface waters within the Pinelands area. The non-degradation standards apply to the portions of North Run Creek and its tributaries because of their location within the Pinelands Area Boundary.

LF003

There are impacts to groundwater and surface water because of the presence of buried waste at LF003. The landfill is approximately 21.5 acres and is estimated to contain approximately 400,000 cubic yards. Buried waste is estimated to extend as deep as 25-30 ft bgs and intrudes into the groundwater table.

The buried waste is likely consistent with municipal waste. Due to the depth that the buried waste extends to, it's estimated that approximately 75-percent of the waste is in direct contact with the groundwater.

Current VOC and SVOC impacts in groundwater are present primarily along the northern edge of the landfill boundary and are limited and sporadic across the remainder of the landfill. In general, the distribution of metals across LF003 is random and only LF03-MW-13 (i.e., located within the landfill boundary and on the northern edge) showed consistent exceedances of ARARs. The specific COCs identified at LF003 are listed within the *Contaminants of Concern at LF003, LF004, and ST007* call-out box below.

Due to the age of the landfill, distinct groundwater plumes at the Site are minimal because much of the waste material has already decomposed or leached out. Concentrations of various VOCs at LF003 were generally below 10 parts per billion (ppb) in the 2016 sampling; however, there are several outliers in the historical sampling record. VOCs were predominantly identified along the northern ridge of the landfill. VOC contamination extends approximately 500 feet to the east of the landfill. Consistent with the VOC impacts, SVOCs are primarily located along the northern ridge of the landfill. Concentrations from samples collected in 2016 ranged from non-detect to 1 ppb. However, historical concentrations observed maximums on the order of 50 ppb. SVOC contamination is generally within the boundary of the landfill waste. In general, concentrations of health-based COCs within these plumes have been steadily decreasing.

Groundwater contamination does not extend beyond the site boundary and under North Run Creek. Groundwater flow through LF003 discharges to the North Run Creek (i.e., as opposed to continued flow moving to the northeast underneath the creek). The lack of detectable VOCs for monitoring wells north of North Run Creek when compared against monitoring wells located south of

North Run Creek is indicative that groundwater impacts originating from LF003 are not migrating beneath the North Run Creek.

Of the five surface water samples collected in 2016 at LF003, only one location, the surface water sampling location most up-gradient of the landfill and within the North Run Creek, had organic (pyrene and toluene) detections exceeding the surface water Class I-PL. Pyrene was also detected at a nearby upgradient well (LF03-MW-13). The presence of this COC in groundwater and at an immediately downgradient surface water location indicates that groundwater is impacting surface water. Toluene was not retained as a COC in groundwater due to the lack of exceedances since 1987; however, due to the historical presence of toluene at the site and 2016 exceedances of the PL standards in surface water, it was retained as a surface water COC. Two inorganics (i.e., arsenic and cobalt) were also detected at this surface water location. Cobalt was detected in all five surface water samples, three of which exceeded the surface water Class I-PL. Arsenic was also detected at the upgradient well at a concentration exceeding the shallow Class I-PL.

Additional surface water samples were collected in 2016 as part of an investigation of a culvert beneath LF003 discharging to North Run Creek. The results indicated that groundwater within the landfill may be contributing to the culvert discharge via infiltration. However, the observed concentrations of organic contaminants that are likely attributed to the landfill are minimal and below the maximum contaminant levels and NJDEP groundwater quality criteria, but several contaminants exceed the Class I-PL.

#### LF004

There are impacts to groundwater and surface water because of the buried waste at LF004. LF004 consists of eight discrete burial pits equating to approximately 2.5 acres. The total volume of buried waste at LF004 is estimated at 110,000 cubic yards. Buried waste is estimated to extend as deep as 18-25 ft bgs and is covered with a sandy soil.

Most VOC and SVOC exceedances of the Class I-PL observed during an investigation performed in 2016 occurred at one well (11-MW-303), which is located centrally to LF004 and screened beneath the buried waste. Additional observations of VOCs and SVOCs are sporadic and limited. Antimony, barium, and copper have historical exceedances of the Class I-PL; however, they are limited to 11-MW-303. Zinc is the most numerous of the COC exceedances being detected at concentrations that exceed the Class I-PLs in six of eight wells.

The specific COCs identified at LF004 are listed within the *Contaminants of Concern at LF003, LF004, and ST007* call-out box below.

Due to the age of the landfill, distinct groundwater plumes at the Site are minimal because much of the waste material already decomposed or leached out, and the waste minimally extends into groundwater. VOC and SVOC impacts were observed in a small subset of wells located near the most downgradient grouping of waste pits. Groundwater at this location flows south (i.e., away from the JB MDL property boundary). Concentrations of VOCs and SVOCs from the sampling events in 2016 generally range from non-detect to 100 ppb, with the exception of chlorobenzene (i.e., maximum 2016 concentration of 260 ppb).

Two surface water samples were collected during an investigation performed at LF004 in 2016. Bis(2-ethylhexyl)phthalate was the only organic contaminant to exceed the surface water Class I-PL. Cobalt and Mercury were detected at concentrations exceeding the surface water Class I-PL.

#### ST007

An excavation of PCB-contaminated soil was completed at ST007 in 1999 (URS 1999). The excavation treated all soils with PCB concentrations exceeding the Residential Direct Contact Soil Cleanup Criterion of 0.49 mg/kg.

However, sampling performed in 2007 as part of the RI identified concentrations of PCBs exceeding the TSCA unrestricted use standard outside of the excavation footprint of the Interim Remedial Action. A **Non-Time Critical Removal Action (NTCRA)** was completed at ST007 in 2011 to address PCBs in surface soils and subsurface soils that posed an immediate risk to site receptors (Shaw 2011). All soils with PCB concentrations exceeding the TSCA unrestricted use standard of 1.0 mg/kg were removed. Residual PCB contamination remains below the 1.0 mg/kg remedial goal of the NTCRA, but above the NJDEP RDCSRS of 0.20 mg/kg.

#### **CONTAMINANTS OF CONCERN at LF003, LF004, and ST007**

The USEPA and USAF have identified 19 contaminants in groundwater at LF003 and 20 contaminants in groundwater at LF004 that present the greatest potential risk to human health, and, therefore, trigger the need for remedial action at the sites. These contaminants were identified either (1) by a formal risk assessment process or (2) by exceeding the more stringent of the state and federal non-zero maximum contaminant goals or maximum contaminant levels.

Due to the action triggered by the health-based COCs in groundwater, 15 additional (34 total) contaminants in groundwater at LF003 and 16 additional (36 total) contaminants in groundwater at LF004 were identified at concentrations that exceed the New Jersey Class I-PL, a non-degradation standard for groundwater in the Pinelands National Reserve developed to preserve groundwater quality in its natural state. These contaminants are called non-degradation COCs. Because groundwater at OU1 discharges into the surface water of North Run Creek, the health-based and non-degradation COCs identified for groundwater are also applicable to the portions of North Run Creek within OU1. One additional compound at both LF003 and LF004 was retained as a COC due to an exceedance of the surface water Class I-PL.

#### **LF003:**

##### GROUNDWATER

The following COCs were identified as non-degradation COCs in groundwater/surface water for LF003:

VOCs: 1,2-dichloroethane<sup>1</sup>; 1,2-dichloropropane<sup>1</sup>; 1,4-dichlorobenzene; benzene<sup>1</sup>; chlorobenzene<sup>1</sup>; cis-1,2-dichloroethene<sup>1</sup>; methyl-tert-butylether; trans-1,2-dichloroethene; trichloroethene<sup>1</sup>; vinyl chloride<sup>1</sup>.

SVOCs: benzo(a)anthracene<sup>1</sup>; benzo(a)pyrene<sup>1</sup>; benzo(b)fluoranthene<sup>1</sup>; bis(2-ethylhexyl)phthalate; carbazole; chrysene; diethyl phthalate; fluorene; indeno(1,2,3-cd)pyrene<sup>1</sup>; naphthalene; pentachlorophenol<sup>1</sup>; and pyrene.

Inorganics: Aluminum<sup>1</sup>; Arsenic<sup>1</sup>; Beryllium<sup>1</sup>; Chromium<sup>1</sup>; Cobalt<sup>1</sup>; Copper; Lead<sup>1</sup>; Mercury; Nickel; Selenium; Vanadium; and Zinc.

##### SURFACE WATER

Non-degradation and health-based groundwater COCs are retained as surface water COCs. Additionally, toluene was retained as a COC in surface water due to an exceedance of the surface water Class I-PL.

**LF004:**

GROUNDWATER

The following COCs were identified as non-degradation COCs in groundwater for LF004:

VOCs: 1,4-dichlorobenzene; acetone; benzene<sup>1</sup>; chlorobenzene<sup>1</sup>; cis-1,2-dichloroethene; dichloromethane<sup>1</sup>; isopropylbenzene; trichloroethene<sup>1</sup>; vinyl chloride<sup>1</sup>; and xylene.

SVOCs: 2-methylnaphthalene<sup>1</sup>; 3-&4-methylphenol; acenaphthene; benzo(a)anthracene<sup>1</sup>; benzo(a)pyrene<sup>1</sup>; benzo(b)fluoranthene<sup>1</sup>; benzo(k)fluoranthene<sup>1</sup>; bis(2-ethylhexyl)phthalate<sup>1</sup>; carbazole<sup>1</sup>; chrysene<sup>1</sup>; dibenz(a,h)anthracene<sup>1</sup>; dibenzofuran<sup>1</sup>; diethyl phthalate; fluoranthene; fluorene; indeno(1,2,3-cd)pyrene<sup>1</sup>; naphthalene; phenanthrene<sup>1</sup>; and pyrene.

Inorganics: antimony<sup>1</sup>; arsenic<sup>1</sup>; barium; cobalt<sup>1</sup>; copper; nickel; zinc.

SURFACE WATER

Non-degradation and health-based groundwater COCs are retained as surface water COCs. Additionally, mercury was retained as a COC in surface water due to an exceedance of the surface water Class I-PL.

**ST007:**

SOIL

No risks were identified for soil; however, PCB concentrations at ST007 exceed the NJDEP unrestricted use standard of 0.2 mg/kg. Total PCBs were retained as a COC in soil at ST007.

<sup>1</sup> Additionally identified as a health-based COC

## **Contaminant Fate and Transport**

### *Fate and Transport in Soil*

Contaminants in surface soil may be transported by surface runoff. Although PCBs detected in surface soil at the ST007 are strongly **sorbed** to soil particles and would not solubilize (i.e., transfer to groundwater) easily, they could still be transported via surface soil particles and to drainage features or low-lying areas via surface runoff.

### *Fate and Transport in Surface Water*

Groundwater at OU1 discharges into the North Run and its tributaries, so they dominate the potential surface water fate and transport processes at OU1. The COCs present in the surface water are the result of infiltration from groundwater.

Contaminants in surface water at the sites may be transported to other areas within OU1 or to off-site locations by the following mechanisms: 1) volatilization (i.e., transfer to

air); 2) transfer to sediment; and 3) flow downstream.

### *Fate and Transport in Groundwater*

Groundwater discharge to North Run Creek is a potentially viable transport mechanism for dissolved contaminants in groundwater. As such, the major fate and transport mechanism for groundwater at OU1 is the discharge of groundwater to North Run Creek with subsequent exposures via surface water exposure pathways. Another potential transport mechanism pertains to the migration of VOC COCs from groundwater to soil gas.

## ***Scope and Role of the Action***

As with many Superfund sites, the contamination at the Site is complex. In order to manage the cleanup more effectively, JB MDL has organized the work into distinct phases of long-term cleanup called Operable Units, under the authority of CERCLA. This Proposed Plan addresses OU1. The response

action for OU1 will protect human health and the environment by controlling potential exposure pathways; reducing receptor risk to acceptable levels; and reducing the mobility, toxicity, or volume of contaminants in media to the appropriate **remedial goals (RGs)** based on the most stringent federal and state ARAR values. The **remedial action objectives (RAOs)** were developed to eliminate contact with landfill materials that remain and manage the potential for exposure to contaminants at concentrations that could pose unacceptable risk to human health or the environment.

The Final FFS Report (Arcadis 2019) identified **remedial alternatives** and evaluated them independently against ARARs and RAOs to determine usability and then against one another. This evaluation was ultimately used to determine the preferred alternative presented in this Proposed Plan.

Sites LF003 and ST007 are co-located. A small portion of ST007 is located outside the LF003 landfill boundary. However, this portion of ST007 is of limited areal extent and located near LF003. Therefore, much of the discussion that pertains to LF003 also pertains to ST007 by virtue of their close proximity, and remedies will be evaluated for LF003/ST007 as one site.

### ***Summary of Site Risks***

The majority of JB MDL-McGuire land use is airfield, consisting of two active runways and support facilities. Other land uses on JB MDL-McGuire include administrative facilities, aircraft operation and maintenance facilities, community spaces, housing (including family housing), industrial facilities, medical facilities, open spaces, and outdoor recreation.

An HHRA and a Screening Level Ecological Risk Assessment were conducted in 2014 and presented in the approved RI (CB&I 2014), followed by a Baseline Ecological Risk Assessment conducted in 2015 (Arcadis 2016). Exceedances of New Jersey Class II-A and Class I-PL standards, as well as the maximum contaminant levels, at LF003/ST007 and LF004 were confirmed in groundwater.

### **Human Health Risks**

The HHRA evaluated risks and hazards to the current/future base maintenance worker, current/future occasional early teen trespasser, future routine worker, future construction worker, future adult off-site resident (lifetime exposure), and future child off-site resident. For carcinogens, risks are generally expressed as the incremental probability of an individual's likelihood of developing cancer over a lifetime as a result of exposure to a carcinogen. This is referred to "excess lifetime cancer risk" because it would be in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. Human health hazard is quantified as the potential for noncarcinogenic health effects as a result of exposure to COCs, averaged over an exposure period. For known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between  $10^{-6}$  and  $10^{-4}$  (one-in-a-million to one-in-ten-thousand) as established under the NCP and a non-cancer **Hazard Index (HI)** of less than or equal to 1.0.

Total cancer risks and non-cancer hazards are discussed below, and for further details the complete HHRA is provided in the OU1 RI Report (CB&I 2014), which can be found in the Administrative Record.

### LF003/ST007

Unacceptable risks and hazards associated with LF003/ST007 were found for the future routine worker, future construction worker, future off-site adult resident (lifetime exposure), and future off-site child resident. The media identified for action based on unacceptable risk and/or hazards at LF003/ST007 are as follows:

- Groundwater: The RI (CB&I) recommended action based on calculated unacceptable risk and/or hazard for the following receptors: a future routine worker (primarily due to ingestion), a future construction worker (primarily due to inhalation), a future adult off-site resident (lifetime exposure) (primarily due to ingestion and inhalation), and a future child off-site resident (primarily due to ingestion and inhalation).
- Buried Waste: Risk and hazard calculations were not conducted for the landfill waste material as action was triggered under the presumptive remedy guidance.

Action was not triggered for any other media at LF003/ST007 based on risk or hazard.

### LF004

Unacceptable risks and hazards associated with LF004 were found for a future routine worker, future off-site adult resident (lifetime exposure), and future off-site child resident. The media identified for action based on unacceptable risk and/or hazards at LF004 are as follows:

- Groundwater: The RI (CB&I 2014) recommended action based on calculated unacceptable hazard for the following receptors: a future routine worker (due primarily to ingestion) a future adult off-site resident (lifetime exposure) (due primarily to ingestion), and a future child

off-site resident (due primarily to ingestion).

- Buried Waste: Risk and hazard calculations were not conducted for the landfill waste material as action was triggered under the presumptive remedy guidance.
  - Action was not triggered for any other media at LF004 based on risk or hazard.

### North Run

The HHRA concluded that the total risk across all media for this receptor was at  $4 \times 10^{-6}$  and total hazard was less than 1. Therefore, no action is required for this receptor and the associated media.

### **Ecological Risks**

A Screening Level Ecological Risk Assessment (SLERA) was conducted and presented within the approved RI (CB&I 2014). The assessment concluded that ecological risks at LF003/ST007 and LF004 are as follows:

- LF003/ST007: Results of the SLERA indicate that a risk management decision was warranted for surface soil based upon potential ecological impacts. A risk management decision was not warranted for surface water.
- LF004: Results of the SLERA indicated that a risk management decision was warranted for surface soil and sediment at LF004 and North Run Creek. A risk management decision was not warranted for surface water.

Based on the risk management decisions warranted in the SLERA, a Baseline Ecological Risk Assessment (BERA) was conducted in 2015. The BERA concluded that no final ecological COCs were identified

for further evaluation within the FFS. The EPA approved the BERA in March 2016

### **Basis for Action**

The following discussion provides the basis for action at LF003/ST007 and LF004 based upon the approved RI and subsequent groundwater sampling:

- Groundwater at LF003 and LF004: Action is triggered through both calculated unacceptable risk or hazard and exceedance of Federal or State MCL/MCLG.
- Buried waste at LF003 and LF004: Action is triggered as unacceptable human health risk is assumed within the landfill boundary under the application of the presumptive remedy, which is applicable at LF003 and LF004.
- Soils at ST007: A NTCRA performed in 2011 initiated an action (soil removal) and stipulated further action (Land Use Controls) be implemented for soil at ST007. As a result, actions are required for soils at ST007 (only).
- Surface Water at LF003 and LF004: Action is triggered for surface water through the exceedance of New Jersey Surface Water Quality Criteria.

Based on the approved RI, no action is required for soil outside of the landfill boundary or sediment at LF003 (including the North Run Corridor) or LF004 as there are no calculated unacceptable human health risks or hazards, nor did the approved Baseline Ecological Risk Assessment identify any final ecological COCs for further evaluation in the FS. Therefore, no action to address ecological risk is required. As part of the groundwater action, surface water will be

monitored for groundwater COCs to ensure continued protectiveness as groundwater from LF003 discharges to North Run.

It is the USAF's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

### ***Remedial Action Objectives***

RAOs are media and site-specific goals based on human health and environmental factors, which are considered in the development of remedial alternatives. Such objectives are developed based on the criteria outlined in Section 300.430(e)(2) of the NCP and Section 121 of CERCLA. Considering protection of human health and the environment, future land use, and the results of the HHRA and Baseline Ecological Risk Assessment, and the Pineland Standards, the following preliminary RAOs were developed:

#### *Landfills (LF003 and LF004)*

- Landfill RAO (Human Health) – Prevent human contact to all landfill waste, including direct contact with the buried waste material.

#### *Groundwater (LF003 and LF004)*

- Groundwater RAO No.1 (Human Health) – Prevent human exposure (due to ingestion) to COCs (see “Contaminants of Concern at LF003, LF004, and ST007” call-out box) exceeding health-based standards in excess of the RGs presented in **Table 2**.
- Groundwater RAO No.2 (Environmental) – Maintain **Classification Exception Area (CEA)**

and monitor groundwater for areas where site-related COCs exceed Pinelands standards (**Table 1**) and prevent further degradation of groundwater quality for site-related constituents beyond the limit of the OU1 landfill areas, given the landfills will remain in-place.

In addition to the base-wide CEA, which has been effective as of March 2, 2018, specific points of compliance for the OU1 landfills will be developed for regulatory review and approval as part of the JB MDL-McGuire OU1 design documents, which will utilize the NJDEP downgradient well requirements.

#### Soil (ST007)

- Soil RAO (Human Health) – Prevent future resident exposure to PCB contamination in soil exceeding the unlimited use/unrestricted exposure standard (0.2 mg/kg).

#### Surface Water (LF003 and LF004)

- Surface Water RAO (Environmental) – Prevent further degradation of surface water quality by reducing concentrations of site-related COCs to the RGs.

**Preliminary Remedial Goals** are media-specific cleanup goals for a selected remedial action. They are established for each of the COCs identified by media. The COCs for OU1 consist of both (1) health-based and (2) non-degradation COCs. The following subsections discuss the identification and selection of preliminary remedial goals for each media whereby COCs were identified (i.e., sediment did not have unacceptable risk and soil meets the remedial goals of the NTCRA).

#### Preliminary Remedial Goal for Landfill Waste

The landfill presumptive remedy will be employed to contain the landfill materials consistent with USEPA's presumptive

remedy guidance (Office of Solid Waste and Emergency Response Directive [OSWER] Directive No. 9355.0-49FS) and 40 CFR 300.430(a)(iii)(B). As part of the landfill presumptive remedy, containment of the wastes and prevention of direct contact with waste and soils will be required by the remedy.

#### Preliminary Remedial Goals for Groundwater and Surface Water

Preliminary remedial goals are established for both health-based and non-degradation COCs. The health-based preliminary remedial goals are based upon promulgated health-based standards. These promulgated state and federal standards were compared, and the more stringent of the standards were selected as the health-based preliminary remedial goals. The non-degradation preliminary remedial goals are the Class I-PLs (i.e., the least stringent of the PQL and Background Threshold Value). Non-degradation standards are not based upon unacceptable risks or hazards, but rather returning the sites to background conditions. The preliminary remedial goals for groundwater and surface water are presented on **Tables 2** and **3**, respectively.

#### Preliminary Remedial Goal for Soil

Preliminary remedial goals for soil were based upon the NRDCSRS for ST007. The NRDCSRS would achieve the RAOs but would require **Land Use Controls (LUCs)** to ensure the continued protection of human health.

It should be noted that the preliminary remedial goals are proposed goals and will be finalized within the **Record of Decision**. Additional discussion in the identification and selection of preliminary remedial goals is contained within the Final FFS (Arcadis 2019).

## ***Summary of Remedial Alternatives***

This section summarizes the remedial action alternatives developed for the LF003/ST007 and LF004 sites to meet the RAOs. A detailed analysis was conducted in accordance with the USEPA *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (USEPA 1988) and, as presented in the Final FFS (Arcadis 2019), is summarized below.

The alternatives for LF003/ST007 and LF004 were prepared under the auspices of USEPA's guidance on the *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills* (USEPA 1996). The USEPA expects engineering controls, such as containment, to be utilized for waste that poses a relatively low long-term threat or where treatment is impractical. Generally, treatment of waste within a landfill is considered impractical due to the volume and heterogeneity of the waste material. As part of the landfill presumptive remedy, the remedy will require containment of the wastes and prevention of direct contact with waste and soils.

Four remedial alternatives were developed for LF003/ST007 and LF004 as follows:

- Alternative 1 – No Action: No remedial action of any kind would be employed at the site to address the landfill, impacted soils, or impacted groundwater;
- Alternative 2 – Optimized Soil Cover, LUCs, and **Long-Term Monitoring (LTM)**;
- Alternative 3 – Supplemental 2-ft thick Soil Cover, LUCs, and LTM; and
- Alternative 4 – Resource Conservation and Recovery Act (RCRA) Subtitle D Cap, LUCs, and LTM.

Alternatives 2, 3, and 4 would implement LUCs to meet RAOs at LF003/ST007 and LF004. Groundwater LUCs include a **CEA/Well Restriction Area (WRA)**, and landfill and soil LUCs could potentially include physical, legal (i.e., deed restrictions or equivalent), and administrative (i.e., no dig permits allowed and restricted personnel) mechanisms to restrict access and prevent construction at the site. Alternatives 2, 3, and 4 all implement a form of capping method; however, the extent of capping technologies varies between the alternatives, with Alternative 2 being the least extensive capping method and Alternative 4 being the most extensive. Additionally, Alternatives 2, 3, and 4 implement LTM to evaluate the effectiveness of capping and LUCs (i.e., CEA/WRA) to prohibit groundwater use, eliminating the primary human exposure pathway.

A summary discussion of each alternative is provided below. The types of costs assessed include the following:

- capital costs, including both direct and indirect costs;
- annual operating and maintenance (O&M) costs; and
- net **present worth** of capital and O&M costs.

An analysis of the various alternative's strengths and weaknesses is described further in the *Evaluation of Alternatives* section. Additional detail regarding the development and evaluation of remedial alternatives can be found in the Final FFS (Arcadis 2019).

### **LF003/ST007**

The following alternatives were developed for LF003/ST007.

### **Alternative 1 No Further Action**

*Estimated Capital Cost: \$0*

*Estimated Total O&M Cost: \$0*

*Estimated Present Worth Cost: \$0*

*Estimated Construction Timeframe: Not Applicable*

*Estimated Time to Achieve RAOs: N/A*

The NCP requires that the “No Further Action” alternative be developed and examined as a potential remedial action for all sites. The alternative includes no remedial action for treatment, control, or monitoring of site groundwater. This alternative would be readily implementable. There are no costs associated with “No Further Action.” The “No Further Action” alternative is required by USEPA’s NCP and USEPA guidance as a baseline with which to compare other remedial action alternatives.

### **Alternative 2 Optimized Soil Cover, LUCs, and LTM of Groundwater and Surface Water**

*Estimated Capital Cost: \$951K*

*Estimated Lifetime O&M Cost: \$1.16M*

*Estimated Present Worth Cost: \$2.11M*

*Estimated Construction Timeframe: 3 months*

*Estimated Time to Achieve RAOs: immediately following implementation of alternative*

Under this alternative, the existing vegetated soil cover currently in-place over the 21.5-acre landfill would be inspected and maintained. The existing vegetated soil cover is 2 ft to 8 ft thick across the majority of the site and is protective of human health under the current and reasonably anticipated future land uses. Portions of the LF003/ST007 sites that do not have 2 ft of soil cover will be augmented to achieve the requisite cover depth (minimum of 2 ft).

A pre-design investigation would be required to (1) identify areas of the existing landfill cover that would require being augmented with additional soil cover to achieve the requisite 2-ft minimum soil cover and (2) evaluate the slope stability of the existing landfill cover that abuts the North Run embankment. This portion of LF003 would be stabilized by regrading of the sub-base and installation of erosion matting and riprap to prevent erosion of the landfill cover along the top of the slope adjacent to the North Run Creek. **Figure 4** presents the potential locations requiring additional fill and stabilization (based on observations from a site walk); however, the entire landfill surface will be evaluated for landfill cover thickness.

LTM of groundwater and surface water would be implemented to monitor COC concentrations. Although there are no unacceptable risks or hazards to sediment, the sediment or porewater would be sampled for a limited duration following remedy implementation to assess whether the installation of the optimized soil cover results in transient conditions in sediment and/or porewater conditions.

PCB-contaminated soil at ST007 above the RDCSRS will be managed using LUCs to restrict residential use of the site in the future. LUCs for the buried waste and the overlying soil will consist of engineering controls (e.g., signage) describing restrictions to site use and activities (e.g., no digging) to prevent exposure of buried waste at the site. Groundwater use controls (i.e., CEA/WRA) would be established to identify the area of ARAR exceedances and to control the use of groundwater within the OU1 area. Because LUCs would be implemented in the same manner for Alternatives 2 through 4, the implementation and types of LUCs is more

comprehensively discussed in the Preferred Alternative Section.

**Alternative 3 Supplemental 2-ft-Thick Soil Cover, LUCs, and LTM of Groundwater and Surface Water**

*Estimated Capital Cost: \$8.47M*

*Estimated Lifetime O&M Cost: \$1.16M*

*Estimated Present Worth Cost: \$9.63M*

*Estimated Construction Timeframe: 6 months*

*Estimated Time to Achieve RAOs: immediately following implementation of alternative*

Under this alternative, an additional 2-ft-thick soil cover would be placed across the entirety of LF003 (requiring extensive clearing of mature forest) and the waste will remain in-place. The current landfill cover would be regraded and the new 2-ft-thick soil cover would be placed atop the landfill, regardless of the existing soil cover thickness. The newly installed 2-ft-thick soil cover would consist of 20 inches of fill material atop the subgrade and 4 inches of top soil. **Figure 5** presents the proposed cut and fill quantities under this alternative, and **Figure 6** presents the final estimated grades of the landfill cover. The soil cover would be compacted. However, compaction is not necessarily intended to preclude infiltration of precipitation through the soil or buried waste.

The North Run embankment would be investigated and stabilized as discussed under Alternative 2.

The alternative would also include LTM of groundwater and surface water, LUCs for soil at ST007, and buried waste and groundwater at LF003, as laid out under Alternative 2. Existing groundwater monitoring wells would need to be abandoned prior to

installation of the soil cover and would be reinstalled following completion of the cover.

**Alternative 4 RCRA Subtitle D Cap, LUCs, and LTM of Groundwater and Surface Water**

*Estimated Capital Cost: \$9.94M*

*Estimated Lifetime O&M Cost: \$1.16M*

*Estimated Present Worth Cost: \$11.10M*

*Estimated Construction Timeframe: 10 months*

*Estimated Time to Achieve RAOs: immediately following implementation of alternative*

Alternative 4 consists of the installation of a RCRA Subtitle D Cap (i.e., a geosynthetic clay liner and a geotextile membrane to act as a composite confining layer and prevent infiltration, and a drainage layer) placed over the entirety of LF003 (requiring extensive clearing of mature forest). A 2-inch-thick protective soil layer would be placed above the subgrade and compacted for stability to protect the clay liner and membrane from potential punctures. Minimal excavation would be required to install a trench to key-in the clay liner and membrane. The drainage layer would be placed atop the clay liner and would consist of 20 inches of fill material and 4 inches of top soil. **Figure 5** presents the proposed cut and fill quantities under this alternative, and **Figure 6** presents the final estimated grades of the landfill cover.

The North Run embankment would be investigated and stabilized as discussed under Alternative 2.

The alternative would include LTM of groundwater and surface water, LUCs for soil at ST007, and buried waste and groundwater at LF003 as laid out under Alternative 2. Existing groundwater monitoring wells

would need to be abandoned prior to installation of the soil cover and would be reinstalled following completion of the cap. However, the groundwater monitoring network would not extend into the landfill to prevent puncture of the cap.

#### **LF004**

The alternatives developed for LF004 are similar to the alternatives described for LF003/ST007; however, actions related to soil contamination at ST007 are not included. Nor will there be the need to conduct a slope stability evaluation or to stabilize the landfill cap along the North Run as the slopes of the North Run are generally flatter compared to LF003.

#### **Alternative 1 No Further Action**

*Estimated Capital Cost: \$0*

*Estimated Lifetime O&M Cost: \$0*

*Estimated Present Worth Cost: \$0*

*Estimated Construction Timeframe: Not Applicable*

*Estimated Time to Achieve RAOs: N/A*

The NCP requires that the “No Further Action” alternative be developed and examined as a potential remedial action for all sites. The alternative includes no remedial action for treatment, control, or monitoring of site groundwater. This alternative would be readily implementable. There are no costs associated with “No Further Action.” The “No Further Action” alternative is required by USEPA’s NCP and USEPA guidance as a baseline with which to compare other remedial action alternatives.

#### **Alternative 2 Optimized Soil Cover, LUCs, and LTM of Groundwater and Surface Water**

*Estimated Capital Cost: \$649K*

*Estimated Lifetime O&M Cost: \$742K*

*Estimated Present Worth Cost: \$1.39M*

*Estimated Construction Timeframe: 3 months*

*Estimated Time to Achieve RAOs: immediately following implementation of the alternative*

This alternative is similar to that described for LF003/ST007 except that LF004 is almost completely covered in mature forest and has an existing soil cover approximately 1 ft in thickness. The existing soil cover will be augmented to achieve the requisite cover depth of 2 ft, and additional care will be taken to protect the existing mature vegetation. The other aspects of this optimized soil cover are the same as for LF003/ST007; however, stabilization of the North Run embankment is not necessary, as steep slopes are not present at LF004. **Figure 7** presents the potential locations requiring additional fill (i.e., the optimized soil cover), which was based on observations from an initial site reconnaissance. A pre-design investigation will be performed to identify areas of the existing landfill cover requiring additional soil cover to achieve the requisite 2-ft minimum thickness.

LTM would be implemented for groundwater and surface water at LF004, and sediment or porewater sampling may be implemented, as described in Alternative 2 for LF003/ST007. LUCs would be implemented for buried waste and groundwater at LF004, similar to LF003.

#### **Alternative 3 Supplemental 2-ft-Thick Soil Cover, LUCs, and LTM of Groundwater and Surface Water**

*Estimated Capital Cost: \$1.59M*

*Estimated Lifetime O&M Cost: \$772K*

*Estimated Present Worth Cost: \$2.37M*

*Estimated Construction Timeframe: 6 months*

*Estimated Time to Achieve RAOs:  
immediately following implementation of the  
alternative*

Under this alternative, an additional 2-ft-thick soil cover would be placed across the entirety of LF004 (requiring extensive clearing of mature forest) and the waste will remain in-place. The soil cover would be installed in a similar manner as described for Alternative 3 at LF003. **Figure 8** presents the proposed cut and fill quantities under this alternative, and **Figure 9** presents the final estimated grades of the landfill cover.

The alternative will also include LTM of groundwater and surface water, and LUCs for buried waste and groundwater, similar to LF003.

**Alternative 4 RCRA Subtitle D Cap, LUCs, and LTM of Groundwater and Surface Water**

*Estimated Capital Cost: \$1.81M*

*Estimated Annual O&M Cost: \$772K*

*Estimated Present Worth Cost: \$2.58M*

*Estimated Construction Timeframe: 10  
months*

*Estimated Time to Achieve RAOs:  
immediately following implementation of the  
alternative*

Alternative 4 consists of a RCRA Subtitle D Cap (i.e., a geosynthetic clay liner and a geotextile membrane to act as a composite confining layer and prevent infiltration, and a drainage layer), placed over the entirety of LF004 (requiring extensive clearing of mature forest). The RCRA Subtitle D Cap would be installed in a similar manner as described for Alternative 4 at LF003. **Figure 8** presents the proposed cut and fill quantities under this alternative, and **Figure 9** presents the final estimated grades of the landfill cover.

The alternative will include LTM of groundwater and surface water, and LUCs for buried waste and groundwater, similar to LF003.

<b>Summary of Remedial Alternatives McGuire – OU1 (LF003, LF004, and ST007)</b>	
<b>FFS Designation</b>	<b>Description</b>
Alternative 1: No Further Action	No action of any kind would be taken at the site to address the landfill, impacted soils, or impacted groundwater.
Alternative 2: Optimized Soil Cover, LUCs, and LTM of Groundwater and Surface Water	<ul style="list-style-type: none"> <li>• Inspection and maintenance of existing vegetated soil cover to maintain a minimum of 2 ft in thickness.</li> <li>• Requires limited clearing of mature forest.</li> <li>• Installation of additional soil, where necessary, to meet the requisite 2-ft-thick soil cover.</li> <li>• Implementation of LUCs for buried waste and groundwater.</li> <li>• (ST007 Only) LUCs for PCB-contaminated soil at ST007 (i.e., not applicable for LF003 or LF004) would restrict future residential use of the site.</li> <li>• LTM of surface and groundwater to monitor for impacts due to significant changes within the landfills.</li> </ul>
Alternative 3: Supplemental 2-ft-Thick Soil Cover, LUCs, and LTM of Groundwater and Surface Water	<ul style="list-style-type: none"> <li>• Installation of an additional 2-ft-thick soil cover placed across entirety of landfill.</li> <li>• Requires extensive clearing of mature forest.</li> <li>• Includes LUCs for buried waste and groundwater.</li> <li>• (ST007 Only) LUCs for PCB-contaminated soil at ST007 (i.e., not applicable for LF003 or LF004) would restrict future residential use of the site.</li> <li>• LTM of groundwater and surface water.</li> </ul>
Alternative 4: RCRA Subtitle D Cap, LUCs, and LTM of Groundwater and Surface Water	<ul style="list-style-type: none"> <li>• Installation of a RCRA Subtitle D Cap to prevent direct contact of buried waste and infiltration of precipitation placed over the entirety of landfill.</li> <li>• Requires extensive clearing of mature forest.</li> <li>• Includes LUCs for buried waste and groundwater.</li> <li>• (ST007 Only) LUCs for PCB-contaminated soil at ST007 (i.e., not applicable for LF003 or LF004) would restrict future residential use of the site.</li> <li>• LTM of groundwater and surface water.</li> </ul>

<b>Evaluation Criteria for Superfund Remedial Alternatives</b>	
<b>THRESHOLD CRITERIA</b>	
<b>Overall Protectiveness of Human Health and the Environment</b>	determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
<b>Compliance with ARARs</b>	evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.
<b>PRIMARY BALANCING CRITERIA</b>	
<b>Long-term Effectiveness and Permanence</b>	considers the ability of an alternative to maintain protection of human health and the environment over time.
<b>Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment</b>	evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
<b>Short-term Effectiveness</b>	considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
<b>Implementability</b>	considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
<b>Cost</b>	includes estimated capital and annual O&M costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
<b>MODIFYING CRITERIA</b>	
<b>State/Support Agency Acceptance</b>	considers whether the state agrees with the USAF's and USEPA's analyses and recommendations, as described in the RI, FFS, and Proposed Plan.
<b>Community Acceptance</b>	considers whether the local community agrees with the USAF's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

### ***Evaluation of Alternatives***

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration.

The nine criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description of the purposes of the three groups follows:

- Threshold criteria, which are requirements that each alternative must meet in order to be eligible for selection.
- Primary balancing criteria, which are used to weigh major trade-offs among alternatives.
- Modifying criteria, which may be considered to the extent that information is available during the FFS but can be fully considered only after public comment is received on the Proposed Plan.

The nine evaluation criteria are discussed below. The “Detailed Analysis of Alternatives” can be found in the FFS. To compare alternatives qualitatively, general ratings of poor, adequate, good, and excellent were assigned to the alternatives for each of the evaluation criteria, based on a subjective appraisal of the degree to which the alternatives meet the criteria. The ratings are defined as follows:

- Poor – Achieves little to no aspects of the criterion;
- Adequate – Achieves some aspects of the criterion;
- Good – Achieves most aspects of the criterion; and
- Excellent – Achieves all aspects of the criterion.

### **1. Overall Protection of Human Health and the Environment**

With the exception of Alternative 1, each of the remaining alternatives is protective of human health and the environment in the long-term. Alternatives 2, 3, and 4 are protective of human health and the environment through containment of buried waste, resulting in isolation of the waste and an incomplete pathway for human and ecological exposure. Additionally, the LUCs associated with each alternative prevent disturbance of PCB-contaminated soil at ST007 or disturbance and penetration of the landfill cover.

While residual risks would remain at the end of the action for all alternatives, these are landfill sites that meet the criteria for selection of a presumptive remedy (capping and leaving waste material in-place). Groundwater LUCs (e.g., CEA/WRA) would help prevent the use and consumption of groundwater within the boundary of the CEA (established by NJDEP on March 2, 2018)

(Arcadis 2018), therefore eliminating the possible human exposure pathway.

LTM of groundwater and surface water at LF003 and LF004 would identify changing conditions within groundwater and surface water and provide advance notification of increasing contaminant trends and allow for an expansion of the LTM network.

Alternatives 2, 3, and 4 would all meet chemical-specific ARARs at the points of compliance (i.e., to be established in the **Remedial Design**) and provide controls (monitoring) within the CEAs. These alternatives would comply with the substantive requirements of the action- and location-specific ARARs through proper design and execution. Routine inspections and maintenance of the cover would ensure that LUCs remain effective and protective of human health and the environment. Adequate controls and protections would be in-place under all alternatives to manage the residual risks, which include the caps, LUCs, and LTM. CERCLA Five-Year Reviews would be required and would be used to ensure the remedies remain protective.

Alternative 1 takes no remedial actions and provides no mechanisms to preclude human and ecological exposure of buried waste at LF003/ST007 and LF004, PCB-contaminated soil at ST007, and impacted groundwater and surface water at LF003 and LF004.

Rating under this threshold category is either “meets” or “does not meet” Overall Protection of Human Health and the Environment. Alternative 1 does not meet this threshold criteria. Alternatives 2, 3, and 4 all meet the threshold criteria.

## **2. Compliance With ARARs**

Chemical-specific ARARs were established for soil at ST007 and for groundwater and surface water at LF003 and LF004. There are no chemical-specific ARARs for buried waste, as they are not applicable for landfills under the Presumptive Remedy.

At ST007, under Alternatives 2, 3, and 4, PCB concentrations in soil would remain above the NJDEP RDCSRS chemical-specific ARARs, but below NJDEP Non-Residential Direct Contact Soil Remediation Standards. LUCs would be implemented under Alternatives 2, 3, and 4 to prevent residential development at ST007.

At LF003 and LF004, under Alternatives 2, 3, and 4, groundwater currently exceeding chemical-specific ARARs would be included in the CEA. Groundwater downgradient from LF003 and LF004, outside the boundary of the CEA, would comply with chemical-specific ARARs for groundwater. Surface water downgradient from LF003 and LF004 would comply with the chemical-specific ARARs for surface water.

Location-specific ARARs include requirements to minimize and control impacts to wetlands and floodplains, comply with the substantive requirements of the Pineland Comprehensive Management Plan, and comply with USAF regulations. Adherence to the substantive requirements for the disruption of the Pinelands Protection Area and wetland disturbance would be documented in the Remedial Design under Alternatives 2, 3, and 4. The activities under these alternatives would comply with location-specific ARARs.

Action-specific ARARs include requirements for the management of hazardous wastes, soil erosion and sediment control, and air quality during construction

activities. The activities that would be conducted under Alternatives 2, 3, and 4 would comply with all action-specific ARARs. The Remedial Design would contain specifics as to how the selected remedy would comply with action-specific ARARs (e.g., erosion and sediment control).

Alternative 1 fails to comply with ARARs as no remedial actions are taken and no LTM program is implemented to monitor anticipated declines in COCs documenting compliance with ARARs.

Rating under this threshold category is either “meets” or “does not meet” Compliance with ARARs. Alternative 1 does not meet this threshold criteria. Alternatives 2, 3, and 4 all meet the threshold criteria.

## **3. Long-Term Effectiveness and Permanence**

Alternatives 2, 3, and 4 are effective in the long-term at preventing direct contact with waste material left in-place and minimizing the potential risk. The residual risks would include the hypothetical future exposure of waste material allowing direct contact and/or direct contact/ingestion of groundwater as soil covers and caps may potentially lose integrity over time. However, routine inspections and maintenance would increase the long-term reliability of the cover to control contaminant exposure and eliminate the potential for direct contact. Alternatives 2, 3, and 4 all have an equivalent magnitude of residual risk associated with the buried waste remaining in-place in perpetuity.

LUCs would be established under Alternatives 2, 3, and 4 and would help prevent development of residential property, thus eliminating the potential risk to residents and future construction workers posed by the residual PCBs (at ST007), and due to the waste-in-place that would be left at the sites. The reliability of LUCs would depend on the

maintenance and enforcement of the controls, which would be required indefinitely because PCB-contaminated soil and waste-in-place would remain on site. Five-year CERCLA reviews would be required.

Alternative 1 has poor long-term effectiveness as no controls are implemented for monitoring any reduction in COC concentrations over time, reduction of exposure, or long-term management measures.

Under this balancing criterion, Alternative 1 is rated as poor, and Alternatives 2, 3, and 4 as excellent. Alternatives 2, 3, and 4 pose the same magnitude of residual risk following the implementation of the remedial action.

#### **4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment**

Alternatives 2, 3, and 4 do not reduce the toxicity, mobility, or volume of the buried waste at LF003/ST007 and LF004 through treatment. Because these landfill sites meet the criterion for the presumptive remedy (capping and leaving waste material in-place), none of the alternatives incorporate active treatment as a component of the remedy. However, there are no principal threat wastes at these sites. Any toxicity due to direct contact with landfill waste would be eliminated to both human and environmental receptors, as the soil covers or RCRA Subtitle D cap would be a physical barrier between receptors and wastes. While these alternatives do not irreversibly reduce the mobility of buried waste, these alternatives reduce the potential for exposure and transport of buried waste.

Alternatives 2, 3, and 4 would not substantially reduce mobility of contaminants in buried waste by minimizing infiltration from precipitation, as

approximately 75 percent of the buried waste is in direct contact with groundwater.

Under Alternative 2, several of the organic COCs (e.g., benzene and chlorobenzene) may degrade under aerobic conditions, thereby reducing the toxicity and volume of organic COCs in groundwater. The existing soil covers at LF003/ST007 and LF004 generally consist of a well-graded sand and allow for the transfer of oxygen through the soils, allowing aerobic degradation of volatile COCs to occur. In addition, the existing soil covers may mitigate metals dissolution due to the reducing anaerobic conditions typically found within a landfill. Alternatives 3 and 4 do not reduce the toxicity, mobility, or volume of contaminants in groundwater because they would reduce the transfer of oxygen through soils.

Implementation of LUCs at ST007 under Alternatives 2, 3, and 4 would not reduce the toxicity, mobility, or volume of PCBs in soil in excess of NJDEP RDCSRS through treatment because contaminants would be left in-place. However, PCBs by nature are relatively immobile once adsorbed to soil and, therefore, their potential for transport is reduced by LUCs through the prohibition of digging and the maintenance of vegetation, which locks soil in-place and prevents erosional transport.

LTM of groundwater and surface water at LF003 and LF004, which would be implemented under Alternatives 2, 3, and 4, would not reduce the toxicity, mobility, or volume of source contaminants that may impact surface water. However, the potential for transport of source wastes would be reduced through implementation of the Presumptive Remedy and is anticipated to improve surface water quality.

Alternative 1 does not employ any active treatment mechanisms to buried waste at LF003/ST007 and LF004, PCB-contaminated soils at ST007, or groundwater and surface water at LF003 and LF004. Natural attenuation mechanisms may reduce the toxicity, mobility, or volume of contaminants in groundwater and surface water; however, no LTM would be implemented and reductions in concentrations could not be verified.

Under this balancing criterion, Alternative 1 was rated as poor. Alternative 2 was rated as good, and Alternatives 3 and 4 were rated as adequate (due to the potential for the additional 2-ft soil cover and RCRA Subtitle D caps to create anaerobic conditions that may mobilize metals).

#### **5. Short-term Effectiveness**

Alternatives 2, 3, and 4 would be protective of the surrounding community, remedial workers, and the environment during remedy implementation primarily because all activities would occur with no anticipated disturbance of waste material. Under Alternative 2, a limited increase in truck traffic would result from the transport of equipment and materials to the sites for augmenting the soil cover and potentially during routine maintenance/repairs. A significant increase in truck traffic would occur under Alternatives 3 and 4 due to an order of magnitude increase in the volume of soil required to complete the remedy, as well as an increase in the volume of vegetation to be removed from the sites. Short-term risks associated with all activities utilizing remedial workers would be minimized through the implementation of an effective required health and safety program.

No dangers to human health or the environment would exist during implementation of Alternatives 2, 3, or 4 at

ST007. The HHRA indicated that risk does not exist for the current low-level PCB surface soil contamination. PCB contamination would be disturbed under Alternative 4 to excavate a trench for the geosynthetic membrane to key-in to. However, there are no unacceptable risks/hazards associated with residual PCBs at ST007 for construction workers.

Groundwater and surface water LTM implemented under Alternatives 2, 3, and 4 is minimally intrusive and does not involve the use of heavy equipment or exposing debris but would generate standard investigation-derived waste and minimal personal protective equipment. Standard safe handling practices of waste would not pose a risk to the community or environment.

While implementation of Alternative 1 does not pose any short-term risks since there are no remedial activities associated with it, there are no actions taken to monitor and document any existing or potential future risks. Under this balancing criterion, Alternative 1 was rated poor. Alternative 2 was rated excellent, and Alternatives 3 and 4 were rated good.

#### **6. Implementability**

Alternative 2 is readily implementable with limited disturbance to the Pinelands Protection Area, whereas Alternatives 3 and 4 would require significant disturbance to the Pinelands Protection Area. Alternatives 3 and 4 require approximately 15 acres and 6 acres, respectively, of mature hardwood forest to be removed and disposed of off-site. Under Alternative 2, a pre-design investigation would be required to augment the current soil cover and for the North Run embankment stabilization at LF003. However, Alternatives 3 and 4 have significantly more robust design requirements due to the complexity of the soil cover and RCRA Subtitle D cap, and due to the potential

stormwater management systems necessary to treat turbidity prior to discharge into the North Run Creek.

Equipment, materials, and services are readily available to augment the soil cover under Alternative 2. However, an order of magnitude increase in the volume of clean fill is required to implement Alternatives 3 and 4. This volume of fill may not be readily available from one vendor and may require a variety of suppliers. Coordinating truck delivery of this volume of fill has potential to cause delays during implementation. Additionally, while RCRA Subtitle D caps are constructed routinely, there are additional challenges because of the specialized equipment, materials, supplies, contractors, and quality control necessary to install the geosynthetic clay liner and geosynthetic membrane.

All actions under Alternatives 2, 3, and 4 would be implemented under CERCLA and thus do not require permits; however, adherence to the substantive requirements of permits would otherwise be required as ARARs would be documented as part of the Remedial Design. Approvals for Alternatives 3 and 4 may require a longer review period than Alternative 2 due to the level of clearing within the Pinelands Protection Area and stormwater treatment requirements.

LUCs at ST007 and LTM of groundwater and surface water at LF003 and LF004 can be easily implemented under Alternatives 2, 3, and 4.

While Alternative 1 does not pose any implementability issues, there are no remedial activities associated with it and there are no actions taken to monitor and document any existing or potential future risks.

Under this balancing criterion, Alternative 1 was rated poor, Alternative 2 excellent, and Alternatives 3 and 4 adequate.

## **7. Cost**

There are no present worth costs and capital costs for the no action alternative because no actions would be undertaken. However, none of the RAOs or RGs would be attained by this zero-cost alternative.

Based on the present worth estimates for the alternatives, Alternatives 3 and 4 are far less effective as they have significant capital costs associated with construction, materials, and equipment. Approximately 100,000 cy of clean fill and top soil are required to implement Alternatives 3 and 4. Additionally, Alternative 4 requires 110,000 square yards of a geocomposite clay liner and a 20-mil geosynthetic membrane. Alternative 2 achieves RAOs for OU1 for the lowest cost, as construction costs for this alternative are substantially less than Alternatives 3 and 4. Alternative 2 requires less imported materials (i.e., approximately 14,200 cy of clean fill are required as compared with the approximately 100,000 cy for Alternatives 3 and 4) and is less intrusive of the Pinelands Protection Area.

Under this balancing criterion, Alternative 1 was rated excellent, Alternative 2 excellent, Alternative 3 adequate, and Alternative 4 poor.

## **8. State/Support Agency Acceptance**

Approval of the Preferred Alternative presented in this Proposed Plan is expected. Regulatory approval will be further evaluated in the Record of Decision following the public comment period.

## **9. Community Acceptance**

Community acceptance of the Preferred Alternative will be evaluated after the public

comment period for this Proposed Plan. All community input will be incorporated into the Record of Decision, which formalizes the selection of the remedy for LF003/ST007 and LF004.

### ***Summary of Preferred Alternative***

The following sections describe the preferred alternatives for LF003/ST007 and LF004.

#### **LF003/ST007**

The Preferred Alternative for Site LF003/ST007 is Alternative 2: Optimized Soil Cover, LUCs, and LTM of Groundwater and Surface Water. Alternative 2 is necessary because COCs at the Site pose a threat to human health and the environment if no action is taken, and Alternative 2 provides adequate protection and monitoring while causing less disturbance to the site than Alternatives 3 and 4. Maintenance of the Soil Cover, CERCLA Five-Year Reviews, LUCs, and LTM would remain in-place in perpetuity.

Under Alternative 2, portions of the landfill that have less than the requisite 2 ft of soil cover would be augmented with additional fill material to ensure that all of the buried waste has a minimum 2-ft soil cover.

Fill material may be obtained from on site (i.e., high spots on LF003/ST007 with an excess of fill material may be regraded to provide additional fill). Alternatively, clean fill may be imported from off site. In general, this alternative would strive to maintain the existing grades. However, there may be occasion to import additional fill material resulting in a slight topographic rise. Should this be necessary, the imported fill material would be graded such that it makes a smooth transition to the existing grades and does not pose an obstruction to maintenance equipment (e.g., mowers). All fill materials

(i.e., on-site or imported) will be sampled for analytical evaluation to verify usability.

Prior to construction, a pre-design investigation would be conducted to verify a minimum 2-ft soil cover over the waste by using soil sample probes. The pre-design investigation would include chemical analysis for an evaluation to ensure that the existing soil cover is protective of human health and the environment. The pre-design investigation would also consist of a further geotechnical investigation of the embankment along the northern edge of the landfill boundary. Although the North Run embankment was previously investigated for its geotechnical properties, the intent of a further geotechnical investigation is to enhance the understanding of the slope stability along the North Run embankment to sufficiently allow for a final engineering design.

The final component of the pre-design investigation would also include a topographic survey of the existing grades and along the landfill cover and the North Run embankment. Additionally, if determined to be necessary, a Natural Resources survey would be performed to evaluate the site for natural and cultural resources. The presence of NR eligible sites (if applicable) will be addressed within the Remedial Design.

It is assumed that stabilization of the North Run embankment would consist of the following components:

- Clearing and grubbing of approximately 32,000 square feet of the embankment;
- Regrading of the embankment so that slopes do not exceed a maximum of 3 (horizontal):1 (vertical) and to ensure that regraded areas transition smoothly with existing topography; and

- Installation of erosion matting and riprap (a type of stone used to stabilize slopes) over the requisite 2 ft of clean fill.

The augmented portions of the soil cover may generally consist of 20 inches of common fill material with a 4-inch top soil layer. Site restoration would consist of finish grading the top soil layer and then revegetating disturbed surfaces with a sod-forming grass.

Periodic maintenance would ensure the continued protectiveness of this alternative. Maintenance will consist of the following:

- Annual inspections would be conducted to observe for signs of landfill cover failure (e.g., slumping, subsidence, significant erosion, slope failure along the North Run) and for any evidence of new DMM/MPPEH items. If found, these items would be removed from the site and the EOD reports included in the annual inspection reports submitted to EPA and NJDEP. The five-year reviews would include an assessment of DMM finds (if any) as part of assessing the remedy protectiveness.
- Periodic repairs would be conducted if signs of cover failure are evident.
- Forested areas would be preserved and allowed to remain in their natural state as part of this alternative. However, forested areas will be inspected annually for evidence of soil erosion exposing waste, or for fallen trees that are uprooted and exposing waste. These areas will be repaired with a minimum 2-ft soil cover.
- Grassed areas would be periodically mowed to preclude weedy vegetation establishment and to facilitate visual inspections of the landfill cover.

- CERCLA Five-Year Reviews.
- Geodetic monuments will be installed during the initial response and settlement surveys of the landfill will be completed every five years in support of the five year review.

PCBs-contaminated soil above the NJDEP RDCSRS remains within ST007 following the NTCRA. Delineation of the areas known to have PCB contamination in soil in excess of 0.20 mg/kg would be refined in the Remedial Design stage. The establishment of LUCs through the amendment of the JB MDL General Plan would be applied to the ST007 area outside of the LF003 optimized soil cover and would include any areas of PCB-contaminated soil in excess of 0.20 mg/kg (the NJDEP RDCSRS, or the NJDEP “unrestricted use standard”). The total area of the ST007 LUCs, the area where PCB-contaminated soil exists in excess of 0.20 mg/kg, is estimated to be 2.2 acres. If additional delineation sampling identifies soil with PCBs above 1.0 mg/kg, then removal of this material would be performed.

Groundwater sampling would be implemented to monitor for impacts due to significant changes within the landfills (i.e., unusual trends or perturbations indicating increasing contamination emanating from the landfill) that may present risk to future downgradient/downstream off-site receptors. The goals of LTM would be to monitor groundwater for possible migration of contaminants and releases due to changes within LF003 and to ensure that contamination in excess of ARARs is not migrating beyond the LF003/ST007 monitoring well network.

In addition, sampling of monitoring wells located north of the North Run Creek would be conducted as compliance points to

confirm that groundwater from the landfill is not migrating below the stream or impacting off-base property. The groundwater monitoring program would be established in the Remedial Design; however, the FFS assumed that during the first five years compliance monitoring of groundwater would be collected on a semi-annual basis and analyzed for COCs at the locations proposed on **Figure 10**. Following five years of semi-annual monitoring, the frequency of monitoring could be reduced to annually until RAOs are met. The sampling frequency and number of wells sampled may be modified over the course of the LTM, as conditions necessitate. In addition, JB MDL -McGuire may also determine, during the CERCLA five-year review process, that the monitoring network may need to be modified in the event the LTM reveals that downgradient receptors are expected to be impacted from OU1 groundwater. The groundwater LTM would include an assessment to determine whether a clear and meaningful trend of decreasing contaminant mass and/or concentration has occurred. This evaluation would continue throughout the LTM program until program modifications are supported. Reduction of the sampling program would be subject to regulatory approval as the remedy proceeds.

There are no unacceptable risks in surface water under the current and reasonably anticipated future use scenarios. However, groundwater within LF003 discharges directly to the North Run. Therefore, the non-degradation COCs within groundwater also will apply to surface water. Thus, the goal of surface water LTM is to (1) ensure that groundwater non-degradation COCs are not negatively affecting surface water, (2) collect data regarding the mitigation of surface water COCs following implementation of the presumptive remedy, and (3) monitor surface water for contaminant releases due to changes within LF003. Additionally,

sediment or porewater sampling may be performed to assess whether the installation of the optimized soil cover results in transient conditions in sediment and/or porewater conditions. **Figure 10** shows the proposed surface water and sediment or pore water sampling locations; however, the final methods (e.g., sediment or pore water) locations would be determined in the Remedial Design.

#### **LF004**

The Preferred Alternative for Site LF004 is Alternative 2: Optimized Soil Cover, LUCs, and LTM of Groundwater and Surface Water. Alternative 2 is necessary because COCs at the site pose a threat to human health and the environment if no action is taken, and Alternative 2 provides adequate protection and monitoring while causing less disturbance to the site than Alternatives 3 and 4. Maintenance of the Soil Cover, CERCLA Five-Year Reviews, LUCs, and LTM would remain in-place in perpetuity.

Under Alternative 2, portions of the LF004 landfill that have less than 2 ft of soil cover would be augmented with additional fill material to ensure that all of the buried waste has a minimum 2-ft soil cover. Prior to construction, a pre-design investigation would be conducted to verify there is a minimum 2-ft soil cover over the waste by using soil sample probes. As discussed for LF003, this pre-design investigation for LF004 may include a chemical analysis to verify that the existing cover is protective of human health and the environment.

The placement of additional fill material to meet the requisite soil cover at LF004 would be implemented in a manner consistent with the preferred remedy at LF003/ST007. Periodic inspections and LTM would be implemented consistent with the preferred remedy described for LF003/ST007. **Figure**

11 shows the proposed LTM network; however, the final locations would be determined in the Remedial Design.

#### **Land Use Controls at LF003/ST007 and LF004**

As indicated in the Air Force Land Use Control Checklist for Active-Duty Bases on the NPL (Department of Defense 2015), LUCs are physical, legal, and/or administrative mechanisms that restrict the use of, or limit access to, real property implemented at a site to provide protection to humans from exposure to contaminants that remain on a site either during or after remedial action and that present an unacceptable risk to human health or the environment.

LUCs would be implemented in perpetuity on-base to mitigate exposure to impacted groundwater and buried waste at LF003 and LF004 and soil at ST007. **Figures 10** and **11** identify the areas where LUCs will be enforced at LF003/ST007 and LF004, respectively. The internal procedures that JB MDL would use to implement the LUCs include, but are not limited to, the JB MDL Installation Development Plan. The Installation Development Plan is a long-range planning tool that designates current and future land uses. It also provides framework for selecting the locations of future facilities needed to carry out the base mission. The Installation Development Plan describes the specific LUCs for each site, the reasons for controls, and the areas where the controls are applied. For a LUC to remain protective, base personnel must have access to information concerning its existence, purpose, and maintenance requirements. The Installation Development Plan provides the important information to ensure that LUC management takes place and that the LUC's presence is effectively communicated. The LUCs managed through the Installation

Development Plan include dig permits restricting soil disturbance, construction review limiting the types of development, well permits to prevent unauthorized use of groundwater, and the **Environmental Impact Analysis Process (EIAP)** required by Title 32 CFR Part 989. The USAF will notify EPA in advance of any changes to internal procedures associated with the selected remedy that might affect the LUCs.

LUCs are required at the LF003 and LF004 because buried waste will remain indefinitely. Additionally, concentrations of COCs in groundwater and surface water at LF003 and LF004 and soil at ST007 present a human health risk and exceed their respective standards. LUCs would be implemented to 1) prevent access to and use of the groundwater until health-based standards are met; 2) maintain integrity of the landfill cover to prevent direct exposure; and 3) preclude change of use at the LF003/ST007 and LF004.

Administrative controls would include retention of the existing CEA/WRA for JB MDL-McGuire. The CEA is administered and established by the State of New Jersey. The WRA is established as a component of the implementation of the CEA. Under the WRA, a well permit not related to the response action would not be approved if the location of the well is within the CEA/WRA boundary unless the well meets the well restriction requirements stipulated in the CEA. The CEA would remain in-place in perpetuity, as long as the waste remains in the landfills, and as long as concentrations in groundwater exceed non-degradation standards. The WRAs could be removed for areas outside of the landfills once health-based standards have been achieved. Signage would be placed at LF003/ST007 and LF004 regarding LUCs and will be implemented and maintained by JB MDL.

In addition to the **institutional controls** for groundwater and surface water, LUCs would preclude development and/or digging at the site and prevent exposure to buried waste at LF003 and LF004 and PCB-contaminated soil at ST007. LUCs for buried waste and the overlying soil cover at LF003 and LF004 and soil at ST007 would consist of engineering controls (e.g., signage) describing restrictions to site use and activities (e.g., no digging). Additional LUCs would include restrictions preventing the construction of occupied buildings (e.g., residential properties or commercial/industrial) over portions of LF003 and LF004 with buried waste and the prohibition of uncontrolled excavation.

In addition to LUCs, under CERCLA 121c, five-year reviews would be conducted at the site following the Record of Decision signature and implementation of the remedial action. The first five-year review would be conducted within five years of remedy initiation and would continue in perpetuity.

The USAF is responsible for implementing, maintaining, monitoring, reporting, and enforcing LUCs. Although the USAF may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or other means, the USAF shall retain ultimate responsibility for remedy integrity. The USAF must provide notice to USEPA and NJDEP at least six months prior to any transfer or sale of property containing LUCs so that USEPA and NJDEP can be involved in discussions to ensure that appropriate provisions are included in the transfer or conveyance documents to maintain effective LUCs. If it is not possible for the facility to notify USEPA and NJDEP at least six months prior to any transfer or sale, then the facility would notify USEPA and NJDEP as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to LUCs. The USAF

agrees to provide USEPA and NJDEP with such notice, within the same time frames, for federal-to-federal transfer of property accountability. The USAF shall provide either access to or a copy of the executed deed or transfer assembly to USEPA and NJDEP.

The USAF shall notify USEPA and NJDEP 45 days in advance of any proposed land use changes that are inconsistent with LUC objectives or the selected remedies. Any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that interferes with the effectiveness of the LUCs would be addressed by the USAF as soon as practicable, but in no case would the process be initiated later than 10 days after the USAF becomes aware of the breach. Additionally, the USAF would notify USEPA and NJDEP as soon as practicable, but no longer than 10 days after discovery of any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs. The USAF would notify USEPA and NJDEP regarding how the USAF has addressed or will address the breach within 10 days of sending USEPA and NJDEP notification of the breach.

JB MDL shall not modify or terminate LUCs, implementation actions, or land use that are associated with the selected remedy without the approval of USEPA and the opportunity for concurrence by NJDEP. JB MDL shall seek prior concurrence of USEPA and NJDEP before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs.

The USAF would conduct annual monitoring of the environmental use restrictions and controls. The monitoring results would be included in a separate report or as a section of

another environmental report, if appropriate, and provided to USEPA and NJDEP. The annual monitoring reports would be used in preparation of the five-year review to evaluate the effectiveness of the remedy. The annual monitoring report, submitted to the regulatory agencies by the USAF, would evaluate the status of the LUCs and how any LUC deficiencies or inconsistent uses have been addressed. The annual evaluation would address whether the use restrictions and controls referenced above were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed to such restrictions and controls.

Based on information currently available, the USAF believes the Preferred Alternatives meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The USAF expects the Preferred Alternatives to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; and (3) be cost-effective. The presence of landfill material buried at OU1 will remain in-perpetuity. Therefore, this alternative does not utilize permanent solutions and alternative treatment technologies to the maximum extent practical. Rather, the preferred alternative relies upon the presumptive remedy for containment. The Preferred Alternative does not satisfy the CERCLA preference for treatment as a principal element of the remedy; however, landfills have been identified as a type of site where waste treatment may be impracticable because of the large volumes and heterogeneous mixture of waste present. Because treatment is impracticable, containment is the appropriate response

action, or the “presumptive remedy,” for the OU1 landfill sites.

#### Assessment of Principal Threat Wastes

USEPA Guidance to Principal and Low Level Threat Wastes (USEPA 1991) defines a Principal Threat Waste as a source material considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Additionally, the guidance states that contaminated groundwater generally is not considered to be a source material although non-aqueous phase liquids (NAPLs) may be viewed as a source material (however, there are no NAPLs at the Sites). Based on this definition, no Principal Threat Waste has been identified at the Sites for the following reasons:

- The buried wastes and COCs at OU1 have shown limited mobility and low-to-moderate toxicity; therefore, the waste and impacted soils at OU1 do not constitute principal threat wastes and are considered to be only low-level threat wastes.

The NCP establishes the expectation that treatment will be used to address the principal threats posed by a site whenever practicable (40 CFR 300.430[a] [1] [iii] [A]). The Preferred Alternative does not satisfy the expectation for treatment of principal threat wastes because no principal threat wastes are present at the Sites.

#### ***Community Participation***

The USAF and USEPA provide information regarding the response action at LF003/ST007 and LF004 to the public through public meetings, the Administrative Record file for the sites, and announcements published in the *Asbury Park Press* and the *Burlington County Times*. The USAF, USEPA, and NJDEP encourage the public to

gain a more comprehensive understanding of the sites and the remedial activities that have been conducted at the sites.

Written and oral comments on this Proposed Plan will be accepted throughout a public comment period between 10 February 2020 and 10 March 2020. Correspondence should be postmarked no later than 10 March 2020 and should be sent to the attention of Mr. James Richman.

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## *Glossary of Terms*

Specialized terms used in this Proposed Plan are defined below:

<p><b><i>Administrative Record</i></b> – A collection of documents (including plans, correspondence, and reports) generated during site investigation and remedial activities. Information in the Administrative Record is used to select the Preferred Response Action and is available for public review.</p>	<p><b><i>Non-Time-Critical Removal Action (NTCRA)</i></b> – Actions that may be initiated 6 months after the determination that a removal action is necessary. If a non-time-critical removal action is justified in any site evaluation, the NCP [40 CFR 300.415(b)(4)(i)] requires the preparation of the Engineering Evaluation/Cost Analysis.</p>
<p><b><i>Applicable or Relevant and Appropriate Requirements (ARARs)</i></b> – The federal and state environmental cleanup standards and other substantive requirements that a selected remedy will meet. These requirements may vary among sites and alternatives.</p>	<p><b><i>Polychlorinated Biphenyls (PCBs)</i></b> – An organic pollutant that was formerly used in electrical transformers and capacitors; their manufacture was banned in 1979. There are 210 different PCB compounds that typically have 40 percent to 60 percent chlorine by weight.</p>
<p><b><i>Background Threshold Value</i></b> – Background groundwater concentrations calculated for the JB MDL-McGuire Area and representative of groundwater quality in surrounding non-impacted areas.</p>	<p><b><i>Polycyclic Aromatic Hydrocarbons (PAHs)</i></b> – Compounds often associated with combustion process and distillation tars.</p>
<p><b><i>Classification Exception Area (CEA)</i></b> – The CEA is administered and established by the State of New Jersey through the state permitting process and administratively restricts well installation within its boundary.</p>	<p><b><i>Practical Quantitation Limit (PQL)</i></b> – This is the minimum concentration of an analyte that can be measured with a high degree of confidence to show that the analyte is present at or above that concentration.</p>
<p><b><i>Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)</i></b> – (Also known as the Superfund Law), as amended by the Superfund Amendments and Reauthorization Act (SARA) (42 U.S.C.A. §§ 9601-9675). CERCLA provides broad authority for responding to releases or threatened releases of hazardous substances, pollutants, and contaminants.</p>	<p><b><i>Preliminary Remedial Goals (PRGs)</i></b> – Proposed medium-specific (i.e., groundwater, soil, surface water) cleanup goals for a selected remedial action. PRGs will be finalized to Remedial Goals (RGs) in the Record of Decision. Remediation efforts would be considered complete and no further action would be necessary upon attainment of the RGs.</p>
<p><b><i>Contaminant of Concern (COC)</i></b> – A subset of the COPCs that are identified in the RI/FFS as needing to be addressed by the response action selected in the Record of Decision.</p>	<p><b><i>Present Worth</i></b> – A method of evaluation of expenditures that occur over different time periods. By discounting all costs to a common base year, the costs for different remedial action alternatives can be compared on the basis of a single figure for each alternative. When calculating present worth cost for Superfund sites, total operations and maintenance costs are included.</p>
<p><b><i>Contaminants of Potential Concern (COPCs)</i></b> – Contaminants that were identified in the RI that are potentially site related and may require action.</p>	<p><b><i>Principal Threat Waste</i></b> – Source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.</p>

<p><b>Discarded Military Munitions (DMM)</b> – Following inspection of MPPEH items and determination of the item’s explosives safety status, the item may be classified as DMM if it was not used for the intentional purpose (i.e., dumping).</p>	<p><b>Proposed Plan</b> – A public document that summarizes the alternatives presented in the FFS and identifies the alternative preferred for implementation as part of the remedial action.</p>
<p><b>Environment Impact Analysis Process (EIAP)</b> – The Environmental Impact Analysis Process is outlined in Title 32 CFR Part 989, also published as Air Force Instruction (AFI) 32-7061, and is the process for the analysis of environmental impacts on installations in the United States and abroad.</p>	<p><b>Record of Decision</b> – A public document that specifies the selected remedial alternative to be implemented at a site. It also includes a presentation of stakeholder concerns and how those concerns were addressed.</p>
<p><b>Focused Feasibility Study (FFS)</b> – Development, screening, and detailed evaluation of remedial action alternatives. It usually starts upon completion of RI activities.</p>	<p><b>Remedial action</b> – An action that stops or substantially reduces a release or threat of a release of hazardous substances that is serious but not an immediate threat to human health or the environment.</p>
<p><b>Groundwater</b> – Underground water that fills pores in soil or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.</p>	<p><b>Remedial Action Objectives (RAOs)</b> – Statements that provide a general description of what each recommended remedial alternative should be designed to accomplish. They are developed based on criteria outlined in Section 300.430(e)(2) of the NCP and Section 121(b) of CERCLA.</p>
<p><b>Hazard Index (HI)</b> – The sum of calculated hazard quotients for substances that affect the same target organ or organ system.</p>	<p><b>Remedial Alternatives</b> – Options evaluated to address the source and/or migration of contaminants to meet health-based or ecology-based remedial goals.</p>
<p><b>Institutional Controls</b> – Non-engineered instruments such as administrative and legal controls that help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy.</p>	<p><b>Remedial Design</b> – The phase in Superfund site cleanup where the technical specifications for cleanup remedies and technologies are designed.</p>
<p><b>Landfill presumptive remedy</b> – USEPA Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills (USEPA 1996). The presumptive remedy process streamlines the remedy selection and evaluation by developing a focused feasibility study that analyzes only alternatives consisting of appropriate components of the presumptive remedy.</p>	<p><b>Remedial Goals (RGs)</b> – Medium-specific (i.e., groundwater, soil, surface water, etc.) cleanup goals for a selected remedial action. Remediation efforts would be considered complete and no further action would be necessary upon attainment of the RGs.</p>
<p><b>Land Use Controls (LUCs)</b> – Physical, legal, and/or administrative mechanisms that restrict the use of, or limit access to, real property to prevent exposure to contaminants that remain on site either during or after remedial action and that present an unacceptable risk to human health or the environment.</p>	<p><b>Remedial Investigation (RI)</b> – An in-depth study to assess the nature and extent of contamination and risk at a site. Site cleanup criteria are also established.</p>

<p><b>Long-term Monitoring (LTM)</b> – Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. Information gathering may include groundwater well sampling, surface water sampling, soil sampling, air sampling, and physical inspections.</p>	<p><b>Sorbed</b> – When one substance takes up or holds another through the adhesion of a thin layer of molecules to the surface of the solid.</p>
<p><b>Material Documented as an Explosive Hazard (MDEH)</b> – MPPEH that has been inspected by a qualified unexploded ordnance technician and has been determined to present an explosive hazard because it contains explosives or munitions.</p>	<p><b>semi-volatile organic compounds</b> – Organic contaminants that are generally insoluble in water and are not readily transported in groundwater.</p>
<p><b>Material Potentially Presenting an Explosive Hazard (MPPEH)</b> – MPPEH is material owned or controlled by the Department of Defense that, prior to determination of its explosives safety status, potentially contains explosives or munitions (e.g., munitions containers, packaging material, expended cartridge cases, and debris remaining after munitions use).</p>	<p><b>To Be Considered (TBCs)</b> – TBCs are federal and state criteria, advisories, guidelines, or proposed standards that are issued by the federal or state government, but which are neither legally binding nor promulgated, and therefore do not have the status of potential ARARs.</p>
<p><b>National Contingency Plan (NCP)</b> – National Oil and Hazardous Substances Pollution Contingency Plan, “National Contingency Plan” (40 CFR 300). Provides the organizational structure and procedures for preparing for and responding to discharges of an oil and releases of hazardous substances, pollutants, and contaminants.</p>	<p><b>Volatile organic compounds</b> - Organic contaminants that tend to volatilize or to change from a liquid to a gas form when exposed to the atmosphere. Many VOCs are readily transported in groundwater.</p>
<p><b>National Priorities List (NPL)</b> – USEPA’s list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under the Superfund program.</p>	<p><b>Well Restriction Area (WRA)</b> – A Well Restriction Area is a component of the implementation of the CEA. Under the WRA, a well permit not related to the response action would not be approved if the location of the well is within the CEA/WRA boundary unless the well meets the well restriction requirements stipulated in the CEA.</p>
<p><b>New Jersey Administrative Code (N.J.A.C.)</b> – The collection of all rules and regulations made by the executive branch agencies of the State of New Jersey.</p>	



## **TABLES**

**Table 1**  
**Summary of Investigations**  
 JB MDL- McGuire – OU1 (LF003, LF004, and ST007)  
 Joint Base McGuire-Dix-Lakehurst, New Jersey

Year	Report	Administrative Record	Company	Sites	Remedial Investigation Details
<b>LF003/ST007</b>					
1982	Phase I Preliminary Assessment	AR-30	EA	LF003	<ul style="list-style-type: none"> <li>- Installation of 3 monitoring wells.</li> <li>- Groundwater sample results indicate elevated TOX.</li> </ul>
1986	Multi-Phase Site Investigation	AR-126	Weston and ABB Environmental Services, Inc. (ABB)	LF003	<ul style="list-style-type: none"> <li>- Installation of three hydraulically upgradient monitoring wells and three downgradient monitoring wells and their subsequent sampling.</li> <li>- Six test borings were drilled to determine landfill thickness, a ground penetrating radar survey was conducted, and three surface water samples were collected.</li> <li>- A supplemental magnetometer survey and terrain conductivity survey were conducted by E.C. Jordan and ABB in 1989 to further delineate the landfill footprint.</li> <li>- Groundwater sampling results indicated elevated BTEX and chlorinated hydrocarbons in wells near the northern boundary of the site</li> </ul>
1993	Media Sampling and Analysis Program	AR-12	ABB	LF003	<ul style="list-style-type: none"> <li>- Three monitoring wells and four test pits were installed and nine soil samples were collected from these locations.</li> <li>- Four surface soil, three surface water and sediment, and two leachate samples were also collected and analyzed for full target compound list.</li> <li>- A total of 29 soil samples were field screened for VOCs with a gas chromatograph. Results indicated landfill debris was present to 22 ft bgs</li> <li>- Sample results indicated elevated concentrations of pesticides and metals in surface and subsurface soil; BTEX, SVOCs, and metals in groundwater samples; and chlorinated and aromatic VOCs in leachate samples.</li> </ul>
1994-1999	UST Removal, Excavation and Sampling	AR-868 and AR-1179	Ogden Environmental Systems	ST007	<ul style="list-style-type: none"> <li>- In 1994, a 10,000-gallon UST that contained aromatic VOCs, SVOCs, and other unknown liquid wastes was removed.</li> <li>- Approximately 200 tons of soil associated with the UST was also removed. The complete removal was incomplete due to a lack of funding.</li> <li>- During removal, landfill waste associated with LF003 was observed deeper than 6 ft bgs.</li> <li>- In 1996, 100 surface soil samples (&lt; 0.5 ft bgs) were collected on a 50'x50' grid. Surface soil sample results detected PCBs in soil greater than 3,100 ppm.</li> <li>- One monitoring well was installed and sampled. Groundwater results indicated elevated concentrations of BTEX.</li> <li>- In 1997, an additional 248 soil samples were collected from 148 locations collected on a 50'x50' grid.</li> <li>- Eighty percent of samples were analyzed using EPA method SW 8080 and only 20 percent of samples were sent off site for laboratory analysis using EPA method SW 8081.</li> <li>- Sample results detected PCBs in soil at concentrations greater than 3,100 ppm.</li> <li>- In 1998, 641 surface soil samples were collected from 215 locations.</li> <li>- Sample locations were designed to meet NJAC 7:26E-6.4 post-IRA requirements when combined with previous results (one sample collected every 900 ft, plus one sample collected every 30 ft around perimeter).</li> <li>- Soil sample results detected elevated PCBs in soil over much of ST007 to a maximum depth of approximately 4 ft bgs.</li> <li>- In 1999, an IRA was performed to remove PCB-contaminated soils based on the 1998 assessment.</li> <li>- Removal of approximately 1,663 tons of PCB-contaminated soils deemed hazardous (&gt; 50 ppm) was completed.</li> </ul>

**Table 1**  
**Summary of Investigations**  
 JB MDL- McGuire – OU1 (LF003, LF004, and ST007)  
 Joint Base McGuire-Dix-Lakehurst, New Jersey

Year	Report	Administrative Record	Company	Sites	Remedial Investigation Details
1995	Lithology Characterization	AR-512	URS	LF003	<ul style="list-style-type: none"> <li>- Installed 14 CPT borings to 26 ft below grade to further characterize the lithology at LF003.</li> <li>- URS recommended natural attenuation and natural assimilation remedial alternative, including institutional and access controls, long-term monitoring, 5-year site reviews, and supplementary assessments.</li> <li>- NJDEP rejected the remedial alternative because of the potential for groundwater contaminants to impact North Run surface water.</li> </ul>
2000	Basewide Background Study	AR-1261	URS	LF003	<ul style="list-style-type: none"> <li>- LF003: Burn pits associated with landfill operations have impacted surface water, sediment, soil and groundwater.</li> <li>- Groundwater contamination at LF003 (shallow aquifer, not detected in deep wells downgradient) COCs are benzene, cadmium, chlorobenzene and vinyl chloride. In addition, VOCs, SVOCs and inorganics detected in GW. PAHs, pesticides, and metals detected in subsurface and surface soils. Benzene and dichloroethene detected in leachate samples.</li> <li>- At ST007, groundwater COCs are aldrin, benzene, chlorobenzene, and cis-1,2-dichloroethylene.</li> </ul>
2006-2008	Remedial Investigation LF-03 and ST-07	AR-1433	Science Applications International Corporation (SAIC)	LF003/ST007	<ul style="list-style-type: none"> <li>- RI included geophysical survey, CPT probing, DPT soil and groundwater sampling.</li> <li>- Included installation of 22 monitoring wells</li> <li>- LF003 materials confirmed to be present underlying northern portion of ST007. COPCs associated with ST007 found within LF003 boundaries.</li> <li>- SAIC recommended the following:               <ul style="list-style-type: none"> <li>- Removal of PCB-contaminated soil exceeding NJDEP target cleanup levels</li> <li>- Determine feasibility of in situ remediation of soil containing residual VOCs and SVOCs associated with the former 10,000 gallon UST</li> <li>- Determine feasibility of engineering controls to eliminate discharge of COPC-contaminated groundwater to the North Run</li> <li>- Determine feasibility of applying EPA presumptive remedy to landfill</li> <li>- Restrict access to North Run surface water and sediment adjacent to the northern boundary of sites</li> <li>- Implement LTM</li> </ul> </li> </ul>
2010	Engineering Evaluation/Cost Analysis	AR-2396	Shaw Environmental, Inc.	ST007	<ul style="list-style-type: none"> <li>- The EE/CA addressed PCB contamination not addressed during the 1999 Interim Removal Action at ST007</li> <li>- A Streamlined Risk Evaluation for surface soils not located within the presumptive remedy cap was completed to support the recommended NTCRA.</li> <li>- Recommended completion of a NTCRA for all soil above the non-residential ARAR of 1.0 mg/kg (NJDEP NRDCSRS and TSCA standard)</li> </ul>
2010-2011	Final Remedial Investigation Report Addendum Operable Unit-1 (OU-1) Sites LF-03, LF-04, and ST-07	AR-2390	Shaw Environmental, Inc.	LF003/ST007	<ul style="list-style-type: none"> <li>- The RI included:               <ul style="list-style-type: none"> <li>- 54 surface soil samples (0-2 ft) using stainless steel hand auger</li> <li>- 50 subsurface soil samples using DPT</li> <li>- installation of 28 piezometers to determine vertical hydraulic gradient</li> <li>- 2 surface soil at ST007 for chromium speciation</li> <li>- 6 sediment samples using stainless steel hand-auger</li> <li>- 47 new and existing wells, installation of 12 new wells GW</li> <li>- 6 DPT TMWs</li> </ul> </li> <li>- Shaw made the following recommendations for LF003/ST007:               <ul style="list-style-type: none"> <li>- For LF003, an FFS is recommended in accordance with EPA guidance on Presumptive Remedy</li> <li>- For ST007, a complete FS is recommended</li> <li>- A baseline ecological risk assessment is recommended</li> </ul> </li> </ul>

**Table 1**  
**Summary of Investigations**  
 JB MDL- McGuire – OU1 (LF003, LF004, and ST007)  
 Joint Base McGuire-Dix-Lakehurst, New Jersey

Year	Report	Administrative Record	Company	Sites	Remedial Investigation Details
2011	Final Removal Action Closure Report for the NTCRA at ST-07	AR-2384	Shaw Environmental, Inc.	ST007	- All soils with PCBs exceeding the TSCA unrestricted soil standard and NJDEP NRDCSRS of 1.0 mg/kg were removed and disposed of as a solid waste in a properly permitted municipal waste landfill. - Residual contamination was assessed using post-NTCRA confirmation sampling, and includes soils with PCBs exceeding the NJDEP RDCSRS of 0.2 mg/kg
2013	Final 2013 Basewide Background Study Report	TBD	BEM Systems, Inc.	McGuire AFB	- Background threshold values were established for: - Metals in surface soil, subsurface soil, surface water, sediment, and groundwater. - Pesticides in surface soil, subsurface soil, surface water, and sediment. - PAHs in surface soil, subsurface soil, and sediment.
2013	LF003 North Run Monitoring Well Investigation	TBD	CB&I	LF003	- As requested by EPA, the USAF installed monitoring wells (LF03-MW-100 to LF03-MW-108, LF03-MW-070 and LF03-MW-071) to assess whether groundwater from beneath LF003 flows underneath the North Run Corridor, or if the Creek is acting as an effective hydraulic discharge point with minimal or no impacts from the landfill to the north of the creek.
2015	Data Gap Investigation	TBD - within FFS	Arcadis	LF003	- Installation of LF03-MW-109 to verify the conclusion from the 2013 Investigation that groundwater is not flowing underneath the North Run Corridor and off-base. Satisfy the gap in data between LF03-MW-100 and LF03-MW-101. - Culvert surface water sampling of a drainage outfall that was identified during an April 2015 site reconnaissance. Concentrations of calcium, magnesium, sodium, chlorobenzene, and cis-1,2-DCE were observed in the surface water at the discharge point. In the downgradient surface water sample, no VOCs or SVOCs were detected. The three exceedances of inorganics are attributed to being (1) naturally occurring [calcium and magnesium] and (2) attributed to road deicing [sodium]. - A landfill cover assessment was performed at 5 locations that were areas identified during site reconnaissance of potentially having less than the requisite 2-ft soil cover and along the north run embankment. - A slope stability analysis was performed along the northern extent of LF003 to ensure that the embankment is stable and resistant to slope failure to ensure that a presumptive capping remedy would be successful. Collected a soil sample for geotechnical analysis (e.g., moisture content, soil classification, grain analyses, Atterberg limits, standard proctor, and triaxial shear testing).
2016	Final Baseline Ecological Risk Assessment	TBD	Leidos	LF003/ST007	- To fully understand the actual impact identified chemicals of potential ecological concern may have on the environment at OU1, and to provide a solid basis for ecological risk management decisions at OU1, a BERA was conducted at OU1. The BERA concluded that no final ecological COCs were identified for further evaluation within this FFS.
2016	Pinelands Refresh Sampling	TBD - within FFS	Arcadis	LF003	- Limitations in the existing data set required additional groundwater sampling to enhance the existing data set. Therefore, two rounds of groundwater/surface water samples were collected during 2016. The first round of sampling was conducted during July/August of 2016 and the second round of sampling was conducted during October 2016.
2019	Final Focused Feasibility Study	TBD	Arcadis	LF003/ST007	- Developed and evaluated four remedial alternatives according to the nine criteria stipulated in the NCP for potential implementation at LF003/ST007. - EOD Incident Report is included as Attachment 1 in the FFS.
<b>LF004</b>					
1981	Phase I Preliminary Assessment	AR-1364	EA	LF004	- Concluded LF004 had a high potential for environmental contamination. - Recommended installing monitoring wells and initiating a groundwater sampling program.
1984	Phase II Stage 1, Installation Restoration Program	AR-124	Weston	LF004	- Installation of three monitoring wells (11-MW-009, 11-MW-010, and 11-MW-011) along the south edge of the presumed waste pits at LF004. - Groundwater samples contained high concentrations of TOC, TOX, and metals (nickel). - Additional investigations were recommended.

**Table 1**  
**Summary of Investigations**  
 JB MDL- McGuire – OU1 (LF003, LF004, and ST007)  
 Joint Base McGuire-Dix-Lakehurst, New Jersey

Year	Report	Administrative Record	Company	Sites	Remedial Investigation Details
1989	Phase II Stage 2, Installation Restoration Program	AR-126	Weston	LF004	<ul style="list-style-type: none"> <li>- The three monitoring wells (11-MW-029, 11-MW-030, and 11-MW-031) were installed in an upgradient groundwater flow direction relative to LF004.</li> <li>- Surface water samples were collected from North Run opposite of the landfill and identified BTEX compounds, chlorobenzene, 1,4-dichlorobenzene (1,4-DCB), and trans-1,2-dichloroethene (trans-1,2-DCE) in two of the samples.</li> <li>- Weston recommended the installation of one upgradient monitoring well.</li> </ul>
1990	Data Gathering Investigation	AR-127 and AR-128	E.C. Jordan	LF004	<ul style="list-style-type: none"> <li>- Performed magnetometer and terrain conductivity surveys at LF004 to better define the landfill footprint.</li> <li>- These surveys concluded that the landfill comprised 2.5 acres and contained four small areas of magnetic anomalies.</li> <li>- The data did not reveal evidence of coal ash deposits (evidence of refuse burning) or the presence of major buried drum areas. Jordan recommended additional investigation of the magnetic anomalies if groundwater indicated sources of contamination in the landfill.</li> </ul>
1991	Installation Restoration Program RI/FS Study Program	AR-13	ABB	LF004	<ul style="list-style-type: none"> <li>- Installed two monitoring wells (11-MW-101 and 11-MW-102) and collected four surface soil samples, two subsurface soil samples, three sediment and surface water samples, and two leachate seeps that flowed into North Run.</li> <li>- ABB concluded that the presence of leachate and groundwater discharging into North Run may pose an imminent threat to public health and the environment.</li> <li>- McGuire AFB disagreed with these conclusions based on an EA field investigation performed in 1996.</li> <li>- ABB recommended implementing a hydropunch groundwater screening program to delineate the horizontal and vertical extent of groundwater contamination. ABB never prepared a formal RI report.</li> </ul>
1996	Field Investigation and Soil Vapor Survey	N/A	EA	LF004	<ul style="list-style-type: none"> <li>• Collected of 21 groundwater screening samples, installation of a shallow monitoring well (11-MW-303), and the collection of two leachate seep samples.</li> <li>• Soil vapor samples showed low levels of BTEX compounds present in soil. Lead, and mercury were detected in the seep samples, and BTEX and chlorinated VOCs were present in the groundwater (specifically, benzene, chlorobenzene, and cis-1,2-DCE above NJDEP PQLs).</li> <li>• Temporary monitoring wells were installed using the direct-push method and were analyzed in the field using a field gas chromatograph. These results indicated low levels of BTEX and cis-1,2-DCE in one sample.</li> <li>• One subsurface soil sample was collected from 2-4 ft and only 4,4-DDE was detected.</li> <li>• Other inorganic constituents were analyzed; however, all were detected at concentrations below NJDEP soil cleanup criteria.</li> <li>• EA recommended additional groundwater investigation to determine the vertical and horizontal extent of contamination and to assess impacts to North Run by collecting sediment and surface water samples in the area of the landfill. Monitoring wells were proposed to be installed on both sides (north and south) of North Run.</li> </ul>

**Table 1**  
**Summary of Investigations**  
 JB MDL- McGuire – OU1 (LF003, LF004, and ST007)  
 Joint Base McGuire-Dix-Lakehurst, New Jersey

Year	Report	Administrative Record	Company	Sites	Remedial Investigation Details
2000	Basewide Background Study	AR-1261	URS	LF004	<ul style="list-style-type: none"> <li>- Concentrations of inorganics and ubiquitous contaminants in soil, groundwater, surface water, and sediment were investigated near LF004.</li> <li>- Monitoring wells BGMW-5S (shallow), BGMW-5I (intermediate), and BGMW-5D (deep) were installed immediately north of waste pits at LF004 in different stratigraphic formations.</li> <li>- Surface water and sediment samples were collected from North Run. Both filtered and unfiltered surface water samples were collected for inorganic analyses.</li> <li>- Subsurface soil samples were collected from borings advanced for BGMW-5S, BGMW-5I and BGMW-5D and analyzed for target analyte list parameters, pH, and TOC. Several inorganic constituents were detected, but at concentrations below NJDEP soil cleanup criteria.</li> <li>- A surface soil sample was collected from the 0- to 12-inch depth interval near the same area as the LF004 background monitoring wells. The surface soil sample was analyzed for inorganics, pesticides, pH, TOC, and grain size. Pesticide compounds were not detected. Several inorganic constituents were detected, but at concentrations below NJDEP soil cleanup criteria.</li> <li>- URS concluded that based on the information collected during previous site investigations, the primary source of contamination to the environment is the material placed in the landfill during its operation. Additionally, based on previous groundwater and soil gas data, localized areas of contamination (hotspots) likely occur throughout LF004. Secondary sources of contamination may consist of leachate seeps and groundwater exiting the landfill and affecting surrounding soils, sediment, and surface water of North Run.</li> </ul>
2006-2008	Remedial Investigation	Results included within AR-2390	URS	LF004	<ul style="list-style-type: none"> <li>- URS contract terminated prior to completion of report</li> <li>- The RI included:               <ul style="list-style-type: none"> <li>- 42 surface soil samples</li> <li>- 5 surface water samples</li> <li>- 5 sediment samples</li> <li>- 12 DPT groundwater samples</li> <li>- 32 monitoring well samples</li> </ul> </li> </ul>
2011-2014	Final Remedial Investigation Report Addendum Operable Unit-1 (OU-1) Sites LF-03, LF-04, and ST-07	AR-2390	Shaw Environmental, Inc.	LF004	<ul style="list-style-type: none"> <li>- The RI included:               <ul style="list-style-type: none"> <li>- 19 subsurface soil samples</li> <li>- 4 groundwater samples</li> </ul> </li> <li>- Shaw made the following recommendations for LF004:               <ul style="list-style-type: none"> <li>- For LF004, an FFS is recommended in accordance with EPA guidance on Presumptive Remedy</li> <li>- A baseline ecological risk assessment is recommended</li> </ul> </li> </ul>
2013	Final 2013 Basewide Background Study Report	TBD	BEM Systems, Inc.	McGuire AFB	<ul style="list-style-type: none"> <li>- Background threshold values were established for:               <ul style="list-style-type: none"> <li>- Metals in surface soil, subsurface soil, surface water, sediment, and groundwater.</li> <li>- Pesticides in surface soil, subsurface soil, surface water, and sediment.</li> <li>- PAHs in surface soil, subsurface soil, and sediment.</li> </ul> </li> </ul>
2015	Data Gap Investigation	TBD - within FFS	Arcadis	LF004	<ul style="list-style-type: none"> <li>- A landfill cover assessment was observed at several monitoring wells. The depth of soil cover at these locations was between 1-2 ft thick.</li> </ul>
2016	Final Baseline Ecological Risk Assessment	TBD	Leidos	LF004	<ul style="list-style-type: none"> <li>- To fully understand the actual impact identified chemicals of potential ecological concern may have on the environment at OU1, and to provide a solid basis for ecological risk management decisions at OU1, a BERA was conducted at OU1. The BERA concluded that no final ecological COCs were identified for further evaluation within this FFS.</li> </ul>

**Table 1**  
**Summary of Investigations**  
 JB MDL- McGuire – OU1 (LF003, LF004, and ST007)  
 Joint Base McGuire-Dix-Lakehurst, New Jersey

Year	Report	Administrative Record	Company	Sites	Remedial Investigation Details
2016	Pinelands Refresh Sampling	TBD - within FFS	Arcadis	LF004	- Limitations in the existing data set required additional groundwater sampling to enhance the existing data set. Therefore, two rounds of groundwater/surface water samples were collected at LF004 during 2016. The first round of sampling was conducted during July/August of 2016 and the second round of sampling was conducted during October 2016.
2019	Final Focused Feasibility Study	TBD	Arcadis	LF004	- Developed and evaluated four remedial alternatives according to the nine criteria stipulated in the NCP for potential implementation at LF003/ST007.

Notes:

- BTEX - benzene, toluene, ethylbenzene, and xylene
- CPT - cone penetrometer testing
- EPA - Environmental Protection Agency
- FFS - Focused Feasibility Study
- IRA - Interim Removal Action
- N/A - No report associated with investigation
- NCP - National Oil and Hazardous Substances Pollution Contingency Plan
- NJDEP - New Jersey Department of Environmental Protection
- NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard
- NTCRA - Non-Time Critical Removal Action
- PAHs - polycyclic aromatic hydrocarbons
- PCBs - polychlorinated biphenyls
- ppm - parts per million
- RDCSRS - Residential Direct Contact Soil Remediation Standard
- SVOCs - semi-volatile organic compounds
- TBD - to be determined
- TOC - total organic carbons
- TOX - total organic halogens
- USAF - United States Air Force
- UST - underground storage tank
- VOCs - volatile organic compounds

**Table 2**  
**Groundwater Preliminary Remedial Goals**  
 JB MDL-McGuire OUI  
 Joint Base McGuire-Dix-Lakehurst

Constituent of Concern <sup>(1)</sup>	LF003 COC	LF004 COC	Practical Quantitation Limit <sup>(2)</sup>	Shallow BTV <sup>(6)</sup>	Intermediate BTV <sup>(6)</sup>	Unrestricted Use/Unrestricted Exposure		Non-Degradation	
						Most Stringent Health-based ARAR	Health-Based PRG <sup>(4)</sup>	Shallow Aquifer PRG	Intermediate Aquifer PRG
<b>Volatile Organic Compounds (VOCs) micrograms per liter (µg/L)</b>									
1,2-Dichloroethane†‡	X		2	--	--	0.3	2	2	2
1,2-Dichloropropane†‡	X		1	--	--	0.5	1	1	1
1,4-Dichlorobenzene	X	X	5	--	--	75	75	5	5
Acetone		X	10	--	--	6000	6000	10	10
Benzene†‡§	X	X	1	--	--	0.2	1	1	1
Chlorobenzene†‡§	X	X	1	--	--	50	50	1	1
cis-1,2-Dichloroethene†‡	X	X	1	--	--	70	70	1	1
Methylene chloride (Dichloromethane)†		X	1	--	--	3	3	1	1
Isopropylbenzene		X	1	--	--	700	700	1	1
Methyl-tert-butylether (MTBE)	X		1	--	--	70	70	1	1
trans-1,2-Dichloroethene	X		1	--	--	100	100	1	1
Trichloroethene†‡§	X	X	1	--	--	1	1	1	1
Vinyl chloride†‡§	X	X	1	--	--	0.08	1	1	1
Xylenes (Total)		X	2	--	--	1000	1000	2	2
<b>Semivolatile Organic Compounds (µg/L)</b>									
2-Methylnaphthalene†		X	10	--	--	30	30	10	10
3&4-Methylphenol		X	0.1	--	--	50	50	0.1	0.1
Acenaphthene		X	10	--	--	400	400	10	10
Benzo(a)anthracene†‡§	X	X	0.1	--	--	0.05	0.1	0.1	0.1
Benzo(a)pyrene†‡§	X	X	0.1	--	--	0.005	0.1	0.1	0.1
Benzo(b)fluoranthene†‡§	X	X	0.2	--	--	0.05	0.2	0.2	0.2
Benzo(k)fluoranthene†		X	0.3	--	--	0.5	0.3	0.3	0.3
bis(2-Ethylhexyl)phthalate†	X	X	3	--	--	--	--	3	3
Carbazole†‡§	X	X	--	--	--	5	5	5	5
Chrysene†	X	X	0.2	--	--	5	5	0.2	0.2
Dibenz(a,h)anthracene†		X	0.3	--	--	0.005	0.3	0.3	0.3
Dibenzofuran†		X	--	--	--	5	5	5	5
Diethyl phthalate	X	X	1	--	--	6000	6000	1	1
Fluoranthene		X	10	--	--	300	300	10	10
Fluorene	X	X	1	--	--	300	300	1	1
Indeno(1,2,3-cd)pyrene†‡§	X	X	0.2	--	--	0.05	0.2	0.2	0.2
Naphthalene	X	X	2	--	--	300	300	2	2
Pentachlorophenol†‡	X		0.1	--	--	0.3	0.3	0.1	0.1
Phenanthrene†		X	--	--	--	5	5	5	5
Pyrene	X	X	0.1	--	--	200	200	0.1	0.1
<b>Inorganics (µg/L)</b>									
Aluminum†‡	X		30	6940	551	200	6940 (shallow) 551 (intermediate) 200 (deep)	6940	551
Antimony†		X	3	ND	ND	6	6	3	3
Arsenic†‡§	X	X	3	3.9	6.5	0.02	3.9 (shallow) 6.5 (intermediate) 3 (deep/off-base)	3.9	6.5
Barium†‡		X	200	165	83	2000	2000	200	200
Beryllium†‡	X		1	ND	ND	1	1	1	1
Chromium†‡	X		1	17	36	70	70	17	36
Cobalt†	X	X	0.5	8.6	5.7	100	100	8.6	5.7
Copper	X	X	4	7.5	10.7	1300	1300	7.5	10.7
Lead†‡	X		5	ND	5.4	5	5 (shallow) 5.4 (intermediate) 5 (deep/off-base)	5	5.4
Mercury	X		0.05	ND	ND	2	2	0.05	0.05
Nickel	X	X	4	38	19	100	100	38	19
Selenium	X		4	ND	ND	40	40	4	4
Vanadium	X		--	9.3	31	86	86	9.3	31
Zinc	X	X	10	57	149	2000	2000	57	149

**Notes:**

- All concentrations are presented in micrograms per liter.
- New Jersey Department of Environmental Protection, Practical Quantitation Limit (PQL) as defined in N.J.A.C. 7:9C-1.4, March 2014.
- New Jersey Department of Environmental Protection, Class II Groundwater Quality Criteria (GWQC) as defined in New Jersey Administrative Code 7:9C-1.5(e).
- The health-based PRG is applicable to wells that are located as follows: (1) within the deep aquifer (i.e., Vincentown formation) or (2) wells that are located off-base and outside of the Pinelands Protection Area (3) only for UU/UE conditions in shallow and intermediate wells. These wells must still meet non-degradation criteria.
- Note that there are separate BTVs for shallow and intermediate groundwater.

-- = no regulatory standard  
 † Risk/Hazard derived constituent of concern. Risk-based COCs are only applicable to groundwater at LF003, as LF004 was determined to have no risk. However, LF004 does have hazard-based COCs. The analyte may be retained as a non-degradation COC at LF003 or LF004, as well.  
 ‡ LF003 Health-based constituent of concern. Analyte exceeds health-based criteria (Class II-A GWQC or MCL) in groundwater, regardless of depth. Analyte may be retained as a non-degradation COC, as well.  
 § LF004 Health-based constituent of concern. Analyte exceeds health-based criteria (Class II-A GWQC or MCL) in groundwater, regardless of depth. Analyte may be retained as a non-degradation COC, as well.  
 ARAR - applicable or relevant and appropriate  
 BTV - background threshold value  
 ND - non-detect  
 PQL - practical Quantitation Limit  
 PRG - preliminary remedial goal

**Table 3**  
**Surface Water Preliminary Remedial Goals**  
 JB MDL-McGuire OU1  
 Joint Base McGuire-Dix-Lakehurst

Contaminant of Concern <sup>(1)</sup>	LF003 COC	LF004 COC	Practical Quantitation Limit <sup>(2)</sup>	North Run BTV <sup>(3)</sup>	Preliminary Remedial Goal <sup>(4)</sup>
<b>Volatile Organic Compounds</b>					
1,2-Dichloroethane	X		2	--	2
1,2-Dichloropropane	X		1	--	1
1,4-Dichlorobenzene	X	X	5	--	5
Acetone		X	10	--	10
Benzene	X	X	1	--	1
Chlorobenzene	X	X	1	--	1
cis-1,2-Dichloroethene	X	X	1	--	1
Methylene chloride (Dichloromethane)		X	1	--	1
Isopropylbenzene		X	1	--	1
Methyl-tert-butylether	X		1	--	1
Toluene	X		1	--	1
trans-1,2-Dichloroethene	X		1	--	1
Trichloroethene	X	X	1	--	1
Vinyl chloride	X	X	1	--	1
Xylene		X	2	--	2
<b>Semivolatile Organic Compounds</b>					
2-Methylnaphthalene		X	10	--	10
3&4-Methylphenol		X	0.1	--	0.1
Acenaphthene		X	10	--	10
Benzo(a)anthracene	X	X	0.1	--	0.1
Benzo(a)pyrene	X	X	0.1	--	0.1
Benzo(b)fluoranthene	X	X	0.2	--	0.2
Benzo(k)fluoranthene		X	0.3	--	0.3
bis(2-Ethylhexyl)phthalate	X	X	3	--	3
Carbazole	X	X	--	--	--
Chrysene	X	X	0.2	--	0.2
Dibenzo(a,h)anthracene		X	0.3	--	0.3
Dibenzofuran		X	--	--	--
Diethyl phthalate	X	X	1	--	1
Fluoranthene		X	10	--	10
Fluorene	X	X	1	--	1
Indeno(1,2,3-cd)pyrene	X	X	0.2	--	0.2
Naphthalene	X	X	2	--	2
Pentachlorophenol	X		0.1	--	0.3
Phenanthrene		X	--	--	--
Pyrene	X	X	0.1	--	0.1
<b>Inorganics</b>					
Aluminum	X		30	372	372
Antimony		X	3	ND	3
Arsenic	X	X	3	ND	3
Barium	X	X	200	62	200
Beryllium	X		1	5	5
Chromium	X		1	ND	1
Cobalt	X	X	0.5	ND	0.5
Copper	X	X	4	ND	4
Lead	X		5	ND	5
Mercury	X	X	0.05	ND	0.05
Nickel	X	X	4	6.3	6.3
Selenium	X		4	ND	4
Vanadium	X		--	--	--
Zinc	X	X	10	50	50

**Notes:**

1. All concentrations are presented in micrograms per liter.
2. New Jersey Department of Environmental Protection, Practical Quantitation Level (PQL) as defined in N.J.A.C. 7:9C-1.4, March 2014.
3. The North Run Background Threshold Value (BTV) as defined in the Joint Base McGuire-Dix-Lakehurst, McGuire Area Final 2013 Basewide Background Study Report.
4. The PRG is the greater of the PQL or North Run BTV. Where no PQL or BTV exists, no PRG is established as no applicable promulgated criteria exists.

-- Not established

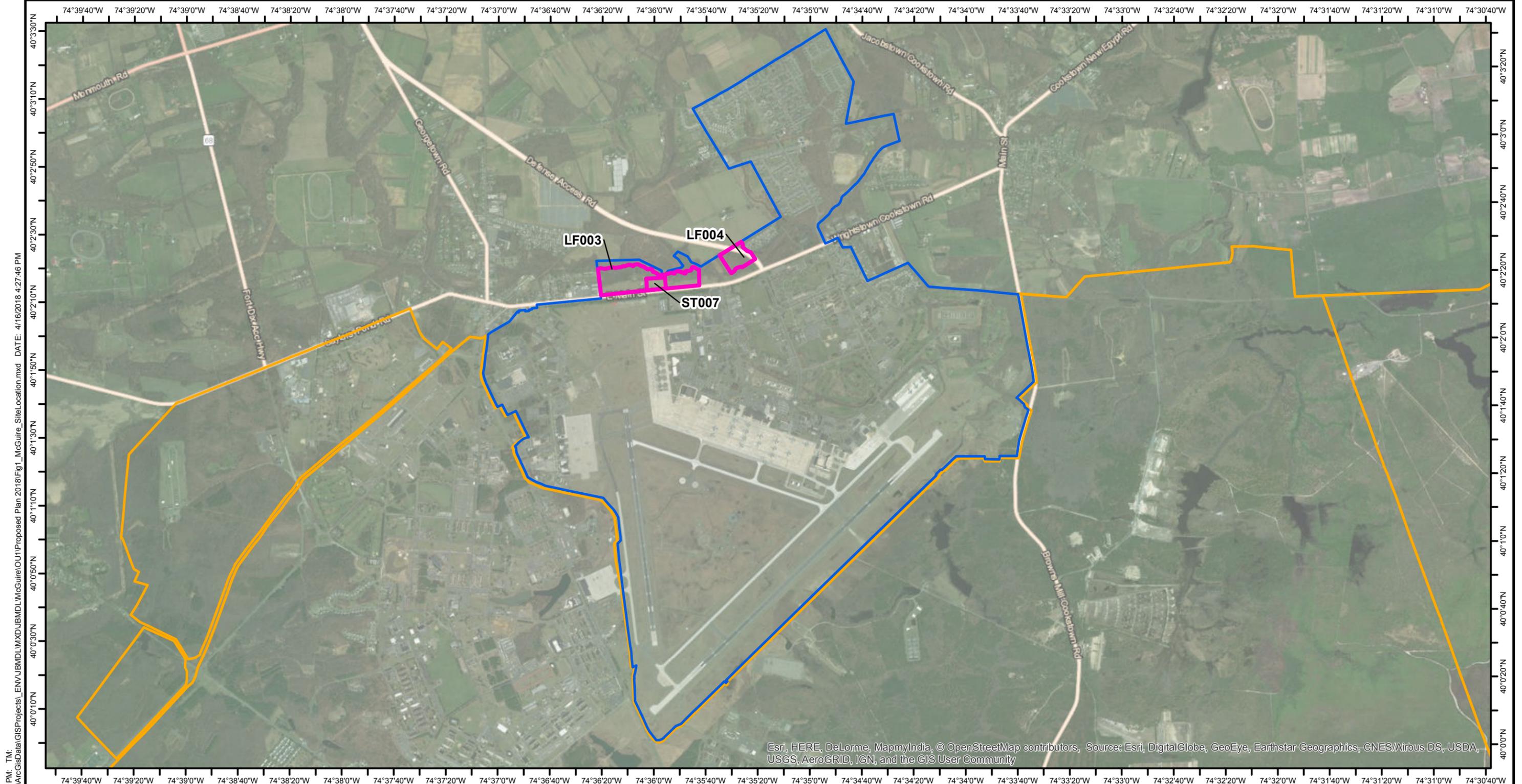
BTV - background threshold value

COC - constituent of concern

PQL - practical quantitation limit

PRG - Preliminary Remedial Goal

## **FIGURES**



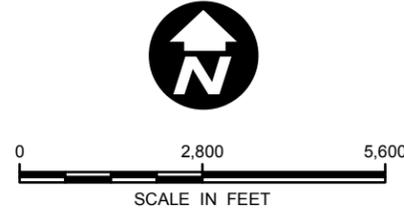
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Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



- Legend**
- Site Location
  - JB MDL - McGuire
  - JB MDL - Dix

Notes:  
1. OU1 consists of sites LF003, LF004 and ST007.



**JOINT BASE  
MCGUIRE - DIX - LAKEHURST  
NEW JERSEY**

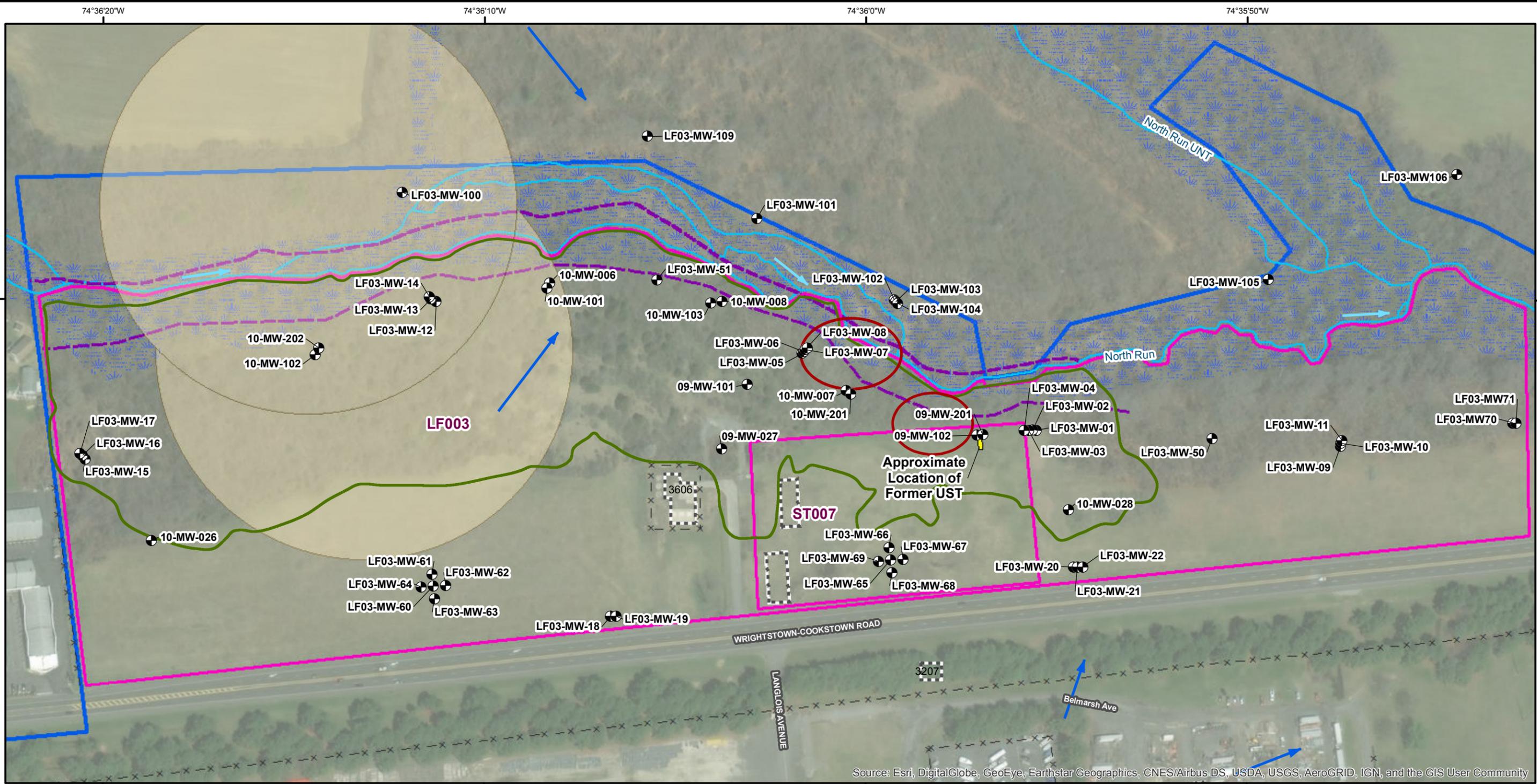
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**OU1 SITE LOCATION MAP**

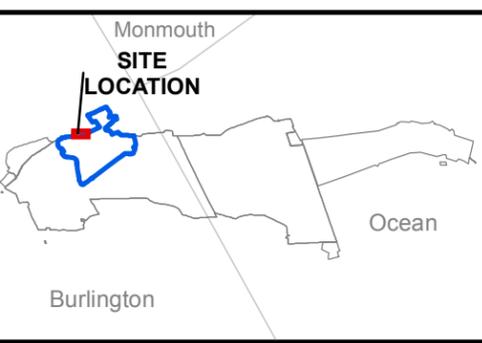
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**FIGURE  
1**

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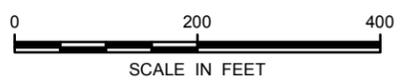


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Legend**

- Monitoring Well
- Fence
- Surface Water
- Landfill Boundary
- North Run Corridor Boundary
- Groundwater Flow Direction
- Waterbody Flow Direction
- MPPEH
- Wetlands
- Former UST
- Approximate Historic Site/Archaeological Artifact Area
- Demolished Building
- Site Boundary
- JB MDL - McGuire



Notes:  
MPPEH = Material Potentially Presenting an Explosive Hazard

**JOINT BASE  
MCGUIRE - DIX - LAKEHURST  
NEW JERSEY**

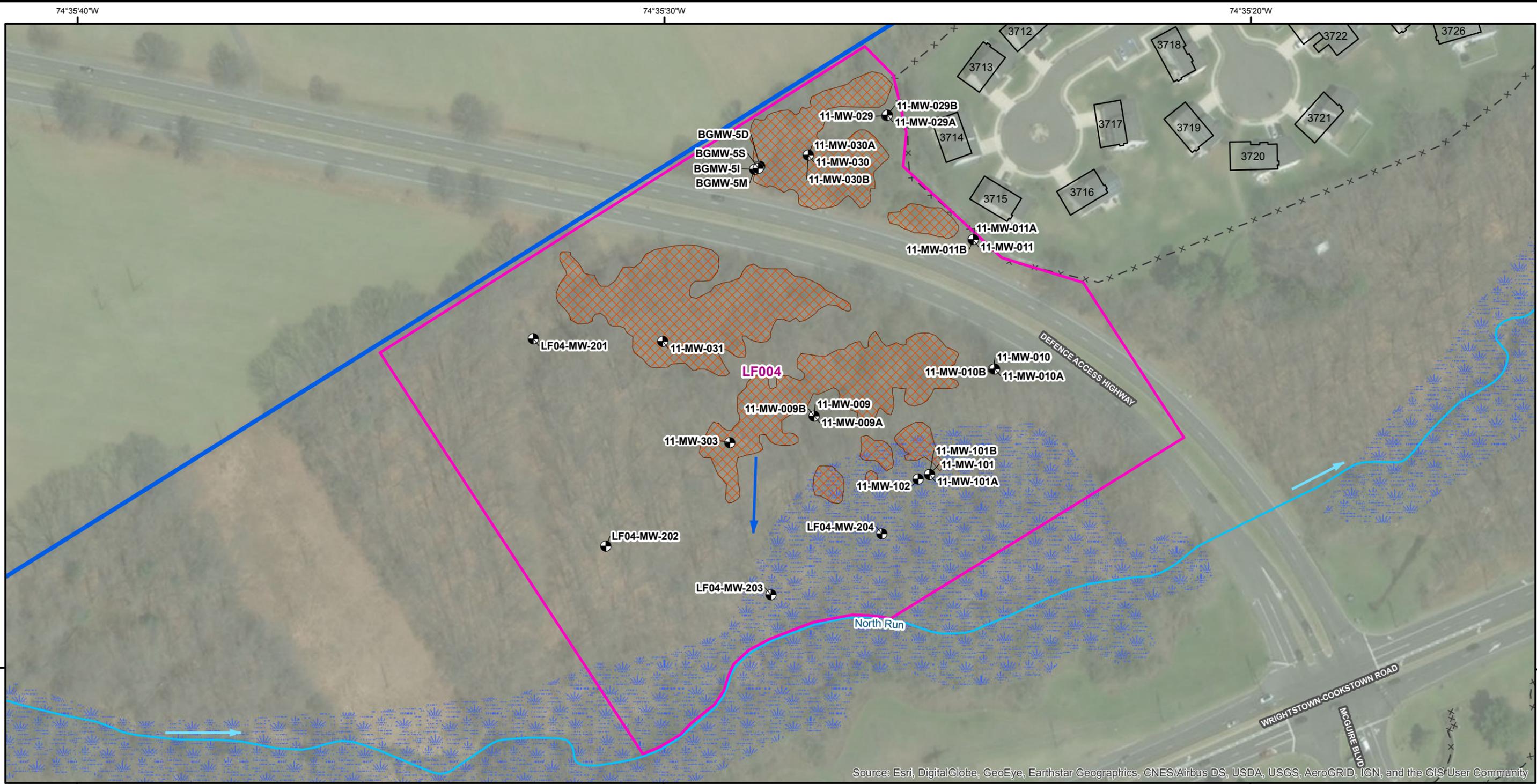
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**LF003/ST007 - SITE MAP**

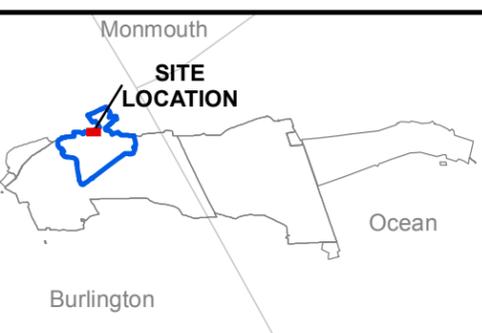
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**FIGURE  
2**

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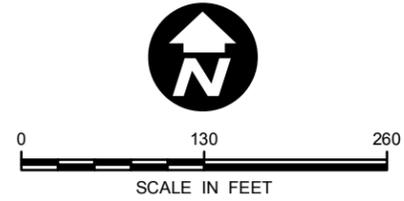
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Legend**

- Monitoring Well
- × - × Fence
- Surface Water
- Groundwater Flow Direction
- Waterbody Flow Direction
- Existing Structure
- Waste Disposal Area
- Wetlands
- Site Boundary
- JB MDL - McGuire

Notes:  
 1. Waste pit locations are approximate. Refer to Remedial Investigation Report Addendum Operable Unit-1 (OU-1) Sites LF-03, LF-04, and ST-07, June 2014.



**JOINT BASE  
 MCGUIRE - DIX - LAKEHURST  
 NEW JERSEY**

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**LF004 - SITE MAP**

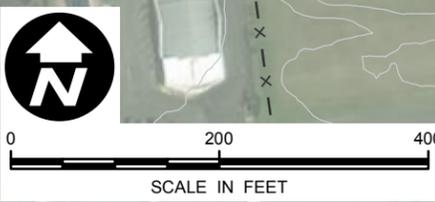
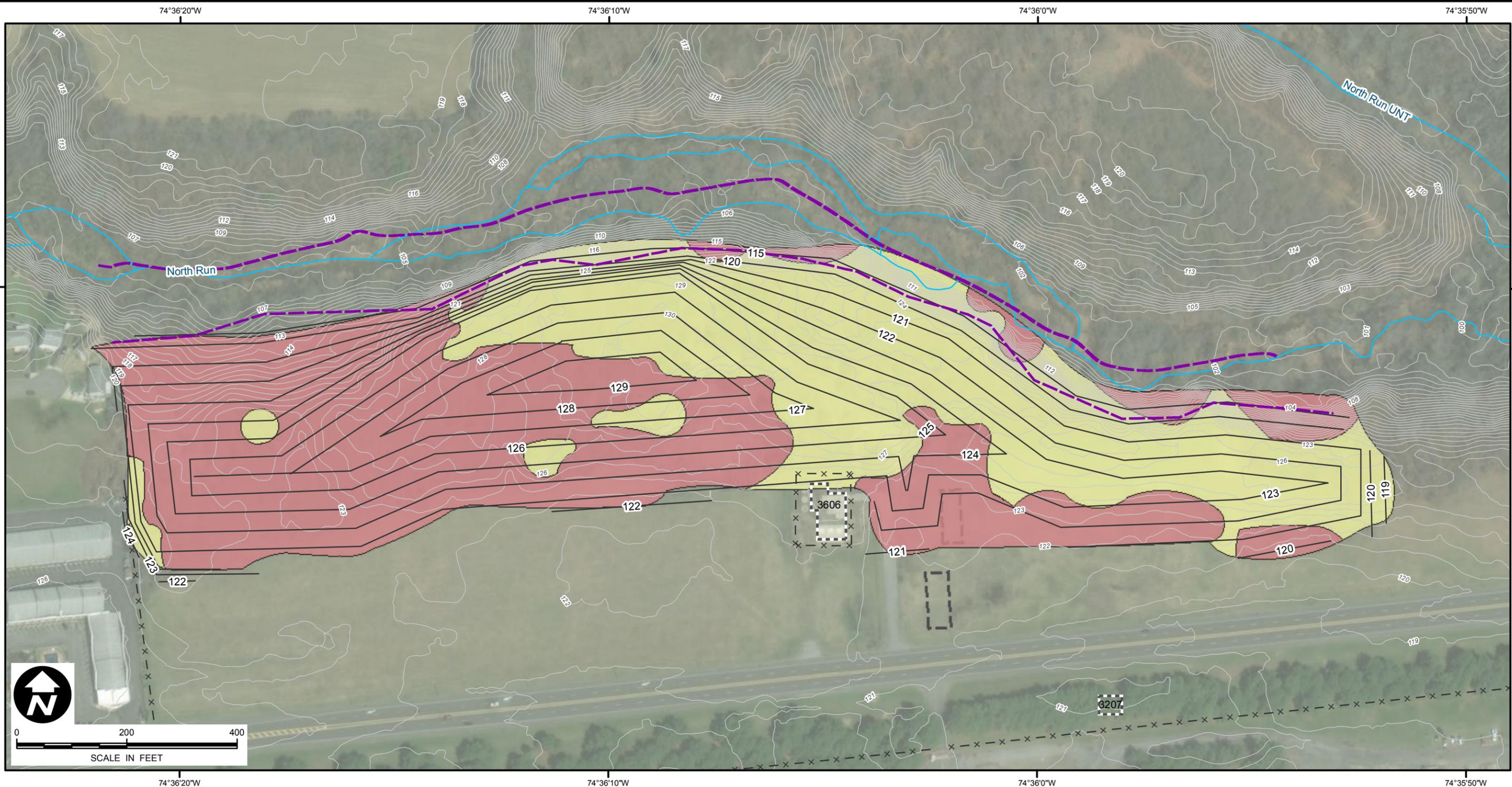
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**ARCADIS**

**FIGURE**  
**3**



DIV\GROUP\EN\IMDV\_DB:sbell.LD:PIC:PM:TM: PROJECT:\BMDL\_PATH:\corpstorage\Data\ArcGisData\GIS\Projects\ENV\BMDL\MXD\JBM\DL\McGuire\OU1\Proposed Plan 2018\Fig5\_McGuire\_OU1\_LF003\_SubgradeAll.mxd DATE: 4/16/2018 4:56:53 PM



**Legend**

- × - × Fence
- Subgrade Contour in Feet
- Existing Contour in Feet
- Surface Water
- North Run Corridor Boundary
- Soil Filled To Meet Subgrade
- Soil Stripped To Meet Subgrade
- Demolished Building
- Demolished Structure
- Site Boundary

	Area ft <sup>2</sup>	Acres
Soil Filled	513,283	11.78
Soil Stripped	423,257	9.72

Notes:  
 1. Maximum slope shall be 3H:1V  
 2. Existing grades shown are approximate and shall be field verified prior to commencement of cap installation

**JOINT BASE  
 MCGUIRE - DIX - LAKEHURST  
 NEW JERSEY**

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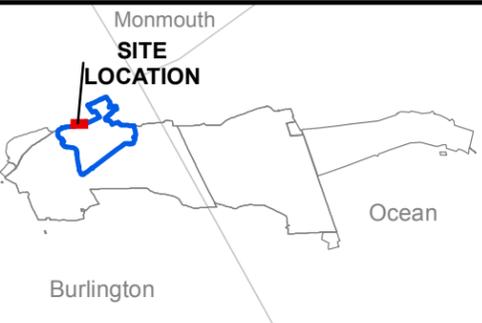
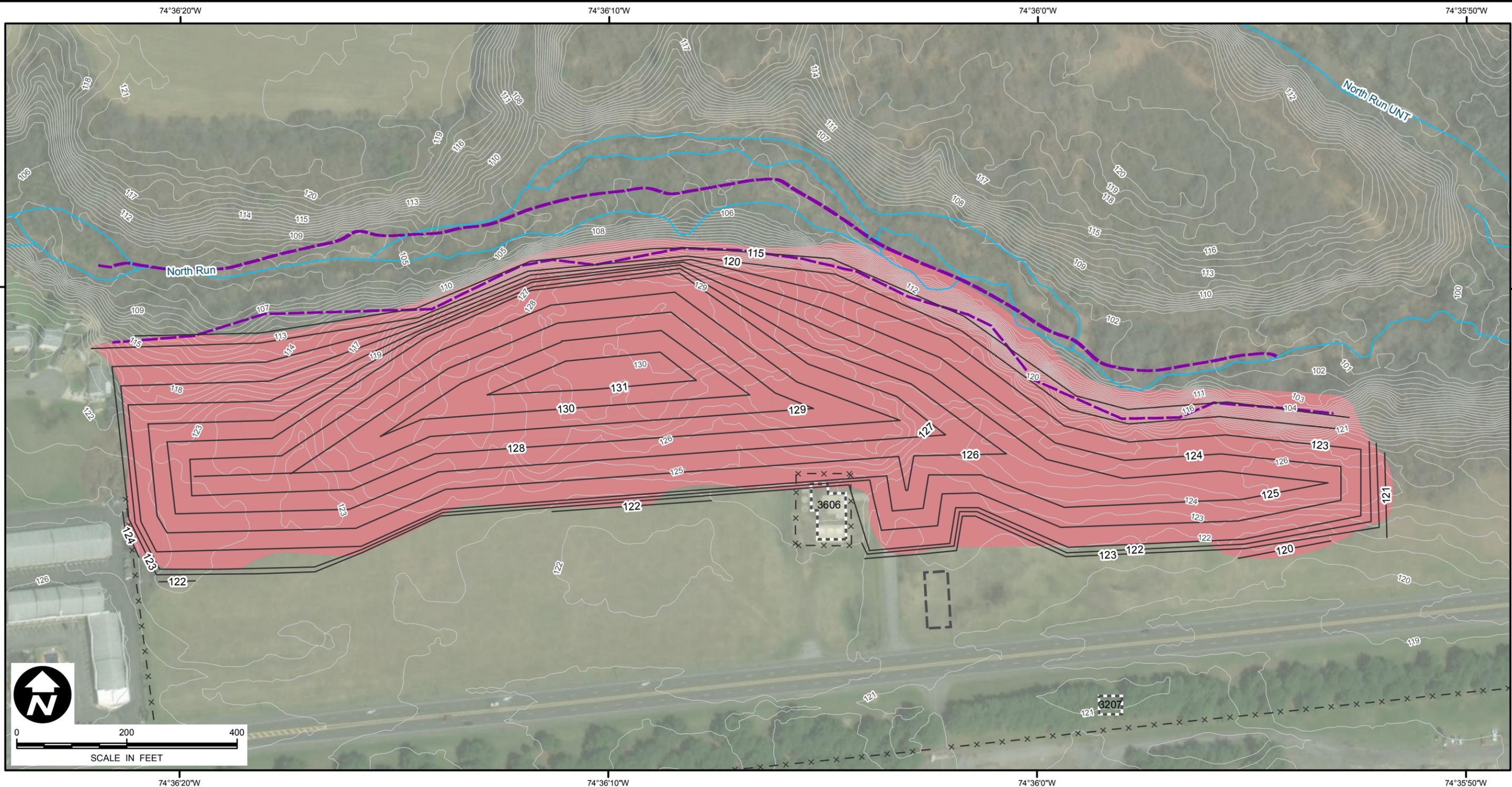
**LF003 SUBGRADE PLAN FOR  
 ALTERNATIVES 3 AND 4**

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**FIGURE  
5**

DIV/GROUP: ENV/IMDV DB: sbell LD: PIC: PM: TM: PROJECT: JBMDL\_PATH: \\corpstorage\Data\ArcGisData\GIS\Projects\ENV\JBMDL\MXD\JBMDL\McGuire\OU1\Proposed Plan 2018\Fig6\_McGuire\_OU1\_LF003\_FinalGradeAlt.mxd DATE: 4/16/2018 4:57:50 PM



**Legend**

- × - × Fence
- Subgrade Contour in Feet
- Existing Contour in Feet
- Surface Water
- North Run Corridor Boundary
- Soil Filled to Meet Final Grade
- Demolished Building
- Demolished Structure
- Site Boundary

	Area ft <sup>2</sup>	Acres
Soil Filled	936,540	21.5

Notes:  
 1. Maximum slope shall be 3H:1V  
 2. Existing grades shown are approximate and shall be field verified prior to commencement of cap installation

**JOINT BASE  
 MCGUIRE - DIX - LAKEHURST  
 NEW JERSEY**

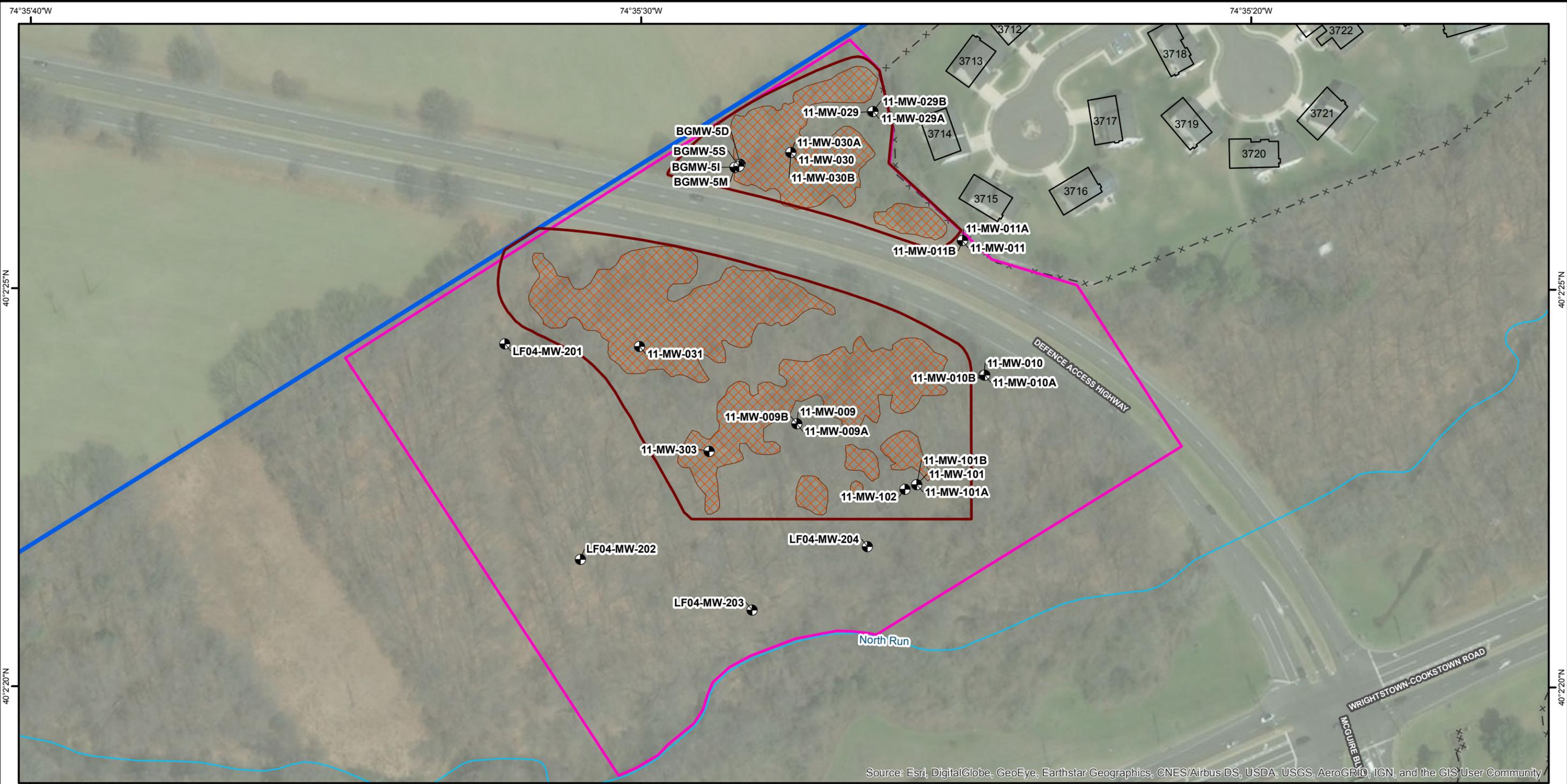
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**LF003 FINAL GRADE PLAN FOR  
 ALTERNATIVES 3 AND 4**

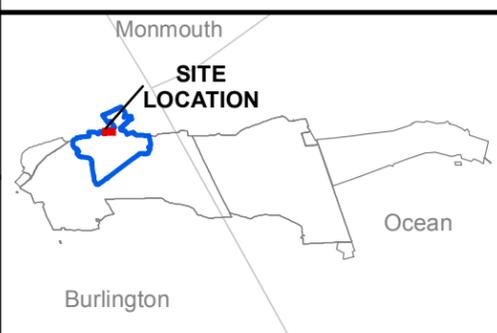
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6

DIV\GROUP: ENV\IMDV DB: sbell LD: PIC: PM: TM: PROJECT: JBMDL PATH: \corporate\GIS\Projects\ENV\JBMDL\MXD\JBMDL\McGuire\OU1\Proposed Plan\_2018\Fig7\_McGuire\_OU1\_LF004\_Air2\_OptSoilCover.mxd DATE: 4/16/2018 4:59:33 PM



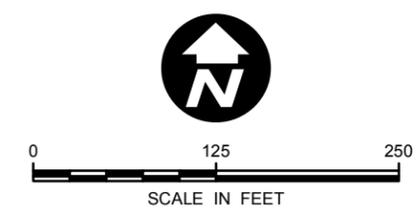
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



- Legend**
- Monitoring Well
  - Fence
  - Surface Water
  - Optimized Soil Cover
  - Waste Disposal Area
  - Existing Structure
  - Site Boundary
  - JB MDL - McGuire

	Area ft <sup>2</sup>	Acres
Optimized Soil Cover South	135,085	3.1
Optimized Soil Cover North	39,155	0.9
Waste Disposal Area	108,900	2.5

- Notes:
1. A pre-design investigation will occur to determine final locations for additional soil cover
  2. An estimated 91,504 square feet of the site will require additional fill material. Locations of the additional fill varies throughout the optimized soil cover boundary.
  3. Waste pit locations are approximate. Refer to Remedial Investigation Report Addendum Operable Unit-1 (OU-1) Sites LF-03, LF-04, and ST-07, June 2014.



JOINT BASE  
MCGUIRE - DIX - LAKEHURST  
NEW JERSEY

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**LF004 ALTERNATIVE 2 –  
OPTIMIZED SOIL COVER**

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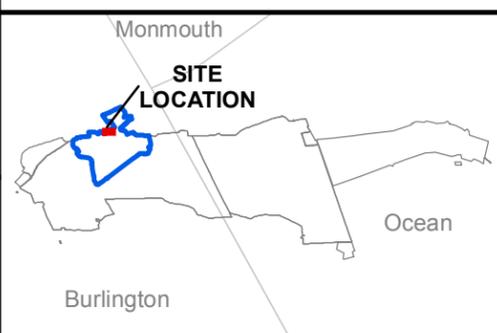
**ARCADIS** | **FIGURE 7**

DIV\GROUP\ENV\IMDV DB: sbeil.LD: PIC: PM: TM: PROJECT: JBMDL\_PATH: \corporate\GIS\Projects\ENV\JBMDL\MXD\JBMDL\McGuire\OU1\Proposed Plan 2018\Fig8\_McGuire\_OU1\_LF004\_SubgradeAll.mxd DATE: 4/16/2018 5:00:51 PM



	Area ft <sup>2</sup>	Acres
Soil Filled	82,302	1.89
Soil Stripped	74,106	1.70

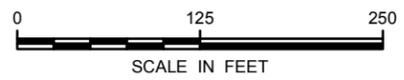
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Legend**

- × - × Fence
- Surface Water
- Subgrade Contour in Feet
- Existing Contour in feet
- Soil Filled To Meet Subgrade
- Soil Stripped To Meet Subgrade
- Existing Structure
- Site Boundary
- JB MDL - McGuire

Notes:  
 1. Maximum slope shall be 3H:1V  
 2. Existing grades shown are approximate and shall be field verified prior to commencement of cap installation.



JOINT BASE  
 MCGUIRE - DIX - LAKEHURST  
 NEW JERSEY

**LF004 SUBGRADE PLAN FOR  
 ALTERNATIVES 3 AND 4**



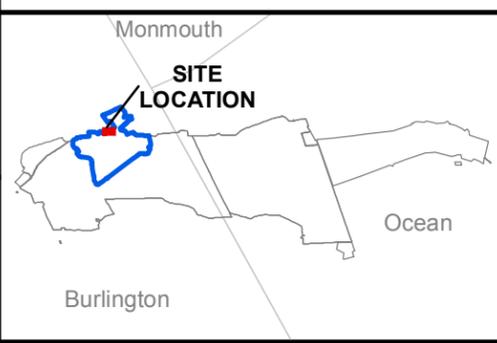
**FIGURE  
8**

DIV\GROUP\ENV\IMDV\DB:sbel.LD:PIC:PM:TM:  
 PROJECT:JBMDL\_PATH:\corporate\GIS\Projects\ENV\JBMDL\MXD\JBMDL\McGuire\OU1\Fig9\_McGuire\_OU1\_LF004\_FinalGradeAlt.mxd DATE: 4/16/2018 5:01:54 PM



	Area ft <sup>2</sup>	Acres
Soil Filled	156,408	3.59

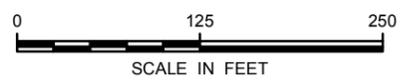
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Legend**

- × - × Fence
- Surface Water
- Subgrade Contour in Feet
- Existing Contour in Feet
- Soil Filled to Meet Final Grade
- Existing Structure
- Site Boundary
- JB MDL - McGuire

Notes:  
 1. Maximum slope shall be 3H:1V  
 2. Existing areas shown are approximate and shall be field verified prior to commencement of cap installation.



**JOINT BASE  
 MCGUIRE - DIX - LAKEHURST  
 NEW JERSEY**

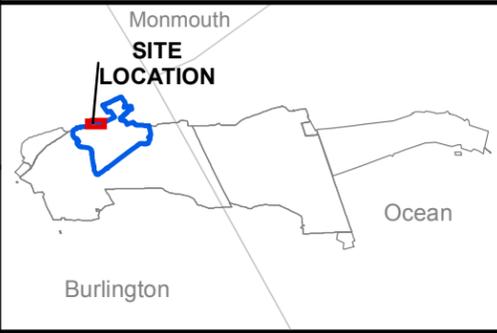
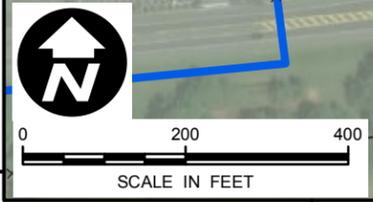
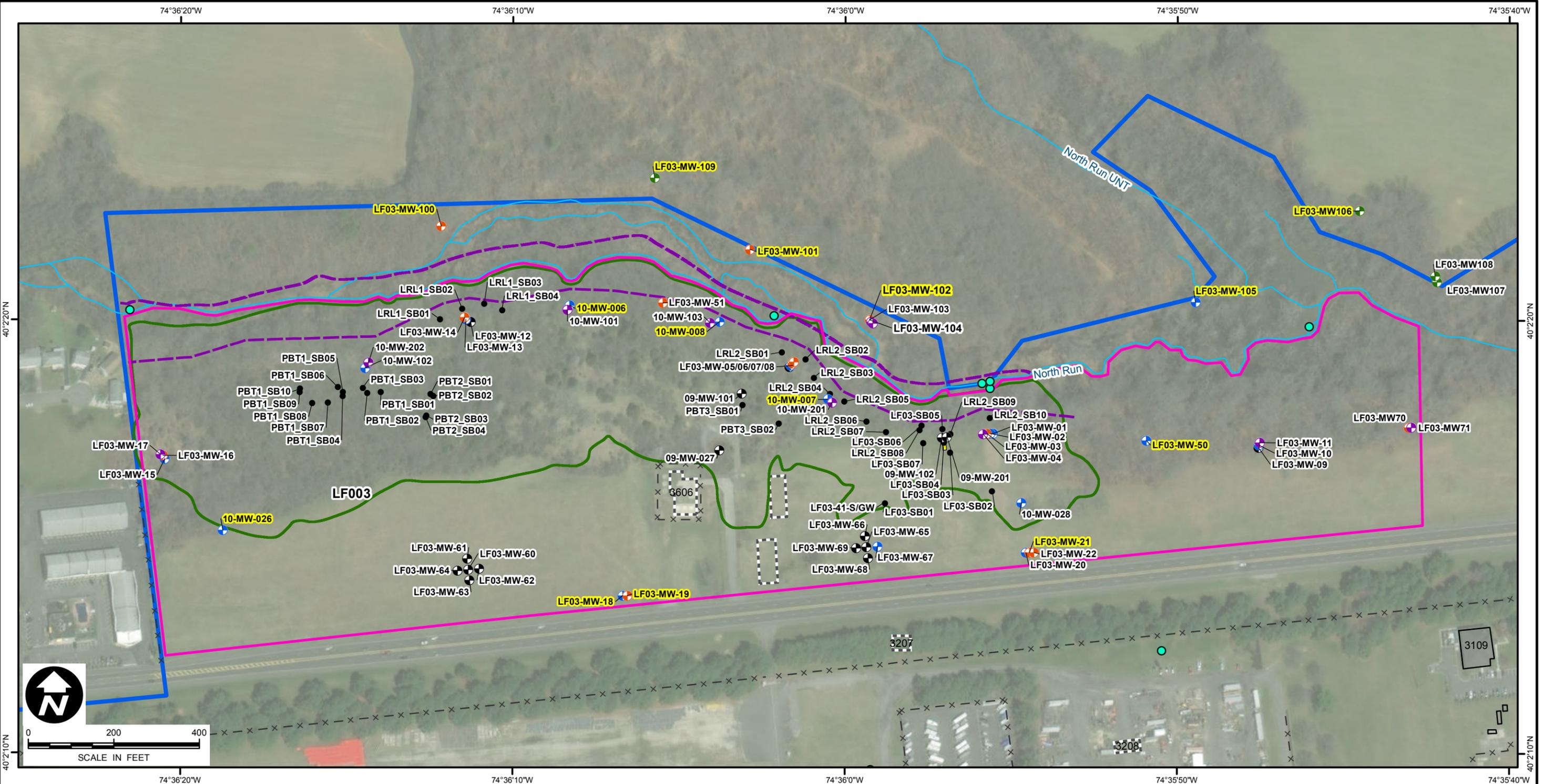
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**LF004 FINAL GRADE PLAN FOR  
 ALTERNATIVES 3 AND 4**

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9

DIV\GROUP\ENVI\MDV\DB: sshell.LD: PIC: PM: TM: PROJECT: JBMDL\_PATH: \corporate\GIS\Projects\ENVI\JBMDL\JBM\DL\McGuire\OU1\Proposed Plan\_2018\Fig10\_McGuire\_OU1\_LF003\_Proposed\_TPlan.mxd DATE: 4/16/2018 5:03:35 PM



**Legend**

- Monitoring Well
- Shallow Monitoring Well
- Intermediate Monitoring Well
- Deep Monitoring Well
- Offsite Monitoring Well
- Surface Water/Sediment Sample
- Soil Boring
- Fence
- Surface Water
- North Run Corridor Boundary
- Landfill Boundary
- Former UST
- Existing Structure
- Demolished Building
- Proposed LUC Boundary
- JB MDL - McGuire

Notes:  
 1. Highlighted wells to be included in LTM.  
 2. Surface Water/Sediment sampling locations to be included in LTM  
 3. Final sampling locations and wells will be established in the RD.

**JOINT BASE  
 MCGUIRE - DIX - LAKEHURST  
 NEW JERSEY**

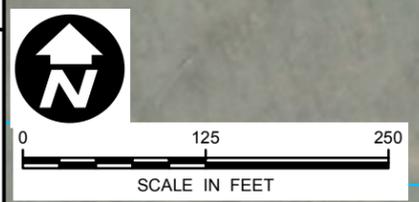
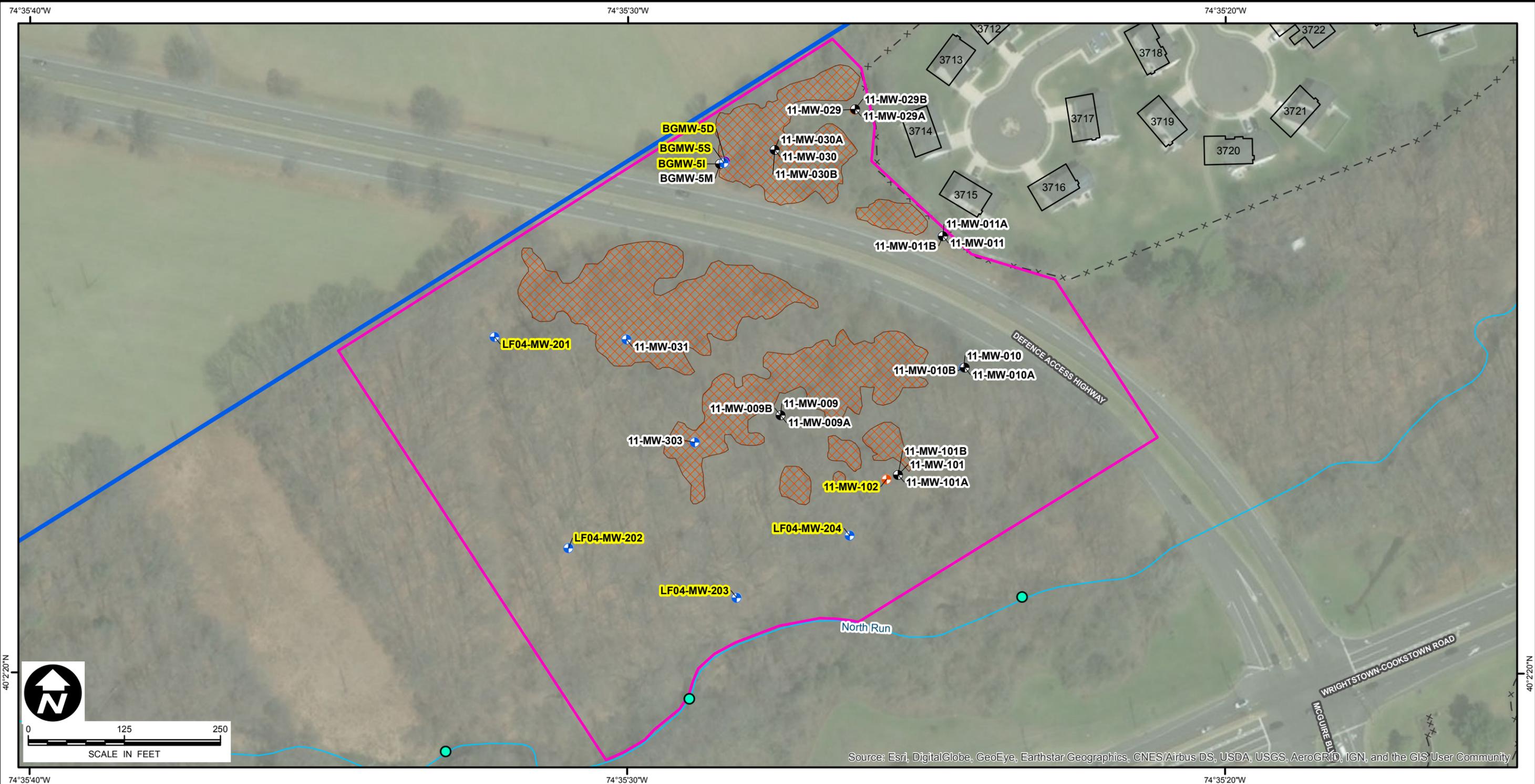
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**LF003 - PROPOSED LONG  
 TERM MONITORING PLAN**

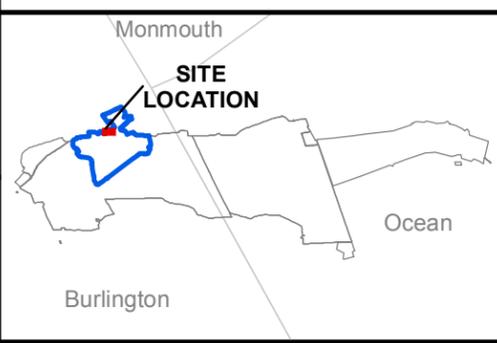
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**FIGURE  
10**

DIV\GROUP: ENV\IMDV DB: sbell LD: PIC: PM: TM: PROJECT: JBMDL PATH: \corporate\GIS\Projects\ENV\JBMDL\MXD\JBMDL\McGuire\OU1\Proposed Plan\_2018\Fig11\_McGuire\_OU1\_LF004\_Proposed\_TPlan.mxd DATE: 4/16/2018 5:05:54 PM



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



**Legend**

- Monitoring Well
- Shallow Monitoring Well
- Intermediate Monitoring Well
- Deep Monitoring Well
- Surface Water Sample
- Fence
- Surface Water
- Waste Disposal Area
- Existing Structure
- Proposed LUC Boundary
- JB MDL - McGuire

**Notes:**

1. Waste pit locations are approximate. Refer to Remedial Investigation Report Addendum Operable Unit-1 (OU-1) Sites LF-03, LF-04, and ST-07, June 2014.
2. Highlighted wells to be included in LTM.
3. Surface Water/Sediment sampling locations to be included in LTM
4. Final sampling locations and wells will be established in the RD.

JOINT BASE  
MCGUIRE - DIX - LAKEHURST  
NEW JERSEY

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**LF004 - PROPOSED LONG  
TERM MONITORING PLAN**

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FIGURE  
**11**