FINAL

ERIE COUNTY CONSERVATION LEAGUE (ECCL) FIRING RANGE REMOVAL ACTION COMPLETION REPORT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN H. GLENN RESEARCH CENTER AT
NEIL A. ARMSTRONG TEST FACILITY
SANDUSKY, OHIO

Prepared for:

NASA Glenn Research Center
21000 Brookpark Road
Cleveland, Ohio 44135

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September 2023

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ACRONYMS AND ABBREVIATIONS

°F	Degrees Fahrenheit
95UCL	95 Percent Upper Confidence Limit
AASHTO	American Association of State Highway and Transportation Officials
ARAR	Applicable or Relevant and Appropriate Requirement
Arrowhead	Arrowhead Contracting, Inc.
BaP_{eq}	Benzo(a)pyrene Equivalent Concentration
bgs	Below Ground Surface
BGSU	Bowling Green State University
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chemical of Concern
COMETS	Construction, Maintenance, and Environmental Testing Services
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbon
CY	Cubic Yard
ECCL	Erie County Conservation League
ECL	Erie County Landfill
EPC	Exposure Point Concentration
ESV	Ecological Screening Value
EU	Exposure Unit
FANS	Firelake-Arrowhead NASA Services
FCR	Field Change Request
ft^2	Square Feet
ft^3	Cubic Feet
GRC	John H. Glenn Research Center
GRC-ATF	Glenn Research Center at Neil A. Armstrong Test Facility
HASP	Health and Safety Plan
IDW	Investigation-Derived Waste
IEUBK	Integrated Exposure Uptake Biokinetic Model for Lead in Children
IRA	Interim Removal Action
LCS	Laboratory Control Sample
LDR	Land Disposal Restriction
MCL	Maximum Contaminant Level
mg/kg	Milligram per Kilogram
mg/L	Milligram per Liter
mg/m^3	Milligram per Cubic Meter
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NASA	National Aeronautics and Space Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NELAP	National Environmental Laboratory Accreditation Program
NTCRA	Non-Time-Critical Removal Action
Ohio EPA	Ohio Environmental Protection Agency
OUPS	Ohio Utility Protection Services
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon
PBS	Plum Brook Station

LIST OF ACRONYMS AND ABBREVIATIONS (Continued)

PCB	Polychlorinated Biphenyl
PPE	Personal Protective Equipment
PPM	Parts per Million
PVC	Polyvinyl Chloride
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RA	Removal Action
RAO	Removal Action Objective
RAWP	Removal Action Work Plan
RCI	Reactivity, Corrosivity, and Ignitability
RCRA	Resource Conservation and Recovery Act
RG	Remediation Goal
RPD	Relative Percent Difference
RPF	Relative Potency Factor
RPM	Remedial Project Manager
RSE	Removal Site Evaluation
RSL	Regional Screening Level
SI	Site Investigation
SL	Screening Level
SRV	Sediment Reference Value
SSHP	Site-Specific Health and Safety Plan
SVOC	Semivolatile Organic Compound
SWP3	Stormwater Pollution Prevention Plan
TCLP	Toxicity Characteristic Leaching Procedure
THQ	Target Hazard Quotient
TR	Target Risk
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence
yd^3	Cubic Yards

EXECUTIVE SUMMARY

This Removal Action (RA) Completion Report documents the Non-Time-Critical Removal Action (NTCRA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at the Erie County Conservation League (ECCL) Firing Range located at the National Aeronautics and Space Administration (NASA) Glenn Research Center (GRC) at Neil A. Armstrong Test Facility (GRC-ATF) (formerly known as Plum Brook Station [PBS]) in Sandusky, Ohio. Removal Action activities took place between 2019 and 2023, and are comprised of the following tasks:

- Fence installation in February 2019,
- Initial mobilization and tree clearing in January, February, and March 2020,
- A stop-work due to COVID-19, which took place from April 2020 through July 2021,
- Re-mobilization in August 2021,
- The excavation, treatment, and disposal of soils from the Trap and Skeet Range and sediment from Dautch Ditch from August 2021 to June 2022,
- The excavation, treatment, and disposal of soils from the Rifle and Pistol Ranges in March and April 2022,
- The excavation, stabilization, and disposal of sediment from Pond A in August 2022,
- Site restoration for the Trap and Skeet, Pistol East, Pistol West, and Rifle Ranges initially completed in September 2022,
- Removal and disposal of construction debris in September 2022,
- Recycling of scrap steel, concrete, and asphalt (from the restoration of Fox Road) in September 2022,
- Additional site restoration of the Pistol and Rifle Ranges in June 2023, and
- Final stabilization approval on June 28, 2023.

The scope of the NTCRA was to excavate, stabilize (if necessary), and dispose of soils and sediment contaminated with Chemicals of Concern (COCs) that pose a threat to human health and the environment. These COCs include metals (antimony, arsenic, lead, copper) and the carcinogenic polycyclic aromatic hydrocarbons (cPAHs) benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Approximately 45,466 tons of soil, 624 tons of sediment, and 108 tons of construction debris were estimated to be generated from the removal activities. The results of the 2016 Site Investigation (SI) (Leidos 2018a) and 2019 Removal Site Evaluation (RSE) sampling activities (Leidos 2020a) were used to define the COCs in the various Exposure Units (EUs) and to delineate the vertical and horizontal extents of the COC-impacted soils and sediment. COCs above remediation goals (RGs) (residential regional screening levels [RSLs] or background screening levels [SLs]) ranged in depth from 0 to 2 feet, and 0 to 6 feet on impact berms, and were primarily located within the pistol and rifles ranges impact berm soils, trap and skeet range soils, and hot spot locations within the target areas.

Impacted soils were stabilized to render the soils non-hazardous (if necessary), removed, and transported to an off-site waste disposal facility (Erie County Landfill) approved by NASA GRC. Stabilization was performed using Calciment, Enviroblend, and Envirophos. A total of 2,340 tons of Calciment, 410 tons of Enviroblend, and 22 tons of Envirophos were used during the project.

Two types of sampling were conducted to achieve the remediation objectives and goals:

- Confirmation sampling was conducted to verify the success of the soil stabilization activities and confirm the suitability of disposing of stabilized soil in a permitted Subtitle D disposal facility (Erie County Landfill). Samples were analyzed for toxicity characteristic leaching procedure (TCLP) lead or TCLP metals. Stabilized soils that remained characteristically hazardous for lead or failed waste disposal facility criteria (e.g., land disposal restrictions [LDRs]) were re-treated and sampled prior to disposal. Once the confirmation sample results were determined to be below Resource Conservation and Recovery Act (RCRA) TCLP limits (i.e., 5 parts per million [ppm] for lead), they were approved by Erie County Landfill (ECL) for disposal.
- Verification sampling was conducted to ensure all impacted soils above RGs were removed. The samples were analyzed for total concentrations of antimony, arsenic, lead, copper, and/or cPAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene). Verification sample locations with soil COC concentrations greater than RGs were further excavated and re-sampled until RGs were attained. X-Ray fluorescence (XRF) field screening was used to guide the lead-impacted soil excavations and verification sample locations. Several overdigs were performed in the Trap and Skeet, Rifle, and Pistol Ranges as guided by verification and XRF results. Excavated areas were backfilled with approved materials, except Pond West A.

This NTCRA attained the Removal Action Objectives (RAOs) and met the Applicable or Relevant and Appropriate Requirements (ARARs) established for ECCL Firing Range, as defined in the Final RSE Report (Leidos 2020a) and Final Action Memorandum (Leidos 2020b). Project activities were completed in accordance with the requirements and specifications of the RA Work Plan (Leidos 2021). The RAO of excavation and off-site disposal of impacted surface soil (depths ranging from 0 to 2 feet) and 0 to 6 feet on impact berms from areas associated with ECCL Firing Range that exceeded RGs was achieved. The verification sampling results confirmed the extent of lead, antimony, arsenic, copper, and Polycyclic Aromatic Hydrocarbon (PAH) contamination was fully addressed by excavation, except six locations (VS-428, -435, -448, -449, -450, and -512) with residual lead, arsenic, or PAH impacts. Leidos performed 95 percent upper confidence level (95UCL) Exposure Point Concentration (EPC) calculations to determine if remediation was complete. Based on comparison of the individual metals and cPAHs to RGs and the comparison of the sum Benzo(a)pyrene Equivalent Concentration (BaP_{eq}) to the benzo(a)pyrene RG, the NTCRA was complete and allows for unrestricted/unlimited use.

A land survey of the final excavation limits was performed. All excavation limits and their exceptions were approved by NASA. The excavations were backfilled with imported common fill as well as the remaining portions of the earthen berms, any ruts were regraded, and the entire disturbed area was seeded. Erosion controls were removed once approval from the NASA Remedial Project Manager (RPM) and Stormwater Coordinator was obtained on October 25, 2022. Final stabilization approval from the NASA RPM and Stormwater Coordinator was given on June 28, 2023 once greater than 70% vegetation coverage was observed across the entire site (i.e., Trap and Skeet, Rifle, and both pistol ranges).

A total of 53,434 tons of treated and non-treated soil and sediment were removed from ECCL and taken to ECL for disposal. Additionally, 13.8 ton of construction debris was removed and 102.6 tons of concrete, 15 tons of scrap metal, 13 tons of wood, and 14.35 tons of asphalt were recycled. The contract value was estimated to be $8,580,561, but the NTCRA was completed under budget at approximately $8,524,125, based on the June 2023 financial report.

1. INTRODUCTION

This Removal Action (RA) Completion Report documents the cleanup activities performed for the completion of a non-time-critical removal action (NTCRA) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at the Erie County Conservation League (ECCL) Firing Range located at the National Aeronautics and Space Administration (NASA) Glenn Research Center (GRC) at Neil A. Armstrong Test Facility (GRC-ATF) (formerly known as Plum Brook Station [PBS]) in Sandusky, Ohio. This report documents the cleanup activities conducted in compliance with the approved work plan and state and federal regulations in February 2020 and from August 2021 through September 2022.

1.1 SCOPE OF WORK

NASA contracted Firelake-Arrowhead NASA Services (FANS) to execute the statement of work titled "Erie County Conservation League (ECCL) Firing Range – Removal Action Implementation," dated May 31, 2018, and modified on August 9, 2018. Arrowhead Contracting, Inc. (Arrowhead) and Leidos were subcontracted to FANS to execute the NTCRA and provide environmental consulting services, respectively. This work is being performed under Prime Contract Number 80GRC018C0022 (Construction, Maintenance, Environmental, and Testing Services [COMETS] Contract), Subcontract Number FA8-1-S1, Task Order E109.

The scope of the NTCRA is to excavate, stabilize (if necessary), and dispose of soils and sediment contaminated with chemicals of concern (COCs) that pose a threat to human health and the environment. These COCs include metals (antimony; arsenic; lead; copper); and the carcinogenic polycyclic aromatic hydrocarbons (cPAHs) benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Approximately 45,466 tons of soil; 624 tons of sediment; and 108 tons of construction debris were estimated to be generated from the removal activities. The results of the 2016 Site Investigation (SI) (Leidos 2018a) and 2019 removal site evaluation (RSE) sampling activities (Leidos 2020a) were used to define the COCs in the various Exposure Units (EUs) and to delineate the vertical and horizontal extents of the COC-impacted soils and sediment. COCs above remediation goals (RGs) (residential regional screening levels [RSLs] or background screening levels [SLs]) ranged in depth from 0 to 2 feet, and 0 to 6 feet on impact berms, and are primarily located within the pistol and rifles ranges impact berm soils, trap and skeet range soils, and hot spot locations within the target areas.

Impacted soils were stabilized to render the soils non-hazardous (if necessary), removed, and transported to an off-site waste disposal facility (Erie County Landfill) approved by NASA GRC.

Two types of sampling were conducted to achieve the remediation objectives and goals:

- Confirmation of soil stabilization, and
- Verification of contaminant removal in soil.

Confirmation sampling was conducted to verify the success of the soil stabilization activities and confirm the suitability of disposing of stabilized soil in a permitted Subtitle D disposal facility (Erie County Landfill). Samples were analyzed for toxicity characteristic leaching procedure (TCLP) lead or TCLP metals. Stabilized soils that remain characteristically hazardous for lead or fail waste disposal facility criteria (e.g., land disposal restrictions [LDRs]) were re-treated and sampled prior to disposal. Verification sampling was conducted to ensure all impacted soils above RGs were removed. The samples were analyzed for total concentrations of antimony, arsenic, lead, copper, and/or cPAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-

cd]pyrene). Verification sample locations with soil COC concentrations greater than RGs were further excavated and sampled until RGs were attained. X-Ray fluorescence (XRF) field screening was used to guide the lead-impacted soil excavations and verification sample locations. Excavated areas were backfilled with approved materials, except Pond West A, in accordance with the *Revised Final Erie County Conservation League (ECCL) Firing Range Removal Action Work Plan, National Aeronautics and Space Administration, Plum Brook Station* ("RA Work Plan") (Leidos 2021).

All cleanup activities, including quality assurance (QA)/quality control (QC) and health and safety procedures, were conducted in conformance with applicable U.S. Environmental Protection Agency (USEPA) guidance, Leidos, Arrowhead, NASA procedures, and NASA-approved work plans (Leidos 2021).

The work plans for the cleanup activities include the Final Action Memorandum for Erie County Conservation League (ECCL) Firing Range Removal Action, National Aeronautics and Space Administration, Plum Brook Station (Leidos 2020b), and the RA Work Plan (including QC Plans, and Site-Specific Health and Safety Plans [SSHPs]) (Leidos 2021).

1.2 ERIE COUNTY CONSERVATION LEAGUE AND GLENN RESEARCH CENTER AT NEIL A. ARMSTRONG TEST FACILITY DESCRIPTION

1.2.1 Location

ECCL and GRC-ATF (formerly known as PBS) are located in southern Erie County, Ohio, approximately 3 miles south of Sandusky, Ohio, and approximately 50 miles west of NASA GRC in Cleveland, Ohio (Figure 1). The GRC-ATF encompasses approximately 6,740 acres (Leidos 2018b). Most of GRC-ATF is in Perkins and Oxford Townships, with some lands in Huron and Milan Townships. The site boundaries are Bogart Road to the north, Mason Road to the south, U.S. Highway 250 to the east, and County Road 43 to the west. The northernmost point is at latitude 41°23'39"N, the southernmost point is at 41°20'04"N, the westernmost point is at longitude 82°43'12"W, and the easternmost point is at 82°38'39"W. ECCL is located near the eastern portion of the GRC-ATF facility outside of the perimeter fence. The ECCL site lies east of the GRC-ATF patrol road, north of Fox Road and west of U.S. Highway 250 and is directly west of the Halleen Kia Dealership. ECCL is surrounded by a boundary fence and access is restricted through locked gates from Fox Road.

1.2.2 Site Setting

ECCL and GRC-ATF are situated in an area known for its agricultural productivity and are bordered by farmland, some of which NASA leased to local farmers. The area surrounding ECCL and GRC-ATF is primarily rural and agricultural, with some recent development. Some food-processing facilities, including dairy and meat-processing operations, are located in the area. Tourism and recreation are important economic influences in the Sandusky area. The Erie County Perkins School District currently uses certain former NASA facilities, located near the former GRC-ATF main gate on Columbus Avenue, and outside the fenced area for transportation and storage purposes. Intensive commercial development, consisting of highway-oriented uses (e.g., motels, restaurants, service stations, and shopping malls) predominate immediately to the east along U.S. Highway 250 and its intersections with Bogart Road and State Highway 2 in Sandusky. A U.S. Army Reserve Center is located adjacent to the southeastern corner, just off Mason Road (Leidos 2018b). A car dealership was constructed in 2016 on the two adjacent parcels between the ECCL site and U.S. Highway 250 (Leidos 2018a). An 8-foot security fence surrounds approximately 5,845 acres of GRC-ATF (Leidos 2018b). Most of the land at GRC-ATF consists of forestland and old fields. An estimated 75 percent of NASA's property at GRC-ATF is considered unused. The remaining land is used for offices, test facilities, roads, and infrastructure. Public access is

restricted at GRC-ATF, and the site is accessed through the security guard house located on Scheid Road. Armed guards staff the guardhouse 24 hours per day. During each 8-hour shift, a security guard patrols the inside perimeter road (Patrol Road) of the facility. Persons gain access to the station by showing the guard a badge that authorizes entry.

1.3 ECCL FIRING RANGE OPERATIONAL HISTORY

The ECCL was founded in 1948 with the purpose of conserving wildlife and improving hunting, fishing, and other outdoor activities in Erie County. In the late 1950s or early 1960s, NASA acquired the ECCL property through eminent domain to act as a security buffer and leased the property back to ECCL (SAIC 2010).

The ECCL facility originally consisted of a single Trap Range, Skeet Range, and Rifle Range. In the early 1960s, the 50-yard Rifle and Pistol Range was added. In the early- to mid-1960s, the additional Trap and Skeet Ranges were added to the facility, and the 25-yard Pistol Range was built in the mid-1980s. The ECCL operated under a Range Safety Plan that provided general rules and operational guidelines. The ECCL facility formerly employed two personnel. In addition, the facility had an annual membership of approximately 700 to 1,000 people. The facility closed on or about August 18, 2007 (SAIC 2010).

1.4 ECCL FIRING RANGE DESCRIPTION

ECCL leased approximately 57 acres of land from NASA on the eastern side of GRC-ATF at the intersection of U.S. Highway 250 and Fox Road, south of Sandusky, Ohio (Figure 2). The ECCL facility is not located within the GRC-ATF 8-foot security fence; however, a perimeter fence was installed in February 2019 to restrict public access. The ECCL facility is currently an inactive firing range.

Based on the 2010 Preliminary Assessment (PA) (SAIC 2010), the ECCL facility included the following:

- A club house and adjacent garage,
- Three trap and two skeet fields,
- A 25-yard Pistol Range (east),
- A 50-yard Rifle and Pistol Range (west),
- A high-power Rifle Range with firing benches at 100 and 200 yards, and
- An archery range and elevated archery stand.

A 250-gallon aboveground diesel storage tank was located on a concrete pad near the garage for fueling maintenance equipment; no leaks or spills have been reported. No documentation for the tank removal was found. A shallow, man-made pond (approximately 2 to 3 feet deep and approximately 10,000 square feet [ft^2]) is south-southwest of the Trap and Skeet Ranges, approximately 275 feet west of the former ECCL club house (SAIC 2010).

The Rifle and Pistol Ranges consisted of a firing stand, an earthen mound backstop (to contain bullets and fragments), and side berms (to contain ricochets). The Trap Range consisted of five shooting positions and one structure, the "traphouse," from which the targets were thrown by a machine called a "trap." Shooting positions at the skeet ranges were arranged along an arc between two structures, the "high house" and the "low house," where targets were released. All firearms were discharged to the north. Trees and bushes are located at various places along the northern and western sides of the range and along the drainage ditch. Access to the Rifle and Pistol Ranges was restricted to range members only through fencing. A locked gate and some adjacent fencing remain at the southwestern access road (partially

demolished in February 2019); however, access to other sides of the ranges was not restricted to the public. Access to the Trap and Skeet Ranges was formerly open (no fencing).

Ammunition fired at the ECCL facility includes standard ball shot (< #6) and jacket ammunition (< 0 caliber). Clay targets (e.g., White Flyer® Standard AA Pitch Trap/Skeet Target) historically were used at the Trap and Skeet Range; however, biodegradable "E-birds" have been used since approximately 2002 (SAIC 2010).

According to the 2010 PA, the reclamation of lead-impacted soils was conducted at the firing range in around the year 2000; however, no documentation of this removal activity is available (SAIC 2010). A relatively recent change in site conditions was identified during the SI Sampling and Plan review of aerial photographs of the property. A historical aerial photograph from 2010 indicates soil excavation activities were conducted at the Rifle Range sometime after 2006. Activities included removal of shallow soil from the range floor and the entire western lateral berm. Structures previously located at the Trap and Skeet Ranges also were removed sometime between 2006 and 2010 (SAIC 2011). The club house and garage were demolished sometime between July 2012 and October 2015, based on the review of more recent aerial photographs (Leidos 2020a). However, no documentation of these removal activities is available.

The ECCL Trap and Skeet Ranges are currently composed of a mixture of open flat, grassy areas, and areas of heavy shrub/scrub vegetation, with some mixed deciduous forest around the northern and southern drainage ditches and western ponds, in the northern portion of the Trap Range and eastern portion of the skeet range. The Rifle and Pistol Ranges are surrounded by earthen berms (mostly shale bedrock), which are vegetated with weeds and shrub/scrub vegetation and grassy areas on the Pistol Range floors. The Rifle Range floor is currently exposed, weathered shale bedrock from previous excavation activities and several areas are covered with *Rosa multiflora* (Multiflora rose).

1.5 PREVIOUS ACTIVITIES

This section summarizes historical information and previous activities supporting the evaluation and determination of the disposition of ECCL Firing Range.

1.5.1 Preliminary Assessment

The ECCL PA Report (SAIC 2010) documented results of a visual inspection of current conditions of the site; identified notable site features (e.g., topography, surface water drainage pathways, and surface/subsurface debris); and contained a records review, including historical investigations at NASA PBS, historical maps, and aerial images. Historical images and photographs of site conditions at the time of the PA are included in the document. The PA did not include environmental sampling. As a result, no information is contained in the report regarding the potential nature and extent of contamination associated with historical firing range operations.

The PA documented changes to activities that have been conducted at the ECCL Firing Range over time. Specifically, soil excavation activities were conducted at the Rifle Range sometime after 2006. Activities included removal of the western lateral berm, scraping of the Rifle Range floor to shale bedrock, and removal of structures previously located at the Trap and Skeet Ranges (SAIC 2010).

1.5.2 Site Investigation

Leidos conducted the SI at the ECCL Firing Range in 2016 to evaluate the extent of the impact of COCs at the site and provide recommendations for any further action. The SI was conducted under the approved *Multi-Site Characterization Sampling and Analysis Plan, National Aeronautics and Space*

Administration, Glenn Research Center-Plum Brook Station (SAIC 2011) and results are presented in the SI Report (Leidos 2018a).

SI activities included collecting 168 surface soil samples, 9 dry sediment samples, and 9 co-located sediment/surface water samples (Figures 3 to 6). Samples were analyzed for firing range metals (antimony, arsenic, copper, iron, lead, tin, and zinc) and semivolatile organic compounds (SVOCs). Surface soil, sediment, and surface water analytical data were screened based upon the following criteria:

- USEPA RSLs;
- USEPA ecological screening values;
- Ohio Environmental Protection Agency (Ohio EPA) sediment reference values (SRVs);
- Ohio EPA ecological SLs;
- Persistent, bioaccumulative, and toxic chemicals; and
- Background values for NASA GRC-ATF (soil only).

These screening criteria were used to determine if contamination exists at concentrations indicative of an unacceptable risk to human health or the environment and to identify the required laboratory analytical reporting limits.

Ecological and human health risk screenings were conducted to identify potential risks and determine the need for additional evaluation. The ecological risk screening identified 23 chemicals of potential ecological concern (COPECs) in surface soil, 10 COPECs in sediment, and 3 COPECs in surface water. COPECs for soil, sediment, and surface water included at least one metal and SVOC.

Human health risk screening identified multiple metals and SVOCs as chemicals of potential concern (COPCs) in soil. Arsenic and lead were identified as COPCs in sediment, and lead was identified as a COPC in surface water.

Results of the SI activities indicated that the surface soil, sediment, and surface water at the ECCL Firing Range have been impacted by previous site activities. Further evaluation was recommended to fully determine the potential risk to human health and ecological receptors, and to determine if media not included in this SI (subsurface soil and/or groundwater) have been impacted. Additional surface/subsurface soil and sediment sampling were recommended to further delineate the vertical and horizontal extents of contamination at the ranges, ditches, and ponds. In addition, an interim removal action (IRA) was recommended for the Trap and Skeet Range and the Rifle and Pistol Firing Range impact berms with surface soil lead concentrations above the RSL. The recommended IRA included additional pre-delineation sampling, treatability study, excavation of surface soil (Trap and Skeet Range 0 to 1 foot below ground surface [bgs]), complete removal of impact and lateral berms, lead bullet screening, soil stabilization (i.e., soil treated with an amendment to immobilize the lead when soil becomes saturated), and offsite non-hazardous waste disposal. Verification and confirmation sampling would ensure the stabilized soil meets waste disposal criteria, and the soil has been removed to residential screening criteria. The recommended IRA included the excavation of the clay target and shotgun shell debris areas (including a portion of the drainage ditch) and burned trap house debris (including an asbestos-containing material survey) within the Trap and Skeet Range.

1.5.3 Removal Site Evaluation

The *Final Erie County Conservation League (ECCL) Firing Range Removal Site Evaluation Report, National Aeronautics and Space Administration, Plum Brook Station* (Leidos 2020a) presented the results

from the 2016 SI and the 2019 RSE activities at ECCL Firing Range. Leidos conducted the RSE to assess the potential threat to human health and the environment and to determine if a need for further action exists. The RSE Report documented the 2016 SI and 2019 RSE sampling results, the streamlined human health and ecological risk assessments, the basis for NTCRA, and the recommended RA to attain unrestricted reuse conditions at the ECCL Firing Range.

Leidos conducted the RSE sampling event in July and August 2019 in accordance with the *Final Erie County Conservation League (ECCL) Firing Range Removal Site Evaluation Sampling and Analysis Plan, National Aeronautics and Space Administration, Plum Brook Station, Sandusky* (Leidos 2019b). During this effort, Leidos collected a total of 140 soil, 9 sediment, 3 groundwater, and 3 asbestos samples, including 19 duplicates (16 for soil, 2 for sediment and 1 for groundwater) (Figures 3 to 6). Sample locations were selected based on SI analytical results to further evaluate potential risk to ecological receptors and human health and further define the extent of contamination. Soil samples collected during the RSE were analyzed for firing range metals (antimony, arsenic, copper, iron, lead, tin, and zinc) and/or polycyclic aromatic hydrocarbons (PAHs) and carbazole. Sediment samples collected during the RSE were analyzed for lead and arsenic. Surface water samples collected during the SI were analyzed for firing range metals and SVOCs. Limited groundwater samples were collected from the temporary monitoring wells installed at the ECCL Firing Range during the RSE and were analyzed for firing range metals and PAHs. Streamlined risk assessments were conducted in accordance with USEPA guidance for conducting NTCRAs (USEPA 1993b). The soil, sediment, surface water, and groundwater sample analytical results from SI and/or RSE and streamlined risk assessment conclusions provided evidence to conclude that the nature and extent of contamination at the ECCL Firing Range has been defined sufficiently for these media (Leidos 2020a).

1.5.3.1 Surface Water

Surface water samples were collected from Pond East, Pond West A, and Pond West B (Figure 6) during the SI and analyzed for firing range metals and SVOCs. SI surface water sample results were compared to background levels and the USEPA RSL values for tap water, USEPA maximum contaminant levels (MCLs), and Ohio Water Quality Standards for drinking and non-drinking water exposures. Lead was detected in both Pond West A and Pond West B at concentrations exceeding tap water RSL. Surface water was not sampled during the RSE site activities (Leidos 2020a). The Erie County Health Department does not allow the use of surface water (e.g., river, stream, creek, drainage ditch) for a private drinking water system, in accordance with Ohio Administrative Code (OAC) 3701-28-14; however, a pond, spring, or cistern tank could be used as a source for a private water system. The ponds at ECCL are not drinking water sources and exposure from incidental ingestion of pond water during wading is much lower than the exposure from a drinking water source. Therefore, no COCs were identified for remediation in surface water.

1.5.3.2 Sediment

Sediment samples were collected from drainage ditches, Pond East, Pond West A, and Pond West B during the SI and RSE activities and analyzed for firing range metals and SVOCs during the SI, and lead and arsenic during the RSE (Figure 6). SI and RSE sediment sample results were compared to ATF-specific background soil values, Ohio Sediment Reference values, USEPA residential soil RSL values, and USEPA ecological screening values (ESVs). Lead was detected only in Pond West A at concentrations exceeding the sediment SRV, soil background, and residential soil RSLs (Leidos 2020a). Dry sediment samples were evaluated as soil for locations in the Drainage Ditch and Pistol Range West EUs.

1.5.3.3 Soil

Soil samples collected during the RSE were analyzed for lead (and select metals) and/or PAHs (Figures 3, 4, and 5). SI and RSE sample results were compared to GRC-ATF-specific background values, USEPA residential RSLs, and USEPA ESVs. Soil sample locations and activities from the SI and RSE were aggregated into six EUs (Figures 3, 4, and 5) based on past use and geography, for the streamlined human health evaluation and ecological evaluation. Surface and subsurface soil COC exceedances above their residential RSL and/or background for each EU are summarized below (and discussed further in Section 1.5.3.5):

- Drainage Ditch – No COCs were identified in surface and subsurface soils.
- Former Clubhouse and Garage – No COCs were identified in surface and subsurface soils.
- Pistol Range East – Lead and antimony were detected at concentrations exceeding the residential RSL and/or background in surface soils. Lead was detected at concentrations exceeding the residential RSL in subsurface soil.
- Pistol Range West – Lead and antimony were detected at concentrations exceeding the residential RSL and/or background in surface soils.
- Rifle Range – Lead and benzo(a)pyrene (PAH) were detected at concentrations exceeding the residential RSL and/or background in surface soils. Lead was detected at concentrations exceeding the residential RSL in subsurface soils.
- Trap and Skeet Ranges – Lead, arsenic, antimony, and PAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) were detected at concentrations exceeding the residential RSL and/or background in surface soils. PAHs were detected at concentrations exceeding the residential RSLs in subsurface soils.

Table 1 presents the COCs per media at the ECCL Firing Range.

1.5.3.4 Groundwater

Twelve temporary monitoring wells were installed within and downgradient from the Trap and Skeet Range, Rifle Range, and Pistol Ranges to determine if contamination is present in groundwater. The temporary wells were constructed of 1-inch diameter polyvinyl chloride (PVC) casing with PVC screens ranging in lengths of 2 to 5 feet. Ten of the 12 wells did not yield groundwater, and the 2 wells that did yield groundwater (MW-9 and MW-12) were poor yielding. Groundwater samples collected were analyzed for metals (filtered and unfiltered) and PAHs (Figure 4). USEPA RSLs for residential exposure to tap water were used as conservative SLs for groundwater.

All of the analytical detections were below tap water RSLs. Therefore, no COCs were identified for groundwater.

1.5.3.5 COC Extent Delineation

The ECCL Firing Range COCs were identified based on streamlined risk assessment to establish the potential risk to human health and the environment in accordance with USEPA's Guidance on Conducting NTCRAs (USEPA 1993b). COCs were identified in surface (0 to 2 feet bgs) and subsurface (greater than 2 feet bgs) soils in the Pistol Range East, Pistol Range West, Rifle Range, and Trap and Skeet Range EUs. COCs were identified in sediment in the Pond West A EU only. COCs were not identified in groundwater or surface water. The COCs identified in each EU are summarized below:

- Pistol Range East Soil COCs
  - Lead was detected above its RSL (400 milligram per kilogram [mg/kg]) in 19 of 37 surface soil samples at concentrations ranging from 470 to 88,000 mg/kg in the target, berm, lateral berm, and high fire areas of the EU. Lead was detected in one of four subsurface soil samples at a concentration (1,700 mg/kg) above its RSL in the berm area of the EU.
  - Antimony was detected at concentrations (64 and 460 mg/kg) above background (9.3 mg/kg) and the RSL (31 mg/kg) at 2 locations (SL-155 and SL-152 within the upper soil interval of the berm). Antimony was either not detected or was detected below the background SL and RSL in the remaining 26 of 28 samples. The elevated concentrations of antimony were co-located with elevated detections of lead (17,000 and 35,000 mg/kg).
- Pistol Range West Soil COCs
  - Lead was detected in 26 of 45 surface soil samples at concentrations ranging from 460 to 29,000 mg/kg above its RSL in the floor, target, berm, lateral berms, and high fire areas of the EU. Lead was not detected in the subsurface soil samples above its RSL.
  - Antimony was detected above the RSL at 3 surface soil locations (SL-119, SL-121, and SL-231) at concentrations ranging from 53 to 57 mg/kg. Antimony either was not detected or was detected below the RSL in the remaining 36 of 39 samples. The elevated concentrations of antimony were co-located with elevated detections of lead (ranging from 7,200 to 29,000 mg/kg).
  - Copper was detected above the RSL (3,100 mg/kg) in 1 surface soil location (8,700 mg/kg at SL-115) within the discharge area of Pistol Range (West). Detected concentrations in the remaining 31 samples were below the RSL. Copper was identified as COC representing a potentially unacceptable risk to ecological receptors.
- Rifle Range Soil COCs
  - Lead was detected in 19 of 50 surface soil samples at concentrations ranging from 430 to 28,000 mg/kg above its RSL in the target, berm, and lateral berm areas of the EU. Lead was detected (at concentrations of 530 and 1,900 mg/kg) in 2 of 6 subsurface soil samples north of the berm above its RSL.
  - Antimony was detected above the RSL at 6 surface soil locations (SL-089, SL-090, SL-093, SL-095, SL-096, and SL-099) at concentrations ranging from 39 to 110 mg/kg. The elevated concentrations of antimony were co-located with elevated detections of lead.
- Trap and Skeet Soil COCs
  - Lead was detected above its RSL in 68 of 131 surface soil samples at concentrations ranging from 420 to 100,000 mg/kg.
  - The cPAHs benzo(a)pyrene, dibenz(a,h)anthracene, benz(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene were detected above RSLs at 12 to 29 of 112 surface soil locations.
  - Antimony was detected above the RSL at 13 surface soil locations (SL-009, SL-046, SL-047, SL-049, SL-051, SL-060, SL-069, SL-070, SL-074, SL-075, SL-076, SL-081, and SL-200) at concentrations ranging from 35 to 10,000 mg/kg. The elevated concentrations of antimony were co-located with elevated detections of lead (ranging from 2,600 to 100,000 mg/kg) or elevated concentrations of benzo(a)pyrene (41 mg/kg).
  - Arsenic was detected above the background screening criteria (36.5 mg/kg) at 13 surface soil locations (SL-009, SL-030, SL-046, SL-049, SL-051, SL-060, SL-069, SL-070, SL-074, SL-075, SL-076, SL-081, and SL-200) at concentrations ranging from 37 to 2,200 mg/kg.

The elevated concentrations of arsenic were co-located with elevated detections of lead (ranging from 3,000 to 100,000 mg/kg) or benzo(a)pyrene (41 mg/kg).

- Pond West A Sediment COCs
  - Lead and copper were detected above their RSLs in Pond West A sediments. However, the wetland at Pond West A is an Ohio Rapid Assessment Method Category 2, of moderate quality. Some remediation was necessary to reduce ecological risk from lead and copper but was balanced with habitat disturbance caused by the remediation. For this reason, only the southern pond area of Pond West A where the highest lead and copper detections occurred (including samples SDSW-017, SDSW-018, SD-028, and SD-029) was recommended for remediation.

Using the results of the COC extent delineation based on detailed risk-based evaluations, the extent of soil removal was calculated (Leidos 2020a) and the areas are depicted in Figures 3 to 5. Some of the locations within the removal extents (e.g., SL-199, SL-214, SL-215, SL-229, and SL-263) were not targeted for removal based on the detailed risk evaluation results; however, these locations were based on XRF screening data for shallower intervals not analyzed by the laboratory. The estimated volumes of soil, sediment, and construction debris to be removed from the ECCL Firing Range are presented in Table 3.

1.5.3.6 Soil Stabilization Study

During the RSE field investigation, representative samples of contaminated soils were collected for treatability studies in support of the Removal Action Work Plan (RAWP). Sample collection involved collecting approximately 0.67 cubic feet (ft^3) (5-gallon bucket) of contaminated soil from three elevated contaminated areas of the ECCL Firing Range. The three areas where the composite samples were collected were the Trap and Skeet Ranges (highest lead concentrations at the ECCL Firing Range), Pistol Range East impact berm, and Pistol Range West impact berm. The treatability study was conducted by mixing a specific volume of untreated sample with stabilization reagents at different dosing rates (percent by wet soil weight). The reagents evaluated include Free Flow 200®, Enviroblend® CS, and Calciment® (Dolomitic). After reagent mixing, the treated samples were analyzed for TCLP lead and total lead concentrations, and pH to determine the optimal dosage rate for each reagent. The results of the study indicated that all reagents were capable of reducing the leachability of lead below 5.0 milligrams per liter (mg/L), as determined by TCLP, enabling treated soils to be managed as solid nonhazardous waste (KEMRON 2019). The RSE cost evaluation concluded that onsite stabilization of excavated lead-impacted soils and sediment was the most effective and economical method to render the soil non-hazardous for disposal under Soil Disposal Option 1 (Alternative 2) (Leidos 2020a).

1.5.3.7 RSE RA Recommendations

In accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), an RA is selected when one or more of eight criteria (as listed in Section 300.415[b][2][i–viii]) are satisfied. At the ECCL Firing Range, the actual or potential exposure to contaminated soils and sediments in the EUs of concern (Pistol Range East and West, Rifle Range, Trap and Skeet Ranges, and Pond West A) creates site conditions that satisfy four criteria listed in the NCP. The RSE recommended an RA to minimize the risk and hazard associated with soil and sediment contamination (primarily lead and cPAHs) in the EUs to protect human and ecological receptors.

The RSE human health risk evaluation identified eight COCs in soil: antimony; arsenic; lead; and five cPAHs, including benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. Copper was also identified as above the preliminary remedial goal (PRG) in soil and sediment for the protection of wildlife. Two detections of copper, sampled within the discharge area

of the Pistol Range (West), resulted in potential unacceptable risk to wildlife. Soil remediation to protect ecological receptors was recommended for the Pistol Range West. However, removal of lead and benzo(a)pyrene for human health receptors would also secondarily protect ecological receptors. These COCs formed the basis for evaluation of soil remedial activities within the framework of the RSE.

The RSE identified and evaluated potential RA alternatives to reduce or eliminate soil and sediment contamination at the ECCL Firing Range and to determine the selected RA alternative. The selected RA is to remove soils and sediment in the EUs of concern such that the RGs that are composed of USEPA residential RSLs (USEPA 2019) or background SLs (IT 1998) are attained for the COCs, thereby allowing potential future unrestricted reuse at the ECCL Firing Range. Table 2 presents the soil and sediment RGs for the ECCL Firing Range. The RG for lead was conservatively set at the residential soil RSL of 400 mg/kg rather than the 95 percent upper confidence limit (95UCL) of exposure point concentrations for lead. The Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) used to calculate the RSL recommends use of the arithmetic average concentration as the exposure point concentration (EPC) for lead in soil (rather than the 95UCL). Therefore, if the arithmetic average lead concentration in an area is less than 400 mg/kg upon completion of remediation, remediation will be considered complete. The RG for cPAHs was conservatively set at the residential soil RSL for benzo(a)pyrene of 1.1 mg/kg. If the calculated EPC (i.e., the 95UCL) of antimony, arsenic, or copper in an area is less than the residential RSL (for antimony and copper) or background SL (for arsenic), remediation will be considered complete. If, upon completion of remediation, the calculated EPC (i.e., the 95UCL benzo[a]pyrene equivalent concentration [BaP_{eq}]) in an area is less than 1.1 mg/kg, remediation will be considered complete. The concentration of cPAHs will be converted to a BaP_{eq} using the following equation: To attain the RGs for antimony, arsenic, and copper, the 95UCL EPC COC concentrations within each EU must be below the 2022 residential RSL for antimony and copper, or background SL for arsenic (Table 2) (Leidos 2021).

$$BaP_{eq} = \sum(PAH_i * RPF)$$

where

BaP_{eq} = Benzo(a)pyrene equivalent concentration for total cPAHs.

PAH_i = Concentration of individual cPAH COCs (i.e., benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene).

RPF = Relative Potency Factor for each cPAH compared to benzo(*a*)pyrene from Table 8 of *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons* (USEPA 1993):

cPAH	RPF
Benz(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Dibenz(a,h)anthracene	1
Indeno(1,2,3-cd)pyrene	0.1

The Removal Action Objectives (RAOs) identified in the RSE (Leidos 2020a) are as follows:

- Minimize the risk associated with exposure to soil contamination (lead and cPAHs) in and around the Pistol Range East, Pistol Range West, Rifle Range, and Trap and Skeet Range to protect human and ecological receptors (Figures 3 to 5); and
- Minimize the risk associated with exposure to sediment contamination (lead) in and around Pond West A (Figure 6).

To meet the RAOs, the RSE evaluated the three potential RA alternatives below for mitigating the COCs in impacted soils and sediment. The ECCL Firing Range RSE recommended Alternative 2 (Leidos 2020a):

- Alternative 1: No action;
- Alternative 2: Excavation, Onsite Treatment, and Offsite Nonhazardous Waste Disposal (*Soil Disposal Option 1*); and
- Alternative 3: Excavation and Offsite Hazardous Waste Disposal (*Soil Disposal Option 2*).

1.5.4 ECCL Firing Range Removal Action Kick-Off Meeting

On October 29, 2019, a kick-off meeting was conducted to discuss major elements of the RA approach, including:

- CERCLA NTCRA process;
- Overview of ECCL Firing Range location on GRC-ATF and features;
- Previous investigations;
- COCs and extents of contamination; and
- Recommended RA, construction approach, site restoration, and confirmation and verification sampling.

Representatives from NASA GRC, Leidos, and Arrowhead attended the kick-off meeting. The results of the discussions and decisions agreed to during the meeting were presented in the RA Work Plan (Leidos 2021), where appropriate.

1.5.5 Action Memorandum

In July 2020, the Action Memorandum requested and documented NASA's approval of the selected NTCRA of antimony-, arsenic-, lead-, and PAH-contaminated soil and lead-contaminated sediment within the ECCL Firing Range under its delegated authority under CERLCA (Leidos 2020b). The Action Memorandum is the primary decision document in establishing the Administrative Record for selecting the NTCRA responses per Section 113(k) of CERCLA.

Section 113(k)(2) of CERCLA provides for involving communities affected by response decisions at Superfund sites. To ensure public involvement of this NTCRA, NASA issued a notice of availability for the RSE Report (Leidos 2020a) on May 4, 2020, seeking public input of the final remedy selection. The notice of availability was published in the local newspaper, the *Sandusky Register*, on the same date mentioned above. The RSE Report and other project-related documents were made available to the public in the Information Repository maintained at the Bowling Green State University (BGSU) Firelands Library located at 1 University Drive, Huron, Ohio. No written comments were received during the public comment period, as documented in the Action Memorandum.

1.5.6 Public Forum

NASA and Leidos co-hosted a virtual public forum on July 27, 2021. Leidos prepared the presentation to present the NTCRA and project schedule. In addition, Leidos prepared a factsheet that was posted to the GRC-ATF Restoration Program website. A public notice was published in the local newspaper, the *Sandusky Register,* on July 10-11, 2021 and July 17-18, 2021 to announce the public forum and solicit public comments or questions. One public comment was received regarding seeding specification,

recommending the use of a native prairie grass seed, specifically Indiangrass. The RA Work Plan was revised in August 2021 to incorporate the recommended native seed mixture and seeding method (Leidos 2021).

1.5.7 Removal Action Objectives

To achieve the RAOs defined by the RSE (Leidos 2020a) and Action Memorandum (Leidos 2020b), the average lead soil concentration, and calculated EPC (i.e., the 95UCL) for antimony, arsenic, copper, and BaP_{eq} within each EU must be below the RGs, as listed in Table 2. The NTCRA will allow potential future unrestricted reuse at the ECCL Firing Range.

1.6 REPORT ORGANIZATION

This report is organized into the following sections:

- ***Section 1. Introduction***—This section states the scope of the NTCRA and describes the site and its operational and incident investigation history.
- ***Section 2. Site Preparation***—This section describes the site preparation activities prior to implementing the NTCRA.
- ***Section 3. RA Activities and Results***—This section describes the cleanup objectives, activities associated with the trap and skeet range soil excavation, earthen backstop soil removal and hotspot soil excavation, soil treatment, sediment removal and solidification, disposal of soil and sediment, and construction debris recycling.
- ***Section 4. Waste Management***—This section describes the wastes generated during the cleanup and the disposal methods for those wastes.
- ***Section 5. Recordkeeping and Reporting***—This section addresses the records maintained onsite and the Daily QC Reports and GRC Construction Stormwater Site Inspection Forms submitted to GRC's Environmental Management Office during the NTCRA.
- ***Section 6. Project Completion Criteria***—This section discusses whether the project completion criteria were achieved by the RA activities conducted at the ECCL Firing Range.
- ***Section 7. References***—This section includes documentation cited in this report.
- ***Appendices A through L*** present documentation from NTCRA implementation.
    - Appendix A: Permits and Approvals
    - Appendix B: Field Change Requests
    - Appendix C: Daily Quality Control Reports
    - Appendix D: Stormwater Inspection Reports
    - Appendix E: Laboratory Analytical Reports
    - Appendix F: Data Validation Checklists
    - Appendix G: ProUCL Input and Output Data
    - Appendix H: Survey Data
    - Appendix I: Waste Manifests and Profiles
    - Appendix J: Photograph Log
    - Appendix K: Dust Monitoring Results
    - Appendix L: X-Ray Fluorescence Screening Data

2. SITE PREPARATION

This section summarizes construction mobilization activities conducted during implementation of the NTCRA, including permit/notification requirements and site preparation activities. All activities were documented in Daily QC Reports (Appendix C).

2.1 PERMIT AND NOTIFICATION REQUIREMENTS

NASA coordinated and consulted with the applicable permitting authorities to facilitate the identification and compliance of federal and state applicable or relevant and appropriate requirements (ARARs). Based on a review of applicable requirements, the following notifications and consultations were required prior to the NTCRA:

- A wetland delineation completed in July 2019 is documented in the *Final Wetland and Other Waters Delineation Report, NASA Plum Brook Station, ECCL Firing Range Site Project located in Perkins Township, Erie County, Ohio* (EnviroScience 2019). Consultation with U.S. Army Corps of Engineers (USACE) determined no jurisdiction for Pond A West but did determine jurisdiction for Dautch Ditch. Dautch Ditch, which transects ECCL, was a temporarily impacted waterway as part of the NTCRA. NASA was returning Dautch Ditch to pre-existing conditions (i.e., natural grading and backfilling with hydric soil); therefore, no additional requirements were added by USACE.
- Consultation with Ohio EPA to determine the appropriate compensation of 0.6 acres in wetland banking credits and other requirements, as Pond A West (southern portion) will be the only temporarily impacted wetland. Prior to beginning remedial work at Pond West A, NASA obtained Wetland Mitigation Credits (Appendix A) since the field team would be placing concrete blocks into the pond as a means to temporarily support equipment (i.e., pump and excavator).
- Consultation with the U.S. Fish and Wildlife Service (USFWS) for tree clearing at a facility where a protected species was identified in previous surveys (Attachment B of the RA Work Plan [Leidos 2021]). The identified species are the federally endangered Indiana bat (*Myotis sodalis*) and the federally threatened northern long-eared bat (*Myotis septentrionalis*).
- Ohio State Historical Preservation Office Consultation (Attachment 1 of the Final Action Memorandum [Leidos 2020b]).
- The Nottawaseppi Huron Band of Potawatomi, the Forest County Potawatomi Community of Wisconsin, and the Miami Tribe of Oklahoma also were consulted pursuant to Section 106 of the National Historic Preservation Act (Attachment 1 of the Final Action Memorandum [Leidos 2020b]).
- Excavation Competent Person submittals, which include GRC Excavation 101 Training (Appendix A.2).
- Health and Safety Plan (HASP) Approvals by SHeD (Appendix A).
- NASA GRC Excavation Permits (Appendix A.1).
- Facility and Transporter Requests (Appendix A.8).
- Stormwater Pollution Prevention Plan (Leidos 2021) was approved by NASA GRC Stormwater Program Lead on January 9, 2020 (Appendix A.4).
- Email approving contractor to remove stormwater best management practices (BMPs) (Appendix A.14).

- Stormwater Stabilization Approval documenting 70% vegetation coverage at ECCL email was received on June 28, 2023 (Appendix A.16).

Permit and consultation requirements were fulfilled prior to initiation of field activities. A pre-construction meeting was held on July 28, 2021 to inform all parties that field implementation would start on August 9, 2021. Attendees included NASA representatives, Arrowhead, and Leidos.

Excavation permit extensions for re-clearing, soil removal, sediment removal, and site restoration activities were submitted and approved by NASA Facilities Division every three months (Appendix A.1).

2.2 MOBILIZATION AND SITE PREPARATION

Arrowhead mobilized in February 2020 for initial site clearing. The second mobilization occurred in August 2021 after a stop-work was issued due to the COVID-19 pandemic, when Arrowhead began preparing the site for the remedial tasks. Site preparation activities included:

- Placing support facilities onsite,
- Installing stormwater controls (e.g., silt socks and earthen berms) (two phases),
- Implementing site access controls,
- Clearing (two phases),
- Identifying utilities,
- Installing dust screen,
- Implementing dust and wind controls, and
- Implementing good housekeeping practices.

Site preparation tasks are discussed in more detail below.

2.2.1 Support Facilities

Support facilities placed onsite starting on August 9, 2021 included:

- Sanitary facilities,
- Field office trailers,
- Equipment trailer,
- Stabilized soil stockpile area, and
- Equipment staging area.

2.2.2 Stormwater Controls

Stormwater controls were established in accordance with the RAWP (Section 3.3 and Attachments A [Stormwater Pollution Prevention Plan (SWP3)] and C) (Leidos 2021). These stormwater controls included:

- Silt socks, and
- Temporary earthen berms.

Silt socks were installed and maintained around all disturbed areas to minimize erosion and sediment runoff following both phases of clearing. Additional work was required to prepare the site for remedial activities in August 2021. Site preparation was complete in February 2020 prior to NASA's onsite restrictions for COVD-19 safety work stoppage. Upon return to work, the site vegetation had overgrown and all sediment and erosion control measures needed to be replaced. Silt socks were installed and maintained around all disturbed areas to minimize erosion and sediment runoff following both phases of clearing. When feasible, existing vegetation was not disturbed. In addition, to minimize the potential for erosion and sediment runoff, no work will be conducted during periods of inclement weather.

Adjacent to the former clubhouse, a stabilized soil stockpiling area was constructed by Arrowhead to stage treated soil excavated from the trap and skeet range prior to being loaded into on-road haul trucks (Figure 7). This area was bound by an earthen berm to collect any water that may have contacted contaminated soil.

The Arrowhead Site QC Manager or Site Supervisor inspected the stormwater controls weekly and documented the findings on the Stormwater Inspection Reports (Appendix D). These stormwater controls were inspected daily and repaired as needed. Stormwater controls also were inspected within 24 hours of a 0.5-inch storm event or 2-inch snowmelt. NASA also conducted monthly stormwater controls inspection and informed Arrowhead of any required corrective action. Per NASA request, Leidos performed weekly site check inspections from May to September 2022 (Appendix D).

Arrowhead placed secondary containment underneath the 800-gal diesel fuel AST and the mobile generator powering the Calciment bulk storage tank's blower system in accordance with NASA GRC-ATF Integrated Contingency Plan (i.e., spill plan) requirements. In addition, monthly inspections and stormwater discharge inspections of the secondary containments underlying the diesel fuel AST and mobile generator were performed by the Arrowhead Site QC Manager (Appendix D).

2.2.3 Site Access Controls

Arrowhead installed a perimeter fence in February 2019 to restrict public access. The northern and southern fence consisted of wire fencing while the eastern fence consisted of 8-ft tall chain-link construction. A Field Change Request (FCR) was approved for tie-in of the woven wire fence to the existing GRC-ATF perimeter fence (Appendix B). Excavation areas and stabilized soil stockpile areas specified in the RAWP (Leidos 2021) were cordoned off using orange plastic fencing during the week of August 9, 2021. Signs were posted at the entrance to the construction areas to prevent unauthorized personnel from entering the site. Site workers and visitors were required to sign-in for a health and safety briefing that was updated on a daily basis.

2.2.4 Clearing

Clearing was conducted in accordance with the RAWP (Leidos 2021). Arrowhead performed tree clearing and additional brush clearing in February 2020 to comply with USFWS requirements and to facilitate equipment access, soil removal and stabilization, and berm removal. Approximately 387 trees with diameters equal to or greater than 3 inches at breast height were felled to remove potential roosting trees prior to the restricted time (between April 1 and September 30) and to assist in the soil excavation and removal activities. The tree tracking log is presented in Appendix A. A total of 48 trees were left in place in the northwestern portion of the trap and skeet range (Appendix A). Grubbing was not necessary for this project and was not performed. Felled large tree segments were cut to short firewood sections (i.e., 2- to 3-foot length) and transferred to the designated firewood staging area, as coordinated with the NASA Construction Manager. Smaller tree segments were recycled into chipped wood mulch product and left

onsite as ground cover. Tree stumps and associated roots within the remedial construction footprint were broken up and placed in haul trucks and disposed at Erie County Landfill.

Additional site re-clearing (i.e., mowing) was performed by Arrowhead during the week of August 9, 2021.

2.2.5 Temporary Haul Road

Three stabilized construction entrances leading from Fox Road were constructed in August 2021 per the RAWP (Leidos 2021). A temporary haul road was extended to the stabilized soil stockpile areas, Calciment bulk storage tank and field trailers. Stone (American Association of State Highway and Transportation Officials [AASHTO] No. 2 and No. 57) and a non-woven geotextile fabric (e.g., Ohio Department of Transportation 712.09 Type D) were placed to facilitate the loading of on-road haul trucks. The construction entrances and temporary haul roads were maintained throughout the project (e.g., stone was kept on the fabric and free of mud) to allow equipment to traverse safely and efficiently. The construction entrances were left in place during site restoration in August 2022. Portions of the temporary roads near truck loading areas were removed and was transported under nonhazardous manifest to Erie County Landfill for disposal (Appendix I).

2.2.6 Utility Clearance

In accordance with the *NASA Glenn Research Center Safety Manual* (NASA 2021), a utility clearance was conducted within the limits of the construction area at ECCL Firing Range prior to excavation activities. Existing utilities were identified with fluorescent spray paint.

Arrowhead coordinated with NASA to obtain the required utility clearance and excavation permit prior to commencing intrusive field activities. Ohio Utility Protection Services (OUPS) was responsible for underground utility clearance for excavations, and sample locations because ECCL is located outside the NASA GRC-ATF perimeter fence. OUPS was contacted at least 48 hours but no more than 10 days prior to commencing intrusive work.

Arrowhead installed signage and barriers to prevent equipment and trucks from contacting the overhead power lines in the former Clubhouse area (construction laydown area).

2.2.7 Dust and Wind Controls

Dust monitoring was conducted in accordance with the Arrowhead HASP (Leidos 2021), which was reviewed and approved by the NASA Glenn Safety Office. Dust suppression techniques (e.g., wetting) were employed during excavation of soils when visible dust was observed.

All excavations, haul routes, permanent access roads, waste areas, and all other work areas within the project boundaries were maintained free from dirt that could cause a dust hazard or nuisance. Arrowhead installed a dust screen with 85 percent blockage on the eastern perimeter fence (installed in February 2019) prior to excavation activities (Appendix A). A dust monitor (DustTrak™) was used by the Arrowhead Site Safety and Health Officer to monitor fugitive dust during soil excavation, soil stabilization mixing, and screening. Dust controls were maintained by keeping traffic on improved roads, maintaining a 10-mile per hour speed limit on roads near the project site, and applying water as required. If fugitive dust exceeded calculated action limits for respirable dust (i.e., greater than or equal to 0.15 milligrams per cubic meter [mg/m^3] for the Trap and Skeet Ranges and 0.4 mg/m^3 for the Rifle and Pistol Ranges, for more than 1 continuous minute), water spraying/misting was used for dust control, as required by the Arrowhead Health and Safety Plan. Arrowhead obtained potable water from Erie County

or NASA hydrants located along Fox Road. The Daily QC Reports indicated action limits were not exceeded during the NTCRA activities. The monitoring data are presented in Appendix K. In addition, the Arrowhead Site Safety and Health Officer daily conducted visual inspections for visible fugitive dust emissions during normal representative operating conditions.

In addition, Arrowhead conducted personal air monitoring for lead during the soil removal activities in accordance with the Arrowhead HASP. The samples were analyzed by ALS Environmental. The Permissible Exposure Limit for lead is time-weighted average of 0.05 mg/m^3. There were no exceedances and no additional controls or personal protective equipment (PPE) were necessary. Appendix E presents the laboratory data reports for the personal air monitoring samples.

2.2.8 Good Housekeeping Practices

Good housekeeping practices were conducted throughout remediation activities to maintain a clean and orderly work environment. These practices included:

- Using an on-site project dumpster (tarped) to manage sanitary trash, equipment, and spill equipment;
- Ensuring spill cleanup procedures were understood and performed by employees and subcontractors;
- Regularly picked up and disposed of garbage and waste material;
- Routinely inspected for leaks or conditions that could lead to discharges of petroleum or chemicals, or contact of stormwater, with raw materials, intermediate materials, waste materials, or products;
- Performed preventive maintenance on equipment to ensure its proper operation and to detect any potential leaks before they occur; and
- Routinely inspected the public roadway for soil and sediment.

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3. REMOVAL ACTION ACTIVITIES AND RESULTS

This section describes soil excavation, stabilization, and removal activities that were conducted in support of the NTCRA executed at ECCL Firing Range:

- Removal of impacted soils at the Pistol Ranges, Rifle Range, and the Trap and Skeet Range;
- Removal of the concrete block retaining wall behind the Rifle Range backstop berm;
- Dewatering of the southern portion of Pond West A;
- Sediment removal from the southern portion of Pond West A;
- Sediment removal from Dautch Ditch;
- Stabilization of lead-impacted soils and sediment, removal, and load-out activities;
- Removal and disposal of construction debris;
- Surveying; and
- Equipment decontamination.

Excavation activities were performed in accordance with the RAWP (Leidos 2021), Arrowhead QC Plan (Arrowhead 2020), and Arrowhead Health and Safety Plan (Leidos 2021). The Arrowhead Health and Safety Plan contained procedures that ensured project worker safety. The procedures complied with 29 Code of Federal Regulations 1926, Subpart P (Safety and Health Regulations for Construction, Excavations) and the NASA GRC Safety Manual (NASA 2021), and NASA GRC Construction Contractor Manual (NASA 2017). Arrowhead and Leidos each provided a NASA-approved Competent Person for excavation work, who inspected the open excavation areas daily to ensure safety around the excavations (Appendix A).

3.1 SOIL EXCAVATION, STABILIZATION, REMOVAL, AND LOAD-OUT ACTIVITIES

Soil removal and treatment activities began the week of August 16, 2021 in the trap and skeet range followed by Rifle and Pistol West/East ranges. Multiple large, tracked excavators were used for the soil removal and treatment process. Arrowhead initially used a large offroad haul truck to transport soil from the Trap and Skeet Range into the Stabilized Soil Staging Area (Figure 7); however, the offroad haul trucks were becoming stuck and were degrading site conditions due to their large tires and the wet soil. Arrowhead mobilized a smaller, tracked "carrier" truck that reduced ground disturbance and increased traction. The final removal of soil and sediment from ECCL took place in August 2022 with the final load of sediment from the remediation of Pond A being hauled to Erie County Landfill on August 16, 2022. The total weight and volume of soil and sediment removed from the site are presented in Table 3.

3.1.1 Trap and Skeet Ranges Excavation Activities

The soil at the Trap and Skeet Ranges (Figure 7), including Dautch Ditch dry sediment, was excavated to a depth ranging from 1 to 2 feet bgs (or bedrock refusal), stockpiled in adjacent sample grid (300-600 cubic yards [CY]), treated (if lead contaminated), transferred to the stabilized soil stockpile area (if below TCLP lead limit), and loaded into dump trucks for offsite disposal. The excavation limits are summarized below:

- Lead fallout zones (northern zone) were excavated to a depth ranging from 1 to 1.5 feet bgs over an approximately 468,464-ft^2 area,

- Lead and cPAHs fallout zone (central zone) were excavated to 1.5 to 2 feet bgs over an approximately 72,353-ft^2 area,
- cPAHs discharge areas (southern zone, excluding hot spots) were excavated to 1.5 feet bgs over an approximately 64,467-ft^2 area, and
- cPAHs hot spot area around location SL-176 (west of Dautch Ditch in the skeet debris area) were excavated to a depth of 2 feet bgs over an approximately 1,199-ft^2 area.
- Overdigs were performed in several areas around the Trap and Skeet Range based on XRF and verification sample exceedances. The overdigs are outlined in Figure 7 and are summarized as follows:
    - The west wall of grid 60 and the northern portion of grid 60 floor (1.5 feet bgs) due to XRF exceedances.
    - A portion of the grid 91 wall due to XRF exceedances.
    - The southwest corner wall of the cPAH removal area near the burned trap house due to remaining skeet debris.
    - The east wall of grids 75 and 90 due to XRF exceedances.
    - The east wall of grid 44 due to a lab sidewall verification sample exceedance.
    - The northeast wall of grids 6, 16, and 29 due to a verification sample and XRF exceedance.
    - A floor overdig (2 feet bgs) as part of grids 25, 26, 40, and 41 due to an XRF exceedance at floor verification point 349.
    - Floor overdigs (1.5 feet bgs) in portions of grids 10, 21, 22, 34, 35, 36, 37, 49, 50, 51, 52, 53, 68, and 69.

The lateral and vertical extent of excavation was guided by XRF screening as discussed in Section 3.6.1. The work plan originally estimated a total of 40,066 tons to be removed; however, approximately 38,988 tons of lead-contaminated soil were generated and stabilized (Section 3.1.5) from the Trap and Skeet Ranges which included overdigs based on XRF and verification sampling results. Approximately 6,749 tons of PAH-contaminated soil were generated but did not require stabilization treatment.

3.1.2 Rifle Range Excavation Activities

The Rifle Range soil excavation activities (Figure 8) began with the removal and segregation, as needed, of the top 6 feet of the approximately 5,042-ft^2 earthen backstop berm. Following the removal of the Rifle Range berm soils, the concrete block retaining wall was removed from the backstop berm (Section 4.2.2). Once confirmed that contaminated berm soils have been removed, staged in temporary stockpile area within the range floor (FCR-007), and treated to render the soils non-hazardous, the approximately 3,325-ft^2 target area was excavated to the required depth of 1.5 feet bgs and treated within the target area's footprint.

Overdigs were performed within the berm and floor of the rifle range to lab verification sample and XRF exceedances. The overdigs are outlined in Figure 8 and are summarized as follows:

- A portion of the western end of the Rifle Range berm was overdug approximately 6 feet due to a lab verification sample exceedance.
- A portion of the east, central end of the Rifle Range berm was overdug approximately 6 feet due to a lab verification sample exceedance.

- An overdig in the center of the soil removal area floor (2 feet bgs) was performed due to XRF exceedance.
- The western, southern, and eastern walls of the soil removal area were overdug (~5-15 feet outward) due to XRF exceedances.

The lateral and vertical extent of excavation was guided by XRF screening as discussed in Section 3.6.1. The work plan originally estimated a total of 1,829 tons to be removed; however, approximately 2,857 tons of lead-contaminated soil were generated and stabilized (Section 3.1.5) from the Rifle Range which included overdigs based on XRF and verification sampling results. The final extent of the excavated berms at the Rifle Range prior to backfill and grading is shown in Figure 8.1.

3.1.3 Pistol Range West Excavation Activities

The Pistol Range West soil excavation activities (Figure 8) began with the removal and segregation, as needed, of the earthen backstop berms and then proceed with the adjacent target and discharge areas. The top 3.5 feet of the berm was removed over an approximately 8,807-ft^2 area. Once confirmed that contaminated berm soils have been removed, staged in temporary stockpile area within the range floor (FCR-007, Appendix B), and treated to render the soils non-hazardous, the target and discharge areas was excavated to 1 to 2 feet bgs over approximately 3,218- and 1,414-ft^2 areas, respectively. The target area soil was treated onsite to render the soil non-hazardous. Two hot spot locations (SL-115 and SL-117) were located in the discharge area (also gravel laden with spent casings); no treatment was required.

Overdigs were performed within the berms and floor of the Pistol Range West due to lab verification sample and XRF exceedances. The overdigs are outlined in Figure 8 and are summarized as follows:

- The western wall/floor of the berm was overdug approximately 3-10 feet to the west and north due to XRF exceedances.
- The floor of the soil removal area of was overdug to 2 feet bgs due to the presence of bullets and casings.
- The southern wall of the soil removal was overdug approximately 25 feet to the south due to the presence of bullets and casings.
- The western wall of the hotspot soil removal area was overdug approximately 15 feet west and the eastern wall was overdug approximately 10 feet east.
- Two areas of the berm, one in the center and one in the southeastern portion were overdug to approximately 6 feet below original berm surface due to XRF exceedances.
- The toe of the Pistol Range West berm was scraped up to a new toe on the northern and western side ranging from approximately 5-20 feet inward.

The lateral and vertical extent of excavation was guided by XRF screening as discussed in Section 3.6.1, and visual observations of additional bullet casings in the target and discharge area. The work plan originally estimated a total of 1,905 tons to be removed; however, approximately 2,361 tons of lead-contaminated soil were actually generated and stabilized (Section 3.1.5) from the Pistol West Range which included overdigs based on XRF and verification sampling results. The final extent of the excavated berms at the Pistol Range West prior to backfill and grading is shown in Figure 8.2.

3.1.4 Pistol Range East Excavation Activities

The Pistol Range East soil excavation activities (Figure 8) began with the removal and segregation, as needed, of the earthen backstop berms and then proceed with the adjacent target and discharge areas. The

top 6 feet of the berm was removed over an approximately 6,070-ft^2 area. Once confirmed that contaminated berm soils have been removed, staged in temporary stockpile area within the range floor (FCR-007, Appendix B), and treated to render the soil non-hazardous, the target area and discharge area (gravel laden with spent casings) was excavated to 1.5 feet and 1 foot bgs over approximately 312- and 1,071-ft^2 areas, respectively. The target area soil was treated onsite to render the soil non-hazardous; no treatment was required for the discharge area (debris removal only [i.e., gravel laden with spent casings]).

Two hot spot locations (SL-157 and SL-252) behind the backstop berm was excavated to 1 foot bgs over an approximately 646-ft^2 area. The hot spot soil was treated onsite to render the soil non-hazardous.

Overdigs were performed within the berms and floor of the Pistol Range West due to lab verification sample and XRF exceedances. The overdigs are outlined in Figure 8 and are summarized as follows:

- The toe of the Pistol Range East berm was scraped up to a new toe on the northern and eastern side ranging from approximately 5 to 15 feet inward.
- A portion of the eastern wall of the berm was overdug approximately 5 feet due to an XRF exceedance.
- The floor of the soil removal area was overdug to 1.5 ft bgs due to XRF exceedance.

The lateral and vertical extent of the excavations was guided by XRF screening as discussed in Section 3.6.1. The work plan originally estimated a total of 1,665 tons to be removed; however, approximately 2,000 tons of lead-contaminated soil were generated and stabilized (Section 3.1.5) from the Pistol East Range which included overdigging based on XRF and sampling results. The final extent of the excavated berms at the Pistol Range East prior to backfill and grading is shown in Figure 8.2.

3.1.5 Stabilization Activities

A stabilization agent staging area was constructed in the construction laydown area to allow easy access to the agent while stabilizing soils. The stabilization agent was staged in an area that was relatively flat and level. The Calciment was delivered in bulk tanker trucks and added to a 125-ton bulk storage tank with onboard blower equipment, powered by a mobile generator. The Calciment was transferred into a rock box that was carried by the excavator to the applicable stockpile undergoing treatment. Enviroblend CS® and Envirophos were delivered in 1-ton supersacks staged on pallets and tarped to keep dry. The stabilization agent staging area was surrounded by sediment controls. A total of 2,340 tons of Calciment, 410 tons of Enviroblend, and 22 tons of Envirophos were used during the project.

Soil characterized as hazardous for lead was stabilized (i.e., treated) with Calciment (6 to 10 percent), or EnviroBlend CS® (at a dosage rate of approximately 2 to 3 percent) (FCR-005, Appendix B) using an excavator bucket within the adjacent grid (Figure 7) or temporary bermed stockpile areas (Figure 8). Mixing continued until the stabilization agent was thoroughly incorporated into the soil. Each stabilized stockpile (300-600 CY) had a composite confirmation sample collected (Section 3.5). Initially, ECL only allowed for samples to be collected every 300 CY, but then later approved samples to be collected for up to every 600 CY. All stabilized soil stockpiles met waste disposal facility criteria (i.e., rendered non-hazardous for lead). Several stockpiles were retreated with Calciment, Enviroblend CS® or EnviroPhos (Table 4). Initially, only Calciment was used, however it was later determined that Calciment was not effective on all soil types at the site, particularly sand-dominant soils. Envirophos was used on stockpiles previously treated with Calciment that failed TCLP analyses multiple times, and Enviroblend was used in place of Calciment for the remainder of the project. More information regarding selection and use of the three amendments is available in Section 3.5.

The results of laboratory analyses specified by the designated disposal site were forwarded to document the material meets the facility's waste acceptance criteria of TCLP lead concentrations below 5 parts per million (ppm). Each stabilized stockpile in the trap and skeet range was transferred into the Stabilized Soil Staging Area. The Pistol Ranges stabilized stockpiles were transferred to the Rifle Range stockpile once approved by the landfill. The stabilized soil was removed from the Stabilized Soil Staging Area or Rifle Range stockpile area, and subsequently transported by Queens Trucking, LLC to a licensed off-site disposal facility (Erie County Landfill). A total of 47,251 tons of treated soil (lead- and PAH-contaminated soil) were disposed of. The waste manifests and profile are included in Appendix I.

3.2 POND WEST A SEDIMENT EXCAVATION ACTIVITIES

3.2.1 Site Preparation and Dewatering

Prior to beginning remedial work at Pond West A, NASA was required to obtain Wetland Mitigation Credits since the field team would be placing concrete blocks into the pond as a means to temporarily support equipment (i.e. pump and excavator). Wetland Mitigation Credits were requested and obtained through payment to The Nature Conservancy and North Coast Regional Council of Park Districts. A total of 0.6 wetland mitigation credits were reserved; documentation is provided in Appendix A.12. Once NASA had received the required wetland credits and the Ohio EPA approved the wetland credits, the stop work for Pond West A work was lifted on April 20, 2022 per an email received from contracting officer Carlos Flores (Appendix A). Although stop work was lifted, the field team decided to delay Pond West A work until the 2022 dry season (late July early August) when the pond level would be lower and access would be easier.

Arrowhead and Leidos remobilized to ECCL Firing Range on July 25, 2022 to begin work required prior to Pond West A sediment removal and site restoration preparation. The rifle berm and concrete blocks remained adjacent to the pond and prevented equipment access. Arrowhead first removed the remaining rifle berm material for use as backfill in the Trap/Skeet area. Several concrete blocks that were stacked behind the berm, between the berm and pond, were then lifted with the excavator, placed on wooden pallets, and moved to a staging area with the skid-steer. Approximately 10 concrete blocks were left for use in the pond during pumping and sediment removal.

Once all the rifle berm soil and blocks had been removed from the work area, a large trailer mounted trash pump was placed into Pond West A and supported with the 10 remaining concrete blocks. Hoses were placed from Pond West A to Pond West B and a large dewatering filter bag (50 micron) was secured to the end of the hose discharging to Pond West B. The filter bag was placed on the southern shore of Pond West B to allow for sufficient flow area and prevent generating any unwanted turbidity. Pumping began on August 2, 2022 and continued for several days with the pump only being run during on-site work hours. Filter bags were changed as necessary if they became clogged with sediment. All water from Pond West A (southern portion) was added to Pond West B.

3.2.2 Sediment Excavation, Solidification, and Disposal

A long-arm excavator was delivered to the site on August 5, 2022 and was used for excavation, stockpiling, and mixing of the pond sediment. Excavation and stockpiling of sediment continued August 8-10, 2022. All sediment was removed down to bedrock refusal and stockpiled near the southern shore of Pond West A where it would be blended with QUICKLIME for solidification. Therefore, no sediment verification samples were able to be collected. Per FCR-008 (Appendix B), QUICKLIME was determined to be the solidification material based on bench testing performed by Mintek Resources. Bench testing results indicated that QUICKLIME should be added at a rate of 10% by dry weight to the sediment. Mintek also indicated that less QUICKLIME could be used if enough pumping and draining/air drying of

the wet sediment could be performed. Twenty-eight 1-ton super sacks of QUICKLIME were delivered to use for solidification of the saturated sediment. Based on visual inspection of the solidification process, a total of 27 tons (27 supersacks) of QUICKLIME were added and mixed into the sediment. The remaining supersack was used to help solidify the haul road for dump truck access.

Hauling of solidified sediment from Pond West A began on August 11, 2022. Initially, one Queens Trucking dump truck (contracted from Petty Farms) was used to haul soil to Erie County Landfill (ECL). A second Queens dump truck was brought in on August 16, 2022 to help complete the hauling of sediment to the landfill. The trucks were weighed on-site with a mobile scale and manifested after each load and prior to departure for the landfill. Each manifest was spot-checked by Arrowhead and Leidos prior to the load leaving the site. A total of 479 tons of solidified Pond West A sediment was transported to ECL for disposal. Waste manifests are presented in Appendix I.

3.3 CONSTRUCTION DEBRIS REMOVAL AND LOADOUT ACTIVITIES

Construction and metal debris, including the concrete retaining blocks behind the Rifle Range backstop berm and the old fencing, gates, and signage at the Fox Road entrance to the Rifle and Pistol Ranges, were removed as nonhazardous, construction debris and reused/recycled, if possible, in accordance with NASA GRC's sustainability goal. Other debris materials were disposed of as non-hazardous construction debris waste at ECL. When sediment removal was completed, the 65 concrete blocks were transported by Barnes Nursery haul trucks for reuse (traffic control barriers) by ECL in Milan, Ohio. A total of 102.63 tons of concrete debris was recycled. The bills of lading are presented in Appendix I. Various construction debris was gathered from around the site and segregated into a roll-off container for nonmetal construction debris (various sewer and drainage piping materials, wood boards, dust screens, exclusion zone fencing, damaged sediment controls) or into a scrap metal pile (historical fencing/gate/posts, steel tank, vehicle wheel, and historical shooting stand/posts). A total of 14.40 tons of nonmetal construction debris, was transported by Barnes Nursery to ECL for disposal. A total of 14.35 tons of asphalt was removed from Fox Road and recycled at Erie Blacktop on August 24, 2022. The scrap steel was recycled at Sandusky Steel in Sandusky, Ohio on September 16, 2022 (Appendix I). A total of 12.08 tons of steel was recycled. The eastern chain-link fence was removed from September 13-15, 2022, and approximately 6 tons will be reused by Petty Farms (subcontracted by Arrowhead). The bills of lading for these wastes are included in Appendix I.

3.4 LAND SURVEYS

The subcontracted licensed surveyor conducted the initial survey to establish the surface elevations and demarcate areas to be excavated using the limits of excavation coordinates defined in the RAWP (Attachment C, Drawings C-4 and C-5) (Leidos 2021). Upon completion of soil excavation and removal activities, the bottoms and walls (or berm slope) of excavations were surveyed to document actual limits and elevations (i.e., horizontal and vertical extent). The excavation limits are presented in Figures 7 and 8, and survey data is included in Appendix H. Table 14 presents the verification sample location survey data.

3.5 CONFIRMATION SAMPLING

Confirmation sampling was performed by Leidos, with support from Arrowhead's excavator operator, in accordance with Section 5.1 of the RAWP and Leidos HASP (Leidos 2021) to verify lead impacted soils at the firing ranges and trap and skeet range were effectively stabilized (i.e., rendered non-hazardous and in compliance with the selected disposal facility's waste acceptance criteria). There were a total of 143 confirmation soil samples (approximately at a frequency of 1 per 300 to 600 CY per FCR-002 (Appendix B) submitted to the analytical laboratory (list in Section 3.8) for analysis of TCLP lead; or

TCLP metals (at beginning and midpoint per landfill requirement). The confirmation samples were collected as seven-point composites from the four sides and three at-depth intervals through the approximate center of each stockpile. The Leidos QC Manager, Leidos Field Manager, and Arrowhead Site QC Manager reviewed confirmation sampling results prior to submitting the data to the landfill for waste acceptance, if results were below the Resource Conservation and Recovery Act (RCRA) limit of 5.0 mg/L for lead (and other metals). If confirmation samples indicated treatment was inadequate (i.e., stabilized soils remain characteristically hazardous for lead), the soils within the subarea (grid) were re-treated with 1% to 3% Calciment. There were continued exceedances where soils with higher sand content were encountered. Mintek Resources representatives met with the project team on October 7, 2021, and determined that Calciment was not effective for the higher sand content, and when ambient temperatures drop below 40°F. The project team collected additional treatability soil samples and sent the collected samples to Enviroblend for testing on October 21, 2021. In addition, the Leidos Project Geologist reviewed previous soil borings from the site and determined that a significant amount of sandy soil remained at ECCL within the areas still requiring excavation and treatment. Enviroblend's results were presented to the project team on November 4, 2021, which indicated their two amendments were effective on all representative soil mixtures and recommended 2-3% dosage rate for Enviroblend CS, depending on range location (Appendix E). FCR-005 approved the use of Enviroblend CS or Enviroblend's Envirophos (if previously stockpile treated with Calciment and consistently failed TCLP) on November 16, 2021 (Appendix B). ECL accepted the confirmation samples results via email communications. Confirmation sampling results are presented in Table 4. Laboratory analytical reports are presented in Appendix E.

3.6 VERIFICATION SAMPLING

This section presents the soil verification sampling and results during the NTCRA. The NTCRA addressed eight COCs in soils at the ECCL Firing Range. The human health risk assessment identified eight COCs in soils at the ECCL Firing Range: antimony, arsenic, lead, and five cPAHs (benz[a]anthracene; benzo[a]pyrene; benzo[b]fluoranthene; dibenz[a,h]anthracene; and indeno[1,2,3-cd]pyrene). Copper was identified as a COC for ecological receptors. In addition, lead and copper were identified as COCs in sediment.

3.6.1 Soil Verification Sampling

Soil verification sampling was performed by Leidos in accordance with the RAWP (Section 5.2) and Leidos HASP (Leidos 2021) to demonstrate achievement of the RGs (Table 2). The verification samples were collected from the perimeter walls and floor within each firing range excavation and hot spot locations. The Rifle and Pistol Ranges excavation floor and berm verification samples were collected at the rate of one sample per 25-foot grid and the excavation wall samples were collected at the rate of one sample per 25-foot distance. The Trap and Skeet Range excavation floor verification samples were collected at a rate of one sample per 75-foot grid, except the cPAHs hot spot, which were sampled at a rate of one sample per 25-foot grid. Due to shallow bedrock refusal in Dautch Ditch, no verification sediment samples were collected. The hot spot samples were collected at a rate of at least one sample per excavation wall and floor. Soil sampling consisted of collecting primary verification samples of soil and included collecting field duplicate samples and QA/QC samples. The soil was captured in a disposable foil pan for homogenization prior to filling the sample containers for analysis. The depth interval was 0 to 6 inches into the exposed floor or the midpoint of the wall. Verification samples were analyzed (field-screened) for lead using an XRF analyzer (where lead was a COC) (Appendix L). If XRF results were greater than 371 mg/kg (correlation of historical XRF and laboratory data to conservatively meet the lead RG of 400 mg/kg), the NASA Remedial Project Manager (RPM), Leidos Field Manager, and Arrowhead Site Supervisor directed additional excavation activities. If lead was detected in the XRF sample at a concentration less than 371 mg/kg, the analytical laboratory analyzed the verification sample.

The samples were transported to the analytical laboratory (Eurofins TestAmerica in North Canton, Ohio and transitioned to other laboratories as discussed in Section 3.7.1) under chain-of-custody. Samples were collected and analyzed for either lead only, lead and other metals (antimony, arsenic, or copper), lead and PAHs, or only PAHs using USEPA Methods SW846 6010D and 8270D, depending on the COCs for each excavation area. Soil sampling was completed using a decontaminated stainless-steel spoons and disposable foil pans for homogenization. Analytical laboratory analyses were expedited and provided to the Leidos Field Manager upon receipt. The Leidos Field Manager and NASA RPM verified the results met the RGs for the ECCL Firing Range EUs. Verification sample locations exhibiting COC concentrations greater than RGs (as specified in Table 2) were further excavated laterally or vertically, with exceptions noted below. If any samples did not meet XRF or laboratory RGs for lead, additional excavation based on the approach described in the RAWP (Leidos 2021) was performed by Arrowhead. In coordination with the NASA RPM, the identified area(s) were excavated in compliance with the established excavation procedures, and three additional verification samples were collected from the area for comparison to RGs. Soil verification sampling results are presented in Tables 5 to 8 and Figures 9 and 10 (only COC exceedances). Appendix E presents the laboratory data reports of the soil verification samples.

The verification sampling results confirmed the extent of lead, antimony, arsenic, copper, and PAH contamination was fully addressed by excavation, except six locations (VS-428, -435, -448, -449, -450, and -512) with residual COC impacts based on individual exceedances of RGs. Following project team discussion, Leidos performed 95UCL EPC and arithmetic average calculations to determine if remediation was complete (Section 3.6.2).

3.6.2 EPC Evaluations

Lead was a COC at the four soil EUs: Pistol Range East, Pistol Range West, Rifle Range, and Trap and Skeet Range (Table 1). In addition, lead was a COC at the Pond West A sediment EU. The Integrated Exposure Uptake Biokinetic Model for Lead in Children used to calculate the RSL recommends use of the arithmetic average concentration as the exposure point concentration (EPC) for lead in soil. The RG for lead was conservatively set at the residential soil RSL of 400 mg/kg (Table 2).

Antimony was a COC at the four soil EUs: Pistol Range East, Pistol Range West, Rifle Range, and Trap and Skeet Range. Arsenic and copper were COCs at one soil EU each: Pistol Range West (copper) and Trap and Skeet Range (arsenic). In addition, copper was a COC at the Pond West A sediment EU (Table 1). To attain the RGs for antimony, arsenic, and copper, the 95UCL EPC COC concentrations within each EU must be below the 2022 residential RSL (for antimony and copper) or background SL (for arsenic) (Table 2) (Leidos 2021). The calculated EPCs are based on the 95UCLs. These EPCs were calculated using ProUCL Version 5.1.002 (USEPA 2016). The ProUCL data input with the historic and confirmatory samples results are presented in Appendix G, Tables G-1 through G-6. Both parent and duplicate results in duplicate field samples were averaged in the calculation of the 95UCL. The 95UCL is a conservative, upper-bound estimate of the mean concentration in which the probability of underestimating the true mean is less than 5 percent. The ProUCL output files for are presented in Appendix G, Tables G-7 through 12.

cPAHs were COCs at the Trap and Skeet Range EU (Table 1). The RGs for cPAHs were conservatively set at the residential soil RSL (the lower of the RSL for a target risk [TR] of 1E-05 or a hazard quotient of 1) for each cPAH. Remediation was considered complete if the calculated if the calculated EPC (i.e., the 95UCL benzo[a]pyrene equivalent concentration [BaP_{eq}]) in an area is less than 1.1 mg/kg after remediation (Table 2) (Leidos 2021).

Pistol Range East

The metals antimony and lead were COCs in surface soil (antimony and lead) and subsurface soil (lead) at the Pistol Range East EU. A comparison of the post excavation concentrations to these metals (Table 9) are below:

- ***Antimony—*** There were no exceedances of the antimony RG in the surface soil. The surface soil 95UCL EPC for antimony was determined to be 1.5 mg/kg, which is below the RG of 31 mg/kg.
- ***Lead—***There were no exceedances of the lead RG in the surface soil or subsurface soil. The arithmetic average concentrations of lead in the surface soil were 82 mg/kg and 273 mg/kg, respectively, which is below the RG of 400 mg/kg.

In summary, as the 95UCL EPC of antimony and arithmetic average EPC of lead are less than the RGs (Table 10), remediation is complete and allows for unrestricted/unlimited use of the Pistol Range East EU.

Pistol Range West

The metals antimony, copper, and lead were COCs in surface soil at the Pistol Range West EU. A comparison of the post excavation concentrations to these metals (Table 9) are below:

- ***Antimony—***There were no exceedances of the antimony RG in the surface soil. The surface soil 95UCL EPC for antimony was determined to be 1.1 mg/kg, which is below the RG of 31 mg/kg.
- ***Copper—***There were no exceedances of the copper RG in the surface soil. The surface soil 95UCL EPC for copper was determined to be 88 mg/kg, which is below the RG of 3,100 mg/kg.
- ***Lead—***There were no exceedances of the lead RG in the surface soil. The arithmetic average concentration of lead in the surface soil was 71 mg/kg, which is below the RG of 400 mg/kg.

In summary, as the 95UCL EPCs of antimony and copper and arithmetic average EPC of lead are less than the RGs (Table 10), remediation is complete and allows for unrestricted/unlimited use of the Pistol Range West EU.

Rifle Range

The metals antimony and lead were COCs in surface soil (antimony and lead) and subsurface soil (lead) at the Rifle Range EU. A comparison of the post excavation concentrations to these metals (Table 9) are below:

- ***Antimony—***There were no exceedances of the antimony RG in the surface soil. The surface soil 95UCL EPC for antimony was determined to be 1.6 mg/kg, which is below the RG of 31 mg/kg.
- ***Lead—***There was one exceedance of the lead RG in the surface soil verification sample from sample VS-512. The arithmetic average concentration of lead in the surface soil was 113 mg/kg, which is below the RG of 400 mg/kg. There were no exceedances of the lead RG in the subsurface soil interval. The arithmetic average concentration of lead in the subsurface soil was 63 mg/kg, which is below the RG of 400 mg/kg.

In summary, as the 95UCL EPC of antimony and arithmetic average EPC of lead are less than the RGs, remediation is complete and allows for unrestricted/unlimited use of the Rifle Range EU.

Trap and Skeet Range

The metals antimony, arsenic, and lead and cPAHs were COCs in surface soil at the Trap and Skeet Range. A comparison of the post excavation concentrations to these metals and cPAHs (Tables 9 and 11) are below:

- ***Antimony—***There were no exceedances of the antimony RG in the surface soil. The surface soil 95UCL EPC for antimony was determined to be 1.5 mg/kg, which is below the RG of 31 mg/kg.
- ***Arsenic—***There were four exceedances of arsenic at verification sample locations VS-435, VS-448, VS-449, and VS-450. VS-448 to VS-450 were collected from the scraped Stabilized Soil Stockpile Area (Figure 9). The 95UCL EPC for arsenic was determined to be 10.0 mg/kg, which is below the RG of 36.5 mg/kg.
- ***Lead—***There were no exceedances of the lead RG in the surface soil. The arithmetic average concentration of lead was 73 mg/kg, which is below the RG of 400 mg/kg.
- ***cPAHs—***The cPAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, or indeno[1,2,3-cd]pyrene) are COCs at the Trap and Skeet Range EU for the surface soil. As shown in Table 5, the maximum detected concentrations of cPAHs at the Trap and Skeet Range EU did not exceed their respective RGs in soil or subsurface soil after remediation. The RGs for cPAHs were conservatively set at the residential soil RSLs, with a target risk of 1E-05 for each cPAH. Remediation is considered complete if the calculated EPC (i.e., the 95UCL benzo[a]pyrene equivalent concentration [BaP_{eq}]) in an area is less than 1.1 mg/kg after remediation (Leidos 2021).

A comparison of calculated EPCs of each cPAH at Trap and Skeet Range to the RGs is shown in Table 12. All of the cPAH EPCs are less than the RGs after remediation. In order to account for combined effects of the cPAHs at the Trap and Skeet Range EU, the PAH EPCs were converted to a benzo(a)pyrene equivalent (BaP_{eq}) concentration for total PAHs, and the resulting BaP_{eq} was compared to the benzo(a)pyrene RG. The BaP_{eq} incorporates a relative potency factor that is a measure of the toxicity of a cPAH relative to benzo(a)pyrene. It is calculated by multiplying each detected cPAH concentration by its associated relative potency factor (e.g., a relative potency factor of 0.5 means the cPAH is half as toxic as benzo[a]pyrene) and then summing the products for all cPAHs. The EPCs were converted to a BaP_{eq} using the equation in Section 1.5.3.7.

A comparison of the BaP_{eq} to the benzo(a)pyrene RG is shown in Table 13. The sum calculated BaP_{eq} of 0.113 mg/kg for surface soil and 0.797 mg/kg for subsurface soil is less than the benzo(a)pyrene RG of 1.1 mg/kg.

In summary, as the 95UCL EPCs of antimony and arsenic, arithmetic average EPC of lead, and sum calculated BaP_{eq} of the cPAHs are less than the RGs, remediation is complete and allows for unrestricted/unlimited use of the Trap and Skeet EU.

Pond West A Sediment

Lead and copper were COCs in the Pond West A sediments for human (lead) and ecological (lead and copper) receptors. The southern pond area of Pond West A where the highest lead and copper detections occurred (including samples SDSW-017, SDSW-018, SD-028, and SD-029) was remediated. Verification samples were not collected as the sediment was removed from this area until bedrock refusal. Prior to the excavation, the average lead and copper concentrations in sediment were 988 and 390 mg/kg, respectively. After the southern pond area was excavated, the average lead and copper concentrations in sediment were 260 and 144 mg/kg, respectively. Although a concentration of 400 mg/kg would allow for

unrestricted/unlimited reuse for humans, removal of concentrations to below 400 mg/kg to protect ecological receptors would have resulted in disturbance of all or nearly all of the wetland. The wetland at Pond West A is an Ohio Rapid Assessment Method Category 2, of moderate quality. Some remediation was necessary to reduce human risk from lead and ecological risk from lead and copper, but this was balanced with habitat disturbance caused by the remediation. As a result, the most elevated concentrations of lead and copper were removed to mitigate risks for human and ecological receptors while prioritizing the functioning of the wetland and remediation of the Pond West A Sediment is complete.

3.7 DATA ANALYSIS

3.7.1 Laboratory

Environmental samples were submitted to Eurofins TestAmerica in North Canton, Ohio for analysis. The laboratory maintains National Environmental Laboratory Accreditation Program (NELAP) certification. In December 2021, the laboratory moved their facilities to a new location in Barberton, OH. During the transition, samples were sent to various Eurofins laboratories to accommodate the project analyses and turnaround times. All laboratories were appropriately accredited under NELAP for SW846 methods comparable to those used in the North Canton laboratory and all reporting limits were able to achieve the RGs and regulatory limits required. The following laboratory locations received and analyzed samples for this project:

- Eurofins TestAmerica, Canton, 4101 Shuffel Street NW, North Canton, OH
- Eurofins Canton, 180 S. Van Buren Avenue, Barberton, OH
- Eurofins Buffalo, 10 Hazelwood Drive, Amherst, NY
- Eurofins Denver, 4955 Yarrow Street, Arvada, CO
- Eurofins Environment Testing New England, 646 Camp Ave, North Kingstown, RI
- Eurofins Edison, 777 New Durham Road, Edison, NJ

3.7.2 Screening Criteria

Confirmation soil (CS) samples were analyzed for lead via the TCLP and evaluated against the RCRA limit (5 mg/l). Analytical soil data for antimony, arsenic, lead, and cPAHs were compared to RGs (residential RSLs [USEPA 2021]). For naturally occurring metals, the data were compared to background concentrations to determine if metals could be present above naturally occurring concentrations and/or background screening levels. Average concentrations and EPCs were calculated to compare to RGs to verify the soil RGs (Table 2) were achieved.

3.7.3 Data Collection

Confirmation and verification soil samples were collected in appropriate containers and analyzed for metals (TCLP or total) and PAHs in accordance with the appropriate USEPA SW-846 Method: 6010C or 8270D, respectively. Backfill samples were analyzed for volatile organic compounds (VOCs), SVOCs, PAHs, Pesticides, polychlorinated biphenyls (PCBs), explosives and metals in accordance with SW846 methods (8260C, 8270D, 8270D low-level, 8081B, 8082A, 8330B, 6010C, respectively). Investigation-derived waste (IDW) liquid and solid samples were collected and analyzed for required parameters; these analyses were not validated.

The following samples were collected during the NTCRA:

- 5 backfill soil samples (the VOC fraction for one sample was re-collected);
- 143 confirmation soil samples;
- 306 verification soil samples;
- 28 verification soil field duplicates;
- 13 verification soil matrix spike [MS]/matrix spike duplicate [MSD] samples; and,
- 3 IDW samples – 2 solid and 1 wastewater (not validated).

3.7.4 Field QC

Field duplicates were collected at 28 locations. Analytical results for the duplicate soil samples were consistent with the associated parent samples for most sample pairs. The relative percent difference (RPD) was below Quality Assurance Project Plan (QAPP) guidance of 50 percent (for sample pairs with concentrations greater than 5 times the reporting limit) for all but five results; for these results the RPD exceeded 50 percent for lead at four locations (VS-314, 348, 351, 399) and arsenic at one location (VS-394), indicating the potential for matrix heterogeneity. Data were not qualified based on field duplicate results.

3.7.5 Analytical QC

Analytical data were verified by examining the analytical QC results documented by the laboratory in the Level 2 data packages, following the appropriate guidelines for laboratory data validation for the reported QC samples. Data were reviewed for compliance with method QC criteria and laboratory control limits based on, but not limited to, the following categories:

- Laboratory report narrative,
- Analytical holding times and sample preservation,
- Preparation (method) blanks,
- Surrogate recoveries (where applicable)
- Spike recoveries (laboratory control sample [LCS], MS/MSD), and
- Re-analyses or dilutions as required.

Data points that were qualified based on QC sample results are summarized in Appendix F, Table F-1 and discussed below.

3.7.5.1 TCLP Lead and Other Metals

Confirmation soil samples were analyzed for TCLP lead; four confirmation soil samples were analyzed for 10 additional TCLP metals (aluminum, antimony, arsenic, barium, cadmium, chromium, mercury, nickel, selenium, and silver). Analytical data were reviewed and qualified as estimated (J) based on calibration data (six data points) and MS RPD (two data points); data were qualified as non-detect (U) based on method blank results (two sample data points),

3.7.5.2 Total Metals

Verification soil samples were analyzed for total antimony, arsenic, copper, and lead. Analytical data were reviewed and qualified as estimated (J, UJ) based on MS/MSD recovery or RPD (43 data points),

LCS recovery (24 antimony data points), calibration (eight data points), and lab replicate outliers (six data point). Note one copper value (sample ECCLVS0502) was associated with one spike recovery below 10 percent but above 10 percent in the other spike, and compliant recovery in the LCS, and was therefore qualified as estimated. Data were reviewed and qualified as non-detect (U, UJ) based on method blank outliers (seven data points). QC samples for antimony consistently had recovery values below control limits; therefore, all antimony results, not just those associated with QC samples, should be considered estimated and usable for this NTCRA.

3.7.5.3 PAHs

Verification soil samples were analyzed for PAHs. Analytical data were reviewed and results for three samples were qualified as estimated (J, UJ) based on an elevated temperature upon sample receipt at the laboratory (48 data points). Non-detect results were qualified as estimated (UJ) based on calibration outliers (four data points) and one value was estimated (J) based on LCS recovery. One result was qualified as non-detect (U) based on method blank outlier.

3.7.5.4 Soil Characterization

Backfill samples were analyzed for VOCs, SVOCs/PAHs, explosives, pesticides/PCBs and metals. Analytical data were reviewed and qualified based on calibration outliers (24 SVOC data points), extraction holding time (14 explosive data points), internal standard area count outliers (six VOC data points), and MS/MSD recovery or RPD (12 data points from one sample for explosives, metals, and SVOCs with one SVOC compound [hexachlorocyclopentadiene] rejected due to recovery less than 10%).

3.7.6 Data Usability

The results of the data quality evaluation indicate the overall quality of the data is suitable to confirm the presence or absence of contamination with the exception of one result that was rejected due to spike recovery < 10% (hexachlorocyclopentadiene in backfill sample BF00006 was qualified R). Through data verification and review, the remaining analytical information has been qualified as appropriate based on QC results from the level 2 laboratory reports as discussed above (and as presented in Appendix F). Data that were associated with QC results that did not meet applicable criteria had data validation qualifiers assigned to the sample results (see Appendix F, Table F-1). QC samples for antimony consistently had recovery values below control limits; all results, not just those that were qualified due to being associated with QC samples, should be considered potentially biased low and used with caution. It should be noted however that all antimony values with one exception were reported at concentrations that were less than 20% of the RG concentration and are therefore considered usable (the one value that was reported at 20 mg/kg against the RG of 31 mg/kg was associated with location VS-510, this location was subjected to additional removal action due to a different exceedance). Data are considered usable if unqualified, non-detect, or if qualified as estimated (J, UJ). For these samples, 99.96 percent of the data was considered usable.

3.8 SITE RESTORATION

Two sources of topsoil (PBSFR-BF-002 and PBSFR-BF-004) and alternate backfill material (PBSFR-BF-001 and PBSFR-BF-003) were sampled by Leidos in March 2020. The data were screened to the requirements listed in Section 7 of the RAWP (Leidos 2021). The screening table is provided in Appendix A, and the laboratory report is provided in Appendix E. NASA approved the topsoil and alternate backfill sources on May 20, 2020 (Appendix A).

Upon completion of the verification sampling and acceptance of results by Leidos and the NASA RPM, the open excavations and stockpile areas were backfilled with offsite source and remaining portions of the earthen berms (estimated 9,000 yards). The verification soil sample data for the remaining soil berms were below RGs and were approved for reuse by the NASA RPM. Topsoil was delivered from the approved off-site source (Barnes Nursery). Ruts and depressions along equipment movement areas and construction support areas were graded. The entire disturbed area was seeded with the approved seed mixture (Indiangrass and annual ryegrass). Erosion and sediment controls remained in place during site restoration activities.

A topographic and verification sample location survey was conducted and recorded by the Leidos licensed surveyor prior to backfilling the excavation areas. Survey data are included in Appendix H and presented on Figures 7 and 8.

Restoration of Pond A began immediately following sediment treatment and removal activities in August 2022. The concrete blocks and pump were removed, and the disturbed southern bank of Pond West A was restored to a more natural slope. Straw mat was placed over the disturbed soil of the bank and silt socks were added around the southern edge of the pond. Initially, no other material or water was added to Pond West A for restoration and the pond was left to restore naturally. However, it was later determined during weekly site inspections that iron-oxidizing bacteria interacting with the exposed shale bedrock were turning the water in the pond an orangish color. Per a discussion between NASA, Arrowhead, and Leidos, it was determined that the water pumped into Pond West B should be pumped back into Pond West A. Arrowhead pumped the water back into Pond West A on September 12, 2022. The added water diluted the orangish color and prevented the oxidizing bacteria from continuing to discolor the water. A final team site-walk on September 16, 2022 confirmed that the added water stopped the bacterial activity and prevented further discoloration of the pond.

The northern woven wire and eastern chain-link fence was removed between September 13-15, 2022. Fencing material will be reused by Petty Farms (subcontracted by Arrowhead). The post holes were backfilled with berm soil, where located outside of delineated wetland boundaries, as advised by NASA. The southern perimeter fence and three gates were left in place per contract modification.

The asphalt roadway adjacent to the easternmost construction entrance along Fox Road was damaged from haul truck traffic. The asphalt was repaired by removing damaged areas and subbase material down to a solid surface before backfilling with new asphalt on September 15, 2022 and 14.35 tons of asphalt and subbase material were recycled by Erie Blacktop.

The removal of stormwater BMPs was approved by the NASA RPM and Stormwater Coordinator once the restoration activities were complete (email communication dated October 25, 2022; Appendix A). Erosion and sediment controls were removed by Arrowhead on October 26-27, 2022. The northwestern area of the Trap and Skeet range had bare areas and was reseeded by Arrowhead on October 27, 2022. The erosion control matting at West Pond A and Dautch Ditch prevented any sediment runoff while the vegetation became established. Arrowhead performed weekly stormwater inspections until 70 percent vegetation establishment was reached at the site on June 28, 2023.

It was determined in May 2023 that sufficient vegetation growth was not observed in the pistol and rifle range area. Barnes Nursery, under the supervision of Leidos, mobilized to the site between May 30, and June 2, 2023. Barnes Nursery delivered 72 loads (~500 tons) of approved topsoil and graded the topsoil over the areas lacking sufficient growth. The site was seeded with the approved seed mixture on 2 2023, and straw was blown and crimped into place to protect the seeding and prevent erosion. Watering using water from Pond A was performed daily, except for days experiencing precipitation, for two weeks after seeding was completed. Once sufficient vegetation growth was observed following the reseeding, final

stabilization approval was given by the NASA RPM and Stormwater Coordinator on June 28, 2023 (Appendix A.16).

3.9 DEMOBILIZATION

After completing the soil removal, mixing, and loading process, the equipment (i.e., excavator buckets and tracks, offroad haul truck) used for completing the task was decontaminated using shovels and scrapers (as needed), and then pressure-washed over the decontamination pad. The decontamination wastewater was transferred into drums, sampled for characterization, and transferred to Building 9206 prior to demobilization. Non-dedicated sampling equipment (stainless steel spoons) was cleaned with Liquinox® and potable water, nitric acid, and isopropanol, and rinsed with deionized water. The minimal sampling decontamination wash water was added to the treated soil stockpile. The minimal amount of nitric acid and isopropanol, and associated rinse water, were containerized into separate waste containers provided by NASA Waste Management. These containers were transferred to Building 9206 prior to demobilization. Arrowhead demobilized both field trailers in May 2022 and the equipment trailer in September 2022. Arrowhead dismantled the temporary scale and loaded onto trailer for demobilization on September 10, 2022.

3.10 SUSTAINABILITY PRACTICES

During the duration of this NTCRA, the project team employed practices to assist GRC in achieving its sustainability goals and policies. As described in Section 2.2.4, approximately 387 large trees were felled and cut to short firewood sections and transferred to the designated firewood staging area at GRC-ATF for personal use by site personnel. In addition, a total of 48 large trees were left in place in the northwestern portion of the trap and skeet range (Appendix A). Smaller tree segments were recycled into chipped wood mulch product and left onsite as ground cover for temporary stabilization following first phase of vegetation clearing. As described in Section 4.1, there was 12.08 tons of scrap metal recycled at Sandusky Steel and 102.63 tons of concrete retaining blocks reused as traffic control barriers at Erie County Landfill, as part of GRC's goal to divert construction and demolition debris from landfill. The temporary fence materials (estimated 6 tons) were removed for reuse by Petty Farms (subcontracted by Arrowhead). The wood pallets from amendment shipments were hauled to Barnes Nursery for reuse (3.12 tons). There was also 14.35 tons of asphalt from Fox Road, recycled by Erie Blacktop.

ECL accepted the nonhazardous stabilized soil as daily cover rather than ECL needing to obtain that quantity of soil (approximately 53,500 tons) from another source. By delivering the reuse daily cover soil directly to ECL's point of use, the amount of greenhouse gas emissions and the need for additional tree felling were reduced. The operation of excavation machinery and haul trucks with subsequent fuel use were not needed while daily cover was provided to ECL by NASA's ECCL RA project. Additionally, vegetation and tree clearing at the regular daily cover soil source area was also reduced. Field change request FCR-001 (Section 5.7) allowed stopping the use of plastic disposable liners in non-hazardous, lead-impacted soil haul trucks. This change reduced the disposal of plastic into a landfill by an estimated 920 rolls of plastic sheeting (approximately 25.3 tons) and allowed the continued use of the soil as daily cover by ECL. In addition, the remaining portions of the impact and lateral berms met backfill screening criteria (Leidos 2021). Therefore, the berm soils were reused as clean backfill in excavation areas, reducing the quantity of backfill hauled to the site (estimated 9,000 yards or approximately 800 truckloads). An additional green and sustainable remediation practice implemented at ECCL Firing Range was the use of low-sulfur diesel fuel in the construction equipment, haul trucks, and generator to reduce air emissions of criteria pollutants.

Prior to August 2021 mobilization, the seeding design was changed to native prairie grass (Indiangrass) in response to a public comment during the public forum on July 27, 2021. During wetland consultation of

Pond West A with Ohio EPA, NASA purchased 0.6 acres of wetland credits for temporary impacts to wetland during sediment remediation of Pond West A. During USACE consultation, hydric soil was recommended as backfill along Dautch Ditch (FCR-006) to facilitate the waterway returning to its natural anaerobic conditions.

The silt socks were removed from the ranges on October 26-27, 2022, following final approval from the NASA RPM on October 25, 2022 (Appendix A). The fabric was cut open and the wood chips were removed and spread out in construction laydown area per NASA RPM. This practice is anticipated to divert an estimated 5 tons of construction debris from the landfill. The fabric (1.80 tons) was disposed under bill of lading at ECL on October 27, 2022.

4. WASTE MANAGEMENT

This section addresses collecting, handling, transporting, and disposing of residual solid and liquid waste from the soil excavation; decontamination activity, debris removal; and other miscellaneous waste. Arrowhead and NASA Waste Management handled manifesting and disposing of the solid and liquid waste and other miscellaneous waste. Table 15 presents a summary of the waste shipments and profile numbers from the ECCL Firing Range.

4.1 EXCAVATED SOIL AND SEDIMENT

Soil samples collected during the RSE soil stabilization study were analyzed for TCLP lead (a waste characterization parameter), and the results showed the samples were hazardous solid wastes (Leidos 2020a). Therefore, the lead-impacted soils were stabilized onsite with Calciment, Enviroblend CS, and disposed of offsite as non-hazardous waste. Stabilized soils that remain characteristically hazardous for lead or fail waste disposal facility criteria (e.g., LDRs) would be re-treated. If follow-up sampling results indicate stabilized soils are non-hazardous and meet landfill requirements, the stabilized soil was removed from the stabilization subareas for transport to the stabilized soil staging area (Figures 7 and 8) and subsequently to a licensed offsite disposal facility (ECL). If re-treatment was not effective, soils were retreated further with Calciment (or Envirophos if previously treated with Calciment), or Enviroblend CS. Areas with only PAH-contamination were not treated prior to nonhazardous disposal. The results of laboratory analyses specified by the designated disposal site were forwarded to document the material meets the facility's waste acceptance criteria. The stabilized soils were removed from the Stabilized Soil Staging Area and subsequently transported by Queens Trucking, LLC to a licensed off-site disposal facility (ECL) starting in September 2021 and completed in June 2022. A total of 6,749 tons of PAH-contaminated soil (no treatment required) and 47,251 tons of lead- and PAH-contaminated soil (treatment required) were disposed of at ECL. ECL used the nonhazardous soil as part of their required daily cover. The waste manifests and profile are included in Appendix I.

The sediment in Pond West A (south portion) was sampled for waste characterization on March 8, 2022, and the results indicated that the sediment was below RCRA TCLP Lead limit of 5 mg/L. Therefore, no lead stabilization was required. However, in order to meet landfill's paint filter analysis requirement (no free liquids), the saturated sediment from Pond West A was excavated and solidified with QUICKLIME per FCR-008 (Appendix B). A total of 479 tons of sediment was transported by Queens Trucking to in August 2022 to a licensed off-site disposal facility (ECL). The waste manifests are included in Appendix I.

4.2 CONCRETE AND METAL DEBRIS

Construction and metal debris, including the concrete retaining blocks behind the Rifle Range backstop berm and the old fencing, gates, and signage at the Fox Road entrance to the Rifle and Pistol Ranges, were removed as nonhazardous, construction debris and reused/recycled, if possible, in accordance with NASA GRC's sustainability goal. Otherwise, these materials were disposed of as non-hazardous construction debris waste at Erie County Landfill.

Per requirements of the Erie County Landfill, one composite sample from the concrete retaining blocks were be collected for TCLP SVOCs; TCLP VOCs; TCLP RCRA metals (plus antimony and nickel); TCLP pesticides; TCLP herbicides; total metals; total SVOCs; total VOCs; PCBs; paint filter liquids test; and reactivity, corrosivity, and ignitability (RCI) analysis for hazardous waste determination in June 2020. The concrete was classified as non-hazardous and reused for temporary crane pads in Pond West A. When sediment removal was completed, the 65 concrete blocks were transported by Barnes Nursery haul

trucks for reuse (traffic control barriers) by Erie County Landfill in Milan, Ohio. A total of 102.63 tons of concrete debris was recycled. The bills of lading are presented in Appendix I.

A total of 14.40 tons of nonmetal construction debris, gathered from around the site, was transported by Barnes Nursery to ECL for disposal. A total of 14.35 tons of asphalt was removed from Fox Road, transported by Swartz Paving for recycling at Erie Blacktop on August 24, 2022. The scrap steel including historical fencing/gate, steel tank, and shooting stand was recycled at Sandusky Steel in Sandusky, Ohio on September 16, 2022 (Appendix I). A total of 12.08 tons of steel was recycled. The eastern chain-link fence was removed from September 13-15, 2022, and approximately 6 tons will be reused by Petty Farms (subcontracted by Arrowhead). The bills of lading for these wastes are included in Appendix I.

4.3 VEGETATION

Smaller trees and brush were mulched and left onsite as ground cover. Segments of large trees were cut into lengths no longer than 3 feet and transported to the designated firewood staging area at GRC-ATF. Tree stumps and roots within excavation footprints were broken up and blended in the treated stockpiles prior to disposal at the ECL.

4.4 DECONTAMINATION FLUIDS

Soil sampling equipment (spoons) was cleaned with Liquinox® and potable water, nitric acid, and isopropanol, and rinsed with deionized water. The minimal sampling decontamination wash water and disposable foil pans was added to the treated soil stockpile per NASA Waste Management. The minimal amount of nitric acid and isopropanol, and associated rinse with deionized water, were containerized in separate waste containers provided by NASA Waste Management. These containers were transferred to Building 9206, and NASA Waste Management. The sampling IDW containers were transported and disposed by Chemtron Corporation in Avon Lake, Ohio, on June 30, 2022. The waste manifest is included in Appendix I.

Containerized truck decontamination water was sampled and analyzed for waste characterization (total VOCs [includes F-listed VOCs], total SVOCs [includes F-listed SVOCs], total RCRA metals, PCBs, pesticides, herbicides, and RCI analysis). The truck wash containers were transported and disposed by Chemtron Corporation in Avon Lake, Ohio, on December 16, 2021 and September 1, 2022.

4.5 OTHER WASTES

Personal protective equipment, plastic sheeting, and other miscellaneous field-generated wastes were disposed of in the soil haul trucks discussed above. The waste manifests for the disposal of the soil truckloads are included in Appendix I. Routine office/household wastes (e.g., boxes, packaging materials, and water bottles) were recycled if possible or otherwise disposed of as sanitary trash in an onsite dumpster and emptied by Republic Waste.

Stormwater control materials (i.e., fabric from silt socks) were disposed of as non-recyclable stormwater materials as sanitary trash at Erie County Landfill on October 27, 2022 (total of 1.80 tons; Appendix I). The wood chips contained within the silt socks was spread out in the construction laydown area (estimated 5 tons diverted from landfill). Removal of controls occurred when sufficient coverage had been established in all disturbed areas, with final inspection and approval from the NASA Remedial Project Manager and Stormwater Inspector (email communication dated October 25, 2022; Appendix A).

5. RECORDKEEPING AND REPORTING

Records of the NTCRA activities were maintained onsite in accordance with the RAWP (Leidos 2021) requirements and are discussed below. These records will be maintained by Arrowhead and Leidos in project files, and by the NASA Environmental Management Office at the completion of the project.

5.1 DAILY QUALITY CONTROL REPORTS

The Arrowhead Site QC Manager provided Daily QC Reports to the Arrowhead and Leidos Project Managers, Leidos Field Manager, NASA Remedial Project Manager, and NASA Construction Manager during implementation of the RAWP (Leidos 2021). The Daily QC Reports included the following:

- Descriptions of the work performed daily;
- Summaries of all findings and sampling;
- Summaries of any changes to the RA design;
- Summaries of all problems or potential problems encountered;
- Summaries of actions taken to achieve and maintain remediation standards and performance standards;
- Weather conditions;
- Copies of site entry logs;
- Copies of daily reports, inspection reports, sampling data, and laboratory/monitoring data; and
- Copies of waste manifests and tracking logs.

Daily QC Reports are presented in Appendix C.

5.2 STORMWATER INSPECTION REPORTS

The Arrowhead Site QC Manager or designee inspected stormwater controls on a weekly basis and documented them on the GRC Construction Stormwater Site Inspection Forms. Stormwater controls also were inspected within 24 hours of a 0.5-inch storm event or 2-inch snowmelt. These inspections were performed in accordance with the RA Work Plan (Leidos 2021). Note the site was an estimated 27 acres of disturbed area and did require a Stormwater Pollution Prevention Plan (Attachment A of RAWP, Leidos 2021). In addition, monthly inspections and stormwater discharge inspections of the secondary containment underlying the diesel fuel AST and mobile generator were performed by the Arrowhead Site QC Manager. These inspection forms are presented in Appendix D.

In addition, the NASA GRC Stormwater Program Lead or designee performed a monthly inspection and provided a copy of the inspection report to the project team. These reports are maintained in NASA's Safety, Health, and Environmental Tracking system.

Per NASA request, Leidos performed weekly site check inspections from May to September 2022. Copies of the site check inspection reports are presented in Appendix D.

5.3 PHOTOGRAPHS

Digital photographs were taken during field activities to document field operations. Select photographs are presented in Appendix J (*photographs of the final site conditions will be included in final report*) and attached to the Daily QC Reports (Appendix C), Weekly Stormwater Inspection Reports (Appendix D), and Site Check Inspections (Appendix D).

5.4 LABORATORY RECORDS

Copies of chain of custody forms for all samples shipped to an off-site laboratory for analysis were maintained onsite. Copies of laboratory records were maintained in the Leidos Twinsburg, Ohio, office and on NASA BOX. The laboratory records maintained in the Leidos Twinsburg, Ohio, office include treated soil confirmation sampling results, soil verification sampling results, and soil and water characterization sampling results; these records are provided in Appendix E.

5.5 PERSONNEL TRAINING RECORDS

Occupational Safety and Health Administration health and safety training records (e.g., 40-hour, 8-hour, and medical), waste manifest training, and documentation of prior experience and training in operating the equipment (i.e., skid steer, excavator, and XRF analyzer), were maintained in the Arrowhead and Leidos field offices.

5.6 EQUIPMENT MAINTENANCE AND CALIBRATION RECORDS

A list of equipment available onsite for use in the NTCRA activities was maintained in the Arrowhead and Leidos field offices, and a record of the type and frequency of equipment maintenance activity and the date on which the equipment was inspected and serviced also was maintained onsite. Monitoring equipment was calibrated to the respective manufacturer's specifications, and the calibration records were maintained in the Arrowhead and Leidos field offices.

5.7 PERMITS AND APPROVALS

Permits and approvals obtained for the NTCRA at ECCL Firing Range included a Digging and Excavation Permit for each phase of vegetation clearing and the NTCRA (extended every 3 months). All permits and approvals are provided in Appendix A.

5.8 FIELD CHANGE REQUESTS

Field change requests (FCRs) were used to document approved changes from the original removal action work plan. All FCRs are included in Appendix B and are summarized as follows:

- FCR (no ID) for Woven Wire Fence Installation, approved on February 27, 2019:
  - GRC-ATF Security Personnel notified Arrowhead that the fence installed as originally scoped (woven wire fence would butt up directly adjacent to the perimeter fence) was not acceptable due to security concerns.
  - Removed the existing brace for the woven wire fence and reinstalled the brace 10' from the perimeter fence. To complete the fence line, an 8x10' chain link fence was installed from the end brace of the woven wire to the perimeter fence.
- FCR-001, approved on September 20, 2021:
  - Stopping use of plastic disposable liners in non-hazardous, lead-impacted soil haul trucks.

- Haul trucks will be cleaned prior to hauling waste in unlined beds.

- FCR-002, approved on September 30, 2021:
  - Decreased confirmation sampling frequency from 1 sample per 300CY to 600 CY stockpile, so larger grid volumes or combining two smaller grids did not require more than one sample.
- FCR-003, approved on September 30, 2021:
  - Loading and hauling soil on Saturdays.
- FCR-004, approved on October 20, 2022:
  - Revised the northern excavation extent of Dautch Ditch south of the delineated wetland boundary.
- FCR-005, approved on November 16, 2022:
  - Changed soil amendment from Calciment to Enviroblend CS and EnviroPhos to overcome lead stabilization challenges with sandy soils and colder air temperatures.
- FCR-006, approved on January 28, 2022:
  - Dautch Ditch will be restored to pre-existing/natural conditions using hydric soil; therefore, no mitigation is required per NASA's consultation with USACE.
- FCR-007, approved on March 3, 2022:
  - Construct additional bermed stockpile areas to stockpile and treat excavated soils at Rifle and Pistol Ranges.
  - Collect additional verification soil samples once stabilized soils are hauled and stockpile areas are scraped.
- FCR-008, approved on April 22, 2022:
  - Pond sediment will not require lead stabilization; however, saturated sediment will be solidified with QUICKLIME prior to disposal at nonhazardous landfill.

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6. PROJECT COMPLETION CRITERIA

This section discusses whether cleanup criteria were met for each medium (i.e., soil and sediment) and if residual contamination was observed in the soil in and around the Pistol Range East, Pistol Range West, Rifle Range, and Trap and Skeet Range following the NTCRA.

6.1 CONCLUSIONS

This NTCRA attained the RAOs and met the ARARs established for ECCL Firing Range, as defined in the Final RSE Report (Leidos 2020a) and Final Action Memorandum (Leidos 2020b). As described in this RA Completion Report, project activities were completed in accordance with the requirements and specifications of the RA Work Plan (Leidos 2021). The RAO of excavation and off-site disposal of impacted surface soil (depths ranging from 0 to 2 feet) and 0 to 6 feet on impact berms from areas associated with ECCL Firing Range that exceeded RGs was achieved. The verification sampling results confirmed the extent of lead, antimony, arsenic, copper, and PAH contamination was fully addressed by excavation, except six locations (VS-428, -435, -448, -449, -450, and -512) with residual lead, arsenic, or PAH impacts (Tables 5 and 6). Following project team discussion, Leidos performed 95UCL EPC calculations to determine if remediation was complete (Section 3.8.1). Based on comparison of the individual metals and cPAHs to RGs and the comparison of the sum BaP_{eq} to the benzo(a)pyrene RG, the NTCRA is complete and allows for unrestricted/unlimited use.

Soil confirmation sampling was performed to verify impacted soils at the excavations and berms have been effectively stabilized (i.e., rendered non-hazardous and in compliance with the selected disposal facility's waste acceptance criteria). The confirmation sample results were below RCRA TCLP limits and were approved by ECL for disposal.

A land survey of the final excavation limits was performed. All excavation limits and their exceptions were approved by NASA. The excavations were backfilled with imported common fill as well as the remaining portions of the earthen berms, any ruts were regraded, and the entire disturbed area was seeded. Erosion controls were removed once approval from the NASA RPM and Stormwater Coordinator was obtained on October 25, 2022 (Appendix A). Final stabilization approval from the NASA RPM and Stormwater Coordinator was given on June 28, 2023 when greater than 70 percent vegetation coverage was observed across the site (Appendix A).

6.2 PROJECT SCHEDULE

The perimeter fence installation including vegetation clearing were expedited in 2019 to comply with USFWS requirements and prevent exposure to contamination. The first phase of vegetation clearing was performed in February 2020 to comply with USFWS requirements and to facilitate equipment access, and soil removal and treatment, originally slated to begin Summer/Fall 2020. Offsite backfill sources were sampled in March 2020. NASA GRC access was restricted due to the COVID-19 pandemic in March 2020. Waste characterization sampling (concrete) was postponed to June 2020. A stop work order was issued by NASA for COMETS Task Order E109 on July 22, 2020, due to the COVID-19 pandemic. The stop work order was lifted on June 14, 2021, with exception of the pond sediment, when preparations for returning to work began.

Arrowhead started site preparation on August 9, 2021. NTCRA activities started on August 16, 2021. Soil removal and treatment was completed in May 2022. Early lead stabilization challenges with Calciment resulted in delays in hauling and excavation progress; the change to Enviroblend CS resulted in much

higher rate of passing confirmation soil samples. Soil hauling to landfill continued into June 2022, due to the 450-ton daily limit at ECL. Majority of the backfilling was postponed due to saturated site conditions (combination of snowmelt and significant rainfall in late winter/early spring). Wetland mitigation credits were obtained for Pond A West sediment removal in April 2022, and the stop work lifted on April 19, 2022. Remobilization occurred on July 25, 2022 to resume backfilling and other site restoration activities. Arrowhead performed pond dewatering and sediment removal, solidification, and disposal in August 2022. Final restoration activities and demobilization were completed in September 2022. Final stabilization (approval to remove erosion and sediment controls) was approved on October 25, 2022. Erosion and sediment controls were removed on October 26-27, 2022.

6.3 PROJECT COST SUMMARY

The contract value was estimated to be $8,580,561, but was completed under budget at approximately $8,524,125, based on the June 2023 financial report. These costs include implementing the RSE, preparing and hosting public forum, developing the Action Memorandum and RAWP, implementing soil and debris removal, onsite stabilization, pond sediment removal, offsite disposal, and site restoration, and reporting.

7. REFERENCES

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TABLES

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Table 1. COCs for Soils and Sediment at the ECCL Firing Range

EU[a]	COC	Medium
Pistol Range (East)	Antimony	Surface Soil
	Lead	
	Lead	Subsurface Soil
Pistol Range (West)	Antimony	Surface Soil
	Copper[b]	
	Lead	
Rifle Range	Antimony	Surface Soil
	Lead	
	Lead	Subsurface Soil
Trap and Skeet Range	Antimony	Surface Soil
	Arsenic	
	Lead	
	Benz(a)anthracene	
	Benzo(a)pyrene	
	Benzo(b)fluoranthene	
	Dibenz(a,h)anthracene	
	Indeno(1,2,3-cd)pyrene	
Pond West A	Copper[b]	Sediment
	Lead	

[a]No COCs are present in the Drainage Ditch, Former Clubhouse and Garage, Pond West B, or Pond East EUs.
[b]Copper was not identified as a human health COC but was identified as a COC representing a potentially unacceptable risk to ecological receptors.

COC = Chemical of Concern
ECCL = Erie County Conservation League
EU = Exposure Unit

Table 2. RGs for Soils and Sediment at the ECCL Firing Range

COC	RG (mg/kg)
Antimony	31[a]
Arsenic	36.5[b]
Copper	3,100[c]
Lead	400[d]
Benz(a)anthracene	11[a,e]
Benzo(a)pyrene	1.1[a,e]
Benzo(b)fluoranthene	11[a,e]
Dibenz(a,h)anthracene	1.1[a,e]
Indeno(1,2,3-cd)pyrene	11[a,e]

[a]RSLs for soil are from the table published in May 2022 (USEPA 2022) unless otherwise noted corresponding to a TR of 1E-05 and a Target Hazard Quotient (THQ) of 1. The EPC for each area was calculated to determine if remediation was complete. RSLs for soil were also used for the sediment RG.
[b]The non-cancer regional screening level (RSL) for arsenic (35 mg/kg) (USEPA 2022) is less than the background criterion (36.5 mg/kg) (IT 1998); therefore, the background concentration for arsenic is used as the RG. The average exposure point concentration (EPC) was calculated for each area to determine if remediation was complete.
[c]The RSL for copper is used as RG to be protective of ecological receptors.
[d]400 mg/kg is used as the RG for lead. The arithmetic average lead concentration was calculated for each area to determine if the mean concentration was less than 400 mg/kg.
[e]The RG for all of the cPAHs is conservatively set at the residential soil RSL for benzo(a)pyrene of 1.1 mg/kg (calculated as a BaP_{eq}).

BaP_{eq} = Benzo(a)pyrene Equivalent Concentration
COC = Chemical of Concern
cPAH = Carcinogenic Polycyclic Aromatic Hydrocarbon
ECCL = Erie County Conservation League
mg/kg = Milligrams per Kilogram
RG= Remediation Goal
RSL = Regional Screening Level
SL = Screening Level
THQ = Target Hazard Quotient
TR = Target Risk

Table 3. Soil, Sediment, and Debris Removal Volume Remediated (Residential Standards)

Removal Area	Depth (ft)	Width (ft)	Length (ft)	Estimated Area (ft^2)	Estimated Volume (yd^3)	Volume Removed (yd^3)	Weight (Ton)
Construction and Demolition Debris Removal							
Concrete retaining wall blocks	2.5 each	3 each	3 each	585	54	54	102.6
Trap house burned wood and metal debris	1	28	32	642	24	24	13.8
Scrap fence/gate/shooting stand	N/A	N/A	N/A	N/A	N/A	N/A	
Rifle Range Removal							
Earthen backstop berm**	6	53	98	5,042	1,035	1618	2,427
Target area**	1.5	40	83	3,325	185	286	430
			Subtotals	**8,367**	**1,220**	**1,904**	**2,857**
Pistol Range West Removal							
Earthen backstop berm**	3.5	67	154	8,807	1,099	1,369	2,053
Target area**	1	41	103	3,218	119	142	213
Soil hot spot at discharge area (SL-115 and SL-117) (*only copper and debris removal)*	1	20	70	1,414	52	63	95
			Subtotals	**13,439**	**1,218**	**1,574**	**2,361**
Pistol Range East Removal							
Earthen backstop berm**	6	57	116	6,070	1,035	1,231	1,847
Target area**	1	14	22	312	12	18	27
Soil hot spot behind berm (SL-157 and SL-252)**	1	23	29	646	24	30	45
Discharge area (debris removal only)	1	19	57	1,071	49	54	81
			Subtotals	**8,099**	**1,120**	**1,333**	**2,000**
Trap and Skeet Range Removal							
Lead fallout zone (1 ft)**	1	436	1,195	381,650	14,121	16,179	24,269
Lead fallout zone (1.5 ft)**	1.5	227	380	86,814	4,818	5,504	8,256
Lead and cPAHs fall zone**	1.5	123	715	72,352	4,016	4,581	6,871
cPAHs discharge area	1.5	116	620	66,076	3,667	4,123	6,185
cPAH hot spot (SL-176)	2	33	37	1,199	89	104	156
			Subtotals	**608,091**	**26,711**	**26,665**	**45,737**
Pond West A Sediment Removal							
Sediment in south pond	1	124	100	11,240	416	400	479
						Subtotal	**479**
						Total Soil and Sediment	**53,434**

Source: Leidos 2021. *Revised Final Erie County Conservation League (ECCL) Firing Range Removal Action Work Plan, National Aeronautics and Space Administration, Plum Brook Station, Sandusky, Ohio*. Revised August 2021.
*Total volumes and weights include overdigs and the added amendments. Each amendment was added at an average recommended rate: Calciment: 6 -10%, Enviroblend: 2 – 3%, and Envirophos: 1-2% for the following total weights: 2340 tons Calciment, 410 tons Enviroblend, and 22 tons Envirophos.
** Indicates soils that were treated with amendment (i.e., Calciment, Envirophos, and/or Enviroblend). Volume removed calculated using soil density of 1.5 tons/yd^3 and sediment density of 1.2 tons/yd^3
ft^2 = Square Feet ECCL = Erie County Conservation League yd^3 = Cubic Yard
ft^3 = Cubic Feet ft = Feet cPAH = Carcinogenic Polycyclic Aromatic Hydrocarbon N/A = Not Applicable

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Table 4. Confirmation Soil Sample Results

Station				ECCL-CS-002	ECCL-CS-003	ECCL-CS-004	ECCL-CS-005	ECCL-CS-006	ECCL-CS-007	ECCL-CS-008	ECCL-CS-009W
Sample Id				ECCLCS0002	ECCLCS0003	ECCLCS0004	ECCLCS0005	ECCLCS0006	ECCLCS0007	ECCLCS0008	ECCLCS0009W
Date				01/20/2022	12/29/2021	11/29/2021	10/11/2021	09/24/2021	01/14/2022	02/10/2022	01/19/2022
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	0.032	<0.015 U	<0.05 U	0.8	0.0052 J	<0.015	0.013 J	1
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-010	ECCL-CS-011	ECCL-CS-012	ECCL-CS-012	ECCL-CS-013A	ECCL-CS-013A	ECCL-CS-013B	ECCL-CS-014
Sample Id				ECCLCS0010	ECCLCS0011	ECCLCS0012	ECCLCS0012.1	ECCLCS0013A	ECCLCS0013A.1	ECCLCS0013B	ECCLCS0014
Date			TCLP Criteria (mg/L)	01/20/2022	01/04/2022	11/24/2021	12/08/2021	10/12/2021	11/16/2021	10/11/2021	10/01/2021
Analyte	CAS Numbers	Units									
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	0.25	0.028 J	**7.1**	0.0042 J	**20**	0.8	1.2	**11**
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-014	ECCL-CS-014	ECCL-CS-015A	ECCL-CS-015A	ECCL-CS-015B	ECCL-CS-016	ECCL-CS-016	ECCL-CS-017
Sample Id			TCLP	ECCLCS0014.1	ECCLCS0014.2	ECCLCS0015A	ECCLCS0015A.1	ECCLCS0015B	ECCLCS0016	ECCLCS0016.1	ECCLCS0017
Date			Criteria	10/07/2021	11/15/2021	09/15/2021	09/23/2021	09/15/2021	08/31/2021	09/08/2021	12/06/2021
Analyte	CAS Numbers	Units	(mg/L)								
pH	N704	Std Unit		12.7	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	**31**	0.43	**12**	0.072	0.015 J	**5.2**	0.0046 J	0.0043 J
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-018	ECCL-CS-019	ECCL-CS-020	ECCL-CS-0205	ECCL-CS-0206	ECCL-CS-0207	ECCL-CS-0208	ECCL-CS-0209
Sample Id				ECCLCS0018	ECCLCS0019	ECCLCS0020	ECCLCS0205	ECCLCS0206	ECCLCS0207	ECCLCS0208	ECCLCS0209
Date			TCLP Criteria (mg/L)	12/29/2021	01/14/2022	02/09/2022	03/24/2022	03/24/2022	03/25/2022	03/25/2022	03/28/2022
Analyte	CAS Numbers	Units									
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	0.044	0.44	<0.05 U	1.5	0.022 J	<0.05 U	<0.05 U	0.014 J
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-0210	ECCL-CS-0211	ECCL-CS-022	ECCL-CS-022	ECCL-CS-022	ECCL-CS-023	ECCL-CS-024	ECCL-CS-025A
Sample Id				ECCLCS0210	ECCLCS0211	ECCLCS0022	ECCLCS0022.1	ECCLCS0022.2	ECCLCS0023	ECCLCS0024	ECCLCS0025A
Date				03/28/2022	03/28/2022	01/20/2022	02/01/2022	02/10/2022	01/04/2022	12/17/2021	10/13/2021
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	<0.05 U	<0.05 U	**7.3**	**7.8 J**	0.1	0.025	<0.015 U	**100**
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-025A	ECCL-CS-025A	ECCL-CS-025A	ECCL-CS-025B	ECCL-CS-026	ECCL-CS-026	ECCL-CS-027	ECCL-CS-028
Sample Id				ECCLCS0025A.1	ECCLCS0025A.2	ECCLCS0025A.3	ECCLCS0025B	ECCLCS0026	ECCLCS0026.1	ECCLCS0027	ECCLCS0028
Date				11/17/2021	11/24/2021	12/08/2021	10/12/2021	10/04/2021	11/12/2021	09/16/2021	09/01/2021
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	5	**17**	2.7	**11**	**160**	0.0067 J	0.078	**9.8**
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-028	ECCL-CS-029	ECCL-CS-030	ECCL-CS-031	ECCL-CS-032	ECCL-CS-033	ECCL-CS-034	ECCL-CS-035
Sample Id				ECCLCS0028.1	ECCLCS0029	ECCLCS0030	ECCLCS0031	ECCLCS0032	ECCLCS0033	ECCLCS0034	ECCLCS0035
Date				09/09/2021	08/23/2021	11/19/2021	11/23/2021	12/06/2021	12/29/2021	01/14/2022	02/09/2022
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	<0.2 U	NA	NA	NA	NA	3.1	NA
Antimony	7440-36-0	mg/L		NA	0.17 J	NA	NA	NA	NA	0.056	NA
Arsenic	7440-38-2	mg/L	5	NA	0.02 J	NA	NA	NA	NA	<0.016	NA
Barium	7440-39-3	mg/L	100	NA	0.43 J	NA	NA	NA	NA	0.22	NA
Cadmium	7440-43-9	mg/L	1	NA	<0.05 U	NA	NA	NA	NA	<0.005	NA
Chromium	7440-47-3	mg/L	5	NA	<0.05 U	NA	NA	NA	NA	0.0041	NA
Lead	7439-92-1	mg/L	5	0.024 J	0.014 J	0.018 J	<1 U	0.003 J	<0.015 U	0.15	<0.05 U
Mercury	7439-97-6	mg/L	0.2	NA	0.00013 J	NA	NA	NA	NA	<0.0006	NA
Nickel	7440-02-0	mg/L		NA	0.0054 J	NA	NA	NA	NA	0.0061	NA
Selenium	7782-49-2	mg/L	1	NA	<0.05 U	NA	NA	NA	NA	0.014	NA
Silver	7440-22-4	mg/L	5	NA	<0.05 U	NA	NA	NA	NA	<0.05	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-037	ECCL-CS-037	ECCL-CS-038	ECCL-CS-039	ECCL-CS-040A	ECCL-CS-040A	ECCL-CS-040B	ECCL-CS-041
Sample Id				ECCLCS0037	ECCLCS0037.1	ECCLCS0038	ECCLCS0039	ECCLCS0040A	ECCLCS0040A.1	ECCLCS0040B	ECCLCS0041
Date				01/20/2022	02/01/2022	01/06/2022	12/14/2021	10/14/2021	11/17/2021	10/13/2021	10/05/2021
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	**9.9**	0.55 J	0.25 J	0.014 J	**48**	1.2	**6.2**	0.0057 J
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-041B	ECCL-CS-042	ECCL-CS-042	ECCL-CS-043	ECCL-CS-044	ECCL-CS-045	ECCL-CS-046	ECCL-CS-047
Sample Id				ECCLCS0041B	ECCLCS0042	ECCLCS0042.1	ECCLCS0043	ECCLCS0044	ECCLCS0045	ECCLCS0046	ECCLCS0047
Date				10/11/2021	09/17/2021	09/27/2021	09/02/2021	08/24/2021	11/19/2021	12/03/2021	12/07/2021
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	<0.2 U	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	0.069 J	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	<0.05 U	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	0.38 J	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	0.00063 J	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	<0.05 U	NA	NA	NA
Lead	7439-92-1	mg/L	5	0.25	**6.3**	1.1	3.8	<0.05 U	0.29	0.053	0.004 J
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	<0.002 U	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	0.0057 J	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	<0.05 U	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	<0.05 U	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-048	ECCL-CS-049	ECCL-CS-050	ECCL-CS-052	ECCL-CS-053	ECCL-CS-054	ECCL-CS-055	ECCL-CS-056
Sample Id				ECCLCS0048	ECCLCS0049	ECCLCS0050	ECCLCS0052	ECCLCS0053	ECCLCS0054	ECCLCS0055	ECCLCS0056
Date			TCLP Criteria (mg/L)	12/09/2021	01/14/2022	02/15/2022	02/01/2022	01/14/2022	12/14/2021	10/15/2021	10/05/2021
Analyte	CAS Numbers	Units									
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	5.4	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	0.053	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	<0.016	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	<0.17	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	<0.005	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	0.0098	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	<0.05 U	0.3	<0.05 U	0.64 J	0.34	0.012 J	0.19 J	0.02 J
Mercury	7439-97-6	mg/L	0.2	NA	<0.0006	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	0.011	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	0.0087	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	<0.05	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-057	ECCL-CS-058	ECCL-CS-059	ECCL-CS-060	ECCL-CS-063	ECCL-CS-064	ECCL-CS-066	ECCL-CS-068
Sample Id				ECCLCS0057	ECCLCS0058	ECCLCS0059	ECCLCS0060	ECCLCS0063	ECCLCS0064	ECCLCS0066	ECCLCS0068
Date				09/14/2021	09/07/2021	08/25/2021	10/20/2021	11/03/2021	11/03/2021	02/15/2022	03/09/2022
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	3.2	<1 U	0.27	**9**	1.2	3.5	<0.05 U	<0.05 U
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-069	ECCL-CS-070	ECCL-CS-071	ECCL-CS-072	ECCL-CS-073	ECCL-CS-073	ECCL-CS-073	ECCL-CS-073
Sample Id				ECCLCS0069	ECCLCS0070	ECCLCS0071	ECCLCS0072	ECCLCS0073	ECCLCS0073.1	ECCLCS0073.2	ECCLCS0073.3
Date				03/04/2022	12/15/2021	10/15/2021	10/07/2021	09/21/2021	09/27/2021	09/28/2021	10/05/2021
Analyte	CAS Numbers	Units	TCLP Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	12.4	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	<0.05 U	<0.015 U	0.024 J	0.055	**46**	0.11	**47**	**29**
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-073	ECCL-CS-074	ECCL-CS-075	ECCL-CS-076	ECCL-CS-076	ECCL-CS-076.1	ECCL-CS-077	ECCL-CS-081
Sample Id				ECCLCS0073.4	ECCLCS0074	ECCLCS0075	ECCLCS0076	ECCLCS0076.2	ECCLCS0076.1	ECCLCS0077	ECCLCS0081
Date			TCLP Criteria (mg/L)	11/15/2021	09/08/2021	08/26/2021	10/22/2021	11/11/2021	11/03/2021	10/26/2021	02/15/2022
Analyte	CAS Numbers	Units									
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	0.15	0.045 J	2	**13**	1.1	**8.9**	2.3	<0.05 U
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-083	ECCL-CS-084	ECCL-CS-085N	ECCL-CS-085S	ECCL-CS-086	ECCL-CS-087	ECCL-CS-087	ECCL-CS-088
Sample Id				ECCLCS0083	ECCLCS0084	ECCLCS0085N	ECCLCS0085S	ECCLCS0086	ECCLCS0087M	ECCLCS0087	ECCLCS0088
Date			TCLP	03/09/2022	03/04/2022	12/17/2021	03/18/2022	10/18/2021	10/06/2021	10/07/2021	09/21/2021
Analyte	CAS Numbers	Units	Criteria (mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	8.2	12.3	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	<0.05 U	<0.05 U	<0.015 U	<0.05 U	0.16	NA	0.57	**23**
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-088	ECCL-CS-088	ECCL-CS-089	ECCL-CS-089A	ECCL-CS-090	ECCL-CS-091	ECCL-CS-093	ECCL-CS-094
Sample Id			TCLP	ECCLCS0088.1	ECCLCS0088.2	ECCLCS0089	ECCLCS0089A	ECCLCS0090	ECCLCS0091	ECCLCS0093	ECCLCS0094M
Date			Criteria	09/29/2021	11/16/2021	09/09/2021	09/10/2021	08/27/2021	10/21/2021	10/19/2021	10/07/2021
Analyte	CAS Numbers	Units	(mg/L)								
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	7.2
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	**42**	0.085	0.021 J	0.0033 J	1	2.7	1.2	NA
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-094	ECCL-CS-095	ECCL-CS-096	ECCL-CS-1.2.9.21.36.51.67.82	ECCL-CS-1.2.9.21.36.51.67.82.E	ECCL-CS-1W.9W.21W.36W	ECCL-CS-200	ECCL-CS-201
Sample Id			TCLP Criteria (mg/L)	ECCLCS0094	ECCLCS0095	ECCLCS0096	ECCLCS1.2.9.21.36.51.67.8	ECCLCS1.2.9.21.36.51.67.8	ECCLCS1W.9W.21W.36W	ECCLCS0200	ECCLCS0201
Date				10/08/2021	09/11/2021	08/30/2021	04/06/2022	04/08/2022	02/16/2022	03/02/2022	03/03/2022
Analyte	CAS Numbers	Units									
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	1.3	0.24	0.39	<0.05 U	<0.05 U	<0.05 U	<0.05 U	<0.05 U
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-202	ECCL-CS-203	ECCL-CS-21.36.51.67.82.W	ECCL-CS-212	ECCL-CS-2136W	ECCL-CS-22.37.52.68.69.83.84	ECCL-CS-25B.40B	ECCL-CS-25B.40B
Sample Id			TCLP Criteria (mg/L)	ECCLCS0202	ECCLCS0203	ECCLCS21.36.51.67.82.W	ECCLCS0212	ECCLCS2136W	ECCLCS22.37.52.68.69.83.8	ECCLCS25B.40B.1	ECCLCS25B.40B.2
Date				03/03/2022	03/21/2022	04/08/2022	03/29/2022	01/19/2022	02/15/2022	11/16/2021	11/16/2021
Analyte	CAS Numbers	Units									
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	0.089	<0.05 U	0.12	0.26	0.52	0.09	0.54	0.048 J
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA

Table 4. Confirmation Soil Sample Results (Continued)

Station				ECCL-CS-5167W	ECCL-CS-6178A	ECCL-CS-6178B	ECCL-CS-6279A	ECCL-CS-6279A	ECCL-CS-6279B	ECCL-CS-6279B	ECCL-CS-65.80	ECCL-CS-83S.92
Sample Id			TCLP Criteria (mg/L)	ECCLCS5167W	ECCLCS61.78A	ECCLCS61.78B	ECCLCS62.79A	ECCLCS62.79A.1	ECCLCS62.79B	ECCLCS62.79B.1	ECCLCS65.80	ECCLCS83S.92
Date				01/19/2022	10/28/2021	10/28/2021	10/29/2021	11/04/2021	10/29/2021	11/04/2021	12/29/2021	03/17/2022
Analyte	CAS Numbers	Units										
pH	N704	Std Unit		NA	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum	7429-90-5	mg/L		NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	7440-36-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	7440-39-3	mg/L	100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	7440-43-9	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	mg/L	5	<0.015 U	1.3	0.6	**13**	4.3	**11**	4	0.04	<0.05 U
Mercury	7439-97-6	mg/L	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	7440-02-0	mg/L		NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	7782-49-2	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	mg/L	5	NA	NA	NA	NA	NA	NA	NA	NA	NA

Bold denotes value exceeded remediation goal.
CAS = Chemical Abstract Service
NA = Not Analyzed
U = Non-Detect
UJ = Analyte was not detected at or above the reporting limit
J = Estimated Quantity
mg/L = Milligrams per Liter
TCLP = Toxicity Characteristic Leaching Procedure

Table 5. Soil Verification Sample Results – Trap and Skeet Range

Area	CAS Numbers	Background Criteria	Remediation Goal	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				**Surface**	**Surface**	**Surface**	**Surface**	**Surface**	**Surface**	**Surface**	**Surface**
Station				**ECCL-VS-300**	**ECCL-VS-301**	**ECCL-VS-302**	**ECCL-VS-303**	**ECCL-VS-304**	**ECCL-VS-305**	**ECCL-VS-305**	**ECCL-VS-306**
Sample Id				**ECCLVS0300**	**ECCLVS0301**	**ECCLVS0302**	**ECCLVS0303**	**ECCLVS0304**	**ECCLVS9010**	**ECCLVS0305**	**ECCLVS0306**
Sample Type				**GR**	**GR**	**GR**	**GR**	**GR**	**FD**	**GR**	**GR**
Depth (ft)				**0.5 - 0.5**	**1.0 - 1.5**	**0.5 - 0.5**	**1.0 - 1.5**	**0.5 - 0.5**	**1.0 - 1.5**	**1.0 - 1.5**	**1.0 - 1.5**
Date				**04/06/22**	**04/06/22**	**02/15/22**	**01/04/22**	**11/18/21**	**11/18/21**	**11/18/21**	**10/08/21**
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<29 U	<26 U	4.1 J	<6.5 UJ	0.42 J	<2.1 U	<1.9 UJ	<2.2 U
Arsenic	7440-38-2	36.5	36.5	NA	NA	9.5	7.7	3.4	2.6	3.6	2.6
Lead	7439-92-1	48.6	400	120	39	210	390	43	3.5	3.4	8.1
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-315	ECCL-VS-315	ECCL-VS-316	ECCL-VS-317	ECCL-VS-318	ECCL-VS-318.1	ECCL-VS-318.2	ECCL-VS-318.3
Sample Id				ECCLVS9003	ECCLVS0315	ECCLVS0316	ECCLVS0317	ECCLVS0318	ECCLVS0318.1	ECCLVS0318.2	ECCLVS0318.3
Sample Type				FD	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.3 - 1.3	1.3 - 1.3	0.5 - 0.5	1.0 - 1.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5
Date	CAS	Background	Remediation	09/15/21	09/15/21	09/10/21	08/31/21	08/24/21	09/10/21	09/10/21	09/10/21
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	<1.9 U	0.42 J	0.89 J	1.3 J	3.4 J	NA	NA	NA
Arsenic	7440-38-2	36.5	36.5	1.1 J	1.7	2.5	7.7	6.4 J	NA	NA	NA
Lead	7439-92-1	48.6	400	3.8	4.5	48	5.3	**600**	300	200	81
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Subsurface
Station				ECCL-VS-319	ECCL-VS-320	ECCL-VS-321	ECCL-VS-322	ECCL-VS-323	ECCL-VS-324	ECCL-VS-325	ECCL-VS-326
Sample Id				ECCLVS0319	ECCLVS0320	ECCLVS0321	ECCLVS0322	ECCLVS0323	ECCLVS0324	ECCLVS0325	ECCLVS0326
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	1.5 - 2.0	1.3 - 1.3	1.0 - 1.5	1.5 - 2.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5
Date	CAS	Background	Remediation	12/29/21	01/20/22	09/15/21	12/02/21	01/12/22	01/13/22	01/19/22	04/06/22
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	2.3 J	0.98 J	<2.1 U	1.5 J	<25 UJ	<4.8 U	<6.1 UJ	<4.7 U
Arsenic	7440-38-2	36.5	36.5	6.2	2.2	3.5	8.1 J	4.4 J	9.2	24	NA
Lead	7439-92-1	48.6	400	60	7.7	8	160	31 J	17	19	18
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-327	ECCL-VS-328	ECCL-VS-329	ECCL-VS-330	ECCL-VS-330	ECCL-VS-331	ECCL-VS-332	ECCL-VS-333
Sample Id				ECCLVS0327	ECCLVS0328	ECCLVS0329	ECCLVS0330	ECCLVS0330A	ECCLVS0331	ECCLVS0332	ECCLVS0333
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.0 - 1.5
Date	CAS	Background	Remediation	01/20/22	01/04/22	11/23/21	10/22/21	11/09/21	09/30/21	09/15/21	09/01/21
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	0.83 J	<6.1 UJ	<2.1 U	1.8 J	2.1	2.2 J	<2 U	0.41 J
Arsenic	7440-38-2	36.5	36.5	7.8	1.2 J	0.65 J	1.1 J	1.1 J	4.6	2.4	3.6
Lead	7439-92-1	48.6	400	19	26	6	16	4.7	69 J	6.1	6.2
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-334	ECCL-VS-335	ECCL-VS-336	ECCL-VS-337	ECCL-VS-338	ECCL-VS-339	ECCL-VS-340	ECCL-VS-341
Sample Id				ECCLVS0334	ECCLVS0335	ECCLVS0336	ECCLVS0337	ECCLVS0338	ECCLVS0339	ECCLVS0340	ECCLVS0341
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.0 - 1.5	0.5 - 0.5	0.5 - 0.5	1.3 - 1.3	0.5 - 0.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5
Date	CAS Numbers	Background Criteria	Remediation Goal	08/24/21	09/01/21	11/12/21	09/16/21	11/11/21	11/11/21	11/12/21	12/02/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<2.2 U	0.5 J	1.9 J	1 J	1.4 J	1.3 J	1.1 J	1 J
Arsenic	7440-38-2	36.5	36.5	4	4.3	15 J	1.8	10	10 J	16	14
Lead	7439-92-1	48.6	400	6.2	51	110	2.8	44	34 J	88	86
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Subsurface	Surface	Surface	Surface
Station				ECCL-VS-342	ECCL-VS-342	ECCL-VS-343	ECCL-VS-344	ECCL-VS-345	ECCL-VS-346	ECCL-VS-347	ECCL-VS-348
Sample Id				ECCLVS9014	ECCLVS0342	ECCLVS0343	ECCLVS0344	ECCLVS0345	ECCLVS0346	ECCLVS0347	ECCLVS9009
Sample Type				FD	GR	GR	GR	GR	GR	GR	FD
Depth (ft)				1.5 - 2.0	1.5 - 2.0	1.0 - 1.5	1.5 - 2.0	2.0 - 2.5	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0
Date	CAS Numbers	Background Criteria	Remediation Goal	01/12/22	01/12/22	01/13/22	01/19/22	04/06/22	01/04/22	12/15/21	11/09/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<4.8 U	<24 U	<4.9 U	<6.8 UJ	<4.3 U	<5.9 U	4.4 J	1.7 J
Arsenic	7440-38-2	36.5	36.5	7.6	12	8.4	19	NA	11	4.3	4.2
Lead	7439-92-1	48.6	400	47	46	70	47	13	26	25	120
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-348	ECCL-VS-349	ECCL-VS-349E	ECCL-VS-349N	ECCL-VS-349S	ECCL-VS-349W	ECCL-VS-350	ECCL-VS-351
Sample Id				ECCLVS0348	ECCLVS0349	ECCLVS0349E	ECCLVS0349N	ECCLVS0349S	ECCLVS0349W	ECCLVS0350	ECCLVS9001
Sample Type				GR	GR	GR	GR	GR	GR	GR	FD
Depth (ft)				1.5 - 2.0	1.5 - 2.0	1.8 - 1.8	1.8 - 1.8	1.8 - 1.8	1.8 - 1.8	1.5 - 2.0	1.0 - 1.5
Date	CAS Numbers	Background Criteria	Remediation Goal	11/09/21	10/01/21	11/09/21	11/09/21	11/09/21	11/09/21	09/16/21	09/02/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	0.54 J	<2	<2.1 U	<2.1 U	<1.9 U	<2.3 U	0.5 J	0.46 J
Arsenic	7440-38-2	36.5	36.5	3.7	1.9	4.5	2.9	2.5	1.4 J	6.9	7.7
Lead	7439-92-1	48.6	400	31	13	8.5	3.1	4.7	5.7	25	34
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-351	ECCL-VS-352	ECCL-VS-353	ECCL-VS-353.1	ECCL-VS-353.2	ECCL-VS-353.3	ECCL-VS-354	ECCL-VS-355
Sample Id				ECCLVS0351	ECCLVS0352	ECCLVS0353	ECCLVS0353.1	ECCLVS0353.2	ECCLVS0353.3	ECCLVS0354	ECCLVS0355
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.0 - 1.5	1.0 - 1.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	1.5 - 2.0	1.3 - 1.3
Date	CAS Numbers	Background Criteria	Remediation Goal	09/02/21	08/24/21	08/24/21	09/10/21	09/10/21	09/10/21	01/21/22	09/17/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	0.62 J	<2.2 U	2.8	NA	NA	NA	0.64 J	<2.4 U
Arsenic	7440-38-2	36.5	36.5	6.2	3.3	9	NA	NA	NA	11	2
Lead	7439-92-1	48.6	400	97	3.6	**450**	22	11	91	31	4.4
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-356	ECCL-VS-357	ECCL-VS-358	ECCL-VS-359	ECCL-VS-360	ECCL-VS-360	ECCL-VS-361	ECCL-VS-362
Sample Id				ECCLVS0356	ECCLVS0357	ECCLVS0358	ECCLVS0359	ECCLVS9011	ECCLVS0360	ECCLVS0361	ECCLVS0362
Sample Type				GR	GR	GR	GR	FD	GR	GR	GR
Depth (ft)				0.7 - 0.7	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.5 - 2.0	1.5 - 2.0	1.0 - 1.5	1.5 - 2.0
Date	CAS	Background	Remediation	10/20/21	11/11/21	11/12/21	12/03/21	12/08/21	12/08/21	01/13/22	01/19/22
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	0.64 J	0.51 J	1.5 J	1.8 J	1.2 J	0.78 J	<4.8 U	<6.5 UJ
Arsenic	7440-38-2	36.5	36.5	2.9	3.8	9.7	36	27	24	3.9	22
Lead	7439-92-1	48.6	400	75	6.7	130	120	31	30	35	110
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Subsurface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-363	ECCL-VS-364	ECCL-VS-365	ECCL-VS-366	ECCL-VS-367	ECCL-VS-368	ECCL-VS-369	ECCL-VS-370
Sample Id				ECCLVS0363	ECCLVS0364	ECCLVS0365	ECCLVS0366	ECCLVS0367	ECCLVS0368	ECCLVS0369	ECCLVS0370
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				2.0 - 2.5	1.5 - 2.0	1.3 - 1.3	1.5 - 2.0	1.3 - 1.3	1.3 - 1.3	1.0 - 1.5	1.0 - 1.5
Date	CAS Numbers	Background Criteria	Remediation Goal	04/06/22	01/06/22	12/14/21	11/09/21	10/04/21	09/17/21	09/07/21	08/26/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<4.4 U	<5.6 UJ	1.6 J	5.2	2.7	<1.7 U	0.55 J	<1.9 UJ
Arsenic	7440-38-2	36.5	36.5	NA	5.3	2.7	5.1	1.1 J	3.4	4.6	2.3
Lead	7439-92-1	48.6	400	17	8.1	32 J	370	4.9	13	26 J	8.7 J
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-371	ECCL-VS-371	ECCL-VS-372	ECCL-VS-373	ECCL-VS-374	ECCL-VS-375	ECCL-VS-376	ECCL-VS-377
Sample Id				ECCLVS9000	ECCLVS0371	ECCLVS0372	ECCLVS0373	ECCLVS0374	ECCLVS0375	ECCLVS0376	ECCLVS0377
Sample Type				FD	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5
Date	CAS Numbers	Background Criteria	Remediation Goal	08/25/21	08/25/21	10/19/21	10/28/21	10/28/21	11/02/21	11/03/21	12/29/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	0.33 J	<2.1 U	0.39 J	0.95 J	0.67 J	1.1 J	0.53 J	1 J
Arsenic	7440-38-2	36.5	36.5	5.6	3.5	2.1	2.7	5.8	16	3	16
Lead	7439-92-1	48.6	400	8.8	10	9	7.1	31	42	28	26
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Subsurface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-378	ECCL-VS-379	ECCL-VS-380	ECCL-VS-381	ECCL-VS-382	ECCL-VS-382	ECCL-VS-383	ECCL-VS-384
Sample Id				ECCLVS0378	ECCLVS0379	ECCLVS0380	ECCLVS0381	ECCLVS9004	ECCLVS0382	ECCLVS0383	ECCLVS0384
Sample Type				GR	GR	GR	GR	FD	GR	GR	GR
Depth (ft)				1.0 - 1.5	2.0 - 2.5	1.5 - 2.0	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5
Date	CAS Numbers	Background Criteria	Remediation Goal	01/19/22	04/06/22	01/06/22	12/15/21	10/14/21	10/14/21	10/04/21	09/14/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<5.6 UJ	<5.1 U	<6 UJ	<5.8 UJ	0.52 J	0.33 J	0.76 J	0.57 J
Arsenic	7440-38-2	36.5	36.5	4.7	NA	5.7	2.5	2.2	2.9	2	4.5
Lead	7439-92-1	48.6	400	27	18	24	33	7.9	9	11	15
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-385	ECCL-VS-385	ECCL-VS-386	ECCL-VS-387	ECCL-VS-388	ECCL-VS-389	ECCL-VS-390	ECCL-VS-391
Sample Id				ECCLVS9002	ECCLVS0385	ECCLVS0386	ECCLVS0387	ECCLVS0388	ECCLVS0389	ECCLVS0390	ECCLVS0391
Sample Type				FD	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	0.8 - 0.8	0.5 - 0.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5
Date	CAS Numbers	Background Criteria	Remediation Goal	09/07/21	09/07/21	08/26/21	08/26/21	10/20/21	10/19/21	10/22/21	10/22/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<2.3 U	0.64 J	0.39 J	0.81 J	<1.8 U	0.56 J	0.58 J	<1.8 U
Arsenic	7440-38-2	36.5	36.5	6.3	6.4	6	14	2.1	3.6	2.1	5.8
Lead	7439-92-1	48.6	400	20	20	21	31	3.6	53	9.6	42
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-392	ECCL-VS-392	ECCL-VS-393	ECCL-VS-394	ECCL-VS-394	ECCL-VS-395	ECCL-VS-396	ECCL-VS-396
Sample Id				ECCLVS9008	ECCLVS0392	ECCLVS0393	ECCLVS9013	ECCLVS0394	ECCLVS0395	ECCLVS9026	ECCLVS0396
Sample Type				FD	GR	GR	FD	GR	GR	FD	GR
Depth (ft)				1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.5 - 2.0	1.5 - 2.0
Date	CAS Numbers	Background Criteria	Remediation Goal	10/28/21	10/28/21	10/28/21	12/29/21	12/29/21	01/19/22	04/07/22	04/07/22
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	0.46 J	0.59 J	0.61 J	0.54 J	0.93 J	<6.2 UJ	<4.2 U	<4.5 UJ
Arsenic	7440-38-2	36.5	36.5	5.3	5.8	8.3	4.5	13	14	NA	NA
Lead	7439-92-1	48.6	400	16	17	19	8.7	13	20	11	10
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	NA	NA	<0.038 U	<0.037 U
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	NA	NA	<0.038 U	<0.037 U
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	NA	NA	<0.038 U	<0.037 U
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	NA	NA	<0.038 U	<0.037 U
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	NA	NA	<0.038 U	<0.037 U

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-397	ECCL-VS-398	ECCL-VS-398	ECCL-VS-399	ECCL-VS-399	ECCL-VS-400	ECCL-VS-401	ECCL-VS-402
Sample Id				ECCLVS0397	ECCLVS9012	ECCLVS0398	ECCLVS9006	ECCLVS0399	ECCLVS0400	ECCLVS0401	ECCLVS0402
Sample Type				GR	FD	GR	FD	GR	GR	GR	GR
Depth (ft)				1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.0 - 1.5	0.0 - 0.0	1.0 - 1.5
Date	CAS	Background	Remediation	03/08/22	12/15/21	12/15/21	10/18/21	10/18/21	10/06/21	09/21/21	09/08/21
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	<5.4 U	<5.2 UJ	<5.7 UJ	0.49 J	0.59 J	0.66 J	<1.7 U	1 J
Arsenic	7440-38-2	36.5	36.5	5.8	2.2	1.9	1.4 J	5.8	1.4 J	7.2	18
Lead	7439-92-1	48.6	400	16	4.3	5.3	4.4	8	15	12	85
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	<0.045 U	<0.077 U	<0.078 U	0.028	0.0071 J	<0.018 U	NA	NA
Benzo(a)pyrene	50-32-8		1.1	<0.045 U	<0.077 U	<0.078 U	0.041	0.014 J	<0.018 U	NA	NA
Benzo(b)fluoranthene	205-99-2		11	<0.045 U	<0.077 U	<0.078 U	0.048	0.012 J	<0.018 U	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	<0.045 U	<0.077 U	<0.078 U	0.013 J	<0.019 U	<0.018 U	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	<0.045 UJ	<0.077 U	<0.078 U	0.028	0.0093 J	<0.018 U	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-403	ECCL-VS-404	ECCL-VS-404.1	ECCL-VS-405	ECCL-VS-406	ECCL-VS-407	ECCL-VS-408	ECCL-VS-409
Sample Id				ECCLVS0403	ECCLVS0404	ECCLVS0404.1	ECCLVS0405	ECCLVS0406	ECCLVS0407	ECCLVS0408	ECCLVS0409
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.0 - 1.5	1.0 - 1.5	0.5 - 0.5	0.5 - 0.5	0.8 - 0.8	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5
Date	CAS	Background	Remediation	08/27/21	09/03/21	09/03/21	11/22/21	03/17/22	10/19/21	10/19/21	10/20/21
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	0.87 J	0.79 J	0.66 J	0.82 J	<4.5 U	<2.3 U	0.57 J	0.46 J
Arsenic	7440-38-2	36.5	36.5	10	12	10	9.2	17	2.6	3.2	2.8
Lead	7439-92-1	48.6	400	31	17	17	83 J	13	3.6	57	11
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	NA	NA	<0.039 UJ	NA	NA	NA
Benzo(a)pyrene	50-32-8		1.1	NA	NA	NA	NA	<0.039 UJ	NA	NA	NA
Benzo(b)fluoranthene	205-99-2		11	NA	NA	NA	NA	<0.039 UJ	NA	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	NA	NA	<0.039 UJ	NA	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	NA	NA	<0.039 UJ	NA	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-410	ECCL-VS-411	ECCL-VS-412	ECCL-VS-413	ECCL-VS-413	ECCL-VS-414	ECCL-VS-415	ECCL-VS-416
Sample Id				ECCLVS0410	ECCLVS0411	ECCLVS0412	ECCLVS9016	ECCLVS0413	ECCLVS0414	ECCLVS0415	ECCLVS0416
Sample Type				GR	GR	GR	FD	GR	GR	GR	GR
Depth (ft)				1.0 - 1.5	0.5 - 0.5	0.8 - 0.8	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0
Date	CAS	Background	Remediation	10/20/21	10/21/21	03/10/22	03/10/22	03/10/22	03/14/22	04/07/22	03/17/22
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	<2.3 U	<1.9 U	NA	NA	NA	NA	<5.2 U	<4.6 U
Arsenic	7440-38-2	36.5	36.5	5	5.7	NA	NA	NA	NA	NA	30
Lead	7439-92-1	48.6	400	26	11	NA	NA	NA	23	14	20
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	NA	NA	<0.039 U	<0.039 U	<0.038 U	<0.04 U	<0.044 U	<0.038 UJ
Benzo(a)pyrene	50-32-8		1.1	NA	NA	<0.039 U	<0.039 U	<0.038 U	<0.04 U	<0.044 U	<0.038 UJ
Benzo(b)fluoranthene	205-99-2		11	NA	NA	<0.039 U	<0.039 U	<0.038 U	<0.04 U	<0.044 U	<0.038 UJ
Dibenz(a,h)anthracene	53-70-3		1.1	NA	NA	<0.039 U	<0.039 U	<0.038 U	<0.04 U	<0.044 U	<0.038 UJ
Indeno(1,2,3-cd)pyrene	193-39-5		11	NA	NA	<0.039 UJ	<0.039 UJ	<0.038 UJ	<0.04 U	<0.044 U	<0.038 UJ

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-417	ECCL-VS-418	ECCL-VS-418	ECCL-VS-419	ECCL-VS-420	ECCL-VS-421	ECCL-VS-422	ECCL-VS-423
Sample Id				ECCLVS0417	ECCLVS9007	ECCLVS0418	ECCLVS0419	ECCLVS0420	ECCLVS0421	ECCLVS0422	ECCLVS0423
Sample Type				GR	FD	GR	GR	GR	GR	GR	GR
Depth (ft)				1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 1.7	1.5 - 2.0	0.6 - 0.6	0.5 - 0.5
Date	CAS Numbers	Background Criteria	Remediation Goal	12/15/21	10/18/21	10/18/21	10/06/21	09/11/21	09/09/21	08/30/21	10/20/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<5.8 UJ	NA	0.55 J	<2 U	0.82 J	1.4 J	1.6 J	0.51 J
Arsenic	7440-38-2	36.5	36.5	7.7	NA	12	7.2	13	24	19	2
Lead	7439-92-1	48.6	400	12	NA	17	35	21	25	290	130
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	<0.084 U	0.033	0.015 J	<0.019 U	<0.019 U	<0.019 U	NA	NA
Benzo(a)pyrene	50-32-8		1.1	<0.084 U	0.045	0.025	<0.019 U	<0.019 U	<0.019 U	NA	NA
Benzo(b)fluoranthene	205-99-2		11	<0.084 U	0.055	0.024	<0.019 U	<0.019 U	<0.019 U	NA	NA
Dibenz(a,h)anthracene	53-70-3		1.1	<0.084 U	0.012 J	<0.019 U	<0.019 U	<0.019 U	<0.019 U	NA	NA
Indeno(1,2,3-cd)pyrene	193-39-5		11	<0.084 U	0.031	0.015 J	<0.019 U	<0.019 U	<0.019 U	NA	NA

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Subsurface	Subsurface	Subsurface	Subsurface	Surface
Station				ECCL-VS-424	ECCL-VS-424A	ECCL-VS-425	ECCL-VS-426	ECCL-VS-427	ECCL-VS-428	ECCL-VS-429	ECCL-VS-430
Sample Id				ECCLVS0424	ECCLVS0424A	ECCLVS0425	ECCLVS0426	ECCLVS0427	ECCLVS0428	ECCLVS0429	ECCLVS0430
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.8 - 0.8	0.8 - 0.8	0.8 - 0.8	2.0 - 2.5	2.0 - 2.5	2.0 - 2.0	2.0 - 2.5	1.5 - 2.0
Date	CAS	Background	Remediation	03/14/22	03/17/22	03/14/22	04/20/22	04/20/22	04/20/22	04/20/22	04/20/22
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	36.5	36.5	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	48.6	400	NA	NA	NA	NA	NA	NA	NA	NA
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	0.076	<0.045 UJ	<0.04 U	0.036 J	0.019 J	0.65	<0.041 U	0.016 J
Benzo(a)pyrene	50-32-8		1.1	0.082	0.016 J	<0.04 U	0.037 J	0.011 J	0.8	0.012 J	<0.041 U
Benzo(b)fluoranthene	205-99-2		11	0.087	0.012 J	<0.04 U	0.042	0.01 J	1	<0.041 U	0.011 J
Dibenz(a,h)anthracene	53-70-3		1.1	0.018 J	<0.045 UJ	<0.04 U	<0.04 U	<0.04 U	0.18	<0.041 U	<0.041 U
Indeno(1,2,3-cd)pyrene	193-39-5		11	0.046 J	<0.045 UJ	<0.04 U	0.025 J	<0.04 U	0.62	<0.041 U	<0.041 U

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-431	ECCL-VS-432	ECCL-VS-432	ECCL-VS-433	ECCL-VS-434	ECCL-VS-435	ECCL-VS-436	ECCL-VS-437
Sample Id				ECCLVS0431	ECCLVS9027	ECCLVS0432	ECCLVS0433	ECCLVS0434	ECCLVS0435	ECCLVS0436	ECCLVS0437
Sample Type				GR	FD	GR	GR	GR	GR	GR	GR
Depth (ft)				0.8 - 0.8	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	1.5 - 2.0
Date	CAS Numbers	Background Criteria	Remediation Goal	04/20/22	04/20/22	04/20/22	04/20/22	04/22/22	04/22/22	11/08/21	11/05/21
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	NA	NA	NA	NA	NA	<5 U	0.79 J	0.7 J
Arsenic	7440-38-2	36.5	36.5	NA	NA	NA	NA	NA	**65**	15	14
Lead	7439-92-1	48.6	400	NA	NA	NA	NA	NA	40	39	26
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	<0.041 U	0.02 J	0.074	0.12	0.2	0.079	0.011 J	0.026
Benzo(a)pyrene	50-32-8		1.1	<0.041 U	0.02 J	0.11	0.15	0.24	0.088	0.022	0.023
Benzo(b)fluoranthene	205-99-2		11	<0.041 U	0.016 J	0.047	0.077	0.27	0.074	0.02 J	0.016 J
Dibenz(a,h)anthracene	53-70-3		1.1	<0.041 U	<0.039 U	0.021 J	0.026 J	<0.04 U	<0.047 U	<0.021 U	<0.02 U
Indeno(1,2,3-cd)pyrene	193-39-5		11	<0.041 U	<0.039 U	0.03 J	0.05	0.15	0.05	<0.021 U	0.011 J

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-438	ECCL-VS-439	ECCL-VS-440	ECCL-VS-441	ECCL-VS-442	ECCL-VS-443	ECCL-VS-444	ECCL-VS-445
Sample Id				ECCLVS0438	ECCLVS0439	ECCLVS0440	ECCLVS0441	ECCLVS0442	ECCLVS0443	ECCLVS0444	ECCLVS0445
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.5 - 1.7	0.8 - 0.8	0.8 - 0.8	1.0 - 1.0	0.8 - 0.8	1.0 - 1.0	1.5 - 2.0	1.5 - 2.0
Date	CAS	Background	Remediation	09/11/21	09/11/21	04/20/22	04/22/22	11/05/21	05/11/22	05/11/22	11/08/21
Analyte (mg/kg)	Numbers	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	0.73 J	1.4 J	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	36.5	36.5	9.8	20	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	48.6	400	14	36	NA	NA	NA	NA	NA	NA
Organics-Semivolatile											
Benz(a)anthracene	56-55-3		11	<0.019 U	<0.019 U	0.1	<0.044 U	0.0061 J	<0.02 U	<0.019 U	0.014
Benzo(a)pyrene	50-32-8		1.1	<0.019 U	<0.019 U	0.14	<0.044 U	<0.018 U	<0.02 U	<0.019 U	0.026
Benzo(b)fluoranthene	205-99-2		11	<0.019 U	<0.019 U	0.16	<0.044 U	<0.018 U	0.01 J	<0.019 U	0.018
Dibenz(a,h)anthracene	53-70-3		1.1	<0.019 U	<0.019 U	0.026 J	<0.044 U	<0.018 U	<0.02 U	<0.019 U	<0.018
Indeno(1,2,3-cd)pyrene	193-39-5		11	<0.019 U	<0.019 U	0.1	<0.044 U	<0.018 U	<0.02 U	<0.019 U	<0.018

Table 5. Soil Verification Sample Results – Trap and Skeet Range (Continued)

Area				Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges	Trap and Skeet Ranges
Group				Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-446	ECCL-VS-447	ECCL-VS-448	ECCL-VS-449	ECCL-VS-450
Sample Id				ECCLVS0446	ECCLVS0447	ECCLVS0448	ECCLVS0449	ECCLVS0450
Sample Type				GR	GR	GR	GR	GR
Depth (ft)				0.8 - 0.8	1.0 - 1.0	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
Date	CAS	Background	Remediation	11/05/21	05/11/22	06/20/22	06/20/22	06/20/22
Analyte (mg/kg)	Numbers	Criteria	Goal					
Metals								
Antimony	7440-36-0	9.3	31	NA	NA	1.7 J	1.6 J	1.5 J
Arsenic	7440-38-2	36.5	36.5	NA	NA	**49**	**51**	**54**
Lead	7439-92-1	48.6	400	NA	NA	43	20	25
Organics-Semivolatile								
Benz(a)anthracene	56-55-3		11	0.018	<0.022 U	0.0063 J	<0.02 U	<0.022 U
Benzo(a)pyrene	50-32-8		1.1	0.021	<0.022 U	<0.022 U	<0.02 U	<0.022 U
Benzo(b)fluoranthene	205-99-2		11	0.022	<0.022 U	0.013 J	0.031	0.021 J
Dibenz(a,h)anthracene	53-70-3		1.1	<0.018 U	<0.022 U	<0.022 U	<0.02 U	<0.022 U
Indeno(1,2,3-cd)pyrene	193-39-5		11	0.012 J	<0.022 U	<0.022 U	<0.02 U	<0.022 U

Bold denotes value exceeded remediation goal.
CAS = Chemical Abstract Service
FD = Field Duplicate
GR = Grab Sample
mg/kg = Milligrams per Kilogram
NA = Not Analyzed
U = Non-Detect
UJ = Analyte was not detected at or above the reporting limit
J = Estimated Quantity

Table 6. Soil Verification Sample Results – Rifle Range

Area				Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range
Group				Surface	Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Surface	Removed	Subsurface
Station				ECCL-VS-500	ECCL-VS-501	ECCL-VS-501	ECCL-VS-502	ECCL-VS-503	ECCL-VS-504	ECCL-VS-505	ECCL-VS-506	ECCL-VS-506.1
Sample Id				ECCLVS0500	ECCLVS9015	ECCLVS0501	ECCLVS0502	ECCLVS0503	ECCLVS0504	ECCLVS0505	ECCLVS0506	ECCLVS0506.1
Sample Type				GR	FD	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.0 - 0.5	6.0 - 6.5	6.0 - 6.5	6.0 - 6.5	6.0 - 6.5	6.0 - 6.5	0.0 - 0.5	6.0 - 6.5	7.5 - 8.0
Date				02/28/22	02/28/22	02/28/22	02/28/22	02/28/22	02/28/22	02/28/22	03/03/22	03/16/22
Analyte (mg/kg)	CAS Number	Background Criteria	Remediation Goal									
Metals												
Antimony	7440-36-0	9.3	31	<4.3 U	<4.5 U	<4.6 U	<5 UJ	<4.5 U	<4.4 U	1.6 J	4.7	NA
Copper	7440-50-8	56.2	3100	90	24	22	37 J	17	100	88	190	NA
Lead	7439-92-1	48.6	400	150	12	14	17	12	15	36	**510**	11

Table 6. Soil Verification Sample Results – Rifle Range (Continued)

Area				Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range
Group				Subsurface	Subsurface	Subsurface	Subsurface	Subsurface	Removed	Subsurface	Subsurface	Subsurface
Station				ECCL-VS-506.2	ECCL-VS-506.3	ECCL-VS-507	ECCL-VS-508	ECCL-VS-509	ECCL-VS-510	ECCL-VS-510.1	ECCL-VS-510.2	ECCL-VS-510.3
Sample Id				ECCLVS0506.2	ECCLVS0506.3	ECCLVS0507	ECCLVS0508	ECCLVS0509	ECCLVS0510	ECCLVS0510.1	ECCLVS0510.2	ECCLVS0510.3
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				7.5 - 8.0	7.5 - 8.0	6.0 - 6.5	6.5 - 7.0	6.0 - 6.5	6.0 - 6.5	7.5 - 8.0	7.5 - 8.0	7.5 - 8.0
Date				03/16/22	03/16/22	03/02/22	03/03/22	03/02/22	03/02/22	03/16/22	03/16/22	03/16/22
Analyte (mg/kg)	CAS Number	Background Criteria	Remediation Goal									
Metals												
Antimony	7440-36-0	9.3	31	NA	NA	2.8 J	<4.9 U	1.8 J	20	NA	NA	NA
Copper	7440-50-8	56.2	3100	NA	NA	90	36	79	50	NA	NA	NA
Lead	7439-92-1	48.6	400	16	10	180	230	110	**2600**	170	48	25

Table 6. Soil Verification Sample Results – Rifle Range (Continued)

Area	CAS Number	Background Criteria	Remediation Goal	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range
Group				Subsurface	Surface	Surface	Surface	Subsurface	Surface	Surface	Surface	Surface
Station				ECCL-VS-511	ECCL-VS-512	ECCL-VS-513	ECCL-VS-513	ECCL-VS-514	ECCL-VS-515	ECCL-VS-516	ECCL-VS-517	ECCL-VS-518
Sample Id				ECCLVS0511	ECCLVS0512	ECCLVS9017	ECCLVS0513	ECCLVS0514	ECCLVS0515	ECCLVS0516	ECCLVS0517	ECCLVS0518
Sample Type				GR	GR	FD	GR	GR	GR	GR	GR	GR
Depth (ft)				6.0 - 6.5	0.8 - 0.8	1.5 - 2.0	1.5 - 2.0	2.0 - 2.5	1.5 - 2.0	1.5 - 2.0	0.8 - 0.8	0.8 - 0.8
Date				03/02/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22
Analyte (mg/kg)												
Metals												
Antimony	7440-36-0	9.3	31	1.6 J	<4.8 U	2.5 J	2 J	<4.7 U	1.6 J	<4.8 U	<4.7 U	<4.7 U
Copper	7440-50-8	56.2	3100	83	280	140	120	93	12	73	38	41
Lead	7439-92-1	48.6	400	100	**420**	370	320	120	86	170	21	61

Table 6. Soil Verification Sample Results – Rifle Range (Continued)

Area	CAS Number	Background Criteria	Remediation Goal	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range
Group				Surface	Surface	Subsurface	Subsurface	Subsurface	Surface	Surface	Surface	Surface
Station				ECCL-VS-519	ECCL-VS-519	ECCL-VS-520	ECCL-VS-520	ECCL-VS-521	ECCL-VS-522	ECCL-VS-523	ECCL-VS-524	ECCL-VS-525
Sample Id				ECCLVS9018	ECCLVS0519	ECCLVS9019	ECCLVS0520	ECCLVS0521	ECCLVS0522	ECCLVS0523	ECCLVS0524	ECCLVS0525
Sample Type				FD	GR	FD	GR	GR	GR	GR	GR	GR
Depth (ft)				1.5 - 2.0	1.5 - 2.0	2.0 - 2.5	2.0 - 2.5	2.0 - 2.5	1.5 - 2.0	0.8 - 0.8	0.8 - 0.8	0.8 - 0.8
Date				03/18/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22	03/18/22
Analyte (mg/kg)												
Metals												
Antimony	7440-36-0	9.3	31	<4.7 U	<5.2 UJ	<4.7 U	<4.7 U	<4.5 U	<4.8 U	<5 U	1.8 J	2.9 J
Copper	7440-50-8	56.2	3100	38	37	35	36	42	44	38	160	120
Lead	7439-92-1	48.6	400	64	75	27	26	36	17	20	200	340

Table 6. Soil Verification Sample Results – Rifle Range (Continued)

Area	CAS Number	Background Criteria	Remediation Goal	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range	Rifle Range
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-526	ECCL-VS-593	ECCL-VS-594	ECCL-VS-595	ECCL-VS-596	ECCL-VS-597	ECCL-VS-598
Sample Id				ECCLVS0526	ECCLVS0593	ECCLVS0594	ECCLVS0595	ECCLVS0596	ECCLVS0597	ECCLVS0598
Sample Type				GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.8 - 0.8	0.5 - 0.8	0.5 - 0.8	0.5 - 0.8	0.5 - 0.8	0.5 - 0.8	0.5 - 0.8
Date				03/18/22	04/22/22	04/22/22	04/22/22	04/22/22	04/22/22	04/26/22
Analyte (mg/kg)										
Metals										
Antimony	7440-36-0	9.3	31	<5.1 U	<4.5 U	<4.8 U	<3.8 U	<4 U	<4 U	0.56 J
Copper	7440-50-8	56.2	3100	62	76	51	45	76	76	71
Lead	7439-92-1	48.6	400	110	250	38	28	48	180	68

Bold denotes value exceeded remediation goal.
CAS = Chemical Abstract Service
FD = Field Duplicate
GR = Grab Sample
mg/kg = Milligrams per Kilogram
NA = Not Analyzed
U = Non-Detect
UJ = Analyte was not detected at or above the reporting limit
J = Estimated Quantity

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Table 7. Soil Verification Sample Results – Pistol West Range

Area				Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)
Group				Surface	Surface	Surface	Surface	Removed	Subsurface	Subsurface	Subsurface
Station				ECCL-VS-527	ECCL-VS-528	ECCL-VS-528	ECCL-VS-529	ECCL-VS-530	ECCL-VS-530	ECCL-VS-530	ECCL-VS-530
Sample Id				ECCLVS0527	ECCLVS9020	ECCLVS0528	ECCLVS0529	ECCLVS0530	ECCLVS0530.1	ECCLVS0530.2	ECCLVS0530.3
Sample Type				GR	FD	GR	GR	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	1.5 - 2.0	2.0 - 2.5	2.0 - 2.5	2.0 - 2.5
Date	CAS	Background	Remediation	03/23/22	03/23/22	03/23/22	03/23/22	03/23/22	04/11/22	04/11/22	04/11/22
Analyte (mg/kg)	Number	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	<4.8 U	<5 U	<4.6 U	<4.2 U	<6.1 U	NA	NA	NA
Copper	7440-50-8	56.2	3100	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	48.6	400	32	27	28	11	**450**	20	23	41

Table 7. Soil Verification Sample Results – Pistol West Range (Continued)

Area				Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-531	ECCL-VS-532	ECCL-VS-533	ECCL-VS-534	ECCL-VS-535	ECCL-VS-536	ECCL-VS-537	ECCL-VS-538
Sample Id				ECCLVS0531	ECCLVS0532	ECCLVS0533	ECCLVS0534	ECCLVS0535	ECCLVS0536	ECCLVS0537	ECCLVS0538
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5
Date	CAS Number	Background Criteria	Remediation Goal	03/23/22	03/23/22	03/24/22	03/23/22	03/23/22	03/23/22	03/24/22	03/24/22
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<4.5 U	<4.5 U	<4.3 U	<4.3 U	<4.4 U	<4.2 U	<4.4 U	<4.2 U
Copper	7440-50-8	56.2	3100	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	48.6	400	220	44	9.6	93	8.4	29	81	69

Table 7. Soil Verification Sample Results – Pistol West Range (Continued)

Area				Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)
Group				Surface	Surface	Surface	Surface	Subsurface	Subsurface	Subsurface	Surface
Station				ECCL-VS-539	ECCL-VS-540	ECCL-VS-541	ECCL-VS-542	ECCL-VS-543	ECCL-VS-544	ECCL-VS-544	ECCL-VS-553
Sample Id				ECCLVS0539	ECCLVS0540	ECCLVS0541	ECCLVS0542	ECCLVS0543	ECCLVS9022	ECCLVS0544	ECCLVS9021
Sample Type				GR	GR	GR	GR	GR	FD	GR	FD
Depth (ft)				0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	1.0 - 1.5	2.0 - 2.5	2.0 - 2.5	2.0 - 2.5	0.5 - 0.5
Date	CAS	Background	Remediation	03/24/22	03/24/22	03/24/22	03/24/22	03/24/22	03/24/22	03/24/22	03/24/22
Analyte (mg/kg)	Number	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	<4.4 U	<4.2 U	<4.4 UJ	<4.7 U	<5 U	<4.8 U	<4.8 UJ	<4.4 U
Copper	7440-50-8	56.2	3100	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	48.6	400	170	86	44 J	63	31	120	140	13

Table 7. Soil Verification Sample Results – Pistol West Range (Continued)

Area	CAS Number	Background Criteria	Remediation Goal	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-553	ECCL-VS-554	ECCL-VS-555	ECCL-VS-556	ECCL-VS-557	ECCL-VS-571	ECCL-VS-572	ECCL-VS-573
Sample Id				ECCLVS0553	ECCLVS0554	ECCLVS0555	ECCLVS0556	ECCLVS0557	ECCLVS0571	ECCLVS0572	ECCLVS0573
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5
Date				03/24/22	04/19/22	04/19/22	04/13/22	04/13/22	04/13/22	04/13/22	04/13/22
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<4.2 U	<4.7 U	<4.4 U	<4.5 U	<4.4 U	NA	NA	NA
Copper	7440-50-8	56.2	3100	NA	NA	NA	NA	NA	130	200	73
Lead	7439-92-1	48.6	400	13	110	39	27	15	NA	NA	NA

Table 7. Soil Verification Sample Results – Pistol West Range (Continued)

Area	CAS Number	Background Criteria	Remediation Goal	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-574	ECCL-VS-574	ECCL-VS-575	ECCL-VS-576	ECCL-VS-577	ECCL-VS-578	ECCL-VS-579	ECCL-VS-580
Sample Id				ECCLVS9023	ECCLVS0574	ECCLVS0575	ECCLVS0576	ECCLVS0577	ECCLVS0578	ECCLVS0579	ECCLVS0580
Sample Type				FD	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5
Date				04/13/22	04/13/22	04/13/22	04/13/22	04/13/22	04/13/22	04/13/22	03/23/22
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	NA	NA	NA	NA	NA	NA	NA	<4.5 U
Copper	7440-50-8	56.2	3100	50	52 J	47	58	180	6.2	9.2	NA
Lead	7439-92-1	48.6	400	NA	NA	NA	NA	NA	NA	NA	39

Table 7. Soil Verification Sample Results – Pistol West Range (Continued)

Area				Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)	Pistol Range (West)
Group				Surface	Subsurface	Subsurface	Subsurface	Surface	Surface	Surface	Surface
Station				ECCL-VS-581	ECCL-VS-582	ECCL-VS-583	ECCL-VS-584	ECCL-VS-589	ECCL-VS-590	ECCL-VS-591	ECCL-VS-592
Sample Id				ECCLVS0581	ECCLVS0582	ECCLVS0583	ECCLVS0584	ECCLVS0589	ECCLVS0590	ECCLVS0591	ECCLVS0592
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	2.0 - 2.5	2.0 - 2.5	2.0 - 2.5	0.5 - 1.0	0.5 - 1.0	0.5 - 1.0	0.5 - 1.0
Date	CAS	Background	Remediation	03/23/22	03/29/22	03/29/22	03/29/22	04/26/22	04/26/22	04/26/22	04/26/22
Analyte (mg/kg)	Number	Criteria	Goal								
Metals											
Antimony	7440-36-0	9.3	31	<4.2 U	<4.7 U	<4.9 U	<4.5 U	1.1 J	<2.3 U	<2.2 U	0.85 J
Copper	7440-50-8	56.2	3100	NA	NA	NA	NA	54	18	8.1	21
Lead	7439-92-1	48.6	400	110	18	17	69	75	31	37	92

Bold denotes value exceeded remediation goal.
CAS = Chemical Abstract Service
FD = Field Duplicate
GR = Grab Sample
mg/kg = Milligrams per Kilogram
NA = Not Analyzed
U = Non-Detect
UJ = Analyte was not detected at or above the reporting limit
J = Estimated Quantity

Table 8. Soil Verification Sample Results – Pistol East Range

Area				Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)
Group				Surface	Surface	Removed	Surface	Surface	Surface	Removed	Surface
Station				ECCL-VS-545	ECCL-VS-546	ECCL-VS-547	ECCL-VS-547	ECCL-VS-547	ECCL-VS-547	ECCL-VS-548	ECCL-VS-548
Sample Id				ECCLVS0545	ECCLVS0546	ECCLVS0547	ECCLVS0547.1	ECCLVS0547.2	ECCLVS0547.3	ECCLVS0548	ECCLVS0548.1
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5
Date	CAS	Background	Remedial	03/25/22	03/25/22	03/25/22	04/11/22	04/11/22	04/11/22	03/25/22	04/11/22
Analyte (mg/kg)	Number	Criteria	Action Level								
Metals											
Antimony	7440-36-0	9.3	31	<4.7 U	1.7 J	3.9 J	NA	NA	NA	3.3 J	NA
Lead	7439-92-1	48.6	400	32	350	**490**	100	30	77	**420**	23

Table 8. Soil Verification Sample Results – Pistol East Range (Continued)

Area				Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-548	ECCL-VS-548	ECCL-VS-549	ECCL-VS-550	ECCL-VS-551	ECCL-VS-552	ECCL-VS-558	ECCL-VS-559
Sample Id				ECCLVS0548.2	ECCLVS0548.3	ECCLVS0549	ECCLVS0550	ECCLVS0551	ECCLVS0552	ECCLVS0558	ECCLVS0559
Sample Type				GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	0.5 - 0.5	0.8 - 0.8	0.8 - 0.8	1.5 - 2.0	0.8 - 0.8	0.5 - 0.5	0.5 - 0.5
Date				04/11/22	04/11/22	03/24/22	03/24/22	03/24/22	03/24/22	03/28/22	03/28/22
Analyte (mg/kg)	CAS Number	Background Criteria	Remedial Action Level								
Metals											
Antimony	7440-36-0	9.3	31	NA	NA	<4.7 U	<4.9 U	<4.6 U	<4.8 U	<5.2 U	<4.8 U
Lead	7439-92-1	48.6	400	230	19	24	15	11	33	60	46

Table 8. Soil Verification Sample Results – Pistol East Range (Continued)

Area	CAS Number	Background Criteria	Remedial Action Level	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-560	ECCL-VS-561	ECCL-VS-562	ECCL-VS-563	ECCL-VS-563	ECCL-VS-564	ECCL-VS-565	ECCL-VS-566
Sample Id				ECCLVS0560	ECCLVS0561	ECCLVS0562	ECCLVS9024	ECCLVS0563	ECCLVS0564	ECCLVS0565	ECCLVS0566
Sample Type				GR	GR	GR	FD	GR	GR	GR	GR
Depth (ft)				0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 0.5	0.5 - 1.0
Date				03/28/22	03/28/22	03/28/22	03/28/22	03/28/22	03/28/22	03/28/22	03/28/22
Analyte (mg/kg)											
Metals											
Antimony	7440-36-0	9.3	31	<4.7 U	<5.2 U	<4.7 U	<4.4 U	<4.5 U	<4.5 U	<4.7 UJ	<4.7 U
Lead	7439-92-1	48.6	400	280	76	22	39	37	56	19 J	120

Table 8. Soil Verification Sample Results – Pistol East Range (Continued)

Area	CAS Number	Background Criteria	Remedial Action Level	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)	Pistol Range (East)
Group				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Station				ECCL-VS-567	ECCL-VS-567	ECCL-VS-568	ECCL-VS-569	ECCL-VS-570	ECCL-VS-585	ECCL-VS-586	ECCL-VS-587	ECCL-VS-588
Sample Id				ECCLVS9025	ECCLVS0567	ECCLVS0568	ECCLVS0569	ECCLVS0570	ECCLVS0585	ECCLVS0586	ECCLVS0587	ECCLVS0588
Sample Type				FD	GR	GR	GR	GR	GR	GR	GR	GR
Depth (ft)				1.5 - 2.0	1.5 - 2.0	1.5 - 2.0	0.5 - 0.5	0.5 - 0.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5	1.0 - 1.5
Date				03/29/22	03/29/22	03/29/22	03/28/22	03/29/22	04/13/22	04/13/22	04/13/22	04/13/22
Analyte (mg/kg)												
Metals												
Antimony	7440-36-0	9.3	31	<4.3 U	<4.5 U	<4.4 U	<4.4 U	<4.5 U	<5 U	<4.1 U	<4.6 U	<5.1 U
Lead	7439-92-1	48.6	400	23	24	22	17	100	73	8.5	18	63

Bold denotes value exceeded remediation goal.
CAS = Chemical Abstract Service
FD = Field Duplicate
GR = Grab Sample
mg/kg = Milligrams per Kilogram
NA = Not Analyzed
U = Non-Detect
UJ = Analyte was not detected at or above the reporting limit
J = Estimated Quantity

Table 9. Comparison of Metals COC MDCs to RGs at the ECCL Firing Range

Exposure Unit	Media	COC	MDC (mg/kg)	RG[a,b,c] (mg/kg)	Comparison of MDC to RG
Pistol Range (East)	Surface Soil	Antimony	5.2	31	MDC < RG
		Lead	350	400	MDC < RG
	Subsurface Soil	Lead	350	400	MDC < RG
Pistol Range (West)	Surface Soil	Antimony	5	31	MDC < RG
		Copper	55.5	3,100	MDC < RG
		Lead	130	400	MDC < RG
Rifle Range	Surface Soil	Antimony	5.1	31	MDC < RG
		Lead	**420**	**400**	**MDC > RG**
	Subsurface Soil	Lead	230	400	MDC < RG
Trap and Skeet Range	Surface Soil	Antimony	29	31	MDC < RG
		Arsenic	**65**	**36.5**	**MDC > RG**
		Lead	390	400	MDC < RG
Pond West A	Sediment	Copper	290	3,100	MDC < RG
		Lead	**650**	**400**	**MDC > RG**

[a]Source of the RGs is the most recent U.S. Environmental Protection Agency regional screening levels (RSLs) for residential soil exposures (USEPA 2022) and reflects the lower of the RSL for a target risk of 1E-05 or a hazard quotient of 1.
[b]The RG for lead corresponds to an acceptable blood lead level 400 mg/kg.
[c]Non-cancer RSL for arsenic (35 mg/kg) is less than the background criteria (36.5 mg/kg); therefore, the background concentration is used as the RG.
Bold denotes MDC exceeds RG
COC = Chemical of Concern
RG = Remediation Goal
MDC = Maximum Detected Concentration
mg/kg = Milligrams per Kilogram

Table 10. Comparison of Metals COC EPCs to RGs for Soils at the ECCL Firing Range

Exposure Unit	Media	COC	EPC[a,b](mg/kg)	RG (mg/kg)	Comparison of EPCs to RG
Pistol Range (East)	Surface Soil	Antimony	1.5	31	EPC < RG
		Lead	82	400	EPC < RG
	Subsurface Soil	Lead	273	400	EPC < RG
Pistol Range (West)	Surface Soil	Antimony	1.1	31	EPC < RG
		Copper	88	3,100	EPC < RG
		Lead	71	400	EPC < RG
Rifle Range	Surface Soil	Antimony	1.6	31	EPC < RG
		Lead	113	400	EPC < RG
	Subsurface Soil	Lead	63	400	EPC < RG
Trap and Skeet Range	Surface Soil	Antimony	1.5	31	EPC < RG
		Arsenic	10.0	36.5	EPC < RG
		Lead	73	400	EPC < RG
Pond West A	Sediment	Copper	144[b]	3,100	EPC < RG
		Lead	260[b]	400	EPC < RG

[a]Unless otherwise noted, the EPC for lead is based on the arithmetic average and the EPCs for antimony, arsenic and copper are based on the 95UCL concentrations.
[b]EPC presented is based on the arithmetic mean of the post remediation samples. The mean concentrations for the sediment assume the sediment in the southern portion of the pond that was excavated would be replaced with deposited material with concentrations of copper and lead similar to soil background concentrations.
COC = Chemical of Concern
EPC = Exposure Point Concentration
mg/kg = Milligrams per Kilogram
RG = Remediation Goal

Table 11. Comparison of Carcinogenic Polycyclic Aromatic Hydrocarbon COC MDCs to RGs for Soils at the ECCL Firing Range

Exposure Unit	Media	COC	MDC (mg/kg)	RG[a] (mg/kg)	Comparison of MDC to RG
Trap and Skeet	Surface Soil	Benz(a)anthracene	0.43	11	MDC < RG
		Benzo(a)pyrene	0.48	1.1	MDC < RG
		Benzo(b)fluoranthene	0.27	11	MDC < RG
		Dibenz(a,h)anthracene	0.1	1.1	MDC < RG
		Indeno(1,2,3-cd)pyrene	0.15	11	MDC < RG
	Subsurface Soil	Benz(a)anthracene	0.76	11	MDC < RG
		Benzo(a)pyrene	0.91	1.1	MDC < RG
		Benzo(b)fluoranthene	1	11	MDC < RG
		Dibenz(a,h)anthracene	0.18	1.1	MDC < RG
		Indeno(1,2,3-cd)pyrene	0.62	11	MDC < RG

[a]Source of the RGs is the most recent U.S. Environmental Protection Agency regional screening levels (RSLs) for residential soil exposures (USEPA 2022) and reflects the lower of the RSL for a target risk of 1E-05 or a hazard quotient of 1.
COC = Chemical of Concern
MDC = Maximum Detected Concentration
mg/kg = Milligrams per Kilogram
RG = Remediation Goal

Table 12. Comparison of Carcinogenic Polycyclic Aromatic Hydrocarbon COC EPCs to RGs for Soils at the ECCL Firing Range

Exposure Unit	Media	COC	EPC (mg/kg)	RG[a] (mg/kg)	Comparison of EPC to RG
Trap and Skeet Range	Surface Soil	Benz(a)anthracene	0.0675	11	EPC < RG
		Benzo(a)pyrene	0.0816	1.1	EPC < RG
		Benzo(b)fluoranthene	0.0649	11	EPC < RG
		Dibenz(a,h)anthracene	0.016	1.1	EPC < RG
		Indeno(1,2,3-cd)pyrene	0.0196	11	EPC < RG
	Subsurface Soil	Benz(a)anthracene	0.459	11	EPC < RG
		Benzo(a)pyrene	0.546	1.1	EPC < RG
		Benzo(b)fluoranthene	0.438	11	EPC < RG
		Dibenz(a,h)anthracene	0.111	1.1	EPC < RG
		Indeno(1,2,3-cd)pyrene	0.498	11	EPC < RG

[a]Source of the RGs is the most recent U.S. Environmental Protection Agency regional screening levels (RSLs) for residential soil exposures (USEPA 2021) and reflects the lower of the RSL for a target risk of 1E-05 or a hazard quotient of 1.

COC = Chemical of Concern
EPC = Exposure Point Concentration
mg/kg = Milligrams per Kilogram
RG = Remediation Goal

Table 13. Comparison of Carcinogenic Polycyclic Aromatic Hydrocarbon BaP_{eq} to Benzo(a)pyrene RGs for Soils at the Trap and Skeet Range EU in the ECCL Firing Range

Exposure Unit	Media	COC	Relative Potency Factor	EPC (mg/kg)	BaP_{eq}[a] (mg/kg)
Trap and Skeet Range	Surface Soil	Benz(a)anthracene	0.1	0.0675	0.00675
		Benzo(a)pyrene	1	0.0816	0.0816
		Benzo(b)fluoranthene	0.1	0.0649	0.00649
		Dibenz(a,h)anthracene	1	0.016	0.016
		Indeno(1,2,3-cd)pyrene	0.1	0.0196	0.00196
		$\sum BaP_{eq}$	--	--	*0.113*
	Subsurface Soil	Benz(a)anthracene	0.1	0.459	0.0459
		Benzo(a)pyrene	1	0.546	0.546
		Benzo(b)fluoranthene	0.1	0.438	0.0438
		Dibenz(a,h)anthracene	1	0.111	0.111
		Indeno(1,2,3-cd)pyrene	0.1	0.498	0.0498
		$\sum BaP_{eq}$	--	--	*0.797*

[a]BaP_{eq} is the exposure point concentration times the relative potency factor for the individual COC.

BaP_{eq} = Benzo(a)pyrene Equivalent
COC = Chemical of Concern
EU = Exposure Unit
EPC = Exposure Point Concentration
RG = Remediation Goal

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Table 14. Verification Sample Location Coordinates

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS0300	1927908.2930	624157.6110	0.5	640
ECCLVS0301	1927899.7410	624150.6120	1-1.5	640.15
ECCLVS0302	1927857.3890	624074.8140	0.5	640.23
ECCLVS0303	1927931.3880	624075.5464	1-1.5	640.87
ECCLVS0304	1928006.7440	624094.6850	0.5	642.9
ECCLVS0305	1928006.4120	624075.5867	1-1.5	641.44
ECCLVS9010	1928006.4120	624075.5867	1-1.5	641.44
ECCLVS0306	1928081.3790	624075.5739	1-1.5	642.45
ECCLVS0307	1928156.3740	624067.9258	0.5	642.51
ECCLVS0308	1927725.2860	624000.6050	0.5	642.4
ECCLVS0309	1927781.3640	624000.5300	1-1.5	641.29
ECCLVS0310	1927856.3970	624000.5790	1-1.5	639.4
ECCLVS0311	1927931.3960	623997.1394	1.25	640.62
ECCLVS0312	1928006.3480	623997.0017	1.5-2	641.76
ECCLVS0313	1928081.3630	623997.0822	1.25	642.16
ECCLVS9005	1928156.3060	623997.0384	1.25	641.78
ECLVS0314	1928156.3060	623997.0384	1.25	641.78
ECCLVS0315	1928232.4648	623993.5622	1.25	640.97
ECCLVS9003	1928232.4648	623993.5622	1.25	640.97
ECCLVS0316	1928305.8000	624034.8930	0.5	640.48
ECCLVS0317	1928306.2557	624000.5072	1-1.5	640.5
ECCLVS0318	1928381.3487	623985.2018	0.5	639.46
ECCLVS0318.1	1928384.3320	624003.2680	0.5	639.43
ECCLVS0318.2	1928402.7330	623987.6580	0.5	639.887
ECCLVS0318.3	1928353.4550	624018.4260	0.5	639.031
ECCLVS0319	1927632.0850	623964.2738	0.5	643.66
ECCLVS0320	1927895.7100	623979.1800	1.5-2	639.68
ECCLVS0321	1928276.9200	623969.8356	1.25	640.09
ECCLVS0322	1927556.3300	623925.6240	1-1.5	641.98
ECCLVS0323	1927631.5140	623925.5872	1.5-2	644.41
ECCLVS0324	1927707.7470	623925.9660	1-1.5	642.37
ECCLVS0325	1927781.4260	623925.5530	1.5-2	641.79
ECCLVS0326	1927856.3230	623925.5720	1.5-2	641.92
ECCLVS0327	1927897.8450	623904.9800	1.5-2	641.13
ECCLVS0328	1927931.3410	623925.6822	1.5-2	641.74
ECCLVS0329	1928006.3730	623925.5651	1.5-2	642.14
ECCLVS0330	1928081.3590	623925.5963	1.5-2.0	641.96
ECCLVS0330	1928081.3800	623925.5300	1.5-2	641.94
ECCLVS0331	1928156.3240	623925.6564	1.5-2	641.57
ECCLVS0332	1928231.3428	623925.6729	1.5-2	640.94

Table 14. Verification Sample Location Coordinates (Continued)

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS0333	1928306.4276	623925.4578	1-1.5	640.62
ECCLVS0334	1928381.4401	623925.6387	1-1.5	639.5
ECCLVS0335	1928438.9397	623924.7332	0.5	638.86
ECCLVS0336	1927482.8670	623888.1938	0.5	640.56
ECCLVS0337	1928279.4706	623882.8325	1.25	641.11
ECCLVS0338	1927407.0780	623862.6700	0.5	639.45
ECCLVS0339	1927405.4900	623850.4910	1-1.5	639.21
ECCLVS0340	1927481.4480	623850.4642	1-1.5	639.84
ECCLVS0341	1927556.5070	623850.5515	1-1.5	640.65
ECCLVS0342	1927631.4230	623850.5165	1.5-2	642.09
ECCLVS9014	1927631.4230	623850.5165	1.5-2	642.09
ECCLVS0343	1927706.3760	623850.5760	1-1.5	640.78
ECCLVS0344	1927781.3830	623850.5450	1.5-2	640.32
ECCLVS0345	1927856.3410	623850.5140	1.5-2	642.16
ECCLVS0346	1927931.3230	623850.6163	1.5-2	641.51
ECCLVS0347	1928006.2820	623850.5520	1.5-2	642.65
ECCLVS0348	1928081.3810	623850.5550	1.5-2	643.3
ECCLVS9009	1928081.3810	623850.5550	1.5-2	643.3
ECCLVS0349	1928156.3230	623850.6152	1.5-2	640.59
ECCLVS0349E	1928194.1290	623857.0914	1.75	640.06
ECCLVS0349N	1928158.0140	623899.8453	1.75	640.51
ECCLVS0349S	1928157.8000	623810.5143	1.75	640.36
ECCLVS0349W	1928123.0250	623854.3642	1.75	640.89
ECCLVS0350	1928231.3721	623850.6479	1.5-2	640.98
ECCLVS0351	1928306.2523	623850.5000	1-1.5	640.86
ECCLVS9001	1928306.2523	623850.5000	1-1.5	640.86
ECCLVS0352	1928381.3550	623850.5640	1-1.5	639.8
ECCLVS0353	1928456.3500	623850.5700	0.5	639.25
ECCLVS0353.1	1928461.8700	623850.0900	0.5	639.31
ECCLVS0353.2	1928454.8500	623879.5600	0.5	638.92
ECCLVS0353.3	1928460.8500	623816.6360	0.5	639.61
ECCLVS0354	1927900.1440	623823.3290	1.5-2	640.82
ECCLVS0355	1928281.8236	623800.8513	1.25	641.14
ECCLVS0356	1927331.5490	623781.3607	0.65	642.09
ECCLVS0357	1927406.5060	623775.7180	1-1.5	641.72
ECCLVS0358	1927481.4130	623775.5050	1-1.5	641.19
ECCLVS0359	1927556.3150	623775.6370	1-1.5	641.46
ECCLVS0360	1927631.3630	623775.5005	1.5-2	642.35
ECCLVS9011	1927631.3630	623775.5005	1.5-2	642.35

Table 14. Verification Sample Location Coordinates (Continued)

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS0361	1927706.3040	623775.5250	1-1.5	640.64
ECCLVS0362	1927781.3900	623775.5710	1.5-2	640.13
ECCLVS0363	1927856.3660	623775.5950	1.5-2	641.89
ECCLVS0364	1927931.3100	623770.5960	1.5-2	641.68
ECCLVS0365	1928006.2760	623770.4040	1.25	642.34
ECCLVS0366	1928081.2440	623770.6055	1.5-2	643.93
ECCLVS0367	1928156.2880	623770.4651	1.25	641.45
ECCLVS0368	1928232.0368	623770.9659	1.25	641.01
ECCLVS0369	1928306.2531	623775.6249	1-1.5	641.03
ECCLVS0370	1928381.1693	623775.4745	1-1.5	640.15
ECCLVS0371	1928456.3809	623775.5733	1-1.5	639.51
ECCLVS9000	1928456.3809	623775.5733	1-1.5	639.51
ECCLVS0372	1927330.5260	623700.6440	1-1.5	643.07
ECCLVS0373	1927406.3520	623700.6806	1-1.5	642.48
ECCLVS0374	1927481.2490	623700.5700	1-1.5	641.8
ECCLVS0375	1927556.3470	623700.6040	1-1.5	641.83
ECCLVS0376	1927631.3860	623700.5640	1-1.5	642.2
ECCLVS0377	1927706.3170	623700.5380	1-1.5	640.92
ECCLVS0378	1927781.3640	623700.5670	1-1.5	640.26
ECCLVS0379	1927856.3980	623700.5970	1.5-2	642.2
ECCLVS0380	1927931.4310	623700.5680	1.5-2	641.61
ECCLVS0381	1928006.3110	623700.5330	1.5-2	642.82
ECCLVS0382	1928081.3160	623700.6719	1-1.5	643.89
ECCLVS9004	1928081.3160	623700.6719	1-1.5	643.89
ECCLVS0383	1928156.3590	623700.5927	1-1.5	643.97
ECCLVS0384	1928231.6946	623700.2544	1-1.5	641.32
ECCLVS0385	1928306.4012	623700.4452	1-1.5	640.81
ECCLVS9002	1928306.4012	623700.4452	1-1.5	640.81
SCCLVS0386	1928381.2865	623700.7004	1-1.5	640.69
ECCLVS0387	1928456.3922	623700.5494	0.75	639.92
ECCLVS0388	1927257.8580	623625.6980	0.5	643.8
ECCLVS0389	1927331.3880	623625.6123	1-1.5	643.18
ECCLVS0390	1927406.3380	623625.5178	1.0-1.5	642.73
ECCLVS0391	1927481.4300	623625.5402	1.0-1.5	642.1
ECCLVS0392	1927556.3270	623625.6006	1-1.5	641.62
ECCLVS9008	1927556.3270	623625.6006	1-1.5	641.62
ECCLVS0393	1927631.3800	623625.5183	1-1.5	641.35
ECCLVS0394	1927706.4130	623625.5500	1-1.5	641.96

Table 14. Verification Sample Location Coordinates (Continued)

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS9013	1927706.4130	623625.5500	1-1.5	641.96
ECCLVS0395	1927781.3490	623625.5300	1-1.5	640.9
ECCLVS0396	1927856.4140	623625.5800	1.5-2	642.54
ECCLVS9026	1927856.4140	623625.5800	1.5-2	642.54
ECCLVS0397	1927931.4140	623625.5380	NA	640.39
ECCLVS0398	1928006.3470	623625.5500	1.5-2	641.86
ECCLVS9012	1928006.3470	623625.5500	1.5-2	641.86
ECCLVS0399	1928081.3480	623625.5880	1.5-2	641.86
ECCLVS9006	1928081.3480	623625.5880	1.5-2	641.86
ECCLVS0400	1928156.3110	623625.5337	1-1.5	642.158
ECCLVS0401	1928231.3760	623625.6897	NA	641.799
ECCLVS0402	1928306.2630	623625.6084	1-1.5	641.382
ECCLVS0403	1928381.4880	623625.4905	1-1.5	640.98
ECCLVS0404	1928445.0000	623625.6077	1-1.5	640.411
ECCLVS0404.1	1928456.8310	623634.0750	0.5	640.178
ECCLVS0405	1927631.3250	623580.5950	0.5	641.65
ECCLVS0406	1927781.3649	623584.7019	0.75	642.515
ECCLVS0407	1927331.2590	623550.5481	1-1.5	643.91
ECCLVS0408	1927332.6750	623532.8058	1-1.5	643.87
ECCLVS0409	1927406.3210	623550.7186	1-1.5	644.08
ECCLVS0410	1927481.3560	623550.6366	1-1.5	643.3
ECCLVS0411	1927549.2390	623499.6610	0.5	642.7
ECCLVS0412	1927633.2400	623550.5400	0.75	642.98
ECCLVS0413	1927706.3510	623550.5890	1.5-2	643.14
ECCLVS9016	1927706.3910	623550.5780	1.5-2	643.14
ECCLVS0414	1927781.3390	623550.5600	0.75	643.24
ECCLVS0415	1927856.3110	623550.6030	1.5-2	642.33
ECCLVS0416	1927931.1820	623550.9510	1.5-2	640.46
ECCLVS0417	1928006.3800	623550.5400	1.5-2	642.9
ECCLVS0418	1928081.5160	623550.2880	1.5-2	640.66
ECCLVS9007	1928081.5160	623550.2880	1.5-2	640.66
ECCLVS0419	1928156.2330	623550.7614	1.5-2	641.27
ECCLVS0420	1928231.3830	623550.2693	1.5-1.7	641.361
ECCLVS0421	1928306.2310	623550.7596	1.5-2	640.485
ECCLVS0422	1928407.8890	623550.6804	0.6	641.049
ECCLVS0423	1927406.4000	623510.8900	0.5	643.66
ECCLVS0424	1927618.6900	623459.2160	0.75	642
ECCLVS0424A	1927619.6830	623498.8800	0.75	643.38

Table 14. Verification Sample Location Coordinates (Continued)

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS0425	1927697.1630	623461.6570	0.75	643.9
ECCLVS0426	1927794.6894	623509.3959	2-2.5	644.1
ECCLVS0427	1927819.6754	623509.3820	2-2.5	644.57
ECCLVS0428	1927798.1410	623487.4620	2	641.61
ECCLVS0429	1927819.9300	623484.5520	2-2.5	642.51
ECCLVS0430	1927856.3580	623501.6460	1.5-2	642.34
ECCLVS0431	1927752.4660	623475.5350	0.75	642.43
ECCLVS0432	1927781.3060	623475.8150	1.5-2	641.92
ECCLVS9027	1927781.3060	623475.8150	1.5-2	641.92
ECCLVS0433	1927856.3020	623475.6730	1.5-2	641.8
ECCLVS0434	1927931.1050	623475.4860	1.5-2	641.61
ECCLVS0435	1928006.2370	623475.5380	1.5-2	641.47
ECCLVS0436	1928081.3900	623475.7200	1.5-2	641.43
ECCLVS0437	1928156.3350	623475.8258	1.5-2	640.498
ECCLVS0438	1928231.4500	623475.4167	1.5-1.7	641.097
ECCLVS0439	1928308.9350	623486.3068	0.75	641.352
ECCLVS0440	1927780.8300	623410.8070	0.75	642.06
ECCLVS0441	1927856.8320	623446.0660	1	641.89
ECCLVS0442	1928231.3500	623443.7900	0.75	645.702
ECCLVS0443	1927984.2720	623400.3910	1	642.24
ECCLVS0444	1928006.3190	623400.6520	1.5-2	641.82
ECCLVS0445	1928081.2890	623400.6670	1.5-2	642.24
ECCLVS0446	1928162.7480	623402.6187	0.75	643.132
ECCLVS0447	1928077.6970	623337.8350	1	641.77
ECCLVS0448	1927890.8800	623404.7900	0-0.5	641.48
ECCLVS0449	1927917.0740	623392.8310	0-0.5	641.22
ECCLVS0450	1927938.4620	623384.5670	0-0.5	641.73
ECCLVS0500	1927260.4770	623186.2735	0-0.5	652.12
ECCLVS0501	1927269.1383	623186.0713	6-6.5	654.83
ECCLVS9015	1927269.1383	623186.0713	6-6.5	654.83
ECCLVS0502	1927293.4404	623191.4467	6-6.5	655.04
ECCLVS0503	1927317.8835	623196.9776	6-6.5	653.53
ECCLVS0504	1927342.2654	623202.3314	6-6.5	648.69
ECCLVS0505	1927358.0577	623199.2984	0-0.5	652.33
ECCLVS0506	1927266.1725	623163.2641	6-6.5	654.39
ECCLVS0506.1	1927268.9600	623164.1700	7.5-8	652.89
ECCLVS0506.2	1927261.4500	623163.4000	7.5-8	652.89
ECCLVS0506.3	1927277.4900	623165.4500	7.5-8	652.89

Table 14. Verification Sample Location Coordinates (Continued)

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS0507	1927274.4106	623161.7706	6-6.5	655.06
ECCLVS0508	1927298.8879	623167.2006	6.5-7	655.76
ECCLVS0509	1927323.2543	623172.5482	6-6.5	657.13
ECCLVS0510	1927347.6847	623177.9008	6-6.5	658.98
ECCLVS0510.1	1927347.2500	623176.4400	7.5-8	657.48
ECCLVS0510.2	1927340.0900	623175.2200	7.5-8	657.48
ECCLVS0510.3	1927354.5600	623177.5800	7.5-8	657.48
ECCLVS0511	1927362.8792	623175.6829	6-6.5	656.56
ECCLVS0512	1927269.7400	623136.2900	0.75	645.33
ECCLVS0513	1927279.7709	623137.3841	1.5-2	645.37
ECCLVS9017	1927279.7709	623137.3841	1.5-2	645.37
ECCLVS0514	1927302.6800	623150.2800	2-2.5	645.61
ECCLVS0515	1927328.6740	623148.1024	1.5-2	645.17
ECCLVS0516	1927353.0845	623153.4235	1.5-2	644.58
ECCLVS0517	1927365.0500	623156.2800	0.75	644.86
ECCLVS0518	1927282.3774	623112.2720	0.75	645.11
ECCLVS0519	1927285.2283	623112.9231	1.5-2	645.44
ECCLVS9018	1927285.2283	623112.9231	1.5-2	645.44
ECCLVS0520	1927309.6319	623118.3235	2-2.5	645.51
ECCLVS9019	1927309.6319	623118.3235	2-2.5	645.51
ECCLVS0521	1927334.0648	623123.6727	2-2.5	645.43
ECCLVS0522	1927358.4218	623129.0417	1.5-2	644.59
ECCLVS0523	1927368.8900	623131.1000	0.75	644.85
ECCLVS0524	1927304.4800	623094.9200	0.75	645.63
ECCLVS0525	1927327.7100	623103.0200	0.75	645.54
ECCLVS0526	1927349.7500	623110.7000	0.75	645.56
ECCLVS0527	1927385.1638	623092.4842	0.5	648.35
ECCLVS0528	1927409.5521	623098.2796	0.5	646.1
ECCLVS9020	1927409.5521	623098.2796	0.5	646.1
ECCLVS0529	1927433.7875	623104.0521	0.5	645.54
ECCLVS0530	1927366.5662	623062.5227	1.5-2	645.83
ECCLVS0530.1	1927368.7200	623063.8000	2-2.5	644.47
ECCLVS0530.2	1927368.2200	623070.9300	2-2.5	644.47
ECCLVS0530.3	1927375.6100	623049.2800	2-2.5	644.47
ECCLVS0531	1927390.8610	623068.2779	0.5	654.21
ECCLVS0532	1927415.1940	623073.9791	0.5	661.91
ECCLVS0533	1927439.0900	623082.9400	0.5	661.88
ECCLVS0534	1927463.8638	623085.5397	0.5	657.29

Table 14. Verification Sample Location Coordinates (Continued)

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS0535	1927488.0888	623091.3147	0.5	657.04
ECCLVS0536	1927396.6623	623043.9731	0.5	652.69
ECCLVS0537	1927420.4100	623052.2200	0.5	648.8
ECCLVS0538	1927445.2697	623055.3916	0.5	647.87
ECCLVS0539	1927469.6542	623061.2079	0.5	648.02
ECCLVS0540	1927493.9064	623066.9864	0.5	648.41
ECCLVS0541	1927426.7174	623025.3449	0.5	645.76
ECCLVS0542	1927451.0703	623031.1222	1-1.5	645.3
ECCLVS0543	1927475.4223	623036.8885	2-2.5	645.21
ECCLVS0544	1927499.7265	623042.6074	2-2.5	645.22
ECCLVS9022	1927499.7265	623042.6074	2-2.5	645.22
ECCLVS0545	1927523.9780	623048.4376	0.5	655.52
ECCLVS0546	1927548.3568	623054.0684	0.5	646.95
ECCLVS0547	1927572.6347	623059.7217	0.5	646.7
ECCLVS0547.1	1927566.2900	623058.3000	0.5	644.52
ECCLVS0547.2	1927560.5400	623057.2100	0.5	644.98
ECCLVS0547.3	1927580.0900	623061.9200	0.5	644.52
ECCLVS0548	1927593.8450	623065.6559	0.5	645.77
ECCLVS0548.1	1927590.6700	623079.3500	0.5	643.64
ECCLVS0548.2	1927578.2000	623078.9400	0.5	643.9
ECCLVS0548.3	1927615.7800	623082.7700	0.5	643.4
ECCLVS0549	1927550.0313	623090.1471	0.75	644.73
ECCLVS0550	1927541.3200	623074.6519	0.75	644.55
ECCLVS0551	1927552.4841	623077.5483	1.5-2	644.47
ECCLVS0552	1927563.3971	623079.8988	0.75	644.22
ECCLVS0553	1927418.9375	623015.0966	0.5	647.25
ECCLVS9021	1927418.9375	623015.0966	0.5	647.25
ECCLVS0554	1927434.7360	622979.1070	0.5	644.07
ECCLVS0555	1927460.2290	622984.5640	0.5	643.85
ECCLVS0556	1927483.0840	622991.6770	0.5	643.53
ECCLVS0557	1927507.3130	622997.8500	0.5	643.75
ECCLVS0558	1927529.4921	623023.8886	0.5	658.9
ECCLVS0559	1927554.0913	623029.8229	0.5	660.24
ECCLVS0560	1927578.4107	623035.5633	0.5	660.71
ECCLVS0561	1927602.7927	623041.3466	0.5	659.3
ECCLVS0562	1927535.4569	622999.7780	0.5	652.85
ECCLVS0563	1927559.7971	623005.6283	0.5	645.47
ECCLVS9024	1927559.7971	623005.6283	0.5	645.47

Table 14. Verification Sample Location Coordinates (Continued)

Sample ID	EASTING (Ohio STPLN North NAD83, ft)	NORTHING (Ohio STPLN North NAD83, ft)	Depth (ft bgs)	Elevation (ft)
ECCLVS0564	1927584.1389	623011.2425	0.5	645.24
ECCLVS0565	1927608.5714	623017.0307	0.5	646.72
ECCLVS0566	1927620.5200	623013.2300	0.5-1	651.41
ECCLVS0567	1927561.4465	622998.8584	1.5-2	645.11
ECCLVS9025	1927561.4465	622998.8584	1.5-2	645.11
ECCLVS0568	1927571.8454	623002.0567	1.5-2	644.79
ECCLVS0569	1927537.7064	622982.2130	0.5	652.74
ECCLVS0570	1927563.1438	622991.5741	0.5	644.85
ECCLVS0571	1927481.2760	622917.4830	0.5	644.62
ECCLVS0572	1927507.4770	622924.3640	0.5	644.53
ECCLVS0573	1927461.5020	622903.1920	0.5	644.74
ECCLVS0574	1927472.8340	622905.9790	1-1.5	644.59
ECCLVS9023	1927472.8340	622905.9790	1-1.5	644.59
ECCLVS0575	1927497.1620	622911.7340	1-1.5	644.58
ECCLVS0576	1927521.4900	622917.4900	1-1.5	644.22
ECCLVS0577	1927529.5360	622919.2870	0.5	644.41
ECCLVS0578	1927487.9420	622898.2880	0.5	645
ECCLVS0579	1927512.3800	622904.7340	0.5	644.31
ECCLVS0580	1927465.9000	623098.0500	0.5	657.29
ECCLVS0581	1927490.9700	623101.8300	0.5	657.04
ECCLVS0582	1927443.7200	623004.2100	2-2.5	643.2
ECCLVS0583	1927459.2500	623007.0500	2-2.5	643.39
ECCLVS0584	1927478.9900	623012.6600	2-2.5	643.8
ECCLVS0585	1927587.3100	622967.2600	1-1.5	644.88
ECCLVS0586	1927565.1100	622961.2900	1-1.5	645.03
ECCLVS0587	1927545.3700	622956.9000	1-1.5	645.28
ECCLVS0588	1927498.0100	622973.5300	1-1.5	644.77
ECCLVS0589	1927481.5700	622967.5700	0.5-1	644.94
ECCLVS0590	1927455.0700	622959.6200	0.5-1	645.28
ECCLVS0591	1927436.5800	622953.7200	0.5-1	645.01
ECCLVS0592	1927408.9590	622948.6820	0.5-1	645.13
ECCLVS0593	1927320.4550	623068.1590	0.5-0.75	645.05
ECCLVS0594	1927328.1660	623036.7880	0.5-0.75	645.92
ECCLVS0595	1927334.5140	623016.4090	0.5-0.75	645.91
ECCLVS0596	1927337.0580	622973.4180	0.5-0.75	646.1
ECCLVS0597	1927343.4310	622946.6330	0.5-0.75	646.07
ECCLVS0598	1927348.9920	622914.8620	0.5-0.75	646.4

Table 15. Waste Shipment Summary for ECCL Firing Range Removal Action

Waste Type	Waste Content	Profile Number	Disposal Facility	# of Loads	Total Weight (tons)
Non-hazardous	All ECCL Soils (Treated and untreated)	2021-013	Erie County Landfill	2,813	52,955
Non-hazardous	PAH only Soil (no treatment)	2021-013	Erie County Landfill	354	6,749
Non-hazardous	Treated Soil Trap/Skeet	2021-013	Erie County Landfill	2,048	38,988
Non-hazardous	Treated Soil Rifle	2021-013	Erie County Landfill	148	2,857
Non-hazardous	Treated Soil Pistol	2021-013	Erie County Landfill	263	4,361
Non-hazardous	Pond West A Sediment	2021-013	Erie County Landfill	28	479
Non-hazardous	Gravel (Decon pad)	2021-013	Erie County Landfill	3	45.01
Non-hazardous	Truck wash water (09/01/22)	20220817-025	Chemtron Corp	2	0.25
Non-hazardous	Truck wash water (12/21/21)	D-218418-1	Chemtron Corp	1	0.2
Universal Waste	Spent Aerosols cans	20200417-022	Chemtron Corp	1	0.05
Non-hazardous	Oil Soaked Rags	Q20010713A24	Chemtron Corp	1	0.80
Hazardous	Nitric Acid Rinse	Q20010713A28	Chemtron Corp	1	0.02
Hazardous	Isopropanol Rinse	Q20010713A25	Chemtron Corp	1	0.02
Sanitary Trash	Construction Debris (silt socks)	NA	Erie County Landfill	2	1.80
Non-solid waste	Construction Debris (nonmetal)	NA	Erie County Landfill	1	14.40
Non-solid waste (Recycling)	Asphalt	NA	Erie Blacktop	1	14.35
Non-solid waste (Reuse)	concrete blocks	NA	Erie County Landfill	7	102.63
Non-solid waste (Recycling)	scrap metal	NA	Sandusky Steel	1	12.08

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FIGURES

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Figure 1. NASA GRC-ATF Location in Ohio

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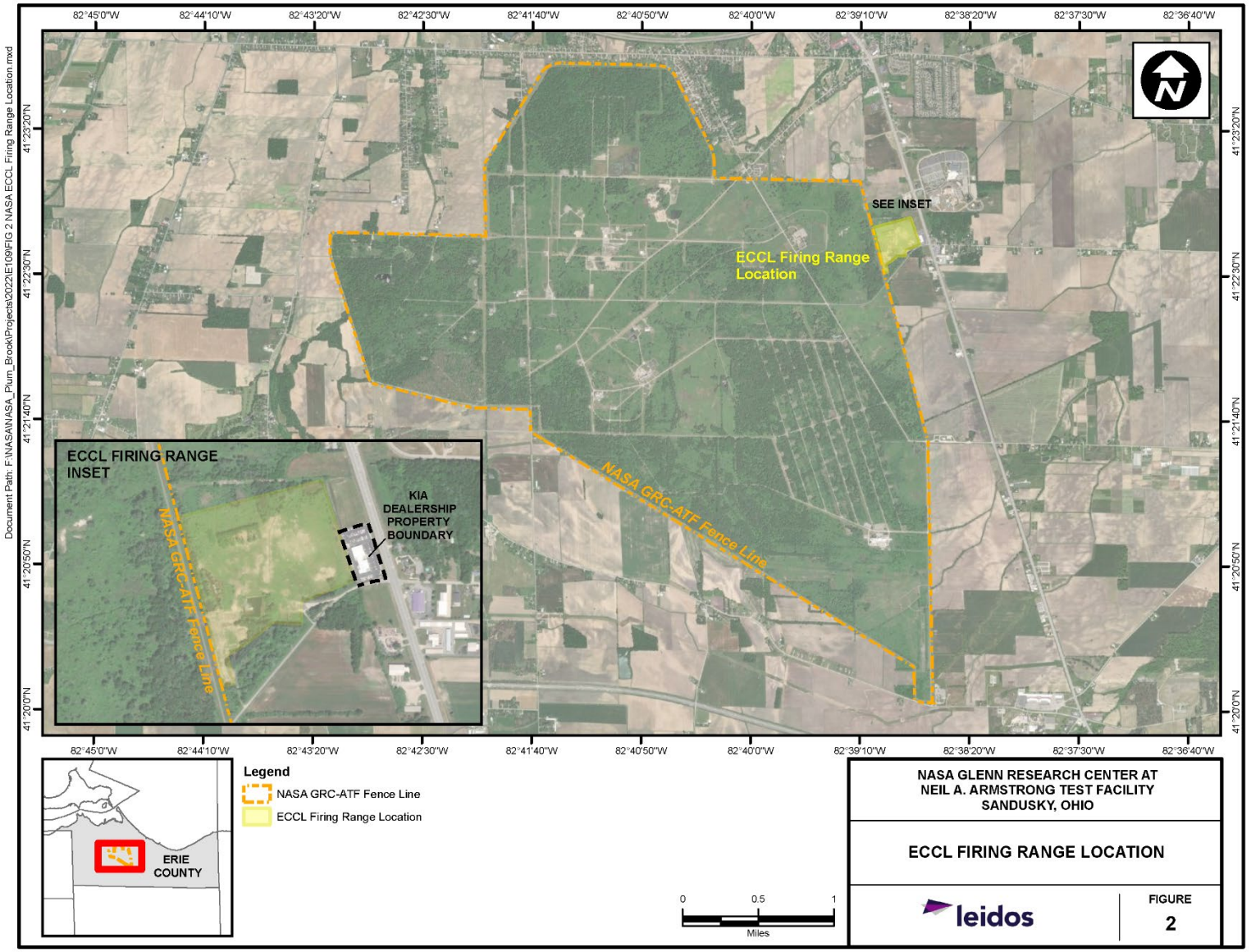

Figure 2. ECCL Firing Range Location

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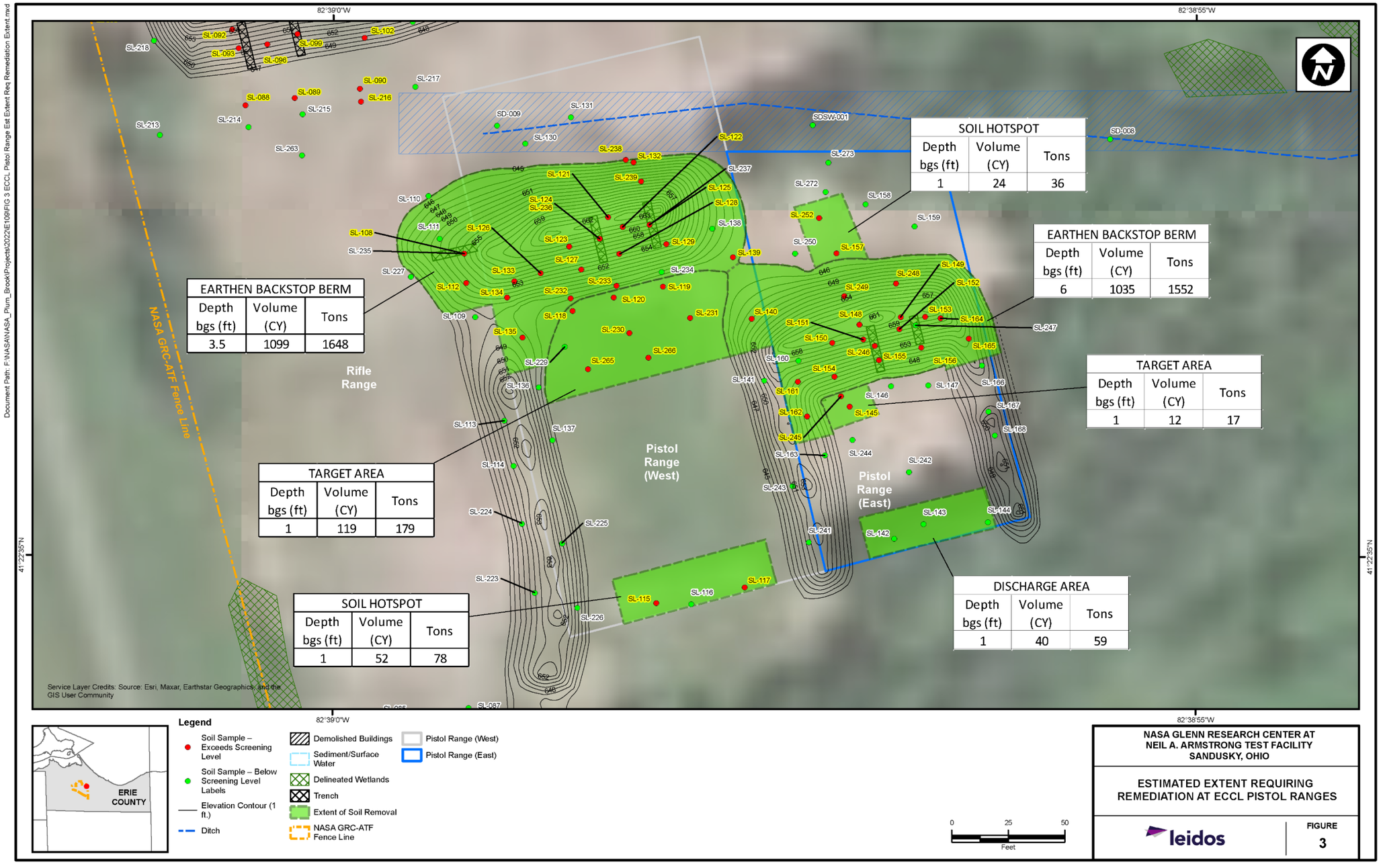

Figure 3. ECCL Pistol Ranges Estimated Extent of Soil Removal

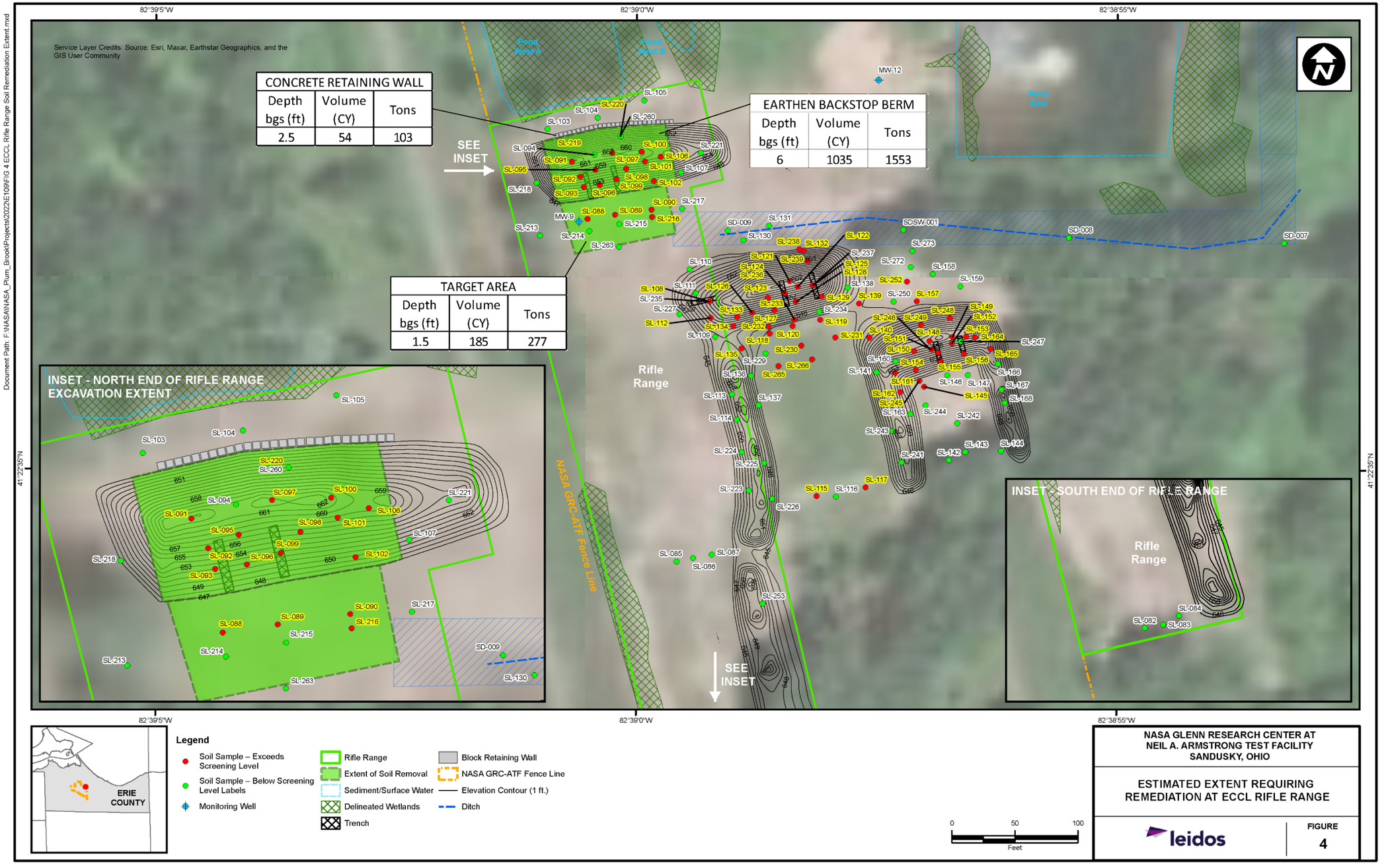

Figure 4. ECCL Rifle Range Estimated Extent of Soil Removal

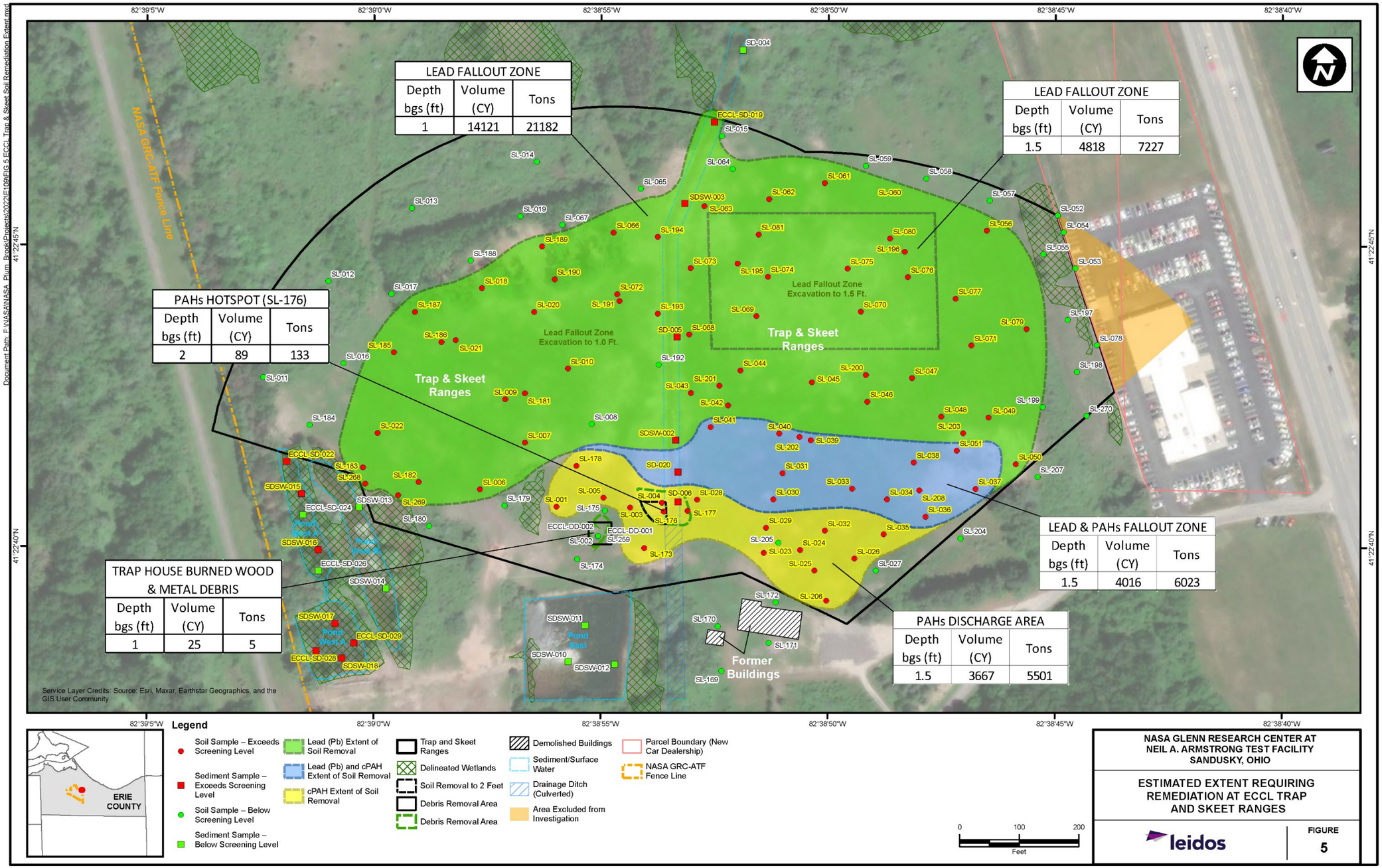

Figure 5. ECCL Trap and Skeet Ranges Estimated Extent of Soil Removal

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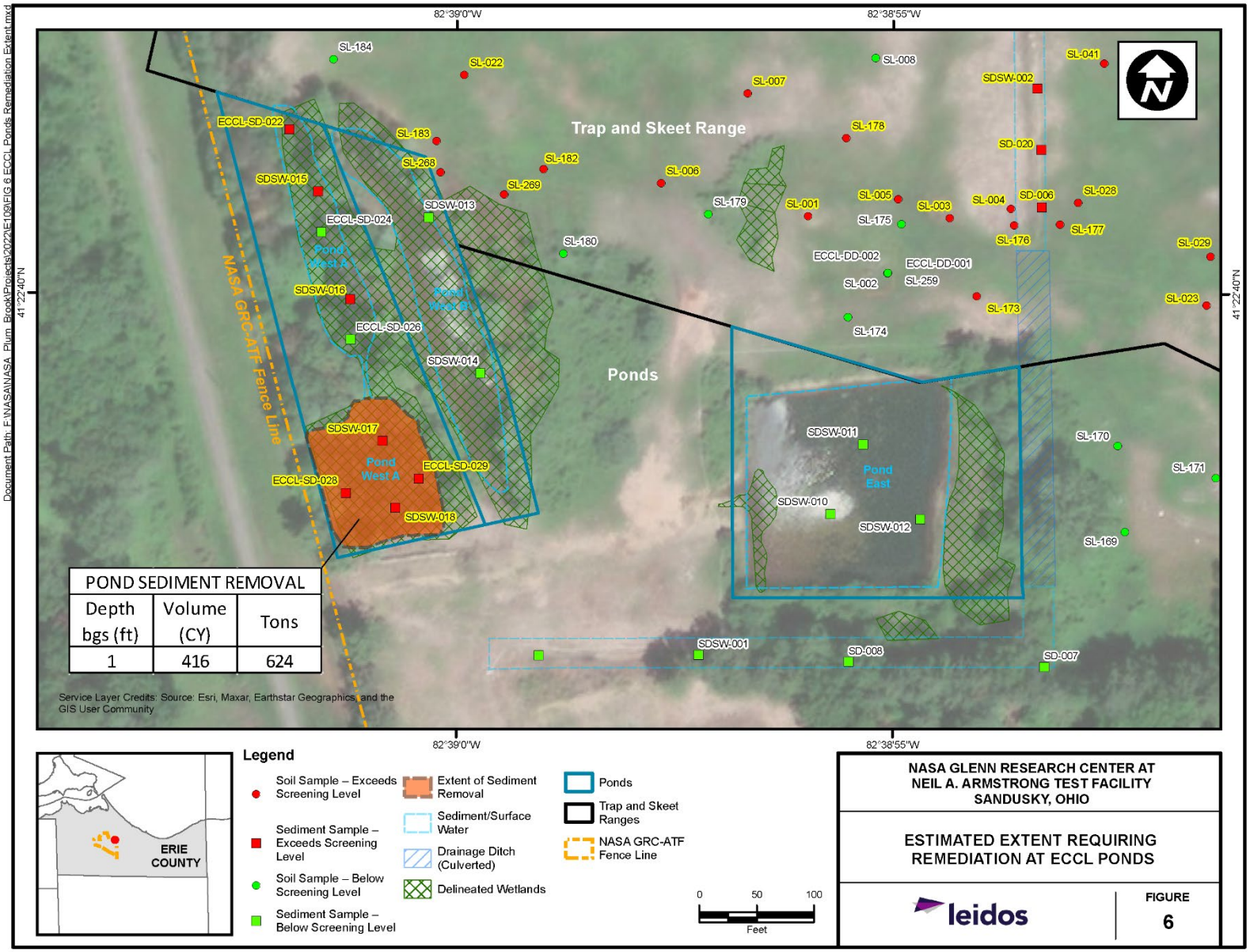

Figure 6. ECCL Pond West A Extent of Estimated Sediment Removal

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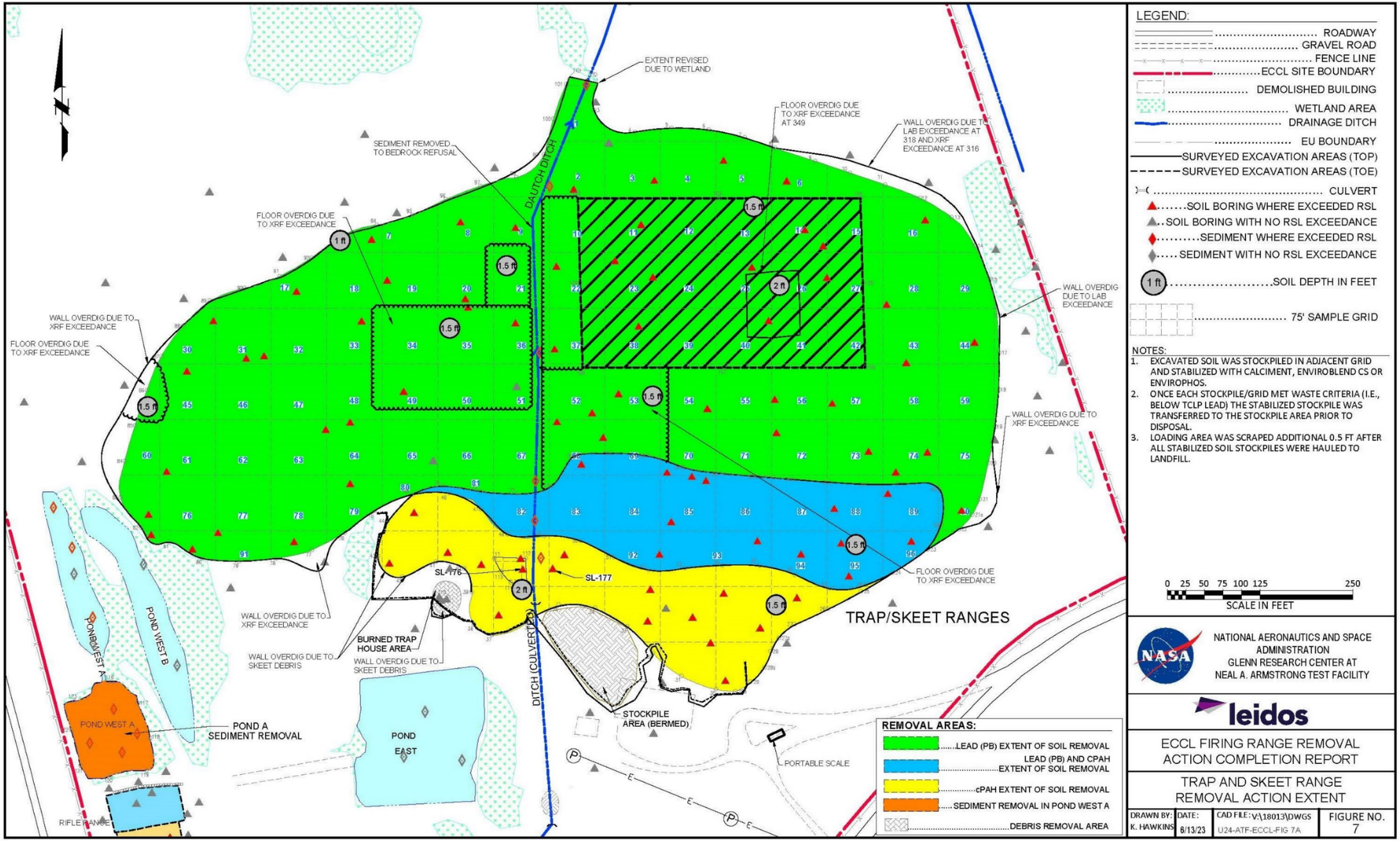


Figure 7. Trap and Skeet Range Removal Action Extent

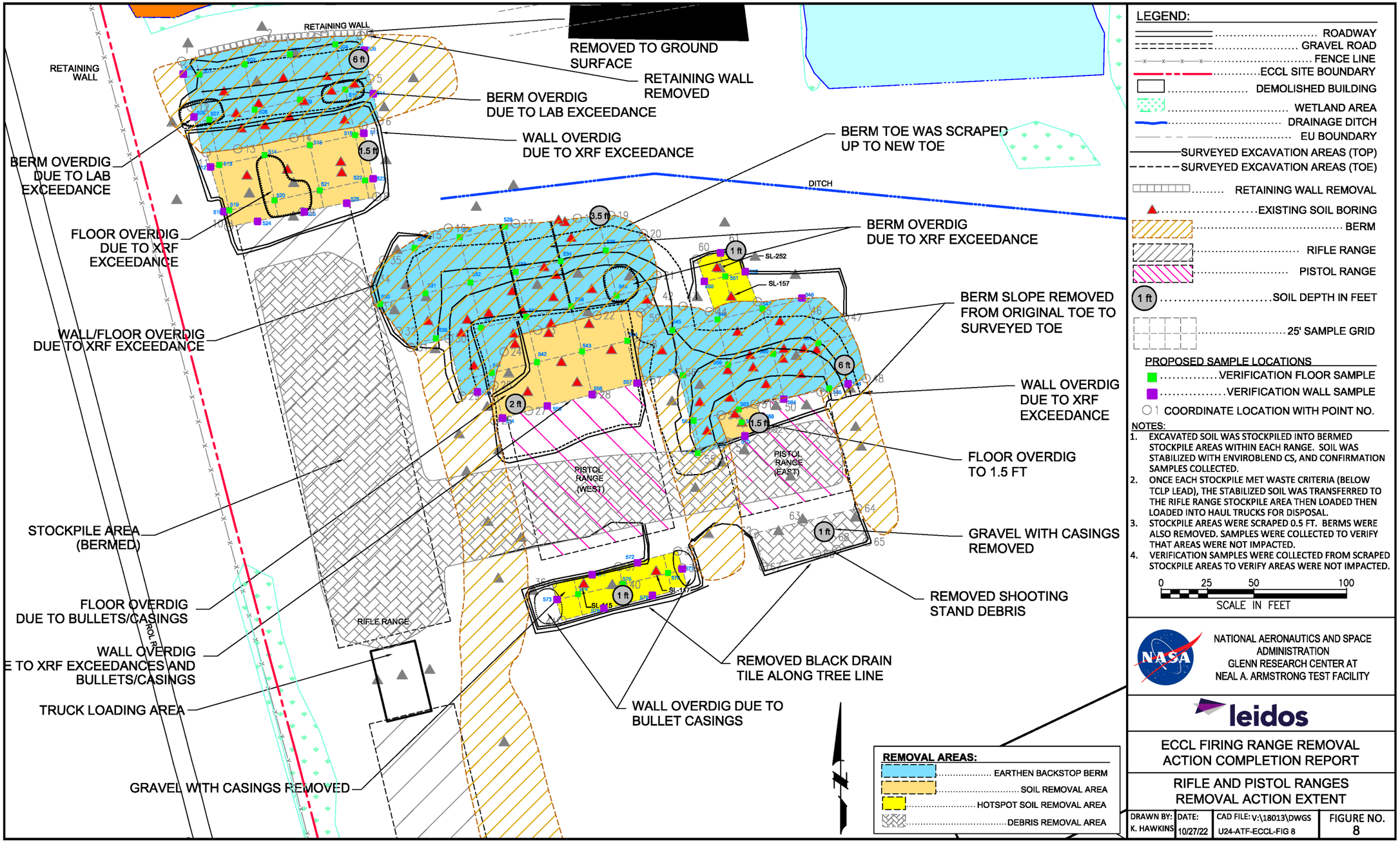


Figure 8. Rifle and Pistol Ranges Removal Action Extent

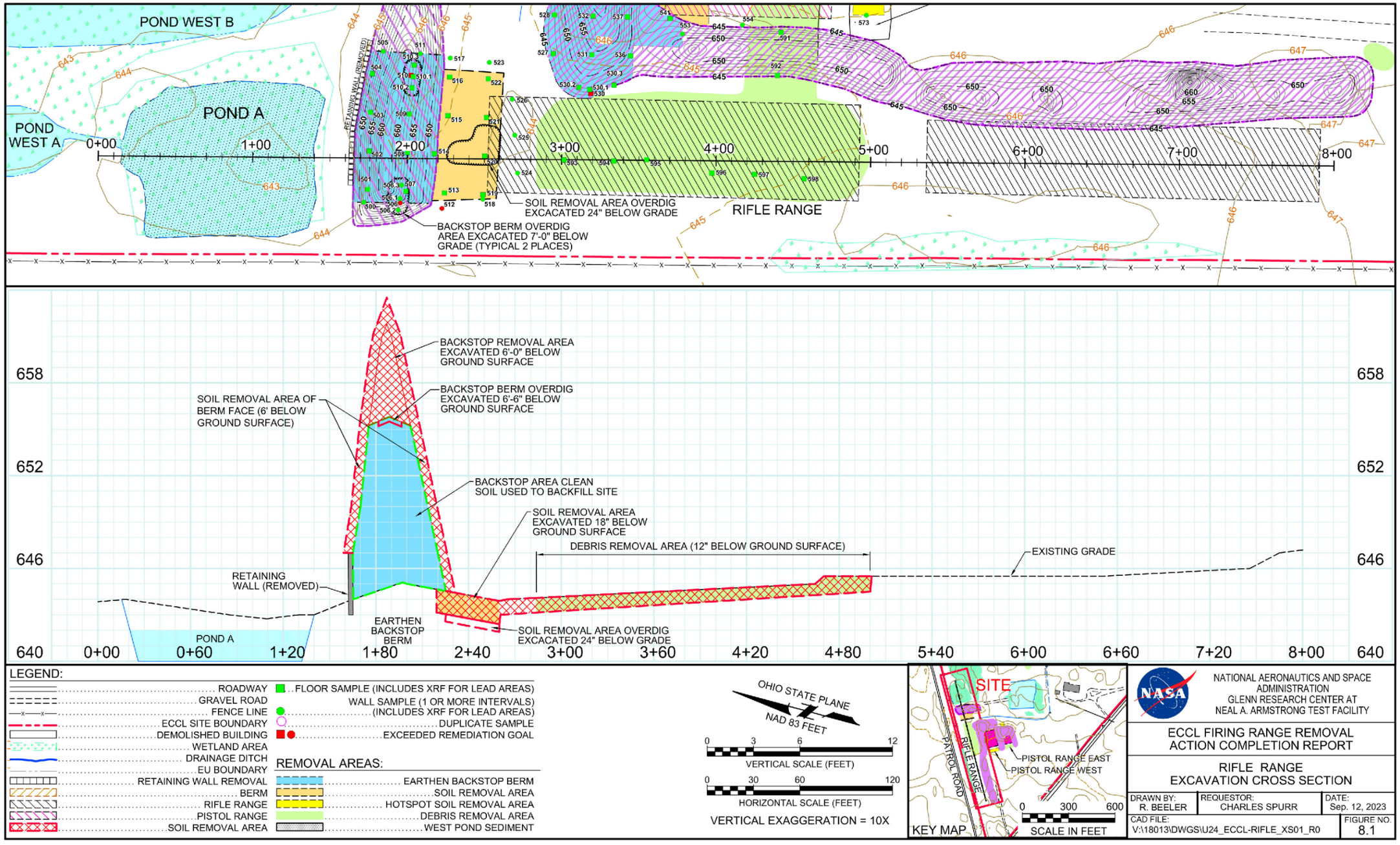


Figure 8.1. Rifle Range Excavation Cross Section

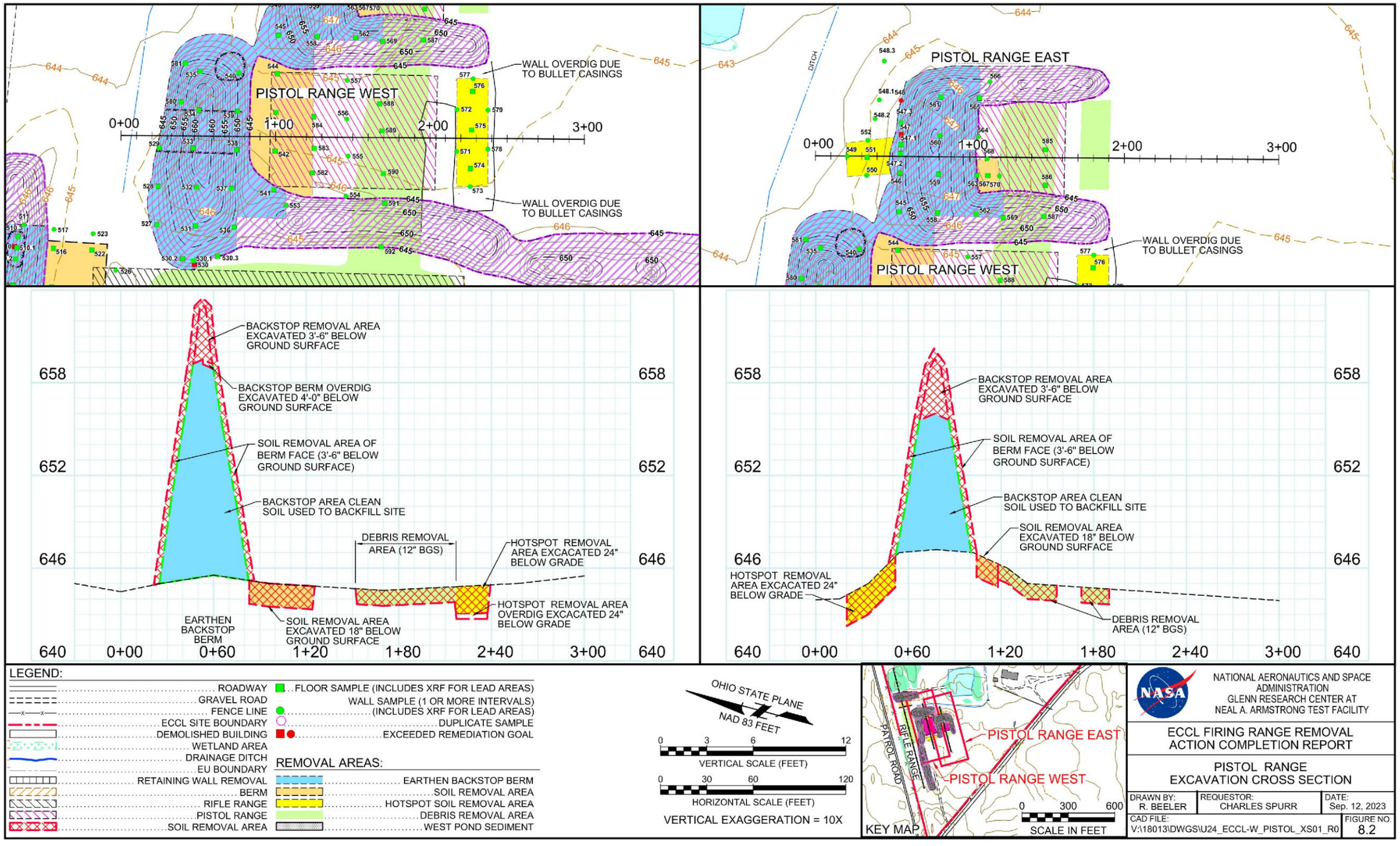


Figure 8.2. Pistol Range Excavation Cross Section

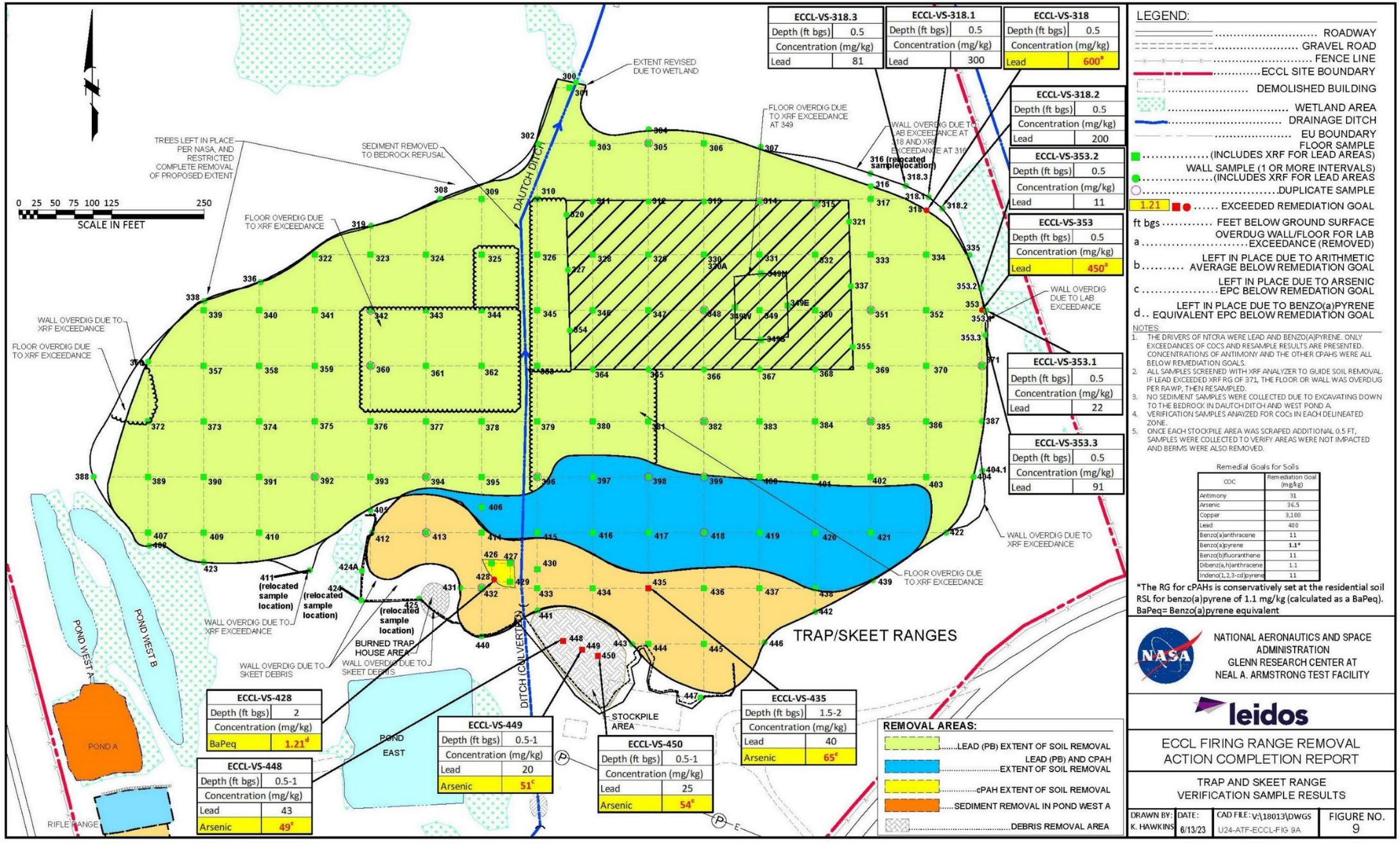


Figure 9. Trap and Skeet Range Verification Sample Results

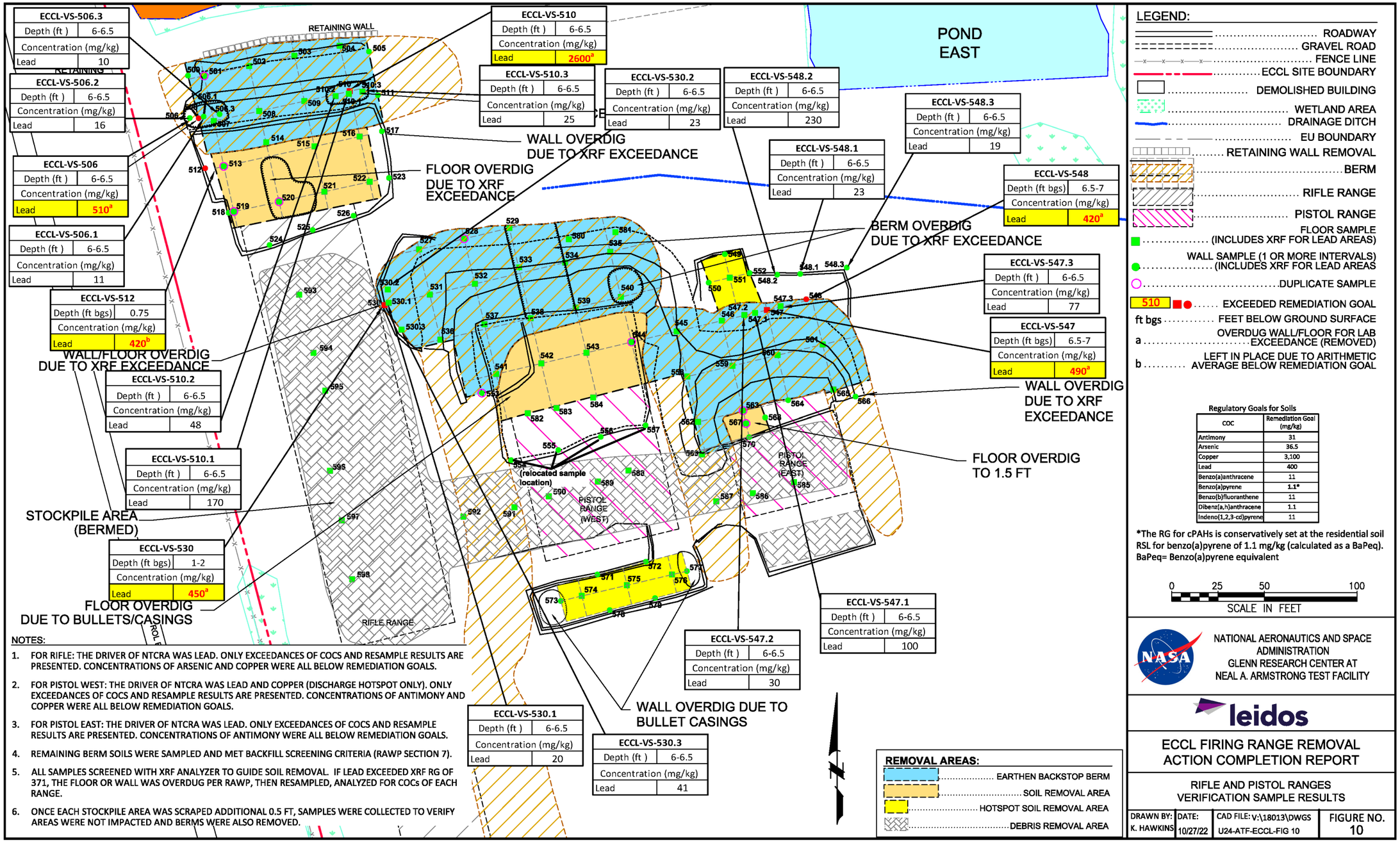


Figure 10. Rifle and Pistol Ranges Verification Sample Results

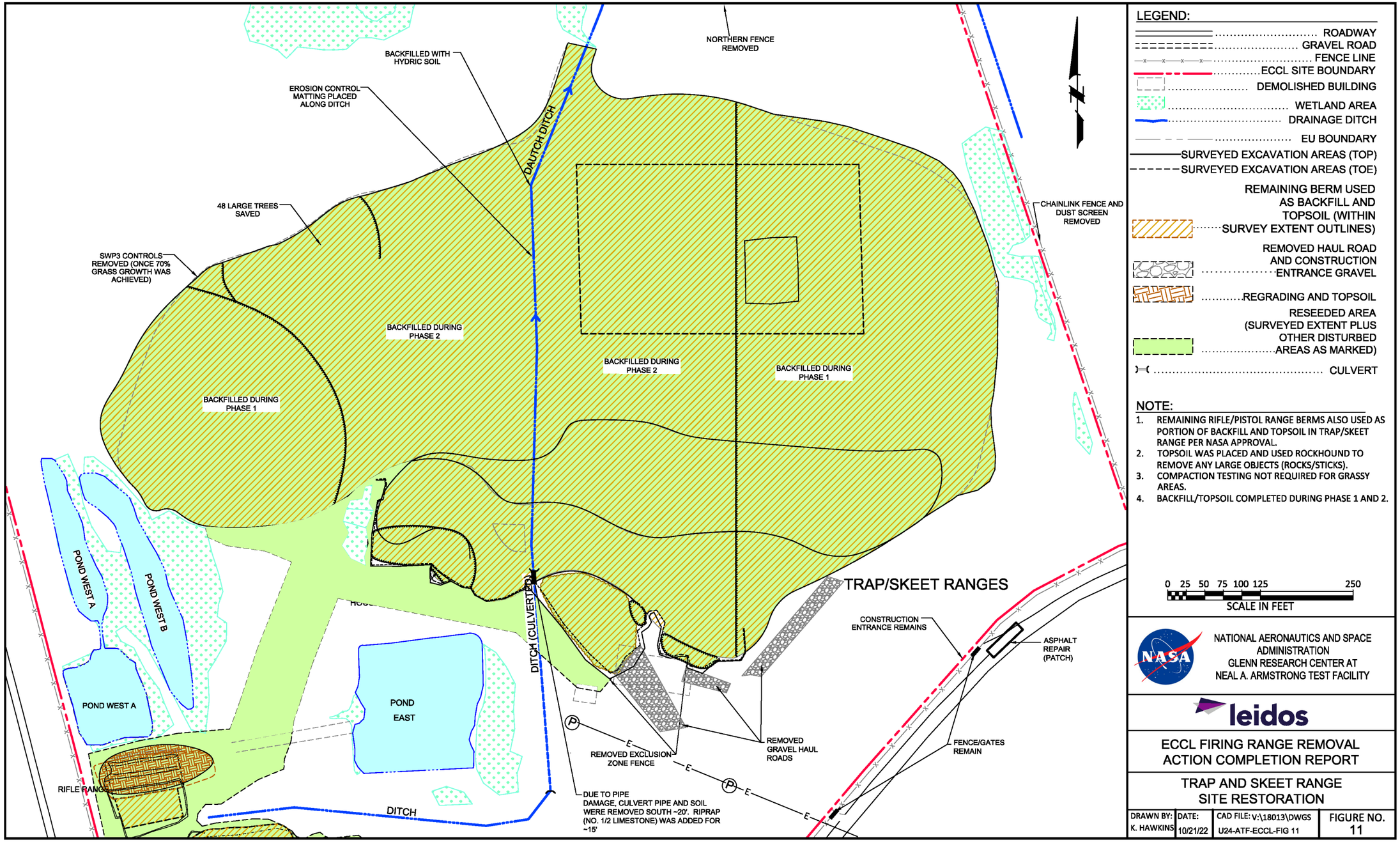
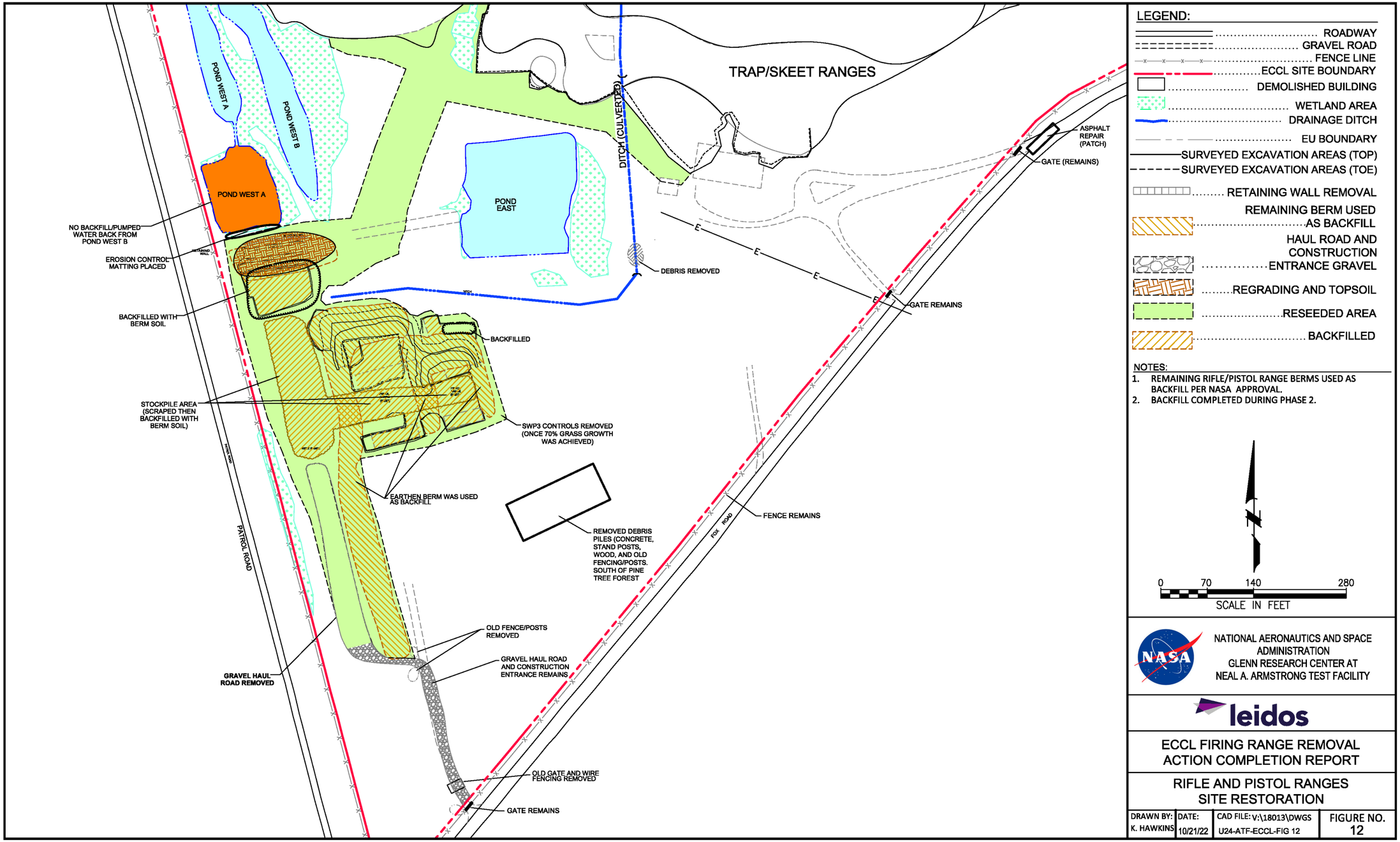


Figure 11. Trap and Skeet Range Site Restoration



LEGEND:

- ROADWAY
- GRAVEL ROAD
- FENCE LINE
- ECCL SITE BOUNDARY
- DEMOLISHED BUILDING
- WETLAND AREA
- DRAINAGE DITCH
- EU BOUNDARY
- SURVEYED EXCAVATION AREAS (TOP)
- SURVEYED EXCAVATION AREAS (TOE)
- RETAINING WALL REMOVAL
- REMAINING BERM USED AS BACKFILL
- HAUL ROAD AND CONSTRUCTION ENTRANCE GRAVEL
- REGRADING AND TOPSOIL
- RESEEDED AREA
- BACKFILLED

NOTES:

1. REMAINING RIFLE/PISTOL RANGE BERMS USED AS BACKFILL PER NASA APPROVAL.
2. BACKFILL COMPLETED DURING PHASE 2.

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SCALE IN FEET

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GLENN RESEARCH CENTER AT
NEAL A. ARMSTRONG TEST FACILITY

leidos

ECCL FIRING RANGE REMOVAL ACTION COMPLETION REPORT

RIFLE AND PISTOL RANGES SITE RESTORATION

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K. HAWKINS	10/21/22	V:\18013\DWGS U24-ATF-ECCL-FIG 12	12

Figure 12. Rifle and Pistol Ranges Site Restoration