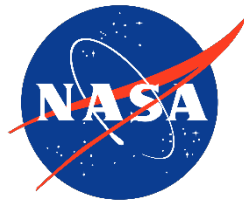


**FINAL
FOURTH FIVE-YEAR REVIEW
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LANGLEY RESEARCH CENTER
HAMPTON, VIRGINIA**

Prepared for



**NASA Langley Research Center
5 Langley Blvd., Bldg. 2101
M/S 12
Hampton, VA 23681-2199
Contract No. 80KSC024DA002
Task Order No. 80LARC25FA014**

August 2026

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EXECUTIVE SUMMARY

The National Aeronautics and Space Administration (NASA) prepared this report to document the fourth Five-Year Review (FYR) conducted for Langley Research Center (LaRC), located in Hampton, Virginia, in accordance with Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 and implemented by the National Oil and Hazardous Substances Pollution Contingency Plan. The previous FYR was completed in August 2021. NASA LaRC and Langley Air Force Base (LAFB) are listed together on the National Priorities List (NPL); however, CERCLA investigations for the two areas have been conducted separately. NASA LaRC is being investigated by NASA and LAFB is being investigated by the Air Force.

This report was prepared in accordance with the U.S. Environmental Protection Agency's (USEPA) (2001) *Comprehensive Five-Year Review Guidance* and follows the USEPA (2016) *Five-Year Review Recommended Template Memorandum*. It summarizes the evaluation of remedies and remedial actions under a Record of Decision (ROD) that resulted in hazardous substances, pollutants, or contaminants remaining at sites above levels that prohibit unlimited use and unrestricted exposure. The following three sites require a CERCLA FYR:

- Operable Unit (OU)-01 - Area E Warehouse (Area E Warehouse),
- OU-02 - Stratton Substation Soil (Stratton Substation Soil), and
- OU-05 - Construction Debris Landfill (CDL).

The objective of the FYR is to evaluate the effectiveness of the remedies to determine if they continue to be protective of human health and the environment in accordance with the requirements set forth in the RODs. This evaluation was accomplished through a review of various reports and documents pertaining to post-remedy implementation activities, analytical data, and findings, and through site visits, interviews, and inspections. The community was notified of the review process through a public notice. This report identifies potential issues (if present) that may prevent a particular remedy from functioning as designed or providing sufficient protection of human health and the environment. The overall evaluations of the effectiveness of each remedy are presented as protectiveness statements in the following FYR Summary Form.

A Per- and Polyfluoroalkyl Substances (PFAS) Preliminary Assessment (PA) and Site Inspection (SI) have been completed at LaRC in 2022 and 2024, respectively. The Area E Warehouse and Stratton Substation Soil OUs were not identified as areas of potential PFAS concern during the PA. The PA Report did recommend the CDL for further PFAS assessment in the SI. The SI results indicated the presence of PFAS in groundwater at the CDL at concentrations greater than the USEPA Regional Screening Levels (target hazard quotient of 0.1). Based on these findings, the CDL is moving forward to the Remedial Investigation (RI) stage. Because there is no direct human health exposure and land use controls are maintained, a “short-term protective” determination has been made for the CDL during this FYR. PFAS will be evaluated again in the next FYR, at which time the Expanded SI is expected to be completed, the RI will be ongoing, and more PFAS data will be available to update the conceptual site model and assess risks.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: NASA Langley Research Center		
USEPA ID: VA2800005033		
Region: 3	State: VA	City/County: Hampton / Not Applicable
SITE STATUS		
NPL Status: Final		
Multiple (OUs)? Yes	Operable Units	Has the site achieved construction completion? Yes
REVIEW STATUS		
Lead agency: Other Federal Agency If “Other Federal Agency” was selected above, enter Agency name: National Aeronautics and Space Administration		
Author name (Federal or State Project Manager): Kristi Francisco, Remedial Project Manager		
Author affiliation: NASA, Environmental Compliance and Restoration Program		
Review period: December 2025 to February 2026		
Date of site inspection: December 17, 2025		
Type of review: Statutory		
Review number: 4		
Triggering action date: September 2021		
Due date (five years after triggering action date): September 2026		

FIVE-YEAR REVIEW SUMMARY FORM (Continued)

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU-1 Area E Warehouse OU-2 Stratton Substation Soil

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU-5 Construction Debris Landfill	Issue Category: Changed Site Conditions			
	Issue: PFAS have been detected in CDL groundwater at concentrations exceeding available screening values.			
	Recommendation: NASA is currently conducting an RI for PFAS at many sites, including the CDL. NASA will work with USEPA and Virginia Department of Environmental Quality to determine the most appropriate path forward to address PFAS at the site.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	NASA	USEPA/State	January 2028

FIVE-YEAR REVIEW SUMMARY FORM (Continued)

Protectiveness Statement(s)

The Protectiveness Statements for the Sites are summarized below.

Protectiveness Statement(s)

<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>
OU-1 Area E Warehouse	Protective

Protectiveness Statement: The remedy at OU-1 Area E Warehouse is protective of human health and the environment. The remedy includes the use of institutional controls to prevent non-industrial exposure to soil. This objective has been achieved by the placement of a land use prohibition in the NASA LaRC Master Plan.

Protectiveness Statement(s)

<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>
OU-2 Stratton Substation Soil	Protective

Protectiveness Statement: The remedy at OU-2 Stratton Substation Soil has not been completed due to engineering concerns that additional excavation would compromise the integrity of existing site structures as documented in an Explanation of Significant Differences for the site. However, the remedy is currently protective of human health and the environment through the use of institutional controls. The remedy will be finalized when soil with polychlorinated biphenyl (PCB) concentrations exceeding 10 milligrams per kilogram is removed. Evaluation of groundwater monitoring data concluded that PCB contamination has migrated to groundwater but is present at concentrations that would not pose an unacceptable risk to human health under a drinking water scenario.

Protectiveness Statement(s)

<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>
OU-5 Construction Debris Landfill	Short-term Protective

Protectiveness Statement: The remedy at OU-5 CDL currently protects human health and the environment because there is no direct exposure to landfill waste and groundwater, institutional controls are in place and maintained, and post-closure groundwater monitoring is performed. PFAS are emerging contaminants that have been detected in groundwater at the CDL. However, the presence of PFAS in groundwater does not impact remedy protectiveness in the short-term because engineering and institutional controls are in place to mitigate exposure.

The signature below acknowledges NASA's review and acceptance of the enclosed Five-Year Review document findings for the Langley Research Center Sites summarized herein. The findings of these Five-Year Reviews, acknowledged by this signature, are summarized in this Five-Year Review Summary Form, and are detailed in the pages that follow.

Trina Dyal

Digitally signed by Trina Dyal
Date: 2026.08.14 08:10:21
-04'00'

**Dr. Trina M. Dyal, Center Director
NASA Langley Research Center (LaRC)**

8/14/26

Date

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LIST OF ACRONYMS AND ABBREVIATIONS

mg/kg	milligrams per kilogram
ng/L	nanogram per liter
pg/L	picograms per liter
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
AOPC	area of potential concern
ARAR	applicable or relevant and appropriate requirements
BHHRA	Baseline Human Health Risk Assessment
BTAG	Biological Technical Assistance Group
CDL	Construction Debris Landfill
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	chemicals of potential concern
DCE	dichloroethene
DDT	dichlorodiphenyltrichloroethane
ESD	Explanation of Significant Differences
FDSA	Former Drum Staging Area
FS	Feasibility Study
FYR	Five-Year Review
HHRA	Human Health Risk Assessment
HI	hazard index
ILCR	Incremental Lifetime Cancer Risk
IRA	Interim Remedial Action
LAFB	Langley Air Force Base
LaRC	Langley Research Center
LTM	long term monitoring
LUC	land use control
MCL	Maximum Contaminant Level
NASA	National Aeronautics and Space Administration
NPL	National Priorities List
NTCRA	Non-Time Critical Remedial Action
O&M	operations and maintenance

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

OU	operable unit
PA	Preliminary Assessment
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
PCE	tetrachloroethene
PEF	particulate emission factor
PFAS	per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PSL	project screening level
RAO	remedial action objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	remedial project manager
RSL	Regional Screening Level
SI	Site Inspection
SVOC	semivolatile organic compound
TCE	trichloroethene
TEF	Toxicity Equivalence Factors
TEQ	toxicity equivalent
USEPA	U.S. Environmental Protection Agency
UU/UE	unrestricted use/unlimited exposure
VC	vinyl chloride
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

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1.0 INTRODUCTION

The National Aeronautics and Space Administration (NASA) has prepared this Five-Year Review (FYR) for Langley Research Center (LaRC) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (40 CFR Section 300.430(f)(4)(ii)) and considering U.S. Environmental Protection Agency (USEPA) policy. The purpose of a FYR is to evaluate the implementation and performance of a remedy and whether that remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

This is the fourth FYR for the NASA LaRC Superfund Site. The triggering action for this review is the completion date of the previous FYR, which was September 2021. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at sites above levels that prohibit unlimited use and unrestricted exposure (UU/UE). The following three sites require a CERCLA FYR:

- Operable Unit (OU)-01 - Area E Warehouse (Area E Warehouse)
- OU-02 - Stratton Substation Soil (Stratton Substation Soil)
- OU-05 - Construction Debris Landfill (CDL)

Two OUs, OU-3 (Tabbs Creek) and OU-6 (Stratton Substation Groundwater), do not require a FYR. At OU-3, a final Remedial Action was completed in 1999 to implement the remedy selected in the 1998 Record of Decision (ROD). Remedial action objectives (RAOs) identified in the ROD were met and the Remedial Action Completion Report was approved and accepted by USEPA. As stated in the OU-3 ROD, no FYR is required because the remedy resulted in UU/UE. A no-action ROD was signed for OU-6 in 2014 (NASA, 2021b).

The NASA LaRC FYR was led by the remedial project manager (RPM) for the Environmental Restoration Program at NASA LaRC with support from the NASA LaRC Environmental Support contractor, HydroGeoLogic, Inc). Participants also included the USEPA Region III RPM, representing the lead regulatory agency, and the RPM for Virginia Department of Environmental Quality (VDEQ), representing the support agency. The review began in December 2025.

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2.0 NASA LaRC BACKGROUND

2.1 FACILITY DESCRIPTION

NASA LaRC occupies approximately 767 acres of U.S. Government-owned land on the lower York-James Peninsula in Hampton Roads, Virginia (Figure 1). Approximately 150 facilities are located at NASA LaRC and are divided among the “West” and “East” areas, with the majority in the West Area. The West Area is bordered on the north by Brick Kiln Creek, Route 172 to the west, and Joint Base Langley-Eustis, Langley Air Force Base (LAFB) to the south and east.

Because NASA LaRC is a federal property and facility activities are of a highly technical nature, access is restricted and the perimeter of the facility is patrolled daily by security. The majority of the perimeter of NASA LaRC is surrounded by an 8-foot-high, chain-link fence, with the CDL being an exception. The CDL is accessible from Brick Kiln Creek as it is not within the fence line. The facility’s border fence is checked periodically for maintenance. Access is controlled through three entrance gates; two are closed at night and the third is staffed 24 hours a day (NASA, 2017).

2.2 FACILITY HISTORY

LaRC was established in 1917 as an aeronautical research laboratory. In 1920, LaRC was dedicated and the world’s first wind tunnel was completed at the facility (East Area). Originally established to research airframe and propulsion engine design and performance, LaRC expanded in 1943 to include rocket research in response to German rocket testing during World War II. In the 1960s, the Mercury Astronauts were trained at LaRC (Ebasco, 1995). This ended in 1962 when the manned space center in Houston opened. After that time, LaRC focused on testing Space Shuttle Systems and the unmanned Viking probes. Aeronautic research activities continued to expand at LaRC and included extensive research on supersonic transports. Studies have focused on instrumentation, materials fatigue, acoustics, aerodynamics and guidance control. LaRC has supported all the major NASA, Department of Defense, and Department of Energy programs assigned to the various NASA centers by providing scientific investigations, laboratory tests, and extensive research. Currently, the primary function of LaRC is the research and development of advanced technologies for aircraft and spacecraft (NASA, 2024).

2.3 ENVIRONMENTAL INVESTIGATION HISTORY

Since the mid-1980s, several areas of potential environmental contamination have been identified and investigated at NASA LaRC. Six separate areas were investigated at NASA LaRC as part of the Superfund process. One of the six areas, the Stormwater System, was cleaned up in 1995 under a Federal Facility Compliance Agreement signed by NASA and USEPA in 1990 (NASA, 2017).

In accordance with CERCLA, NASA conducted a formal Preliminary Assessment (PA) at NASA LaRC in February 1988 to determine whether any areas at NASA LaRC presented a release or threat of a release sufficient enough to warrant further investigation. The PA consisted of records review and interviews with employees and retirees (NASA, 2017).

To complete the PA, a review of available data and interviews with NASA LaRC employees and retirees were conducted. Documents reviewed included reports on previous waste handling and

disposal practices for waste disposal areas, past chemical spills and past polychlorinated biphenyl waste storage areas. Results of the PA revealed seven areas warranting Site Inspections (SIs), which included on-site investigations, inspections, or assessments to determine whether there was a release or threat of release of contaminants to the environment (NASA, 2017).

Data from the PA/SI was used to calculate a Hazard Ranking System score as part of the CERCLA process to determine whether the site should be proposed for inclusion on the National Priorities List (NPL). Sites with a score of 28.5 or higher (out of 100) are placed on the USEPA NPL. In 1993, USEPA published the calculated combined score of 50 for NASA LaRC and LAFB, based on the PA/SI that resulted in NASA LaRC being placed on the NPL (NASA, 2017).

2.4 FEDERAL FACILITIES AGREEMENT

NASA LaRC was proposed by USEPA for inclusion on the NPL in May 1993 and was formally placed on the NPL in May 1994 (NASA, 2017). As a result of NASA LaRC being proposed for inclusion on the NPL, NASA entered into negotiations for a Federal Facility Agreement with USEPA Region III and VDEQ pursuant to CERCLA Section 120. The purpose of this agreement was to:

- Identify OUs for purposes of site investigation and cleanup activities prior to the implementation of final Remedial Action(s);
- Establish requirements for the performance of the Remedial Investigation (RI)/Feasibility Study (FS);
- Identify the nature, objective, and schedule of all activities to be taken at the site; and
- Ensure that selected Remedial Actions are implemented in accordance with CERCLA and applicable State law and assure compliance with other federal and state laws and regulations.

The Federal Facility Agreement was signed on December 16, 1993, at which time USEPA announced the beginning of a 45-day public review and comment period. No significant comments were noted. The final agreement was published in April 1994 after all public comments were addressed. NASA LaRC was the first federal facility to sign a Federal Facility Agreement prior to being formally included on the NPL (NASA, 2017).

2.5 PHYSICAL CHARACTERISTICS

NASA LaRC is situated on the small coastal basin of the Back River, a tidal estuary of the Chesapeake Bay. The Brick Kiln Creek runs along the northern boundary of LaRC and joins the northwest branch of the Back River. The Newmarket Creek flows to the southwest of the LaRC and discharges into the southwest branch of the Back River. Tabbs Creek, which drains most of the West Area of LaRC and a part of LAFB, flows in a northerly direction to join the Back River near the confluence of its two branches (NASA, 2024).

Tidal wetlands exist in two locations at the facility. The tidal wetland zones at NASA LaRC are comprised of natural coastal marshes typical of the region. These areas currently serve as a natural buffer, and are also valuable ecosystems (NASA, 2024).

NASA LaRC is located above a shallow aquifer system, which includes the Columbia, Cornwallis Cave, and Yorktown-Eastover aquifers. These aquifers are not used for drinking water at the NASA facility because LaRC is connected to municipal water (NASA, 2024).

2.6 NASA LARC CHRONOLOGY

The table below provides a chronology of site actions at NASA LaRC. Further details of the actions associated each OU addressed in this FYR are discussed in Section 3.0.

Table 1. NASA LaRC Chronology of Site Actions

Site	Event	Date
Stratton Substation	Polychlorinated biphenyls (PCBs) detected in Stratton Substation Soils	1984
Stratton Substation	Site Investigations and Three Removal Actions	1984 through 1987
Area E Warehouse and Stratton Substation	NASA LaRC Conducts PA	April 1988
Area E Warehouse and Stratton Substation	SI Report	May 1989
Area E Warehouse	Site Assessment	November 1990
Area E Warehouse	Contamination Assessment	October 1992
Basewide	Federal Facility Agreement	April 1994
Basewide	NASA LaRC Added to NPL	May 31, 1994
Area E Warehouse	Addendum to the Site Assessment	1995
CDL	Expanded Site Inspection identifies CDL	1995
Tabbs Creek	Remedial Investigation (RI)/ Feasibility Study for Tabbs Creek 1992-1996	1992 - 1996
Stratton Substation	FS for Stratton Substation	1996 - 1997
CDL	CDL Site Investigation 1996-1997	1996 - 1997
Area E Warehouse	Site Investigation at Area E Warehouse	1997
Area E Warehouse	Proposed Plan	January 1998
Area E Warehouse	ROD	September 28, 1998
Area E Warehouse	ROD Remedy Implemented	1998
Tabbs Creek	ROD	September 30, 1998
Stratton Substation	ROD for Soil	September 2, 1999
Tabbs Creek	Removal Action at Tabbs Creek	1999 - 2000
Tabbs Creek	Final Remedial Action Report	2000
Stratton Substation	Removal Action at Stratton Substation	2000
Stratton Substation	Final Remedial Action Report for Soil	December 2000
Stratton Substation	Remedial Action Completion Report for Stratton Substation Soil	August 2002
Tabbs Creek	Biological Monitoring of Tabbs Creek	2000 - 2007
Stratton Substation	Final Groundwater RI at Stratton Substation OU-06	2000 - 2012
CDL	Baseline Ecological Risk Assessment	2001 - 2003
CDL	Human Health Risk Assessment	2003
CDL	Final FS	2009
CDL	Non-Time Critical Removal Action	2009 - 2010
CDL	ROD for Interim Remedy	2010
CDL	Interim Remedy for VOC-Contaminated Groundwater	2011 - 2020

Table 1. (Continued) NASA LaRC Chronology of Site actions

Site	Event	Date
CDL	Final Construction Completion Report on the Interim Remedial Action	2012
CDL	RI Addendum	2016
Stratton Substation	Explanation of Significant Difference (ESD) for Soil ROD	2013
Stratton Substation	No Action ROD for Groundwater	2014
Stratton Substation	Groundwater Long Term Monitoring (LTM) for Soil	2015
Basewide	Final Second FYR Report	2017
CDL	Proposed Plan for Final CDL Remedy	2020
Stratton Substation	LTM Groundwater Sampling	2020
CDL	ROD for Final Remedy	2021
Basewide	Final Third FYR Report	2021
Basewide	Per- and Polyfluoroalkyl Substances (PFAS) PA Report	2022
CDL	Land Use Control (LUC) Remedial Design	2022
CDL	LTM Plan	2022
CDL	Remedial Action Completion Report	2023
Stratton Substation	LUC Remedial Design for Stratton Substation Soil	2023
Area E Warehouse	LUC Remedial Design	2023
Basewide	PFAS SI Report	2024
Stratton Substation	LTM Groundwater Sampling	2025

2.7 BASEWIDE PFAS

A PFAS PA (NASA, 2022b) and SI (NASA, 2024) have been completed at LaRC in 2022 and 2024, respectively. The Area E Warehouse and Stratton Substation Soil OUs were not identified as areas of potential PFAS concern during the PA. The PA Report did recommend the CDL for further PFAS assessment in the SI.

The objective of the SI was to sample wells at the CDL for presence or absence of PFAS, compare PFAS concentrations to USEPA Regional Screening Levels (RSLs) for tapwater, and determine whether further investigation would be warranted. The field investigation activities included collecting groundwater samples from four existing monitoring wells at the CDL screened in shallow groundwater (screen depths ranging from 2 to 14 feet below ground surface) and analyzing for PFAS. Fourteen PFAS analytes were identified in the groundwater samples and detected Perfluorooctanoic Acid (PFOA) and Perfluorooctanesulfonic Acid (PFOS) concentrations were greater than the tapwater RSLs. PFOA was detected at concentrations exceeding the tapwater RSL of 0.0027 nanograms per liter (ng/L) in all four groundwater samples at concentrations ranging from 9.4 ng/L to 28 ng/L. PFOS was detected in three of the four samples at concentrations ranging from 4.1 ng/L to 36 ng/L, which exceeds the tapwater RSL of 0.2 ng/L (NASA, 2024). Based on these findings, the CDL was recommended for further investigation and is moving forward to the RI stage.

An Expanded Site Inspection is currently being conducted at LaRC. The Expanded SI will not be completed in time to be summarized in this FYR. However, none of the sites included in this FYR were evaluated as part of the Expanded SI.

3.0 RESPONSE ACTION SUMMARY

3.1 AREA E WAREHOUSE

The Area E Warehouse serves as a storage and distribution center for supplies and is located between South Marvin Street and Gregg Road along the eastern property boundary between NASA LaRC and Joint Base Langley Eustis-LAFB (Figure 1). The site is approximately 4.5 acres in size and contains several structures including Buildings 1170 through 1174, 1176, and 1255 (Figure 2). The site is surrounded by chain-link security fencing and consists of mainly asphalt and gravel surfaces, with a small area of maintained grass. The Area E Warehouse is located approximately 1,200 feet south of Tabbs Creek and within the tidal zone of the Chesapeake Bay. The northeast portion of the site is located within the 100-year flood plain. The storm sewers located at Area E Warehouse discharge to a drainage ditch immediately adjacent to the site, which then discharges into the sitewide drainage system ultimately draining into Tabbs Creek. There is no surface water on the site other than stormwater runoff that discharges to the drainage ditch. The aquifer directly underlying the site, the Columbia aquifer, is currently not used as a source of potable water. The past and current use of the Area E Warehouse site makes it a very unlikely location for ecological habitat because it is primarily covered with buildings, gravel, paved surfaces, and a small area of maintained landscape. There are no environmentally sensitive areas at the site (NASA, 2017).

From the 1960s through the 1980s, transformers and drums containing waste materials were stored at the Area E Warehouse. During these years, low levels of metals and PCBs were released into the site soil. Environmental investigations conducted from 1988 through 1997 identified mercury, lead, manganese, and PCBs as contaminants in site soil. In addition, low levels of PCBs were also detected in soil collected from the adjacent storm water drainage ditch (NASA, 2017).

3.1.1 Basis for Taking Action

Based on historical operations and sampling activities, the main contaminants of concern at Area E Warehouse are lead, mercury, manganese and PCBs. These contaminants were detected in site soils at levels requiring remedial response. In the groundwater and drainage ditch sediment (soil), metals were detected at concentrations consistent with site background levels. PCBs were not detected in groundwater and were detected at low concentrations in the drainage ditch sediments immediately adjacent to the site. However, the site assessment determined that it was unlikely significant contamination would migrate off site or impact groundwater (NASA, 1998).

Investigations conducted at the Area E Warehouse identified two potential pathways for ecological impact, which were sediment transport of contaminated soil to Tabbs Creek via storm water drains and/or groundwater infiltration. Because of the flat profile of the area, sediment transport was determined to be very unlikely. As stated in the ROD, although soil screening levels have been exceeded in the soil at the Area E Warehouse, there is no indication from samples taken in the storm drain or in Tabbs Creek that there exists an ecological risk as a result of surface runoff from the site. In addition, the physical setting of the Area E Warehouse makes it a very unlikely location for terrestrial habitat (NASA, 1998).

A Human Health Risk Assessment (HHRA) was conducted for soils, which were evaluated only for construction worker exposure. The risk assessment assumed that the person would be working

at the site for 8 hours a day, 5 days a week and would be exposed to the maximum concentration of soil contaminants during the duration of each shift. The direct contact risk, including oral and dermal exposures to contaminated soils, for LaRC workers was calculated in the risk assessment included in the Area E Site Assessment. The Incremental Lifetime Cancer Risk (ILCR) from PCB exposure for the workers at the Area E Warehouse was calculated at $4.9\text{E-}05$, which is within USEPA's acceptable risk range of $1\text{E-}06$ to $1\text{E-}04$. The Hazard Index (HI) for the non-carcinogenic risk due to exposure to metals in contaminated soils was estimated to be 0.2, which is below the target of 1 (Ebasco, 1990).

3.1.2 Response Actions

There were no pre-ROD actions or responses at OU-1. The selected remedy identified in the September 1998 ROD (NASA, 1998) was Alternative 4: Institutional Controls.

3.1.2.1 Remedial Action Objectives

The RAO identified in the ROD for the Area E Warehouse is to protect human health and the environment by assuring that the property use does not allow non-industrial exposure to the soils.

3.1.2.2 Remedy Components

The remedy components identified in the 1998 ROD are the following institutional controls (there have been no amendments to the 1998 ROD):

- The prohibition of use of the property for purposes other than industrial (e.g., residential, child care, or recreational use).
- Inputting these restrictions in the NASA LaRC Master Plan.
- Within 90 days of ROD signature, NASA shall produce a survey plat prepared by a professional land surveyor registered by the Commonwealth of Virginia indicating the location and dimensions of the Area W Warehouse OU and the extent of the soil contamination. The plat shall contain a note, prominently displayed, that states the owner's future obligation to restrict the land use of the property. The plat shall be submitted to the local recording authority.
- Incorporate these restrictions and supply a copy of the plat into any real property documents necessary for transferring ownership from NASA, in the unlikely event that NASA sells the property. The real property document also would include a discussion of the NPL status of this site, as well as a description of the soil contamination.
- The NASA LaRC RPM in the Environmental Management Office will certify to USEPA on an annual basis that there have been no violations of these prohibitions. If a violation has occurred, a description of the violation and corrective actions to be taken will be provided.

Although not discussed in the ROD, additional controls consisting of a chain-link fence surrounding the site boundary and signage restricting unauthorized site access have been implemented. The chain-link fence surrounding the site was initially installed for site security

processes; however, it was added because it also limits the individuals who may be exposed to contaminated soils by preventing unauthorized access (NASA, 1998).

3.1.3 Status of Implementation

The above institutional control requirements have been implemented. The NASA LaRC Master Plan states the land use designation for the Area E Warehouse is industrial. A survey plat of the site, including the extent of soil contamination and a note of land use restrictions, was prepared in 1999 and has been submitted to the city of Hampton. Since the implementation of the remedy, the NASA LaRC Environmental Management Office has made annual certifications to USEPA stating there is no evidence of any violations of the land use prohibitions detailed in the ROD. Annual operations and maintenance (O&M) activities at the site consist of upkeep of the security fencing, signage, and site grounds.

3.2 STRATTON SUBSTATION SOIL

Stratton Substation serves as an electrical switchyard for the West Area of NASA LaRC (Figure 1). The station is situated on approximately 2.5 acres of land, on the northeast side of Victory Street between Taylor Road and Warner Road (Figure 3). A chain-link security fence is installed along the perimeter of the substation. The substation is designated by NASA as Building 1233, and is comprised of switch gear structures, a control house, and a pump house. The aquifer directly underlying the site, the Columbia aquifer, is currently not used as a source of potable water. There is no surface water on the site. The past and current use of the site makes it a very unlikely location for a terrestrial habitat because it is covered with buildings, concrete, and gravel. There are no significant environmentally sensitive areas on the site (NASA, 2017).

The Stratton Substation houses a number of transformers that once were filled with fluid containing PCBs. In 1984, PCBs associated with the release of transformer fluids were detected in site soil. Between 1984 and 1987, additional investigations and three soil removal actions were completed; however, residual PCB soil contamination (less than 50 milligrams per kilogram [mg/kg]) remained in some areas (Ebasco 1993). A Focused FS delineated the remaining PCB surface and subsurface soil contamination. PCBs (Aroclor-1260) were identified in discrete, isolated areas and the reported PCB results ranged from non-detect to a maximum of 1,100 mg/kg (Foster Wheeler, 1998).

3.2.1 Basis for Taking Action

Based on historical operations and sampling activities, PCBs are the contaminant of concern (COC) in the soil at Stratton Substation. An HHRA was conducted to determine risks from direct contact exposures, including oral and dermal contact, to contaminated soils for LaRC workers. The ILCR from PCB exposure for the on-site workers was calculated at 1.5 E-04. The HHRA concluded that direct exposure to contaminated soil would pose an ILCR that exceeds the USEPA's acceptable risk range of 1E-06 to 1E-04. Because the substation is an actively operated and fenced area, no ecological receptors exist and risks to ecological receptors were not assessed (NASA, 1999).

3.2.2 Response Actions

The selected remedy identified in the ROD for Stratton Substation Soil OU-02 was excavation and off-site disposal of PCB-contaminated soil and institutional controls (NASA, 1999).

3.2.2.1 Remedial Action Objectives

In view of the results of the HHRA, the RAOs for soil are as follows::

- Remediate PCBs in the soil to a cleanup level of 10 mg/kg based on the protection of human health.
- Ensure that the property use does not allow non-industrial exposure to soil.

3.2.2.2 Remedy Components

The remedy components identified in the September 1999 ROD for the Stratton Substation Soil OU-2 are as follows:

- Excavate soil with PCB concentrations greater than 10 mg/kg (estimated at 212 cubic yards).
- Transport and dispose of the soil off site to a Toxic Substances Control Act-approved chemical waste landfill.
- Backfill the excavated areas with clean material.
- Prohibit the use of the property for purposes other than industrial (e.g., residential, childcare, or recreational use).
- Place these restrictions in the NASA LaRC Master Plan.
- Within 90 days of ROD signature, produce a survey plat prepared by a professional land surveyor registered by the Commonwealth of Virginia indicating the location and dimensions of the Stratton Substation Soil OU and the extent of the soil contamination. The plat shall contain a note, prominently displayed, which states the owner's future obligation to restrict the land use of the property. The plat shall be submitted to the local recording authority.
- Incorporate these restrictions and supply a copy of the plat into any real property documents necessary for transferring ownership from NASA in the unlikely event that NASA sells the property. The real property document would also include a discussion of the NPL status of this site, as well as a description of the soil contamination.
- The NASA LaRC RPM in the Environmental Management Office will certify to USEPA on an annual basis that there have been no violations of these prohibitions. If a violation has occurred, a description of the violation and corrective actions to be taken will be provided.

Although not discussed in the ROD, additional controls consisting of a chain-link fence surrounding the site boundary and signage restricting unauthorized site access have been

implemented. The chain-link fence surrounding the site was initially installed for site security processes; however, it was added as an institutional control because it also limits potential exposure to PCB-contaminated soil for human and ecological receptors.

3.2.3 Status of Implementation

The Stratton Substation Soil excavation remedy was conducted in 2000. However, remedial goals were not met at all locations due to engineering concerns that additional excavation would compromise the integrity of site structures. After the soil excavation, wells were installed to monitor the effectiveness of the source removal actions on groundwater. The *Final Remedial Action Report, Stratton Substation Operable Unit* documented the soil excavation and well installation (Foster Wheeler, 2000).

The institutional control requirements were implemented following the source removal actions. The NASA LaRC Master Plan states the land use designation for the Stratton Substation is industrial. A survey plat of the site, including the extent of soil contamination and a note of land use restrictions, was prepared in 2001 and has been submitted to the city of Hampton. Since the implementation of the remedy, the NASA LaRC Environmental Management Office has made annual certifications to USEPA stating there is no evidence of any violations of the land use prohibitions detailed in the ROD (Foster Wheeler, 2000).

A modification of the 1998 ROD was necessary as the RAO for soil remediation could not be met. In 2013, an ESD for Stratton Substation Soil OU-02 was issued that documented two significant differences. The first included the need for a groundwater LTM program. The second significant difference indicated that the final removal of soil with PCB concentrations greater than 10 mg/kg would require more than 3 months because NASA had no plans to demolish the substation structures that lay over residual contamination (NASA, 2013).

In February 2015, a groundwater LTM plan was developed requiring sampling of site monitoring wells every 5 years to support the FYR (Tetra Tech, 2015). The first groundwater sampling event under the plan was completed in 2015, the second sampling event was conducted in September 2020 and the third sampling event was conducted in August 2025. Other annual O&M activities at the site consist of upkeep of the security fencing, signage, and site grounds.

3.3 CONSTRUCTION DEBRIS LANDFILL

The CDL is located in the northcentral portion of the West Area within NASA LaRC (Figure 1). The CDL occupies approximately 7.5 acres and is bound by Brick Kiln Creek to the north; two stormwater conveyance channels to the east and west, and the Landing Loads Facility to the south (Figure 4). The CDL can be accessed via a road that extends to a gated fence along its southern boundary. A gravel access road extends from the fence onto the site, wrapping around the landfill's eastern and northern edges, ending in the western part of the site.

A landfill of consolidated soil, waste, and debris overlain by a non-contaminated soil cover material occupies approximately 3.5 acres in the southern portion of the site. The top elevation of the landfill is approximately 20 feet above mean sea level. The soil cover is vegetated with grasses and shrubs. The northern portion of the site contains approximately 1.3 acres of estuarine wetland.

The southeastern corner of the site is vegetated with both mature and sub-mature trees and a dense undergrowth of groundcover and shrubs (NASA, 2021c).

Surface water flow generally occurs radially off the landfill towards the conveyance channels and wetlands. Shallow groundwater at the CDL occurs from the ground surface (e.g., at the edges of the stormwater conveyance channels and within the wetlands) to approximately 6 feet below the ground surface within the landfill footprint. Beneath this shallow groundwater is a confining layer that separates the shallow groundwater from the Cornwallis Cave aquifer (a deeper groundwater-bearing unit) and inhibits the migration of chemicals from the shallow groundwater to the aquifer. Shallow groundwater generally flows to the north and east but is influenced by tidal action (NASA, 2021c).

During the late 1960s and early 1970s, the western and northern portions of the CDL were filled with soil and construction debris, such as reinforced concrete, scrap reinforcement bar, large cement slabs, miscellaneous vehicle parts, wood, and small cans. Additionally, historical interviews indicate a chemical waste disposal pit was excavated within the CDL footprint around 1965 or 1966. Chemicals and chemical wastes generated during a “closet cleanout” of chemicals were buried in the waste disposal pit in small plastic, metal, and glass containers. The pit was estimated to be two-thirds full at the time of backfilling. A 1973 aerial photograph shows that during the second generation of filling, several hundred drums were located on the east-central portion of the CDL. Aerial photography shows that the drums had been removed by 1975 and additional regrading at the CDL had occurred (NASA, 2021c).

Environmental impacts from historical activities at the CDL have been evaluated during several field investigations conducted between 1989 and 1997. These investigations identified the presence of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polynuclear aromatic hydrocarbons (PAHs), metals, pesticides, and PCBs in the groundwater, surface water, soil, or sediment resulting from the prior use of the site as a landfill.

3.3.1 Basis for Taking Action

A 1997 RI at the CDL identified chlorinated VOCs, SVOCs, pesticides, and metals as COCs (Foster Wheeler, 1997). VOCs and trace metals were present in groundwater; pesticides and trace metals were present in surface water; and PAHs, pesticides, PCBs, petroleum materials, and metals were present in surface and subsurface soil. Early investigations also identified a tar-like material at the CDL, which was considered a principal threat waste. The RI Baseline Human Health Risk Assessment (BHHRA) concluded that the COCs resulted in ILCRs and/or HIs exceeding acceptable risk for site worker exposure to surface and subsurface soil (HI of 1.3 and 1.5, respectively), child fish consumers (HI of 1.8), and hypothetical off-site resident exposure to groundwater (ILCR of 1.60E-02 and HIs of 270 for adult and 57 for child) (Foster Wheeler, 2003).

Further refinement of the BHHRA and ecological risk assessment was conducted in a 2016 RI Addendum after completion of a Non-Time Critical Removal Action (NTCRA) in 2010 and an Interim Groundwater Remedy in 2011 at the CDL to re-evaluate the potential exposure scenarios of a construction worker and future (hypothetical) on-site resident (adult and child). No remaining risk to construction workers was identified. Unacceptable risks (ILCRs of 8.2E-04 and 5.1E-04 for adult and child, respectively and HIs of 14 and 22 for adult and child, respectively) were identified

for the hypothetical future child/adult residents from groundwater ingestion. An ecological risk assessment identified no threats to ecological receptors at the CDL (NASA, 2016b).

In 2017, the USEPA Biological Technical Assistance Group (BTAG) further evaluated the ecological screening assessment in the RI Addendum and concluded that no unacceptable risk to ecological receptors remains on site (EPA, 2017). In 2019, the effectiveness of the previously implemented actions and the most recent groundwater concentrations were assessed to identify remaining COCs based on potential risk to human health. The assessment memorandum concluded that only six VOCs (1,4-dioxane, 1,2-dichloroethane, cis-1,2-dichloroethene [DCE], tetrachloroethene [PCE], trichloroethene [TCE], and vinyl chloride [VC]) remain as COCs in groundwater (HSG, 2019).

3.3.2 Response Actions

An NTCRA was conducted from April 2009 through June 2010 to implement the construction activities described within the 2008 *Final Action Memorandum* (Tetra Tech, 2008). The removal action consisted of contaminated material excavation and off-site disposal, consolidation of contaminated soil and debris, enhanced aerobic bioremediation of residual petroleum contamination, installation of a permeable soil cover (approximately 2.4 acres), and institutional controls. The on-site wastes (contaminated soil and debris) that were not shipped off site for disposal were consolidated under a vegetated cover consisting of 18 inches of clean fill (infiltration layer) and 6 inches of topsoil (erosion layer). Removal of contaminated soil and debris that encroached on wetlands was also conducted. The contaminated soil and invasive wetland vegetation was removed, and the area was regraded (lowered) and planted to promote the formation of healthy native wetland vegetation. There was no net loss of wetlands and any wetlands disturbed during implementation of the removal action were restored in accordance with applicable or relevant and appropriate requirements (ARARs) (NASA, 2023).

In July 2011, an Interim Remedial Action (IRA) was conducted to address site groundwater in accordance with the ROD for the CDL Interim Remedy (NASA, 2010) and the *Interim Remedial Design/Remedial Action Work Plan* (Tetra Tech, 2011). The objective of the IRA was to introduce ethyl lactate into groundwater to promote anaerobic biodegradation of chlorinated VOCs. Two areas were delineated for treatment within and adjacent to the Former Drum Staging Area (FDSA). The main area was approximately 120 feet by 80 feet and immediately downgradient of the FDSA. The second area (approximately 25 feet by 25 feet) was localized to well point SB-04 in the northwest portion of the FDSA (NASA, 2023).

Following completion of the CDL ROD for the final remedy in 2021 (NASA, 2021c), institutional controls were implemented in accordance with the CDL LUC Remedial Design (NASA, 2022c) to prevent human exposure to landfill waste, groundwater, and soil gas and will remain in place in perpetuity.

3.3.2.1 Remedial Action Objectives

Following completion of the 2010 NTCRA and the 2011 IRA, contaminated groundwater and materials encapsulated beneath the CDL soil cover were still considered potential threats to human

health and the environment. To address these potential threats, the following RAOs were developed for the CDL as documented in the final ROD (NASA, 2021c):

- Prevent human and ecological contact with contaminated media underneath the soil cover and control surface water runoff and erosion.
- Prevent further migration of contaminated groundwater.
- Prevent potential future migration of vapor into occupied buildings that could adversely affect occupants.
- Prevent residential exposure to contaminated soil or groundwater until and unless the soil is remediated to levels protective of residential exposure and the groundwater is restored to its maximum beneficial use as a drinking water source.

3.3.2.2 Remedy Components

The remedy components documented in the final 2021 ROD for the CDL include sitewide institutional controls (i.e., LUCs) to reduce or eliminate potential exposure to COCs in soil and groundwater and sitewide groundwater LTM to ensure COCs meet cleanup levels and comply with post-closure monitoring requirements. The objectives of the institutional controls for the CDL are to:

- Maintain the soil cover at the CDL;
- Prohibit intrusive activities on the soil cover;
- Maintain the wetlands area;
- Prohibit the use of the CDL for residential, childcare, elementary or secondary school, or playground facilities. Uses resulting in a structure with a potential complete vapor intrusion pathway will require an exposure mitigation plan;
- Prohibit the extraction and potable water use of groundwater at the CDL except for environmental monitoring and testing until cleanup levels are met;
- Prevent potential future exposure to volatile emissions from impacted groundwater (e.g., via vapor intrusion into buildings) until cleanup levels are met; and
- Maintain the integrity of any current or future remedial or monitoring system.

The institutional controls required identification of the CDL as an Environmental Hazard in the NASA LaRC Center Master Plan. Proposed changes in land use in this area would require approval by the NASA LaRC Environmental Program, USEPA, and VDEQ. In addition, ground-disturbing construction activities would require a Center Dig Permit that involves consultation of the Center Master Plan (NASA, 2022c).

The institutional controls also stipulated that within 90 days of ROD signature, NASA will produce a survey plat prepared by a professional land surveyor registered by the Commonwealth of Virginia indicating the location and dimensions of the CDL OU-5 and the extent of the soil contamination. Groundwater monitoring well locations will be included and identified on the survey plat. The plat shall be submitted to the local recording authority. In addition, NASA will

incorporate these restrictions and supply a copy of the plat into any real property documents necessary for transferring ownership from NASA in the unlikely event that NASA sells the property. The real property document would also include a discussion of the NPL status of this site, as well as a description of the soil contamination. The NASA LaRC RPM in the Environmental Management Office will certify to USEPA on an annual basis that there have been no violations of these institutional controls (NASA, 2021c).

3.3.3 Status of Implementation

The soil cover in place at the CDL is currently preventing direct and indirect contact with landfill contents and the required institutional controls have been implemented including signage restricting access. In addition, the CDL was identified as an Environmental Hazard on the NASA LaRC Center Master Plan. A survey plat of the site, including the extent of soil contamination and a note of land use restrictions, was prepared in 2022 and has been submitted to the city of Hampton (NASA, 2022c).

Inspections are being conducted at the CDL on an annual basis. The inspections consist of checking the integrity of the CDL soil cover, boundary fence, LUC signs, and monitoring wells. The inspections also evaluate the status of the institutional controls, confirm whether use restrictions and controls are documented in the NASA LaRC Master Plan, and determine whether use of the CDL has conformed to such restrictions and controls. In addition, LTM is being performed to meet the Virginia Solid Waste Management Regulations post-closure monitoring requirements for landfills. The NASA LaRC Environmental Management Office has made annual certifications to USEPA stating there is no evidence of any violations of the land use prohibitions detailed in the ROD.

Periodic O&M activities are conducted at the CDL to maintain the integrity and effectiveness of the soil cover and maintain the groundwater monitoring network. These activities include:

- Mowing vegetation on the soil cover and around the monitoring well network;
- Maintaining the gravel access road around the soil cover;
- Maintaining, repairing, and/or improving existing monitoring wells; and
- Repairing and/or replacing fencing and signage used for access control.

During the August 2025 CDL maintenance event, sediment that had accumulated in the existing stormwater drainage channel on the south and east side of the soil cover was removed to facilitate drainage and mitigate ponding in the channel. The disturbed areas were seeded and straw was applied for erosion control.

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4.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This section includes the protectiveness determinations and statements from the previous FYR (Table 2) as well as the recommendations from the previous FYR and the current status of those recommendations (Table 3).

Table 2. Protectiveness Determinations and Statements from the Previous FYR

Site and OU Number	Protectiveness Determination	Protectiveness Statement
Area E Warehouse – OU-1	Protective	The remedy at OU-1 (Area E Warehouse) is protective of human health and the environment. The remedy includes the use of institutional controls to ensure that the property use does not allow non-industrial exposure to soil. This objective is being met by the placement of a land use prohibition in the NASA LaRC Master Plan and real property documents. A survey plat of the affected land was prepared and submitted to the city of Hampton. Since the Remedial Action was implemented in 1998, NASA has made annual certification to USEPA and there is no evidence of any violations of the land use prohibitions or other remedial requirements.
Stratton Substation Soil – OU-2	Protective	Although the remedy at OU-2 (Stratton Substation Soil) has not been completed, it is currently protective of human health and the environment through the use of institutional controls. The remedy will be final when soil with PCB concentrations of 10 mg/kg or greater is removed. In the interim, remedial activities completed to date have adequately addressed exposure pathways that could result in unacceptable risk. Institutional controls are in place and groundwater monitoring has confirmed no migration of PCBs to groundwater.
CDL – OU-5	Short-term Protective	The interim remedy at OU-5 (CDL) will be fully protective of human health and the environment upon completion of the ROD. Construction activities are complete, and the interim remedy is operational. The interim remedy currently protects human health and the environment by eliminating exposure pathways (maintaining the existing soil cap) and prohibiting use of groundwater and placement of structures on the CDL. No exposure is occurring; however, institutional controls are not fully implemented. Although achieving the RAO of restoring groundwater to allow UU/UE within 10 years of implementation of the Interim Groundwater Remedy has not been met, the chlorinated VOC plume is no longer present (exceedances are limited to one well). During the interim remedy, 1,4-dioxane was not identified as a COC, so there is currently no cleanup goal to ensure that groundwater will meet USEPA's total risk standard. However, a cleanup goal that will result in a total risk standard that falls within USEPA's acceptable risk range is being established in the upcoming ROD. The ROD will also finalize and fully implement the institutional controls.

Table 3. Status of Recommendations from the Previous FYR

Site and OU Number	Issue	Recommendations	Current Status	Current Implementation Status Description
CDL – OU-5	Need to finalize the institutional controls, as they are currently in place in an interim state.	Finalize the ROD for the CDL, which will formalize the existing institutional controls and establish cleanup goals for 1,4-dioxane (the only COC without a federal Maximum Contaminant Level [MCL]).	Completed	The CDL ROD for the final selected remedy was finalized in October of 2021. Institutional controls and a cleanup goal for 1,4-dioxane were formalized as a part of the ROD.

Other Findings

The current status of other findings and recommendations identified during the previous FYR that did not affect the protectiveness determinations are discussed below:

- All OUs: VDEQ has recommended that LUC signs, where present, be upgraded to include current phone numbers and generic contact names such as “Environmental Management Office.”

Status: Signs with contact information are present at all the OUs.

- Area E Warehouse: Five monitoring wells installed during the 1995 site assessment have not been sampled since. Consideration should be made to abandon these wells since ongoing monitoring is not required at this site.

Status: NASA will work towards obtaining funding for well abandonment.

- Stratton Substation Soil: A change in the analytical method listed in the 2009 Quality Assurance Project Plan (Tetra Tech, 2009) and the LTM Work Plan (Tetra Tech, 2015) for Stratton Substation has been suggested as very few laboratories hold certifications in the method currently listed in these documents.

Status: The PCB analytical method (USEPA Method 680) listed in the 2009 Quality Assurance Project Plan and the LTM Work Plan was replaced with USEPA Method 1668, which uses high-resolution gas chromatography/high-resolution mass spectrometry to identify and quantify individual PCB congeners with much greater precision and lower detection limits. To accommodate the changes in methodology for PCB congeners, a new Quality Assurance Project Plan was developed for Stratton Substation Soil OU-02 monitoring in March 2022 (NASA, 2022a).

- CDL: The site monitoring network will be evaluated during the development of the LTM plan (once the ROD is finalized)

Status: An LTM plan was prepared and finalized in October 2022, to support post-closure care activities for the CDL. The existing CDL monitoring well network was evaluated during the development of the plan to determine the wells most appropriate for use in LTM based on the requirements of the ROD. Monitoring wells selected for the LTM well network were chosen based on their design and placement as either upgradient or

downgradient of sources of contamination and screened within the uppermost groundwater bearing zone.

- CDL: Minor repairs are needed at three of the monitoring wells at the site.

Status: Repairs to existing monitoring wells are ongoing and are conducted as part of O&M activities.

Progress on evaluating PFAS since the previous FYR are summarized as follows. A PA and SI have been completed at LaRC in 2022 and 2024, respectively. The Area E Warehouse and Stratton Substation were not moved forward to the SI. Therefore, groundwater at the Area E Warehouse and Stratton Substation was not investigated for PFAS. The PA Report did recommend the CDL for further PFAS assessment in the SI. The SI results indicated the presence of PFAS in groundwater at the CDL at concentrations greater than the USEPA RSLs (target hazard quotient of 0.1). Based on these findings, the CDL is moving forward to the RI stage. PFAS will be evaluated again in the next FYR, at which time the Expanded SI is expected to be completed, the RI will be ongoing, and more PFAS data will be available to update the conceptual site model and assess risks.

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5.0 FIVE-YEAR REVIEW PROCESS

5.1 COMMUNITY NOTIFICATION, INVOLVEMENT, AND SITE INTERVIEWS

A public notice was published in the *Daily Press Newspaper* on February 21, 2026 and February 22, 2026, and posted on NASA’s website to notify the public of the FYR process initiation and the sites to be included. In addition, an email notifying Stakeholders (including Tribes in Virginia) of the FYR process initiation was sent on February 18, 2026. Upon completion and acceptance of this FYR, a notice will be published in the same newspaper and on NASA’s website to indicate the completion of the FYR Report and the report’s availability to the public in the public information repository maintained at the Poquoson Public Library (500 City Hall Avenue, Poquoson, Virginia). Federally recognized Tribes in Virginia will also be notified of the availability of the FYR.

During the FYR process, site questionnaires were completed by the NASA RPM and regulatory authorities (USEPA and VDEQ). The questionnaires were used to document any perceived problems or successes with the remedies that have been implemented to date. The completed questionnaires are provided in Appendix A. Based on the provided feedback, there are no problems or issues related to potential community concerns, vandalism, trespassing, intrusive activities, and off-site groundwater use. The following comments were noted on the adequacy of the implemented remedies:

- USEPA believes that the remedies are functioning as intended, the appropriate constituents are included, and the monitoring frequency is adequate.
- VDEQ believes the remedies implemented at the sites are adequate for their intended purposes. Each remedy addresses the appropriate constituents and while monitoring is occurring at the correct frequency, optimization of the monitoring activities should be considered.
- NASA believes the remedies are functioning as intended and protective of human health and the environment. In addition, 10 years of landfill post-closure monitoring was completed in 2024 at the CDL and another year of monitoring has been conducted to support the evaluation in this FYR. A *Post-Closure Care Evaluation Report* is currently in preparation and will recommend reduction of LTM from annually to once every 5 years. Monitoring at the Stratton Substation is adequate. NASA will continue investigating PFAS at the facility.

5.2 DATA REVIEW

5.2.1 Area E Warehouse

The data review included assessing ARARs and analytical data from the 1990 Site Assessment and 1992 Contamination Assessment. There were no ARARs identified in the Area E Warehouse ROD and no new ARARs that affect the protectiveness of the remedy. No additional analytical data has been collected from the Area E Warehouse since signature of the ROD in 1998.

5.2.2 Stratton Substation Soil

The data review included assessing ARARs, soil data from the 2000 Remedial Action, and LTM groundwater data from 2015, 2020, and 2025. Data from the cleanup activities in 2000 were documented in the *Final Remedial Action Report, Stratton Substation Operable Unit* (Foster Wheeler, 2000). Groundwater analytical results from 2015 and 2020 are presented in the *2015 Groundwater Long-Term Monitoring Report* (NASA, 2016a) and *2021 Final Groundwater Long-Term Monitoring Report* (NASA, 2021a), respectively. Analytical results from the 2025 groundwater LTM event are presented in the 2025 Groundwater Long-Term Monitoring Report for Stratton Substation Soil (NASA, 2026) and in Appendix B (Table B.3).

There have been no changes to the ARARs that would affect the protectiveness of the remedy. Groundwater monitoring was conducted in 2025 to assess whether PCBs are migrating to groundwater. Groundwater samples were collected from LTM monitoring wells SSMW03C, SSMW05C, and SSMW06C and analyzed for PCB homologs via EPA Method 1668. PCB homologs were detected in all groundwater samples. However, for individual congeners with tap water RSLs, all detections were less than the screening values.

5.2.3 Construction Debris Landfill

The data reviewed included ARARs and groundwater data from 2021 through 2025. The CDL ROD was finalized in 2021 and presented the selected final remedy (LUCs and LTM) to address remaining risk related to surface and subsurface soil, surface water, sediment, and groundwater contamination at the site (NASA 2021c). The ARARs developed during the ROD were reviewed to identify changes in standards or newly promulgated standards that would call into question the effectiveness of the remedy. There have been no changes to the ROD ARARs that affect protectiveness of the remedy.

The CDL monitoring network consists of nine existing wells: six downgradient locations at or near the soil cover limits (54S, 55S, 56S, 56I, 57S, and 58S), two upgradient wells (41S and 41I), and one reference well identified by USEPA Region 3 BTAG (53S). The COCs monitored as required by the CDL ROD include 1,2-dichloroethane, DCE, PCE, TCE, VC, and 1,4-dioxane. In addition to the ROD COCs, NASA agreed to monitor other chemicals recommended by USEPA including anthracene, benzo(a)anthracene, fluoranthene, naphthalene, phenanthrene, 4-4-dichlorodiphenyltrichloroethane (DDT), iron, and manganese (NASA, 2022d). Analytical results from the 2021 to 2025 groundwater sampling events are provided in Appendix B (Table B.5).

The analytical results from 2021 through 2025, for all the ROD COCs were below the cleanup levels established in the ROD. Anthracene and fluoranthene were sporadically detected at low concentrations in groundwater collected from two wells, 55S and 56S. In addition, iron and manganese were detected at concentrations exceeding the USEPA BTAG Freshwater Screening Benchmarks (USEPA, 2006) in the majority of the samples collected from the CDL wells. Although metal concentrations are elevated, the detected levels are consistent with historical detections observed in groundwater at the CDL. PFAS are emerging contaminants that have been detected in groundwater at the CDL above USEPA RSLs (see Section 2.7) and are being further investigated under an RI.

In 2025, a Post-Closure Care Evaluation Report (HGL, 2025) was prepared for the CDL to request a reduction in the LTM groundwater sampling frequency. Groundwater data collected at the CDL between 2011 and 2025 was used to evaluate long-term trends and determine if changes in site conditions have occurred since the 2016 RI Addendum that would alter the conclusions of the risk assessment. Based on the evaluation, the report concluded that groundwater conditions at the CDL are stable and pose no immediate threat to human health or the environment.

5.3 FIVE-YEAR REVIEW SITE INSPECTIONS

The FYR site inspections were conducted on December 16, 2025, by members of NASA LaRC, USEPA, and VDEQ and on December 17, 2025, by NASA's environmental contractor. The purpose of the inspections was to assess site conditions and the protectiveness of the remedies. Appendix C contains the FYR site inspection checklists. Photographs taken at each OU during the site inspections are provided in Appendix D.

5.3.1 Area E Warehouse

The entire LaRC facility is surrounded by a fence with security personnel at each gate to restrict access. In addition, the Area E Warehouse site is surrounded by a 6-foot fence. The inspection indicated that the security fencing and signage to restrict unauthorized access are in place as required. The inspection verified the land use continued to be industrial as required in the ROD and the remedy is functioning as intended.

5.3.2 Stratton Substation Soil

The FYI site inspection did not identify any problems with the monitoring well network or disturbances in the surface area (stone substation yard). The inspection indicated that the security fencing and signage to restrict unauthorized access are in place as required and the remedy is effective and functioning as intended.

5.3.3 Construction Debris Landfill

The CDL is surrounded by a 6-foot fence on all sides, except where bordering Brick Kiln Creek. The inspection indicated that the security fencing and signage to restrict unauthorized access are in place as required. The landfill cover was found to be in good condition. The majority of site monitoring wells were found to be in good condition. However, there were maintenance issues observed (e.g., damage to protective outer steel casing, damage to inner polyvinyl chloride well) for some wells at the site. The FYR site inspection indicated the remedy is functioning as intended.

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6.0 TECHNICAL ASSESSMENT

This section presents the technical assessment for each of the three sites. Each site is discussed separately.

6.1 AREA E WAREHOUSE

6.1.1 Question A: Is The Remedy Functioning As Intended By The Decision Documents?

Yes. Review of documents, historical analytical data, and the FYR site inspection indicates that the selected remedy, which is implementation of institutional controls restricting the use of the property to industrial land use, is functioning as intended by the ROD (NASA, 1998). Institutional controls prohibit the use of the property for purposes other than industrial-type activities, and these restrictions have been recorded in the NASA LaRC Master Plan. Although not required by the ROD, in addition to the institutional controls, engineered controls consisting of a perimeter fence around the NASA LaRC property and posted signs continue to be maintained to restrict unauthorized access. There have been no problems related to implementation of the institutional or engineered controls.

6.1.2 Question B: Are The Exposure Assumptions, Toxicity Data, Clean-Up Levels, And RAOs Used At The Time Of The Remedy Selection Still Valid?

Yes. The RAOs from the 1998 ROD are still valid (NASA, 1998). Institutional controls remain in place to prohibit residential land use. Cleanup levels were not established in the 1998 ROD. Exposure assumptions and toxicity data have changed since the time of the remedy selection in 1998. As summarized below, these changes do not ultimately affect remedy protectiveness.

Default exposure assumptions for typical receptors, including workers, were most recently updated by USEPA in 2014, and toxicity values have changed for several analytes since the time of remedy selection in 1998. Additionally, there have been several changes in USEPA risk assessment methodology since preparation of the risk assessment in the 1990 *Area E Warehouse Site Assessment* (NASA, 1990). As detailed in the Second FYR (NASA, 2017) and Third FYR (NASA, 2021b), these changes include, but are not limited to, the release of USEPA Risk Assessment Guidance for Superfund Parts B through F (1992-2008) and the current approach and guidance for evaluating mutagens (2005).

The effect of changes in toxicity values, exposure assumptions, and risk assessment methods has been evaluated in each prior FYR by screening data from the 1990 *Area E Warehouse Site Assessment* (NASA, 1990) and the *Final Contamination Assessment Report* (NASA, 1992) against EPA RSLs for industrial soil current at the time and estimating potential risks for analytes with detections greater than these screening values. Since completion of the 2021 Third FYR, risk assessment methods and guidance have not substantially changed. During the past 5 years, toxicity values for acetone, chromium (hexavalent), and nickel were updated. Additionally, new lead guidance was released by USEPA in October 2025; however, this guidance is primarily focused on residential exposure and does not affect the industrial soil RSL of 800 mg/kg historically used for the project (USEPA, 2025).

Soil and sediment are the media of concern for this site. To mirror the prior FYRs, the 1990 and 1992 soil data were screened against the November 2024 industrial RSLs (target cancer risk of $1\text{E-}06$ and target non-cancer hazard quotient of 0.1) and the current lead screening value. Because institutional controls are in place to prevent non-industrial land use, the historical data was not compared to residential soil RSLs. As long as the institutional controls remain in place, the remedy will remain protective of residential and other non-industrial receptors.

As presented in Table B.1 in Appendix B, historical detections of Aroclor 1248, Aroclor 1254, Aroclor 1260, and arsenic in surface soil, and dieldrin, Aroclor 1254, Aroclor 1260, arsenic, and chromium in subsurface soil exceed current industrial soil RSLs. These analytes are the same chemical of potential concern (COPCs) identified in the Second FYR (NASA, 2017) and Third FYR (NASA, 2021b). Chromium (hexavalent) is the only one of these COPCs to have updated toxicity values since the 2021 Third FYR, with an updated, lower (i.e., less toxic) value released in 2024 (USEPA, 2024).

The health risks associated with worker exposure to the COPCs listed above were evaluated using the USEPA RSL calculator and default exposure assumptions for an industrial worker and a construction worker. Consistent with the 2017 Second FYR (NASA, 2017) and 1998 ROD (USEPA, 1998), a site-specific worker also was evaluated using an exposure frequency of 244 days per year and an exposure duration of 44 years. The 1998 ROD notes that an exposure frequency of 78 days per year was used for the dermal exposure route. Because the reason for this approach is not explained in the 1998 ROD, and the USEPA RSL calculator does not support different exposure frequencies for each exposure route, the greater exposure frequency of 244 days per year was assumed for all exposure routes for the site-specific worker. EPA's current default exposure frequency and exposure duration for an outdoor worker are 250 days per year and 25 years, respectively (EPA, 2014). Because the site-specific exposure frequency is approximately equal to EPA's default assumption and the site-specific exposure duration is more conservative, the site-specific values remain valid. Additionally, mirroring the historical exposure assumptions ensures comparability with historical risk estimates. The exposure point concentrations and particulate emission factors (PEFs) used in the 2017 Second FYR were used for all three receptors, including the site-specific worker and industrial worker PEFs of $5.8\text{E}09\text{ m}^3/\text{kg}$ calculated during the 2017 Second FYR using EPA's RSL calculator. The site-specific assumptions used to calculate the PEF, such as mean annual wind speed and fraction of vegetative cover, are listed in Appendix D, Table 4.6 of the 2017 FYR and remain valid (NASA, 2017).

The estimated risks are summarized in Table B.2 and RSL calculator output files are provided in Appendix B. The cumulative cancer risks range from $1\text{E-}06$ for the construction worker to $1\text{E-}05$ for the site-specific worker, and the non-cancer hazard indices range from 0.05 for the site-specific worker and default industrial worker to 0.3 for the construction worker. The lowest cumulative cancer risk equals the point of departure ($1\text{E-}06$), and the highest cumulative cancer risk is in the middle of the target risk range ($1\text{E-}06$ to $1\text{E-}04$). All HIs are less than the target value of 1. These results demonstrate that site conditions remain protective of the receptors who could contact site media under the current restricted land use.

With respect to ecological receptors, the developed nature of the site (buildings, gravel, paved surfaces, and a small area of maintained landscape) preclude the presence of terrestrial or aquatic habitat. There have been no changes in these site conditions since the last FYR.

6.1.3 Question C: Has Any Other Information Come To Light That Calls Into Question The Protectiveness Of The Remedy?

No. There are no emerging contaminants associated with the Area E Warehouse. There has been no additional information that has come to light that would call into question the protectiveness of the remedy.

6.2 STRATTON SUBSTATION SOIL

6.2.1 Question A: Is The Remedy Functioning As Intended By The Decision Documents?

Yes. Review of documents, historical and current analytical data, and the FYR site inspection indicates the remedy is functioning as intended by the ROD (NASA, 1999) and ESD (NASA, 2013). Institutional controls have been implemented to prohibit the use of the property for purposes other than industrial and have been recorded in the NASA LaRC Master Plan. Although not required by the ROD, in addition to the institutional controls, engineered controls consisting of a perimeter fence around the NASA LaRC property and posted signs continue to be maintained to restrict unauthorized access. There have been no problems related to implementation of the institutional or engineered controls.

A groundwater LTM program was established in the 2013 ESD to determine whether PCBs in residual contaminated soil are migrating to site groundwater (NASA, 2013). The ESD states that groundwater sampling is to occur every 5 years. To date, sampling events were conducted in 2015, 2020, and 2025. As detailed in Question B below, the 2025 groundwater data indicates the soil-to-groundwater migration pathway is complete, but groundwater concentrations do not exceed risk-based screening levels. PCB contamination in groundwater will continue to be monitored.

6.2.2 Question B: Are The Exposure Assumptions, Toxicity Data, Clean-Up Levels, And RAOs Used At The Time Of The Remedy Selection Still Valid?

Yes. The cleanup levels and RAOs established in the 1999 ROD are still valid (NASA, 1999). PCBs in soil are the only COC for the Stratton Substation. Exposure assumptions and toxicity data for PCBs have changed since the remedy was selected in 1999. To assess these changes, the cleanup level of 10 mg/kg for Aroclor mixture in soil was evaluated in the 2017 Second FYR and determined to be protective (NASA, 2017). There have not been any changes to exposure assumptions or toxicity values for Aroclors since 2017. As such, the soil cleanup level remains valid.

There have been no changes at the site that would have resulted in new exposure pathways to human or ecological receptors. Land use remains industrial, with no new receptors identified. The institutional controls have been implemented and are enforced by NASA. Access to the remaining subsurface soil with PCB concentrations in excess of 10 mg/kg remains restricted by existing structures.

In accordance with the 2013 ESD (NASA, 2013), groundwater is sampled every 5 years to evaluate whether the soil-to-groundwater migration pathway is complete for PCBs. Three sampling events

have been completed to date. The first sampling event occurred in 2015, as reported in the *2015 Groundwater Long-Term Monitoring Report* (NASA, 2016a). The second sampling event occurred in 2020, as reported in the *2021 Final Groundwater Long-Term Monitoring Report* (NASA, 2021a). For both sampling events, groundwater samples were analyzed for PCB homologs using USEPA Method 680, and no PCB homologs were detected.

USEPA Method 680 uses gas chromatography coupled with mass spectrometry. The method primarily provided data on PCB homolog groups rather than on individual congeners, which restricted its usefulness for regulatory and risk assessment purposes. Method 680 was discontinued due to limitations in sensitivity, selectivity, and congener-level resolution. To address the shortcomings associated with Method 680, USEPA developed Method 1668, which uses high-resolution gas chromatography/high-resolution mass spectrometry to identify and quantify individual PCB congeners with much greater precision and lower detection limits. USEPA Method 1668 was used for the 2025 samples, the results of which are presented in Table B.3 (in Appendix B) along with screening values established for the PCB homologs in the 2022 *Quality Assurance Project Plan, PCB Homologs, Stratton Substation* (NASA, 2022a).

As shown in Table B.3, some PCB congeners have tap water RSLs. The screening values selected for each homolog in the 2022 *Quality Assurance Project Plan, PCB Homologs, Stratton Substation* (NASA, 2022a) correspond to the tap water RSL(s) for individual congeners within the homolog group. Screening values are not available for most PCB congeners and for some of the homologs.

While individual congeners with tap water RSLs were detected at concentrations, less than the screening values, the following screening value exceedances were identified for total pentachlorobiphenyl and total hexachlorobiphenyl homologs:

- 2,600 J picograms per liter (pg/L) total pentachlorobiphenyls in SSMW06C, greater than the lowest screening value of 1.2 pg/L (based on PCB-126) and less than the highest screening value of 4,000 pg/L (based on PCB-105, PCB-114, PCB-118, and PCB-123);
- 80 J pg/L total pentachlorobiphenyls in SSMW03C, greater than the lowest screening value of 1.2 pg/L and less than the highest screening value of 4,000 pg/L;
- 5,100 J pg/L total hexachlorobiphenyls in SSMW06C, greater than the lowest screening value of 4 pg/L (based on PCB-169) and the highest screening value of 4,000 pg/L (based on PCB-156/157 and PCB-167); and
- 340 J pg/L total hexachlorobiphenyls in SSMW03C, greater than the lowest screening value of 4 pg/L and less than the highest screening value of 4,000 pg/L.

Because the congeners that comprise the total homolog detections lack screening values, there is a high degree of uncertainty in assessing the tap water RSL exceedances shown in Table B.3. For this reason, the total PCB concentrations were compared to the USEPA MCL of 500,000 pg/L (0.5 micrograms per liter). The maximum total PCB concentration, 10,000 pg/L in SSMW06C, is less than the MCL, indicating that concentrations are protective of human health under a drinking water scenario.

Some PCB congeners are categorized as dioxin-like PCBs because they exert similar toxicity to 2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). In addition to the screening and MCL

comparison presented above, the results for the dioxin-like PCB congeners were used along with Toxicity Equivalence Factors (TEFs) from USEPA's *Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds* (USEPA, 2010) to estimate a 2,3,7,8-TCDD toxicity equivalent (TEQ) concentration. As presented in Table B.4 in Appendix B, dioxin-like PCBs were detected in one of three samples, SSMW06C-080425, with an estimated 2,3,7,8-TCDD TEQ concentration of 0.0028 pg/L. This concentration is less than the USEPA tap water RSL for 2,3,7,8-TCDD of 0.12 pg/L. This comparison further supports the above conclusion that PCB concentrations in groundwater would not pose an unacceptable risk to human health under a drinking water scenario.

The presence of PCB congeners in groundwater suggests that the soil-to-groundwater pathway is complete. However, as described above, PCB concentrations would not pose an unacceptable risk to human health under a drinking water scenario. Based on the decision statements #1 and #2 as documented in Worksheet #11 step 2 of the *Quality Assurance Project Plan, PCB Homologs, Stratton Substation*, current conditions result in acceptable risks (e.g., the exposure concentrations are less than action levels) (NASA, 2022a). PCB concentrations in groundwater will continue to be monitored every 5 years.

Due to the characteristics of the site, which include a fenced-in, gravel-covered area and no surface water bodies in the immediate vicinity, exposure to ecological receptors was considered to be an incomplete pathway and an ecological risk assessment was not performed. There have been no changes in site conditions since the last FYR that affect this historical determination.

6.2.3 Question C: Has Any Other Information Come To Light That Calls Into Question The Protectiveness Of The Remedy?

There are no emerging contaminants associated with the Stratton Substation. There has been no additional information that has come to light that would call into question the protectiveness of the remedy.

6.3 CONSTRUCTION DEBRIS LANDFILL

6.3.1 Question A: Is The Remedy Functioning As Intended By The Decision Documents?

Yes. Review of documents, current groundwater monitoring results, and the FYR site inspection indicates the remedy, which includes LUCs with LTM, is functioning as intended by the 2021 Final ROD (NASA, 2021c). Groundwater analytical results for the ROD COCs indicate a downward trend of concentrations, and all 2021 through 2025 results are less than cleanup levels, suggesting the historical amendment injections were effective. Institutional controls have been implemented at the CDL to prevent human exposure to landfill waste and groundwater that could present unacceptable risk. The institutional controls are responsible for the remedy functioning as intended and include restriction on the use of groundwater at the site and are recorded in the NASA LaRC Master Plan. No activities have been observed that would have violated the institutional controls. The remedy is in place and is successfully preventing exposure to the site-related contaminants.

6.3.2 Question B: Are The Exposure Assumptions, Toxicity Data, Clean-Up Levels, And RAOs Used At The Time Of The Remedy Selection Still Valid?

Yes. The exposure assumptions, cleanup levels, and RAOs established in the 2021 ROD are still valid (NASA, 2021c). The cleanup levels for 1,2-dichloroethane, cis-1,2-DCE, PCE, TCE, and VC are the federal MCLs and have not changed. The cleanup level for 1,4-dioxane is risk-based and toxicity values have not changed for 1,4-dioxane since the 2021 ROD and 2021 Third FYR. Toxicity values have changed for cis-1,2-DCE and VC since 2021. However, because the cleanup levels are chemical-specific ARARs and not risk-based, the changes to toxicity values do not affect the cleanup levels or remedy protectiveness. The most recent groundwater data from 2021 to 2025 for the COCs are presented in Table B.5 in Appendix B.

As discussed in Section 4.0, PFAS (chemicals of emerging concern) are potentially applicable to the site and are being addressed in an RI at the time of this FYR. As such, PFAS contamination is not further discussed. PFAS contamination does not affect current protectiveness because there are institutional controls in place to prevent groundwater use.

LTM groundwater samples are collected routinely from the CDL monitoring well network and analyzed for anthracene, benzo(a)anthracene, fluoranthene, naphthalene, phenanthrene, 4,4'-DDT, iron, and manganese in addition to the ROD COCs discussed above. As detailed in the November 2025 *Post-Closure Care Evaluation Report*, these analytes are not COCs but were included in the LTM analytical suite based on potential ecological exposure and at the request of EPA BTAG (HGL, 2025). The *Post-Closure Care Evaluation Report* evaluated groundwater data spanning 2011 to 2025 with respect to ecological receptors and concluded that groundwater conditions pose no immediate threat to the environment. As such, recent groundwater data for the additional analytes listed above do not affect remedy protectiveness with respect to ecological receptors. With respect to human receptors, toxicity values for 4,4'-DDT have changed since the 2021 ROD and 2021 Third FYR. 4,4'-DDT was not detected in any of the 2021 to 2025 samples and non-detect reporting limits are less than the EPA tap water RSL. As such, changes to toxicity data for 4,4'-DDT since the 2021 Third FYR do not affect remedy protectiveness.

6.3.3 Question C: Has Any Other Information Come To Light That Calls Into Question The Protectiveness Of The Remedy?

No. In 2018, 1,4-dioxane was added to the LTM suite as an emerging contaminant and all groundwater results for this FYR period are less than the cleanup level. Excluding PFAS, there are no other new emerging contaminants associated with the CDL and no additional information that has come to light that would call into question the protectiveness of the remedy.

7.0 ISSUES AND RECOMMENDATIONS

OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
OU-1 Area E Warehouse				
OU-2 Stratton Substation Soil				

Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU-5 Construction Debris Landfill	Issue Category: Changed Site Conditions			
	Issue: PFAS have been detected in CDL groundwater at concentrations exceeding available screening values.			
	Recommendation: NASA is currently conducting an RI for PFAS at many sites, including the CDL. NASA will work with USEPA and VDEQ to determine the most appropriate path forward to address PFAS at the site.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	NASA	USEPA/State	January 2028

7.1 OTHER FINDINGS

The following recommendations were identified during the FYR that may reduce costs and improve management of O&M, but do not affect current and/or future protectiveness:

- Area E Warehouse: Five monitoring wells installed during the 1995 site assessment have not been sampled since. Consideration should be made to abandon these wells since ongoing groundwater monitoring is not required at this site.
- CDL: Repairs to existing monitoring wells are needed based on the findings of the FYR site inspection.

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8.0 PROTECTIVENESS STATEMENTS

Protectiveness Statement(s)

<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>
OU-1 Area E Warehouse	Protective

Protectiveness Statement: The remedy at OU-1 Area E Warehouse is protective of human health and the environment. The remedy includes the use of institution controls to prevent non-industrial exposure to soil. This objective has been achieved by the placement of a land use prohibition in the NASA LaRC Master Plan.

Protectiveness Statement(s)

<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>
OU-2 Stratton Substation Soil	Protective

Protectiveness Statement: The remedy at OU-2 Stratton Substation Soil has not been completed due to engineering concerns that additional excavation would compromise the integrity of existing site structures as documented in an Explanation of Significant Differences for the site. However, the remedy is currently protective of human health and the environment through the use of institutional controls. The remedy will be finalized when soil with PCB concentrations exceeding 10 mg/kg is removed. Groundwater monitoring data indicates that PCB contamination has migrated to groundwater but is present at concentrations that would not pose an unacceptable risk to human health under a drinking water scenario.

Protectiveness Statement(s)

<i>Operable Unit:</i>	<i>Protectiveness Determination:</i>
OU-5 Construction Debris Landfill	Short-term Protective

Protectiveness Statement: The remedy at OU-5 CDL currently protects human health and the environment because there is no direct exposure to landfill waste and groundwater, institutional controls are in place and maintained, and post-closure groundwater monitoring is performed. PFAS are emerging contaminants that have been detected in groundwater at the CDL. However, the presence of PFAS in groundwater does not impact remedy protectiveness in the short-term because engineering and institutional controls are in place to mitigate exposure.

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9.0 NEXT FIVE-YEAR REVIEW

The next FYR Report for the NASA LaRC Superfund Site is required 5 years from the completion date of this review.

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FIGURES

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Figure 2
Site Layout
Area E Warehouse
Operable Unit 01

Legend

- Monitoring Well (approximate location)
- Restricted Access Sign (approximate location)
- B1172 Building Number
- Chain-link Fence
- Area E Warehouse (Operable Unit 01)
- JBLE-Langley

Notes:
JBLE-Joint Base Langley-Eustis, Langley Air Force Base
NASA=National Aeronautics and Space Administration

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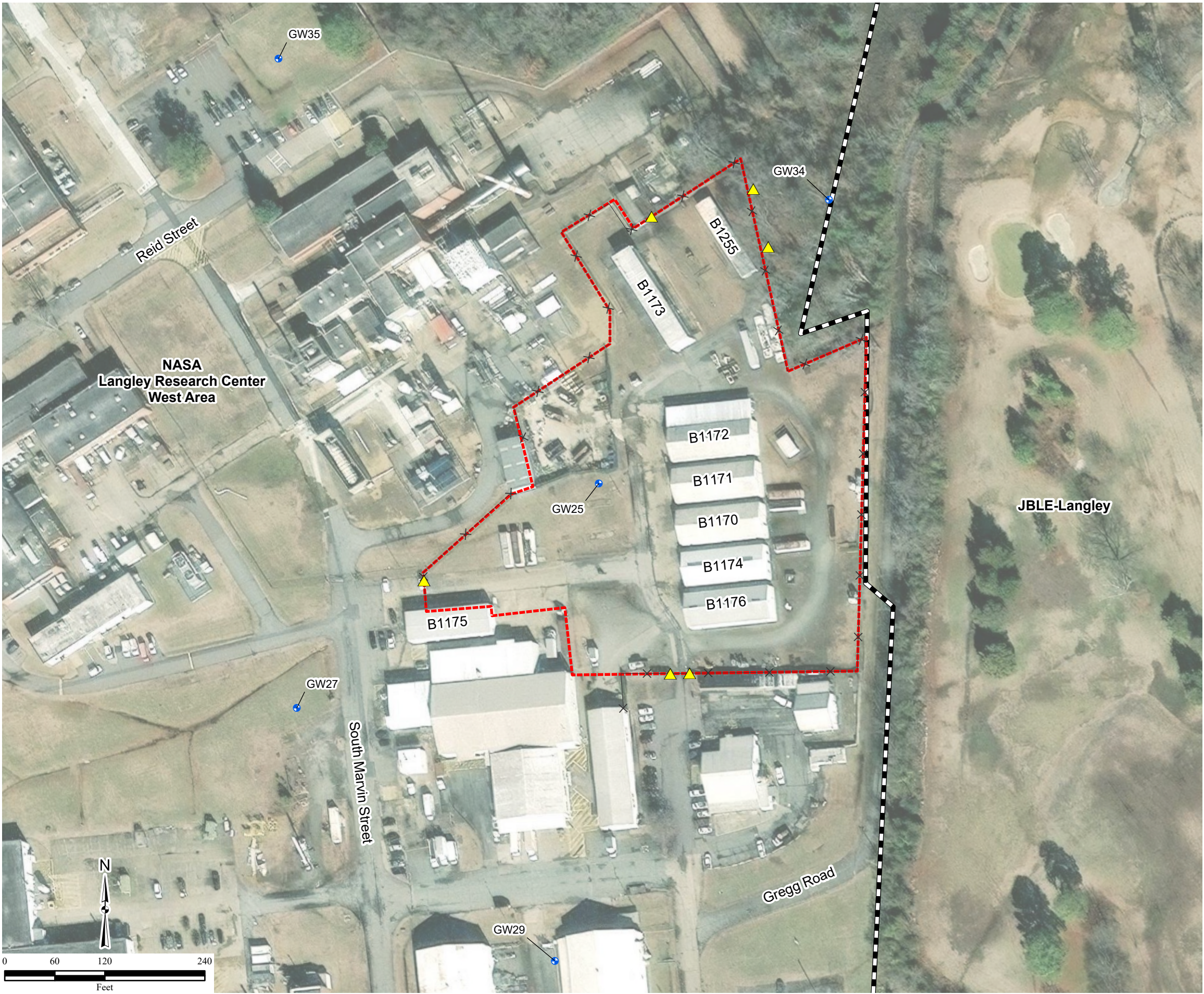


Figure 3
Site Layout
Stratton Substation
Operable Unit 2

Legend

- Monitoring Well (approximate location)
- Restricted Access Sign (approximate location)
- B1216 Building Number
- Chain-link Fence
- Soil Sample Location with PCBs Above the Site Clean-up Goal (10 mg/kg)
- Stratton Substation Soil (Operable Unit 02)

Notes:
PCB=polychlorinated biphenyls
mg/kg=milligrams per kilogram
NASA=National Aeronautics and Space Administration

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1/14/2026 GP
Source: HGL,
ArcGIS Online Imagery



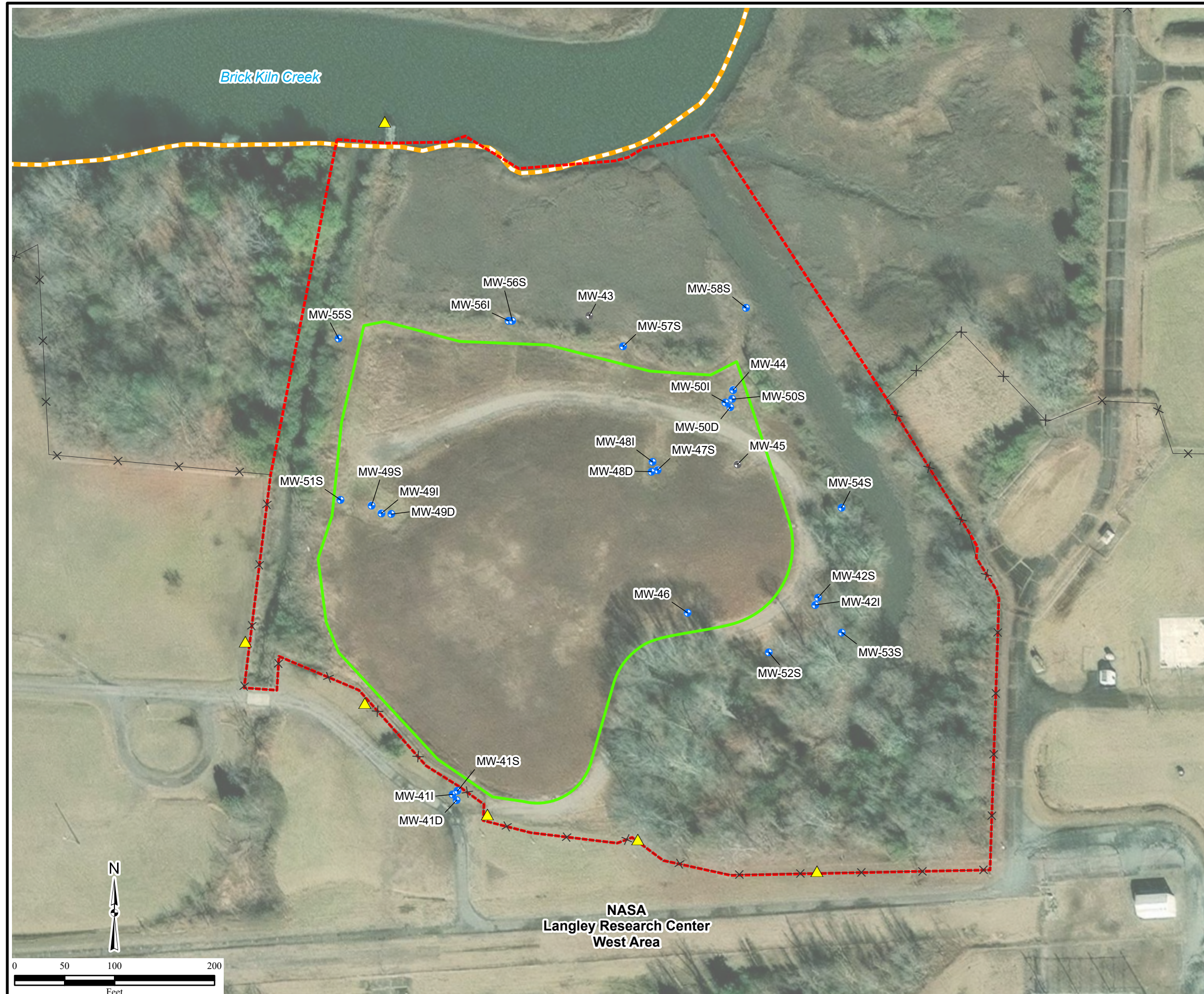
Figure 4
Site Layout
Construction Debris Landfill
Operable Unit 5

Legend

-  Monitoring Well (approximate location)
-  Abandoned or Damaged Monitoring Well (approximate location)
-  Restricted Access Sign (approximate location)
-  Chain-link Fence
-  Soil Cover Boundary
-  Construction Debris Landfill (Operable Unit 05)
-  NASA LaRC Boundary

Notes:
LaRC=Langley Research Center
NASA=National Aeronautics and Space Administration

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ArcGIS Online Imagery



APPENDIX A

SITE QUESTIONNAIRES

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FIVE-YEAR REVIEW QUESTIONNAIRE

Facility:	NASA Langley Research Center, Hampton, VA 23681
EPA ID:	VA2800005033
Five-Year Review No.	Five-Year Review No. 4 (Fourth); Year 2026
Site(s):	1. Area E Warehouse 2. Straton Substation 3. Construction Debris Landfill
Format:	Questionnaire / Email
Interviewee:	Kristi Francisco
Agency/Title/etc:	NASA LaRC, Remedial Project Manager
Date:	12/19/2025

BACKGROUND

1. Are you aware of any efforts by NASA to solicit or engage input and concerns from the Public? If so, please describe these efforts.

There have been past efforts to establish a Remedial Action Board but there was no interest in the community. The Administrative Record is maintained, and documents will be made readily available upon request. A website for restoration activities is currently being published and will be utilized to announce the Five-Year Review.

2. What effects have site operations had on the surrounding community or area?

There are no known effects that site operations have had on the surrounding community or area.

3. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

I am not aware of any community concerns regarding the site or its operation and administration.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, give details.

I am not aware of any events, incidents, or activities that would result in vandalism and trespassing. There have been no emergency responses at the sites.

5. Are you aware of any intrusive activities being conducted at the site or uses of the site other than monitoring or maintenance?

There have been no intrusive activities at the sites.

6. Are you aware of any uses of the groundwater at or downgradient of the site?

Groundwater is not used at or downgradient of the Site. The center and surrounding community uses potable water provided by the City of Newport News Waterworks.

STATE AND LOCAL CONSIDERATIONS (REGULATORY)

1. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

EPA and DEQ meets with NASA once a month via TEAMS to discuss ongoing and upcoming restoration projects. The team has also met in person at NASA LaRC to conduct site visits and review long-term monitoring data. In addition, the CERCLA process has been started to investigate PFAS. A preliminary assessment for PFAS has been completed. The team has had scoping meetings for the Site Inspection, Expanded Site Inspection, and Remedial Investigation. During the most recent meeting at LaRC, December 16, 2025, site visits were conducted at PFAS sites and inspections were completed for the Five-Year Review.

2. Have there been any complaints, violations, or other compliance issues related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

There have been no violations and compliance issues. Concerns were noted in the field about the aging monitoring wells at the Construction Debris Landfill. A damaged monitoring well will be repaired during the monitoring well installation task of the PFAS RI, which is anticipated in Summer or Fall of 2026. Additional funds would need to be obtained to make further improvements to the monitoring well network.

3. Have there been any changes in regulations or cleanup levels since implementation that may impact the site?

There have been no changes to regulations or cleanup levels. PFAS is currently being investigated at the Construction Debris Landfill. NASA continues to stay up to date on the latest regulations for this contaminant.

PERFORMANCE, OPERATION, AND MAINTENANCE PROBLEMS

1. Is the remedy functioning as intended by the decision documents? How well is the remedy performing?

The remedy is functioning as intended and protective of Human Health and the Environment. The soil cover is maintained to ensure the integrity of the cap.

2. Describe the Long-Term Monitoring (LTM) staff and activities. If there is not a continuous on-site presence, describe the staff and frequency of site inspections and activities.

LTM is conducted by contracted staff and samples are sent to an offsite firm fixed laboratory. LTM at CDL is currently conducted on an annual basis. LTM at Stratton Substation is conducted every five years to support the evaluation in the Five-Year Review. Land Use Control

inspections are conducted annually but the presence of NASA onsite allows for periodic checks throughout the year.

3. Have there been any significant changes in the LTM requirements, operational adjustments, maintenance schedules, or sampling routines since start up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe the changes and impacts.

There are no changes to the LTM requirements, operational adjustments, maintenance schedules, or sampling routine since start up.

4. Do you have any comments or feedback on the adequacy of the implemented remedy? Are all the right constituents included? Is the monitoring frequency adequate?

The 10 years of landfill post closure monitoring has been completed in 2024 at the Construction debris Landfill. An additional year of monitoring has been conducted to support the evaluation in the Five-Year Review. A Post-Closure Care document is currently in preparation and will recommend reduction of LTM from annually to once every five years. Monitoring at the Stratton Substation is adequate.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

NASA will work with EPA and DEQ to reduce the monitoring requirements for the Construction Debris Landfill. NASA will continue investigating PFAS at the facility. There are no other suggestions or recommendations regarding the site's management or operation.

FIVE-YEAR REVIEW QUESTIONNAIRE

Facility:	NASA Langley Research Center, Hampton, VA 23681
EPA ID:	VA2800005033
Five-Year Review No.	Five-Year Review No. 4 (Fourth); Year 2026
Site(s):	1. Area E Warehouse 2. Straton Substation 3. Construction Debris Landfill
Format:	Questionnaire / Email
Interviewee:	Ali Arvanaghi
Agency/Title/etc:	EPA Region 3, Remedial Project Manager
Date:	1/7/26

BACKGROUND

1. Are you aware of any efforts by NASA to solicit or engage input and concerns from the Public? If so, please describe these efforts.

NASA provides the opportunity for public input by publishing announcements in newspapers for their required document (i.e., PRAP)

NASA also maintains their administrative record for the site.

2. What effects have site operations had on the surrounding community or area?

Unknown

3. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

I am not aware of any community concerns.

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, give details.

I am not aware of any such events.

5. Are you aware of any intrusive activities being conducted at the site or uses of the site other than monitoring or maintenance?

I am not aware of any such activities.

6. Are you aware of any uses of the groundwater at or downgradient of the site?

Groundwater is not used on site. Several thousand feet downgradient, groundwater may be used for drinking water.

STATE AND LOCAL CONSIDERATIONS (REGULATORY)

1. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

The team communicates via emails and regularly scheduled calls. In person, on site meetings occur annually when practicable. OUs subject to FYR have been regularly visited.

2. Have there been any complaints, violations, or other compliance issues related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

no

3. Have there been any changes in regulations or cleanup levels since implementation that may impact the site?

no

PERFORMANCE, OPERATION, AND MAINTENANCE PROBLEMS

1. Is the remedy functioning as intended by the decision documents? How well is the remedy performing?

EPA believes that the remedies are functioning as intended

2. Describe the Long-Term Monitoring (LTM) staff and activities. If there is not a continuous on-site presence, describe the staff and frequency of site inspections and activities.

LTM activities are conducted by off-site contractors. NASA arranges for the contractors to be on site for periodic monitoring/sampling activities and site inspections.

3. Have there been any significant changes in the LTM requirements, operational adjustments, maintenance schedules, or sampling routines since start up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe the changes and impacts.

No

4. Do you have any comments or feedback on the adequacy of the implemented remedy? Are all the right constituents included? Is the monitoring frequency adequate?

EPA believes the appropriate constituents are included and the monitoring frequency is adequate.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

No

FIVE-YEAR REVIEW QUESTIONNAIRE

Facility:	NASA Langley Research Center, Hampton, VA 23681
EPA ID:	VA2800005033
Five-Year Review No.	Five-Year Review No. 4 (Fourth); Year 2026
Site(s):	1. Area E Warehouse 2. Straton Substation 3. Construction Debris Landfill
Format:	Questionnaire / Email
Interviewee:	Stephanie Sawyer
Agency/Title/etc:	VDEQ, Remedial Project Manager
Date:	December 19, 2025

BACKGROUND

1. Are you aware of any efforts by NASA to solicit or engage input and concerns from the Public? If so, please describe these efforts.

NASA publishes public notices in the local newspapers announcing the FYR process and provides contact information for further inquiry. The AR is also available for review.

2. What effects have site operations had on the surrounding community or area?

To my knowledge, NASA Langley Research Center's CERCLA response action has little to no negative effect on the surrounding community.

3. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details.

No

4. Are you aware of any events, incidents, or activities at the site such as vandalism, trespassing, or emergency responses from local authorities? If so, give details.

No

5. Are you aware of any intrusive activities being conducted at the site or uses of the site other than monitoring or maintenance?

Other than field activities already approved by the DEQ (and USEPA), the DEQ is not aware of any intrusive activities being conducted at the sites.

6. Are you aware of any uses of the groundwater at or downgradient of the site?

Other than monitoring, the DEQ is not aware of any other uses of the groundwater at or downgradient of the sites.

STATE AND LOCAL CONSIDERATIONS (REGULATORY)

1. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please give purpose and results.

Yes, the DEQ routinely communicates with NASA LaRC and conducts periodic site visits. Communication via conference calls or in person meetings are regularly held to

discuss remediation activities, long-term monitoring results, and maintenance activities. Site visits and inspections are conducted to evaluate and assess remedies in place and observe any maintenance or repair actions in progress. Often, such inspections/visits show the remedies are functioning as intended by the RODs.

The three subject OU's were recently visited for the purposes of performing this Five-Year Review. The site visit revealed the remedy implemented for each OU to be functioning as designed.

2. Have there been any complaints, violations, or other compliance issues related to the site requiring a response by your office? If so, please give details of the events and results of the responses.

Not to my knowledge.

3. Have there been any changes in regulations or cleanup levels since implementation that may impact the site?

The DEQ is not aware of any changes in regulations or cleanup levels that would affect the selected remedies for the three subject OU's.

PERFORMANCE, OPERATION, AND MAINTENANCE PROBLEMS

1. Is the remedy functioning as intended by the decision documents? How well is the remedy performing?

DEQ believes the remedies are functioning as designed and are performing adequately.

2. Describe the Long-Term Monitoring (LTM) staff and activities. If there is not a continuous on-site presence, describe the staff and frequency of site inspections and activities.

LTM activities are conducted periodically by a NASA contractor at a frequency that has been approved by USEPA and DEQ.

3. Have there been any significant changes in the LTM requirements, operational adjustments, maintenance schedules, or sampling routines since start up or in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe the changes and impacts.

DEQ is not aware of any significant changes to the LTM requirements, operational adjustments, maintenance schedules, or sampling routines in the last five years. LTM optimization activities have been discussed and DEQ anticipates that an optimization plan will be drafted prior to the next Five-Year Review.

4. Do you have any comments or feedback on the adequacy of the implemented remedy? Are all the right constituents included? Is the monitoring frequency adequate?

The DEQ believes the remedies implemented at the sites are adequate for their intended purposes. Each remedy addresses the appropriate constituents and while monitoring is occurring at the correct frequency, optimization of the monitoring activities should be considered.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

None at this time.

APPENDIX B

SUPPORTING DATA

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Table B.1
Comparison of Historical Soil Data to Current Screening Levels
Area E Warehouse, NASA Langley Research Center, Virginia

Analyte	CAS Number	Maximum Detected Concentration	Qualifier	Location of Maximum Detection	Background Concentration	EPA Industrial Soil RSL ^[1]	Industrial COPC (Y/N)?
Surface Soil							
Volatile Organic Compounds (µg/kg)							
Methylene Chloride	75-09-2	60	J	SS05-01	ND	320000	No
Acetone	67-64-1	110	J	SS11-01	13	110000000	No
Semi-Volatile Organic Compounds (µg/kg)							
Fluoranthene	206-44-0	420	J	SS05-01	ND	3000000	No
Bis(2-ethylhexyl)phthalate	117-81-7	470		SS04-01	ND	160000	No
PCBs (µg/kg)							
Aroclor 1248	12672-29-6	1,000		S-SS-06-01	ND	940	Yes
Aroclor 1254	11097-69-1	3,100		S-SS-03-01	ND	970	Yes
Aroclor 1260	11096-82-5	4,800		S-SS-17-01	4300 J	990	Yes
Metals (mg/kg)							
Aluminum	7429-90-5	16,100		SS04-01	14,700	110000	No
Arsenic	7440-38-2	6	J	SS12-01	ND	3	Yes
Barium	7440-39-3	379	J	SS04-01	32 J	22000	No
Beryllium	7440-41-7	2	J	SS04-01	1 J	230	No
Cadmium	7440-43-9	6	J	SS12-01	4 J	10	No
Calcium	7440-70-2	94,900		SS11-01	1,150	--	--
Chromium	18540-29-9	17		SS04-01	19	20	No
Cobalt	7440-48-4	10	J	SS12-01	8 J	35	No
Copper	7440-50-8	15	J	SS12-01	4 J	4700	No
Iron	7439-89-6	20,900		SS04-01	23,600	82000	No
Lead	7439-92-1	63		S-SS-31-01	ND	800	No
Magnesium	7439-95-4	9,240		SS11-01	2020	--	--
Manganese	7439-96-5	1,100		S-SS-17-01	17 J	2600	No
Mercury	7439-97-6	27		SS05-01	ND	35	No
Nickel	7440-02-0	21	J	SS12-01	15 J	1700	No
Potassium	7440-09-7	903	J	SS11-01	1890 J	--	--
Sodium	7440-23-5	491	J	SS04-01	567 J	--	--
Vanadium	7440-62-2	46	J	SS04-01	36 J	580	No
Zinc	7440-66-6	461	J	SS04-01	20 J	35000	No
Cyanide	57-12-5	2.2		SS12-01	ND	16	No
Subsurface Soil							
Volatile Organic Compounds (µg/kg)							
Methylene Chloride	75-09-2	93		SB38-01	37 J	320000	No
Acetone	67-64-1	25		SB37-01	24 J	110000000	No
Carbon Disulfide	75-15-0	36	J	SB26-01	ND	350000	No
Pesticides (µg/kg)							
beta-BHC	319-85-7	32	J	SB26-01	ND	1300	No
Dieldrin	60-57-1	250	J	SB39-01	ND	140	Yes
4,4'-DDT	50-29-3	42	J	SB39-01	ND	8500	No
PCBs (µg/kg)							
Aroclor 1254	11097-69-1	1,100		S-SB-20-01	ND	970	Yes
Aroclor 1260	11096-82-5	3,800	J	SB37-01	ND	990	Yes
Metals (mg/kg)							
Aluminum	7429-90-5	14,300		SB26-01	21200 - 27800	110000	No
Arsenic	7440-38-2	11	J	SB26-01	19 J - 56 J	3	Yes
Barium	7440-39-3	61	J	SB38-01	56 J - 73 J	22000	No
Beryllium	7440-41-7	1	J	SB26-01	1 J	230	No
Cadmium	7440-43-9	4	J	SB38-01	5 J - 9 J	10	No
Calcium	7440-70-2	14,500		SB26-01	1530 - 5520	--	--
Chromium	18540-29-9	31		SB38-01	10	20	Yes
Cobalt	7440-48-4	6	J	SB26-01	8 J - 12 J	35	No
Copper	7440-50-8	18	J	SB26-01	7 J	4700	No
Iron	7439-89-6	19,900		SB26-01	30300 - 43100	82000	No
Lead	7439-92-1	36		S-SB-20-01	11 J - 25 J	800	No
Magnesium	7439-95-4	3,140		SB37-01	1280 J -1530	--	--

Table B.1
Comparison of Historical Soil Data to Current Screening Levels
Area E Warehouse, NASA Langley Research Center, Virginia

Analyte	CAS Number	Maximum Detected Concentration	Qualifier	Location of Maximum Detection	Background Concentration	EPA Industrial Soil RSL ^[1]	Industrial COPC (Y/N)?
Manganese	7439-96-5	618		S-SB-33-01	29 J - 260 J	2600	No
Mercury	7439-97-6	0.8		SB26-01	ND	3	No
Nickel	7440-02-0	18	J	SB26-01	24 J - 34 J	1700	No
Potassium	7440-09-7	1,320	J	SB37-01	472 J - 678 J	--	--
Sodium	7440-23-5	482	J	SB26-01	618 J - 1000 J	--	--
Vanadium	7440-62-2	46	J	SB38-01	62 J - 72 J	580	No
Zinc	7440-66-6	81	J	SB26-01	21 J - 33 J	35000	No
Sediment							
PCBs (µg/kg)							
Aroclor 1260	11096-82-5	313		CB-329	NA	9900	No

[1] EPA industrial soil RSL, November 2024, target cancer risk of 1E-06, target non-cancer hazard quotient of 0.1. The industrial soil RSLs are multiplied by 10 for comparison to sediment data.

Bolded analytes indicate the maximum detection exceeds the RSL and the analyte is a COPC.

µg/kg = micrograms per kilogram

mg/kg = milligrams per kilogram

J = estimated value

RSL = regional screening level

COPC = chemical of potential concern

EPA = U.S. Environmental Protection Agency

-- = not applicable or not available

Table B.2
Human Health Risk Estimates
Area E Warehouse, NASA Langley Research Center, Virginia

COPC	Site-Specific Worker		Construction Worker		Industrial Worker	
	Cancer Risk	Non-Cancer HQ/HI	Cancer Risk	Non-Cancer HQ/HI	Cancer Risk	Non-Cancer HQ/HI
Aroclor 1248	2.E-06	--	1.E-07	--	1.E-06	--
Aroclor 1254	5.E-07	0.02	3.E-08	0.04	2.E-07	0.02
Aroclor 1260	2.E-06	--	1.E-07	--	8.E-07	--
Arsenic, Inorganic	4.E-06	0.01	3.E-07	0.1	2.E-06	0.01
Chromium(VI)	2.E-06	0.02	5.E-07	0.1	8.E-07	0.02
Dieldrin	3.E-06	0.006	2.E-07	0.01	2.E-06	0.005
Total	1.E-05	0.05	1.E-06	0.3	6.E-06	0.05

COPC = chemical of potential concern

HQ = hazard quotient

HI = hazard index

Table B.3
2025 Groundwater PCB Homolog and Congener Results
Stratton Substation, NASA Langley Research Center, Virginia

Sample Identification			SSMW05C-080425		SSMW05C-080425-FD		SSMW06C-080425		SSMW03C-080425	
Sample Date			8/4/2025		8/4/2025		8/4/2025		8/4/2025	
Sample Type			Normal		Field Duplicate		Normal		Normal	
Units			pg/L		pg/L		pg/L		pg/L	
Analyte	CAS Number	EPA Tapwater RSL ^[1]	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Polychlorinated biphenyls, Total	1336-36-3	--	270	J	240	J	10000	J	740	J
Monochlorobiphenyls (PCB-1 through PCB-3)										
PCB-1	2051-60-7	--	76	U	76	U	76	U	76	U
PCB-2	2051-61-8	--	38	U	38	U	38	U	38	U
Total Monochlorobiphenyls	27323-18-8	4,600 to	38	U	38	U	38	U	38	U
Dichlorobiphenyls (PCB-4 through PCB-15)										
PCB-10	33146-45-1	--	38	U	38	U	38	U	38	U
PCB-11	2050-67-1	--	120	J	120	U	120	U	120	U
PCB-12/13	STL01797	--	38	U	38	U	38	U	38	U
PCB-14	34883-41-5	--	38	U	38	U	38	U	38	U
PCB-15	2050-68-2	--	38	U	20	J	38	U	38	U
Total Dichlorobiphenyls	25512-42-9	4,600 to	150	J	49	J	38	U	32	J
Trichlorobiphenyls (PCB-16 through PCB-39)										
PCB-16	38444-78-9	--	19	J	20	J	38	U	38	U
PCB-17	37680-66-3	--	38	U	20	J	38	U	19	J
PCB-18/30	STL01798	--	76	U	76	U	76	U	76	U
PCB-19	38444-73-4	--	46	U	45	U	45	U	45	U
PCB-20/28	STL01799	--	50	J	52	J	40	J	48	J
PCB-21/33	STL01800	--	76	U	76	U	76	U	76	U
PCB-22	38444-85-8	--	19	J	23	J	38	U	20	J
Total Trichlorobiphenyls	25323-68-6	4,600 to	88	J	160	J	40	J	130	J
Tetrachlorobiphenyls (PCB-40 through PCB-81)										
Total Tetrachlorobiphenyls	26914-33-0	400 to 6,000	33	J	30	J	360	J	26	J
Pentachlorobiphenyls (PCB-82 through PCB-127)										
PCB-103	60145-21-3	--	38	U	38	U	38	U	38	U
PCB-104	56558-16-8	--	38	U	38	U	38	U	38	U
PCB-105	32598-14-4	4,000	38	U	38	U	38	U	38	U
PCB-106	70424-69-0	--	38	U	38	U	38	U	38	U
PCB-107	70424-68-9	--	38	U	38	U	38	U	38	U
PCB-108/124	STL02294	--	76	U	76	U	76	U	76	U
PCB-110/115	STL01826	--	76	U	76	U	76	U	76	U
PCB-111	39635-32-0	--	38	U	38	U	38	U	38	U
PCB-112	74472-36-9	--	38	U	38	U	38	U	38	U
PCB-114	74472-37-0	4,000	38	U	38	U	38	U	38	U
PCB-118	31508-00-6	4,000	38	U	38	U	93		38	U
PCB-120	68194-12-7	--	38	U	38	U	38	U	38	U
PCB-121	56558-18-0	--	38	U	38	U	38	U	38	U
PCB-122	76842-07-4	--	38	U	38	U	38	U	38	U
PCB-123	65510-44-3	4,000	38	U	38	U	38	U	38	U
PCB-126	57465-28-8	1.2	38	U	38	U	38	U	38	U
PCB-127	39635-33-1	--	38	U	38	U	38	U	38	U
Total Pentachlorobiphenyls	25429-29-2	1.2 to 4,000	38	U	38	U	2600	J	80	J
Hexachlorobiphenyls (PCB-128 through PCB-170)										
PCB-128/166	STL01816	--	76	U	76	U	54	J	76	U
PCB-129/138/163	STL01817	--	130	U	130	U	1000		94	J
PCB-130	52663-66-8	--	38	U	38	U	30	J	38	U
PCB-131	61798-70-7	--	38	U	38	U	38	U	38	U
PCB-132	38380-05-1	--	38	U	38	U	330		34	J
PCB-133	35694-04-3	--	38	U	38	U	38	U	38	U
PCB-134	52704-70-8	--	38	U	38	U	48	J	38	U
PCB-135/151	STL01819	--	76	U	76	U	610		76	J
PCB-136	38411-22-2	--	38	U	38	U	250		26	J
PCB-137	35694-06-5	--	38	U	38	U	38	U	38	U
PCB-139/140	STL01820	--	76	U	76	U	76	U	76	U
PCB-141	52712-04-6	--	44	U	43	U	260		26	J
PCB-142	41411-61-4	--	38	U	38	U	38	U	38	U
PCB-143	68194-15-0	--	38	U	38	U	38	U	38	U
PCB-144	68194-14-9	--	38	U	38	U	86		38	U
PCB-145	74472-40-5	--	38	U	38	U	38	U	38	U
PCB-146	51908-16-8	--	38	U	38	U	140		38	U
PCB-147/149	STL01821	--	82	U	81	U	1000		81	U
PCB-148	74472-41-6	--	38	U	38	U	38	U	38	U
PCB-150	68194-08-1	--	38	U	38	U	38	U	38	U
PCB-152	68194-09-2	--	38	U	38	U	38	U	38	U
PCB-153/168	STL01822	--	97	U	96	U	1100		88	J
PCB-154	60145-22-4	--	38	U	38	U	38	U	38	U
PCB-155	33979-03-2	--	38	U	38	U	38	U	38	U
PCB-156/157	STL01792	4,000	76	U	76	U	76	U	76	U
PCB-158	74472-42-7	--	38	U	38	U	83		38	U

Table B.3
2025 Groundwater PCB Homolog and Congener Results
Stratton Substation, NASA Langley Research Center, Virginia

Sample Identification			SSMW05C-080425		SSMW05C-080425-FD		SSMW06C-080425		SSMW03C-080425	
Sample Date			8/4/2025		8/4/2025		8/4/2025		8/4/2025	
Sample Type			Normal		Field Duplicate		Normal		Normal	
Units			pg/L		pg/L		pg/L		pg/L	
Analyte	CAS Number	EPA Tapwater RSL ^[1]	Result	Qual	Result	Qual	Result	Qual	Result	Qual
PCB-159	39635-35-3	--	38	U	38	U	38	U	38	U
PCB-160	41411-62-5	--	38	U	38	U	38	U	38	U
PCB-161	74472-43-8	--	38	U	38	U	38	U	38	U
PCB-162	39635-34-2	--	38	U	38	U	38	U	38	U
PCB-164	74472-45-0	--	38	U	38	U	76		38	U
PCB-165	74472-46-1	--	38	U	38	U	38	U	38	U
PCB-167	52663-72-6	4,000	38	U	38	U	38	U	38	U
PCB-169	32774-16-6	4	38	U	38	U	38	U	38	U
Total Hexachlorobiphenyls	26601-64-9	4 to 4,000	38	U	38	U	5100	J	340	J
Heptachlorobiphenyls (PCB-170 through PCB-193)										
PCB-170	35065-30-6	--	80	U	79	U	190		79	U
PCB-171/173	STL01823	--	76	U	76	U	75	J	76	U
PCB-172	52663-74-8	--	38	U	38	U	33	J	38	U
PCB-174	38411-25-5	--	89	U	89	U	260		89	U
PCB-175	40186-70-7	--	38	U	38	U	38	U	38	U
PCB-176	52663-65-7	--	38	U	38	U	37	J	38	U
PCB-177	52663-70-4	--	46	U	45	U	140		45	U
PCB-178	52663-67-9	--	38	U	38	U	44	J	38	U
PCB-179	52663-64-6	--	38	U	38	U	120		20	J
PCB-180/193	STL01824	--	95	U	94	U	450		62	J
PCB-181	74472-47-2	--	38	U	38	U	38	U	38	U
PCB-182	60145-23-5	--	38	U	38	U	38	U	38	U
PCB-183/185	STL02297	--	80	U	79	U	160		79	U
PCB-184	74472-48-3	--	38	U	38	U	38	U	38	U
PCB-186	74472-49-4	--	38	U	38	U	38	U	38	U
PCB-187	52663-68-0	--	76	U	76	U	260		45	J
PCB-188	74487-85-7	--	38	U	38	U	38	U	38	U
PCB-189	39635-31-9	4,000	38	U	38	U	38	U	38	U
PCB-190	41411-64-7	--	38	U	38	U	45	J	38	U
PCB-191	74472-50-7	--	38	U	38	U	38	U	38	U
PCB-192	74472-51-8	--	38	U	38	U	38	U	38	U
Total Heptachlorobiphenyls	28655-71-2	4,000	38	U	38	U	1800	J	130	J
Octachlorobiphenyls (PCB-194 through PCB-205)										
PCB-194	35694-08-7	--	76	U	76	U	58	J	76	U
PCB-195	52663-78-2	--	38	U	38	U	29	J	38	U
PCB-196	42740-50-1	--	38	U	38	U	32	J	38	U
PCB-197/200	STL02692	--	76	U	76	U	76	U	76	U
PCB-198/199	STL01825	--	76	U	76	U	56	J	76	U
PCB-201	40186-71-8	--	38	U	38	U	38	U	38	U
PCB-202	2136-99-4	--	38	U	38	U	38	U	38	U
PCB-203	52663-76-0	--	49	U	49	U	49	U	49	U
PCB-204	74472-52-9	--	38	U	38	U	38	U	38	U
PCB-205	74472-53-0	--	38	U	38	U	38	U	38	U
Total Octachlorobiphenyls	55722-26-4	--	38	U	38	U	180		38	U
Nonachlorobiphenyls (PCB-206 through PCB-208)										
PCB-206	40186-72-9	--	55	U	55	U	55	U	55	U
PCB-207	52663-79-3	--	38	U	38	U	38	U	38	U
PCB-208	52663-77-1	--	76	U	76	U	76	U	76	U
Total Nonachlorobiphenyls	53742-07-7	--	38	U	38	U	38	U	38	U

[1] EPA tapwater RSL, November 2024, target cancer risk of 1E-06, target non-cancer hazard quotient of 0.1. The selected RSLs for each PCB homolog are in accordance with the 2022 QAPP for the Stratton Substation site.

Bold indicates a detected result.

Shaded indicates an exceedance of the lowest screening level.

PCB = polychlorinated biphenyl

pg/L = picograms per liter

RSL = regional screening level

TEF = toxic equivalency factor

TEQ = toxic equivalent

J = estimated result

U = non-detect result

Table B.4
2025 Groundwater Dioxin-Like PCB Congener Results
Stratton Substation, NASA Langley Research Center, Virginia

Sample Identification				SSMW05C-080425			SSMW05C-080425-FD			SSMW06C-080425			SSMW03C-080425		
Sample Date				8/4/2025			8/4/2025			8/4/2025			8/4/2025		
Sample Type				Normal			Field Duplicate			Normal			Normal		
Units				pg/L			pg/L			pg/L			pg/L		
Analyte	CAS Number	EPA Tapwater RSL ^[1]	TEF ^[2]	Result	Qual	TEQ	Result	Qual	TEQ	Result	Qual	TEQ	Result	Qual	TEQ
Dioxin-like PCB Congeners															
PCB-126	57465-28-8	1.2	0.1	38	U	--	38	U	--	38	U	--	38	U	--
PCB-169	32774-16-6	4	0.03	38	U	--	38	U	--	38	U	--	38	U	--
PCB-105	32598-14-4	4,000	3E-05	38	U	--	38	U	--	38	U	--	38	U	--
PCB-114	74472-37-0	4,000	3E-05	38	U	--	38	U	--	38	U	--	38	U	--
PCB-118	31508-00-6	4,000	3E-05	38	U	--	38	U	--	93		0.0028	38	U	--
PCB-123	65510-44-3	4,000	3E-05	38	U	--	38	U	--	38	U	--	38	U	--
PCB-156/157	STL01792	4,000	3E-05	76	U	--	76	U	--	76	U	--	76	U	--
PCB-167	52663-72-6	4,000	3E-05	38	U	--	38	U	--	38	U	--	38	U	--
PCB-189	39635-31-9	4,000	3E-05	38	U	--	38	U	--	38	U	--	38	U	--
2,3,7,8-TCDD TEQ^[2]		0.12	--	--	--	--	--	--	--	--	--	0.0028	--	--	--

[1] EPA tapwater RSL, November 2024, target cancer risk of 1E-06, target non-cancer hazard quotient of 0.1. RSL for low risk PCBs used for total PCBs.

[2] Dioxin-like PCBs were evaluated as TEQ to 2,3,7,8-tetrachlorodibenzo-p-dioxin. TEQs were calculated using the 2005 World Health Organization toxic equivalency factors presented in EPA (2010). Non-detections were assigned a value of 0.

Bold indicates a detected result.

Shaded indicates an exceedance of the lowest screening level.

PCB = polychlorinated biphenyl

pg/L = picograms per liter

RSL = regional screening level

TEF = toxic equivalency factor

TEQ = toxic equivalent

J = estimated result

U = non-detect result

EPA, 2010. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. EPA/100/R-10/005. December.

Table B.5 - CDL Summary of Historical Analytical Results 2021-2025

		Volatile Organic Compounds										Semi-Volatile Organic Compounds												Pesticides		Metals			
Well Name	Year	1,2-Dichloroethane 107-06-2		cis-1,2-Dichloroethene 156-59-2		Tetrachloroethene 127-18-4		Trichloroethene 79-01-6		Vinyl chloride 75-01-4		1,4-Dioxane 123-91-1		Anthracene 120-12-7		Benzo(a)anthracene 56-55-3		Fluoranthene 206-44-0		Naphthalene 91-20-3		Phenanthrene 85-01-8		4-4-DDT 50-29-3		Iron 7439-89-6		Manganese 7439-96-5	
Screening Level		5		70		5		5		2		18		0.012		0.018		0.04		1.1		0.4		0.04*		300		120	
		Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
MW-41I	2023	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.77 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.038 U		198 J		49.6	
MW-41I	2024	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.04 U		50 U		25.4	
MW-41I	2025	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		1.2 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.037 U		263		54.2	
MW-41S	2021	1 U		1 U		1 U		1 U		1 U		0.25		--		--		--		--		--		--		--		--	
MW-41S	2023	0.5 UJ		0.5 UJ		0.5 UJ		0.5 UJ		0.5 UJ		0.77 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.038 U		8720		1030	
MW-41S	2024	0.5 U		0.5 U		0.5 U		0.5 UJ		0.5 U		0.2 U		0.42 U		0.042 U		0.42 U		0.42 U		0.42 U		0.04 U		9540		1130	
MW-41S	2025	0.5 U		0.5 U		0.5 U		0.5 U		1.5 U		0.2 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.037 U		10000		1120	
MW-53S	2021	1 U		4		1 U		0.54 J		1 U		0.77		--		--		--		--		--		--		--		--	
MW-53S	2022	0.3 U		2.9		0.3 U		1.1		0.2 U		0.37 B		0.1 U		0.1 U		0.1 U		0.1 U		0.11 U		--		3500		3700	
MW-53S	2023	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.8 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.042 U		6720		7580	
MW-53S	2024	0.5 U		1.9		0.5 U		0.5 U		0.5 U		0.2 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.038 U		5230		6160	
MW-53S	2025	0.5 U		2.8		0.5 U		0.5 U		0.5 U		0.2 U		0.38 U		1.038 U		1.38 U		1.38 U		1.38 U		0.037 U		5860		6170	
MW-54S	2021	1 U		1 U		0.31 J		1 U		1 U		0.76		--		--		--		--		--		--		--		--	
MW-54S	2022	0.3 U		0.3 U		0.3 U		0.3 U		0.2 U		0.6 B		0.1 U		0.1 U		0.1 U		0.1 U		0.11 U		--		7300		260	
MW-54S	2023	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.8 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.042 U		12600		601	
MW-54S	2024	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.038 U		11000		727	
MW-54S	2025	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.042 U		11300		467	
MW-55S	2022	15 U		15 U		15 U		15 U		10 U		0.89		0.1 U		0.1 U		0.12 J		0.1 U		0.11 U		--		7200		520	
MW-55S	2023	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.8 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.04 U		13400		680	
MW-55S	2024	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.038 U		6750		235	
MW-55S	2025	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.038 U		14900		691	
MW-56I	2023	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.8 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.04 U		26000		729	
MW-56I	2024	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.04 U		25800		663	
MW-56I	2025	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.38 U		0.038 U		0.038 U		0.038 U		0.038 U		0.04 U		25900		655	
MW-56S	2022	0.3 U		0.3 U		0.3 U		0.3 U		0.2 U		14 B		0.1 U		0.1 U		0.37 J		0.1 U		0.18 J		--		41000		540	
MW-56S	2023	0.5 UJ		0.5 UJ		0.5 UJ		0.5 UJ		0.5 UJ		8.4		0.42 U		0.042 U		0.21 J		0.42 U		0.42 U		0.04 UJ		34800		487	
MW-56S	2024	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		2.9		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.04 U		23200		273	
MW-56S	2025	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		2.6 J		0.25 J		0.038 U		0.21 J		0.38 U		0.38 U		0.038 U		32300		307	
MW-57S	2021	1 U		1 U		1 U		1 U		1 U		3.4		--		--		--		--		--		--		--		--	
MW-57S	2022	0.3 U		0.3 U		0.3 U		0.3 U		0.2 U		1.2 B		0.1 U		0.1 U		0.1 U		0.1 U		0.11 U		--		230		90	
MW-57S	2023	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.66 J		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.042 U		21400		555	
MW-57S	2024	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.3		0.38 U		0.038 U		0.38 U		0.38 U		0.38 U		0.042 U		9380		414	
MW-57S	2025	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.57		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.04 U		240		220	
MW-58S	2021	1 U		1 U		1 U		1 U		1 U		0.51		--		--		--		--		--		--		--		--	
MW-58S	2023	0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.8 U		0.4 U		0.04 U		0.4 U		0.4 U		0.4 U		0.042 U		250 U		523	

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Well Name		Year	Volatile Organic Compounds								Semi-Volatile Organic Compounds												Pesticides		Metals					
			1,2-Dichloroethane 107-06-2		cis-1,2-Dichloroethene 156-59-2		Tetrachloroethene 127-18-4		Trichloroethene 79-01-6		Vinyl chloride 75-01-4		1,4-Dioxane 123-91-1		Anthracene 120-12-7		Benzo(a)anthracene 56-55-3		Fluoranthene 206-44-0		Naphthalene 91-20-3		Phenanthrene 85-01-8		4-4-DDT 50-29-3		Iron 7439-89-6		Manganese 7439-96-5	
Screening Level			5		70		5		5		2		18		0.012		0.018		0.04		1.1		0.4		0.04*		300		120	
			Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
MW-58S	2024		0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.08 U		0.038 U		0.38 U		0.38 U		0.4 U		0.042 U		250 U		583	
MW-58S	2025		0.5 U		0.5 U		0.5 U		0.5 U		0.5 U		0.2 U		0.38 U		0.038 U		0.38 U		0.38 U		0.4 U		0.08 U		50 U		485	
Notes: - All values are micrograms per liter. - Shaded cells exceed screening criteria. - Screening levels for volatile organic compounds and 1,4-dioxane are from NASA. 2022. Record of Decision for Construction Debris Landfill Operable Unit 5. NASA Langley Research Center, Hampton, Virginia. January. - Screening levels for other compounds are from EPA. 2006. Region 3 Environmental Protection Agency Biological Technical Assistance Group Freshwater Screening Benchmarks. July 2006. - *0.04 micrograms per liter is the SW846 method detection limit (presented in the approved 2022 Final Long-Term Monitoring Plan for the CDL), which exceeds the BTAG screening benchmark of 0.0005 micrograms per liter. In 2022, NASA, EPA, and VDEQ agreed that the BTAG screening benchmark is not feasibly achievable; therefore, the method detection limit was selected as the screening value since any detection over the MDL would constitute an exceedance. -- = Not analyzed.											U J B	The analyte was not identified in the sample analyzed; the associated numerical value is the detection limit. The analyte was positively identified; the associated numerical value is the approximate concentration. Analyte found in sample and associated blank.																		

Site-specific
Site-Specific Worker Soil Inputs

Variable	Outdoor Worker Soil Default Value	Site-Specific Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	11.911
A (VF Dispersion Constant - mass limit)	11.911	11.911
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.4385
B (VF Dispersion Constant - mass limit)	18.4385	18.4385
City (PEF Climate Zone) Selector	Default	Default
City (VF Climate Zone) Selector	Default	Default
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	209.7845
C (VF Dispersion Constant - mass limit)	209.7845	209.7845
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.194
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm ³	1.5	1.5
p_b (dry soil bulk density - mass limit) Mg/m ³	1.5	1.5
PEF (particulate emission factor) m ³ /kg	1359344438	5800000000
p_s (soil particle density) g/cm ³	2.65	2.65
Q/C_{wind} (g/m ² -s per kg/m ³)	93.77	93.77
Q/C_{vol} (g/m ² -s per kg/m ³)	68.18	68.18
Q/C_{vol} (g/m ² -s per kg/m ³ - mass limit)	68.18	68.18
A_s (PEF acres)	0.5	0.5
A_s (VF acres)	0.5	0.5
A_s (VF mass-limit acres)	0.5	0.5
AF_{out} (skin adherence factor - outdoor worker) mg/cm ²	0.12	0.12
AT_{out} (averaging time - outdoor worker)	365	365
BW_{out} (body weight - outdoor worker)	80	80
ED_{out} (exposure duration - outdoor worker) yr	25	44
EF_{out} (exposure frequency - outdoor worker) day/yr	225	244
ET_{out} (exposure time - outdoor worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	0.1
IRS_{out} (soil ingestion rate - outdoor worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_{out} (surface area - outdoor worker) cm ² /day	3527	3527
TR (target cancer risk) unitless	0.000001	0.000001
T_w (groundwater temperature) Celsius	25	25
Θ_{a_s} (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
Θ_{w_s} (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) y	26	26
U_m (mean annual wind speed) m/s	4.69	4.69
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

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Site-specific
Outdoor Worker Risk for Soil

Chemical	SF _o (mg/kg-day) ⁻¹	SF _o Ref	IUR (ug/m ³) ⁻¹	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m ³)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)	K _{oc} (cm ³ /g)	K _d (cm ³ /g)
Aroclor 1248	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.00E-01	7.65E+04	4.59E+02
Aroclor 1254	2.00E+00	G	5.71E-04	G	2.00E-05	I	-		1.00E+00	1.40E-01	1.00E+00	-	4.30E-02	1.31E+05	7.83E+02
Aroclor 1260	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.44E-02	3.50E+05	2.10E+03
Arsenic, Inorganic	1.50E+00	I	4.30E-03	I	3.00E-04	I	1.50E-05	C	1.00E+00	3.00E-02	6.00E-01	-	-	-	2.90E+01
Chromium(VI)	1.60E-01	I	1.10E-02	I	9.00E-04	I	3.00E-05	I	2.50E-02	-	1.00E+00	-	1.69E+06	-	1.90E+01
Dieldrin	1.60E+01	I	4.60E-03	I	5.00E-05	I	-		1.00E+00	1.00E-01	1.00E+00	-	1.95E-01	2.01E+04	-
<i>*Total Risk/HI</i>	-		-		-		-		-	-	-	-	-	-	-

Site-specific

Outdoor Worker Risk for Soil

Henry's Law Constant (atm-m ³ /mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T _c (K)	T _c Ref	Chemical Type	D _{ia} (cm ² /s)	D _{iw} (cm ² /s)	D _A (cm ² /s)	Particulate Emission Factor (m ³ /kg)
4.40E-04	1.80E-02	PHYSPROP	6.13E+02	EPI	9.20E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.41E-02	6.18E-06	5.03E-08	5.80E+09
2.83E-04	1.16E-02	PHYSPROP	6.51E+02	EPI	9.57E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.37E-02	6.10E-06	1.87E-08	5.80E+09
3.36E-04	1.37E-02	PHYSPROP	6.89E+02	EPI	9.87E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.20E-02	5.61E-06	7.70E-09	5.80E+09
-	-		8.88E+02	PHYSPROP	1.67E+03	CRC	INORGANIC	1.79E-01	2.96E-05	-	5.80E+09
-	-		-		-		INORGANIC	1.36E-01	1.59E-05	-	5.80E+09
1.00E-05	4.09E-04	PHYSPROP	6.03E+02	PHYSPROP	9.05E+02	Approx. from Tcrit=1.5xTBoil	PEST	2.33E-02	6.01E-06	-	5.80E+09
-	-		-		-			-	-	-	-

Site-specific
Site-Specific Worker Soil Inputs

Site-specific
Outdoor Worker Risk for Soil

Volatilization Factor Unlimited Reservoir (m³/kg)	Volatilization Factor Mass Limit (m³/kg)	Volatilization Factor Selected (m³/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
5.14E+05	-	5.14E+05	1.00E+00	1.05E-06	6.22E-07	1.56E-07	1.83E-06	-	-	-	-
8.43E+05	-	8.43E+05	2.64E-01	2.77E-07	1.64E-07	2.51E-08	4.67E-07	1.10E-02	6.54E-03	-	1.76E-02
1.31E+06	-	1.31E+06	8.80E-01	9.24E-07	5.48E-07	5.36E-08	1.53E-06	-	-	-	-
-	-	-	6.80E+00	3.21E-06	6.80E-07	7.06E-10	3.90E-06	1.14E-02	2.40E-03	1.74E-05	1.38E-02
-	-	-	1.81E+01	1.52E-06	-	4.81E-09	1.53E-06	1.68E-02	-	2.32E-05	1.68E-02
-	-	-	2.50E-01	2.10E-06	8.89E-07	2.78E-11	2.99E-06	4.18E-03	1.77E-03	-	5.95E-03
-	-	-	-	9.09E-06	2.90E-06	2.40E-07	1.22E-05	4.34E-02	1.07E-02	4.06E-05	5.41E-02

Site-specific
Outdoor Worker Soil Inputs

Variable	Outdoor Worker Soil Default Value	Site-Specific Value
A (PEF Dispersion Constant)	16.2302	16.2302
A (VF Dispersion Constant)	11.911	11.911
A (VF Dispersion Constant - mass limit)	11.911	11.911
B (PEF Dispersion Constant)	18.7762	18.7762
B (VF Dispersion Constant)	18.4385	18.4385
B (VF Dispersion Constant - mass limit)	18.4385	18.4385
City (PEF Climate Zone) Selector	Default	Default
City (VF Climate Zone) Selector	Default	Default
C (PEF Dispersion Constant)	216.108	216.108
C (VF Dispersion Constant)	209.7845	209.7845
C (VF Dispersion Constant - mass limit)	209.7845	209.7845
foc (fraction organic carbon in soil) g/g	0.006	0.006
F(x) (function dependent on U_m/U_t) unitless	0.194	0.194
n (total soil porosity) L_{pore}/L_{soil}	0.43396	0.43396
p_b (dry soil bulk density) g/cm ³	1.5	1.5
p_b (dry soil bulk density - mass limit) Mg/m ³	1.5	1.5
PEF (particulate emission factor) m ³ /kg	1359344438	1359344438
p_s (soil particle density) g/cm ³	2.65	2.65
Q/C_{wind} (g/m ² -s per kg/m ³)	93.77	93.77
Q/C_{vol} (g/m ² -s per kg/m ³)	68.18	68.18
Q/C_{vol} (g/m ² -s per kg/m ³ - mass limit)	68.18	68.18
A_s (PEF acres)	0.5	0.5
A_s (VF acres)	0.5	0.5
A_s (VF mass-limit acres)	0.5	0.5
AF_{out} (skin adherence factor - outdoor worker) mg/cm ²	0.12	0.12
AT_{out} (averaging time - outdoor worker)	365	365
BW_{out} (body weight - outdoor worker)	80	80
ED_{out} (exposure duration - outdoor worker) yr	25	25
EF_{out} (exposure frequency - outdoor worker) day/yr	225	225
ET_{out} (exposure time - outdoor worker) hr	8	8
THQ (target hazard quotient) unitless	0.1	0.1
IRS_{out} (soil ingestion rate - outdoor worker) mg/day	100	100
LT (lifetime) yr	70	70
SA_{out} (surface area - outdoor worker) cm ² /day	3527	3527
TR (target cancer risk) unitless	0.000001	0.000001
T_w (groundwater temperature) Celsius	25	25
Θ_{a_s} (air-filled soil porosity) L_{air}/L_{soil}	0.28396	0.28396
Θ_{w_s} (water-filled soil porosity) L_{water}/L_{soil}	0.15	0.15
T (exposure interval) s	819936000	819936000
T (exposure interval) y	26	26
U_m (mean annual wind speed) m/s	4.69	4.69
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

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Site-specific
Outdoor Worker Risk for Soil

Chemical	SF _o (mg/kg-day) ⁻¹	SF _o Ref	IUR (ug/m ³) ⁻¹	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m ³)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)	K _{oc} (cm ³ /g)	K _d (cm ³ /g)
Aroclor 1248	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.00E-01	7.65E+04	4.59E+02
Aroclor 1254	2.00E+00	G	5.71E-04	G	2.00E-05	I	-		1.00E+00	1.40E-01	1.00E+00	-	4.30E-02	1.31E+05	7.83E+02
Aroclor 1260	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.44E-02	3.50E+05	2.10E+03
Arsenic, Inorganic	1.50E+00	I	4.30E-03	I	3.00E-04	I	1.50E-05	C	1.00E+00	3.00E-02	6.00E-01	-	-	-	2.90E+01
Chromium(VI)	1.60E-01	I	1.10E-02	I	9.00E-04	I	3.00E-05	I	2.50E-02	-	1.00E+00	-	1.69E+06	-	1.90E+01
Dieldrin	1.60E+01	I	4.60E-03	I	5.00E-05	I	-		1.00E+00	1.00E-01	1.00E+00	-	1.95E-01	2.01E+04	-
<i>*Total Risk/HI</i>	-		-		-		-		-	-	-	-	-	-	-

Site-specific
Outdoor Worker Risk for Soil

Henry's Law Constant (atm-m ³ /mole)	Henry's Law Constant Used in Calcs (unitless)	H` and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T _c (K)	T _c Ref	Chemical Type	D _{ia} (cm ² /s)	D _{iw} (cm ² /s)	D _A (cm ² /s)	Particulate Emission Factor (m ³ /kg)
4.40E-04	1.80E-02	PHYSPROP	6.13E+02	EPI	9.20E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.41E-02	6.18E-06	5.03E-08	1.36E+09
2.83E-04	1.16E-02	PHYSPROP	6.51E+02	EPI	9.57E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.37E-02	6.10E-06	1.87E-08	1.36E+09
3.36E-04	1.37E-02	PHYSPROP	6.89E+02	EPI	9.87E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.20E-02	5.61E-06	7.70E-09	1.36E+09
-	-		8.88E+02	PHYSPROP	1.67E+03	CRC	INORGANIC	1.79E-01	2.96E-05	-	1.36E+09
-	-		-		-		INORGANIC	1.36E-01	1.59E-05	-	1.36E+09
1.00E-05	4.09E-04	PHYSPROP	6.03E+02	PHYSPROP	9.05E+02	Approx. from Tcrit=1.5xTBoil	PEST	2.33E-02	6.01E-06	-	1.36E+09
-	-		-		-			-	-	-	-

Site-specific
Outdoor Worker Risk for Soil

Volatilization Factor Unlimited Reservoir (m³/kg)	Volatilization Factor Mass Limit (m³/kg)	Volatilization Factor Selected (m³/kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
5.14E+05	-	5.14E+05	1.00E+00	5.50E-07	3.26E-07	8.16E-08	9.58E-07	-	-	-	-
8.43E+05	-	8.43E+05	2.64E-01	1.45E-07	8.61E-08	1.31E-08	2.45E-07	1.02E-02	6.03E-03	-	1.62E-02
1.31E+06	-	1.31E+06	8.80E-01	4.84E-07	2.87E-07	2.81E-08	7.99E-07	-	-	-	-
-	-	-	6.80E+00	1.68E-06	3.56E-07	1.58E-09	2.04E-06	1.05E-02	2.22E-03	6.85E-05	1.28E-02
-	-	-	1.81E+01	7.97E-07	-	1.07E-08	8.08E-07	1.55E-02	-	9.12E-05	1.56E-02
-	-	-	2.50E-01	1.10E-06	4.66E-07	6.21E-11	1.57E-06	3.85E-03	1.63E-03	-	5.48E-03
-	-	-	-	4.76E-06	1.52E-06	1.35E-07	6.42E-06	4.00E-02	9.88E-03	1.60E-04	5.00E-02

Site-specific
Construction Worker Inputs

Variable	Construction Worker Soil - Unpaved Default Value	Site-Specific Value
L _R (length of road segment) ft	147.58077	147.58077
A (PEF Dispersion Constant)	12.9351	12.9351
A _R (surface area of contaminated road segment) m ²	274.21393	274.21393
A (VF Dispersion Constant)	2.4538	2.4538
W _R (width of road segment) ft	20	20
B (PEF Dispersion Constant)	5.7383	5.7383
B (VF Dispersion Constant)	17.566	17.566
C (PEF Dispersion Constant)	71.7711	71.7711
C (VF Dispersion Constant)	189.0426	189.0426
distance (road length) km/day	0.04498	0.04498
DW _{con} (days worked - construction worker) days/week	5	5
EW _{con} (weeks worked - construction worker) weeks/year	50	50
F _D Unitless Dispersion Correction Factor	0.185837208	0.185837208
foc (fraction organic carbon in soil) g/g	0.006	0.006
M _{dry} (road surface material moisture content under dry, uncontrolled conditions) %	0.2	0.2
n (total soil porosity) L _{pore} /L _{soil}	0.43396	0.43396
p _b (VF _{ulim-sc} dry soil bulk density) g/cm ³	1.5	1.5
p _b (VF _{mlim-sc} dry soil bulk density) Mg/m ³	1.5	1.5
p _s (soil particle density) g/cm ³	2.65	2.65
Q/C _{sr} (g/m ² -s per kg/m ³)	23.01785	23.01785
Q/C _{vol} (g/m ² -s per kg/m ³)	14.31407	14.31407
Q/C _{sa} (g/m ² -s per kg/m ³)	14.31407	14.31407
s (road surface silt content) %	8.5	8.5
A _s (PEF _{sc} - acres)	0.5	0.5
A _s (VF _{mlim-sc} acres)	0.5	0.5
A _s (VF _{ulim-sc} acres)	0.5	0.5
AF _{con} (skin adherence factor - construction worker) mg/cm ²	0.3	0.3
AT _{con} (averaging time - construction worker) days	365	365
AT _{con-a} (averaging time - construction worker) days	350	350
BW _{con} (body weight - construction worker) kg	80	80
ED _{con} (exposure duration - construction worker) yr	1	1
EF _{con} (exposure frequency - construction worker) day/yr	250	250
ET _{con} (exposure time - construction worker) hr/day	8	8
THQ (target hazard quotient) unitless	0.1	0.1
IRS _{con} (soil ingestion rate - construction worker) mg/day	330	330
LT (lifetime) yr	70	70
SA _{con} (surface area - construction worker) cm ² /day	3527	3527
TR (target cancer risk) unitless	0.000001	0.000001
t _c (overall duration of construction) hours	8400	8400
T _c (overall duration of construction) s	30240000	30240000
T _w (groundwater temperature) C	25	25
Theta _a (air-filled soil porosity) L _{air} /L _{soil}	0.28396	0.28396
Theta _w (water-filled soil porosity) L _{water} /L _{soil}	0.15	0.15
T _t (overall duration of traffic) s	7200000	7200000

Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Chemical	SF _o (mg/kg-day) ⁻¹	SF _o Ref	IUR (ug/m ³) ⁻¹	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m ³)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)	K _{oc} (cm ³ /g)	K _d (cm ³ /g)
Aroclor 1248	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.00E-01	7.65E+04	4.59E+02
Aroclor 1254	2.00E+00	G	5.71E-04	G	3.00E-05	A /Subchronic	-		1.00E+00	1.40E-01	1.00E+00	-	4.30E-02	1.31E+05	7.83E+02
Aroclor 1260	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.44E-02	3.50E+05	2.10E+03
Arsenic, Inorganic	1.50E+00	I	4.30E-03	I	3.00E-04	I /Chronic	1.50E-05	C /Chronic	1.00E+00	3.00E-02	6.00E-01	-	-	-	2.90E+01
Chromium(VI)	1.60E-01	I	1.10E-02	I	1.74E-03	A /Subchronic	3.00E-05	I /Chronic	2.50E-02	-	1.00E+00	-	1.69E+06	-	1.90E+01
Dieldrin	1.60E+01	I	4.60E-03	I	1.00E-04	A /Subchronic	-		1.00E+00	1.00E-01	1.00E+00	-	1.95E-01	2.01E+04	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-	-	-

Site-specific
Construction Worker Risk for Soil - Unpaved Road Traffic

Henry's Law Constant (atm·m ³ /mole)	Henry's Law Constant Used in Calcs (unitless)	H ⁺ and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T _c (K)	T _c Ref	Chemical Type	D _{ia} (cm ² /s)	D _{iw} (cm ² /s)	D _A (cm ² /s)	Particulate Emission Factor (m ³ /kg)
4.40E-04	1.80E-02	PHYSPROP	6.13E+02	EPI	9.20E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.41E-02	6.18E-06	5.03E-08	1.62E+06
2.83E-04	1.16E-02	PHYSPROP	6.51E+02	EPI	9.57E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.37E-02	6.10E-06	1.87E-08	1.62E+06
3.36E-04	1.37E-02	PHYSPROP	6.89E+02	EPI	9.87E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.20E-02	5.61E-06	7.70E-09	1.62E+06
-	-		8.88E+02	PHYSPROP	1.67E+03	CRC	INORGANIC	1.79E-01	2.96E-05	-	1.62E+06
-	-		-		-		INORGANIC	1.36E-01	1.59E-05	-	1.62E+06
1.00E-05	4.09E-04	PHYSPROP	6.03E+02	PHYSPROP	9.05E+02	Approx. from Tcrit=1.5xTBoil	PEST	2.33E-02	6.01E-06	-	1.62E+06
-	-		-		-			-	-	-	-

Site-specific

Construction Worker Risk for Soil - Unpaved Road Traffic

Volatilization Factor Unlimited Reservoir (m ³ /kg)	Volatilization Factor Mass Limit (m ³ /kg)	Volatilization Factor Selected (m ³ /kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
1.12E+05	-	1.12E+05	1.00E+00	8.07E-08	3.62E-08	1.79E-08	1.35E-07	-	-	-	-
1.83E+05	-	1.83E+05	2.64E-01	2.13E-08	9.57E-09	2.99E-09	3.39E-08	2.59E-02	1.16E-02	-	3.76E-02
2.85E+05	-	2.85E+05	8.80E-01	7.10E-08	3.19E-08	6.76E-09	1.10E-07	-	-	-	-
-	-	-	6.80E+00	2.47E-07	3.96E-08	5.89E-08	3.45E-07	4.01E-02	6.42E-03	6.66E-02	1.13E-01
-	-	-	1.81E+01	1.17E-07	-	4.01E-07	5.18E-07	3.06E-02	-	8.87E-02	1.19E-01
-	-	-	2.50E-01	1.61E-07	5.18E-08	2.32E-09	2.16E-07	7.37E-03	2.36E-03	-	9.73E-03
-	-	-	-	6.98E-07	1.69E-07	4.90E-07	1.36E-06	1.04E-01	2.04E-02	1.55E-01	2.80E-01

Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Chemical	SF _o (mg/kg-day) ⁻¹	SF _o Ref	IUR (ug/m ³) ⁻¹	IUR Ref	RfD (mg/kg-day)	RfD Ref	RfC (mg/m ³)	RfC Ref	GIABS	ABS	RBA	Soil Saturation Concentration (mg/kg)	S (mg/L)	K _{oc} (cm ³ /g)	K _d (cm ³ /g)
Aroclor 1248	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.00E-01	7.65E+04	4.59E+02
Aroclor 1254	2.00E+00	G	5.71E-04	G	3.00E-05	A /Subchronic	-		1.00E+00	1.40E-01	1.00E+00	-	4.30E-02	1.31E+05	7.83E+02
Aroclor 1260	2.00E+00	G	5.71E-04	G	-		-		1.00E+00	1.40E-01	1.00E+00	-	1.44E-02	3.50E+05	2.10E+03
Arsenic, Inorganic	1.50E+00	I	4.30E-03	I	3.00E-04	I /Chronic	1.50E-05	C /Chronic	1.00E+00	3.00E-02	6.00E-01	-	-	-	2.90E+01
Chromium(VI)	1.60E-01	I	1.10E-02	I	1.74E-03	A /Subchronic	3.00E-05	I /Chronic	2.50E-02	-	1.00E+00	-	1.69E+06	-	1.90E+01
Dieldrin	1.60E+01	I	4.60E-03	I	1.00E-04	A /Subchronic	-		1.00E+00	1.00E-01	1.00E+00	-	1.95E-01	2.01E+04	-
*Total Risk/HI	-		-		-		-		-	-	-	-	-	-	-

Site-specific
Construction Worker Risk for Soil - Other Construction Activities

Henry's Law Constant (atm-m ³ /mole)	Henry's Law Constant Used in Calcs (unitless)	H ⁺ and HLC Ref	Normal Boiling Point BP (K)	BP Ref	Critical Temperature T _c (K)	T _c Ref	Chemical Type	D _{ia} (cm ² /s)	D _{iw} (cm ² /s)	D _A (cm ² /s)	Particulate Emission Factor (m ³ /kg)
4.40E-04	1.80E-02	PHYSPROP	6.13E+02	EPI	9.20E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.41E-02	6.18E-06	5.03E-08	1.62E+06
2.83E-04	1.16E-02	PHYSPROP	6.51E+02	EPI	9.57E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.37E-02	6.10E-06	1.87E-08	1.62E+06
3.36E-04	1.37E-02	PHYSPROP	6.89E+02	EPI	9.87E+02	Approx. from Tcrit=1.5xTBoil	PCB	2.20E-02	5.61E-06	7.70E-09	1.62E+06
-	-		8.88E+02	PHYSPROP	1.67E+03	CRC	INORGANIC	1.79E-01	2.96E-05	-	1.62E+06
-	-		-		-		INORGANIC	1.36E-01	1.59E-05	-	1.62E+06
1.00E-05	4.09E-04	PHYSPROP	6.03E+02	PHYSPROP	9.05E+02	Approx. from Tcrit=1.5xTBoil	PEST	2.33E-02	6.01E-06	-	1.62E+06
-	-		-		-			-	-	-	-

Site-specific

Construction Worker Risk for Soil - Other Construction Activities

Volatilization Factor Unlimited Reservoir (m ³ /kg)	Volatilization Factor Mass Limit (m ³ /kg)	Volatilization Factor Selected (m ³ /kg)	Concentration (mg/kg)	Ingestion Risk	Dermal Risk	Inhalation Risk	Carcinogenic Risk	Ingestion HQ	Dermal HQ	Inhalation HQ	Noncarcinogenic HI
1.12E+05	-	1.12E+05	1.00E+00	8.07E-08	3.62E-08	1.79E-08	1.35E-07	-	-	-	-
1.83E+05	-	1.83E+05	2.64E-01	2.13E-08	9.57E-09	2.99E-09	3.39E-08	2.59E-02	1.16E-02	-	3.76E-02
2.85E+05	-	2.85E+05	8.80E-01	7.10E-08	3.19E-08	6.76E-09	1.10E-07	-	-	-	-
-	-	-	6.80E+00	2.47E-07	3.96E-08	5.89E-08	3.45E-07	4.01E-02	6.42E-03	6.66E-02	1.13E-01
-	-	-	1.81E+01	1.17E-07	-	4.01E-07	5.18E-07	3.06E-02	-	8.87E-02	1.19E-01
-	-	-	2.50E-01	1.61E-07	5.18E-08	2.32E-09	2.16E-07	7.37E-03	2.36E-03	-	9.73E-03
-	-	-	-	6.98E-07	1.69E-07	4.90E-07	1.36E-06	1.04E-01	2.04E-02	1.55E-01	2.80E-01

APPENDIX C

SITE INSPECTION CHECKLISTS

Site Inspection Checklist

I. SITE INFORMATION	
Site name: NASA Langley Research Center – Area E Warehouse	Date of inspection: 12/17/2025
Location and Region: Hampton, Virginia – EPA Region 3	EPA ID: VA2800005033
Agency, office, or company leading the five-year review: NASA	Weather/temperature: Sunny, 40°F
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☒ Access controls ☒ Institutional controls ☐ Groundwater pump and treatment ☐ Surface water collection and treatment ☐ Other _____ ☐ Monitored natural attenuation ☐ Groundwater containment ☐ Vertical barrier walls	
Attachments: ☐ Photo Log ☐ Site map attached	
II. INTERVIEWS (Check all that apply)	
1. Site Manager <u>Kristi Francisco</u> <u>LaRC RPM</u> <u>12/19/25</u> Name Title Date Interviewed ☐ at site ☐ at office ☐ by phone Phone no. <u>(757)824-6704</u> Problems, suggestions; ☐ Report attached _____ _____	
2. O&M staff <u>N/A</u> _____ _____ Name Title Date Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____ Problems, suggestions; ☐ Report attached _____ _____	
3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. Agency <u>Virginia Department of Environmental Quality</u> Contact <u>Stephanie Sawyer</u> <u>VDEQ RPM</u> <u>12/19/25</u> <u>(804) 659-1735</u> Name Title Date Phone no. Problems; suggestions; ☐ Report attached _____ _____ Agency <u>US Environmental Protection Agency</u> Contact <u>Ali Arvanaghi</u> <u>EPA RPM</u> <u>01/07/26</u> <u>(215) 814-5436</u> Name Title Date Phone no. Problems; suggestions; ☐ Report attached _____ _____	
4. Other interviews (optional) ☐ Report attached.	

Site Inspection Checklist

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents ☐ O&M manual ☐ As-built drawings ☐ Maintenance logs Remarks _____	☐ Readily available ☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date ☐ Up to date	☒ N/A ☒ N/A ☒ N/A
2.	Site-Specific Health and Safety Plan ☐ Contingency plan/emergency response plan Remarks _____	☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date	☒ N/A ☒ N/A
3.	O&M and OSHA Training Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
4.	Permits and Service Agreements ☐ Air discharge permit ☐ Effluent discharge ☐ Waste disposal, POTW ☐ Other permits _____ Remarks _____	☐ Readily available ☐ Readily available ☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date ☐ Up to date ☐ Up to date	☒ N/A ☒ N/A ☒ N/A ☒ N/A
5.	Gas Generation Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
6.	Settlement Monument Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
7.	Groundwater Monitoring Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
8.	Leachate Extraction Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
9.	Discharge Compliance Records ☐ Air ☐ Water (effluent) Remarks _____	☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date	☒ N/A ☒ N/A
10.	Daily Access/Security Logs Remarks _____	☐ Readily available	☐ Up to date	☒ N/A

Site Inspection Checklist

IV. O&M COSTS																																											
☐ Applicable ☒ N/A																																											
1.	O&M Organization ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☐ Contractor for Federal Facility ☐ Other _____																																										
2.	O&M Cost Records ☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place Original O&M cost estimate _____ ☐ Breakdown attached Total annual cost by year for review period if available <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 30%;"></td> <td style="width: 40%; text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> </table>			From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost	
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3.	Unanticipated or Unusually High O&M Costs During Review Period Describe costs and reasons: _____ _____ _____																																										
V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A																																											
A. Fencing																																											
1.	Fencing damaged ☐ Location shown on site map ☐ Gates secured ☐ N/A Remarks: <u>Gate to the Area E Warehouse is kept open during normal working hours. The gate is shut/secured at the end of the working day. There is no damage to the fencing; however, the privacy covers on the fence are falling in some areas.</u>																																										
B. Other Access Restrictions																																											
1.	Signs and other security measures ☐ Location shown on site map ☐ N/A Remarks: <u>Signs restricting access, indicating authorized personnel only are posted on the perimeter fence and at the entrance gates.</u>																																										

Site Inspection Checklist

C. Institutional Controls (ICs)			
1.	Implementation and enforcement Site conditions imply ICs are properly implemented Site conditions imply ICs are being fully enforced Type of monitoring: <u>Self-reporting</u> Frequency <u>Annually</u> Responsible party/agency <u>NASA</u> Contact: <u>Kristi Francisco</u> Name <u>LaRC RPM</u> Title <u>(757)824-6704</u> Date Phone no.	☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A	
	Reporting is up-to-date Reports are verified by the lead agency Specific requirements in deed or decision documents have been met Violations have been reported Other problems or suggestions: ☒ Report attached <u>N/A</u>	☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☒ N/A	
2.	Adequacy ☒ ICs are adequate ☐ ICs are inadequate Remarks: <u>The site is on federal property with restricted access to the facility.</u>	☐ N/A	
D. General			
1.	Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident Remarks: <u>N/A</u>		
2.	Land use changes on site ☒ N/A Remarks: <u>Land use has not changed at Area E Warehouse. The site remains industrial-type use only.</u>		
3.	Land use changes off site ☒ N/A Remarks: <u>N/A</u>		
VI. GENERAL SITE CONDITIONS			
A. Roads ☒ Applicable ☐ N/A			
1.	Roads damaged ☐ Location shown on site map ☒ Roads adequate Remarks: <u>The paved surfaces surrounding the warehouse buildings are in good condition.</u>	☒ N/A	

Site Inspection Checklist

B. Other Site Conditions			
Remarks: <u>N/A</u>			
VII. LANDFILL COVERS ☐ Applicable ☒ N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☐ Settlement not evident	
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	☐ Location shown on site map ☐ Cracking not evident	
3.	Erosion Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☐ Erosion not evident	
4.	Holes Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☐ Holes not evident	
5.	Vegetative Cover ☐ Grass ☐ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		
6.	Alternative Cover (armored rock, concrete, etc.) ☐ N/A Remarks _____		
7.	Bulges Areal extent _____ Height _____ Remarks _____	☐ Location shown on site map ☐ Bulges not evident	
8.	Wet Areas/Water Damage ☐ Wet areas/water damage not evident ☐ Wet areas ☐ Location shown on site map Areal extent _____ ☐ Ponding ☐ Location shown on site map Areal extent _____ ☐ Seeps ☐ Location shown on site map Areal extent _____ ☐ Soft subgrade ☐ Location shown on site map Areal extent _____ Remarks _____		

Site Inspection Checklist

9.	Slope Instability	☐ Slides	☐ Location shown on site map	☐ No evidence of slope instability
	Areal extent _____			
	Remarks _____			

B. Benches				
	☐ Applicable	☒ N/A		
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	Flows Bypass Bench	☐ Location shown on site map	☐ N/A or okay	
	Remarks _____			

2.	Bench Breached	☐ Location shown on site map	☐ N/A or okay	
	Remarks _____			

3.	Bench Overtopped	☐ Location shown on site map	☐ N/A or okay	
	Remarks _____			

C. Letdown Channels				
	☐ Applicable	☒ N/A		
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			
1.	Settlement	☐ Location shown on site map	☐ No evidence of settlement	
	Areal extent _____	Depth _____		
	Remarks _____			

2.	Material Degradation	☐ Location shown on site map	☐ No evidence of degradation	
	Material type _____	Areal extent _____		
	Remarks _____			

3.	Erosion	☐ Location shown on site map	☐ No evidence of erosion	
	Areal extent _____	Depth _____		
	Remarks _____			

Site Inspection Checklist

4.	Undercutting Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☐ No evidence of undercutting	
5.	Obstructions Type _____ ☐ Location shown on site map Areal extent _____ Size _____ Remarks _____	☐ No obstructions	
6.	Excessive Vegetative Growth Type _____ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent _____ Remarks _____		
D. Cover Penetrations ☐ Applicable ☒ N/A			
1.	Gas Vents ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
2.	Gas Monitoring Probes ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
3.	Monitoring Wells (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
4.	Leachate Extraction Wells ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
5.	Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A Remarks _____		

Site Inspection Checklist

E. Gas Collection and Treatment ☐ Applicable ☒ N/A			
1.	Gas Treatment Facilities ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks _____ _____		
2.	Gas Collection Wells, Manifolds and Piping ☐ Good condition ☐ Needs Maintenance Remarks _____ _____		
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks _____ _____		
F. Cover Drainage Layer ☐ Applicable ☒ N/A			
1.	Outlet Pipes Inspected ☐ Functioning ☐ N/A Remarks _____ _____		
2.	Outlet Rock Inspected ☐ Functioning ☐ N/A Remarks _____ _____		
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A			
1.	Siltation Areal extent _____ Depth _____ ☐ N/A ☐ Siltation not evident Remarks _____ _____		
2.	Erosion Areal extent _____ Depth _____ ☐ Erosion not evident Remarks _____ _____		
3.	Outlet Works ☐ Functioning ☐ N/A Remarks _____ _____		
4.	Dam ☐ Functioning ☐ N/A Remarks _____ _____		

Site Inspection Checklist

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

Site Inspection Checklist

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	Pumps, Wellhead Plumbing, and Electrical ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks _____ _____ _____
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks _____ _____
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	Collection Structures, Pumps, and Electrical ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks _____ _____

Site Inspection Checklist

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

Site Inspection Checklist

D. Monitored Natural Attenuation			
1.	Monitoring Wells (natural attenuation remedy)		
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A			
Remarks _____ _____			
X. OTHER REMEDIES			
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.			
XI. OVERALL OBSERVATIONS			
A. Implementation of the Remedy			
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <u>The selected remedy at the Area E Warehouse includes institutional controls to restrict land use to industrial. These restrictions were recorded in the NASA Langley Master Plan and a survey plat. The NASA LaRC RPM inspects the site on an annual basis and certifies to the EPA that there have been no violations of these prohibitions. The remedy at the Area E Warehouse is functioning as intended.</u>			
B. Adequacy of O&M			
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>Not applicable</u>			
C. Early Indicators of Potential Remedy Problems			
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. <u>Not applicable</u>			
D. Opportunities for Optimization			
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. <u>Not applicable</u>			

Site Inspection Checklist

I. SITE INFORMATION	
Site name: NASA Langley Research Center – Stratton Substation Soil	Date of inspection: 12/17/2025
Location and Region: Hampton, Virginia – EPA Region 3	EPA ID: VA2800005033
Agency, office, or company leading the five-year review: NASA	Weather/temperature: Sunny, 40°F
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment ☒ Access controls ☒ Institutional controls ☐ Groundwater pump and treatment ☐ Surface water collection and treatment ☐ Other: _____ ☒ Long-Term Monitoring (LTM) ☐ Groundwater containment ☐ Vertical barrier walls	
Attachments: ☐ Photo Log ☐ Site map attached	
II. INTERVIEWS (Check all that apply)	
1. Site Manager <u>Kristi Francisco</u> <u>LaRC RPM</u> <u>12/19/25</u> Name Title Date Interviewed ☐ at site ☐ at office ☐ by phone Phone no. <u>(757)824-6704</u> Problems, suggestions; ☐ Report attached _____ _____	
2. O&M staff <u>N/A</u> _____ _____ Name Title Date Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____ Problems, suggestions; ☐ Report attached _____ _____	
3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. Agency <u>Virginia Department of Environmental Quality</u> Contact <u>Stephanie Sawyer</u> <u>VDEQ RPM</u> <u>12/19/25</u> <u>(804) 659-1735</u> Name Title Date Phone no. Problems; suggestions; ☐ Report attached _____ _____ Agency <u>US Environmental Protection Agency</u> Contact <u>Ali Arvanaghi</u> <u>EPA RPM</u> <u>01/07/26</u> <u>(215) 814-5436</u> Name Title Date Phone no. Problems; suggestions; ☐ Report attached _____ _____	
4. Other interviews (optional) ☐ Report attached.	

Site Inspection Checklist

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents ☒ O&M manual ☒ As-built drawings ☐ Maintenance logs Remarks: <u>LTM Plan and QAPP for Stratton Substation Soil updated in March 2022.</u>	☒ Readily available ☒ Readily available ☐ Readily available	☐ Up to date ☐ Up to date ☐ Up to date	☒ N/A ☒ N/A ☒ N/A
2.	Site-Specific Health and Safety Plan ☐ Contingency plan/emergency response plan Remarks: <u>SSHSP utilized during LTM sampling events. Developed and maintained by LTM sampling contractor(s) and present onsite during activities.</u>	☒ Readily available ☒ Readily available	☒ Up to date ☐ Up to date	☐ N/A ☐ N/A
3.	O&M and OSHA Training Records Remarks: <u>Collected prior to the field event then filed away by LTM sampling Contractor.</u>	☒ Readily available	☒ Up to date	☐ N/A
4.	Permits and Service Agreements ☐ Air discharge permit ☐ Effluent discharge ☐ Waste disposal, POTW ☐ Other permits _____ Remarks _____	☐ Readily available ☐ Readily available ☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date ☐ Up to date ☐ Up to date	☒ N/A ☒ N/A ☒ N/A ☒ N/A
5.	Gas Generation Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
6.	Settlement Monument Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
7.	Groundwater Monitoring Records Remarks: <u>Groundwater LTM for OU-02 Soils is conducted once every 5 years. A groundwater monitoring report is issued upon completion of each field event.</u>	☒ Readily available	☒ Up to date	☐ N/A
8.	Leachate Extraction Records Remarks _____	☐ Readily available	☐ Up to date	☒ N/A
9.	Discharge Compliance Records ☐ Air ☐ Water (effluent) Remarks _____	☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date	☒ N/A ☒ N/A
10.	Daily Access/Security Logs Remarks _____	☐ Readily available	☐ Up to date	☒ N/A

Site Inspection Checklist

IV. O&M COSTS																																											
☐ Applicable ☒ N/A																																											
1.	O&M Organization ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP ☐ Federal Facility in-house ☐ Contractor for Federal Facility ☐ Other _____																																										
2.	O&M Cost Records ☐ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place Original O&M cost estimate _____ ☐ Breakdown attached Total annual cost by year for review period if available <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">From _____</td> <td style="width: 10%;">To _____</td> <td style="width: 30%;"></td> <td style="width: 40%; text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> <tr> <td>From _____</td> <td>To _____</td> <td></td> <td style="text-align: right;">☐ Breakdown attached</td> </tr> <tr> <td style="text-align: center;">Date</td> <td style="text-align: center;">Date</td> <td style="text-align: center;">Total cost</td> <td></td> </tr> </table>			From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost		From _____	To _____		☐ Breakdown attached	Date	Date	Total cost	
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V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A																																											
A. Fencing																																											
1.	Fencing damaged ☐ Location shown on site map ☒ Gates secured ☐ N/A Remarks: <u>No issues.</u>																																										
B. Other Access Restrictions																																											
1.	Signs and other security measures ☐ Location shown on site map ☐ N/A Remarks: <u>Signage (restricted access) is posted on the substation perimeter fence.</u>																																										

Site Inspection Checklist

C. Institutional Controls (ICs)				
1.	Implementation and enforcement			
Site conditions imply ICs are properly implemented		☒ Yes	☐ No	☐ N/A
Site conditions imply ICs are being fully enforced		☒ Yes	☐ No	☐ N/A
Type of monitoring: <u>Self-reporting</u> Frequency: <u>Annually</u> Responsible party/agency: <u>NASA</u> Contact <u>Kristi Francisco</u> <u>LaRC RPM</u> <u>(757)824-6704</u> Name Title Date Phone no.				
Reporting is up-to-date		☒ Yes	☐ No	☐ N/A
Reports are verified by the lead agency		☒ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met		☒ Yes	☐ No	☐ N/A
Violations have been reported		☐ Yes	☐ No	☒ N/A
Other problems or suggestions: ☐ Report attached				
<u>N/A</u>				
2.	Adequacy		☒ ICs are adequate	☐ ICs are inadequate
			☐ N/A	
Remarks: <u>The site is on federal property with restricted access to the facility, monitoring wells, and the substation area.</u>				
D. General				
1.	Vandalism/trespassing		☐ Location shown on site map	☒ No vandalism evident
Remarks: <u>N/A</u>				
2.	Land use changes on site		☒ N/A	
Remarks: <u>Land use has not changed at the Stratton Substation.</u>				
3.	Land use changes off site		☒ N/A	
Remarks: <u>N/A</u>				
VI. GENERAL SITE CONDITIONS				
A. Roads				
		☐ Applicable	☒ N/A	
1.	Roads damaged		☐ Location shown on site map	☐ Roads adequate
		☐ N/A		
Remarks: _____				

Site Inspection Checklist

B. Other Site Conditions			
Remarks: <u>During the site inspection, a construction company was laying gravel down in the substation yard.</u>			
VII. LANDFILL COVERS ☐ Applicable ☒ N/A			
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☐ Settlement not evident	
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	☐ Location shown on site map ☐ Cracking not evident	
3.	Erosion Areal extent _____ Remarks _____	☐ Location shown on site map ☐ Erosion not evident	
4.	Holes Areal extent _____ Remarks _____	☐ Location shown on site map ☐ Holes not evident	
5.	Vegetative Cover ☐ Grass ☐ Cover properly established ☐ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks _____		
6.	Alternative Cover (armored rock, concrete, etc.) ☐ N/A Remarks _____		
7.	Bulges Areal extent _____ Remarks _____	☐ Location shown on site map ☐ Bulges not evident	
8.	Wet Areas/Water Damage ☐ Wet areas/water damage not evident ☐ Wet areas ☐ Location shown on site map Areal extent _____ ☐ Ponding ☐ Location shown on site map Areal extent _____ ☐ Seeps ☐ Location shown on site map Areal extent _____ ☐ Soft subgrade ☐ Location shown on site map Areal extent _____ Remarks _____		

Site Inspection Checklist

9.	Slope Instability	☐ Slides	☐ Location shown on site map	☐ No evidence of slope instability
	Areal extent _____			
	Remarks _____			

B. Benches				
	☐ Applicable	☒ N/A		
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)			
1.	Flows Bypass Bench	☐ Location shown on site map	☐ N/A or okay	
	Remarks _____			

2.	Bench Breached	☐ Location shown on site map	☐ N/A or okay	
	Remarks _____			

3.	Bench Overtopped	☐ Location shown on site map	☐ N/A or okay	
	Remarks _____			

C. Letdown Channels				
	☐ Applicable	☒ N/A		
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)			
1.	Settlement	☐ Location shown on site map	☐ No evidence of settlement	
	Areal extent _____	Depth _____		
	Remarks _____			

2.	Material Degradation	☐ Location shown on site map	☐ No evidence of degradation	
	Material type _____	Areal extent _____		
	Remarks _____			

3.	Erosion	☐ Location shown on site map	☐ No evidence of erosion	
	Areal extent _____	Depth _____		
	Remarks _____			

Site Inspection Checklist

4.	Undercutting Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☐ No evidence of undercutting	
5.	Obstructions Type _____ ☐ Location shown on site map Areal extent _____ Size _____ Remarks _____	☐ No obstructions	
6.	Excessive Vegetative Growth Type _____ ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map Areal extent _____ Remarks _____		
D. Cover Penetrations ☐ Applicable ☒ N/A			
1.	Gas Vents ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
2.	Gas Monitoring Probes ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
3.	Monitoring Wells (within surface area of landfill) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
4.	Leachate Extraction Wells ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A Remarks _____		
5.	Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A Remarks _____		

Site Inspection Checklist

E. Gas Collection and Treatment ☐ Applicable ☒ N/A		
1.	Gas Treatment Facilities ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks _____ _____	
2.	Gas Collection Wells, Manifolds and Piping ☐ Good condition ☐ Needs Maintenance Remarks _____ _____	
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks _____ _____	
F. Cover Drainage Layer ☐ Applicable ☒ N/A		
1.	Outlet Pipes Inspected ☐ Functioning ☐ N/A Remarks _____ _____	
2.	Outlet Rock Inspected ☐ Functioning ☐ N/A Remarks _____ _____	
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A		
1.	Siltation Areal extent _____ Depth _____ ☐ N/A ☐ Siltation not evident Remarks _____ _____	
2.	Erosion Areal extent _____ Depth _____ ☐ Erosion not evident Remarks _____ _____	
3.	Outlet Works ☐ Functioning ☐ N/A Remarks _____ _____	
4.	Dam ☐ Functioning ☐ N/A Remarks _____ _____	

Site Inspection Checklist

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

Site Inspection Checklist

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	Pumps, Wellhead Plumbing, and Electrical ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks _____ _____ _____
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks _____ _____
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	Collection Structures, Pumps, and Electrical ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks _____ _____

Site Inspection Checklist

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

Site Inspection Checklist

2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks: <u>A groundwater sampling event was completed in 2025. PCB homologs and congeners were detected in groundwater; however, none of the detected concentrations exceeded the EPA RSLs. No action is necessary.</u>
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LTM Sampling

1.	Monitoring Wells ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: <u>All monitoring wells are in good, working order.</u>
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X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy selected for Stratton Substation OU-02 Soil consisted of excavation and off-site disposal of PCB-contaminated soil and institutional controls to restrict land use to industrial. In 2000, most of the contaminated soil removal action was completed, but critical site structures prevented complete removal to the cleanup goal beneath site structures. Land use controls restrict site use to industrial only. These restrictions are recorded in the NASA Langley Master Plan and a survey plat.

In 2013, an ESD to the 1999 ROD was signed by NASA and the EPA to document that final removal of contaminated soil will require more than 3 months to complete; therefore, a groundwater LTM Program was developed to assess whether PCBs from residual contaminated soil are leaching to groundwater. Groundwater sampling was conducted in 2015, 2020, and 2025. Samples were analyzed for PCB homologs. No PCB homologs were detected in 2015 or 2020. In 2025, a different analytical method was used for testing the PCBs in soil (Method 1668C). The new method reporting limits are lower than previous years (pg/L vs µg/L). PCB homologs and congeners were detected in groundwater; however, none of the detected concentrations exceeded the EPA RSLs. No action is necessary.

Any construction planned at the substation requires coordination with the NASA Langley Environmental Management Office to ensure monitoring wells are not disturbed and to prevent exposure to residual PCB-contaminated soil. The NASA Langley RPM inspects the site annually and certifies to the EPA in an annual report that there have been no violations of these prohibitions. The remedy is effective and functioning as intended.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
Not applicable.

Site Inspection Checklist

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. <u>Not applicable.</u>
D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None.

Site Inspection Checklist

I. SITE INFORMATION	
Site name: NASA Langley Research Center – Construction Debris Landfill	Date of inspection: 12/17/2025
Location and Region: Hampton, Virginia – EPA Region 3	EPA ID: VA2800005033
Agency, office, or company leading the five-year review: NASA	Weather/temperature: Sunny, 40°F
Remedy Includes: (Check all that apply) ☒ Landfill cover/containment ☒ Access controls ☒ Institutional controls ☐ Groundwater pump and treatment ☐ Surface water collection and treatment ☐ Other _____ ☒ Long-Term Monitoring (LTM) ☐ Groundwater containment ☐ Vertical barrier walls	
Attachments: ☐ Photo Log ☐ Site map attached	
II. INTERVIEWS (Check all that apply)	
1. Site Manager <u>Kristi Francisco</u> <u>LaRC RPM</u> <u>12/19/25</u> Name Title Date Interviewed ☐ at site ☐ at office ☐ by phone Phone no. <u>(757)824-6704</u> Problems, suggestions; ☐ Report attached _____ _____	
2. O&M staff <u>N/A</u> _____ _____ Name Title Date Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____ Problems, suggestions; ☐ Report attached _____ _____	
3. Local regulatory authorities and response agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. Agency <u>Virginia Department of Environmental Quality</u> Contact <u>Stephanie Sawyer</u> <u>VDEQ RPM</u> <u>12/19/25</u> <u>(804) 659-1735</u> Name Title Date Phone no. Problems; suggestions; ☐ Report attached _____ _____ Agency <u>US Environmental Protection Agency</u> Contact <u>Ali Arvanaghi</u> <u>EPA RPM</u> <u>01/07/26</u> <u>(215) 814-5436</u> Name Title Date Phone no. Problems; suggestions; ☐ Report attached _____ _____	
4. Other interviews (optional) ☐ Report attached.	

Site Inspection Checklist

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents ☐ O&M manual ☒ As-built drawings ☒ Maintenance logs Remarks: <u>The latest CDL Maintenance Summary Report was submitted in 2024.</u>	☐ Readily available ☒ Readily available ☒ Readily available	☐ Up to date ☐ Up to date ☒ Up to date ☒ N/A ☐ N/A ☐ N/A
2.	Site-Specific Health and Safety Plan ☒ Contingency plan/emergency response plan Remarks: <u>NASA Langley has a Center-wide ISCP. SSHSP utilized during LTM sampling events. Developed and maintained by LTM sampling contractor(s) and present onsite during activities.</u>	☒ Readily available ☒ Readily available	☒ Up to date ☒ Up to date ☐ N/A ☐ N/A
3.	O&M and OSHA Training Records Remarks: <u>Collected prior to the field event then filed away by LTM sampling Contractor.</u>	☒ Readily available	☒ Up to date ☐ N/A
4.	Permits and Service Agreements ☐ Air discharge permit ☐ Effluent discharge ☐ Waste disposal, POTW ☐ Other permits _____ Remarks _____	☐ Readily available ☐ Readily available ☐ Readily available ☐ Readily available	☐ Up to date ☐ Up to date ☐ Up to date ☐ Up to date ☒ N/A ☒ N/A ☒ N/A ☒ N/A
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6.	Settlement Monument Records Remarks _____	☐ Readily available	☐ Up to date ☒ N/A
7.	Groundwater Monitoring Records Remarks <u>A groundwater monitoring report is issued upon completion of each field event.</u>	☒ Readily available	☒ Up to date ☐ N/A
8.	Leachate Extraction Records Remarks _____	☐ Readily available	☐ Up to date ☒ N/A
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Site Inspection Checklist

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Site Inspection Checklist

C. Institutional Controls (ICs)			
1.	Implementation and enforcement Site conditions imply ICs are properly implemented Site conditions imply ICs are being fully enforced Type of monitoring: <u>Self-reporting</u> Frequency: <u>Annually</u> Responsible party/agency: <u>NASA</u> Contact <u>Kristi Francisco</u> <u>LaRC RPM</u> <u>(757)824-6704</u> Name Title Date Phone no. Reporting is up-to-date Reports are verified by the lead agency Specific requirements in deed or decision documents have been met Violations have been reported Other problems or suggestions: ☐ Report attached <u>N/A.</u>	☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A ☒ Yes ☐ No ☐ N/A ☐ Yes ☐ No ☒ N/A	
2.	Adequacy ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks: <u>ICs preventing groundwater use is documented in the NASA Langley Master Plan.</u>		
D. General			
1.	Vandalism/trespassing ☐ Location shown on site map ☒ No vandalism evident Remarks: _____ _____		
2.	Land use changes on site ☒ N/A Remarks: Land use has not changed at the CDL.		
3.	Land use changes off site ☒ N/A Remarks: _____ _____		
VI. GENERAL SITE CONDITIONS			
A. Roads ☒ Applicable ☐ N/A			
1.	Roads damaged ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks: <u>Well-maintained and even gravel road. Routine maintenance of the road conducted annually.</u>		

Site Inspection Checklist

B. Other Site Conditions		
Remarks: <u>A portion of geotextile fabric, approximately 2 feet, is daylighting on the northeastern portion of the gravel road.</u>		
VII. LANDFILL COVERS ☒ Applicable ☐ N/A		
A. Landfill Surface		
1.	Settlement (Low spots) Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☒ Settlement not evident
2.	Cracks Lengths _____ Widths _____ Depths _____ Remarks _____	☐ Location shown on site map ☒ Cracking not evident
3.	Erosion Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☒ Erosion not evident
4.	Holes Areal extent _____ Depth _____ Remarks _____	☐ Location shown on site map ☒ Holes not evident
5.	Vegetative Cover ☒ Grass ☒ Cover properly established ☒ No signs of stress ☐ Trees/Shrubs (indicate size and locations on a diagram) Remarks _____	
6.	Alternative Cover (armored rock, concrete, etc.) ☒ N/A Remarks _____	
7.	Bulges Areal extent _____ Height _____ Remarks _____	☐ Location shown on site map ☒ Bulges not evident
8.	Wet Areas/Water Damage ☒ Wet areas/water damage not evident ☐ Wet areas ☐ Location shown on site map Areal extent _____ ☐ Ponding ☐ Location shown on site map Areal extent _____ ☐ Seeps ☐ Location shown on site map Areal extent _____ ☐ Soft subgrade ☐ Location shown on site map Areal extent _____ Remarks _____	

Site Inspection Checklist

9.	Slope Instability ☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability Areal extent _____ Remarks _____ _____	
B. Benches ☐ Applicable ☒ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	Flows Bypass Bench ☐ Location shown on site map ☐ N/A or okay Remarks _____ _____	
2.	Bench Breached ☐ Location shown on site map ☐ N/A or okay Remarks _____ _____	
3.	Bench Overtopped ☐ Location shown on site map ☐ N/A or okay Remarks _____ _____	
C. Letdown Channels ☐ Applicable ☒ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement ☐ Location shown on site map ☐ No evidence of settlement Areal extent _____ Depth _____ Remarks _____ _____	
2.	Material Degradation ☐ Location shown on site map ☐ No evidence of degradation Material type _____ Areal extent _____ Remarks _____ _____	
3.	Erosion ☐ Location shown on site map ☐ No evidence of erosion Areal extent _____ Depth _____ Remarks _____ _____	
4.	Undercutting ☐ Location shown on site map ☐ No evidence of undercutting Areal extent _____ Depth _____ Remarks _____ _____	
5.	Obstructions Type _____ ☐ No obstructions ☐ Location shown on site map Areal extent _____ Size _____ Remarks _____ _____	

Site Inspection Checklist

6.	Excessive Vegetative Growth ☐ No evidence of excessive growth ☐ Vegetation in channels does not obstruct flow ☐ Location shown on site map	Type _____ Areal extent _____ Remarks _____ _____
D. Cover Penetrations ☒ Applicable ☐ N/A		
1.	Gas Vents ☐ Active ☐ Passive ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A	Remarks _____ _____
2.	Gas Monitoring Probes ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A	Remarks _____ _____
3.	Monitoring Wells (within surface area of landfill) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ Evidence of leakage at penetration ☒ Needs Maintenance ☐ N/A	Remarks: <u>24 monitoring wells were inspected as a part of this five-year review. 2 monitoring wells' (MW-42S and MW-44) protective casing lid was broken at the hinge. The lids stay on due to the padlock but they are broken at the hinge. The protective casing on MW-46 does not fully shut. It looks to be an issue with the protective casing rather than an issue of PVC sticking up too high. MW-49S does not have a J-plug covering the PVC within the protective well casing. MW-50I has a piece of disconnected PVC within the protective well casing. None of the issues to MW-42S, MW-44, MW-46, MW-49S, or MW-50I cause issues during sampling. MW-45 needs total maintenance. The protective casing and the PVC within are crushed and unable to be opened or sampled; however, this well is not sampled as part of the LTM program.</u>
4.	Leachate Extraction Wells ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A	Remarks _____ _____
5.	Settlement Monuments ☐ Located ☐ Routinely surveyed ☒ N/A	Remarks _____ _____

Site Inspection Checklist

E. Gas Collection and Treatment ☐ Applicable ☒ N/A			
1.	Gas Treatment Facilities ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse ☐ Good condition ☐ Needs Maintenance Remarks _____ _____		
2.	Gas Collection Wells, Manifolds and Piping ☐ Good condition ☐ Needs Maintenance Remarks _____ _____		
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) ☐ Good condition ☐ Needs Maintenance ☐ N/A Remarks _____ _____		
F. Cover Drainage Layer ☐ Applicable ☒ N/A			
1.	Outlet Pipes Inspected ☐ Functioning ☐ N/A Remarks _____ _____		
2.	Outlet Rock Inspected ☐ Functioning ☐ N/A Remarks _____ _____		
G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A			
1.	Siltation Areal extent _____ Depth _____ ☐ N/A ☐ Siltation not evident Remarks _____ _____		
2.	Erosion Areal extent _____ Depth _____ ☐ Erosion not evident Remarks _____ _____		
3.	Outlet Works ☐ Functioning ☐ N/A Remarks _____ _____		
4.	Dam ☐ Functioning ☐ N/A Remarks _____ _____		

Site Inspection Checklist

H. Retaining Walls ☐ Applicable ☒ N/A	
1.	Deformations ☐ Location shown on site map ☐ Deformation not evident Horizontal displacement _____ Vertical displacement _____ Rotational displacement _____ Remarks _____ _____
2.	Degradation ☐ Location shown on site map ☐ Degradation not evident Remarks _____ _____
I. Perimeter Ditches/Off-Site Discharge ☒ Applicable ☐ N/A	
1.	Siltation ☐ Location shown on site map ☒ Siltation not evident Areal extent _____ Depth _____ Remarks: <u>During the August 2025 CDL maintenance event, built up sediment in the existing stormwater drainage channel on the south and east side of the soil cover was removed to facilitate drainage and mitigate ponding in the channel.</u>
2.	Vegetative Growth ☐ Location shown on site map ☐ N/A ☒ Vegetation does not impede flow Areal extent _____ Type _____ Remarks _____ _____
3.	Erosion ☐ Location shown on site map ☒ Erosion not evident Areal extent _____ Depth _____ Remarks _____ _____
4.	Discharge Structure ☐ Functioning ☒ N/A Remarks _____ _____
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
1.	Settlement ☐ Location shown on site map ☐ Settlement not evident Areal extent _____ Depth _____ Remarks _____ _____
2.	Performance Monitoring Type of monitoring _____ ☐ Performance not monitored Frequency _____ ☐ Evidence of breaching Head differential _____ Remarks _____ _____

Site Inspection Checklist

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	Pumps, Wellhead Plumbing, and Electrical ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A Remarks _____ _____ _____
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks _____ _____
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
1.	Collection Structures, Pumps, and Electrical ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances ☐ Good condition ☐ Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided Remarks _____ _____

Site Inspection Checklist

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

Site Inspection Checklist

D. Monitored Natural Attenuation	
1.	Monitoring Wells (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☒ Needs Maintenance ☐ N/A Remarks: <u>See remarks on monitoring wells in Section VII. D. 3.</u>
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). <u>The final Remedy for the CDL includes site-wide LUCs to reduce or eliminate potential exposure to COCs in soil and groundwater and site-wide long-term monitoring of groundwater to ensure COCs meet cleanup levels and to monitor post-closure monitoring requirements. The soil cover in place at the CDL is currently preventing direct and indirect contact with landfill contents and further migration of contaminated groundwater. The required LUCs have been implemented including signage restricting access and the CDL was identified as an Environmental Hazard on the NASA LaRC Center Master Plan. In addition, a survey plat of the site, including the extent of soil contamination and a note of land use restrictions, was prepared in 2022 and has been submitted to the City of Hampton. The remedy is functioning as intended.</u>	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. <u>Not applicable.</u>	
C. Early Indicators of Potential Remedy Problems	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. <u>As discussed in Section VII. D. 3 of this checklist, maintenance activities are recommended for select monitoring wells at the CDL. MW-42S, MW-44, MW-45, MW-46, MW-49S, and MW-50I were observed to require some level of maintenance.</u>	

Site Inspection Checklist

D. Opportunities for Optimization

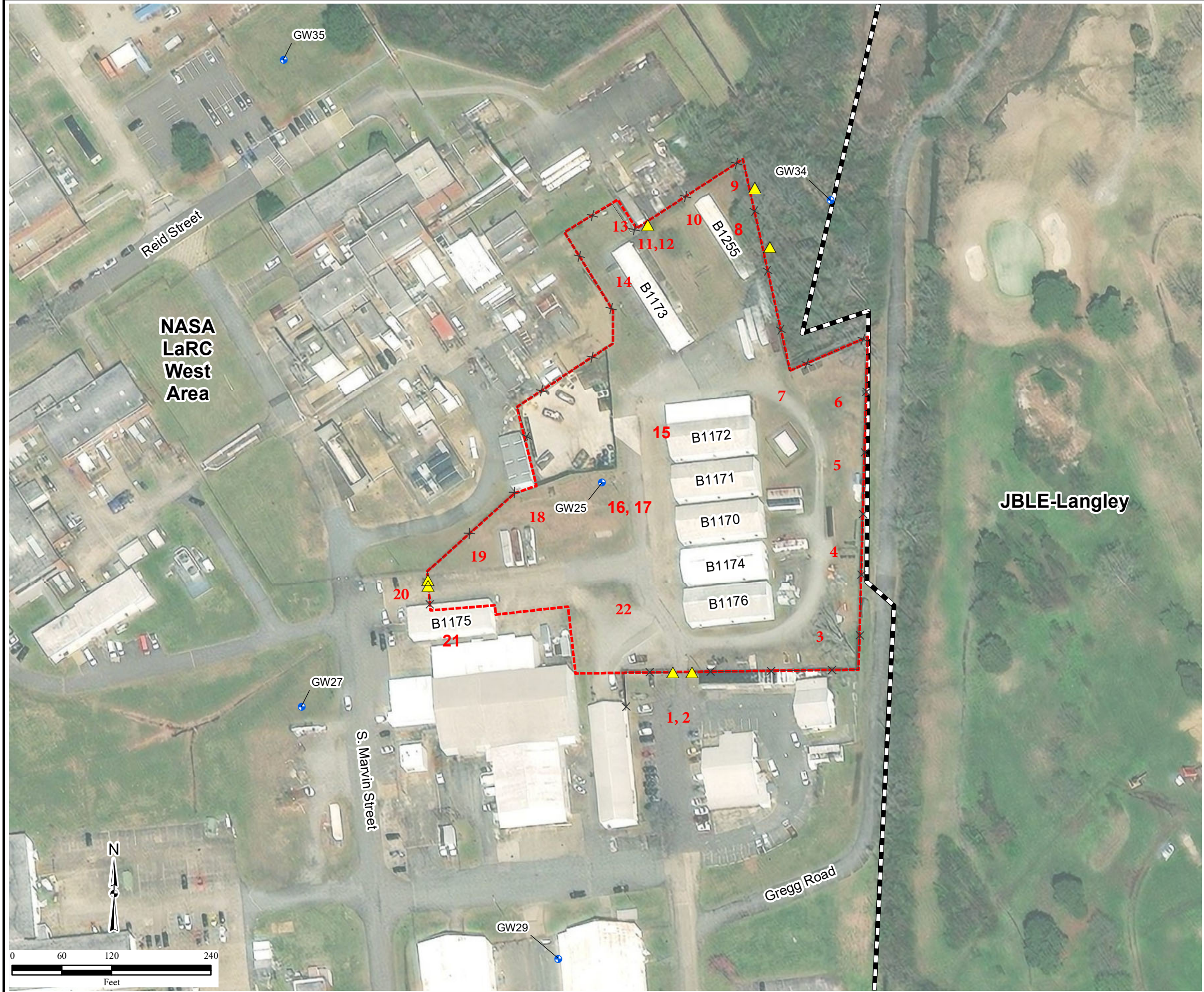
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. NASA Langley Research Center has completed 11 years of post-closure care for the CDL that included annual LTM groundwater sampling, LUC inspections, and maintenance of the soil cover, boundary fence, and monitoring wells. Fifteen LTM groundwater sampling events have been conducted at the CDL since 2011, and a sufficient dataset has been established to evaluate long-term trends and groundwater conditions at the site. Based on the emplacement of a soil cover, implementation of LUCs, and completion of 11 years of post-closure care, NASA has satisfied requirements to request a reduction of post-closure care monitoring activities, as allowed by the Virginia Solid Waste Management Regulations. The Post-Closure Care Evaluation Report has been prepared to justify reducing LTM groundwater sampling frequency at the CDL from annually to once every five years in conjunction with the FYR to provide data to support a remedy protectiveness evaluation.

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APPENDIX D

PHOTO LOG

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Area E Warehouse (Operable Unit 01)—NASA LaRC,
Hampton, VA

**Site Layout
Photo Log Locations
Area E Warehouse
Operable Unit 01
NASA Langley Research
Center, Hampton, Virginia**

Legend

- Monitoring Well
(approximate location)
- Restricted Access Sign
(approximate location)
- B1172 Building Number
- Chain-link Fence
- Land Use Control
Boundary
- JBLE-Langley

Notes:
JBLE-Langley=Joint Base Langley-Eustis, Langley Air Force Base
NASA=National Aeronautics and Space Administration
LaRC=Langley Research Center

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(02)Area_E_Layout.mxd
5/26/2023 TH
Source: HGL, ArcGIS Online Imagery



NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 1

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The southern entrance to Area E Warehouse.



Photograph No.: 2

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The southern entrance showing a stop sign, a restricted access sign, and a no thru traffic sign.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 3

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The privacy cover falling off of the fence in the SE corner.



Photograph No.: 4

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing east/northeast
Date: December 17, 2025

Description: The privacy cover falling off of the fence on the eastern side.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 5

Location: Area E Warehouse
 Photographer: Eddie Weiss

Direction: Facing north/northeast
 Date: December 17, 2025

Description: The privacy cover falling off of the eastern fence.



Photograph No.: 6

Location: Area E Warehouse
 Photographer: Eddie Weiss

Direction: Facing north
 Date: December 17, 2025

Description: The privacy cover falling off of the fence in the Northeastern fence.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 7

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The privacy cover falling off of the eastern fence in the northern section of the Area E Warehouse.



Photograph No.: 8

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing southeast
Date: December 17, 2025

Description: A sign on the outside of the eastern fence in the northern section of the Area E Warehouse.

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 9	Location: Area E Warehouse Photographer: Eddie Weiss	Direction: Facing east/northeast Date: December 17, 2025
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Description:.



Photograph No.: 10	Location: Area E Warehouse Photographer: Eddie Weiss	Direction: Facing northeast Date: December 17, 2025
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Description: A portion of the northern fence line in the northeastern portion of Area E Warehouse.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 11

Location: Area E Warehouse
 Photographer: Eddie Weiss

Direction: Facing northeast
 Date: December 17, 2025

Description: A portion of the northern fence featuring Gate 10, out of Area E Warehouse.



Photograph No.: 12

Location: Area E Warehouse
 Photographer: Eddie Weiss

Direction: Facing north
 Date: December 17, 2025

Description: Signs on Gate 10 containing contact information for the facility.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 13

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: Northeastern corner of the fence separating Area E Warehouse and Gate 10 area.



Photograph No.: 14

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing northwest
Date: December 17, 2025

Description: The western fence in the northern area of Area E Warehouse.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 15

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: Semi-fenced in area within the western area of Area E Warehouse.



Photograph No.: 16

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The semi-fenced in area with GW25 pictured.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 17

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: GW25



Photograph No.: 18

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing northeast
Date: December 17, 2025

Description: Fence along the northern portion of the western area of Area E Warehouse.

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 19

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: Northwestern fence line along the western portion in Area E Warehouse. Western gate is directly left of this photo..



Photograph No.: 20

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing east
Date: December 17, 2025

Description: The western gate of Area E with visible land use control signage.

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 21

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: A gate of the western side of Area E Warehouse, south of B1175.

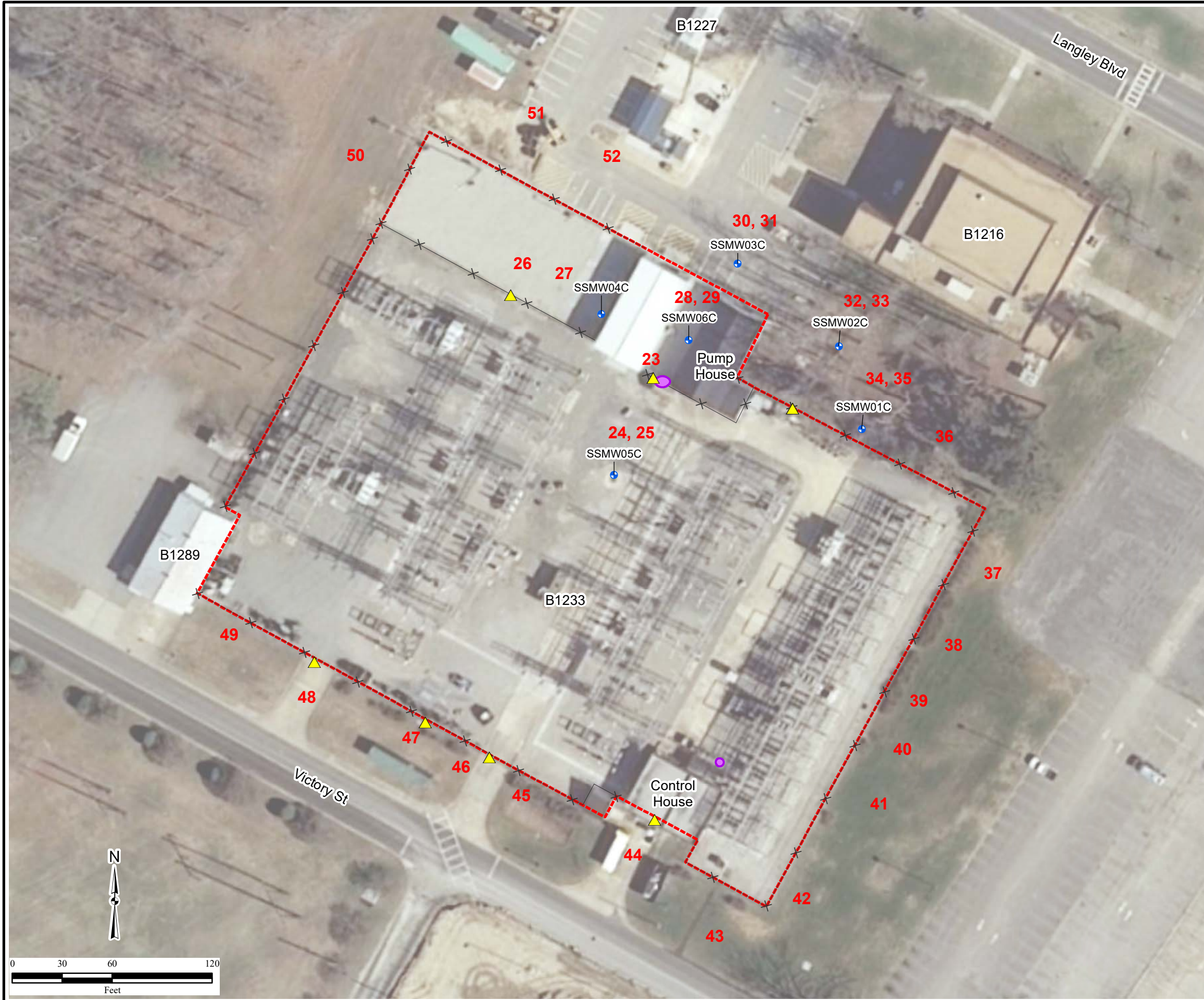


Photograph No.: 22

Location: Area E Warehouse
Photographer: Eddie Weiss

Direction: Facing southwest
Date: December 17, 2025

Description: The southwestern fence adjacent to the south gate entrance to Area E Warehouse.



Stratton Substation Soil (Operable Unit 02)—NASA LaRC,
Hampton, VA

Site Layout

Photo Log Locations

Stratton Substation

Operable Unit 02

NASA Langley Research Center,
Hampton, Virginia

Legend

Monitoring Well
(approximate location)

Restricted Access Sign
(approximate location)

B1216

Building Number

Chain-link Fence

Soil Sample Location with PCBs
Above the Site Clean-up Goal (10 mg/kg)

Land Use Control Boundary

Notes:

PCB=polychlorinated biphenyls

LaRC=Langley Research Center

mg/kg=milligrams per kilogram

NASA=National Aeronautics and Space Administration

\\srv-gst-01\hglgis\Langley-NASA\OU2\LUC_RD\

(02)SiteLayout.mxd

5/4/2023 TB

Source: HGL, ArcGIS Online Imagery

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 23

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing southwest
Date: December 17, 2025

Description: Entry gate to Stratton Substation off of Langley Boulevard.



Photograph No.: 24

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing southwest
Date: December 17, 2025

Description: MW-05C inside of the large fenced in area.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 25	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-05C



Photograph No.: 26	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing southeast Date: December 17, 2025
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Description: Restricted access sign near MW-04C.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 27

Location: Stratton Substation
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-04C



Photograph No.: 28

Location: Stratton Substation
 Photographer: Eddie Weiss

Direction: Facing southwest
 Date: December 17, 2025

Description: MW-06C

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 29	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing MW-06C Date: December 17, 2025
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Description: MW-06C



Photograph No.: 30	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing southwest Date: January 8, 2025
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Description: Flush mount MW-03C with the substation gate in the background

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 31	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing down Date: January 8, 2025
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Description: MW-03C



Photograph No.: 32	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing southwest Date: December 17, 2025
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Description: MW-02C with Stratton Substation in the background.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 33

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing well
Date: December 17, 2025

Description: MW-02C



Photograph No.: 34

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing southwest
Date: December 17, 2025

Description: MW-01C with a LUC sign in the background on the fenceline of the substation area.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 35	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing MW-01C Date: December 17, 2025
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Description: MW-01C



Photograph No.: 36	Location: Stratton Substation Photographer: Eddie Weiss	Direction: Facing southwest Date: December 17, 2025
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Description: Fence and LUC sign on the northern side, near MW-01C.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 37

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing southwest
Date: December 17, 2025

Description: Fence along the eastern boundary of the substation.



Photograph No.: 38

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: Fence along the eastern boundary of the substation.

NASA LaRC Five-Year Review Photo Log
December 17, 2025

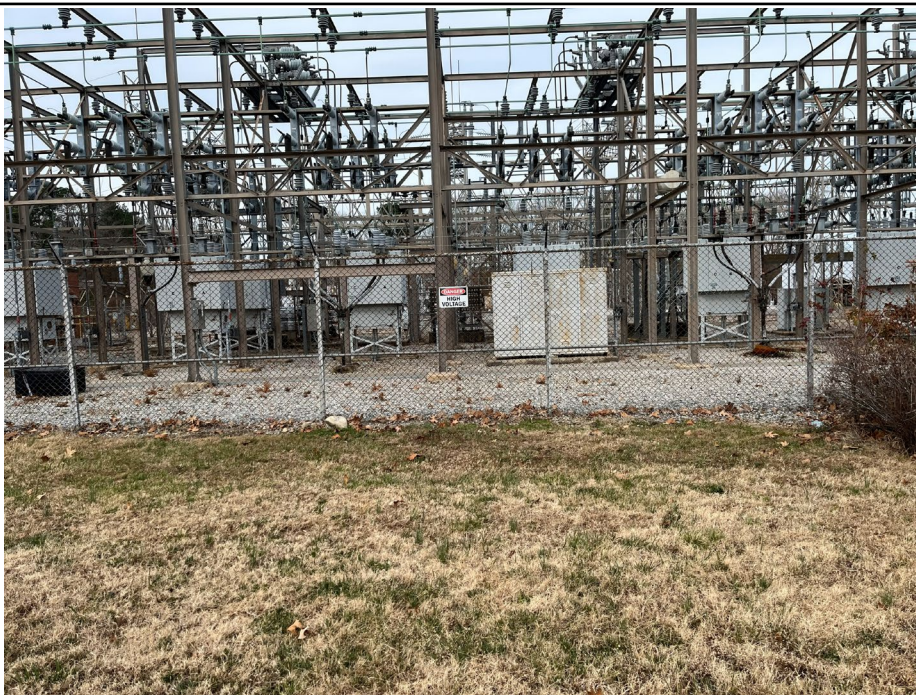


Photograph No.: 39

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: Fence along the eastern boundary of the substation.



Photograph No.: 40

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: Fence along the eastern boundary of the substation.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 41

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: Fence along the eastern boundary of the substation.



Photograph No.: 42

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: The southeast corner of the fence around the substation.

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 43

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing northeast
Date: December 17, 2025

Description: The southeast corner of the fenceline around the substation.



Photograph No.: 44

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing northeast
Date: December 17, 2025

Description: Building 1233 with LUC signage containing facility contact information.

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 45

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The gate closest to Building 1233. The gate was open and a car was parked in the driveway for a crew to work inside of the substation.



Photograph No.: 46

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing northeast
Date: December 17, 2025

Description: The gate closest to Building 1233. The gate was open and a car was parked in the driveway for a crew to work inside of the substation. Signage contains facility contact information.

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 47

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing northeast
Date: December 17, 2025

Description: Southern fenceline around the substation.



Photograph No.: 48

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing northeast
Date: December 17, 2025

Description: Locked gate with LUC signs close to the southwest corner of the fence. Signage contains facility contact information.

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 49

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The southwest corner of the fence, up against Building 1289.



Photograph No.: 50

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing east
Date: December 17, 2025

Description: The northwestern corner of the fenceline..

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 51

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing south
Date: December 17, 2025

Description: The northern fenceline, by Building 1233b.

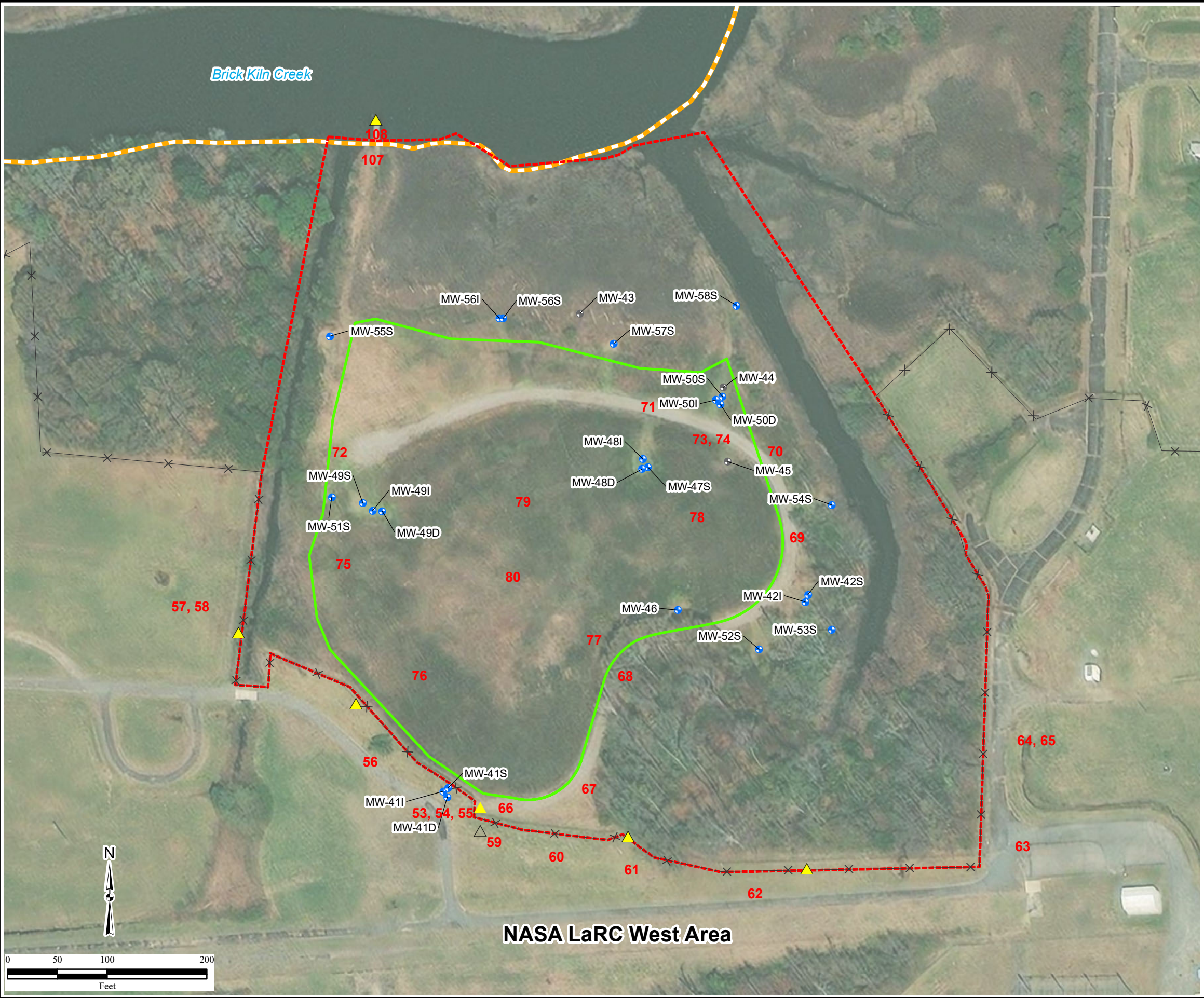


Photograph No.: 52

Location: Stratton Substation
Photographer: Eddie Weiss

Direction: Facing south
Date: December 17, 2025

Description: The northern fenceline, by Building 1233b.



Site Layout
Photo Log Locations
Construction Debris Landfill
Operable Unit 05
NASA Langley Research Center,
Hampton, Virginia

Legend

- Monitoring Well (approximate location)
- Abandoned or Damaged Monitoring Well (approximate location)
- Restricted Access Sign (approximate location)
- Chain-link Fence
- Soil Cover Boundary
- LUC Boundary
- NASA LaRC Boundary

Notes:
LaRC=Langley Research Center
LUC=Land Use Control
NASA=National Aeronautics and Space Administration

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6/16/2023 TA
Source: HGL, ArcGIS Online Imagery

NASA LaRC Five-Year Review Photo Log

December 17, 2025



Photograph No.: 53

Location: CDL

Photographer: Eddie Weiss

Direction: Facing east

Date: December 17, 2025

Description: Closed entry gate to the CDL with LUC signage containing facility contact information.



Photograph No.: 54

Location: CDL

Photographer: Eddie Weiss

Direction: Facing east

Date: December 17, 2025

Description: Open entry gate to the CDL with LUC signage.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 55

Location: CDL
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: Southern fenceline of the CDL featuring MW-41S, MW-41I, and MW-41D.



Photograph No.: 56

Location: CDL
Photographer: Eddie Weiss

Direction: Facing northwest
Date: December 17, 2025

Description: Southern fenceline of the CDL. LUC sign present on fence.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 57

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing east
 Date: December 17, 2025

Description: Western fenceline of the CDL with visible LUC signage.



Photograph No.: 58

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing northeast
 Date: December 17, 2025

Description: Western fenceline of the CDL. The corner shown is the edge of the LUC boundary.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 59

Location: CDL
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: Southern fenceline of the CDL. Entry gate is on the left side of the picture.



Photograph No.: 60

Location: CDL
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: Southern fenceline of the CDL.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 61

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing north
 Date: December 17, 2025

Description: Southern fenceline showing LUC signage.



Photograph No.: 62

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing northeast
 Date: December 17, 2025

Description: Southern fenceline showing LUC signage containing facility contact information.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 63

Location: CDL
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: Southeastern corner of the fenceline.



Photograph No.: 64

Location: CDL
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: Eastern fenceline of the CDL

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 65

Location: CDL
Photographer: Eddie Weiss

Direction: Facing northwest
Date: December 17, 2025

Description: Eastern edge of the fenceline at the CDL.



Photograph No.: 66

Location: CDL
Photographer: Eddie Weiss

Direction: Facing east
Date: December 17, 2025

Description: The gravel road at the entrance of the CDL.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 67

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing north
 Date: December 17, 2025

Description: The gravel road coming from the entrance, facing north.



Photograph No.: 68

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing east
 Date: December 17, 2025

Description: The gravel road, facing east. MW-46 seen on the left side of the picture.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 69

Location: CDL
Photographer: Eddie Weiss

Direction: Facing southeast
Date: December 17, 2025

Description: The gravel road facing MW-42S and other wells.



Photograph No.: 70

Location: CDL
Photographer: Eddie Weiss

Direction: Facing northwest
Date: December 17, 2025

Description: The gravel road facing MW-50D and other wells.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 71

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing west
 Date: December 17, 2025

Description: The gravel road north of the CDL.



Photograph No.: 72

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing east
 Date: December 17, 2025

Description: The end of the gravel road north of the CDL.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 73

Location: CDL
Photographer: Eddie Weiss

Direction: Facing northwest
Date: December 17, 2025

Description: Geotextile fabric daylighting along the gravel road. Facing MW-50D and other wells.



Photograph No.: 74

Location: CDL
Photographer: Eddie Weiss

Direction: Facing down
Date: December 17, 2025

Description: Geotextile fabric daylighting along the gravel road.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 75

Location: CDL
Photographer: Eddie Weiss

Direction: Facing south
Date: December 17, 2025

Description: On top of the CDL.



Photograph No.: 76

Location: CDL
Photographer: Eddie Weiss

Direction: Facing west
Date: December 17, 2025

Description: On top of the CDL.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 77

Location: CDL
Photographer: Eddie Weiss

Direction: Facing south
Date: December 17, 2025

Description: On top of the CDL, near MW-46.



Photograph No.: 78

Location: CDL
Photographer: Eddie Weiss

Direction: Facing southwest
Date: December 17, 2025

Description: On top of the CDL.

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 79

Location: CDL
Photographer: Eddie Weiss

Direction: Facing south
Date: December 17, 2025

Description: On top of the CDL.



Photograph No.: 80

Location: CDL
Photographer: Eddie Weiss

Direction: Facing southwest
Date: December 17, 2025

Description: On top of the CDL.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 81

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-41S



Photograph No.: 82

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-41I

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 83	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-41D



Photograph No.: 84	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-46

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 85

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-52s



Photograph No.: 86

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-53S

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 87

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-42I



Photograph No.: 88

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-42S

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 89	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-54S



Photograph No.: 90	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-45 damaged

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 91	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-50D



Photograph No.: 92	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-50I with disconnected PVC

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 93	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-50S



Photograph No.: 94	Location: CDL Photographer: Eddie Weiss	Direction: Facing well Date: December 17, 2025
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Description: MW-44. Protective casing lid is broken at the hinge.

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 95

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-48I



Photograph No.: 96

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-48S

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 97

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-56S



Photograph No.: 98

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-58S

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 99

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-47S



Photograph No.: 100

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-57S

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 101

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-56I



Photograph No.: 102

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-55S

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 103

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-51S



Photograph No.: 104

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-49S

NASA LaRC Five-Year Review Photo Log **December 17, 2025**



Photograph No.: 105

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-49I



Photograph No.: 106

Location: CDL
 Photographer: Eddie Weiss

Direction: Facing well
 Date: December 17, 2025

Description: MW-49D

NASA LaRC Five-Year Review Photo Log
December 17, 2025



Photograph No.: 107

Location: CDL
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: The dock to the north of the CDL.



Photograph No.: 108

Location: CDL
Photographer: Eddie Weiss

Direction: Facing north
Date: December 17, 2025

Description: LUC signage from behind at the dock north of the CDL.