

Picatinny Arsenal Installation Restoration Program

Picatinny Arsenal is an Official Hawk Watch Site

RECORD OF DECISION
FOR SITE 53 (PICA-057) PICATINNY LAKE
WEBCASS CRL ID: 34855.1025
PICATINNY ARSENAL
NEW JERSEY

Final **December 2025**

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
§	Section
µg/L	micrograms per liter
ANL	Argonne National Laboratory
ARARs	applicable or relevant and appropriate requirements
Army	U.S. Department of the Army
As	Arsenic
BaP	benzo(a)pyrene
BDAT	Best Demonstrated Available Technology
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Identification System
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern
CSM	conceptual site model
DDD	4,4-dichlorodiphenyl-dichloroethane
DDT	dichlorodiphenyltrichloroethane
DERP	Defense Environmental Restoration Program
DGM	digital geophysical mapping
DoD	Department of Defense
ECC	Environmental Chemical Corporation
EOD	Explosive Ordnance Disposal
ERA	Environmental Risk Assessment
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FS	feasibility study
ft	feet
GIS	Geographic Information System
GPB	Green Pond Brook
gpm	gallons per minute

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

HHRA	human health risk assessment
HI	hazard index
ICFKE	ICF Kaiser Engineers, Inc.
ID	Identifier
IRP	Installation Restoration Program
IT	IT Corporation
LOC	level of concern
LUC	land use control
MC	munitions constituents
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
MNA	Monitored Natural Attenuation
MRS	Munitions Response Site
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJDHSS	New Jersey Department of Health and Senior Services
NPL	National Priorities List
NR	not relevant
NTCRA	non-time-critical removal action
O&M	operations and maintenance
OSWER	Office of Solid Waste and Emergency Response
PAERAB	Picatinny Arsenal Environmental Restoration Advisory Board
PCB	polychlorinated biphenyl
PHC	Public Health Command
PP	proposed plan
PRG	preliminary remediation goal
R&D	research and development
RA	remedial action

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	cyclotrimethylene-trinitramine
RG	remedial goal
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
Shaw	Shaw Environmental, Inc.
SI	site investigation
SLERA	screening-level ecological risk assessment
SRP	Site Remediation Program
SVOC	semi volatile organic compound
TACOM-ARDEC	U.S. Army Tank-Automotive and Armaments Command Armament Research, Development and Engineering Center
TBC	to be considered
TECUP	Toxic Energetics Cleanup Program
TNT	2,4,6-trinitrotoluene
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UU/UE	unlimited use and unrestricted exposure
UXO	unexploded ordnance
VOC	volatile organic compound
WEBCASS-E CRL	Web Compliance Assessment and Sustainment System - Enterprise Clean-up, Restoration and Liabilities
WESTON®	Weston Solutions, Inc.

1. DECLARATION

1.1 SITE NAME AND LOCATION

Picatinny Arsenal, formally designated as United States (U.S.) Department of the Army (Army), Installation Management Command, Northeast Region, Garrison Office, is located in north central New Jersey in Morris County near the city of Dover (**Figure 1**). Picatinny Arsenal was included on the National Priorities List (NPL) in March 1990 and was assigned a Comprehensive Environmental Response, Compensation, and Liability Identification System (CERCLIS) number of NJ3210020704. The Army signed a Federal Facility Agreement (FFA) with the U.S. Environmental Protection Agency (USEPA) in 1991.

This Record of Decision (ROD) addresses contaminated sediment at Picatinny Lake (Site 53 [PICA-057], Web Compliance Assessment and Sustainment System - Enterprise (WEBCASS-E) Clean-up, Restoration and Liabilities (CRL) Identifier [ID]: 34855.1025). Generally, Picatinny Arsenal sites have three numbers assigned to them. The site numbers are individual, unique identifiers for each site that were assigned during the Site Inspection (SI)/Remedial Investigation (RI) phase of work. The "PICA" numbers were assigned to individual sites or to groups of sites for the Army to track progress on environmental sites on a national basis in the Army Environmental Database. The Army Environmental Database has been incorporated into the WEBCASS-E, the current Army centralized environmental database of record and has developed a unique CRL ID number for each site. Picatinny Arsenal sites' geographic locations are also identified by their area.

To ensure that the areas with the greatest potential for environmental contamination were addressed first, the Army categorized the 16 areas of the Base into Areas A (greatest potential) through P (least potential). These areas were delineated in the RI Concept Plan (Argonne National Laboratory [ANL], 1991). The Army further grouped these areas into three phases, with Area A investigated separately. Phase I included Areas B though G; Phase II included Areas H through K, and Phase III included Areas L through P. Picatinny Arsenal RI Concept Plan Areas are shown on **Figure 1**.

Picatinny Lake is managed as part of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response program as Site 53 (PICA-057) and is one of the three sites included in the Lakes Group, which comprises the following three man-made water bodies:

- Picatinny Lake (Site 53 [PICA-057])
- Lake Denmark (Site 54 [PICA-015])
- Reservoir/Explosive Ordnance Disposal (EOD) Pond (Site 103 [PICA-164])

Lake Denmark and the Reservoir/EOD Pond were combined into the same CERCLA documents in 2017 and are addressed under a separate ROD, *Record of Decision for EOD Pond (Site 103/PICA-164) and Lake Denmark (Site 54/PICA-015)* (Army, 2018). The site boundary for Picatinny Lake and the locations of Lake Denmark and the EOD Pond are shown in **Figure 1**.

Picatinny Lake is also included in the Lakes Munitions Response Site (MRS) (PICA-008-R-01). The Lakes MRS addresses explosive hazards associated with munitions and explosives of concern (MEC) at Lake Denmark and Picatinny Lake separately under the Military Munitions Response Program (MMRP). The Proposed Plan (PP) and ROD for the Lakes MRS are currently in progress.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD for Picatinny Lake presents the Selected Remedy for addressing contaminated sediment at the site. The Selected Remedy was chosen by the Army (as the Lead Agency) and USEPA (as the lead regulatory agency) in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986; Executive Order 12580; and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as required by the Defense Environmental Restoration Program (DERP). The information supporting the decision on the Selected Remedy presented in this ROD is contained in the Administrative Record file for the site. The Administrative Record file is available at the locations listed in Section 2.3. The New Jersey Department of Environmental Protection (NJDEP) concurs with the Selected Remedy, as presented in the PP (Weston Solutions, Inc. [WESTON®], 2021). A letter of concurrence is provided in **Appendix A**.

1.3 ASSESSMENT OF THE SITE

The Selected Remedy presented in this ROD is necessary to protect public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment at Picatinny Lake. The Selected Remedy addresses contaminated sediment. The environmental media at Picatinny Lake were investigated under the Army's Installation Restoration Program (IRP). Additional sampling for munitions constituents (MC) and investigation of MEC were performed separately under the Army's MMRP (see earlier reference to Lakes MRS).

Numerous investigations were conducted at Picatinny Lake between 1976 and 2016 under the purview of the Army, USEPA Region 2, and NJDEP, and are summarized in **Table 1**. The reports detailing the results of these investigations are included in the Administrative Record file. Previous lake-wide investigations have included surface water and sediment sampling, surface soil sampling of areas around the lake, and fish tissue sampling. The soil located around the perimeter of Picatinny Lake is addressed under various land-based sites located in Area I and is not included in this ROD.

Evaluation of the risks identified based on data from fish tissue indicated there was unacceptable noncancer hazard to potential adult onsite and/or local, retired personnel and the child of the on-site and/or local retired personnel receptors due to the presence of mercury in edible tissue from fish collected from Picatinny Lake. The risks resulting from exposure to lake-wide surface water and sediment were within the USEPA acceptable cancer risk range and noncancer hazard for Picatinny Lake as a whole. However, exposure to sediment hot spots due to elevated metals concentrations may pose localized risk to ecological receptors, particularly benthic organisms in the lake, and contribute to the unacceptable human health risk due to fish consumption.

The four hot spots (i.e., areas where elevated copper, lead, mercury, and/or silver concentrations were observed) were identified at Sites 63/65, 82, 108, and 113, which are located on the shore of Picatinny Lake (**Figure 2**).

A Supplemental Investigation was conducted in 2016 to evaluate the lateral and vertical extent of these metals constituents at these four hot spots. The results of the 2016 Supplemental Investigation indicated the contaminants of concern (COCs) at each site were as follows:

- Offshore of Site 63/65: Copper, mercury, and silver
- Offshore of Site 82: Silver
- Offshore of Site 108: Copper, lead, mercury, and silver
- Offshore of Site 113: Copper, mercury, and silver

Based on the unacceptable risk to human health from exposure due to the consumption of fish tissue, the Remedial Action Objectives (RAOs) are as follows:

- Reduce risk to potential adult onsite and/or local, retired personnel and the child of the on-site and/or local retired personnel receptors from ingestion of mercury-contaminated fish tissue collected from Picatinny Lake by treating contaminated sediment offshore of Sites 63/65, 82, 108 and 113.
- Reduce to the extent practicable the consumption of edible fish with elevated concentrations of mercury. Inform potential receptors of on-site fish consumption advisories.

Based on protection of ecological receptors, the ecological RAOs and remedial goals (RGs) are as follows:

- Eliminate the exposures to sediment offshore of Site 63/65 with concentrations of copper, mercury, and silver above the RGs (261, 13.2, and 36 milligrams per kilogram [mg/kg], respectively) for the protection of benthic invertebrates.
- Eliminate the exposures to sediment offshore of Site 82 with concentrations of silver above the RG (36 mg/kg) for the protection of benthic invertebrates.
- Eliminate the exposures to sediment offshore of Site 108 with concentrations of copper, lead, mercury, and silver above the RGs (261; 1,000; 13.2; and 36 mg/kg, respectively) for the protection of benthic invertebrates.
- Eliminate the exposures to sediment offshore of Site 113 with concentrations of copper, mercury, and silver above the RGs (261, 13.2, and 36 mg/kg, respectively) for the protection of benthic invertebrates.

Remedial alternatives were identified and evaluated in the *Final Picatinny Lake (AEDB-R# PICA-057/Site 53) Feasibility Study* (FS) (Environmental Chemical Corporation [ECC], 2016, and the preferred alternative was identified in the *Final Proposed Plan for Site 53 (PICA-057)* (WESTON, 2021), issued by the Army and USEPA. This ROD presents the Army's and USEPA's Selected Remedy to achieve the RAOs; the Selected Remedy is presented and described in Section 1.4.

Table 1 Chronology of Investigations at Picatinny Lake

Activity	Report Author	Date
Installation Assessment of Picatinny Arsenal	U.S. Army Toxic and Hazardous Materials Agency (USATHAMA)	1976 1980
U.S. Army Environmental Hygiene Agency (USAEHA) Reservoir Investigation	USAEHA	1984
Pesticide Risk Management Study	USAEHA	1988
RI Concept Plan	ANL	1991
Assessment of Streambed-Material Characteristics and Surface-Water Quality, Green Pond Brook and Tributaries	U.S. Geological Survey (USGS)	1991
Phase II RI Report, Round 1, Volume 1	ICF Kaiser Engineers, Inc. (ICFKE)	1999
Phase II Ecological Risk Assessment (ERA)	IT Corporation (IT)	2000
Fish Consumption Human Health Risk Assessment (HHRA)	Shaw Environmental, Inc. (Shaw) IT	2004 2002
Phase II RI – Area I Remaining Sites	Shaw	2005
Draft Final Lakes FS Site 54 (PICA-015), Site 53 (PICA-057), and Site 103 (PICA-164)	ARCADIS	2010
Final Lakes FS Site 54 (PICA-015), Site 53 (PICA-057), and Site 103 (PICA-164)	ARCADIS	2012
MMRP RI	WESTON	2014
Draft Lakes FS	ARCADIS	2014a
Draft Benthic Macroinvertebrate and Sediment Sampling Data Summary Report	ARCADIS	2014b
Final Picatinny Lake FS	Environmental Chemical Corporation (ECC)	2016a
Final Picatinny Lake Sediment Sampling Work Plan	ECC	2016b

1.4 DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy for Picatinny Lake is ***Alternative 4: Sediment Capping with Land Use Controls***. The Selected Remedy for contaminated sediment at Picatinny Lake, pursuant to this ROD, is part of a comprehensive environmental investigation and remediation process currently being performed at Picatinny Arsenal. Alternative 4 was selected over other remedial alternatives evaluated because it meets the threshold criteria, including protection of human health and the environment, compliance with applicable or relevant and appropriate requirements (ARARs), and provides the best combination of primary balancing criteria. The Selected Remedy will meet the remedial action objectives (RAOs) by reducing sediment concentration offshore of Sites 63/65, 82, 108, and 113 that may potentially contribute to mercury contamination in fish tissue; reducing to the extent practicable the consumption of edible fish with elevated mercury; and eliminating exposure of ecological receptors to sediment off shore of Sites 63/65, 82, 108 and 113 with concentration of copper, lead, mercury and/or silver above the RGs for the protection of benthic invertebrates. Alternative 4, includes the following elements in order to achieve the RAOs based on the available site data:

- MEC clearance of upland areas prior to commencement of construction activities and the sediment capping areas to include areas identified for design phase sediment sampling, will be conducted during the preliminary design investigation (PDI).
- Fish tissue concentration sampling will be limited to a baseline event during the PDI. Depending on the results, the Army, in consultation with EPA and NJDEP, will determine if fish tissue sampling will have value going forward.
- Design phase sediment sampling will be completed during the PDI prior to cap placement to better define the areal extent of the site-specific hot spots.
- Bench scale testing would be conducted prior to cap placement to determine specific capping materials (i.e., physical barriers or reactive amendment) and how the capping materials would be placed.
- Cap placement at site specific hot spots.
- Post-construction sampling to evaluate cap thickness.
- Implementation of Land Use Controls (LUCs), including land use restrictions, fish consumption advisories, and limits on any activities (i.e., dredging, excavation, shallow water training, gasoline-powered boating) that would disturb the cap material, unless these activities were performed with appropriate prior planning.
- Annual cap inspections, monitoring and maintenance to ensure the Selected Remedy continues to be protective of human health and the environment.

This response action was selected because it provides the best balance of tradeoffs among the other alternatives with respect to the five primary balancing criteria (i.e., long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) and is protective of human health and the environment. Sediment capping avoids short term risks associated with re-suspending contaminated sediments and short-term hazards associated with the potential for encountering MEC.

Fish tissue concentration sampling will be limited to a baseline event during the PDI. Depending on the results, the Army will determine if this type of sampling will have value going forward in the remedial design. Additional site-specific details of the Selected Remedy implementation and execution, such as capping, which may produce effects on open water or wetland habitats, annual inspections, and long-term monitoring will be further defined during the remedial design process. Implementation and execution of signage/buoys placement and cap stability surveys and concentration sampling will be specified during the remedial design process, which occurs after remedy selection. The inspections, surveys and sampling will assist in determining whether the selected remedy is meeting the RAOs.

The Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on the site above levels that allow for unlimited use and unrestricted exposure (UU/UE). Therefore, the Army will perform annual LUCs inspections and CERCLA Five-Year Reviews no less often than every 5 years after initiation of the remedial action.

The Selected Remedy is for Picatinny Lake only. The Selected Remedy is intended to meet the RAOs by reducing ecological and human health risks associated with fish consumption through sediment capping which provides a barrier to exposure to localized contaminated sediment in Picatinny Lake Sites 63/65, 82, 108 and 113 and fish consumption advisories. This is the final remedy for the site. The Selected Remedy does not include or affect any other IRP or MMRP sites at Picatinny Arsenal.

1.4.1 Sediment Capping

Picatinny Lake offshore contaminated sediment locations Site 63/65, Site 82, Site 108 and Site 113 will be capped to limit chemical migration and reduce the potential ecological risk to benthic organisms that may potentially contribute to mercury contamination in fish tissue. Sediment

capping entails placement of an engineered physical barrier over the Picatinny Lake offshore contaminated sediment locations Site 63/65, Site 82, Site 108 and Site 113 to limit chemical migration and reduce benthic exposures. MEC clearance of the sediment capping areas to include areas identified for design phase sediment sampling will be conducted during the PDI. Design phase sediment sampling and surveys to delineate boundaries and topography will be required prior to cap placement to determine the areal extent of the areas to be capped, as some of the hot spots have not been fully delineated. As part of the remedial design, a bench scale study will be conducted to determine whether a physical cap (composed only of aggregate) or a reactive cap (containing aggregate and a reactive material such as carbon or clay) will be constructed to support the selection of appropriate amendments and assist in determining the placement of the cap. The selected remedy requires MEC clearance for access roads along the shoreline and small staging areas for cap material at each site prior to the start of field activities. Cap placement will be completed by crane/excavator from the shoreline or via small scale hydraulic slurry from a barge. Post-construction verification sampling and topography surveys will be conducted following cap placement to confirm placement and thickness. Site restoration of the staging and dewatering areas and roads will be conducted through grading and broadcast seeding as required.

1.4.2 Land Use Controls

Reducing sediment exposures is anticipated to decrease future exposure to benthos at the hotspots. Fish tissue concentrations are not likely to decrease enough to change the risk to human health from fish consumption. Therefore, LUCs are needed to mitigate fish consumption for adult on-site and/or local, retired personnel and the child of on-site and/or local retired personnel receptors. Fish consumption advisory restrictions will be managed under the installations Sportsman Program, which issues bulletins that prescribes the responsibilities and rules governing recreation hunting, trapping, fishing, boating for participants in these activities (Army, 2022). The objective of the LUCs component of the Selected Remedy is to safeguard human health and the environment. LUCs achieve the objective of the Selected Remedy by providing awareness of the consumption advisories for the ingestion of fish at Picatinny Lake and prohibiting activities that would disturb the cap material (i.e., dredging, excavation, shallow water training and gasoline-powered boat use). LUCs will consist of land use restrictions, the installation/maintenance of signs and/or buoy's prohibiting specific activities (i.e., fish consumption and gasoline-powered boat restrictions) at

Picatinny Lake, and maintenance of existing LUCs, which restrict activities at the lake. Established fish advisories and gasoline-powered boat use in the vicinity of the sediment caps would be enforced at Picatinny Lake through the Installation Sportsman Program.

The LUCs under this remedy include the following performance objectives:

- Maintain administrative and educational controls consisting of fish consumption advisory programs, and signage to raise awareness of fish consumption hazards present at the site.
- Maintain institutional controls that provide notifications of fish consumption advisory recommendations of NJDEP (via posting/maintaining signage around the lake and incorporating fish consumption restrictions).
- Establish land use restrictions in the vicinity of Sites 63/65, 82, 108 and 113 sediment cap areas.
- Conduct annual inspections, monitoring and maintenance (as discussed in Subsection 1.4.3), and submittal of annual reports.

Picatinny Arsenal also has internal Army measures in place as components of regular facility operations, which prevent unlimited use/unrestricted exposure (UU/UE). These internal measures include the following:

Site Clearance/Soil Management Procedures—Prior to all soil movement, the Picatinny Environmental Affairs Office must be notified and give approval.

MEC Construction Support—Intrusive activities require a permit from the Picatinny Safety Office and are subject to Picatinny UXO Safety requirements. MEC construction support is required for any planned excavations. Identified MEC is handled in accordance with Picatinny UXO safety requirements.

Master Plan Regulations (Army Regulation 210-20) (U.S. Army, 2005a)—Land use restrictions are memorialized in the Picatinny Arsenal Real Property Vision Plan (AECOM Joint Venture [AECOM], 2015).

Geographic Information System (GIS) Database—The GIS database contains a record of the site location/boundaries, size, chemical analytical data (and screening criteria for the site COCs), and

any land use restrictions. The GIS database is used by the Environmental Affairs Office to administer procedures for site clearance and soil management.

Base Access Restrictions (Security)—Picatinny Arsenal is surrounded by a fence, and entrances are guarded. The entire Picatinny Lake lies within Picatinny Arsenal, which has controlled access.

Safety Programs—To raise awareness and provide an understanding of the potential hazards associated with the contaminated soil and potential MEC within Picatinny Lake, all contractors are required to attend safety training, to include 3Rs and UXO safety awareness training conducted by the Picatinny Safety Office.

1.4.3 Long-Term Monitoring and Maintenance

Annual inspections, monitoring and maintenance are included in the Selected Remedy to ensure that LUCs remain in effect and are being properly implemented. Annual inspections, monitoring and maintenance will include signage/buoy inspections and cap stability surveys and concentration sampling. Restrictions on gasoline-powered boats within the vicinity of Picatinny Lake Sites 63/65, 82, 108, and 113 signage/buoys and fish consumption advisory signage will be installed, maintained, repaired, and replaced as needed. Cap stability surveys will consist of topographic surveys at each cap location to ensure cap placement remains within the bench survey parameters. Cap material samples from each location will be conducted to ensure the integrity of the cap has not been compromised. Implementation and execution of signage/buoys placement, cap stability surveys and cap concentration sampling will be developed during the remedial design process, which will be completed after this ROD is finalized. If the outcome of the PDI fish tissue concentration sampling baseline concludes that long-term monitoring of fish tissue concentration sampling should be conducted, details of the fish tissue sampling program (e.g., frequency, quantity of samples, fish species to be sampled, contaminants to be sampled for, reporting) will be further defined during the remedial design process.

The inspections, surveys and sampling will assist in determining whether the selected remedy is meeting the RAOs. Following annual inspections, cap surveys and concentration sampling, and sign maintenance an annual report will be completed describing the inspection results, needed maintenance or repairs, and assessment of the effectiveness of the LUCs. The Army is responsible for implementing, maintaining, reporting on, and enforcing LUCs.

1.5 STATUTORY DETERMINATIONS

The Selected Remedy for Picatinny Lake is protective of human health and the environment, complies with ARARs, is cost-effective, and uses permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

The Army will remain responsible for ensuring that the Selected Remedy remains protective of human health and the environment. Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on the site above levels that allow for unlimited use and unrestricted exposure (UU/UE), the Army will conduct a statutory review every 5 years after initiation of the response action to ensure that the Selected Remedy continues to be protective of human health and the environment.

The Selected Remedy complies with the chemical-, action-, and location-specific ARARs, as specified in Subsection 2.10.1.2 in this ROD.

1.5.1 Five-Year Reviews

Alternative 4 will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for UU/UE. Therefore, statutory reviews will be conducted every 5 years after the initiation of the RA, pursuant to CERCLA Section 121(c) and the NCP, Title 40 Code of Federal Regulations (CFR) § 300.430(f)(4)(ii). Five-year reviews will continue as long as contaminants remain on-site at concentrations greater than levels that allow for UU/UE.

In compliance with CERCLA and the NCP, five-year reviews will be conducted as part of the Selected Remedy to evaluate the implementation and performance to ensure that the remedy continues to be protective of human health and the environment.

1.6 DATA CERTIFICATION CHECKLIST

This section provides a data certification checklist (**Table 2**), which certifies that this ROD contains key remedy selection information. **Table 2** includes references to section numbers where the information is presented in the body of this ROD. Additional information can be found in the Administrative Record for this site.

Table 2 Data Certification Checklist

Criterion	Section/Table Nos.	Page Nos.
COCs and their respective concentrations	Section 2.5.2	24-34
Risks represented by contaminated media	Section 2.7/Tables 5, 6	36-39
Cleanup levels and the basis for these levels	Section 2.8	41-45
How source materials constituting principal threats will be addressed	Section 2.11	56
Current and reasonably anticipated future land use assumptions	Section 2.6	34-35
Estimated capital, annual operations and maintenance (O&M), total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	Section 2.12.2	59
Key factor(s) that led to selecting the remedy	Section 2.12.1	59

1.7 AUTHORIZING SIGNATURES

Record of Decision
Site 53 (PICA-057) Picatinny Lake
WEBCASS CRL ID: 34855.1025
Picatinny Arsenal, New Jersey

This ROD presents the Selected Remedy of ***Alternative 4: Sediment Capping with Land Use Controls*** for Picatinny Lake at Picatinny Arsenal, located in Morris County, New Jersey.

The Army is the lead agency under DERP and has developed the ROD consistent with CERCLA, as amended by SARA, and to the extent practicable with the NCP. This action is selected by the Army and USEPA, the lead regulatory agency, with the concurrence of NJDEP, the support regulatory agency. This ROD will be incorporated into the Administrative Record file for Picatinny Lake available for public review at the locations described in Section 2.3. This document, which presents the Selected Remedy, is approved by the undersigned, pursuant to Memorandum, DAIM-ISE, February 11, 2019, Subject: Summary of Results, Decision Document In-Progress Review, 27 November 2018--Corrected.

Vance M Brunner

Vance M. Brunner
Colonel, Commander
U.S. Army Environmental Command

13FEB2026

Date

Record of Decision
Site 53 (PICA-057) Picatinny Lake
WEBCASS CRL ID: 34855.1025
Picatinny Arsenal, New Jersey

This signature sheet documents the United States Army Environmental Command and United States Environmental Protection Agency selection of the remedy selected in this Record of Decision for Site 53 (PICA-057) Picatinny Lake at Picatinny Arsenal, located in Morris County, New Jersey.

Pat Evangelista

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Pat Evangelista — Date
Director, Superfund and Emergency Management
United States Environmental Protection Agency, Region 2

2. DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

Picatinny Lake is located on the grounds of Picatinny Arsenal in Rockaway Township, Morris County, New Jersey. Picatinny Arsenal is an NPL site and is registered under CERCLIS number NJ3210020704.

The installation encompasses approximately 5,900 acres and is located about 40 miles west of New York City and 4 miles northeast of Dover, New Jersey. The site location within Picatinny Arsenal is presented in **Figure 1**. Picatinny Lake is freshwater, and the IRP site covers approximately 121 acres.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Picatinny Background

Picatinny Arsenal is an active military installation that houses government-operated munitions research and development (R&D) facilities; operational ranges for munitions testing; residential housing; and recreational facilities, including a golf course and water park. Picatinny Arsenal was a major source of munitions for World War I, World War II, the Korean War, and the Vietnam War.

In recent years, the mission of Picatinny Arsenal has shifted to conducting and managing research development, lifecycle engineering, and support of other military weapons and weapon systems. The facility has responsibility for R&D of armament items.

Picatinny Arsenal will continue to be used for military R&D, industrial military operations, residential housing, and recreational activities (fishing, boating, hunting, and golfing) for the foreseeable future. Picatinny Arsenal is not closed to the public, but access is strictly controlled. Trespassing and unauthorized activities are prohibited.

2.2.2 Picatinny Lake Site Background

Picatinny Lake is located within Area I at the approximate center of the Picatinny Arsenal, as shown in **Figure 2**. Area I consists of Picatinny Lake and storage facilities located around the

shoreline of the lake. Area I is bounded to the northwest by Green Pond Mountain and to the southeast by an unnamed ridge. The main valley floor continues to the northeast and southwest of the area. Following regional topographic trends, the elevated ridges slope into the valley floor, and the valley floor then slopes gently to the southwest. Operations in Area I include R&D.

Picatinny Lake is a man-made lake that was constructed in the 1880s by the damming of Green Pond Brook (GPB) for use as a dammed forge pond. Early ironmasters built dams to impound water bodies and erected water wheels to drive the hammers and other machinery needed for iron ore-making operations (Rutsch, 1999; Morrell, 1995). Picatinny Lake is a man-made lake with a water surface area of approximately 108 acres, a storage capacity of approximately 165 million gallons, and a maximum depth of 20 feet (ft). Surface water flows from Lake Denmark to Burnt Meadow Brook to GPB to Picatinny Lake.

Active and inactive mission related buildings surround Picatinny Lake. Current land use surrounding Picatinny Lake includes laboratories, R&D, and storage. Previous land uses surrounding Picatinny Lake included smokeless powder production and testing, munitions production to include the storage of lead azide and pentaerythritol tetranitrate, blender operations, explosive scrap waste reclamation, and screening of explosives. Numerous buildings around Picatinny Lake near site 63/65 have been demolished.

Historically, water from Picatinny Lake has been used for many operations at Picatinny Arsenal. To supplement Picatinny Arsenal's drinking water supply, a 6-inch pipe leading from Picatinny Lake near the now-demolished power plant was once used to transmit water to an auxiliary boiler house, which historically housed five pumps with a pumping capability of 7,480 gallons per minute (gpm). Additionally, water was once pumped to storage tanks and reservoirs located above Picatinny Lake for use in the lower portion of the Picatinny Arsenal. Water from Picatinny Lake is, however, no longer used as a potable source. Picatinny Lake water was also used for industrial and firefighting purposes, including non-contact cooling water for the former power plant. Currently, the water in Picatinny Lake is used for fire protection, with two locations for intake: one near Site 63/65 and one just north of Site 157. In 2016, 68,478 gallons of water were used from the Site 63/65 location. The intake near Site 157 is for fire protection but has never been used.

A 3-inch projectile Barbette gun firing range, constructed between 1919 and 1922, was operated over Picatinny Lake until 1931, with a firing point located on the southeastern shore and a sand butt (i.e., impact area) located across the lake to the west near Site 157. The firing range was most likely used for munitions testing and would have been located in a single, fixed location. Historical reports document smokeless powder and explosives being stored underwater in the southern portion of Picatinny Lake between 1910 and 1960 for protection from lightning, spontaneous ignition, and heat. From World War II through the 1970s, pyrotechnics were tested on Whiley's Island, also known as Flare Island. Whiley's Island is located near the southwestern shore of Picatinny Lake (Site 108 [PICA-143]). Pyrotechnics were tested to reduce the potential of fire. During pyrotechnic tests, the burned material may have been transported by air and eventually fallen into Picatinny Lake. Several explosive-related accidents occurred in the back room of a building located south of Site 157 along the southwestern portion of Picatinny Lake. These explosions could have potentially caused MEC releases into Picatinny Lake. There are also unconfirmed reports of munitions being fired over Picatinny Lake into an operation range on the side of a hill. As a result, munitions could have landed within Picatinny Lake (WESTON, 2014).

The types and quantity of munitions that may have been fired, or fallen, into Picatinny Lake were historically not recorded or quantified. The potential for MEC to be located in Picatinny Lake is being evaluated separately under the MMRP (WESTON, 2014) and is included under the Lakes MRS (PICA-008-R-01), which includes Lake Denmark and Picatinny Lake. The potential munitions-related risks for Picatinny Lake are currently managed through interim LUCs as detailed in the Final Non-Time-Critical Removal Action (NTCRA) Interim Land Use Control Plan (U.S. Army Corps of Engineers [USACE], 2013). The MMRP interim LUCs include restrictions on land use, dig permits, public advisories, signage, and monitoring that are intended to work with, and complement, the CERCLA-based LUCs for the site included in the Selected Remedy (Picatinny Arsenal, 2012). Therefore, evaluation of potential MEC presence and associated MEC risks at Picatinny Lake are not included in this ROD. Based on the current schedule, the IRP remedy will be implemented prior to the MMRP remedy. LUCs implemented under the Selected Remedy will be protective of the capped areas and will inhibit disturbance of the cap during remedy implementation under the MMRP. Therefore, the remedies are not expected to impact one another.

Historical releases and discharges from buildings located near Picatinny Lake have also contributed to debris or potential contamination in the lake (details of these releases are presented in the FS [ECC, 2016a]).

Picatinny Arsenal currently manages Picatinny Lake as a recreational resource, and it is accessible for various recreational activities that are specified in the *Installation Sportsman Program Bulletin for Recreational Hunting, Trapping, Fishing, and Boating*, which is available upon request (Army, 2022). Fishing is permitted from the Picatinny Lake shore (although some areas are restricted due to site activities); by boat; or, if seasonal conditions allow, fishing can be conducted from the ice. Both gasoline-powered and non-motorized boats are currently allowed on Picatinny Lake. Under the existing program, boats may be launched from permissible areas; however, boat launches are not limited to ramps/docks. The use of boat anchors is prohibited except in the case of an emergency. No swimming or sailboarding is allowed in Picatinny Lake. Only recreational fishing is permitted. Fish consumption advisories are in place and managed under the Installation Sportsman Program (Army, 2022).

2.2.2.1 Previous Investigations

Numerous investigations were conducted at Picatinny Lake between 1976 and 2016 under the purview of the Army, USEPA Region 2, and NJDEP and are summarized in **Table 1**. The reports detailing the results of these investigations are included in the Administrative Record file.

Previous lake-wide investigations have included surface water and sediment sampling, surface soil sampling of areas around Picatinny Lake, and fish tissue sampling. In May 2016, additional sampling was conducted to determine the nature and extent of chemicals at identified sediment hot spots, and the data were used in the evaluation of the remedial alternatives presented in the 2016 FS (ECC, 2016a). Cleanup of the soil located around the perimeter of Picatinny Lake is addressed under various land-based sites located in Area I and is not addressed in this ROD. Groundwater has been investigated at other Area I sites in the vicinity of Picatinny Lake and is not addressed in this ROD. At Picatinny Arsenal, a base-wide institutional control for groundwater has been established and is currently in place, which is the Classification Exception Area.

In addition, geophysical surveys have been conducted along select areas of Picatinny Lake, as well as a follow-on underwater intrusive investigation (ICF Kaiser Engineers, Inc. [ICFKE], 1999;

WESTON, 2014). MEC and munitions debris have historically been found along the southeastern portion of the shoreline and on the peninsula where several building explosions occurred; and based on the findings of the MMRP RI (WESTON, 2014), MEC density was determined to vary across Picatinny Lake. MEC were found at depths up to 4 inches below ground surface (bgs) along the shoreline; however, the depth of MEC within Picatinny Lake is unknown and was not determined during the MMRP RI (WESTON, 2014).

2.3 COMMUNITY PARTICIPATION

The NCP, 40 CFR § 300.430(f)(3) establishes many public participation activities that the lead agency must conduct during the remedy selection process. Components of these activities and documentation of how each component was satisfied for the site are described in **Tables 3** and **4**.

Table 3 Public Notification of Document Availability

Requirement	Satisfied By
Notice of the availability and brief analysis of the PP must be published in a major local newspaper of general circulation. [NCP, 40 CFR § 300.430(f)(3)(i)(A)]	Notice of availability was published on March 25, 2021, in *The Star Ledger*, and on March 24, 2021, in the *Daily Record,* and they are included for reference in **Appendix B**.

Table 4 Public Comment Period Requirements

Requirement	Satisfied By
The lead agency should make the document available to the public for review. CERCLA § 117(a)(2) requires the lead agency to provide the public with a reasonable opportunity, not less than 30 days, to submit written and oral comments on the PP and the supporting analysis and information in the information repository. The lead agency must extend the public comment period by at least 30 additional days upon timely request. [NCP, 40 CFR § 300.430(f)(3)(i)(C)]	The PP was made available to the public on March 31, 2021. The Army provided a public comment period for the PP and other supporting information from March 31 to April 30, 2021 (30 days). Public comments and prepared responses from the public meeting are discussed in Part 3. The Army received no requests to extend the public comment period.
The lead agency must provide the opportunity for a public meeting to be held at or near the Installation during the public comment period. [NCP, 40 CFR § 300.430(f)(3)(i)(D)]	A public meeting was held as a virtual meeting due to COVID-19 pandemic restrictions and concerns. The meeting was held on March 31, 2021, at 7:30 p.m. Members of the public, the Picatinny Arsenal Environmental Restoration Advisory Board (PAERAB), and other stakeholders were invited to join the meeting.

Requirement	Satisfied By
The lead agency must keep a transcript of the public meeting held during the public comment period and make such transcript available to the public. [NCP, 40 CFR § 300.430(f)(3)(i)(E)]	Transcripts from the March 31, 2021, public meeting are provided in **Appendix B**.

2.4 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

This ROD addresses the Selected Remedy for contaminated sediment at Picatinny Lake. The Selected Remedy, ***Alternative 4 – Sediment Capping with Land Use Controls***, is designed to provide protection to human health for both the current and reasonably anticipated future site uses (i.e., military/industrial and recreational) and to the environment. The COCs at the site are discussed in detail in Section 2.5.2.

2.4.1 Soil/Groundwater

Cleanup of the soil and groundwater located in the vicinity of Picatinny Lake is addressed under other RODs and is, therefore, not addressed within this ROD (see **Figure 3**).

Group 1 Sites (PICA-079)

The Group 1 Sites (PICA-079) are located in Area I at Picatinny Arsenal. Group 1 is approximately four acres in size and encompasses Sites 40, 93, 157 and 156 located on the Picatinny Lake northcentral peninsula and shoreline. Group 1 Sites consist of active and inactive mission related buildings including laboratories, R&D, and storage. Surface and subsurface soil and groundwater at the site are addressed under the *Final Record of Decision Group 1 Sites (PICA-079)* (Army, 2010). Remedies in place under the final ROD include excavation, removal and off-site disposal of explosive contaminated soil, implementation and maintenance of LUCs for arsenic, PAHs and PCB contaminated soils, and LUCs and monitored natural attenuation for explosives in groundwater. The LUCs maintain the integrity of the monitoring system and prohibit the development of the site for residential housing, schools, or childcare facilities. The monitoring program includes annual groundwater, surface water, and sediment monitoring. Surface water and sediment data collection occurs concurrently with groundwater monitoring program and samples are analyzed for 2-amino-4,6-Dinitrotoluene, 4-amino-2,6- Dinitrotoluene, amino Dinitrotoluene, RDX, and 2,4,6-TNT.

Area I Sites 16, 32, 33, 46, 50, 63/65, 97, 105, 108, 113, 147, 148, 150, and 184

Area I is located at the approximate center of Picatinny Arsenal, consists of Picatinny Lake and includes production and storage facilities located around the shore of the lake. Surface and subsurface soil, sediment, surface water, and groundwater are addressed under the *Final No Further Action with Monitoring of Land Us Record of Decision for Site Within PICA 001, 006, 002, 085, 143, 163, 171, 192, and 199 and No Further Action for PICA 146* (Army, 2014). Remedies in place under the final ROD include no action at Site 113, and no further action with annual monitoring of land use to ensure the existing land use remains intact.

Site 149 (PICA-149)

Site 149 (PICA-149) is situated in Area I, which is located at the approximate center of Picatinny Arsenal, and consists of Picatinny Lake and production and storage areas positioned on the shore around the lake. Site 149 (PICA-149) is located along the southeast shore of Picatinny Lake and covers 0.8 acres of forested habitat. Site 149 (PICA-149) historically housed a rectangular building used for production and storage. The Site 149 (PICA-149) structure was demolished in 1983. Surface and subsurface soil are addressed under the *Final Record of Decision for 3 Site Group (Sites 118 [PICA-097], 131 [PICA-131] and 149 [PICA-149])* (Army, 2017). Remedies in place under the final ROD include removal and off-site disposal of PAH contaminated soil and LUCs to ensure the existing land use remains intact.

2.4.2 Sediment/Surface Water

There are no unacceptable lake-wide cancer risks and noncancer hazards to human health or ecological receptors associated with Picatinny Lake through exposure to surface water or sediment. However, hot spots due to elevated metal concentrations in sediment may pose localized risk to ecological receptors, particularly benthic organisms in Picatinny Lake and may contribute to the unacceptable risk to human health due to fish consumption.

The potential for MEC at Picatinny Lake is being evaluated separately and is included under the Lakes MRS (PICA-008-R-01). The potential munitions-related risks for Picatinny Lake are currently managed through interim LUCs. These interim controls complement the CERCLA-based

controls for Picatinny Lake included in this ROD. Therefore, the potential risk associated with MEC at Picatinny Lake is not within the scope of this RA for Picatinny Lake.

2.4.3 Fish Tissue

The results of the fish tissue sampling and risk evaluation indicated a hazard index (HI) greater than the threshold of 1 for fish consumption, ranging from less than 1 for the adult personnel on-site and/or local, retired personnel receptor to 8 for the child of on-site and/or local retired personnel receptor, primarily due to the presence of mercury in edible fish tissue collected from Picatinny Lake. Although the levels of mercury in fish tissue are partially due to widespread non-military sources, Picatinny Arsenal has historically released waste mercury into Picatinny Lake.

2.5 SITE CHARACTERISTICS

2.5.1 Physical Characteristics

2.5.1.1 Size, Topography, and Geology/Hydrogeology

Picatinny Arsenal consists of approximately 5,900 acres of improved and unimproved property. Picatinny Arsenal encompasses a wide central valley (Picatinny Valley) that is approximately 7 miles long and a narrower parallel valley (Green Pond Valley) about 2 miles long. Picatinny Arsenal is situated between Green Pond Mountain to the northwest, Copperas Mountain to the east, and an unnamed hill to the southeast. Overall, the topographic gradient is predominantly from the northeast to the southwest with severe slopes present along the northwestern boundary of Picatinny Arsenal along Green Pond Mountain. Most of the buildings and other facilities at Picatinny Arsenal are located on the valley floor or on the slopes along the southeast side of the property.

Elevations at Picatinny Arsenal range from approximately 700-1,000 ft above mean sea level at GPB at the southern installation boundary. Green Pond Valley is filled with a thin layer of soil and glacially derived sediments surrounded and underlain by bedrock, which is a massive, bedded pebble conglomerate and sandstone known as the Green Pond Conglomerate. The basement rocks are faulted by a series of steeply dipping northeast/southwest trending faults. Lake Denmark and Picatinny Lake are fed by GPB within the valley.

Four separate aquifers have been identified beneath Picatinny Arsenal. The aquifers include an unconfined glacial aquifer, an upper semi-confined glacial aquifer, a lower semi-confined glacial aquifer and a dolomitic bedrock aquifer (Dames and Moore, 1998). Details regarding the four aquifers are provided in the MMRP RI Report (WESTON, 2014). The unconfined aquifer is continuous throughout the valley except where bedrock is exposed at the surface. Groundwater in the unconfined aquifer generally flows toward surface water discharge areas such as the GPB.

2.5.1.2 Surface Water

Surface water bodies in the area of Picatinny Lake and GPB act as groundwater discharge areas and drain the installation. Picatinny Lake was formed by damming GPB and is approximately 5,300 ft long and 1,000 ft wide, has a maximum depth of 20 ft, and has an approximate capacity of 165 million gallons of water. The primary tributary to Picatinny Lake is GPB, which enters the lake from the north and exits from the south. Picatinny Lake is designated by NJDEP and U.S. Fish and Wildlife Service as an open-water wetland. The water body is lacustrine and limnetic, with an unconsolidated bottom, and is permanently flooded and impounded. At the north end of Picatinny Lake, there are approximately 2 acres of freshwater forested or shrub wetlands (palustrine). This site is located in the 100-year floodplain as specified by the Federal Emergency Management Agency.

2.5.1.3 Soil Types

There are 26 recognized soil types (U.S. Department of Agriculture [USDA], 1976) on the Installation. Soils are primarily coarse textured, mostly sandy loams. These soils are derived from bedrock, glacial till, and colluvium (U.S. Army Tank-Automotive and Armaments Command Armament Research, Development and Engineering Center [TACOM-ARDEC], 2001). Soils adjacent to Picatinny Lake slope 8% to 25% and include disturbed and natural materials, Rockaway sandy loam, and very to extremely stony soils (USDA, 2016), which are overlain by pavement, concrete, buildings, and other structures.

Sediments within Picatinny Lake tend to consist of a gravel and stone base covered by soft organic matter and fine-grained sediments. In some areas, the gravel is barren. In deeper areas, softer sediments may be several feet deep, but in shallower areas along the shoreline they tend to be only 0.5-2 ft deep.

2.5.1.4 Climate

Northern New Jersey has a continental temperate climate controlled by weather patterns from the continental interior and the proximity to the Atlantic Ocean. The average monthly temperature ranges from a high of about 72 degrees Fahrenheit (°F) in July to a low of about 27 °F in January and February. The average date of the last freeze is May 2, and the average date of the first freeze is October 8. Average annual precipitation at the Boonton monitoring station located approximately 5 miles east of Picatinny Arsenal is 48 inches and is evenly distributed throughout the year.

2.5.2 Summary of Site Information

The information presented in this section is discussed in more detail in the *Final Picatinny Lake (AEDB-R# PICA 057/Site 53) Feasibility Study* (ECC, 2016a) and the other investigations and studies conducted at Picatinny Lake, as listed in **Table 1**.

Figures 4 and **5** show historical sampling locations and the chemicals that were reported at concentrations exceeding Levels of Concern (LOCs) in sediment and surface water, respectively. The initial lake-wide sampling of Picatinny Lake included data generated from 1995 through 2011. These results were presented in the *Phase II Remedial Investigation Report, Round 1, Volume 1* ("Phase II RI Report, Round 1"; ICFKE, 1999) and *Phase II Remedial Investigation Report, Rounds 1 and 2, Volume 3 – Area I Remaining Sites* ("Phase II RI Report, Rounds 1 and 2"; Shaw Environmental, Inc. [Shaw], 2005). The LOCs were originally established in the April 2012 FS (ARCADIS, 2012) and are shown in the figures included in this ROD.

Although both of the Phase II RI reports (ICFKE, 1999 and Shaw, 2005, respectively) identified that risks were within the generally acceptable risk range for Picatinny Lake as a whole, USEPA and NJDEP expressed concern regarding elevated concentrations of chemicals in sediments located offshore of Sites 63/65, 82, 108, 113, and 157, as shown in **Figure 4**. To address these concerns, the Army resampled sediments in November 2011 and again in September 2013 offshore of Site 63/65, Site 82, Site 108, and Site 113 and the sediment data were used to reevaluate the Phase II RI Report, Rounds 1 and 2 HHRA and ERA and were presented in the Draft Picatinny Lake FS.

In addition to the November 2011 and September 2013 sampling, further sediment sampling was conducted in May 2016 in the vicinity of Sites 63/65, 82, 108, 113, and 157 to specifically bound the sediment hot spots. The results of the 2016 sampling of Site 157 indicated that remediation would not be necessary. However, due to intermittent detections of cyclotrimethylene-trinitramine (RDX) at Site 157, the Army recommended that Site 157 be investigated separately/addressed appropriately under the Group 1 long-term monitoring program (Section 2.4.1). Thus, this ROD will not address contaminated sediment offshore of Site 157. The Final Sediment Sampling Work Plan for additional sampling was implemented (ECC, 2016b), which specifically focused on those areas where unbounded metal concentrations in sediment exceeded the ecological toxicity levels established in the *Green Pond and Bear Swamp Brook Focused Feasibility Study* (FFS) ("GPB and Bear Swamp Brook FFS"; IT Corporation [IT], 2001). LOCs (described above) are used during the Phase II RI Report, Rounds 1 and 2. They were agreed upon by the Army, USEPA and NJDEP as relevant, site-specific, toxicity-based values, and protective of the benthic organisms (benthos), and have a strong precedent for use as comparison values for lake environments at Picatinny Arsenal. The offshore site sediment results collected in 2011, 2013, and 2016 are discussed below relative to the RGs. The May 2016 data are discussed in detail in the Picatinny Lake FS (ECC, 2016a). There are no principal threat wastes associated with these sites. Picatinny Lake provides a relatively quiescent environment where contaminated sediments are unlikely to be mobile.

Picatinny Lake Sediment

The initial lake-wide sampling data from Picatinny Lake include data generated from 1995 through 2011. The results of the Picatinny Lake-wide sampling are presented in Appendix A of the Picatinny Lake FS (ECC, 2016a) and are summarized in this section.

Within the sediment, three volatile organic compounds (VOCs) were detected at concentrations exceeding the LOCs (acetone, toluene, and methylene chloride). Acetone was the VOC most frequently observed exceeding its LOC (0.0087 mg/kg). It was detected in 18 samples collected throughout Picatinny Lake with a maximum concentration of 1.0 mg/kg at 53-SD-013. Toluene exceeded the LOC (0.05 mg/kg) in three samples with a maximum concentration of 0.76 mg/kg at 53-SD-014. Toluene LOC exceedances were confined to the southern portion of Picatinny Lake.

Methylene chloride exceeded the LOC (0.37 mg/kg) in one sample (53-SD-006) at a concentration of 0.42 mg/kg. Of these three VOCs, acetone and methylene chloride are common laboratory contaminants. Sampling locations are depicted on **Figure 4**. In general, VOC impacts to the sediment are minimal.

Twenty-two semivolatile organic compounds (SVOCs), primarily polycyclic aromatic hydrocarbons, were detected at concentrations greater than their respective LOCs. The highest concentrations for 14 of these compounds were associated with one sample (108-SD-001), which was collected at the southwestern side of the site, as shown on **Figure 4**.

Two explosive compounds (RDX and 2,4,6-trinitrotoluene [TNT]) were detected at concentrations exceeding their LOCs. RDX was detected in two samples (I-40-SD-003 and I-40-SD-005) with respective concentrations of 2,500 and 7,680 mg/kg, compared to the LOC of 24 mg/kg. TNT exceeded the LOC (95 mg/kg) in sample I-40-SD-003 with a concentration of 1,100 mg/kg. Samples I-40-SD-003 and I-40-SD-005 were collected along the western shoreline offshore of two buildings located north of Site 157. The two buildings were formerly used in the manufacturing/washing of projectile shells. Follow-up sampling conducted in February 2011 indicated concentrations of the explosive compounds were less than the LOCs. At the request of NJDEP, these sampling locations (I-40-SD-003 and I-40-SD-005) were resampled, and an additional sample (I-40-SD-015) between the original two (**Figure 6**) was collected in November 2011. The results of the November 2011 sampling confirmed the concentrations of explosive compounds in lake sediment were below the LOCs.

Five pesticides were detected in concentrations greater than the LOCs. 4,4-dichlorodiphenyl-dichloroethane (DDD) was detected at two sampling locations (I-40-SD-004 and I-40-SD-005). 4,4-dichlorodiphenyl-dichloroethylene (DDE) and 4,4-dichlorodiphenyl-trichloroethane (DDT) were detected at two sampling locations (I-53-SD-026 and I-159-SD-001). Endosulfan sulfate was detected at sampling location I-40-SD-005. Finally, Mirex was detected at sampling location I-108-SD-002.

Of the 41 sediment samples analyzed for PCBs, only one sample had concentrations (Aroclor 1260) in exceedance of the LOC (0.0341 mg/kg). This sample (I-65-SD-002) was detected at the south side of the site at a concentration of 0.14 mg/kg.

Ten metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, strontium, and zinc) were detected at concentrations greater than the LOCs in sediment samples collected from the site (**Figure 4**).

Offshore Site Sediment

Additional sampling was completed in 2011, 2013, and 2016 to determine the nature and extent of elevated COC concentrations at sediment hot spots in Picatinny Lake. Offshore locations of Sites 63/65, 82, 108, and 113 are of specific interest as source areas because these sites are associated with offshore sediment hot spots with elevated concentrations of copper, lead, mercury, and silver likely due to historical releases. The sediment sampling conducted at these sites is shown in **Figures 7, 8, 9,** and **10**. The sites are described as follows:

- Site 63/65 was the former steam and power plant previously housed in a building that has been demolished.
- Site 82 contains a general-purpose laboratory housed in a site building.
- Site 108 consists of facilities and a laboratory located in multiple site buildings.
- Site 113 is a plant housed in a site building.

The metals (i.e., copper, mercury, and silver) reported in sediments at each of the areas from the four offshore locations of Sites 63/65, 82, 108, and 113 are discussed in the following subsections. The concentrations in sediment are discussed relative to ecological toxicity levels established in the GPB and Bear Swamp Brook FFS (IT, 2001). The GPB and Bear Swamp Brook FFS toxicity values were determined to be relevant to Picatinny Lake due to similarities in COCs, chemical sources, habitat and receptors, and expected sediment type. These ecological toxicity levels also represent the best available indicator of site-specific risk to benthos given that they utilize information from site-specific toxicity testing. The use of these ecological toxicity levels as RGs will maintain consistency among remedial alternative evaluations for lake environments completed across Picatinny Arsenal (ECC, 2016a).

The data evaluated in the Final Picatinny Lake FS (ECC, 2016a) for the offshore areas included RI and FS data sets spanning from 1995 through 2016 (ICFKE, 1999; Shaw, 2005; ARCADIS, 2012 and 2014a; ECC, 2016a).

Offshore of Site 63/65

Site 63/65 consists of a former building, which has been used as the former Picatinny Arsenal steam and power plant as well as a 90-day storage area. Waste was stored on a 12-meter square concrete pad located on the south side of the building (consisting of fly ash residue from machine maintenance and waste oil from various sources at Picatinny Arsenal). Runoff from the pad drained into an oil/water separator; however, waste oil was historically burned in a boiler at the site's former building until 1983 when it was stored off-site (there is no record on the quantity or source of waste oil that was burned). Sediment concentrations at six sample locations collected between 1995 and 2013 in the offshore area of Site 63/65 were elevated above the RG for the following COCs: copper, mercury, and silver. Each of the exceedances were reported at a depth of 0.0-0.5 ft; no elevated concentrations were detected in any of the deeper samples collected from those locations (1.5-2.0 ft). See **Figure 7** for historical sediment sample locations and RG exceedances offshore of Site 63/65.

To delineate the previous reported exceedances of metals, 22 samples from 14 locations were collected in May 2016 from depth intervals of 0.0-0.5 ft and 1.5-2.0 ft and were analyzed for copper, mercury, and/or silver. Location-specific depth intervals were targeted based on historical sampling results. See **Figure 7** for May 2016 sediment sample locations and RG exceedances. Copper was detected at concentrations exceeding the RG of 261 mg/kg in 7 of the 22 sediment samples collected in May 2016. No additional mercury sample concentrations were detected above the RG (13.2 mg/kg) during the May 2016 sampling event. Silver was reported at concentrations exceeding the RG of 36 mg/kg in 5 of the 22 samples collected. Offshore of Site 63/65, no copper, silver, or mercury concentrations above the RG were detected in sediment collected from the 1.5-2.0-ft depth interval, verifying that contamination is localized to the shallow sediments at 0.0-0.5 ft deep.

Offshore of Site 82

Site 82 is occupied by a site building, which was built in 1918 as a storage facility. It was later renovated for use as a physics laboratory until 1945, when it was converted into an X-ray processing facility for Picatinny Arsenal. Waste generated from the X-ray O&M is stored on the concrete floor of the building, and the silver recovery unit, which operated from 1963 to 1983,

originally had an overflow line directly into Picatinny Lake. During the 1970s, the overflow line was rerouted to the sanitary sewer for treatment at Picatinny Arsenal's industrial waste plant. There is no documentation on how waste was handled prior to 1963. Sediment concentrations at five sample locations collected between 1995 and 2013 in the offshore area of Site 82 were elevated above the RG of 36 mg/kg for silver. See **Figure 8** for historical sediment sample locations and RG exceedances.

To delineate the previous reported exceedances of silver, 18 additional sediment samples from 8 locations were collected in May 2016 between depth intervals of 0.0-0.5 ft, 1.5-2.0 ft, and 2.5-3.0 ft, and were analyzed for silver. Location-specific depth intervals were targeted based on historical sampling results. See **Figure 8** for May 2016 sediment sample locations and RG exceedances. The May 2016 sampling results indicate that silver is elevated above the RG of 36 mg/kg in 11 samples from 8 locations. The results indicate that the depth of contamination is localized in the top 2 ft of sediment offshore of Site 82.

Offshore of Site 108

Site 108 consists of ordnance facilities and a laboratory. Various chemicals were utilized at Site 108. Historically, a concrete pit containing waste, such as aluminum and magnesium oxides, heavy metals, and pyrotechnic powder, was present at one building that is now closed. Pyrotechnics and solvents were also used in the now-closed building. Sediment concentrations at 12 sample locations collected between 1995 and 2013 in the offshore area of Site 108 were elevated above the RG for one or more of the following COCs: copper, lead, mercury, and silver. See **Figure 9** for historical sediment sample locations and RG exceedances offshore of Site 108.

To delineate the previous reported exceedances of metals, 41 additional sediment samples from 26 sample locations were collected in May 2016 from depth intervals of 0.0-0.5 ft, 1.5-2.0 ft, and 2.5-3.0 ft, and were analyzed for copper, lead, mercury, and silver. Location-specific depth intervals were sampled based on historical sampling results. May 2016 sediment sample locations and RG exceedances are shown on **Figure 9**. Copper was detected at concentrations exceeding the RG of 261 mg/kg in 12 of the samples collected in May 2016. No additional lead sample concentrations were detected above the RGs of 2,500 mg/kg or 1,000 mg/kg during the May 2016 sampling event. Mercury was reported in concentrations exceeding the RG of 13.2 mg/kg in seven

samples. Silver was reported at concentrations exceeding the RG of 36 mg/kg in five samples. The results indicate that the depth of contamination is generally in the top 0.5 ft; however, contamination is reported as deep as 2 ft in some areas offshore of Site 108 within Picatinny Lake.

Offshore of Site 113

Site 113 consists of a building, which was historically used for the manufacturing of explosives and ammunitions. The building has since been demolished under the Toxic Energetics Cleanup Program (TECUP). Historical activities have not been documented for this site; and, based on previous interviews conducted with building occupants, the soil around the building may have been contaminated. Sediment concentrations at 10 sample locations collected between 1995 and 2013 in the offshore area of Site 113 were elevated above the RG within the 0.0-0.5-ft depth interval for the following COCs: copper, mercury, and silver. See **Figure 10** for historical sediment sample locations and RG exceedances offshore of Site 113.

To delineate the previous reported exceedances of metals, 21 samples were collected from 14 sample locations in May 2016 from depth intervals of 0.0-0.5 ft, 1.5-2.0 ft, and 2.5-3.0 ft, and analyzed for copper, mercury, and silver. Location-specific depth intervals were sampled based on historical sampling results. May 2016 sediment sample locations and RG exceedances are shown on **Figure 10**. Copper was detected at concentrations exceeding the RG of 261 mg/kg in 3 of 21 sediment samples collected in May 2016. Mercury was reported in concentrations exceeding the RG of 13.2 mg/kg in four samples and silver was reported at a concentration in exceedance of the RG of 36 mg/kg in one sample collected in May 2016. The results indicate that the depth of contamination is generally in the top 0.5 ft; however, contamination is found as deep as 2.0 ft in some areas offshore of Site 113 within Picatinny Lake.

Surface Water

A summary of the analytical results of lake-wide surface water sampling completed between 1995 and 2011 is discussed in this section; however, chemicals in surface water were not identified as causing an unacceptable risk. The historical surface water sampling locations and reported exceedances of LOCs are shown on **Figure 5** and the results are presented in Appendix A of the Final Picatinny Lake FS (ECC, 2016a). A detailed evaluation of the surface water sampling data

is provided in the Phase II RI, Round 1 and Phase II RI Report, Rounds 1 and 2 reports (ICFKE, 1999 and Shaw, 2005, respectively).

Methylene chloride was the only VOC detected in surface water samples at a concentration exceeding the LOC. It exceeded the LOC (2.5 micrograms per liter [µg/L]) in 14 of the surface water samples with a maximum concentration of 17 µg/L at sample I-53-SW-002.

Bis(2-ethylhexyl)phthalate was detected at concentrations greater than its LOC (1.2 µg/L) in two surface water samples collected in August 1996: 11 µg/L at sample 53-SW-001 and 15 µg/L at sample 53-SW-020. Since the surface water samples were not in close proximity to each other, they are not likely to be source-related.

One pesticide (alpha-benzene hexachloride ([BHC]-α-isomer) was detected exceeding the LOC (0.000049 µg/L) at one sample location (0.45 µg/L at I-SWBG-29) collected in November 1993, which is located in the tributary draining into Picatinny Lake.

Three explosive compounds (2,4-dinitrotoluene, RDX, and TNT) and one propellant (nitroglycerine) were reported in two surface water samples (I-159-SW-002 collected in August 1996 and I-40-SW-003 collected in July 1996) in exceedance of their respective LOCs. Historical data indicate that 2,4-dinitrotoluene exceeded the LOC (0.11 µg/L) at I-159-SW-002 with a concentration of 0.20 µg/L. Sample I-159-SW-002 is located at the northern portion of the site. The remaining exceedances occur in sample I-40-SW-003, located at the northern portion of the site. Nitroglycerine exceeded the LOC (3.7 µg/L) with a concentration of 250 µg/L. RDX exceeded the LOC (2.0 µg/L) at a concentration of 24.5 µg/L. TNT exceeded the LOC (2.0 µg/L) with a concentration of 5.77 µg/L. There is a correlation for sampling location I-40-SW/SD-003 in that both the surface water and sediment samples have exceeded the LOC for TNT in the past. Sampling location I-40-SW/SD-003 is near the outfalls of discharge pipes, which are no longer active. It is presumed that the source is no longer active and the contributions to the location have ceased. There are no other correlations between surface water and sediment for any of the other explosives that exceed the LOC. Surface water sampling conducted in the vicinity of these samples in 2008 indicates that surface water no longer exceeds LOCs for explosives.

Eight metals (aluminum, cadmium, chromium, copper, lead, manganese, mercury, and silver) were detected in surface water samples at concentrations greater than the LOCs. The maximum concentrations detected were: 232 µg/L of aluminum (LOC = 190 µg/L) at 53-SW-26, 0.54 µg/L of cadmium (LOC = 0.28 µg/L) at 40-SW-006, 59.90 µg/L of chromium (LOC = 11.4 µg/L) at 53-SW-016, 24.2 µg/L of copper (LOC = 9.4 µg/L) at SW-53-4, 79.3 µg/L of lead (LOC = 3.2 µg/L) at 40-SW-03, 1,480 µg/L of manganese (LOC =383 µg/L) at 108-SW-002, 0.38 µg/L of mercury (LOC = 0.05 µg/L) at SW-65-1, and 16.20 µg/L of silver (LOC = 3.8 µg/L) at SW-82-2.

Sulfide was detected in concentrations exceeding the LOC (2,200 µg/L) only in sample 53-SW-024 at a concentration of 4,500 µg/L.

The only other chemical detected in surface water at a concentration greater than the LOC was cyanide, which was detected at a concentration of 18.6 µg/L (LOC = 5.2) at sampling location 40-SW-003.

Fish Tissue

Human health risks from fish consumption were evaluated for Picatinny Lake (Shaw, 2004). Fish tissue data collected from Picatinny Lake, Lake Denmark, and GPB were combined into one area called the Lakes and Brook Surface Water Area (**Figure 3**). They were combined because it is likely that fish can migrate between these water bodies, which supports evaluating risks/hazards for these water bodies as a group. The data from the Lakes and Brook Surface Water Area were used to evaluate potential risks and to derive exposure point concentrations by fish species, which were calculated specifically for Picatinny Lake. The exposure point concentrations were then used to estimate risk associated with consumption of fish by the following receptors:

- Current and future on-site personnel and/or local retired personnel
- Current and future children of on-site personnel and/or local retired personnel
- Future adult and child residents, which is a hypothetical receptor.

The Lakes and Brook Surface Water Area sampling results indicated that the potential cancer risks for the current use receptors were within the generally acceptable cancer risk range while some of the non-cancer hazards were greater than 1. The non-cancer hazards that exceeded 1 were primarily

due to the presence of mercury, with some contribution from PCBs for the child of on-site and/or local, retired personnel in yellow perch and largemouth bass fish tissue.

Results were the same for the hypothetical future adult and child residents who could consume fish from the Lakes and Brook Surface Water Area. Mercury was a hazard driver for both hypothetical receptors due to four species of fish (black crappie, chain pickerel, largemouth bass, and yellow perch). Additionally, there was an increased HI value for hypothetical child receptors from the ingestion of largemouth bass and yellow perch containing both mercury and PCBs (Aroclor 1254).

Of the water bodies in the Lakes and Brook Surface Water Area group, Picatinny Lake had the highest fish tissue mercury concentrations. Mercury concentrations were not above ambient water quality standards in Picatinny Lake surface water, but sediment concentrations were elevated in several hot spots along the shoreline. Only one sediment sample from Picatinny Lake had detected PCB concentrations in exceedance of the LOC. Mercury and PCB concentrations in Picatinny Lake fish tissue samples were generally similar to the concentrations detected in the off-site background fish tissue samples, which were collected from a location at GPB upgradient of Picatinny Arsenal (ARCADIS, 2012).

While mercury is elevated on-site, it has been found to be a ubiquitous contaminant for which the State of New Jersey has already instituted a statewide fish consumption advisory (NJDEP and New Jersey Department of Health, 2017). Mercury can come from a variety of widespread sources other than past activities at Picatinny Arsenal (USEPA, 1997).

Therefore, as noted in the fish tissue evaluation (Shaw, 2004), only mercury concentrations in fish tissue at Picatinny Arsenal exceeded state guidelines and NJDEP recommended fish consumption advisories; however, it is not clear what proportion of the calculated risks/hazards are directly related to site-specific sources or if they are due to other widespread anthropogenic influences and/or natural background. Given the exceedance of guidelines, advisories providing restrictions specific to the water bodies located on Picatinny Arsenal were established as a result of the comprehensive fish tissue analysis and HHRA conducted for Picatinny Arsenal (Shaw, 2004), and NJDEP's review of the data and subsequent recommendations (Appendix C, Final 2012 FS [ARCADIS, 2012]). For each fish species and water body on Picatinny Arsenal, the advisories are

consistent with the New Jersey statewide general freshwater advisories, as shown in the *Installation Sportsman Program Bulletin for Recreational Hunting, Trapping, Fishing, and Boating* (Army, 2022). The bulletin specifies the steps needed to obtain a fishing license in order to fish within Picatinny Arsenal for all water bodies, as well as a map that defines the fishing areas and special instructions for fishermen within those areas. For Picatinny Lake, the map specifies the allowable fishing schedule and how portions of the lake are subject to closure due to mission activities. The bulletin is updated regularly and can be obtained through the Picatinny Arsenal Environmental Affairs office. Nearby Lake Denmark and EOD Pond have fishing restrictions on yellow perch instituted per the *Final Record of Decision for 3 Site Group (Sites 118 [PICA-097], 131 [PICA-131] and 149 [PICA-149])* (Army, 2018), and LUC signs that prohibit swimming and fishing are located along segments of Bear Swamp Brook, in accordance with the Final GPB and Bear Swamp Brook ROD (Army, 2004).

2.5.2.1 Conceptual Site Model

The conceptual site model (CSM) for Picatinny Lake is presented on **Figure 11**. The CSM identifies the source areas, exposure pathways, and potential receptors at the site. Potential receptors considered as part of the risk evaluations under the current and reasonably anticipated future land-use scenarios (military/industrial and recreational) include:

- Current/future industrial/research workers
- On-site youth visitor (recreational)
- Consumption of fish by current and future adult and child of on-site personnel and/or local retired personnel
- Consumption of fish by future adult and child residents (hypothetical receptors)

2.6 CURRENT AND POTENTIAL FUTURE LAND USE

Picatinny Arsenal is an active installation and the location of the Army's Armament Research, Development, and Engineering Center whose mission is to conduct or manage research, development, and engineering for assigned weapon systems for the Army. It is expected the facility will continue to be operated and maintained by the Army for the foreseeable future.

The facility houses government-operated munitions R&D facilities, operational ranges for munitions testing, residential housing, and recreational facilities that include a golf course and

water park. Picatinny Arsenal will continue to be used for military R&D, industrial military operations, residential housing, and recreational activities (fishing, boating, hunting, and golfing) in the future.

Picatinny Arsenal has controls in place that prevent UU/UE due to residual contamination at multiple IRP sites as components of regular facility operations. These controls include: Picatinny Arsenal access regulations; the Picatinny Arsenal safety program; the Army military construction program development and execution; site clearance/soil management procedures; MEC clearance procedures; and Picatinny Arsenal Installation Master Plan environmental notations, which includes the Picatinny Arsenal Geographic Information System (GIS) Database showing the boundaries of each site and any land use restrictions. Additional controls include the procedures followed by the Environmental Directorate of Public Works of the Picatinny Garrison to ensure environmental compliance for construction and other projects. An example of these procedures includes the use of the Picatinny Arsenal Environmental Management System and its corresponding database.

LUCs have been developed with consideration of all reasonably anticipated land uses at Picatinny Arsenal and include administrative and industrial military operations and outdoor recreation. The various offices of the Picatinny Garrison enforce regulations and policies. The Garrison offices include the Garrison Safety Office, Environmental Division; and the Office of Plans, Training, Mobilization, and Security.

The fish consumption advisory is also another media-specific control published in the Installation Sportsman Program Bulletin on Recreational Hunting, Trapping, Fishing, and Boating. The Bulletin specifies the prohibitions on fishing except for recreational purposes and advises on the consumption of fish caught from the water bodies on the facility property. The Installation Sportsman Program Bulletin on Recreational Hunting, Trapping, Fishing, and Boating was last updated on May 1, 2022. Picatinny Arsenal is not closed to the public; however, access to Picatinny Arsenal is controlled and restricted in some areas. Trespassing and unauthorized activities at Picatinny Arsenal are illegal.

2.7 SITE RISKS

In accordance with CERCLA, USEPA, and NJDEP guidance, the Army conducted a HHRA (Shaw, 2004; IT, 2002) and ERA (IT, 2000) to quantify potential cancer risks and noncancer hazards to human health and aquatic wildlife that may be exposed to chemicals in the surface water and/or sediment at Picatinny Lake. Risk is a measure of the likelihood that chemicals will have an adverse effect on people or wildlife. Risk assessments were conducted during the Phase II, RI Report, Rounds 1 and 2 to evaluate the potential risk associated with lake-wide exposure to chemicals in surface water and sediment (Shaw, 2005). As discussed in Section 2.5.2, resulting risks were within the generally actable risk range for Picatinny Lake as a whole. Based on USEPA and NJDEP expressed concern regarding elevated concentrations of chemicals in sediments located offshore, the Army conducted additional offshore sediment sampling in November 2011, September 2013 and May 2016. Additional assessments of the Phase II RI Report, Round 1 and 2 HHRA and the November 2011, September 2013 and May 2016 offshore sediments sampling were conducted to support the identification, development, and evaluation of remedial alternatives in the Final Picatinny Lake FS.

2.7.1 Human Health Risk Results

The results of the assessment of the Phase II RI, Rounds 1 and 2 HHRA for Picatinny lake-wide exposures and additional Army sediment sampling data collect in conjunction with the Picatinny Lakes FS are summarized in detail in the Final Picatinny Lake FS (ECC, 2016a). Risks were calculated for the current and reasonably anticipated future use, as well as hypothetical use scenarios. The current land use for the site is for military/industrial purposes by the Army and limited recreational use (i.e., hunting, trapping, fishing, and boating), with no plans to change the land use in the foreseeable future.

Potential receptors considered as part of the Picatinny Lakes FS risk evaluations under the current/reasonably anticipated future land-use scenarios (military/industrial and recreational) include:

- Current and future industrial/research worker exposed via contact with sediment and surface water.

- On-site youth visitor (recreational) exposed via contact with sediment and surface water.
- Consumption of fish by current and future on-site personnel and/or local, retired personnel.
- Consumption of fish by current and future children of on-site personnel and/or local, retired personnel.
- Consumption of fish by future adult and child residents (hypothetical receptors).

The risk assessment determined there were unacceptable risks to future adult and child residents; however, these hypothetical receptors were included in the fish consumption risk evaluation for evaluation purposes only.

As reported in the Phase II RI Report, Rounds 1 and 2, and the Picatinny Lakes FS evaluation of additional sediment sampling, human health risks are within acceptable cancer range for exposures to sediment and surface water in Picatinny Lake. However, the non-cancer HI for fish consumption is greater than the threshold of 1 for the adult on-site and/or local, retired personnel and the child of the on-site and/or local retired personnel receptors, primarily due to the presence of mercury, with some contribution from PCBs in Largemouth Bass and Yellow Perch for the child of on-site and/or local retired personnel. As noted in the fish tissue evaluation (Shaw, 2004), it is unclear if the calculated risks/hazards are directly related to site-specific sources or if they are due to other, widespread anthropogenic influences or natural background (in the case of inorganics) (ECC, 2016a). The fish tissue evaluation indicates that due to the "uncertain source of the elevated compound in the fish, the analytical data were evaluated in consultation with NJDEP to determine the State's recommendation for institution of additional fishing advisories at PICA." The conclusions of this review indicated that only mercury concentrations exceeded NJDEP guidelines and the NJDEP recommended non-CERCLA fish consumption advisories for PICA (ECC, 2016a).

The Picatinny Arsenal Installation Sportsman Program provides fish consumption advisories for all fish tissue, with the exception of stocked trout, obtained from Picatinny Arsenal water bodies, which have been reviewed and approved by NJDEP, and are consistent with NJDEP statewide restrictions. The consumption restrictions are specified in the *Installation Sportsman Program Bulletin for Recreational Hunting, Trapping, Fishing, and Boating* (Army, 2022). Overall site risks

and hazards are within the acceptable range and HI for the current and reasonably anticipated future land use of Picatinny Lake, with the exception of fish tissue consumption.

The results of the Picatinny Lake FS individual site-specific HHRA are presented in **Table 5**. Risks due to fish consumption are presented in **Table 6**.The Picatinny Lake FS evaluation of the Phase II RI Rounds 1 and 2 HHRA (Shaw, 2005), Fish Consumption Human Health Risk Assessment (Shaw, 2004), and November 2011, September 2013 and May 2016 offshore sediments sampling (ECC, 2016a) found the following for current and reasonably anticipated future use of the site:

- The potential cancer risk is within the acceptable risk range of 1E-6 to 1E-4 for the on-site youth visitor (recreational) for exposure to sediments and surface water across Picatinny Lake (lake-wide) as a whole during recreational activities. The non-cancer HI for the on-site youth visitor is less than the threshold of 1.
- The fish consumption HI ranges from the unacceptable value of 8 for the child of on-site and/or local, retired personnel receptor (due primarily to the presence of mercury in the edible fish tissue collected from Picatinny Lake) to less than 1 for the adult on-site and/or local, retired personnel receptor.
- The potential human health cancer risk is within the acceptable risk range of 1E-6 to 1E-4 for industrial/research worker exposure to sediment and surface water, and the non-cancer hazard is less than the threshold of 1.

Table 5 Human Health Risk Assessment Conclusions for Sediment and Surface Water Contact

Site	Media	Population	Carcinogenic Risk	Primary Risk Drivers
63-65	Sediment	On-Site Youth Visitor	3E-05	BaP
	Surface Water	On-Site Youth Visitor	NE	NA
82	Sediment	On-Site Youth Visitor	3E-06	As
	Surface Water	On-Site Youth Visitor	1E-09	NR
108	Sediment	On-Site Youth Visitor	7E-07	NR
	Surface Water	On-Site Youth Visitor	3E-08	NR
113	Sediment	On-Site Youth Visitor	2E-06	As
	Surface Water	On-Site Youth Visitor	NE	NA

Notes:
All reported cancer risks are based on chemical risks unless otherwise indicated.
The land use scenario for each risk presented is Current/Future. Noncarcinogenic risks are not presented as each are below 1 and there is no hazard.
Source: Table 2, Final Picatinny Lake Proposed Plan (Weston, 2021)
As – Arsenic
BaP – Benzo(a)pyrene
NA – Not applicable
NE – Not evaluated
NR – Not relevant. Cancer risk driver not present because risk is below USEPA's target cancer risk range of 1E-4 to 1E-6 for the evaluated receptors.

Table 6 Human Health Risk Assessment Conclusions for Fish Consumption for the Lakes and Brook Area

Fish Species	Adult On-Site and/or Local, Retired Personnel		Child of On-Site and/or Local, Retired Personnel	
	Cancer Risk	HI	Cancer Risk	HI
Brown Bullhead	NE	≤1	NE	1
Black Crappie	NE	2 (mercury)	NE	4 (mercury)
Carp	6.00E-06	≤1	3.00E-06	1
Chain Pickerel	3.00E-05	3 (mercury)	1.00E-05	5 (mercury)
Largemouth Bass	3.00E-05	4 (mercury)	1.00E-05	8 (mercury, PCBs)
Yellow Perch	4.00E-05	2 (mercury)	2.00E-05	5 (mercury, PCBs)

Notes:
Source: Table 4-5, *Fish Consumption Human Health Risk Assessment Report* (Shaw, 2004).
NE – Not evaluated as there were no carcinogenic contaminants of potential concern in fish tissue

2.7.2 Ecological Risk Results

An ecological risk assessment (ERA) was performed to evaluate the potential risk to wildlife such as birds, fish, mammals, and bottom-dwelling organisms (benthos) that live in Picatinny Lake. The ERA included calculating risks via food web exposure models, comparing concentrations in sediment to benchmarks protective of aquatic life, toxicity tests, bioavailability analyses, and benthic community surveys. The findings of the ERA are that COCs in sediment, surface water, and fish do not pose unacceptable lake-wide risks to ecological receptors. However, the ERA

identified sediment hot spots offshore of Sites 63/65, 82, 108, and 113 where elevated concentrations of metals in sediment (specifically copper, lead, mercury, and silver) may potentially pose risks to benthos. Lines of evidence regarding the potential for impacts at hot spots are conflicting, with bulk sediment chemistry and toxicity tests indicating impacts, but benthic community surveys and bioavailability analyses indicating no current impacts. The typical focus of a CERCLA ERA is at the population level, and benthic surveys for Picatinny Lake and lake-wide risks indicate that population level impacts are unlikely.

2.7.3 Summary of Site Risks

The consumption of fish by current and future adult personnel on-site and/or local, retired personnel and the child of on-site and/or local retired personnel receptors were retained as an unacceptable human health risk scenario for Picatinny Lake. The fish consumption risk scenario indicates hazards exceed the HI of 1 ranging from an unacceptable HI of 8 for the child of on-site and/or local retired personnel receptor to an HI less than 1 for the adult on-site and/or local personnel receptor. As the HI is greater than 1, there is unacceptable risk due primarily to the presence of mercury in edible fish tissue collected from Picatinny Lake. Therefore, site conditions do not allow for unrestricted use. Exposure to sediment and surface water in Picatinny Lake does not pose unacceptable risk. The human health risks are, therefore, limited to those associated with consumption of mercury in fish tissue. Overall site risks and hazards are within the acceptable range for the current and reasonably anticipated current and future land use, with the exception of risks associated with fish consumption. There are no unacceptable lake-wide ecological risks due to the sediment or surface water; ecological risks are limited to potential risk to benthos at sediment hot spots, with a low likelihood that risks are producing impacts based on field survey results. It is important to note that the typical focus of the ERA under CERCLA is at the population level, and that benthic surveys and lake-wide risks indicate that population level impacts are unlikely. However, based on coordination between the Army, NJDEP, and USEPA, it was determined that risk management actions are necessary to address unacceptable risks at sediment hot spots, as they may potentially contribute to mercury contamination in fish tissue and the unacceptable fish consumption HI for the adult personnel on-site and/or local, retired personnel and the child of on-site and/or local retired personnel. It is the lead agency's judgment that the Selected Remedy

identified in this ROD is necessary to protect public health (indirectly through fish consumption) and benthic organisms from contaminated sediment.

2.8 REMEDIAL ACTION OBJECTIVES

This section summarizes the response actions to achieve the RAOs for the environmental media and COCs at Picatinny Lake. The Selected Remedy is one of several ongoing and remaining actions that will be completed to address the impacts to environmental media at Picatinny Arsenal. The RAOs for the site are based on the continued management of human health and ecological risks that drive the formulation and development of response actions. RGs for the sediment in Picatinny Lake are based on the constituent ecological toxicity levels in the GPB and Bear Swamp Brook FFS (IT, 2001), which are sites with similar COCs, chemical sources, habitats, expected sediment types, and ecological risks to benthic organisms.

Based on agreements between the Army, USEPA and NJDEP, there are a few areas of Picatinny Lake where additional RAOs will be evaluated due to possible localized risks to benthos at hot spots, with these regions called "areas of attainment." Active remedy components are potentially applicable to specific areas of attainment as indicated in **Figures 7** through **10**. The COCs in Picatinny Lake sediments (copper, lead, mercury, and silver) are located in these areas of attainment adjacent to Sites 63/65, 82, 108, and 113.

Based on the unacceptable risk to human health from exposure due to the consumption of fish tissue, the human health RAOs are as follows:

- Reduce risk to potential adult onsite and/or local, retired personnel and the child of the on-site and/or local retired personnel receptors from ingestion of mercury-contaminated fish tissue collected from Picatinny Lake by treating contaminated sediment offshore of Sites 63/65, 82, 108 and 113.
- Reduce, to the extent practicable, the consumption of edible fish with elevated concentrations of mercury. Inform potential receptors on site fish consumption advisories.

Based on protection of ecological receptors, the ecological RAOs and RGs are as follows:

- Eliminate the exposures to sediment offshore of Site 63/65 with concentrations of copper, mercury, and silver above the RGs (261, 13.2, and 36 mg/kg, respectively) for the protection of benthic invertebrates.

- Eliminate the exposures to sediment offshore of Site 82 with concentrations of silver above the RG (36 mg/kg) for the protection of benthic invertebrates.
- Eliminate the exposures to sediment offshore of Site 108 with concentrations of copper, lead, mercury, and silver above the RGs (261; 1,000; 13.2; and 36 mg/kg, respectively) for the protection of benthic invertebrates.
- Eliminate the exposures to sediment offshore of Site 113 with concentrations of copper, mercury, and silver above the RGs (261, 13.2, and 36 mg/kg, respectively) for the protection of benthic invertebrates.

2.8.1 Chemical-Specific Requirements

Chemical-specific requirements establish health- or risk-based concentration limits for specific hazardous substances in various environmental media. These standards provide media cleanup levels or a basis for calculating cleanup levels for COCs. Chemical-specific standards are also used to indicate an acceptable level of discharge, to determine treatment and disposal requirements for a particular remedial activity, and to assess the effectiveness of a remedial alternative.

The chemical-specific To Be Considered (TBC) guidance identified for the site are presented in **Table 7** below. These include USEPA water quality criteria for methylmercury in fish tissue (0.3 mg/kg fish), which is considered a TBC, and the New Jersey Ecological Evaluation Guidance which is also considered a TBC.

Table 7 Applicable Chemical-Specific TBCs

Media	Authority	Requirement	Requirement Synopsis	ARAR or TBC
Fish Tissue	Federal Criteria, Advisories	USEPA Methylmercury Water Quality Criterion (EPA-823-R-01-001)	USEPA has developed a water quality criterion for the protection of human health based on the concentration of methylmercury in fish tissue as 0.3 mg/kg.	TBC
Sediment	NJDEP	New Jersey Ecological Evaluation Technical Guidance (NJDEP, Site Remediation Program, May 2023), version 2.0	Non-promulgated guidance document that provides a tiered approach for the evaluation of ecological risk in aquatic and terrestrial habitats associated with contaminated sites.	TBC

Notes:
ARAR – Applicable or Relevant and Appropriate Requirement
mg/kg – milligrams per kilogram
NJDEP – New Jersey Department of Environmental Protection
TBC – To Be Considered Guidance
USEPA – U.S. Environmental Protection Agency

2.8.2 Applicable Location-Specific Requirements

Location-specific requirements set restrictions on the types of remedial activities that can be performed based on specific site characteristics or location. Location-specific standards provide a basis for assessing restrictions during the formulation and evaluation of site-specific remedies. Remedial activities may be restricted or precluded by requirements for hazardous waste facilities or based on their proximity to wetlands, riparian areas, floodplains, or man-made features, such as landfills, disposal areas, and/or local historical buildings. Location-specific ARARs include wetland regulations under the Clean Water Act (Clean Water Act Section 402, 40 CFR § 320.4, pertinent substantive provisions of New Jersey Administrative Code [NJAC] 7:7A), State criteria, and Flood Plain regulations under both Federal and State criteria. These regulations would be complied with during sediment capping activities and would include wetlands restoration, if applicable, and best management practices. Current site conditions and anticipated future non-intrusive activities will not likely trigger the location-specific ARARs identified in **Table 8**. Permits and administrative reviews are not required for on-site CERCLA remedial actions; however, the remedial action will comply with the substantive requirements of the regulations.

Table 8 Applicable Location-Specific ARARs and TBCs

Location	Authority	Requirement	Requirement Synopsis	ARAR or TBC
Wetlands	Federal Criteria	Clean Water Act Section 402, 40 CFR § 320.4	To the extent possible, action must be taken to avoid degradation or destruction of wetlands. Discharges for which there are practicable alternatives with less adverse impacts or those that would cause or contribute to significant degradation are prohibited. If adverse impacts are unavoidable, action must be taken to enhance, restore, or create alternative wetlands.	ARAR
	State Criteria	Fresh Waterland Protection Act Rules (NJAC 7:7A)	Wetlands rules are administered by the NJDEP Land Use Regulation Program to minimize disturbances to local wetlands.	ARAR
Flood Plains	Federal Criteria	Protection of flood plains as defined in Executive Order 11988 § 6(c) and 40 CFR 6, Appendix A § 4(d)	Federal agencies shall take action to reduce the risk of flood loss; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values of flood plains. Federal agencies shall evaluate potential effects on actions in flood plain and ensure consideration of flood plain hazards and floodplain management.	ARAR
	State Regulatory Requirement	NJDEP and NJDHSS Fish Advisories	The NJDEP and NJDHSS have developed statewide and water body-specific fish consumption advisories to protect the population from potential chemicals that have been identified as bioaccumulating in fish tissue.	TBC

Notes:
ARAR – Applicable or Relevant and Appropriate Requirement
NJDEP – New Jersey Department of Environmental Protection
NJDHSS – New Jersey Department of Health and Senior Services
TBC – To Be Considered Guidance

2.8.3 Action-Specific Requirements

Action-specific requirements set controls or restrictions on the design, implementation, and performance of waste management actions. These standards specify performance levels, actions, or technologies and specific levels for discharge of residual chemicals. They also provide a basis for assessing the feasibility and effectiveness of the RAs. The action-specific ARARs standards identified for the site are presented in **Table 9** below.

Table 9 Applicable Action-Specific ARARs and TBCs

Authority	Requirement	Requirement Synopsis	ARAR or TBC
Federal Regulatory Requirement	Clean Air Act (40 CFR Part 50)—National Primary and Secondary Ambient Air Quality Standards (§ 50.6); Part 60 Standards of Performance for New Stationary Sources Subpart C and Part 61 National Emission Standards for Hazardous Air Pollutants Subpart A and E.	Engineering controls are required to reduce fugitive dust emissions while performing remedial activities, including continuous application of dust suppressants before, during, and after excavation.	ARAR
	National Primary and Secondary Ambient Air Quality Standards (40 CFR Part 50 Clean Air Act § 109), NAAQS Section 109 (42 U.S.C. 7409).	Appropriate engineering controls are required to reduce emissions associated with excavation and transportation.	ARAR
	RCRA—Land Disposal Restrictions (40 CFR § 268.43).	This regulation establishes restrictions for the burial of wastes and hazardous materials. Listed and characteristic hazardous wastes are required to meet Best Demonstrated Available Technology (BDAT) treatment standards.	ARAR
	RCRA—Identification and Listing of Hazardous Waste (40 CFR Part 261).	This regulation provides guidance for classifying wastes as hazardous under RCRA.	ARAR
State Regulatory Requirement	New Jersey Air Pollution Control (NJAC 7:27); Subparts 4, 16, 21, 25, and 28.	This regulation outlines restrictions and requirements for construction and remedial activities that emit particulate matter into the ambient air. Restrictions for air emissions from treatment technologies and nuisance and odor control are required.	ARAR
	New Jersey Solid Waste Regulations (NJAC 7:26A (v) and G).	This regulation establishes hazardous waste identification, manifesting, transport, recordkeeping, and reporting requirements and outlines land disposal restrictions.	ARAR
	New Jersey Stormwater Management Regulations (NJAC 7:8); Subchapter 5 including 5.4 erosion control, groundwater recharge and runoff quantity standards; Subchapter 6, Safety Standards for Stormwater Management Basins.	This regulation establishes design criteria for stormwater control from construction activities, such as maintained pre-development runoff characteristics and reduction of stream channel erosion, sedimentation, and pollution.	ARAR
	Fill Material Guidance for Site Remediation Program Sites http://www.nj.gov/dep/srp/guidance/srra/fill_protocol.pdf?version_3_0.	Guidance to be followed when using fill material at Site Remediation Program (SRP) Sites as part of a RA, specifically at an area of concern as defined at NJAC 7:26E-1.8. (Note that an Area of Concern could include the whole site).	TBC

Notes:
CFR – Code of Federal Regulations
NAAQS – National Ambient Air Quality Standards
NJAC – New Jersey Administrative Code
NJDEP – New Jersey Department of Environmental Protection
RCRA – Resource Conservation and Recovery Act

2.9 DESCRIPTION OF REMEDIAL ALTERNATIVES

This section provides an overview of the remedial alternatives evaluated as part of the Final Picatinny Lake FS (ECC, 2016a) and Final Picatinny Lake PP (WESTON, 2021) to address the contaminated sediment at Picatinny Lake. The General Response Actions evaluated in the Final Picatinny Lake FS and Final Picatinny Lake PP were: No Action, LUCs, Monitoring, Sediment Removal and Disposal, Containment, In-Situ Treatment, and Ex-Situ Treatment. After the screening of technologies based on effectiveness, implementability, and cost, the following remedial alternatives were developed:

- **Alternative 1:** No Action
- **Alternative 2:** LUCs
- **Alternative 3A:** Removal via Mechanical Dredging
- **Alternative 3B:** Removal via Hydraulic Dredging
- **Alternative 4**: Sediment Capping with LUCs

In accordance with Title 40 CFR § 300.430(e) of the NCP, nine CERCLA criteria (threshold and balancing) were used to evaluate the remedial alternatives, as presented in the Final Picatinny Lake FS (ECC, 2016a) and Final Picatinny Lake PP (Weston, 2021). The five remedial alternatives evaluated in the Final Picatinny Lake FS are described below with their respective estimated capital costs, estimated cost for O&M activities, and an estimate of the present worth costs for each of the remedial alternatives.

2.9.1 Alternative 1 – No Action

No additional actions would be undertaken as part of this remedial alternative. The No Action Alternative is intended to serve as a baseline by which to compare the risk reduction effectiveness of other potential alternatives as required by CERCLA and U.S. Department of Defense (DoD). No RAs would be performed under this alternative. No efforts would be undertaken to contain, remove, monitor, or treat the contaminated sediment or surface water. The interim LUCs would be allowed to expire under this alternative. There is no cost associated with this alternative.

2.9.2 Alternative 2 – Land Use Controls

Alternative 2 consists of LUCs, which would apply to the Picatinny Lake water body. The human health risks are in the acceptable cancer risk range for the current and reasonably anticipated future uses at each site, which is military/industrial and recreational. However, there is potential exposure to chemicals in fish tissue if species with elevated concentrations of chemicals are over-consumed. Therefore, LUCs would be implemented to provide notification of fish consumption advisories, which would be consistent with the State of New Jersey statewide fish consumption advisory (NJDEP and New Jersey Department of Health, 2017) (i.e., posting signage around Picatinny Lake and continued enforcement of fish consumption restrictions). The Army is responsible for implementing, maintaining, monitoring, reporting on, and enforcing the LUCs that will be included under this alternative. Ecological risks are not significant for the site on a lake-wide basis; however, limited potential risk to benthic organisms is present at small sediment hot spots adjacent to Sites 63/65, 82, 108, and 113, with a low likelihood that risks are producing impacts based on field survey results. It is important to note that the typical focus of ERA under CERCLA is at the population level, and that benthic surveys of lake-wide risks indicate that population-level impacts are unlikely (ECC, 2016b). The estimated present worth cost of Alternative 2 is $207,892.

2.9.3 Alternative 3A – Removal via Mechanical Dredging

Under Alternative 3A, contaminated sediment would be excavated to reduce future exposures to ecological receptors. Reducing sediment exposures will possibly contribute to lower fish tissue concentrations in the future. Additional sediment sampling would be required to determine the areal extent of dredging as some of the hot spots have not been fully delineated. Mechanical dredging would entail removal of contaminated sediments from Picatinny Lake, using equipment such as long-reach excavators and cranes. Mechanical dredging may encounter unexploded ordnance (UXO); high explosive rounds of up to 6 inches may be expected. Therefore, special precautions will be required prior to and during dredging that may include surveys, diver clearance of UXO, spreading excavated material for manual screening via magnetometry, and/or MEC disposal. Excavated materials would be classified and managed/disposed of in accordance with applicable federal and state regulations. This alternative would also include effluent pumping and treatment prior to discharge into Picatinny Lake, adding amendments to the dredged material, transporting the solidified sediment via truck to an off-site landfill for disposal, post-construction

sampling, residual cover as necessary, and ongoing fish tissue sampling. LUCs would be required to control exposures to fish tissue until achievement of RAOs. RAs such as dredging may produce significantly detrimental effects on open water and wetland habitats. Methods of minimizing effects would be considered in the RD. The estimated present worth cost associated with Alternative 3A is $5,134,133.

2.9.4 Alternative 3B – Removal via Hydraulic Dredging

Under Alternative 3B, contaminated sediment would be excavated to reduce future exposure to ecological receptors. Reducing sediment exposures will possibly contribute to lower fish tissue concentrations in the future. Additional sediment sampling would be required to determine the areal extent of dredging as some of the hot spots have not been fully delineated. Hydraulic dredging would entail sediment removal using a small environmental dredge and pumping of the contaminated sediments to a facility for collecting and processing the resulting slurry. Hydraulic dredging may encounter UXO; therefore, special precautions would likely be required during dredging. An advantage of hydraulic dredging is that the suction head can be screened to limit the size of UXO taken up. Some surveys, magnetometry, and/or MEC disposal may also be required. Excavated materials would be classified and managed/disposed of in accordance with applicable federal and state regulations. This alternative would also include effluent pumping and treatment prior to discharge into Picatinny Lake, adding amendments to the dredged material, transporting the solidified sediment via truck to an off-site landfill for disposal, post-construction sampling, residual covers as necessary, and ongoing fish tissue sampling. LUCs would be required to control exposures to fish tissue until achievement of RAOs. RAs such as dredging may produce significantly detrimental effects on open water or wetland habitats. Methods of minimizing effects would be considered in the RD. The estimated present worth cost associated with Alternative 3B is $6,046,579.

2.9.5 Alternative 4 – Sediment Capping with Land Use Controls

Under Alternative 4, contaminated sediment would be capped to reduce future exposure to ecological receptors. Reducing sediment exposures will possibly contribute to lower fish tissue concentrations in the future. MEC clearance of the sediment capping areas including areas identified for design phase sediment sampling will be conducted during the PDI. In addition, fish

tissue concentration sampling will be limited to a baseline event during the PDI. Depending on the results, the Army, in consultation with EPA and NJDEP, will determine if fish tissue sampling will have value going forward.

Sediment capping entails placement of an engineered physical barrier over contaminated sediments to limit chemical migration and reduce benthic exposures. Additional sediment sampling would be required to determine the areal extent that will be capped as some of the hot spots have not been fully delineated. As part of the remedial design, a bench scale study will be conducted to determine whether a physical cap (composed only of aggregate) or a reactive cap (containing aggregate and a reactive material such as carbon or clay) will be constructed to support the selection of appropriate amendments and assist in determining the placement of the cap. MEC clearance for access roads along the shoreline and small staging areas for cap material at each site will be conducted prior to the start of field activities. Cap placement will be completed by crane/excavator from the shoreline or via small scale hydraulic slurry from a barge. Post-construction verification sampling and topography surveys will be conducted following cap placement to confirm placement and thickness. Site restoration of the staging and dewatering areas and roads will be conducted through grading and broadcast seeding as required. LUCs are needed to mitigate fish consumption at Picatinny Lake and prohibit activities that would disturb the cap material (i.e., dredging, excavation, shallow water training and gasoline-powered boat use). LUCs will consist of land use restrictions and the installation/maintenance of signs and/or buoys prohibiting specific activities (i.e., fish consumption and gasoline-powered boat restrictions) at the site and maintenance of existing LUCs. Annual inspections will include signage/buoy inspections and cap stability surveys and concentration sampling. Additional site-specific details of the Selected Remedy implementation and execution, such as capping; which may produce effects on open water or wetland habitats, annual inspections, and long-term monitoring will be further defined during the remedial design process. If the outcome of the PDI fish tissue concentration sampling baseline concludes that long-term monitoring of fish tissue concentration sampling should be conducted, details of the fish tissue sampling program (e.g., frequency, quantity of samples, fish species to be sampled, contaminants to be sampled for, reporting) will be further defined during the remedial design process. The estimated present worth cost associated with Alternative 4 is $3,132,179.

2.10 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

This section summarizes the comparative analysis of the expected performance of each remedial alternative to identify the respective advantages and disadvantages of each remedy, as presented in detail in the Final FS (ECC, 2016a). In accordance with 40 CFR § 300.430(e) of the NCP, nine CERCLA criteria were used to evaluate the different remedial alternatives considered for the site. The nine CERCLA criteria are as follows:

1) Protection of human health and the environment is used to determine whether an alternative eliminates, reduces, or controls threats to public health and the environment through LUCs, engineering controls, or treatment.
2) Compliance with ARARs is used to evaluate whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site(s), or whether a waiver is justified.
3) Long-term effectiveness and permanence are used to consider the ability of an alternative to maintain protection of human health and the environment over time.
4) Reduction of toxicity, mobility, or volume through treatment is used to evaluate an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
5) Short-term effectiveness is used to consider the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
6) Implementability is used to consider the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
7) Cost is used to evaluate the estimated capital and O&M costs, as well present-worth costs for the alternatives considered.
8) State acceptance is used to consider whether the State agrees with the analyses and recommendations and to assess that the State’s key concerns related to the preferred alternative are addressed.
9) Community acceptance is used to consider whether the local community agrees with the analyses and the preferred alternative as presented in the PP.

The nine CERCLA evaluation criteria are divided into threshold criteria, primary balancing criteria, and modifying criteria. An overview of the comparative analysis of threshold and balancing criteria is provided in **Table 10**.

Table 10 Comparative Analysis of Threshold and Balancing Criteria

Type	Screening Criterion	Alternative 1 No Action	Alternative 2 Land Use Controls*	Alternative 3A Removal via Mechanical Dredging	Alternative 3B Removal via Hydraulic Dredging	Alternative 4 Sediment Capping with Land Use Controls
Threshold	Protection of human health and the environment	Fail	Pass	Pass	Pass	Pass
	Compliance with ARARs	Fail	Pass	Pass	Pass	Pass
Balancing	Long-term effectiveness and permanence	4	3	1	1	2
	Reduction of toxicity, mobility, or volume through treatment	4	4	2	2	3
	Short-term effectiveness	3	3	2	2	1
	Implementability	1	2	3	3	2
	Costs	$0	$207,892	$5,134,133	$6,046,579	$3,132,179
	Overall Rating	**4**	**3**	**2**	**2**	**2**

Notes:

* Land use controls are a viable component of other remedial alternatives.

Ratings: Threshold criteria are pass/fail. Balancing criteria analyses are scored from 1 to 4, where a score of 4 indicates least favorable and a score of 1 indicates most favorable: Excellent (1); Good (2); Adequate (3); Poor (4) (Modified from Final FS Table 6-7 [ECC, 2016a]).

2.10.1 Threshold Criteria

Protection of human health and the environment, and compliance with ARARs unless a waiver can be granted under Section 121(d)(4) of CERCLA, are requirements that must be met by the selected response action.

2.10.1.1 Protection of Human Health and the Environment

Alternative 1 would not be protective of human health. Alternative 1 would not be protective of the environment (i.e., benthos) on a lake-wide basis. Alternative 2 would be protective of human health by posting and formally notifying lake users of potential risk associated with fish consumption. Alternative 2 would be ecologically protective on a lake-wide basis. Limited potential risk is present for benthic organisms in the sediments adjacent to Sites 63/65, 82, 108,

and 113, but overall, Alternative 2 would be effective. Alternatives 3A and 3B would remove targeted sediments at these areas; therefore, these alternatives are protective of both human health and the environment. Alternative 4 would also protect human health and the environment, by providing a barrier to exposure to the contaminated sediments. Therefore, Alternative 1 fails to meet this threshold criterion, whereas Alternatives 2, 3A, 3B, and 4 pass by meeting the criterion.

2.10.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 1 would not comply with chemical-specific ARARs because it would not eliminate exposure to human health or ecological receptors. Alternatives 2, 3A, 3B, and 4 would meet chemical-specific ARARs by addressing risks to human and ecological receptors.

No action-specific ARARs would be associated with Alternatives 1 and 2. Alternatives 3A, 3B, and 4 would be designed and implemented to comply with action-specific ARARs, including clean air regulations, stormwater control requirements, Clean Water Act and in the case of the dredging alternatives, disposal of removed sediments.

No location-specific ARARs would be associated with Alternative 1. Alternative 2, 3A, 3B and 4 would be designed and implemented to comply with location-specific ARARs.

Overall, Alternative 1 fails to meet the criterion, whereas Alternatives 2, 3A, 3B, and 4 pass by meeting the criterion.

2.10.2 Primary Balancing Criteria

These are criteria by which the tradeoffs between alternatives are assessed in the detailed evaluation and comparative analysis of alternatives. In general, a high rating on one criterion can offset a low rating on another balancing criterion.

2.10.2.1 Long-Term Effectiveness and Permanence

Alternative 1 would not be effective because it would not address the specific sediment areas that contribute to potential risks; therefore, this alternative is rated as poor.

Alternative 2 would be effective for addressing potential risks to human health and would cause no change to lake-wide ecological risks, which are good; however, because it would not be effective for addressing risk to benthic organisms at hot spots, this alternative is rated as adequate.

Alternatives 3A and 3B provide excellent long-term reliability and effectiveness because the sediments that are cause for concern based on risk are removed. These alternatives would also utilize a residuals cover if needed to meet RAOs following dredging.

Alternative 4 would be highly effective but less permanent, as it would require long-term monitoring and maintenance to ensure continued protectiveness.

Therefore, Alternatives 3A and 3B are rated excellent, and Alternative 4 is rated good.

2.10.2.2 Reduction in Toxicity, Mobility or Volume Through Treatment

Alternatives 1 and 2 do not contribute to a reduction in the toxicity, mobility, or volume of wastes present; therefore, these are rated poor.

Alternatives 3A and 3B provide the largest reduction in the toxicity, mobility, and volume/mass of contaminants present in Picatinny Lake sediment in the areas of concern, though not through treatment. These alternatives remove the contaminated sediments to an off-site disposal location, effectively reducing the potential mobility of COCs, the toxicity of the remaining lake sediments, and the volume/mass of COCs on-site. However, the toxicity is moved to another location (disposal facility or approved on-site location). Alternative 4, in contrast, reduces the mobility of contaminants but does not reduce their volume/mass, and limits the potential for toxicity through exposure; though, similar to Alternatives 3A and 3B, not through treatment. Therefore, Alternatives 3A and 3B are rated good, and Alternative 4 is rated adequate.

2.10.2.3 Short-Term Effectiveness

Alternatives 1 and 2 pose no additional short-term risks or hazards to the community, workers, or recreational users; however, as stated for long-term effectiveness, the short-term effectiveness is limited based on their ability to address risks. Therefore, these alternatives are rated as adequate.

Alternatives 3A and 3B have the potential to increase short-term risks to workers and the community, through dust generation, odor generation, resuspension of contaminated sediments, and increased heavy equipment/traffic. Alternative 4 would also have the potential to generate some dust, and could cause resuspension of contaminated sediments; however, this alternative would have fewer potential impacts than would Alternatives 3A and 3B. All three of these alternatives would also include risk of MEC exposure. Suitable protective clothing and equipment

and engineering controls would be utilized to prevent exposure to minimize potential risks. The time frame for implementation of these three alternatives would be similar; all would require several months for implementation. Based on this evaluation, Alternatives 3A and 3B are rated good, and Alternative 4 is rated excellent.

2.10.2.4 Implementability

The most readily implementable alternative is Alternative 1 because no action would be needed or required; therefore, Alternative 1 is rated excellent. Because LUCs are relatively easy to implement but recordkeeping and reporting are required, Alternative 2 is rated good. Alternatives 3A and 3B will require site clearing, MEC clearance, machinery and operators, disposal of sediment, etc. The primary challenge to implementability for Alternative 3B is identifying a large area available for centralized dewatering and the extended time period required for dewatering, whereas the primary challenge to implementation of Alternative 3A is identifying areas for staging at each hot spot where UXO screening can occur and the potential need to shut down operations at nearby buildings and roadways. These alternatives are the most involved and are therefore less implementable than Alternative 4. Alternative 4 would require bench scale testing to guide the design and would require long-term monitoring and maintenance. However, MEC is less of a concern for the implementation of Alternative 4. Overall, Alternatives 3A and 3B are rated adequate, and Alternative 4 is rated good.

2.10.2.5 Cost

There are no costs associated with Alternative 1. Alternative 2 is more costly ($207,892) than Alternative 1. Alternatives 3A and 3B are the costliest alternatives ($5,134,133 and $6,046,579, respectively). The cost difference between Alternatives 3A and 3B is not expected to be substantial. Alternative 4 is intermediate in cost ($3,132,179).

The estimated cost breakdown for each alternative detailing the estimated capital costs, discounted O&M, and total present worth costs are summarized in **Table 11**.

Table 11 Estimated Costs for Each Alternative

Cost Item	Alternative 1 – No Action	Alternative 2 – Land Use Controls	Alternative 3A – Removal via Mechanical Dredging	Alternative 3B – Removal via Hydraulic Dredging	Alternative 4 – Sediment Capping with Land Use Controls
Administrative Actions	$0	$58,840	$40,000	$55,000	$57,590
General Actions/Site Preparation	$0	$0	$757,290	$1,034,980	$428,250
Alternative-Specific Actions*	$0	$0	$2,924,559	$3,301,939	$739,225
Long-Term Operations and Maintenance**	$0	$133,283	$0	$0	$1,295,589
Implementation	$0	$15,769	$1,412,284	$1,654,660	$611,525
Total	**$0**	**$207,892**	**$5,134,133**	**$6,046,579**	**$3,132,179**

Notes:
*Alternative-specific actions include the following:
- Alternatives 3A and 3B: Sediment excavation and disposal
- Alternative 4: Sediment capping

** Discount factor is 0.65%

2.10.3 Modifying Criteria

These are criteria that have been considered based on the public and regulator comments received during the public comment period and during the public meeting held on Thursday, 9 July 2020.

2.10.3.1 State/Agency Acceptance

NJDEP has concurred on selection of Alternative 4 as the Selected Remedy. NJDEP's letter of concurrence is provided in **Appendix A**.

2.10.3.2 Community Acceptance

During the public comment period (March 31 to April 21, 2021), the community generally expressed its support for the preferred alternative that was presented; however, comments were received from two members of the public. The Army's responses to the public comments are presented in the Responsiveness Summary in this ROD. It is the judgment of the Army as lead agency and USEPA as lead regulatory agency that the Selected Remedy identified in this ROD is

necessary to protect human health (indirectly through fish consumption) and benthic organisms from contaminated sediment. As stated in Subsection 2.10.3.1, NJDEP has concurred on selection of Alternative 4.

2.11 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable (NCP, 40 CFR § 300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. Conversely, non-principal threat wastes are those source materials that generally can be reliably contained and would present only a low risk in the event of exposure. The manner in which principal threats are addressed generally will determine whether the statutory preference for treatment as a principal element is satisfied. There are no principal threat wastes associated with Picatinny Lake, which provides a relatively quiescent environment where contaminated sediments are unlikely to mobilize.

2.12 SELECTED REMEDY

The Selected Remedy for Picatinny Lake is ***Alternative 4: Sediment Capping with LUCs*** and is based upon the results of the various RIs, supplemental investigations, and risk assessments conducted under the IRP. Based on the nine criteria analyses, sediment capping has a number of distinct benefits and is expected to be effective at reducing ecological and human health risks. It also avoids short-term risks associated with re-suspending contaminated sediments and short-term hazards associated with the potential for encountering UXO. Sediment capping is more easily implemented than dredging and is cost-effective. It also achieves the RAOs as sediment capping is protective of human health and the environment as it would provide a barrier to exposure to localized contaminated sediment.

Alternative 4, includes the following elements in order to achieve the RAOs based on the available site data:

- MEC clearance of upland area prior to commencement of construction activities and of the sediment capping areas, including areas identified for design phase sediment sampling, will be conducted during the PDI.
- Fish tissue concentration sampling will be limited to a baseline event during the PDI. Depending on the results, the Army, in consultation with EPA and NJDEP, will determine if fish tissue sampling will have value going forward in the remedial design.
- Design phase sediment sampling will be completed prior to cap placement to better define the areal extent of the site-specific hot spots.
- Bench scale testing would be conducted prior to cap placement to determine specific capping materials (i.e., physical barriers or reactive amendment) and how the capping materials would be placed.
- Cap placement at site specific hot spots.
- Post-construction sampling to evaluate cap thickness.
- Implementation of LUCs including land use restrictions, fish consumption advisories, and limits on any activities (i.e., dredging, excavation, shallow water training, gasoline-powered boating) that would disturb the cap material, unless these activities were performed with appropriate prior planning.
- Annual cap inspections, monitoring and maintenance to ensure the Selected Remedy continues to be protective of human health and the environment.

Sediment capping entails placement of an engineered physical barrier over the Picatinny Lake offshore contaminated sediment locations Site 63/65, Site 82, Site 108 and Site 113 to limit chemical migration and reduce the benthic exposures. MEC clearance of the sediment capping areas including areas identified for design phase sediment sampling will be conducted during the PDI. A depiction of the sediment capping alternative is presented as **Figure 12.** Design phase sediment sampling and surveys to delineate boundaries and topography will be required prior to cap placement to determine the areal extent of the areas to be capped, as some of the hot spots have not been fully delineated.

As part of the remedial design, a bench scale study will be conducted to determine whether a physical cap (composed only of aggregate) or a reactive cap (containing aggregate and a reactive material such as carbon or clay) will be constructed to support the selection of appropriate amendments and assist in determining the placement of the cap. MEC clearance for access roads along the shoreline and small staging areas for cap material at each site. Cap placement will be completed by crane/excavator from the shoreline or via small scale hydraulic slurry from a barge. Post-construction verification sampling and topography surveys will be conducted following cap

placement to confirm placement and thickness. Site restoration of the staging and dewatering areas and roads will be conducted through grading and broadcast seeding as required.

Fish tissue concentration sampling will be limited to a baseline event during the PDI. Depending on the results, the Army will determine if this type of sampling will have value going forward in the remedial design. Fish tissue concentrations are not likely to decrease enough to change the risk to human health from fish consumption. Therefore, LUCs are needed to mitigate fish consumption for adult on-site and/or local, retired personnel and the child of on-site and/local retired personnel receptors. LUCs will consist of land use restrictions and the installation/maintenance of signs and/or buoy's prohibiting specific activities (i.e., fish consumption and gasoline-powered boat restrictions) at the Picatinny Lake and maintenance of existing LUCs, which restricts activities at the lake. Established fish advisories and gasoline-powered boat use in the vicinity of the sediment caps a would be enforced at Picatinny Lake through the Installation Sportsman Program.

The LUCs under this remedy include the following performance objectives:

- Maintain administrative and educational controls consisting of fish consumption advisory programs, and signage to raise awareness of fish consumption hazards present at the site.
- Maintain institutional controls that provide notifications of fish consumption advisory recommendations of NJDEP (via posting/maintaining signage around the lake and incorporating fish consumption restriction).
- Establish use restrictions in the vicinity of Sites 63/65, 82, 108 and 113 sediment cap areas.
- Conduct annual inspections, monitoring and maintenance and submittal of annual reports.

Annual inspections, monitoring and maintenance are included in the Selected Remedy to ensure that LUCs remain in effect and are being properly implemented. Annual inspections will include signage/buoy inspections and cap stability surveys and concentration sampling. If the outcome of the PDI fish tissue concentration sampling baseline concludes that long-term monitoring of fish tissue concentration sampling should be conducted, details of the fish tissue sampling program (e.g., frequency, quantity of samples, fish species to be sampled, contaminants to be sampled for, reporting) will be further defined during the remedial design process.

Additional site-specific details of the Selected Remedy implementation and execution, such as capping, which may produce effects on open water or wetland habitats, annual inspection, and long-term monitoring will be further defined during the remedial design process.-Implementation and execution of signage/buoys placement and cap stability surveys and concentration sampling will be specified during the remedial design process. The remedial design process will be completed after this ROD is finalized. The inspections, surveys and sampling will assist in determining whether the selected remedy is meeting the RAOs. Based on information currently available, the lead agency believes the Selected Remedy meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The Army expects the selected Remedial Alternative to satisfy the following statutory requirements of CERCLA § 121: (1) be protective of human health and the environment, (2) comply with ARARs, (3) be cost-effective, (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and (5) satisfy the preference for treatment as a principal element to the extent feasible. In the case of Picatinny Lake, treatment was not evaluated, as it is not considered practical because mercury is non-degradable and there are significant logistical challenges associated with modifying its mobility and toxicity in-situ. Reactive capping, if incorporated, would provide some treatment of mobile porewater to decrease mobility of mercury.

2.12.1 Summary of the Rationale for the Selected Remedy

The Selected Remedy achieves the RAOs, meets the threshold criteria, and provides the best balance of tradeoffs with respect to the balancing and modifying criteria, as detailed in Section 2.10. Alternative 4 is implementable, effective in meeting the RAOs, and cost-effective for addressing the contaminated sediment at Picatinny Lake. The Selected Remedy is consistent with CERCLA.

2.12.2 Summary of Estimated Costs for the Selected Remedy

The total estimated cost for Alternative 4 is $3,132,179, as summarized in **Table 11**. Detailed costs for Alternative 4 are provided in **Appendix C**.

2.12.3 Expected Outcomes of the Selected Remedy

Under the Selected Remedy, human health and ecological risks associated with contaminated media will be addressed through placement of an engineered, physical barrier over the contaminated sediments to limit chemical migration. Maintenance and implementation of LUCs will address the potential risks to recreational users by educating potential receptors of the potential risks due to contact with contaminated media. The Selected Remedy will minimize direct contact between receptors and COCs in the contaminated media. The LUCs that comprise the Selected Remedy will be compatible with current and future anticipated recreational land uses of the site.

2.13 STATUTORY DETERMINATIONS

The selected remedy meets the requirements for remedial actions set forth in CERCLA § 121 (as required by NCP § 300.430(f)(5)(ii)) because it (1) is protective of human health and the environment, (2) complies with ARARs, (3) is cost-effective, (4) uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable, and (5) satisfies the preference for remedies that employ treatment which permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, and contaminants as a principal element.

2.13.1 Protection of Human Health and the Environment

Alternative 4 meets the criterion for overall protection of human health and the environment. This alternative provides protection to human health through capping of contaminated sediment, as well as the continued implementation and enforcement of LUCs. Sediment capping will limit chemical migration to other media on-site, eliminating risk to future human and ecological receptors. The comparative analysis of threshold and balancing criteria for Alternative 4 is presented in **Table 10**.

2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements

Alternative 4 meets this threshold criterion. The Selected Remedy would comply with the location- and action-specific ARARs. Location-specific ARARs include wetland regulations under the Clean Water Act (Clean Water Act Section 402, 40 CFR § 320.4 and pertinent substantive provisions of New Jersey Administrative Code [NJAC] 7:7A). These regulations would be

complied with during sediment cap placement. Action-Specific ARARS associated with sediment cap placement would be complied with during the remedial action.

2.13.3 Cost-Effectiveness

In the lead agency's judgment, the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (NCP 40 CFR § 300.430(f)(1)(ii)(D)). This determination was accomplished by evaluating the "overall effectiveness" of the remedial alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing the balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; short-term effectiveness; and implementability), and a comparison of the costs to the overall effectiveness was conducted to determine cost-effectiveness. The overall effectiveness of the Selected Remedy was determined to be proportional to its costs, and hence the Selected Remedy represents a reasonable value for the money to be spent.

2.13.4 Long-Term Effectiveness and Permanence

Alternative 4 meets the RAOs by minimizing potential risks associated with contaminated media at Picatinny Lake and supporting future military and limited recreational land use. LUCs are an adequate and reliable control method to reduce long-term risk associated with potential exposure to contaminated media. Existing interim LUCs already implemented at Picatinny Arsenal have demonstrated that they are capable of adequately addressing the long-term risk.

2.13.5 Preference for Treatment as a Principal Element

The mobility of contaminants in sediment would be reduced at the site through the sediment capping activities, which would effectively limit the migration of contamination from sediment into surface water. The Selected Remedy may employ a treatment aspect if reactive amendments are incorporated in the capping material, which would further limit mobility, but would not reduce the toxicity or volume of COC-impacted media.

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES FROM SELECTED REMEDY FROM PROPOSED PLAN

The Selected Remedy in this ROD was presented as the Army's Preferred Remedy for Picatinny Lake in the Final PP (WESTON, 2021). The Green Pond & Bear Swamp Brooks Focused Feasibility Study, May 2001, was approved with a RG of 2,500 mg/kg for lead. The Army received comments from the EPA on March 18, 2025, stating that the proposed RG of 2,500 mg/kg for lead is no longer protective based on the current blood lead level of five micrograms per deciliter. EPA requested that a RG of 1,000 mg/kg for lead be incorporated into the PDI leading to better define the areal extent of the site-specific hot spots.

Lead was only found above 1,000 mg/kg at Site 108 and Site 113 based on examining all the historical data (1995-2016). Site 108 - Lead was only found above 1,000 mg/kg at three sediment sampling locations (I-108-SD-014, I-108-SD-024, & I-108-SD-026) at a depth interval of 0.0-0.5 ft bgs and not deeper. The values ranged from 1,200 mg/kg to 2,530 mg/kg. Site 113 - Lead was only found above 1,000 mg/kg at one sediment sampling location (I-113-SD-012) at two depth intervals of 0.0-0.5 ft bgs (1,380 mg/kg) and 1.5-2.0 ft. bgs (1,070 mg/kg). All of the sampling locations exhibiting lead concentrations above 1,000 mg/kg are already located within the designated remediation areas to be capped under the selected remedy. All other surrounding sediment sampling locations exhibited lead concentrations above the method of detection but were mostly below the PICA sediment background threshold value of 38.8 mg/kg (ITC, 2002). Otherwise, surrounding sediment samples exhibited lead concentrations as high as 317 mg/kg and 284 mg/kg at Site 108 and Site 113, respectively.

Revising the RG for lead to 1000 mg/kg will not change the overall physical scope or cost of the selected remedy or anticipated volume of material to be addressed under this remedy and thus will be incorporated into the selected remedy. It will be applied when implementing the design phase sediment sampling during the PDI prior to cap placement to better define the areal extent of site-specific hot spots.

3. RESPONSIVENESS SUMMARY

The purpose of the Responsiveness Summary is to provide a summary of the public's comments, concerns, and questions about the Selected Remedy for Picatinny Lake and the Army's responses to these concerns.

The Army has fulfilled the public participation requirements identified in 40 CFR § 300.430(f) and Title 10 United States Code 2705(b)(2), and maintains an administrative record, which is available for the public, in accordance with 40 CFR § 300.800. A copy of the *Final Proposed Plan for Site 53 (PICA-057) Picatinny Lake, Picatinny Arsenal, New Jersey* (WESTON, 2021), was provided to the Picatinny Arsenal Environmental Restoration Advisory Board (PAERAB) co-chair, and a copy was offered to all PAERAB members. The Final PP was completed and released to the public on March 31, 2021, at the information repositories listed in Section 2.3.

The Army held a public meeting on March 31, 2021, to inform the attendees of the remedial alternatives considered and the Selected Remedy for Picatinny Lake and to seek comments on the remedy. At this meeting, representatives from the Army, NJDEP, USEPA, and the Army's contractor, WESTON, were present to answer questions about the site and the RA under consideration.

Following the public meeting, a 30-day public comment period was held from March 31 to April 30, 2021, for written comments from the public.

3.1 PUBLIC ISSUES AND LEAD AGENCY RESPONSES

The comments received on the Final Picatinny Lake PP during the public meeting and public comment period and the Army's response are summarized in the following subsections. Written comments received are provided in **Appendix B**.

3.1.1 Summary of Written Comments Received During the Public Comment Period

Comment No. 1A, Commenter No. 1 (Letter dated April 22, 2021) (NOTE: Due to the length of this letter, only excerpts of the letter directly relevant to this ROD and requiring responses are presented in this section. The letter is presented in its entirety in **Appendix B**).

Comment No. 1A, Point No. 1: Make available the test and analysis results of the soil, sediment, and water samples that were taken and are expected to be taken at various depths – and the resultant conclusions.

Army Response to Comment No. 1A, Point No. 1: *Sediment and surface water results and findings are presented in the FS and PP, and are summarized in this ROD. This ROD does not address soil.*

Any additional sampling or other field activities conducted to support the remedy/remedial design for Picatinny Lake will be included in a separate document and placed in the Administrative Record for the site and will be available for public review.

Comment No. 1A, Point No. 2: The improved topographical and/or contaminant presence delineations that are expected to result from additional sampling should be made available.

Army Response to Comment No. 1A, Point No. 2: *Any additional sampling or other field activities conducted to support the remedy/remedial design for Picatinny Lake will be included in a separate document and placed in the Administrative Record for the site and will be available for public review.*

Comment No. 1A, Point No. 3: Provide the amounts of contaminated materials to be disposed of, the locations to which they will be placed, the methods of disposal, the duration of timely disposal and the offices/departments/divisions/agencies (count, state, or federal) supervising disposal.

Army Response to Comment No. 1A, Point No. 3: *The Selected Remedy does not entail removal and/or disposal of contaminated materials. The selected remedy, which entails capping of the sediment, addresses risks associated with consumption of fish and risks to ecological receptors but does not entail removal of contaminated materials. The risk levels are highest for consumption of fish tissue and ecological receptors but all risks are shown to be within the risk management range (1×10^{-6} to 1×10^{-4}) that USEPA uses to manage site risk. The noncancer hazards for fish consumption, however, exceed USEPA's threshold of a HI of 1; hence the need to take a remedial action. The Army, USEPA, and NJDEP believe the selected remedy is acceptable based on the site risk levels.*

Comment No. 1A, Point No. 4: Avoid mere reliance on Monitored Natural Attenuation (MNA) since the duration and FINAL COSTS of MNA are problematic and are difficult to EXACTLY and COMPLETELY anticipate – and accurately quantify.

Army Response to Comment No. 1A, Point No. 4: *MNA is not a component of the selected remedy. The selected remedy involves capping the contaminated sediment with an engineered physical barrier to limit chemical migration, post-construction sampling to evaluate cap thickness, and fish tissue sampling to demonstrate the effects of the remedy on contaminant concentrations in fish tissue.*

Comment No. 1A, Point No. 5: "HOT SPOT" locations are those on which substantial amounts of contaminants exist in quantities sufficient to assure that federal code, state statutes, and/or ARARs legally mandate (trigger) either their REMOVAL or their isolation – with sufficiently protective measures. Accordingly, it is urged and recommended that "HOT SPOTs" be prioritized for cleanup and REMOVAL. In addition, disposal should be OFFSITE to a location OUTSIDE of Picatinny Arsenal both to minimize LONG TERM COST and to assure the safety, health and welfare of the following:

a. The Public
b. The Employees of Picatinny Arsenal
c. Contract Employees assigned to the Arsenal
d. Picatinny Arsenal's Garrison and their dependents
e. Visitors

Contaminated materials present on "HOT SPOT" locations should either be entirely removed or removed in sufficient quantities to assure that those "HOT SPOT" locations no longer possess amounts of contaminants sufficient to trigger relevant federal code, state statutes and/or ARARs.

Army Response to Comment No. 1A, Point No. 5:

Chemical-specific ARARs will be met upon completion of the remedial action. The sediment capping alternative meets chemical-specific TBCs (which are contaminant levels used in lieu of ARARs) by eliminating human and ecological exposure to the contaminated sediments. The selected remedy will be designed and implemented to comply with action-specific ARARs.

Engineering controls would be used to reduce fugitive dust emissions from stockpiled capping material, as needed, in compliance with the Clean Air Act, National Air Quality Standards, and New Jersey Air Pollution Control regulations. Hot spot removal is not needed to achieve protectiveness. Also the removal process can expose the field team to additional risks and hazards due to exposure to contaminants and MEC, as well as cause more harm to benthic communities.

Comment No. 1B, Commenter No. 1, Written Comments on the Picatinny Lake Public Meeting Slides, submitted April 2021

Comment No. 1B, Slide 13 "Sediment Exceedances Offshore of Site 108": Samples taken below 2.0 feet?

Army Response to Comment No. 1B, Slide 13: *During the Supplemental Investigation in 2016, samples were collected from the following intervals: 0-6 inches, 18-24 inches, and 30-36 inches. All samples from the 0- to 6-inch interval were submitted for laboratory analysis. In accordance with the Sediment Sampling Work Plan (ECC, 2016b), samples from the 18- to 24-inch depth interval were only analyzed by the laboratory if the collocated 0- to 6-inch sample exceeded an LOC. Based on results from shallow sample intervals, samples from the 18- to 24-inch depth interval were submitted for analysis, and none of the 18- to 24-inch samples analyzed by the laboratory exceeded an LOC. Therefore, none of the 30- to 36-inch samples collected were analyzed by the laboratory.*

Comment No. 1B, Slide 14 "Sediment Exceedances Offshore of Site 113": Samples taken below 2.0 feet?

Army Response to Comment No. 1B, Slide 14: *See response to previous comment.*

Comment No. 1B, Slide 15 "Fish Tissue Evaluation": Mercury, PCBs, Dioxin?

Army Response to Comment No. 1B, Slide 15: *Dioxins were not identified as a site-specific COC, therefore fish tissue samples were not analyzed for dioxins.*

Comment No. 1B, Slide 22 "Recommended Remedial Alternative": Sediment Capping may initially appear to be immediately cost-effective. However, over the long run the initial cost savings, due to incomplete cleanup and/or contaminant removal can increase long term costs both

to the public and to the health of Picatinny Arsenal's employees and its assigned personnel thus reducing their work effectiveness.

Army Response to Comment No. 1B, Slide 22: *The Army evaluated the remedial alternatives and determined sediment capping would best achieve the Remedial Action Objectives. Long-term monitoring and maintenance are included in the "Recommended Remedial Alternative" cost and was included in the Army's evaluation of the remedial alternatives. It is not anticipated that the remedy will have an adverse effect on Picatinny Arsenal's employees.*

Comment No. 1B, Slide 23 "Preferred Remedial Alternative": Place reliable monitoring sensors in and around the physical barriers (caps) to assure timely detection of any contaminant migration.

Army Response to Comment No. 1B, Slide 23: *Real-time monitoring sensors are not needed and were not included in the cost estimate for Alternative 4. As stated in the Selected Remedy section of this ROD, the Army will conduct fish tissue sampling for several years to demonstrate effects of the remedial action on tissue concentrations. The selected remedy also includes maintenance and monitoring of the cap stability to ensure long-term protectiveness.*

Comment No. 2, Commenter No. 2 (Email/Letter dated April 29, 2021).

Comment No. 2, Point No. 1: There are no "unacceptable" human health risks or ecological risk for this site and hence anything beyond a remedy of "No Further Action with Monitoring of Land Use" is not warranted. The subsequent ROD could reflect this without another public notice of a PP.

The unnecessary proposed active remedy for capping four areas in Lake Picatinny would be a waste of government resources, produce constraints and interference with Army's weapons research and other Army activities, create a burden if a cap would fail and "…may produce effects on open water or wetland habitats" (page 15).

According to 2.6.4 Summary of Site Risks of the approved FS for the site:
"Based on the risk assessments performed for this site, for current and reasonably anticipated future use:

- The potential risk is within the generally acceptable risk range of 1E-4 to 1E-6 for industrial/research worker exposure to sediment and surface water, and the non-cancer hazard is less than the threshold of 1.
- The potential risk is within the generally acceptable risk range of 1E-4 to 1E-6 for the onsite youth visitor (recreational) for exposure to sediments and surface water across Picatinny Lake as a whole during recreational activities, and the non-cancer hazard is less than the threshold of 1 when separated by target organ.
- The fish consumption HI is greater than the threshold of 1. (Note: See below discussion.)
- COCs in sediment and surface water do not pose lake-wide risks to ecological receptors. Lines of evidence regarding the potential for impacts at hot spots is conflicting, with bulk sediment chemistry and toxicity tests indicating impacts, but benthic community surveys and bioavailability analyses indicating no impacts."

Army Response to Comment No. 2, Point No. 1: *The fish consumption HI is greater than the threshold of 1, therefore there is an unacceptable risk to human health from exposure due to the consumption of fish tissue. The Army, in consultation with USEPA, selected an active remedy due to the potential risks associated with fish consumption and risks to ecological receptors due to possible localized risks to benthos at hot spots, with these regions called "areas of attainment".*

Comment No. 2, Point No. 2: In current circumstances, there are no exceedances of chemical specific Applicable or Relevant and Appropriate Requirements (or ARARs):

Compliance with ARARS – specifically in this case chemical ARARs – is a threshold CERCLA criteria but neither the PP nor the 2016 FS note any concentration found in the sediment of Lake Picatinny above a promulgated standard or an ARAR.

On page 15 of the PP, the assumption of the section entitled **Compliance with Applicable or Relevant and Appropriate Requirements** incorrectly suggests that: "This criterion addresses [whether] the RA complies with ARARs or TBCs. The sediment levels of concern were used to establish screening levels and provide the basis for the risk-based approach to remediating PICA-57/Site 53 – Picatinny Lake. PICA-057/Site 53 – Picatinny Lake consists only of the surface water and sediment in the Lake."

This statement suggests to the reader that compliances with screening level or levels of concern are equivalent to compliance with ARAR. The paragraph makes no mention of compliance with ARARs – despite its title.

These levels of concern became preliminary remediation goals (PRGs) that were never discussed in the FS or PP as indicators of unacceptable risk under CERCLA and were not defined as ARARs: they could not be as they were not promulgated.

During 2014 – according to the FS – the USEPA and Army agreed that the "defined areas of attainment for hot spots would be defined as the area the PRGs are to be achieved or where discrete areas where active remedy components will be implemented." PRG are meant by guidance of an indication of potential risk requiring more study and the "more study" was completed by the Army. The studies are detailed in the FS.

Further even if there were exceedances of chemical-specific ARARs, the Army and the USEPA have determined that if "there are no unacceptable risks, there are no ARARS."

Army Response to Comment No. 2, Point No. 2: *The Army has acknowledged the USEPA Methylmercury Water Quality Criterion (EPA-823-R-01-001); USEPA's water quality criterion for the protection of human health based on the concentration of methylmercury in fish tissue as 0.3 mg/kg as a chemical-specific TBC. However, it is not accurate to conclude that the Army and USEPA have concluded that there is no acceptable risk associated with the site. The Army, in consultation with USEPA, determined that "no action" alternative would not be protective of human health and the environment. In particular, action is required to address the unacceptable risk to human health from exposure due to the consumption of fish tissue, and localized risk to benthos within areas of attainment.*

The language was clarified in the ROD to better define the RGs and their purpose and to discuss the fact that the contaminant concentrations are compared to TBCs and not ARARs.

Comment No. 2, Point No. 3: Remediation is for the sake of the health of benthic creatures.

Remedial Action Goals identified on page 13 of the PP include the statements to "eliminate the exposures to sediment offshore (the four hotspots) with concentrations of copper, mercury, and

silver (and other chemicals) above the **PRGs (261, 13.2, and 36 mg/kg, respectively)** {is} for the protection of benthic invertebrates."

Neither the FS (nor studies performed for the FS) or the PP describe any unacceptable risk to the benthic community at the four hot spots. For instance, on page 9 of the "**Benthic and MacroInvertabrate Report**" – included as an attachment of the FS:

"The approved Phase II ERA (IT 2000) concluded that there was little potential risk to upper trophic level species associated with constituents in fish from Picatinny Lake based on dose modeling. The available evidence collected more recently appears to support the conclusion that potential risks are low.

High TOC concentrations and AVS/SEM results lower than 130 µmol/goc indicate limited potential for bioavailability. Similarly, lack of substantial differences in the benthic community structure relative to reference samples collected in Lake Denmark are considered evidence that elevated COPC **concentrations in sediment are not adversely impacting the aquatic community**.

The sample results did not identify substantial differences between the Picatinny Lake and Lake Denmark benthic communities, with the exception of sample location I-108-SD-024. In addition, the AVS/SEM analysis indicates a lack of bioavailability at the majority of sample locations.

Sample location I-108-SD-024 is the only location where the benthic community may be impacted by elevated COPC concentrations. However, additional samples collected in Site 108 surrounding location I-108-SD-024 do not show adverse impacts to the benthic community. The AVS/SEM analysis coupled with the benthic community analysis indicates that **the presence of localized, elevated COPC concentrations are not adversely affecting the overall benthic community.**

The results of the Phase II ERA (IT 2000) indicated that ecological risks are not significant for Picatinny Lake as a whole. The results of the additional benthic community and sediment investigation conducted in September 2013 confirm this conclusion for both ecological and human health risks……"

Further according to the Army documents:

"The findings of the ERA are that COCs in sediment, surface water, and fish do not pose unacceptable lake-wide risks to ecological receptors. However, the ERA identified sediment hotspots offshore of Sites 63/65, 82, 108, and 113 where elevated concentrations of metals in sediment (specifically copper, lead, mercury, and silver) may potentially pose risks to benthos. Lines of evidence regarding the potential for impacts at hotspots are conflicting, with bulk sediment chemistry and toxicity tests indicating impacts, but benthic community surveys and bioavailability analyses indicating no current impacts. The typical focus of an ERA within CERCLA is at the population level, and benthic surveys for the Lake and lake-wide risks indicate that population level impacts are unlikely."

(The physical action of capping the existing sediment hotspot will clearly impact the existing benthic population at those locations - most likely by destroying it.)

Army Response to Comment No. 2, Point No. 3: *The Army acknowledges the PP stated, "there are no unacceptable lake-wide risks to human health or ecological receptors associated with Picatinny lake for surface water or sediment." However, the PP follows that statement by describing how the areas with elevated metal concentrations in sediment could pose localized risk to ecological receptors, particularly benthic organisms in Picatinny Lake and contribute to the unacceptable risk due to fish consumption. As discussed in Section 3.4.3 of the Final FS, the risks to ecological receptors in areas of attainment adjacent to Sites 63/65, 82, 108, and 113 were determined to be at a level that warranted an active remedy (i.e., greater than potential effect level remedial goals (RGs) for benthic organisms based on GPB toxicity test result and established in the GPB and Swamp Brook ROD)*

Comment No. 2, Point No. 4: Fish consumption HI is greater than the threshold of 1 and a comparison to the remedy required by "Record of Decision EOD Pond (Site 103/PICA-164) and Lake Denmark (Site 54/PICA-015)"

The statement that "the fish consumption HI is greater than the threshold of 1" is the only reference in the PP and the FS to an unacceptable risk under CERCLA: this should not be considered a driver for a remedial action.

The two exposure scenarios that exceeded the threshold were the adult and child non-military resident and child non-military resident receptor – but as stated in the PP:

"The adult and child non-military resident receptor scenarios **are not reasonably anticipated future scenarios and are, therefore, hypothetical risks**."

Note that the referenced 2016 Sportsman Bulletin (e.g., page 10) was updated in 2019 by Picatinny Commander, the revised 2019 Bulletin is on the Picatinny Public Web. This 2019 version is more restrictive than the 2016 version stating that "NO FISH CAUGHT ON POST (stocked trout excepted) SHOULD BE CONSUMED BY ANYONE." This restriction should also be taken into consideration as it was in the "Record of Decision EOD Pond (Site 103/PICA-164) and Lake Denmark (Site 54/PICA-015)."

There was a similar unacceptable risk identified but handled differently in this signed ROD. This ROD identified that there was an unacceptable HI for the same exposure scenarios for those 2 water bodies as were calculated for Lake Picatinny.

The ROD required that:

"No remedial action is necessary for EOD Pond and Lake Denmark; however, annual monitoring of land use is required at these sites, as they cannot be released for unrestricted use. … calculated risks/hazards associated with elevated mercury in fish tissue are not believed to be attributed to site-specific releases, or sources, but are known to be widespread within the region and related to anthropogenic influences. The Remedial Action Objective (RAO) for EOD Pond and Lake Denmark is to control consumption of edible fish with concentrations of mercury, as well as polychlorinated biphenyls (PCBs) in yellow perch and largemouth bass from Lake Denmark due to elevated levels found in interconnected water bodies, which are driving the unacceptable risk or hazard."

Army Response to Comment No. 2, Point No. 4: *The comment states: "The two exposure scenarios that exceeded the threshold were the adult and child non-military resident and child non-military resident receptor." As stated in the "Risk Assessment Results" of the PP and in the "Site Risks" section of this ROD, the two exposure scenarios that exceed the noncancer HI*

threshold were the adult personnel and children of on-site personnel receptors. The PP and ROD further state that the future adult and child resident receptors are hypothetical.

It is acknowledged that the 2016 Sportsman Bulletin was updated in 2019 to include the referenced statement about not consuming fish caught in Picatinny Lake. The active remedy of sediment capping was not selected only because of the potential risks associated with fish consumption. The sediment capping remedy will also protect the benthic macroinvertebrate population in Picatinny Lake.

Comment No. 2, Point No. 5: The Environmental Health Risk Assessment Program of Army Institute of Public Health has referenced in a June 2014 letter that is on the Picatinny Environmental Restoration web page "that the need to further address areas of Picatinny Lake contamination is not justified, given that risks and hazards for the lake are shown to be acceptable."

Has that Army organization given its approval or concurrence for this action? Is that agreement or concurrence required before a ROD is signed by the Army.

Army Response to Comment No. 2, Point No. 5: *It has been determined the Public Health Command (PHC) does not need to provide approval for cleanup plans or remedies. PHC's responsibilities are approving human health risk assessment and reviewing environmental hazards and ecological risk assessments.*

3.1.2 Summary of Comments Received During the Public Meeting

Comment No. 1: I will be providing comments on the Proposed Plan. My general concern is there is no unacceptable risk; there is no reason to do this remediation. It has not been shown in the Feasibility Study, or in the Proposed Plan which summarized the Feasibility Study, that there is unacceptable risk. It seems like you are adding sediment over the benthic life you are trying to protect. The Proposed Plan on page 4 says "although resulting risks are in the generally acceptable risk range for Picatinny as a whole, US EPA and NJDEP expressed concern." There is no regulatory requirement to be doing this. I am going to be asking the Army to talk with the Natural Resources Manager and ask the Fishing Club of Picatinny if there are any fish that seem to be impacted by how they are living in Lake Picatinny that is different than the EOD Pond or Lake Denmark, both of which have a Record of Decision for no further action. There is no unacceptable

risk here. It seems to be a stretch to do this action, tying up the installation with the project, getting the materials, and monitoring this forever when it should be treated the same as the EOD Pond and Lake Denmark—no further action with monitoring of land use controls. There are a lot of statements in the Proposed Plan which contradict each other regarding risk. That is my general comment as a member of the public that you will be receiving in writing.

Army Response to Comment No. 1: *As noted in Section 2.7.3 of this ROD, the recreational use risk scenario indicates hazards exceed the HI of 1 ranging from an unacceptable HI of 8 for the on-site child receptor to an HI less than 1 for the on-site adult receptor. Because the HI is greater than 1, there is unacceptable risk due primarily to the presence of mercury in edible fish tissue collected from Picatinny Lake.*

Comment No. 2: Has the U.S. Public Health Command (formerly called CHPMM) approved this cleanup plan?

Army Response to Comment No. 2: *See above response to Comment No. 2, Point No. 5.*

3.1.3 Summary of Comments Received from the EPA in March 2025

On March 18, 2025, the Army received the comment below from the EPA regarding their reassessment of the remediation goals identified for lead in sediments.

In review of Section 3.4.4.1 of the May 2001 Green Pond & Bear Swamp Brooks Focused Feasibility Study, the EPA has identified the rationale for how the NOEC for mercury of 1,250 mg/kg was calculated and based on June 2014 letter the LOEC of 2,500 mg/kg as the PRG. There are no unacceptable lake-wide cancer risks and noncancer hazards to human health or ecological receptors associated with Picatinny Lake through exposure to surface water or sediment. However, hot spots due to elevated lead concentrations in sediment may pose localized risk to ecological receptors, particularly benthic organisms contribute to the unacceptable risk to human health due to fish consumption.

Based on the current EPA blood lead level of 5 ug/dL, the EPA believes the current PRG of 2,500 mg/kg identified in the Feasibility Study and Proposed Plan for lead in sediment is no longer protective. The EPA requests that during sediment sampling phase of the Preliminary Design

Investigation (PDI) that the Army compare the existing and new sediment data to the updated commercial lead value (based on the Adult Lead Model (ALM) of 1,000 mg/kg. Language should be included to the ROD indicating that although the FS and PP identified an original PRG of 2,500 mg/kg, changes to blood lead levels leading to a revised PRG of 1,000 mg/kg will be incorporated into the PDI leading to better define the areal extent of the site-specific hot spots.

3.2 TECHNICAL AND LEGAL ISSUES

The Army reviewed existing site data and determined that all of the historical sampling locations exhibiting lead concentrations above 1,000 mg/kg for lead are already located within the designated remediation areas to be capped under this remedy. Therefore, the scope or estimated cost of the action will not increase, and the volume of waste to be managed would not significantly change if the RG for lead was reduced to 1,000 mg/kg. The Army has agreed to change the RG for lead to 1,000 mg/kg. This RG for lead will be applied during the pre-design investigation phase of the selected remedy to define the areal extent of the site-specific hot spots. No other technical and legal issues were identified as a result of the public and agency review process.

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FIGURES

Figure 1 **Site Location**

Figure 2 **Picatinny Lake and Vicinity**

Figure 3 **Picatinny Lake Areas of Interest**

Figure 4 **Historical Sediment Exceedances at Site 53/PICA 057 – Picatinny Lake**

Figure 5 **Historical Surface Water Exceedances**

Figure 6 **RDX and TNT LOC Exceedances in Sediment, Site 40**

Figure 7 **Sediment Exceedances Offshore of Site 63/65**

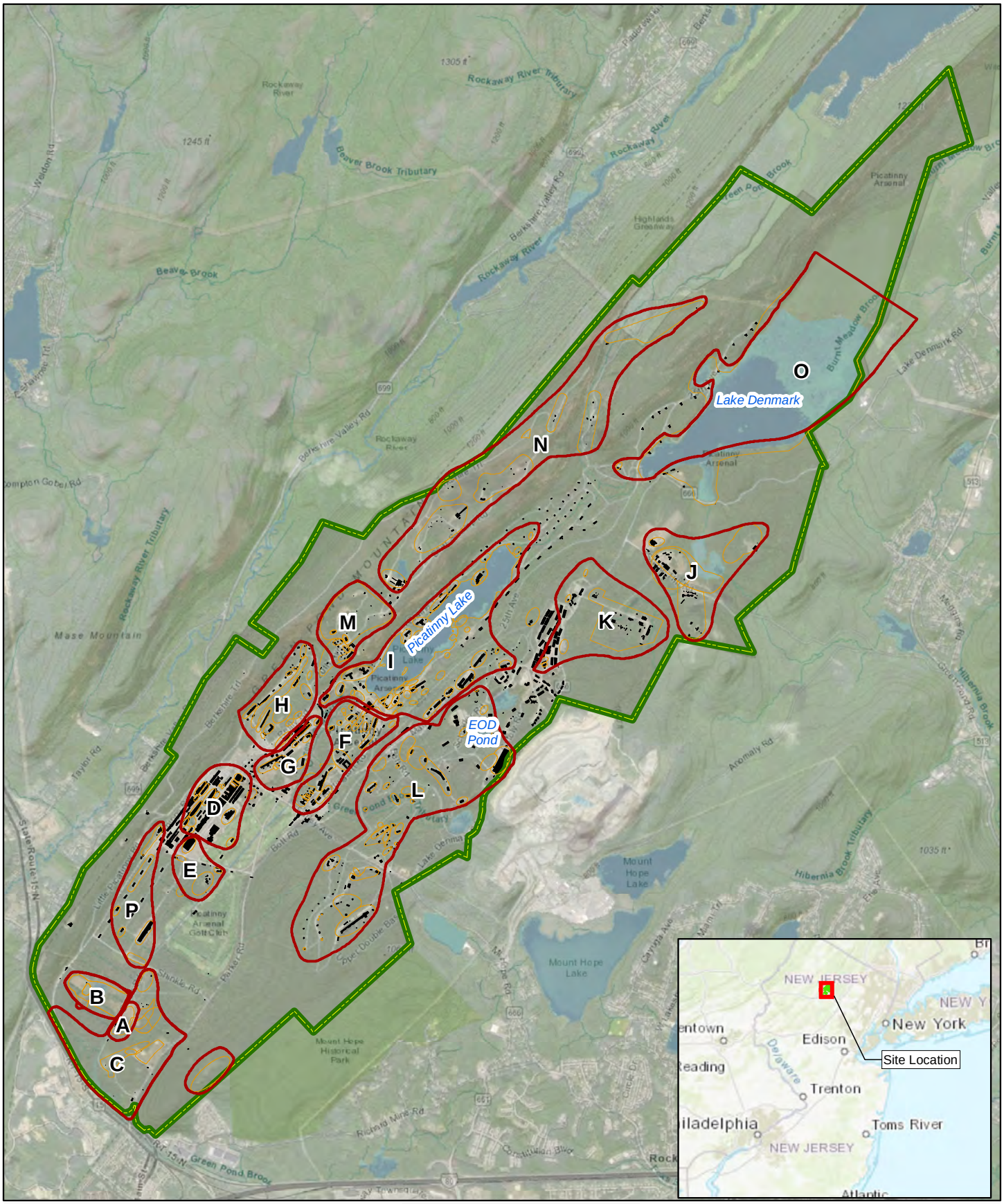
Figure 8 **Sediment Exceedances Offshore of Site 82**

Figure 9 **Sediment Exceedances Offshore of Site 108**

Figure 10 **Sediment Exceedances Offshore of Site 113**

Figure 11 **Human Health Conceptual Site Model**

Figure 12 **Picatinny Lake Site 53 (PICA-057) Selected Remedy – Sediment Capping**



Legend

- Picatinny Arsenal Boundary
- ANL RI Concept Plan Areas
- IRP Site Locations
- Buildings

Picatinny Arsenal
Morris County,
New Jersey

N
0 2,400 4,800 Feet
0 480 960 1,440 Meters

Figure 1
Site Location
Record of Decision for Picatinny Lake
Site 53 (PICA-057)

10/20/2021

Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Site_Location_Map.mxd





Legend

- Installation Boundary
- Picatinny Lake
- ANL RI Concept Plan Areas
- Buildings
- Stream

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

N

0 700 1,400 Feet

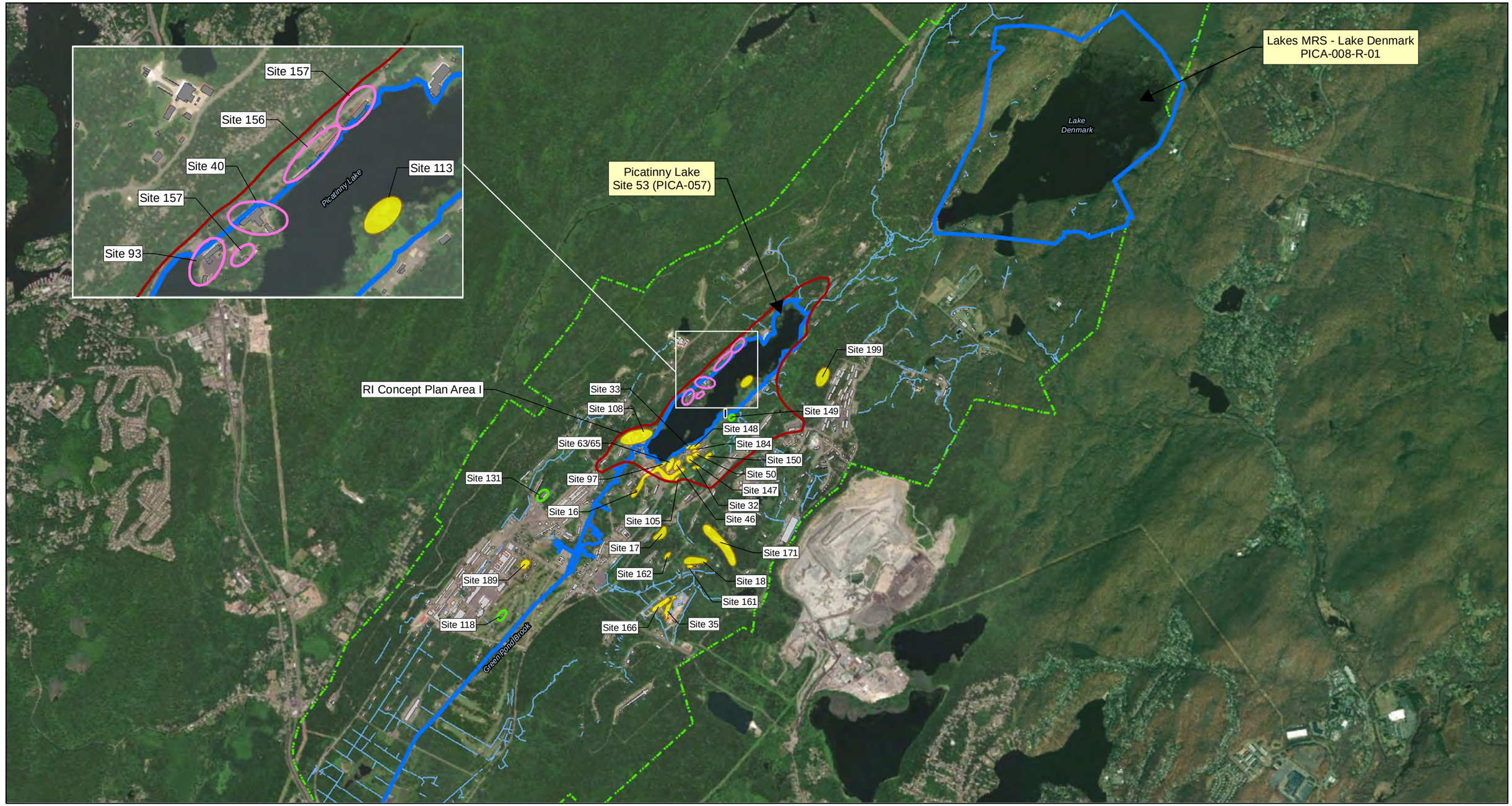
0 240 480 Meters

Picatinny Arsenal
Morris County,
New Jersey

Figure 2
Picatinny Lake and Vicinity
Record of Decision for Picatinny Lake
Site 53 (PICA-057)

10/26/2021

File: Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Picatinny_Lake_Vicinity.mxd



Legend

- Installation Boundary
- Lakes and Brook Surface Water Area
- ANL RI Concept Plan Areas
- Buildings
- Stream
- Group 1 Sites (PICA-079)
- 3 Site Group (Site 149 [PICA-149])
- Area I Sites No Further Actions with Monitoring of Land Use

SOURCE:
Base Imagery: ESRI, Maxar Imagery, 2022
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

N

0 2,500 5,000 Feet

0 870 1,740 Meters

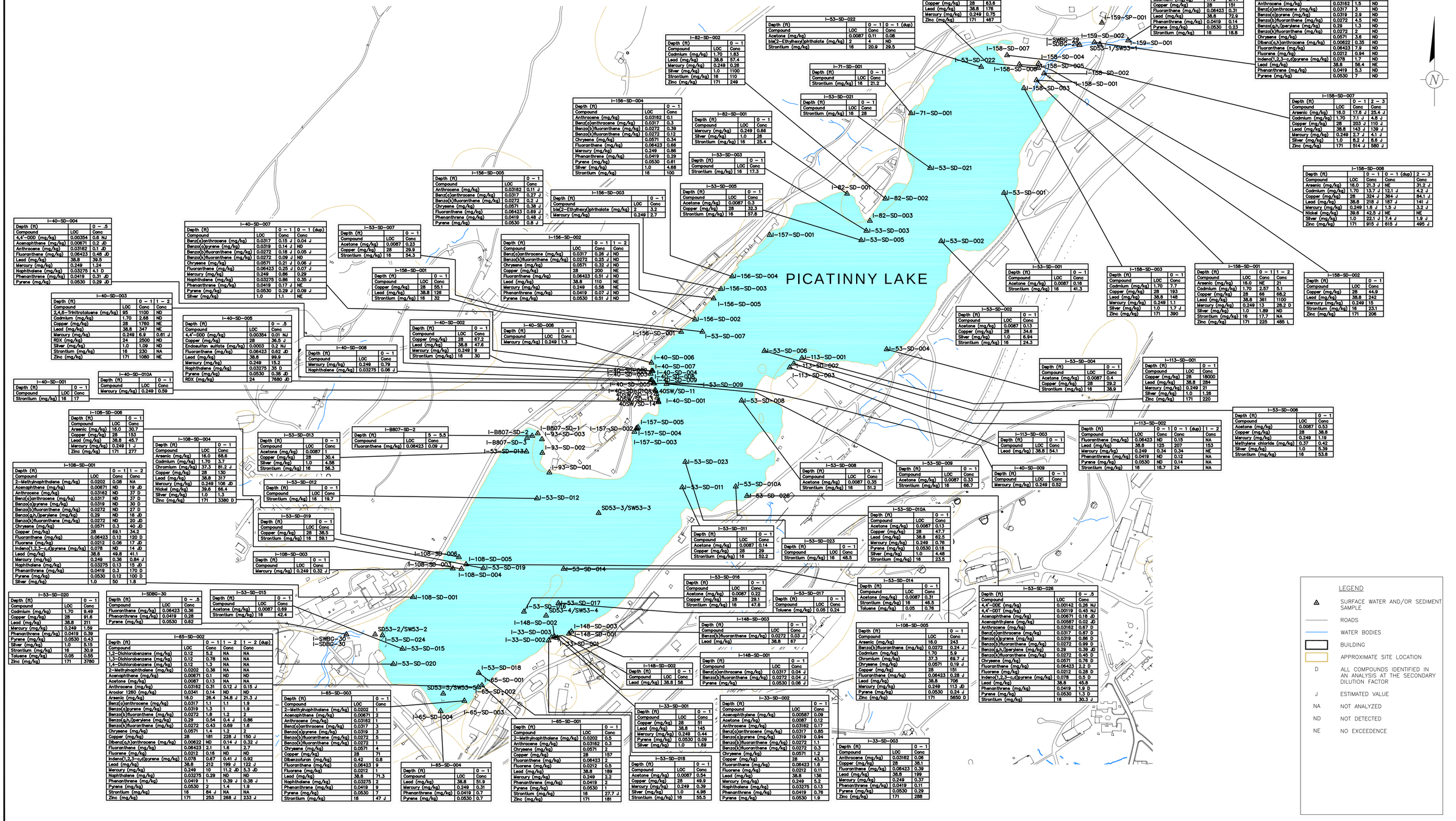
Picatinny Arsenal
Morris County,
New Jersey

WESTON SOLUTIONS

Figure 3
Picatinny Lake Areas of Interest
Record of Decision for Picatinny Lake
Site 53 (PICA-057)

6/15/2023

File: Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Picatinny_Lake_Areas_of_Interest.mxd



I-40-SD-004

Depth (ft)		0 – .5
Compound	LOC	Conc
4,4'-DDD (mg/kg)	0.00354	0.6 NJ
Acenaphthene (mg/kg)	0.00871	0.2 JD
Anthracene (mg/kg)	0.03162	0.1 JD
Fluoranthene (mg/kg)	0.06423	0.48 JD
Lead (mg/kg)	38.8	39.5
Mercury (mg/kg)	0.249	1.24
Naphthalene (mg/kg)	0.03275	4.1 D
Phenanthrene (mg/kg)	0.0419	0.31 JD
Pyrene (mg/kg)	0.0530	0.29 JD

I-40-SD-007

Depth (ft)		0 – 1	0 – 1 (dup)
Compound	LOC	Conc	
Benz(a)anthracene (mg/kg)	0.0317	0.15 J	0.04 J
Benzo(a)pyrene (mg/kg)	0.0319	0.14 J	ND
Benzo(b)fluoranthene (mg/kg)	0.0272	0.18 J	0.05 J
Benzo(k)fluoranthene (mg/kg)	0.0272	0.09 J	ND
Chrysene (mg/kg)	0.0571	0.21 J	0.06 J
Fluoranthene (mg/kg)	0.06423	0.25 J	0.07 J
Mercury (mg/kg)	0.249	0.86	0.29
Naphthalene (mg/kg)	0.03275	0.86	0.35 J
Phenanthrene (mg/kg)	0.0419	0.17 J	NE
Pyrene (mg/kg)	0.0530	0.29 J	0.09 J
Silver (mg/kg)	1.0	1.1	NE

I-53-SD-007

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.23
Copper (mg/kg)	28	29.9
Strontium (mg/kg)	16	54.3

I-156-SD-001

Depth (ft)		0 – 1
Compound	LOC	Conc
Copper (mg/kg)	28	55.1
Lead (mg/kg)	38.8	126
Strontium (mg/kg)	16	32

I-40-SD-003

Depth (ft)		0 – 1	1 – 2
Compound	LOC	Conc	Conc
2,4,6-Trinitrotoluene (mg/kg)	95	1100	ND
Cadmium (mg/kg)	1.70	2.68	ND
Copper (mg/kg)	28	1760	NE
Lead (mg/kg)	38.8	347	NE
Mercury (mg/kg)	0.249	6.9	0.61 J
RDX (mg/kg)	24	2500	ND
Silver (mg/kg)	1.0	1.09	ND
Strontium (mg/kg)	16	230	NA
Zinc (mg/kg)	171	1080	NE

I-40-SD-005

Depth (ft)		0 – .5
Compound	LOC	Conc
4,4'-DDD (mg/kg)	0.00354	0.01 NJ
Copper (mg/kg)	28	36.5 J
Endosulfan sulfate (mg/kg)	0.0003	0.2 NJ
Fluoranthene (mg/kg)	0.06423	0.62 JD
Lead (mg/kg)	38.8	99.9
Mercury (mg/kg)	0.249	15.2
Naphthalene (mg/kg)	0.03275	35 D
Pyrene (mg/kg)	0.0530	0.39 JD
RDX (mg/kg)	24	7680 JD

I-40-SD-008

Depth (ft)		0 – 1
Compound	LOC	Conc
Mercury (mg/kg)	0.249	0.79
Naphthalene (mg/kg)	0.03275	0.06 J

I-40-SD-002

Depth (ft)		0 – 1
Compound	LOC	Conc
Copper (mg/kg)	28	67.2
Lead (mg/kg)	38.8	47.6
Mercury (mg/kg)	0.249	9
Strontium (mg/kg)	16	30

I-40-SD-006

Depth (ft)		0 – 1
Compound	LOC	Conc
Mercury (mg/kg)	0.249	1.3

I-40-SD-001

Depth (ft)		0 – 1
Compound	LOC	Conc
Strontium (mg/kg)	16	17

I-40-SD-010A

Depth (ft)		0 – 1
Compound	LOC	Conc
Mercury (mg/kg)	0.249	0.59

I-108-SD-006

Depth (ft)		0 – 1
Compound	LOC	Conc
Arsenic (mg/kg)	16.0	30.7
Copper (mg/kg)	28	153
Lead (mg/kg)	38.8	45.7
Mercury (mg/kg)	0.249	1 J
Zinc (mg/kg)	171	277

I-108-SD-004

Depth (ft)		0 – 1
Compound	LOC	Conc
Arsenic (mg/kg)	16.0	68.8
Cadmium (mg/kg)	1.70	3.7
Chromium (mg/kg)	37.3	81.2 J
Copper (mg/kg)	28	130
Lead (mg/kg)	38.8	317
Mercury (mg/kg)	0.249	108 JD
Nickel (mg/kg)	39.6	66.4
Silver (mg/kg)	1.0	1.3
Zinc (mg/kg)	171	3380 D

I-108-SD-001

Depth (ft)		0 – 1	1 – 2
Compound	LOC	Conc	Conc
2-Methylnaphthalene (mg/kg)	0.0202	0.08	NA
Acenaphthene (mg/kg)	0.00871	ND	19 JD
Anthracene (mg/kg)	0.03162	ND	37 D
Benz(a)anthracene (mg/kg)	0.0317	ND	37 D
Benzo(a)pyrene (mg/kg)	0.0319	ND	30 D
Benzo(b)fluoranthene (mg/kg)	0.0272	ND	27 D
Benzo(g,h,i)perylene (mg/kg)	0.29	ND	16 JD
Benzo(k)fluoranthene (mg/kg)	0.0272	ND	20 JD
Chrysene (mg/kg)	0.0571	0.3	40 JD
Copper (mg/kg)	28	69.1	34.2
Fluoranthene (mg/kg)	0.06423	0.12	120 D
Fluorene (mg/kg)	0.0212	0.06	17 JD
Indeno(1,2,3-c,d)pyrene (mg/kg)	0.078	ND	14 JD
Lead (mg/kg)	38.8	49.8	41.1
Mercury (mg/kg)	0.249	0.36	0.84 J
Naphthalene (mg/kg)	0.03275	0.13	15 JD
Phenanthrene (mg/kg)	0.0419	0.3	170 D
Pyrene (mg/kg)	0.0530	0.12	100 D
Silver (mg/kg)	1.0	50	1.8

I-53-SD-020

Depth (ft)		0 – 1
Compound	LOC	Conc
Cadmium (mg/kg)	1.70	9.49
Copper (mg/kg)	28	91.6
Lead (mg/kg)	38.8	211
Mercury (mg/kg)	0.249	1.59
Phenanthrene (mg/kg)	0.0419	0.39
Pyrene (mg/kg)	0.0530	0.43
Silver (mg/kg)	1.0	5.15
Strontium (mg/kg)	16	30.9
Toluene (mg/kg)	0.05	0.55
Zinc (mg/kg)	171	3780

I-SDBG-30

Depth (ft)		0 – .5
Compound	LOC	Conc
Fluoranthene (mg/kg)	0.06423	0.36
Phenanthrene (mg/kg)	0.0419	0.28
Pyrene (mg/kg)	0.0530	0.62

I-53-SD-015

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.69
Strontium (mg/kg)	16	42.4

I-65-SD-002

Depth (ft)		0 – 1	1 – 2	1 – 2 (dup)
Compound	LOC	Conc	Conc	Conc
1,2-Dichlorobenzene (mg/kg)	0.12	5.2	NA	NA
1,3-Dichlorobenzene (mg/kg)	0.12	0.78	NA	NA
1,4-Dichlorobenzene (mg/kg)	0.12	1.3	NA	NA
2-Methylnaphthalene (mg/kg)	0.0202	0.36	NA	NA
Acenaphthene (mg/kg)	0.00871	0.1	ND	ND
Acetone (mg/kg)	0.0087	0.13	NA	NA
Anthracene (mg/kg)	0.03162	0.31	0.12 J	0.15 J
Aroclor 1260 (mg/kg)	0.0341	0.14	ND	ND
Arsenic (mg/kg)	16.0	26.4	34.8 J	21.3 J
Benz(a)anthracene (mg/kg)	0.0317	1.1	1.1	1.9
Benzo(a)pyrene (mg/kg)	0.0319	1.3	1	1.9
Benzo(b)fluoranthene (mg/kg)	0.0272	1.8	1.2	2
Benzo(g,h,i)perylene (mg/kg)	0.29	0.54	0.4 J	0.86
Benzo(k)fluoranthene (mg/kg)	0.0272	0.43	0.69	1.6
Chrysene (mg/kg)	0.0571	1.4	1.2	2
Copper (mg/kg)	28	181	228 J	150 J
Dibenz(a,h)anthracene (mg/kg)	0.00822	ND	0.14 J	0.32 J
Fluoranthene (mg/kg)	0.06423	2.1	1.6	2.7
Fluorene (mg/kg)	0.0212	0.16	ND	ND
Indeno(1,2,3-c,d)pyrene (mg/kg)	0.078	0.67	0.41 J	0.92
Lead (mg/kg)	38.8	212	199 J	122 J
Mercury (mg/kg)	0.249	10	11.2 JD	5.3 JD
Naphthalene (mg/kg)	0.03275	0.29	ND	ND
Phenanthrene (mg/kg)	0.0419	1	0.39 J	0.38 J
Pyrene (mg/kg)	0.0530	2	1.4	1.9
Strontium (mg/kg)	16	84 J	NA	NA
Zinc (mg/kg)	171	253	288 J	233 J

I-65-SD-003

Depth (ft)		0 – 1
Compound	LOC	Conc
2-Methylnaphthalene (mg/kg)	0.0202	1
Acenaphthene (mg/kg)	0.00871	2
Anthracene (mg/kg)	0.03162	3
Benz(a)anthracene (mg/kg)	0.0317	3
Benzo(a)pyrene (mg/kg)	0.0319	3
Benzo(b)fluoranthene (mg/kg)	0.0272	5
Benzo(k)fluoranthene (mg/kg)	0.0272	1
Chrysene (mg/kg)	0.0571	4
Copper (mg/kg)	28	71
Dibenzofuran (mg/kg)	0.42	0.8
Fluoranthene (mg/kg)	0.06423	9
Fluorene (mg/kg)	0.0212	1
Lead (mg/kg)	38.8	71.3
Naphthalene (mg/kg)	0.03275	2
Phenanthrene (mg/kg)	0.0419	9
Pyrene (mg/kg)	0.0530	7
Strontium (mg/kg)	16	47 J

I-65-SD-004

Depth (ft)		0 – 1
Compound	LOC	Conc
Lead (mg/kg)	38.8	51.9
Mercury (mg/kg)	0.249	0.31
Phenanthrene (mg/kg)	0.0419	0.7
Pyrene (mg/kg)	0.0530	0.7

I-B807-SD-2

Depth (ft)		5 – 5.5
Compound	LOC	Conc
Fluoranthene (mg/kg)	0.06423	0.09 J

I-53-SD-013

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	1
Copper (mg/kg)	28	30.4
Silver (mg/kg)	1.0	4.58
Strontium (mg/kg)	16	56.3

I-53-SD-012

Depth (ft)		0 – 1
Compound	LOC	Conc
Strontium (mg/kg)	16	19.7

I-53-SD-019

Depth (ft)		0 – 1
Compound	LOC	Conc
Copper (mg/kg)	28	38.5
Strontium (mg/kg)	16	59.1

I-108-SD-003

Depth (ft)		0 – 1
Compound	LOC	Conc
Mercury (mg/kg)	0.249	0.32 J

I-156-SD-005

Depth (ft)		0 – 1
Compound	LOC	Conc
Anthracene (mg/kg)	0.03162	0.11 J
Benz(a)anthracene (mg/kg)	0.0317	0.27 J
Benzo(k)fluoranthene (mg/kg)	0.0272	0.2 J
Chrysene (mg/kg)	0.0571	0.38 J
Fluoranthene (mg/kg)	0.06423	0.69 J
Phenanthrene (mg/kg)	0.0419	0.48 J
Pyrene (mg/kg)	0.0530	0.8 J

I-156-SD-003

Depth (ft)		0 – 1
Compound	LOC	Conc
bis(2-Ethylhexyl)phthalate (mg/kg)	2	5.2
Mercury (mg/kg)	0.249	2.7

I-156-SD-002

Depth (ft)		0 – 1	1 – 2
Compound	LOC	Conc	Conc
Benz(a)anthracene (mg/kg)	0.0317	0.26 J	ND
Benzo(k)fluoranthene (mg/kg)	0.0272	0.25 J	ND
Chrysene (mg/kg)	0.0571	0.32 J	ND
Copper (mg/kg)	28	200	NE
Fluoranthene (mg/kg)	0.06423	0.51 J	ND
Lead (mg/kg)	38.8	110	NE
Mercury (mg/kg)	0.249	0.58	NE
Phenanthrene (mg/kg)	0.0419	0.07 J	ND
Pyrene (mg/kg)	0.0530	0.51 J	ND

I-82-SD-002

Depth (ft)		0 – 1
Compound	LOC	Conc
Cadmium (mg/kg)	1.70	1.83
Lead (mg/kg)	38.8	57.4
Mercury (mg/kg)	0.249	0.28
Silver (mg/kg)	1.0	1100
Strontium (mg/kg)	16	110
Zinc (mg/kg)	171	249

I-82-SD-001

Depth (ft)		0 – 1
Compound	LOC	Conc
Mercury (mg/kg)	0.249	0.66
Silver (mg/kg)	1.0	28
Strontium (mg/kg)	16	25.4

I-53-SD-003

Depth (ft)		0 – 1
Compound	LOC	Conc
Strontium (mg/kg)	16	17.3

I-53-SD-005

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.3
Copper (mg/kg)	28	32.3
Strontium (mg/kg)	16	57.8

I-53-SD-022

Depth (ft)		0 – 1	0 – 1 (dup)
Compound	LOC	Conc	Conc
Acetone (mg/kg)	0.0087	0.11	0.08
bis(2-Ethylhexyl)phthalate (mg/kg)	2	4	ND
Strontium (mg/kg)	16	20.9	29.5

I-71-SD-001

Depth (ft)		0 – 1
Compound	LOC	Conc
Strontium (mg/kg)	16	21.2

I-53-SD-021

Depth (ft)		0 – 1
Compound	LOC	Conc
Strontium (mg/kg)	16	28

I-158-SD-005

Depth (ft)		0 – 1
Compound	LOC	Conc
Arsenic (mg/kg)	16.0	34.9
Cadmium (mg/kg)	1.70	2.8
Copper (mg/kg)	28	63.6
Lead (mg/kg)	38.8	178
Mercury (mg/kg)	0.249	0.75
Zinc (mg/kg)	171	467

I-159-SD-001

Depth (ft)		0 – 1
Compound	LOC	Conc
4,4'-DDE (mg/kg)	0.00142	0.03
4,4'-DDT (mg/kg)	0.00119	0.01
Cadmium (mg/kg)	1.70	2.44
Copper (mg/kg)	28	151
Fluoranthene (mg/kg)	0.06423	0.31
Lead (mg/kg)	38.8	72.9
Phenanthrene (mg/kg)	0.0419	0.14
Pyrene (mg/kg)	0.0530	0.23
Strontium (mg/kg)	16	18.8

I-159-SD-002

Depth (ft)		0 – 1	1 – 2
Compound	LOC	Conc	Conc
Acenaphthene (mg/kg)	0.00871	0.11	ND
Acenaphthylene (mg/kg)	0.00587	0.15	ND
Anthracene (mg/kg)	0.03162	1.5	ND
Benz(a)anthracene (mg/kg)	0.0317	3	ND
Benzo(a)pyrene (mg/kg)	0.0319	2.9	ND
Benzo(b)fluoranthene (mg/kg)	0.0272	4.5	ND
Benzo(g,h,i)perylene (mg/kg)	0.29	1.3	ND
Benzo(k)fluoranthene (mg/kg)	0.0272	2	ND
Chrysene (mg/kg)	0.0571	3.6	ND
Dibenz(a,h)anthracene (mg/kg)	0.00822	0.35	ND
Fluoranthene (mg/kg)	0.06423	7.9	ND
Fluorene (mg/kg)	0.0212	0.94	ND
Indeno(1,2,3-c,d)pyrene (mg/kg)	0.078	1.7	ND
Lead (mg/kg)	38.8	56.4	NE
Phenanthrene (mg/kg)	0.0419	5.3	ND
Pyrene (mg/kg)	0.0530	7	ND

I-158-SD-007

Depth (ft)		0 – 1	2 – 3
Compound	LOC	Conc	Conc
Arsenic (mg/kg)	16.0	17.6 J	25.4 J
Cadmium (mg/kg)	1.70	7.1 J	4.8 J
Copper (mg/kg)	28	203 J	110 J
Lead (mg/kg)	38.8	143 J	139 J
Mercury (mg/kg)	0.249	2.7 J	4.1 J
Silver (mg/kg)	1.0	8.2 J	5.6 J
Zinc (mg/kg)	171	514 J	580 J

I-158-SD-006

Depth (ft)		0 – 1	0 – 1 (dup)	2 – 3
Compound	LOC	Conc	Conc	Conc
Arsenic (mg/kg)	16.0	21.3 J	NE	31.2 J
Cadmium (mg/kg)	1.70	13.7 J	12.1 J	4.2 J
Copper (mg/kg)	28	324 J	364 J	84.1 J
Lead (mg/kg)	38.8	218 J	187 J	141 J
Mercury (mg/kg)	0.249	1.6 J	1.5 J	3.2 J
Nickel (mg/kg)	39.6	42.5 J	NE	NE
Silver (mg/kg)	1.0	22.1 J	7.4 J	1.9 J
Zinc (mg/kg)	171	915 J	615 J	495 J

I-158-SD-004

Depth (ft)		0 – 1
Compound	LOC	Conc
Anthracene (mg/kg)	0.03162	0.1
Benz(a)anthracene (mg/kg)	0.0317	0.3
Benzo(b)fluoranthene (mg/kg)	0.0272	0.39
Benzo(k)fluoranthene (mg/kg)	0.0272	0.12
Chrysene (mg/kg)	0.0571	0.34
Fluoranthene (mg/kg)	0.06423	0.66
Mercury (mg/kg)	0.249	0.86
Phenanthrene (mg/kg)	0.0419	0.29
Pyrene (mg/kg)	0.0530	0.61
Silver (mg/kg)	1.0	4.68
Strontium (mg/kg)	16	100

I-53-SD-001

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.16
Strontium (mg/kg)	16	41.3

I-158-SD-003

Depth (ft)		0 – 1
Compound	LOC	Conc
Cadmium (mg/kg)	1.70	1.7
Copper (mg/kg)	28	193
Lead (mg/kg)	38.8	148
Mercury (mg/kg)	0.249	1.1
Silver (mg/kg)	1.0	1.7 J
Zinc (mg/kg)	171	390

I-158-SD-001

Depth (ft)		0 – 1	1 – 2
Compound	LOC	Conc	Conc
Arsenic (mg/kg)	16.0	NE	21
Cadmium (mg/kg)	1.70	2.57	5.1
Copper (mg/kg)	28	66	68.2
Lead (mg/kg)	38.8	361	1100
Mercury (mg/kg)	0.249	13	28.2 D
Silver (mg/kg)	1.0	1.89	ND
Strontium (mg/kg)	16	17.7	NA
Zinc (mg/kg)	171	225	485 L

I-158-SD-002

Depth (ft)		0 – 1
Compound	LOC	Conc
Copper (mg/kg)	28	44.9
Lead (mg/kg)	38.8	242
Mercury (mg/kg)	0.249	15
Strontium (mg/kg)	16	23.1
Zinc (mg/kg)	171	206

I-53-SD-002

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.13
Copper (mg/kg)	28	34.8
Silver (mg/kg)	1.0	6.94
Strontium (mg/kg)	16	24.3

I-53-SD-004

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.4
Copper (mg/kg)	28	29.2
Strontium (mg/kg)	16	36.9

I-113-SD-001

Depth (ft)		0 – 1
Compound	LOC	Conc
Copper (mg/kg)	28	18000
Lead (mg/kg)	38.8	284
Mercury (mg/kg)	0.249	21
Silver (mg/kg)	1.0	1.26
Zinc (mg/kg)	171	220

I-113-SD-002

Depth (ft)		0 – 1	0 – 1 (dup)	1 – 2
Compound	LOC	Conc	Conc	Conc
Fluoranthene (mg/kg)	0.06423	ND	0.15	NA
Lead (mg/kg)	38.8	125	207	153
Mercury (mg/kg)	0.249	0.34	0.34	NE
Phenanthrene (mg/kg)	0.0419	ND	0.12	NA
Pyrene (mg/kg)	0.0530	ND	0.14	NA
Strontium (mg/kg)	16	16.7	24	NA

I-113-SD-003

Depth (ft)		0 – 1
Compound	LOC	Conc
Lead (mg/kg)	38.8	54.1

I-40-SD-009

Depth (ft)		0 – 1
Compound	LOC	Conc
Mercury (mg/kg)	0.249	0.52

I-53-SD-006

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.53
Copper (mg/kg)	28	38.8
Mercury (mg/kg)	0.249	1.19
Methylene chloride (mg/kg)	0.37	0.42
Silver (mg/kg)	1.0	5.39
Strontium (mg/kg)	16	53.8

I-53-SD-008

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.35
Strontium (mg/kg)	16	51.2

I-53-SD-009

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.33
Strontium (mg/kg)	16	66.7

I-53-SD-010A

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.13
Copper (mg/kg)	28	47.7
Lead (mg/kg)	38.8	62.5
Mercury (mg/kg)	0.249	0.76
Pyrene (mg/kg)	0.0530	0.18
Silver (mg/kg)	1.0	4.48
Strontium (mg/kg)	16	23.5

I-53-SD-011

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.14
Copper (mg/kg)	28	29
Strontium (mg/kg)	16	52.2

I-53-SD-023

Depth (ft)		0 – 1
Compound	LOC	Conc
Strontium (mg/kg)	16	45.5

I-53-SD-014

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.31
Strontium (mg/kg)	16	48.5
Toluene (mg/kg)	0.05	0.78

I-53-SD-026

Depth (ft)		0 – .5
Compound	LOC	Conc
4,4'-DDE (mg/kg)	0.00142	0.26 NJ
4,4'-DDT (mg/kg)	0.00119	0.45 NJ
Acenaphthene (mg/kg)	0.00871	0.18 JD
Acenaphthylene (mg/kg)	0.00587	0.02 JD
Anthracene (mg/kg)	0.03162	0.67 D
Benz(a)anthracene (mg/kg)	0.0317	0.87 D
Benzo(a)pyrene (mg/kg)	0.0319	0.86 D
Benzo(b)fluoranthene (mg/kg)	0.0272	0.99 D
Benzo(g,h,i)perylene (mg/kg)	0.29	0.39 JD
Benzo(k)fluoranthene (mg/kg)	0.0272	0.46 D
Chrysene (mg/kg)	0.0571	0.76 D
Fluoranthene (mg/kg)	0.06423	2.2 D
Fluorene (mg/kg)	0.0212	0.28 D
Indeno(1,2,3-c,d)pyrene (mg/kg)	0.078	0.5 D
Lead (mg/kg)	38.8	45.8
Phenanthrene (mg/kg)	0.0419	1.9 D
Pyrene (mg/kg)	0.0530	1.3 D
Strontium (mg/kg)	16	30.3 J

I-53-SD-016

Depth (ft)		0 – 1
Compound	LOC	Conc
Acetone (mg/kg)	0.0087	0.22
Copper (mg/kg)	28	29.1
Strontium (mg/kg)	16	47.6

I-53-SD-017

Depth (ft)		0 – 1
Compound	LOC	Conc
Toluene (mg/kg)	0.05	0.24

I-148-SD-003

Depth (ft)		0 – 1
Compound	LOC

I-SWBG-29		
Date		11/02/93
Compound	LOC	Conc
alpha-BHC, USAEC UH20 (ug/L)	0.0026	0.45 N
alpha-BHC, USAEC UM25 (ug/L)	0.0026	ND

I-82-SW-001		
Date		8/01/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	4.6

I-53-SW-021		
Date		8/19/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	14

I-159-SW-002		
Date		8/09/96
Compound	LOC	Conc
2,4-Dinitrotoluene (ug/L)	0.11	0.2
Aluminum (ug/L)	190	295
Methylene Chloride (ug/L)	2.5	11

I-156-SW-002		
Date		7/23/96
Compound	LOC	Conc
Aluminum (ug/L)	190	246

I-159-SW-001		
Date		8/09/96
Compound	LOC	Conc
Lead (ug/L)	5	21.5

I-156-SW-001		
Date		7/23/96
Compound	LOC	Conc
Lead (ug/L)	3.2	4.6

I-40-SW-003		
Date		7/18/96
Compound	LOC	Conc
2,4,6-Trinitrotoluene (ug/L)	2.2	5.77
Aluminum (ug/L)	190	389
Cyanide (ug/L)	5.2	18.6
Lead (ug/L)	5	43.6
Nitroglycerin (ug/L)	3.7	250
RDX (ug/L)	2	24.5

I-53-SW-001		
Date		8/19/96
Compound	LOC	Conc
Bis(2-Ethylhexyl)phthalate (ug/L)	1.2	11
Methylene Chloride (ug/L)	2.5	16

I-53-SW-013		
Date		8/14/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	10

I-53-SW-002		
Date		8/19/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	17

I-53-SW-019		
Date		8/12/96
Compound	LOC	Conc
Chromium (ug/L)	11.4	24.9
Methylene Chloride (ug/L)	2.5	2.7

I-53-SW-003		
Date		8/19/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	14

I-53-SW-024		
Date		9/01/98
Compound	LOC	Conc
Sulfide (ug/L)	2200	4500

I-113-SW-001		
Date		8/02/96
Compound	LOC	Conc
Lead (ug/L)	5	8.55
Mercury (ug/L)	0.05	0.54

I-53-SW-020		
Date		8/12/96
Compound	LOC	Conc
Bis(2-Ethylhexyl)phthalate (ug/L)	1.2	15
Chromium (ug/L)	11.4	50.5

I-53-SW-018		
Date		8/13/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	5.2

I-65-SW-001		
Date		7/11/96
Compound	LOC	Conc
Mercury (ug/L)	0.05	0.38

I-53-SW-017		
Date		8/13/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	5

I-113-SW-002/I-113-SW-002 DUP		
Date		8/01/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	ND/2.6

I-53-SW-016		
Date		8/13/96
Compound	LOC	Conc
Chromium (ug/L)	11.4	59.9
Methylene Chloride (ug/L)	2.5	5

I-53-SW-026		
Date		9/01/98
Compound	LOC	Conc
Aluminum (ug/L)	190	232

I-53-SW-010A		
Date		8/14/96
Compound	LOC	Conc
Methylene Chloride (ug/L)	2.5	10

Legend

- Installation Boundary
- Picatinny Lake
- ANL RI Concept Plan Areas
- Buildings
- Stream
- Surface Water and Sediment Sample

SOURCE:
Base Imagery: ESRI Mapping Service, 2019
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

N

0 1,000 2,000 Feet

0 360 720 Meters

Picatinny Arsenal
Morris County,
New Jersey

Figure 5
Historical Surface Water Exceedences
Proposed Plan for Picatinny Lake
Site 53 (PICA-057)

6/15/2023

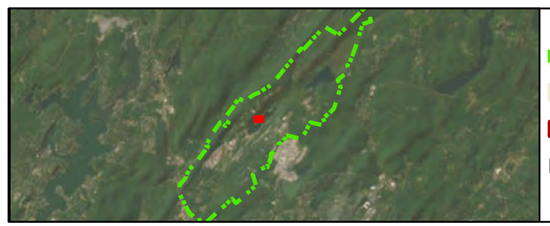
File: Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Picatinny_Lake_SW_Results_Dsize.mxd

I-40-SD-003							
Depth (ft)		0 - 1	1 - 2	0 - 1	1 - 2	0 - 0.5	1.5 - 2
Compound	LOC	Jul-96	May-01	Feb-11	Feb-11	Nov-11	Nov-11
2,4,6-Trinitrotoluene (mg/kg)	95	1100	ND	NE	ND	ND	ND
RDX (mg/kg)	26	2500	ND	ND	ND	ND	ND

I-40-SD-005							
Depth (ft)		0 - 0.5	0 - 1	0 - 1 DUP	1 - 2	0 - 0.5	1.5 - 2
Compound	LOC	Oct-98	Feb-11	Feb-11	Feb-11	Nov-11	Nov-11
RDX (mg/kg)	26	7680 JD	ND	ND	ND	ND	ND

I-40-SD-6
0810A
I-40-SD-2
I-40-SD-7
I-40-SD-4
I-40-SD-8
I-40-SD-15
I-53-SD-9
I-40-SD-9
I-40-SW-4
I-40-SD-10
I-40-SD-1
I-40-SW-5

Notes:
Source: Arcadis U.S., Inc. (ARCADIS). 2012. Lakes Feasibility Study Site 54/PICA 015, Site 53/PICA 057, and Site 103/PICA 164, U.S. Army Garrison Picatinny Arsenal, New Jersey, Final Report, April.



Legend
- Installation Boundary
- Picatinny Lake
- ANL RI Concept Plan Areas
- Buildings
- Sediment Sample

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

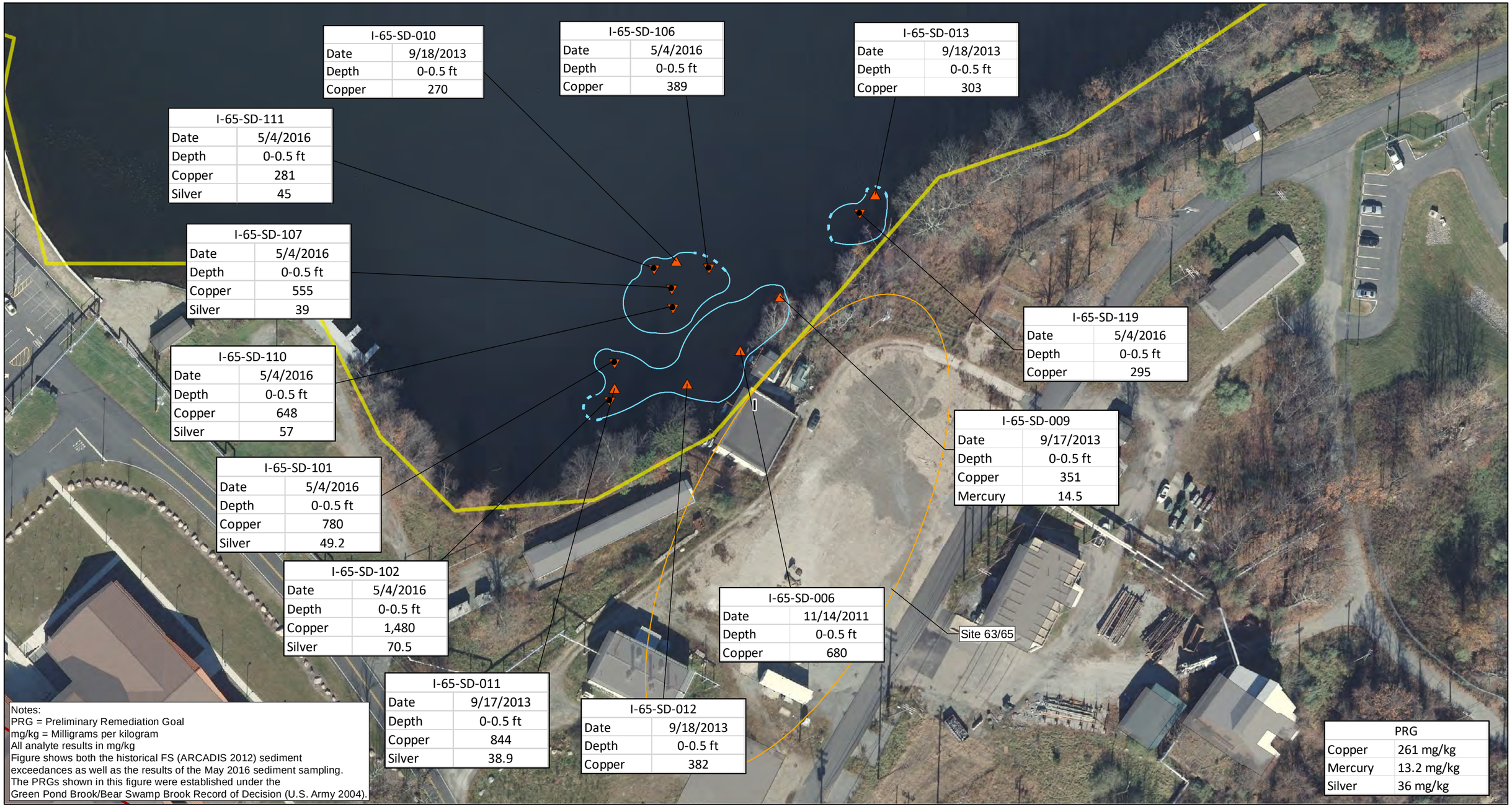
N
0 50 100 Feet
0 10 20 Meters

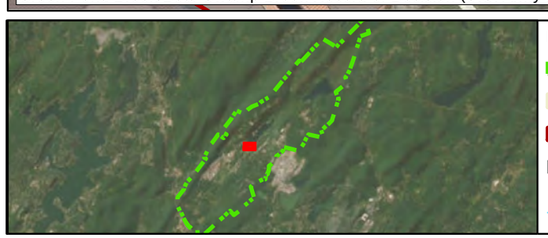
Picatinny Arsenal
Morris County,
New Jersey

Figure 6
RDX and TNT LOC Exceedances
in Sediment, Site 40
Proposed Plan for Picatinny Lake
Site 53 (PICA-057)

6/15/2023

File: Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Picatinny_Lake_RDX_TNT_Results.mxd





Legend

- Installation Boundary
- Picatinny Lake
- ANL RI Concept Plan Areas
- Buildings
- New Area of Attainment (dashed where inferred)
- Historical Sediment Sample with Exceedances of PRG
- May 2016 Sediment Sample with Exceedances of PRG

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

N

0 75 150 Feet

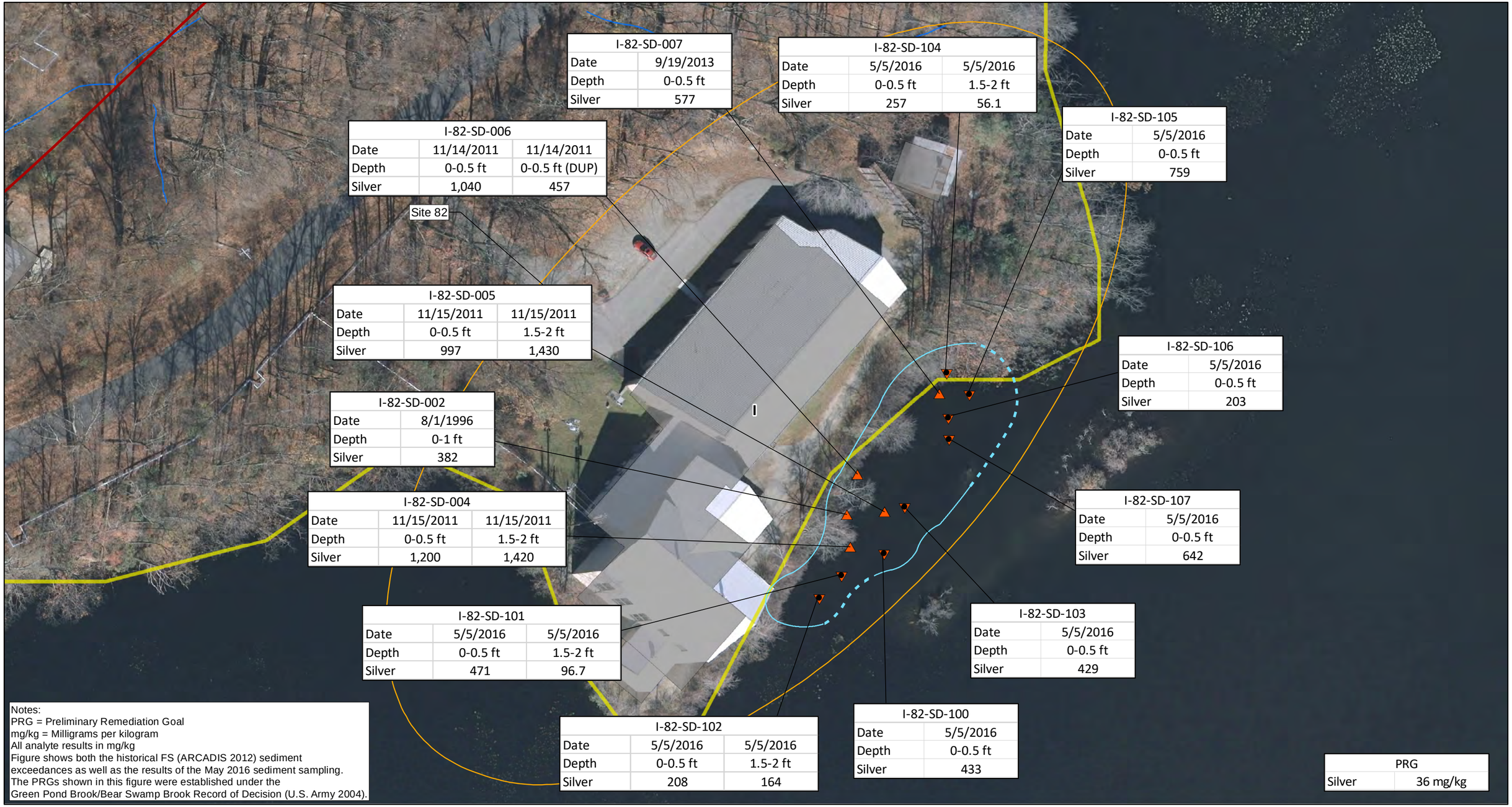
0 25 50 Meters

Picatinny Arsenal
Morris County,
New Jersey

Figure 7
Sediment Exceedances at
Offshore of Site 63/65
Proposed Plan for Picatinny Lake
Site 53 (PICA-057)

6/15/2023

Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Picatinny_Lake_Sed_Results_Offshore6365.mxd





Legend

- Installation Boundary
- Picatinny Lake
- ANL RI Concept Plan Areas
- Buildings
- Stream
- New Area of Attainment (dashed where inferred)
- Historical Sediment Sample with Exceedances of PRG
- May 2016 Sediment Sample with Exceedances of PRG

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

Picatinny Arsenal
Morris County,
New Jersey

N

0 60 120 Feet

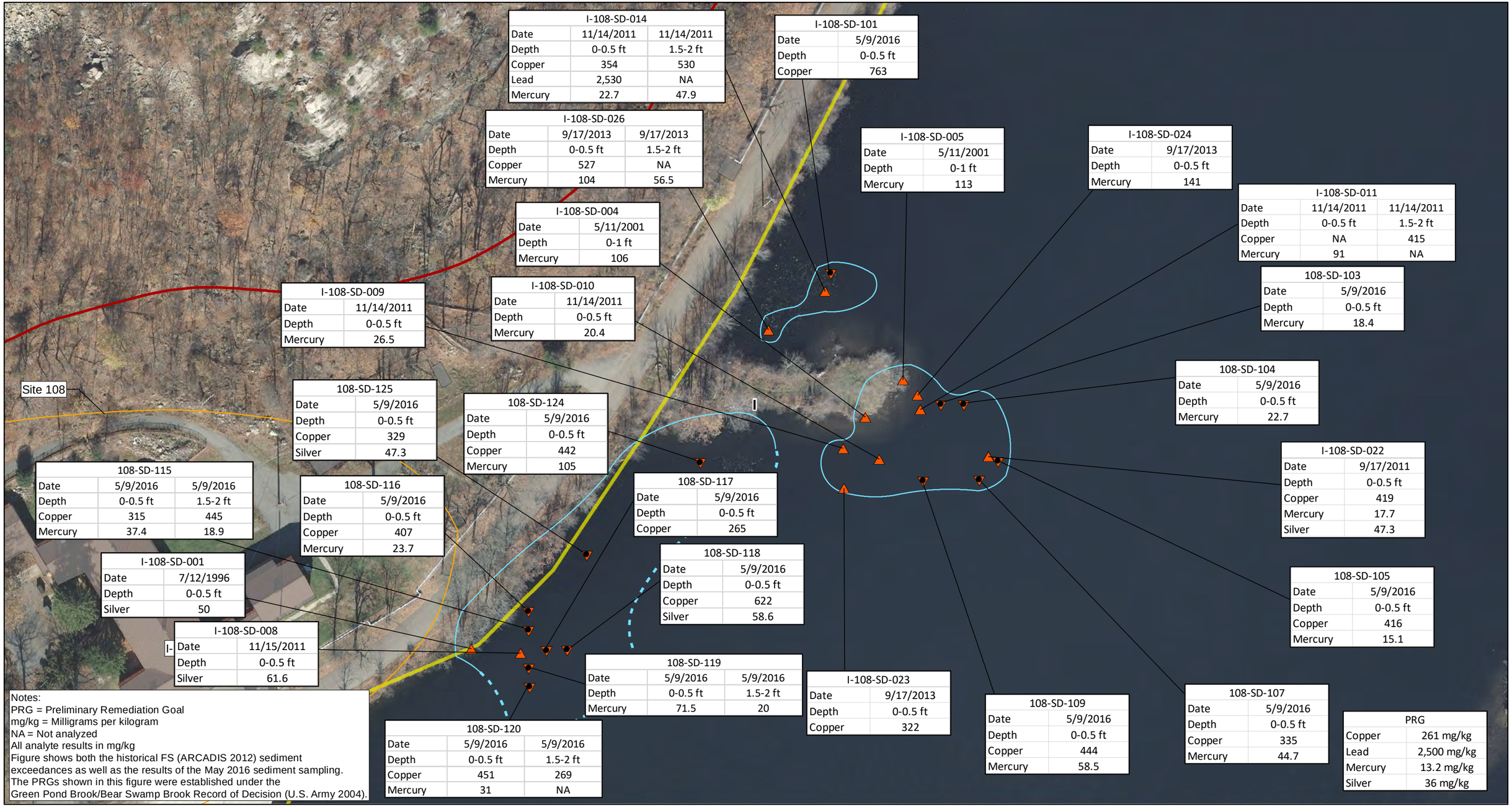
0 20 40 Meters

WESTON SOLUTIONS

Figure 8
Sediment Exceedances at Offshore of Site 82
Proposed Plan for Picatinny Lake
Site 53 (PICA-057)

6/15/2023

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Legend

- Installation Boundary
- Picatinny Lake
- ANL RI Concept Plan Areas
- Buildings
- New Area of Attainment (dashed where inferred)
- Historical Sediment Sample with Exceedances of PRG
- May 2016 Sediment Sample with Exceedances of PRG

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

N

0 75 150 Feet

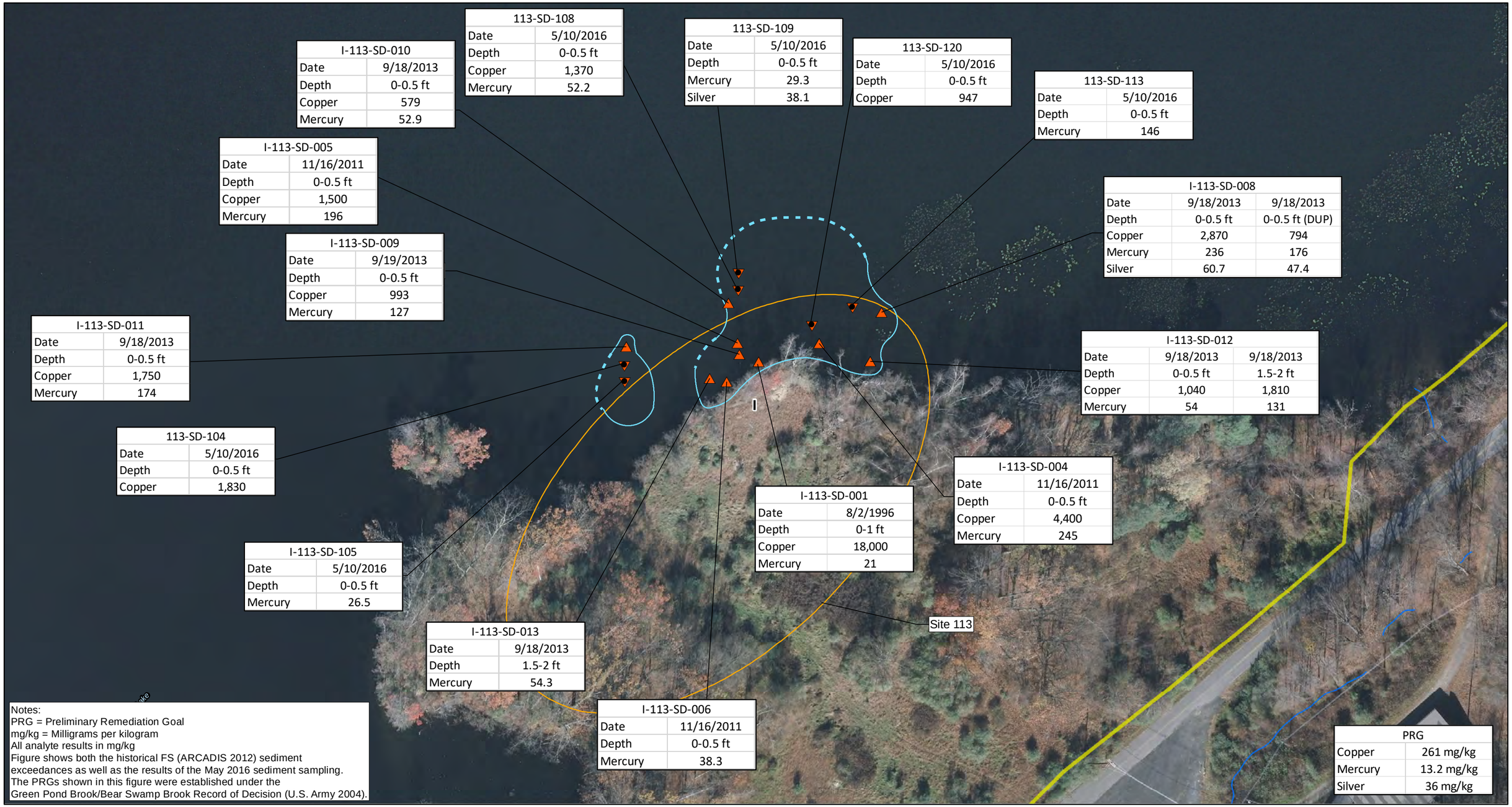
0 25 50 Meters

Picatinny Arsenal
Morris County,
New Jersey

Figure 9
Sediment Exceedances at Offshore of Site 108
Proposed Plan for Picatinny Lake
Site 53 (PICA-057)

6/15/2023

Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Picatinny_Lake_Sed_Results_Offshore108.mxd



Notes:
PRG = Preliminary Remediation Goal
mg/kg = Milligrams per kilogram
All analyte results in mg/kg
Figure shows both the historical FS (ARCADIS 2012) sediment exceedances as well as the results of the May 2016 sediment sampling.
The PRGs shown in this figure were established under the Green Pond Brook/Bear Swamp Brook Record of Decision (U.S. Army 2004).



Legend
- Installation Boundary
- Picatinny Lake
- ANL RI Concept Plan Areas
- Buildings
- Stream
- New Area of Attainment (dashed where inferred)
- Historical Sediment Sample with Exceedances of PRG
- May 2016 Sediment Sample with Exceedances of PRG

SOURCE:
Base Imagery: NJ 2012 Natural Color Imagery
Data Source: Army GIS Layers (August 2011)

Coordinate System: UTM Zone 18N
Datum: WGS84. Units: Feet

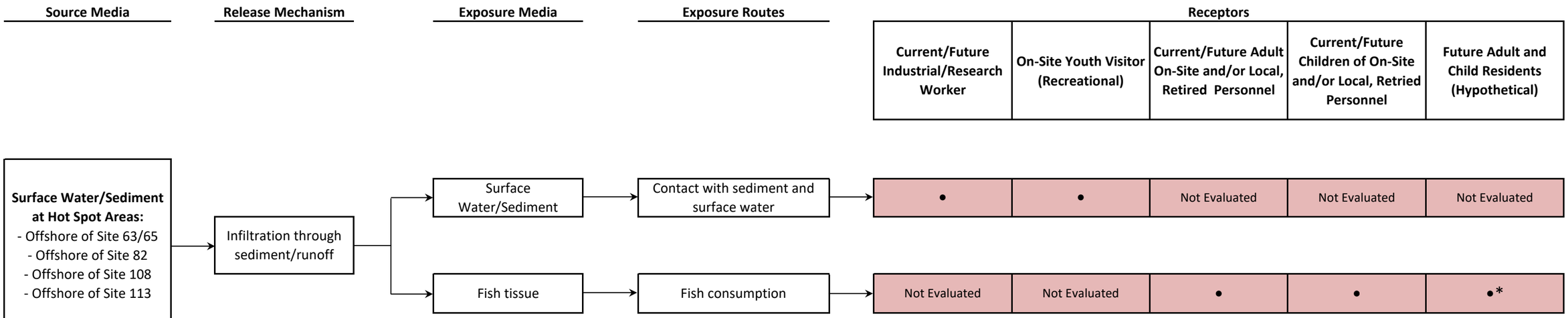
N
0 75 150 Feet
0 25 50 Meters

Picatinny Arsenal
Morris County,
New Jersey

Figure 10
Sediment Exceedances at
Offshore of Site 113
Proposed Plan for Picatinny Lake
Site 53 (PICA-057)

10/20/2021

Y:\Picatinny\MXD\MAMMS_2019\Lakes\ROD\Picatinny_Lake_Sed_Results_Offshore113.mxd



•	Indicates pathway is potentially complete.
*	Future Only.

Figure 11
Human Health Conceptual Site Model
Picatinny Lake - Site 053 (PICA-057)
Picatinny Arsenal
Morris County, New Jersey

FIGURE 12 tL/ !¢Lbb¸ [!Y9 SITE 53 (PICA-057) {9[9/¢95 w9a95¸π{95La9b¢ / ! t tLbD

SEDIMENT CAPPING

1. PREPARATION AND TRANSPORT OF CAP MATERIAL

Capping material would be transported & mixed per design

- Bench scale testing during design
- Sand and/or stone as a physical barrier
- Small amounts of organoclay or carbon to encourage sequestering of metals

2. CAPPING

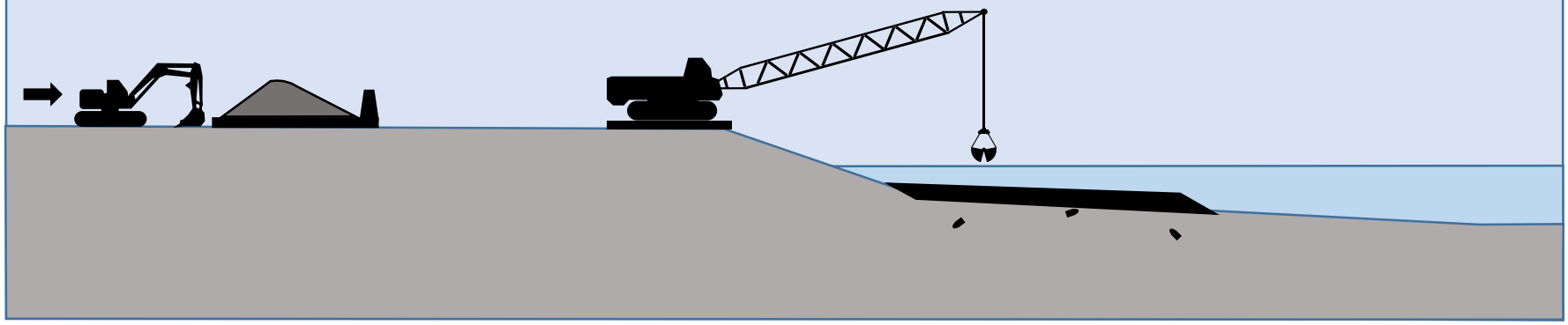
Underwater sediment capping would likely include:

- Pre-survey to establish bottom elevation
- Placement of cap layer (nominally 1 ft.)
- Additional efforts to improved cap stability (i.e., sloping, coir logs, or plantings)

3. Long-Term Monitoring and Maintenance

Long-Term Monitoring and Maintenance would likely include:

- Periodic survey and inspection of cap
- Monitoring of cap thickness and fish tissue sampling
- LUCs preventing cap disturbance.



APPENDIX A
USEPA AND NJDEP PROPOSED PLAN CONCURRENCE LETTERS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

July 12, 2021

LTC Samuel W. Morgan III
Garrison Commander
Department of the Army
Installation Management Command Headquarters
Picatinny Arsenal, New Jersey 07806-5000

Re: Final Proposed Plan for Picatinny Lake, Site 53 (PICA-057), Picatinny Arsenal, New Jersey

Dear LTC Morgan:

The purpose of this letter is to notify the U.S. Army that the U.S. Environmental Protection Agency (EPA) has reviewed the Proposed Remedial Action Plan (PRAP) dated March, 2021, for Picatinny Lake (Site 54, PICA-057) at Picatinny Arsenal, a federal facility listed on the National Priorities List. The PRAP proposes a response action pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended (CERCLA), 42 U.S.C. §9601 *et seq.,* and by this letter I am notifying the U.S. Army that EPA concurs with the release of the PRAP for public review and comment.

The proposed preferred remedial action for this site is ***Alternative 4: Sediment Capping.*** This remedial action includes:

- Capping of contaminated sediment via the placement of an engineered barrier at hot spots with concentrations of mercury, lead, copper and silver that exceed established cleanup levels. Capping will be preceded by bench scale testing and further delineation of hot spot areas.

- Maintenance and monitoring of the placed cap, and land use controls to maintain cap effectiveness, including limits on dredging, excavation and shallow water training that would disturb the cap material.

- Land Use Controls to control exposures to fish tissue until the achievement of fish tissue mercury concentrations at or below state-wide background levels.

The preferred remedy will achieve the Remedial Action Objectives developed for the site by eliminating future exposures of silver, lead, copper and mercury to ecological receptors, and contributing to reducing sediment concentrations of mercury as a means of contributing to lower fish tissue mercury concentrations.

EPA will make a final determination on the selection of the final remedy after the close of the public comment period for the Proposed Plan, and when we have completed our review of the comments, the response to the comments, and the draft Record of Decision.

If you have any questions regarding the subject of this letter, please contact me at 212-637-4447, or your staff may contact Sharon Hartzell, EPA Project Manager, at 212-637-4132.

Sincerely,

Evangelista, Pat
Digitally signed by Evangelista, Pat
Date: 2021.07.12 14:52:09 -04'00'

Pat Evangelista, Director
Superfund and Emergency Management Division

cc: Mark J. Pedersen, Assistant Commissioner, NJDEP

bcc: Scott Vondy, NJDEP
Paul Reibel, Picatinny Arsenal

State of New Jersey

PHILIP D. MURPHY
Governor

SHEILA Y. OLIVER
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Site Remediation and Waste Management Program
401 East State Street
Mail Code 401-406
P.O. Box 420
Trenton, New Jersey 08625-0420
Telephone: 609-292-1250

SHAWN M. LATOURRETTE
Acting Commissioner

April 15, 2021

Pat Evangelista, Director
Superfund and Emergency Management Division
U.S. Environmental Protection Agency Region II
290 Broadway
New York, NY 10007

RE: Picatinny Arsenal Superfund Site – Picatinny Lake (Site 53) Proposed Plan

Dear Mr. Evangelista:

The New Jersey Department of Environmental Protection (Department) has completed its review of the Final Proposed Plan for Picatinny Arsenal's Picatinny Lake (Site 53) dated March 2021. The Department concurs with the preferred alternative, which consists of the following:

- Sediment capping of hotspots near source sites 63/65, 82, 108, and 103 that are located along the shoreline to prevent risk to benthic communities. Historical operations at these sites include explosives manufacturing, loading and storage, shell washout, and research and development. The potential for Munitions of Explosive Concern (MEC) is being considered separately under the Military Munitions Response Program with oversight by the Department's Emergency Management Program.
- MEC clearance of land-side staging and access areas, post-construction sampling to evaluate cap thickness, and ongoing fish tissue sampling.
- Monitoring and land use controls.

The Department looks forward to working with the EPA and the Army on the issuance of a Record of Decision and remediation of Picatinny Lake.

Sincerely,

Mark J. Pedersen
Assistant Commissioner

cc: Sharon Hartzell, USEPA
Christopher Gallo, USEPA
Paul Reibel, Picatinny Arsenal

APPENDIX B
COMMUNITY PARTICIPATION DOCUMENTATION

PROOF OF PUBLICATION

NJ SL Legal Dsp Ag

Star Ledger

LEGAL AFFIDAVIT

AD#: 0009919316 Total $270.32

State of New Jersey,) ss
County of Middlesex)

[redacted] being duly sworn, deposes that he/she is principal clerk of NJ Advance Media; that Star Ledger is a public newspaper, with general circulation in Atlantic, Burlington, Cape May, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, and Warren Counties, and this notice is an accurate and true copy of this notice as printed in said newspaper, was printed and published in the regular edition and issue of said newspaper on the following date(s):

Star Ledger 03/25/2021

[redacted]

Principal Clerk of the Publisher

Sworn to and subscribed before me this 29th day of March 2021

[redacted]

Notary Public

[redacted]
Notary Public
New Jersey
My Commission Expires November 13, 2022
No. 50071877

PUBLIC NOTICE

U.S. ARMY INVITES PUBLIC COMMENT ON PROPOSED PLAN FOR SITE 53 (PICA-057) PICATINNY LAKE

PROPOSED PLAN FOR PICATINNY LAKE

The US Army's Environmental Program at Picatinny Arsenal invites public comment on a Proposed Plan for Picatinny Lake, a 183-acre area located in the southern portion of Picatinny Arsenal. Picatinny Lake is approximately a 108-acre man-made lake with a maximum depth of 15 feet. Surface water flows from Lake Denmark to Burnt Meadow Brook to Green Pond Brook to Picatinny Lake. Water from Picatinny Lake is no longer used as a potable source. Many active, inactive, and demolished buildings surround Picatinny Lake. Surrounding land use includes propellant and munitions research and development, production, storage, and chemical laboratories. The area was formerly used as an operational range with a portion used for recreational trap and skeet shooting. Extensive environmental investigations have found unacceptable ecological risks in sediment to bottom-dwelling organisms due to the presence of metals in specific areas in Picatinny Lake.

The Army evaluated four alternatives for addressing the sediment hotspots at Picatinny Lake including (1) no action; (2) land use controls; (3a) removal via mechanical dredging; (3b) removal by hydraulic dredging; and, (4) sediment capping. The Army's preferred response is alternative 4: sediment capping. Contaminated sediment would be capped to reduce future exposure to ecological receptors and reducing sediment exposures will possibly contribute to lower fish tissue concentrations in the future. The cap would require maintenance and monitoring (i.e. cap stability), fish tissue samples would be collected, and land use controls would be implemented to maintain effectiveness. The estimated cost of the preferred response is $3,100,000.

Proposed Plan Public Meeting

The Army invites the public to attend a meeting on **Thursday, March 31, 2021, 7:30 p.m.** Due to current pandemic restrictions, the meeting will be a virtual online meeting through Microsoft Teams. For information on joining the meeting online or by phone, contact [redacted]

Written Comments

Copies of the Feasibility Study, Remedial Investigation, and the Proposed Plan for Picatinny Lake are available for public review on Picatinny's environmental web site at www.pica.army.mil/envrestore. The documents are also available at the Rockaway Township Library (61 Mount Hope Road) and Morris County Library (30 East Hanover Avenue, Whippany) (please check with the libraries for operating hours). In addition, you can have the Proposed Plan emailed to you by contacting Mr. [redacted] by email at [redacted].

The public may submit written comments during the 30-day comment period (**March 31 to April 30, 2021**). Comments must be postmarked by April 30, 2021 and sent to [redacted], U.S. Army Garrison, Picatinny Arsenal, AMIM-PIP-E, Building 3002, Picatinny Arsenal, NJ, 07806-5000 or by email to [redacted]

10-9159166

3/25/21 $180.32

AFFIDAVIT OF PUBLICATION

Publisher's Fee $47.30 Affidavit $35.00

STATE OF WISCONSIN
Brown County

Personally appeared [redacted] at County of Brown, State of Wisconsin.

Of the **Daily Record,** newspaper printed in Freehold, New Jersey and published in Parsippany, in State of New Jersey and County of Morris, and of general circulation in Morris County, who being duly sworn, deposeth and saith that the advertisement of which the annexed is a true copy, has been published in the said newspaper 1 times, once in each issue as follows:

03/24/2021 **A.D 2021**

[redacted]

Notary Public State of Wisconsin County of Brown

5.15.23

My commission expires

[redacted]
Notary Public
State of Wisconsin

PUBLIC NOTICE
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($47.30)

0004655938-01

TRANSCRIPT OF AND PRESENTATION FROM MARCH 31, 2021 PUBLIC MEETING

Picatinny Arsenal Installation Restoration Program
Public Meeting Transcript For
Proposed Plan for Picatinny Lake, Site 53 (PICA-057)
Thursday, March 31, 2021

Meeting Format

Due to COVID-19 pandemic restrictions and concerns, the meeting was held using a virtual format. Members of the public, the Restoration Advisory Board, and other stakeholders were invited to join the meeting via Microsoft Teams by utilizing a link to connect with video and audio or to dial a call-in number to connect by phone for audio capability. Copies of the Proposed Plan and the presentation used for the meeting were made available prior to the meeting. The Proposed Plan meeting immediately followed a Restoration Advisory Board meeting.

The meeting opened at 7:45 p.m.

Introduction by Mr. [redacted]

Good evening. I'm [redacted] with Picatinny Arsenal's Public Affairs Office and the moderator of tonight's meeting. On behalf of the U.S. Army, I'd like to thank you for attending this meeting, which is a critical part of our environmental restoration program.

We are conducting this meeting virtually, and I welcome any comments and suggestions on the conduct of this type of meeting to help us next time.

In order for the audio of this meeting to function as effectively as possible, we may at times mute everyone but the speaker. However, as a general rule of thumb for virtual meetings, we ask that you check to be sure you are muted when you are not speaking. This can reduce background noise and help the sound quality tremendously.

Please be aware that this meeting is being recorded so that we can provide a transcript later.

The first thing I would like to do is to conduct a roll call. I will begin by calling the names of our participants. Please unmute yourself when you speak and mute yourself again after you are done:

From the U.S. Environmental Protection Agency:

- [redacted] (present)
- [redacted] (present)
- [redacted] (present)

From the New Jersey Department of Environmental Protection

- [redacted] (present)

Are there any other representatives from the EPA in attendance?

From the Army team, we have LTC [redacted]. Colonel [redacted], do you have any comments for the group.

LTC [redacted]: Thank you, [redacted]. I want to thank everyone for attending. This is my third environmental public meeting since taking Command of the Garrison last summer, and I'm always impressed with the thoughtful level of analysis put into the presentations, particularly the presenters' ability to present the information in a way that is understandable to those such as myself with a limited environmental background. Thank you.

([redacted] encountered technical difficulties and was temporarily disconnected from the meeting.)

Ms. [redacted]: [redacted] was next going to welcome all the Restoration Advisory Board members and any members of the general public who have joined the meeting. Next, we'll have [redacted] start the presentation.

Presentation by [redacted], Weston Solutions Project Manager, Army Contractor

The purpose of the meeting tonight is to invite the public to comment on the proposed cleanup of Picatinny Lake. The 30-day comment period begins today, March 31, and runs through April 30. Additional information on how the public can submit comments will be provided at the end of this presentation.

These are the topics I'll be covering tonight: the CERCLA (Comprehensive Environmental Response, Compensation and Liability Act) Process, Site Information and Field Investigations, the Risk Assessment results, Remedial Action Objectives, Remedial Alternatives, the Recommended Alternative, and the Public Comment Period Information.

The CERCLA process starts with Site Discovery and then moves to the Preliminary Assessment and Site Inspection. The Remedial Investigation consists of the field work done to determine the nature and extent of contamination at a site, along with risk assessments to evaluate the levels of contamination. The Feasibility Study is where goals are established for cleanup, and alternatives are evaluated to address those goals. Currently, we are at the Proposed Plan stage for this site. The Proposed Plan summarizes the Remedial Investigation and Feasibility Study and presents the recommended alternative for public comment. The next step is the Record of Decision which is a legal document that formalizes the selected alternative. The Remedial Design and Remedial Action phases address the construction and implementation of the selected alternative.

We will have a question and comment time at the end, but if anyone has any questions as I go through the presentation, feel free to raise your hand or speak up.

Picatinny Lake was constructed in the 1880s by the damming of Green Pond Brook. It is approximately 108 acres and has a storage capacity of approximately 165 million gallons. There is a maximum depth of 15 feet in the Lake. The Lake is centrally located at Picatinny and is entirely located within Area I of the Arsenal.

Several investigations have been conducted at and around Picatinny Lake over the years, starting as far back as 1976 and most recently in 2016. Those investigations have included surface water and sediment sampling, surface soil sampling around the Lake, fish tissue sampling, geophysical surveys and intrusive investigations for munitions and explosives of concern or MEC. It should be noted that soil around the Lake and potential hazards associated with munitions and explosives of concern and munitions constituents (MC) are not being addressed as part of this project and the Proposed Plan we are discussing. Soil around Picatinny Lake is addressed under several land-based sites located in Area I. The MEC and MC are being separately addressed under the Military Munitions Response Program, specifically Munitions Response Site PICA-008-R-01.

Field investigations have been conducted for quite some time. Lake-wide sampling of surface water and sediment was conducted between 1995 and 2001. Results from the Lake-wide sampling identified five locations with elevated concentrations of metals in sediment. As shown on this map, the five locations were off-shore land sites. There was additional follow-on sampling conducted at the five sites between 2011 and 2016 to support the risk assessment and bound the sediment hot spots.

The follow-on sampling conducted in 2016 at Site 157 determined sediment remediation is not necessary at this location. Site 157 is being addressed separately under the Group 1 Long-Term Monitoring Program due to some intermittent detections of RDX.

Based on all the sampling conducted, this Proposed Plan addresses the overall (Lake-wide) sediment and surface water of Picatinny Lake and the sediment from the four hotspots located along the shoreline. Those four hotspot locations are presented on this figure by the yellow polygons that are offshore—63/65, 82, 108 and 113.

The analytes detected in sediment above levels of concern during the sampling were volatile organic compounds, semi-volatile organic compounds, explosives, pesticides, and metals. The analytes detected in surface water above levels of concern were metals, volatile organic compounds, semi-volatile organic compounds, pesticides, explosives, propellant, sulfide and cyanide. It is important to note that none of the chemicals in surface water were identified as driving risk, and the metals detected in sediment were the risk drivers based on the Remedial Investigation.

We are now going to dig into the four hotspot locations I mentioned. This graphic shows the sediment exceedances offshore of Site 63/65. The red triangles are the historical sediment samples where metals exceeded the preliminary remedial goal. The red circles

are the 2016 sampling locations where metals exceeded the preliminary remedial goal. Copper, mercury and silver were the metals detected above the preliminary remedial goal, and the metals were detected in the 0.0 to 0.5 foot depth interval. The black lines show the identified hotspot; the dashed areas are approximate boundaries of the metal contamination, and those areas will be further delineated as part of the Remedial Design phase.

This graphic shows the sediment exceedances offshore of Site 82. Again, the red triangles are the historical sediment samples with metal exceedances, and the red circles are the 2016 sampling locations with metal exceedances. Silver was the only metal detected above the preliminary remedial goal at this site, and it was detected in the top 2 feet of sediment. The black lines show the hotspot area, and the dashed lines indicate where further delineation will be conducted as part of the Remedial Design phase.

This graphic shows the sediment exceedances offshore of Site 108. Again, the red triangles are the historical sediment samples with metal exceedances, and the red circles are the 2016 sampling locations with metal exceedances. At this site copper, lead, mercury, and silver were detected above the preliminary remedial goal; the contamination in this area was generally in the top six inches of sediment; however, some contamination was as deep at two feet in some locations. There are also some dashed lines at this site where further delineation is required during the Remedial Design phase.

This graphic shows the sediment exceedances at the fourth location offshore of Site 113. Copper, mercury, and silver were detected above the preliminary remedial goal. The depth of contamination was generally in the top six inches of sediment; however, contamination was identified as deep at two feet in some locations. There are also some dashed lines at this site where further delineation is required during the Remedial Design phase.

Any questions on the slides on these four specific sites?

As I mentioned earlier, there was also a fish tissue evaluation conducted and the results are presented on this slide to the right. Analytical results from the Lakes and Brook Surface Water Area fish tissue sampling events were used to assess potential risk to human health from fish consumption. The evaluation found potential cancer risks for the current use receptors were within the acceptable risk range; some non-cancer hazards were greater than 1, and thus posed a risk, due to mercury and PCBs in fish tissue. There are currently controls in place to limit consumption of fish from the Lake.

As part of the Remedial Investigation, Human Health and Ecological Risk Assessments were conducted. The Human Health Risk Assessment determined that human health risks were within the acceptable range for exposures to surface water and sediment in Picatinny Lake, but as I mentioned earlier, the non-cancer hazard index for fish consumption was greater than the threshold of 1, specifically for a child of on-site Army personnel. A hazard index greater than 1 indicates an unacceptable risk. The Ecological Risk Assessment determined that contaminants of concern in sediment, surface water,

and fish tissue do not pose unacceptable Lake-wide risks to ecological receptors. However, the sediment hotspots discussed earlier may potentially pose risks to benthos (organisms which live in the Lake bottom).

Based on all the sampling results and the Risk Assessments, the Feasibility Study developed Remedial Action Objectives to address the risks. The Remedial Action Objectives developed to address unacceptable risk to human health include reducing sediment concentrations at four hotspot locations that may potentially contribute mercury to fish tissue as a means of reducing fish tissue concentrations to below or at state-wide background levels, and reducing to the extent practicable the consumption of fish with elevated concentrations of mercury. The Remedial Action Objective developed to address potential ecological risk was to eliminate exposures to sediment at four hotspot locations to protect the benthic invertebrates. The chart at the bottom of this slide shows the contaminants of concern above the preliminary remedial goal at the four hotspot locations.

The Feasibility Study evaluated Remedial Alternatives; there were five that were evaluated. Alternative 1 is No Action which is required by law and is evaluated to provide a baseline for evaluation of the other alternatives. Alternative 2 is Land Use Controls. Alternative 3(a) is Sediment Removal via Mechanical Dredging and Land Use Controls. Alternative 3(b) is Sediment Removal via Hydraulic Dredging and Land Use Controls. Alternative 4 is Sediment Capping.

As required by CERCLA, the alternatives were evaluated against seven criteria in the Feasibility Study: overall protection of human health and the environment; compliance with applicable or relevant and appropriate requirements; long-term effectiveness and permanence; reduction of toxicity, mobility, and volume through treatment; short-term effectiveness; implementability; and, cost.

This chart summarizes that evaluation evaluation. All alternatives need to pass the first two criteria, referred to as threshold criteria, in order to be considered a viable alternative. Alternatives 1 and 2 both failed the screening criteria. With the exception of cost, the other criteria are balancing criteria, and are rated between 1 and 4, with 1 being the most favorable and 4 being the least favorable. Looking at long-term effectiveness and permanence and the reduction of toxicity, mobility, and volume through treatment, both the dredging options were rated a little higher than the sediment capping alternative. For short-term effectiveness and implementability, sediment capping was rated higher than the dredging alternatives. Looking at cost, removal via hydraulic dredging was estimated to be the highest cost to implement whereas sediment capping was estimated to be the most cost effective.

The remaining two criteria, State and Community Acceptance, are evaluated now during the public comment period.

The preferred response action is Alternative 4, Sediment Capping. This alternative was determined to be effective at reducing ecological and human health risks. It would avoid

short-term risks associated with re-suspending contaminated sediments and short-term hazards associated with the potential for encountering unexploded ordnance which could occur during dredging. It is also easily implemented compared to dredging and is cost effective. It would also achieve the Remedial Action Objectives by providing a barrier to prevent exposure to localized contaminated sediment.

This is a summary of what the sediment capping alternative would entail. The first phase would include preparation and transport of the cap materials. Bench-scale testing would be performed during the design phase. Sand and/or stone would likely be used as the physical barrier, as well as small amounts of organoclay or carbon to further prevent migration. The second phase would be the capping itself, including a pre-survey to establish the bottom elevation of the hotspot areas, placement of the capping materials, and additional efforts to promote cap stability. Following the capping, long-term monitoring and maintenance would be conducted which would likely include periodic surveys and cap inspections, chemical monitoring of the cap and biota, and land use controls to prevent disturbance of the cap.

Copies of the Feasibility Study and Proposed Plan are available for review at the Environmental Affairs Division at Picatinny with advance contact through [redacted] ([redacted]). They can also be found on the Picatinny Environmental Restoration Web Page at https://www.pica.army.mil/envRestore/PublicNotice.aspx. Additionally, copies of the Proposed Plan are available at two public libraries: Rockaway Township Library, (973) 627-2344, 61 Mount Hope Road, Rockaway Township, NJ 07866, and the Morris County Library, (973) 285-6930, 30 East Hanover Avenue, Whippany, NJ 07981.

Written comments will be accepted until April 30, 2021 and can be sent to [redacted], Project Manager for Environmental Restoration, US Army Garrison, Picatinny Arsenal AMIM-PIP-E, Building 3002, Picatinny Arsenal, NJ 07806-5000 or emailed to: [redacted]. Verbal comments during this meeting will be included in the meeting minutes and in the Responsiveness Summary included in the Record of Decision, as applicable.

Comments and Questions Moderated by Mr. Tim Rider

Before we open the floor for public comments or questions, we'd like to let you hear from the regulatory agencies. First, Mr. [redacted] from the U.S. Environmental Protection Agency.

Mr. [redacted]: EPA wants to reiterate that we are in concurrence with the Proposed Plan and alternative at this time; EPA's management chain is still reviewing, but EPA was in agreement to proceed with the public meeting. The actual remedy will not be selected until the Record of Decision, after the public comment period.

Thank you, [redacted]. Next, [redacted] from the New Jersey Department of Environmental Protection.

Mr. [redacted]: NJDEP provided informal approval last week and will provide formal concurrence with the Proposed Plan in the next week or so

Thank you, [redacted]

Now, I'd like to open the floor to any public comments or questions.

Please give me a moment to see if there were any questions submitted in Teams Chat. No questions are in Chat at this time.

Next, if you are in Teams and if you have a question, please use the hand raising function with the hand icon near the bottom of your screen, and I will call on you. Please make sure you are un-muted.

Mr. [redacted] (former Project Manager, Picatinny Environmental Restoration Program): I will be providing comments on the Proposed Plan. My general concern is there is no unacceptable risk; there is no reason to do this remediation. It has not been shown in the Feasibility Study, or in the Proposed Plan which summarized the Feasibility Study, that there is unacceptable risk. It seems like you are adding sediment over the benthic life you are trying to protect. The Proposed Plan on page 4 says "although resulting risks are in the generally acceptable risk range for Picatinny as a whole, US EPA and NJDEP expressed concern." There is no regulatory requirement to be doing this. I am going to be asking the Army to talk with the Natural Resources Manager and ask the Fishing Club of Picatinny if there are any fish that seem to be impacted by how they are living in Lake Picatinny that is different than the EOD Pond or Lake Denmark, both of which have a Record of Decision for no further action. There is no unacceptable risk here. It seems to be a stretch to do this action, tying up the installation with the project, getting the materials, and monitoring this forever when it should be treated the same as the EOD Pond and Lake Denmark—no further action with monitoring of land use controls. There are a lot of statements in the Proposed Plan which contradict each other regarding risk. That is my general comment as a member of the public that you will be receiving in writing.

Mr. [redacted]: Has the U.S. Public Health Command (formerly called CHPMM) approved this cleanup plan?

Mr. [redacted]: I will find out and respond to this question.

Ms. [redacted]: I know the Public Health Command reviews and approves risk assessments, but I don't believe they have an active role in remedies; but, we will certainly look into this question.

Any other questions or comments?

Mr. [redacted], Restoration Advisory Board Community Co-Chair: I am familiar with capping on land but not as familiar with capping under water; can you provide a

little more detail such as is it gravel or stone and how do you keep it from eroding. These contaminants are not going to go away so it seems like we are encapsulating them forever.

[redacted], **U.S. Army Corps of Engineers:** The material would be placed on the areas by some type of excavator and it will be sand and gravel, based on the bench-scale study that would determine the proper material to be used. It would encapsulate the material. The site would be monitored to make sure the cap is still functioning; a survey would be conducted periodically to validate the cap is still in place as designed.

Any other comments or questions at this time?

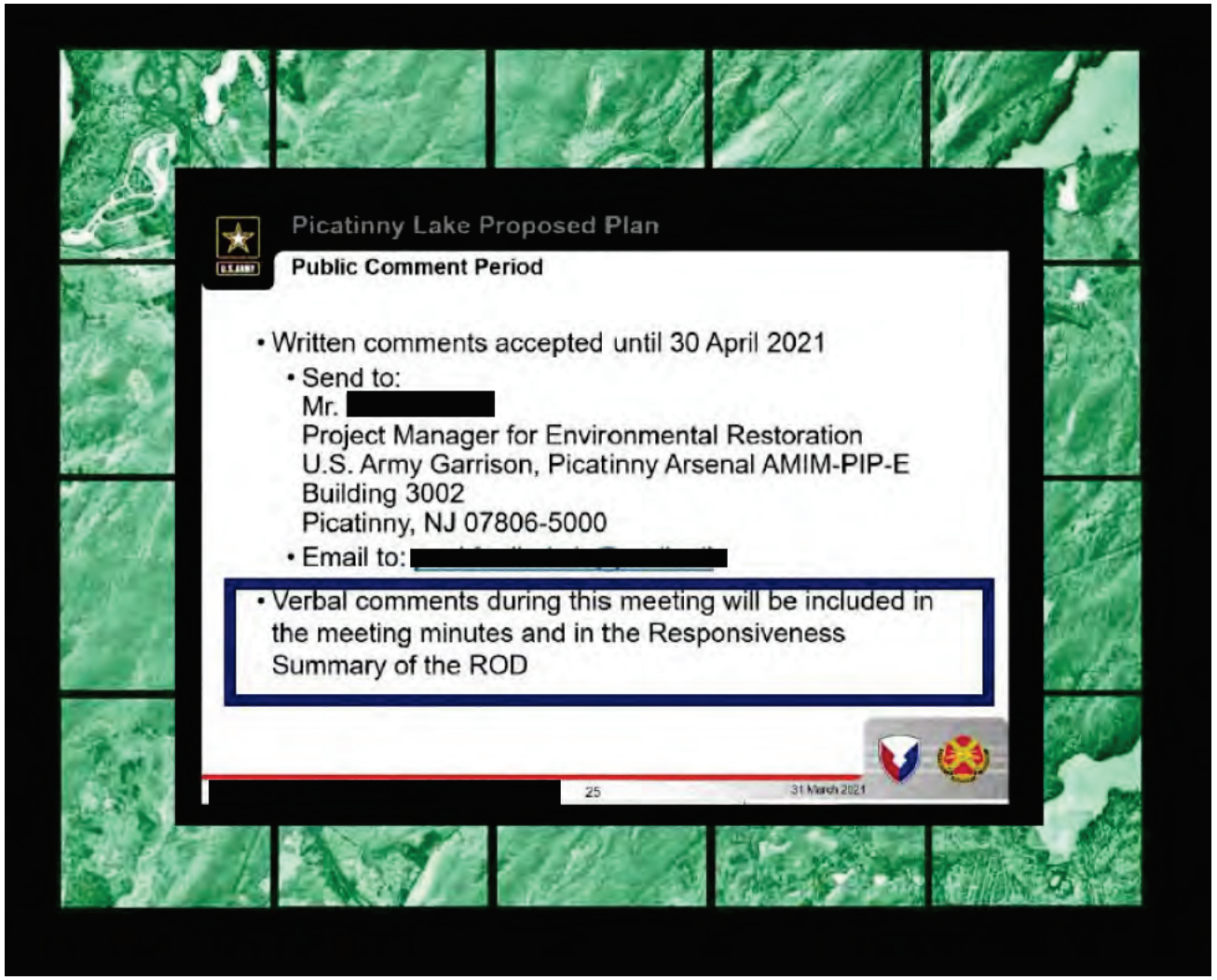
I'd like to introduce the rest of the Army team which I was not able to do when I was disconnected. From Picatinny Arsenal, [redacted] and [redacted], and [redacted], an on-site contractor from the Environmental Research Group. We also have [redacted] from the U.S. Army Corps of Engineers and [redacted] from the Army Environmental Command.

Hearing none, we'll conclude the meeting. As a reminder, you have until April 30 to submit any additional comments. Again, we appreciate your taking the time to attend and provide your input.

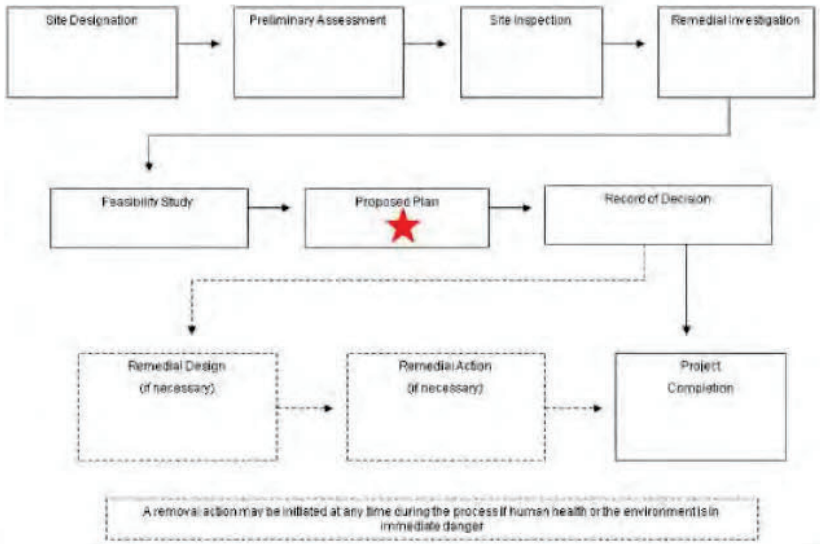
The meeting ended at 8:27 p.m.

[redacted]
Katrina Harris
Meeting Recorder

Attachment: Power Point Presentation


Picatinny Lake Proposed Plan
Public Comment Period
• Written comments accepted until 30 April 2021
• Send to:
Mr. [redacted]
Project Manager for Environmental Restoration
U.S. Army Garrison, Picatinny Arsenal AMIM-PIP-E
Building 3002
Picatinny, NJ 07806-5000
• Email to: [redacted]
• Verbal comments during this meeting will be included in the meeting minutes and in the Responsiveness Summary of the ROD
25
31 March 2021

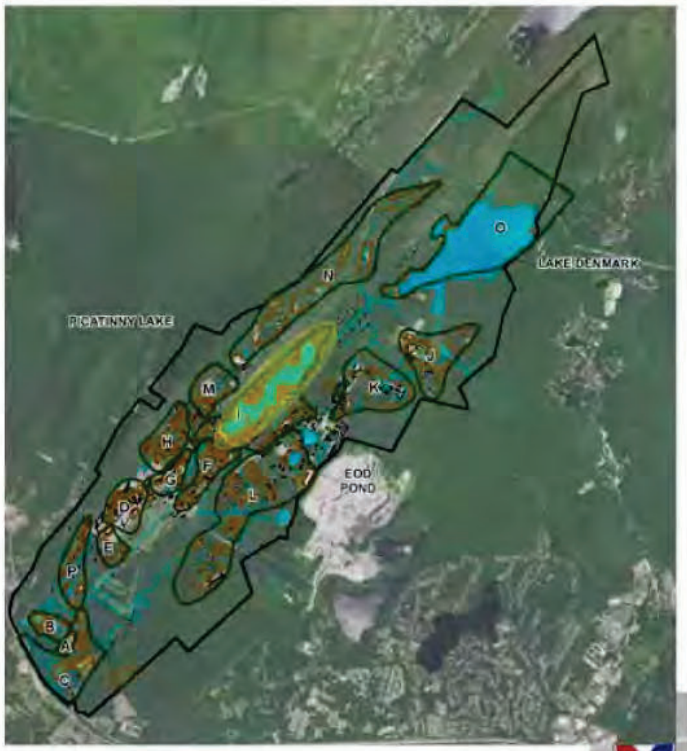
CERCLA Process



Picatinny Lake Proposed Plan

Site Information:

- Picatinny Lake is a ~108-acre man-made lake with a storage capacity of ~165 million gallons and maximum depth of 15 feet
- Constructed in the 1880s by the damming of Green Pond Brook
- Located entirely within *"Area I"* at Picatinny Arsenal



Site Information:

- Numerous investigations conducted at Picatinny Lake between 1976 and 2016
  - Surface water and sediment sampling
  - Surface soil sampling of on-land areas
  - Fish tissue sampling
  - Geophysical surveys and intrusive investigations
- Soil located around Picatinny Lake addressed under land-based sites located in Area I
- Munitions and explosives of concern (MEC) and munitions constituents (MC) addressed under Military Munitions Response Program (MMRP) Munitions Response Site (MRS) PICA-008-R-01

Picatinny Lake Proposed Plan

Field Investigations:

- Lake-wide sampling: 1995-2011
- 5 locations found with high sediment levels (offshore of land sites 63/65, 82, 108, 113, and 157)
- Additional sediment sampling between 2011 & 2016 to support the project



Picatinny Lake Proposed Plan

Field Investigations:

- 2016 sampling offshore of Site 157 determined sediment remediation is not necessary
- Site 157 being addressed separately under the Group 1 Long-Term Monitoring Program due to intermittent detections of RDX



Picatinny Lake Proposed Plan

The Picatinny Lake Proposed Plan addresses:

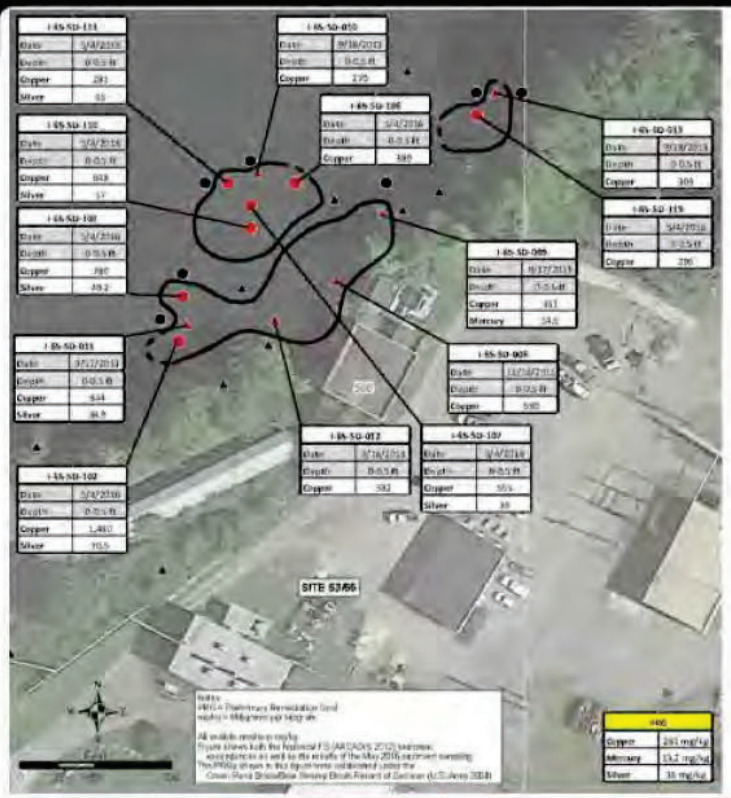
- Overall (lake-wide) sediment and surface water of Picatinny Lake
- Sediment from four sites located along the shoreline of Picatinny Lake



Overall (lake-wide) sediment and surface water detections above Levels of Concern (LOCs)

- **Sediment**
  - VOCs: Acetone, Toluene, Methylene Chloride
  - SVOCs: 22 SVOCs, primarily PAHs
  - Explosives: RDX, TNT
  - Pesticides: 4,4-dichlorodiphenyl-dichloroethane (DDD), 4,4-dichlorodiphenyl-dichloroethylene (DDE), 4,4-dichlorodiphenyl-trichloroethane (DDT), Endosulfan sulfate, Mirex
  - Metals: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Silver, Strontium, Zinc
- **Surface Water**
  - Metals: Aluminum, Cadmium, Chromium, Copper, Lead, Manganese, Mercury, Silver
  - VOCs: Methylene Chloride
  - SVOCs: Bis(2-ethylhexyl)Phthalate
  - Pesticides: Alpha Benzene Hexachloride (BHC)
  - Explosives: 2,4-Dinitrotoluene, RDX, TNT
  - Propellant: Nitroglycerine
  - Other: Sulfide, Cyanide
  - None of the chemicals in surface water were identified as driving risk.

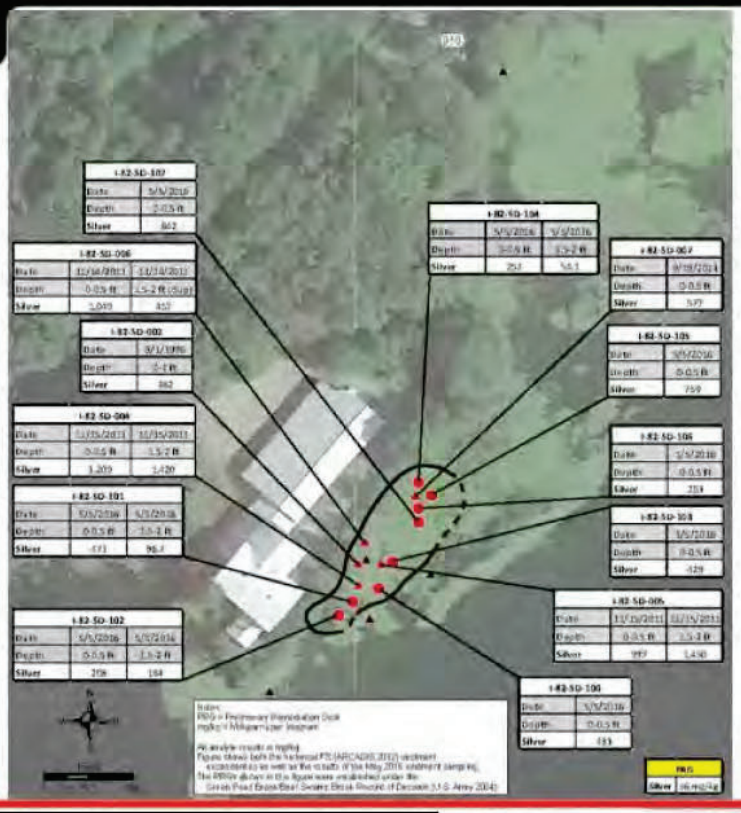
Picatinny Lake Proposed Plan



Sediment Exceedances Offshore of Site 63/65

- Three sediment hotspot locations identified
- Copper, mercury, and silver detected in sediment above preliminary remedial goal (PRG) in 0.0-0.5 feet depth interval
- Dashed areas will be further delineated as part of the remedial design

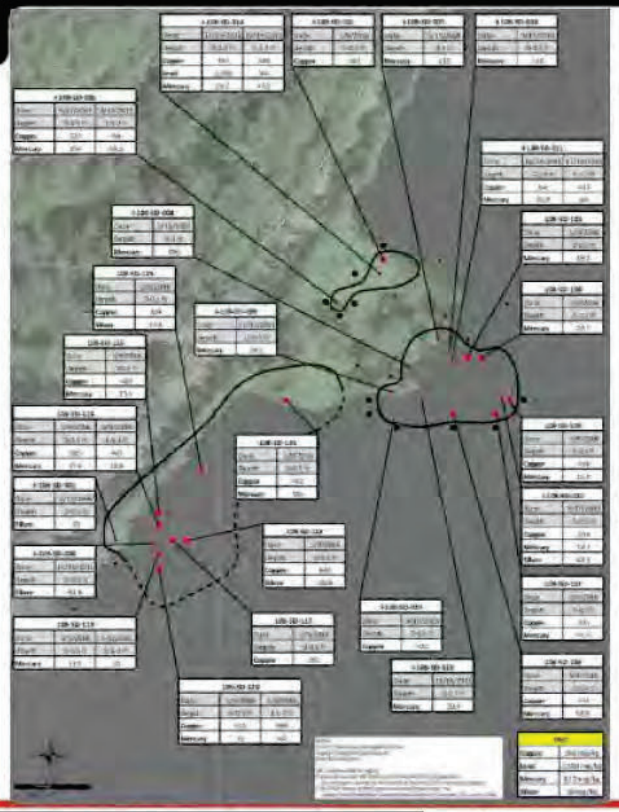
Picatinny Lake Proposed Plan



Sediment Exceedances Offshore of Site 82

- One sediment hotspot identified
- Silver detected above PRG in top 2.0 feet of sediment
- Dashed areas will be further delineated as part of the remedial design

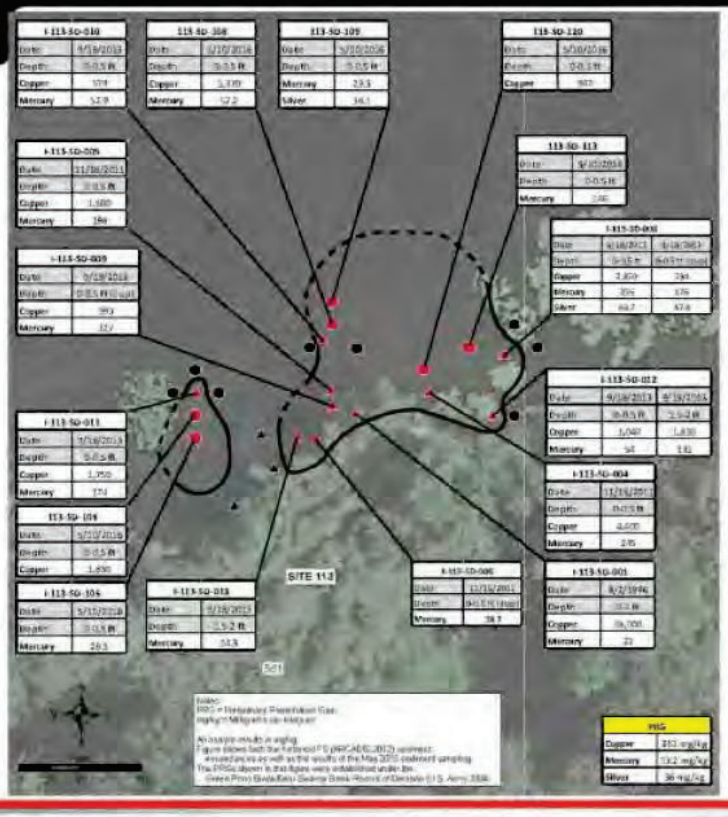
Picatinny Lake Proposed Plan



Sediment Exceedances Offshore of Site 108

- Three sediment hotspot locations identified
- Copper, lead, mercury, and silver detected in sediment above PRG. Depth of contamination generally in top 0.5 feet of sediment; however, contamination as deep as 2.0 feet in some locations
- Dashed areas will be further delineated as part of the remedial design

Picatinny Lake Proposed Plan



Sediment Exceedances Offshore of Site 113

- Two sediment hotspot locations identified
- Copper, mercury, and silver detected in sediment above PRG. Depth of contamination generally in top 0.5 feet of sediment; however, contamination as deep as 2.0 feet in some locations
- Dashed areas will be further delineated as part of the remedial design

Fish Tissue Evaluation

- Data from Lakes and Brook Surface Water Area fish tissue sampling events were used
- Conducted to evaluate human health risks from fish consumption
- Potential cancer risks for the current use receptors were within acceptable risk range; however, some of the non-cancer hazards were greater than 1 due to presence of mercury and PCBs in fish tissue

Human Health Risk Assessment Conclusions for Fish Consumption

Fish Species	Adult Army Personnel		Child of Army Personnel	
	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
Brown Bullhead	NE	≤1	NE	1
Black Crappie	NE	2 (mercury)	NE	4 (mercury)
Carp	6E-6	≤1	3E-6	1
Chain Pickerel	3E-5	3 (mercury)	1E-05	5 (mercury)
Largemouth Bass	3E-5	4 (mercury)	1E-05	8 (mercury, PCBs)
Yellow Perch	4E-5	2 (mercury)	2E-05	5 (mercury, PCBs)

Notes:
NE = Not evaluated as there were no carcinogenic COPCs in fish tissue

Risk Assessment Results

- **Human Health Risk Assessment**
  - Human health risks within acceptable risk range for exposures to sediment and surface water in Picatinny Lake
  - Noncancer hazard index for fish consumption greater than the threshold of 1 for child of onsite Army personnel receptor, indicating unacceptable risk
- **Ecological Risk Assessment (ERA)**
  - Contaminants of concern in sediment, surface water, and fish do not pose unacceptable lake-wide risks to ecological receptors
  - However, sediment hotspots offshore of Sites 63/65, 82, 108, and 113 may potentially pose risks to benthos due to elevated metals concentrations (copper, lead, mercury, and silver)

Remedial Action Objectives (RAOs)

RAOs to address the unacceptable risk to human health from exposure due to the consumption of fish tissue include:

- Reduce sediment concentrations at four hotspot locations that may potentially contribute mercury to fish tissue, as a means of reducing fish tissue concentrations to or below state-wide background levels.
- Reduce to the extent practicable the consumption of fish with elevated concentrations of mercury.

Based on protection of ecological receptors, the RAOs include:

- Eliminate exposures to sediment at four hotspot locations with COCs above PRGs for the protection of benthic invertebrates:

Site	COCs
Offshore of Site 63/65	Copper, Mercury, Silver
Offshore of Site 82	Silver
Offshore of Site 108	Copper, Lead, Mercury, Silver
Offshore of Site 113	Copper, Mercury, Silver

Remedial Alternatives

Picatinny Lake Feasibility Study finalized in December 2016

- **Alternative 1: No Action**
- **Alternative 2: Land Use Controls (LUCs)**
- **Alternative 3A: Removal via Mechanical Dredging and LUCs**
- **Alternative 3B: Removal via Hydraulic Dredging and LUCs**
- **Alternative 4: Sediment Capping**

Remedial Alternatives Evaluation

As required by CERCLA, the alternatives were evaluated against seven criteria in the FS:

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Short-term effectiveness
- Implementability
- Cost

Remedial Alternatives Evaluation

Screening Criteria	Alternative				
	1	2*	3A	3B	4
Threshold					
Overall Protectiveness of Human Health and Environment	F	F	P	P	P
Compliance with ARARs	F	F	P	P	P
Balancing					
Long-Term Effectiveness and Permanence	4	3	1	1	2
Reduction of Toxicity, Mobility, or Volume through Treatment	4	4	2	2	3
Short-Term Effectiveness	3	3	2	2	1
Implementability	1	2	3	3	2
Cost	$0	$208K	$5.1M	$6M	$3.1M
Overall Rating	4	3	2	2	2

Ratings: Threshold criteria are pass/fail and are scored with a P (pass) or F (fail). Balancing criteria analyses scored from 1 to 4; where a score of 4 indicates least favorable and a score of 1 indicates most favorable. Modified from (Final Feasibility Study Table 6-7 [ECC, 2016a]).
Excellent (1); Good (2); Adequate (3); Poor (4)
K = Thousands.
M = Millions.
* Although Alternative 2 failed, LUCs are viable components of other action alternatives.

Note: Balancing criteria analysis scored from 1 to 4. 1 is most favorable, 4 is least favorable.

Remedial Alternatives Evaluation – Remaining Two Criteria

- **State/Support Agency Acceptance:** Indicates whether the State agrees with, opposes, or has no comment on the Preferred Alternative (USEPA is the lead regulatory agency for Picatinny Lake)
- **Community Acceptance:** Assessed after the Public Comment period. Includes components of the Alternatives that the public supports, has reservations about, or opposes.

Recommended Remedial Alternative

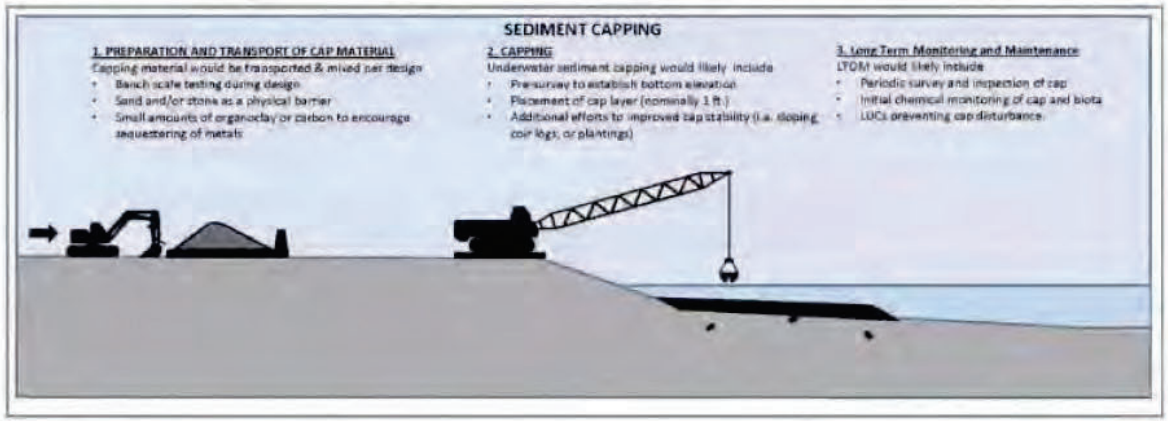
Alternative 4: Sediment Capping

- Determined to be effective at reducing ecological and human health risks
- Avoids short-term risks associated with re-suspending contaminated sediments and short-term hazards associated with the potential for encountering UXO
- More easily implemented than dredging and is cost effective
- Achieves the RAOs - would provide a barrier to prevent exposure to localized contaminated sediment

Preferred Remedial Alternative

Alternative 4: Sediment Capping

- Entails placement of an engineered physical barrier over the contaminated sediments in Picatinny Lake to limit chemical migration and reduce the potential ecological risk to benthic organisms.



Public Comment Period

- Copies of the Feasibility Study and Proposed Plan are available for review at:
  - Environmental Affairs Division at Picatinny Arsenal
  - Contact Paul Reibel (973-724-5952) in advance
  - A PDF version of the 2016 FS and 2021 Proposed Plan can be found on the Picatinny Environmental Restoration Webpage: https://www.pica.army.mil/envRestore/PublicNotice.aspx
- Copies of the Proposed Plan are also available for review at:
  - Rockaway Township Library (973-627-2344)
    61 Mount Hope Rd.
    Rockaway Township, NJ 07866
  - Morris County Library (973-285-6930)
    30 East Hanover Ave.
    Whippany, NJ 07981

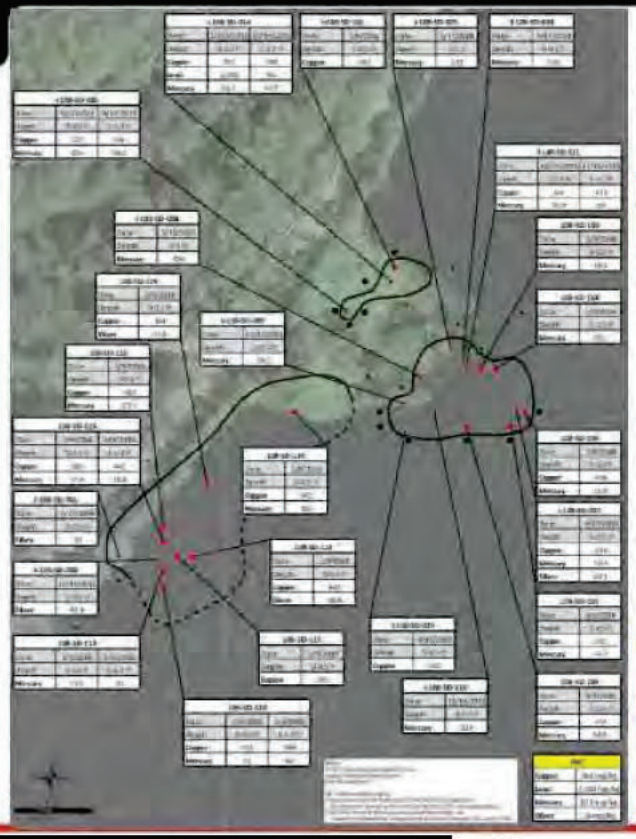
Public Comment Period

- Written comments accepted until 30 April 2021
  - Send to:

    [redacted]

    Project Manager for Environmental Restoration
    U.S. Army Garrison, Picatinny Arsenal AMIM-PIP-E
    Building 3002
    Picatinny, NJ 07806-5000
  - Email to: [redacted]
- Verbal comments during this meeting will be included in the meeting minutes and in the Responsiveness Summary of the ROD

Picatinny Lake Proposed Plan

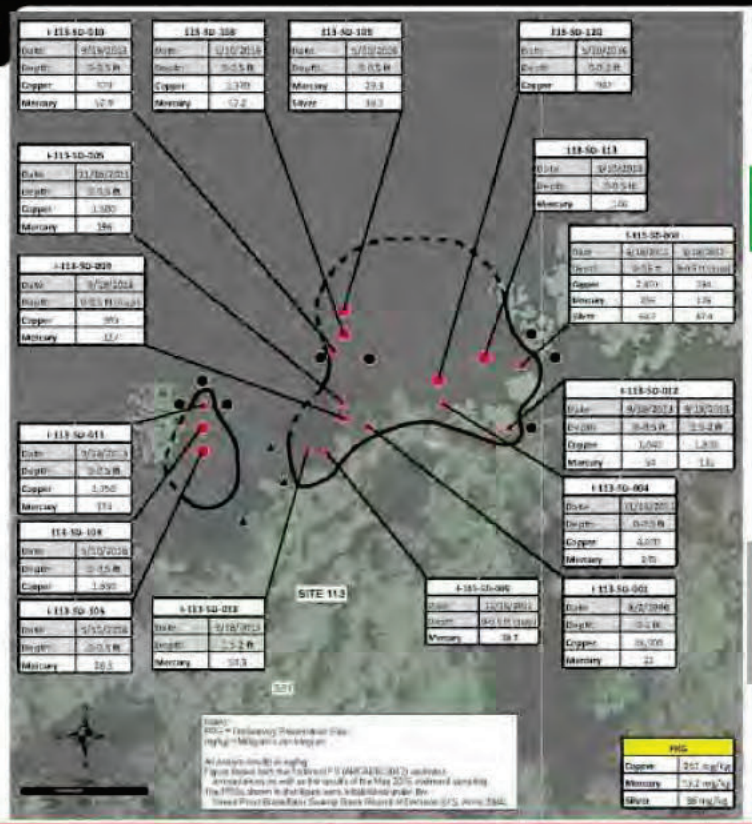


Sediment Exceedances Offshore of Site 108

- Three sediment hotspot locations identified
- Copper, lead, mercury, and silver detected in sediment above PRG. Depth of contamination generally in top 0.5 feet of sediment; however, contamination as deep as 2.0 feet in some locations
- Dashed areas will be further delineated as part of the remedial design

? Samples taken BELOW 2.0 feet ?

Picatinny Lake Proposed Plan



Sediment Exceedances Offshore of Site 113

- Two sediment hotspot locations identified
- Copper, mercury, and silver detected in sediment above PRG. Depth of contamination generally in top 0.5 feet of sediment; however, contamination as deep as 2.0 feet in some locations
- Dashed areas will be further delineated as part of the remedial design

?

? Samples taken below 2.0 feet ?

Fish Tissue Evaluation

- Data from Lakes and Brook Surface Water Area fish tissue sampling events were used
- Conducted to evaluate human health risks from fish consumption
- Potential cancer risks for the current use receptors were within acceptable risk range; however, some of the non-cancer hazards were greater than 1 due to presence of mercury and PCBs in fish tissue

Human Health Risk Assessment Conclusions for Fish Consumption

Fish Species	Adult Army Personnel		Child of Army Personnel	
	Cancer Risk	Hazard Index	Cancer Risk	Hazard Index
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Carp	6E-6	≤1	3E-6	1
Chain Pickerel	3E-5	3 (mercury)	1E-05	5 (mercury)
Largemouth Bass	3E-5	4 (mercury)	1E-05	8 (mercury, PCBs)
Yellow Perch	4E-5	2 (mercury)	2E-05	5 (mercury, PCBs)

Notes:
NE = Not evaluated as there were no carcinogenic COPCs in fish tissue

Mercury, PCBs, ? DIOXIN ?

Recommended Remedial Alternative

Alternative 4: Sediment Capping

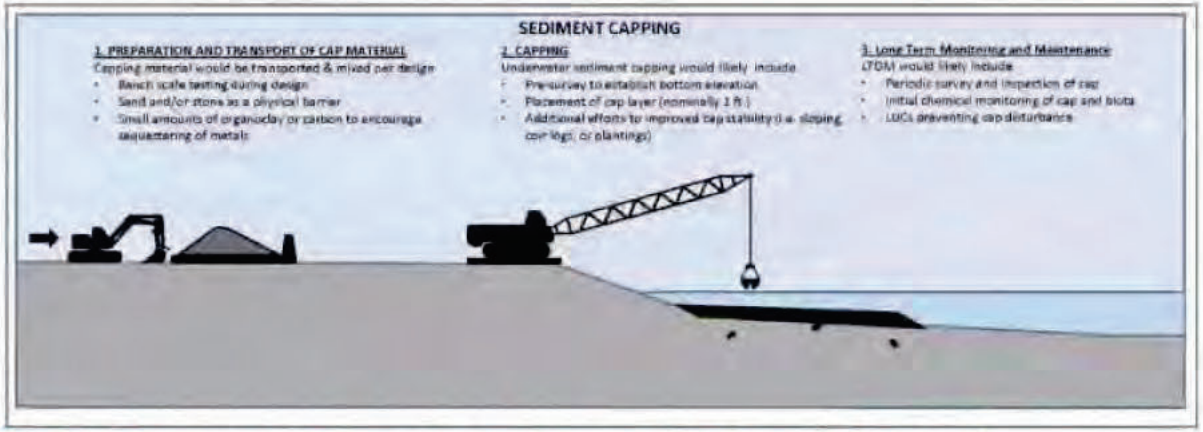
- Determined to be effective at reducing ecological and human health risks
- Avoids short-term risks associated with re-suspending contaminated sediments and short-term hazards associated with the potential for encountering UXO
- More easily implemented than dredging and is cost effective
- Achieves the RAOs - would provide a barrier to prevent exposure to localized contaminated sediment

Sediment Capping may *initially appear* to be ***immediately*** cost-effective. However, over the long run the initial cost savings, due to incomplete cleanup and/or contaminant removal can INCREASE long term costs *both* to the public and - to the health of Picatinny Arsenal's employees and its assigned personnel thus reducing their work effectiveness.

Preferred Remedial Alternative

Alternative 4: Sediment Capping

- Entails placement of an engineered physical barrier over the contaminated sediments in Picatinny Lake to limit chemical migration and reduce the potential ecological risk to benthic organisms.



Place reliable monitoring sensors in and around the physical barriers (caps) to assure timely detection of any contaminant migration.

PUBLIC REVIEW COMMENTS

Comments from [redacted]

[redacted] on the March 2021 Final Proposed Plan for Site 53 (PICA-057) Picatinny Lake (the PP)

Please address the issues or comments brought out in the paragraphs below for the responsive summary of the ROD for Lake Picatinny.

1. There are no "unacceptable" human health risks or ecological risk for this site and hence anything beyond a remedy of "No Further Action with Montoring of Land Use" is not warranted. The subsequent ROD could reflect this without another public notice of a PP

   The unnecessary proposed active remedy for capping four areas in Lake Picatinny would be a waste of government resources, produce constraints and interference with Army's weapons research and other Army activities, create a burden if a cap would fail and "…may produce effects on open water or wetland habitats (page 15).

According to **2.6.4 Summary of Site Risks** of the approved Feasibility Study (the FS) for the site:

"Based on the risk assessments performed for this site, for current and **reasonably anticipated future use**:

• The potential risk is within the generally acceptable risk range of 1E-4 to 1E-6 for industrial/research worker exposure to sediment and surface water, and the non-cancer hazard is less than the threshold of 1.
• The potential risk is within the **generally acceptable risk range of 1E-4 to 1E-6 f**or the onsite youth visitor (recreational) for exposure to sediments and surface water across Picatinny Lake as a whole during recreational activities, and the non-cancer hazard is less than the threshold of 1 when separated by target organ.
• The fish consumption HI is greater than the threshold of 1.(***Note : see below discussion***)
• COCs in sediment and surface water **do not pose lake-wide risks to ecological receptors**.
Lines of evidence regarding the potential for impacts at hot spots is conflicting, with bulk sediment chemistry and toxicity tests indicating impacts, but **benthic community surveys and bioavailability analyses indicating no impacts**. "

2. In current circumstances, there are no exceedances of chemical specific **Applicable or Relevant and Appropriate Requirements (or** ARARs):

Compliance with ARARS - specifically in this case chemical ARARs - is a threshold CERCLA criteria but neither the Proposed Plan nor the 2016 FS note any concentration found in the sediment of Lake Picatinny above a promulgated standard or an ARAR.

On page 15 of the PP, the assumption of the section entitled **Compliance with Applicable or Relevant and Appropriate Requirements incorrectly suggests that: "**This criterion addresses the "RA complies with ARARs or TBCs. The sediment levels of concern were used to establish screening levels and provide the basis for the risk based approach to remediating PICA-57/Site 53 – Picatinny Lake. ICA-057/Site 53 – Picatinny Lake consists only of the surface water and sediment in the Lake."

This statement suggests to the reader that compliances with screening level or levels of concern are equivalent to compliance with ARAR. The paragraph makes no mention of compliance with ARARs - despite its title.

These levels of concern became preliminary remediation goals (PRGs) that were never discussed in the FS or PP as indicators of unacceptable risk under CERCLA and were not defined as ARARs: they could not be as they were not promulgated.

During 2014 - according the FS - the USEPA and Army agreed that the "defined areas of attainment for hot spots would be defined as the area the PRGs are to be achieved or where discrete areas where active remedy components will be implemented." PRG are meant by guidance of an indication of potential risk requiring more study and the "more study" was completed by the Army. The studies are detailed in the FS.

Further even if there were exceedances of chemical specific ARARs (, the Army and the USEPA have determined that if " *there are no unacceptable risks, there are no ARARS*".

3. Remediation is for the sake of the health of benthic creatures

   Remedial Action Goals identified on page 13 of the PP include the statements to "eliminate the exposures to sediment offshore (the four hotspots) with concentrations of copper, mercury, and silver (*and other* chemicals) above the ***PRGs (261, 13.2, and 36 mg/kg, respectively)*** {is} for the protection of benthic invertebrates."

Neither the FS (nor studies performed for the FS) or the PP describe any unacceptable risk to the benthic community at the four hot spots. For instance on page 9 of the **"Benthic and MacroInvertabrate Report"** - included as an attachment of the FS:

"The approved Phase II ERA (IT 2000) concluded that there was little potential risk to upper trophic level species associated with constituents in fish from Picatinny Lake based on dose modeling. The available evidence collected more recently appears to
support the conclusion that potential risks are low.

High TOC concentrations and AVS/SEM results lower than 130 µmol/goc indicate
limited potential for bioavailability. Similarly, lack of substantial differences in the
benthic community structure relative to reference samples collected in Lake Denmark are considered evidence that elevated COPC **concentrations in sediment are not adversely impacting the aquatic community**.

The sample results did not identify substantial differences between the Picatinny Lake and Lake Denmark benthic communities, with the exception of sample location I-108-SD-024. In addition, the AVS/SEM analysis indicates a lack of bioavailability at the majority of sample locations.

Sample location I-108-SD-024 is the only location where the benthic community may be impacted by elevated COPC concentrations. However, additional samples collected in Site 108 surrounding location I-108-SD-024 do not show adverse impacts to the benthic community. The AVS/SEM analysis coupled

with the benthic community analysis indicates that **the presence of localized, elevated COPC concentrations are not adversely affecting the overall benthic community**.

The results of the Phase II ERA (IT 2000) indicated that ecological risks are not significant for Picatinny Lake as a whole. The results of the additional benthic community and sediment investigation conducted in September 2013 confirm this conclusion for both ecological and human health risks……"

Further according to the Army documents

"The findings of the ERA are that COCs in sediment, surface water, and fish do not pose unacceptable lake-wide risks to ecological receptors. However, the ERA identified sediment hotspots offshore of Sites 63/65, 82, 108, and 113 where elevated concentrations of metals in sediment (specifically copper, lead, mercury, and silver) may potentially pose risks to benthos. Lines of evidence regarding the potential for impacts at hotspots are conflicting, with bulk sediment chemistry and toxicity tests indicating impacts, but benthic community surveys and bioavailability analyses indicating no current impacts. The typical focus of an ERA within CERCLA is at the population level, and benthic surveys for the Lake and lake-wide risks indicate that population level impacts are unlikely."

(The physical action of capping the existing sediment tspot will clearly impact the existing benthic population at those locations - most likely by destroying it.)

4. Fish consumption HI is greater than the threshold of 1 and a comparison to the remedy required by"*Record of Decision EOD Pond (Site 103/PICA-164) and Lake Denmark (Site 54/PICA-015)*"

The statement that "the fish consumption HI is greater than the threshold of 1" is the only reference in the PP and the FS to an unacceptable risk under CERCLA: this should not be considered a driver for a remedial action.

The two exposure scenarios that exceeded the threshold were the adult and child non-military resident and child non-military resident receptor - but as stated in the PP:

"The adult and child non-military resident receptor scenarios **are not reasonably anticipated future scenarios and are, therefore, hypothetical risks."**

Note: that the referenced 2016 Sportsman Bulletin (e.g. page 10) was updated in 2019 by Picatinny Commander , the revised 2019 Bulletin is on the Picatinny Public web. This 2019 version is more restrictive then the 2016 version stating that "NO FISH CAUGHT ON POST (stocked trout excepted) SHOULD BE CONSUMED BY ANYONE". This restriction should also been taken into consideration as it was in the "*Record of Decision EOD Pond (Site 103/PICA-164) and Lake Denmark (Site 54/PICA-015)*"

There was a similar unacceptable risk indentified and but handled differently in this signed ROD. This ROD identified that there was an unacceptable HI for the same exposure scenarios for those 2 water bodies as were calculated for Lake Picatinny.

The ROD required that:

"No remedial action is necessary for EOD Pond and Lake Denmark; however, annual monitoring of land use is required at these sites, as they cannot be released for unrestricted use. … calculated risks/hazards associated with elevated mercury in fish tissue are not believed to be attributed to site-specific releases, or sources, but are known to be widespread within the region and related to anthropogenic influences. The Remedial Action Objective (RAO) for EOD Pond and Lake Denmark is to control consumption of edible fish with concentrations of mercury, as well as polychlorinated biphenyls (PCBs) in yellow perch and largemouth bass from Lake Denmark due to elevated levels found in interconnected water bodies, which are driving the unacceptable risk or hazard."

5. The Environmental Health Risk Assessment Program of Army Institute of Public Health has referenced in a June 2014 letter that is on the Picatinny Environmental Restoration web page ",that the need to further address areas of Picatinny Lake contamination is not justified, given that risks and hazards for the lake are shown to be acceptable."

   Has that Army organization given its approval or concurrence for this action? Is that agreement or concurrence required before a ROD is signed by the Army.

April 22, 2012

[redacted]
Official representative of the Community of Jefferson Township

Mr. [redacted]
Project Manager for Environmental Restoration
U.S. Army Garrison, Picatinny Arsenal AMIM-PIP-E
Building 3002
Picatinny, NJ 07806-5000

RE: Picatinny Lake Proposed Plan – Site 53 [30-day comment period (March 31 to April 30, 2021)]
DRAFT PAERAB Meeting Minutes of the March 31, 2021 Virtual Meeting and Hearing

Dear Sir:

1. Make available the test and analysis results of the soil, sediment and water samples that were taken and are expected to be taken at various depths - and the resultant conclusions.
2. The improved topographical and/or contaminant presence delineations that are expected to result from additional sampling should be made available.
3. Provide the amounts of contaminated materials to be disposed of, the locations to which they will be placed, the methods of disposal, the duration of timely disposal and the offices/departments/divisions/agencies (county, state or federal) supervising disposal.
4. Avoid *mere* reliance on Monitored Natural Attenuation (MNA) since the duration and **FINAL COSTS** of MNA are problematic and are difficult to EXACTLY and <u>COMPLETELY</u> anticipate - and accurately quantify.
5. "HOT SPOT" locations are those on which substantial amounts of contaminants exist in quantities sufficient to assure that federal code, state statutes and/or ARARS legally mandate (trigger) either their REMOVAL or their isolation - with sufficiently protective measures. Accordingly, it is urged and recommended that "HOT SPOT"s be prioritized for cleanup and REMOVAL. In addition, disposal should be OFFSITE to a location OUTSIDE of Picatinny Arsenal both to minimize LONG TERM COST and to assure the safety, health and welfare of the following:

    a. The Public
    b. The Employees of Picatinny Arsenal
    c. Contract Employees assigned to the arsenal
    d. Picatinny Arsenal's Garrison *and their dependants*
    e. Visitors

    Contaminated materials present on "HOT SPOT" locations should either be entirely removed or removed in sufficient quantities to assure that those "HOT SPOT" locations no longer possess amounts of contaminants sufficient to trigger relevant federal code, state statutes and/or ARARS.

Yours truly,

[redacted]

[redacted]
Representative of the Community of Jefferson Twp.

CC: Email: [redacted]

APPENDIX C
COST COMPARISON SUMMARY FOR REMEDIAL ALTERNATIVES EVALUATED AND DETAILED COST TABLES
(SOURCE: ECC, 2016a [APPENDIX D IN FINAL FS])

Appendix C
Engineering Assumptions and Cost Estimate for Alternative 4:
Sediment Capping

Cost Item	Quantity	Units	Unit Price	Line Item Cost	Cost	Approach Description & Assumptions for Purposes of Costing
Description & Alternative-Specific Assumptions: Picatinny Lake sediments in the vicinity of Sites 63/65, 82, 108, and 113 will be capped in place. As part of remedial design, studies will be conducted to determine whether a physical cap (composed only or aggregate) or a reactive cap (containing aggregate and a reactive material such as carbon or clay) will be required to suffficiently reduce exposures. Prior to capping, the area will be surveyed to delineate boundaries and topography. The only MEC clearance required is assumed to be that required for access roads along the shoreline and small staging areas for cap material at each site. The cap will be placed either by crane/excavator from the shoreline or via small scale hydraulic slurrying from a barge. For purposes of the FS it is assumed to consist of a 1.5 ft thick layer of sand amended with carbon. After capping, land use controls and long term operations/monitoring and maintenance will be required because material will remain in place. These are assumed to consist of sediment and fish tissue sampling and LUCs preventing cap distrubance. **Assumptions:** - No significant tidal or wave action is expected within Picatinny Lake. - Restoration will consist of grading, seeding, and mulching the bank. No armoring or tree planting has been included. - All work will be performed in Level D PPE, 100% efficiency. - Assumes volume estimates and geotechnical parameters based on RI/FS sampling are representative of field conditions. Assumes volumes, rates, and durations as presented in Table 6-2. - All equipment and labor costs are assumed and incorporated into estimates.						
A. ADMINISTRATIVE ACTIONS					**$57,590**	
Permitting					$57,590	**Approach:** Coordinate with resources agencies on sensitive habitats, threatened and endangered species, wetlands, and dredging. Incorporate requirements into design documentation. LUCs will be established to prevent disturbance of the cap and to restrict fish tissue consumption until reemedy effectiveness is demonstrated. **Assumptions:** No wetlands mitigation is required.
Coordination with water resource agencies regarding wetland/open water ARARs	1	LS	$40,000	$40,000		
Signs	25	each	$550	$13,750		
GIS Support	32	hours	$95	$3,040		
Coordination of LUC and public notice	8	hours	$100	$800		
B. GENERAL ACTIONS/SITE PREPARATION					**$428,250**	
Mobilization/Demobilization					$110,000	**Approach:** Mobilize equipment and personnel to the site. **Assumptions:** Single mobilization to post followed by continuous work at each AA in sequence, moving equipment between sites.
Clearing, Grubbing, Survey, Sampling	1	LS	$10,000	$10,000		
Staging Area Construction	1	LS	$15,000	$15,000		
Capping Equipment - Shoreline	1	LS	$30,000	$30,000		
Excavation Equipment - Floating	1	LS	$30,000	$30,000		
Movement of equipment between AA	1	LS	$25,000	$25,000		
Site Preparation					$44,250	**Approach:** Clear staging area for central preparation of cap materials & temporary road ways; construct temporary gravel roads for access. **Assumptions:** Roads are 15 ft wide gravel over geotextile; MEC clearance is included as a separate item below.
Clearing, Grubbing, Utility Clearance	2	AC	$15,000	$30,000		
Temporary Access Road Construction	750	LF	$19	$14,250		
Treatability studies					$250,000	**Approach:** Field collection of sediment for use in bench scale studies and in situ measurements of environmental chemistry to support selection of appropriate amendments. **Assumptions:** Assumes single field effort with collection of material primarily for bench scale evaluation. Assumes no field pilot testing or porewater flow/flux measurements
Treatability Studies	1	LS	$250,000	$250,000		
Erosions and Sediment Controls					$6,000	**Approach:** Construct silt fencing around staging and dewatering pads. **Assumptions:** Controls will consist of silt fencing and berms.
Upland temporary erosion and sediment controls for work areas	600	linear ft	$10	$6,000		
Surveying					$18,000	**Approach:** Perform surveys of upland areas to support construction and restoration. **Assumptions:** Site survey will consist of topographic survey with methods modified for shallow in-water work.
Site survey support for defining dredge limits and documenting work (assumes physical survey only, no multi-beam or single beam bathymetry)	12	days	$1,500	$18,000		
C. CAPPING					**$739,225**	
MEC Clearance					$52,400	**Approach:** Perform upland clearance prior to construction.

Appendix C
Engineering Assumptions and Cost Estimate for Alternative 4:
Sediment Capping

MEC Clearance of upland staging & access areas	8	days	$2,800	$22,400		**Assumptions:** Perform upland clearance prior to construction using two technicians per day. Assumes buildings and roads can be shut down any time for EOD response.
EOD response to UXO	2	Day	$15,000	$30,000		
Cap Material Purchase & Preparation					$306,615	**Approach:** Mix reactive cap material at a central staging area and truck to each site.
Aggregate purchased and delivered	2805	CY	$45	$126,225		**Assumptions:** Assumes mixing of aggregate (i.e. sand) and reactive amendment (i.e. organic carbon, organoclay) at aratio specified in Table 6-2. Actual ratio will depend on outcome of treatability studies. Assumes a 0.5 acre staging area that does not require a liner, and only requires E&S controls
Reactive amendment purchased and delivered	148	CY	$200	$29,600		
Staging area preparation	32670	SF	$1	$32,670		
Mixing of cap material via excavator and vibratory screen	2,953	CY	$30	$88,590		
Transport of cap material to placement sites	2,953	CY	$10	$29,530		
Cap Placement					$254,710	**Approach:** Place using a long reach excavator from the shoreline or, for deeper areas, a long reach excavator from a temporary barge system/floating platform along the shoreline.
Mechanical Placement with long reach excavator.	7,620	cubic yards	$30	$228,610		**Assumptions:** Rate assumes use of conventional bucket. Volumes will not exceed target volume plus overdredge. Half of excavation will occur from shore and half from barge. Equipment will be fitted with a real-time dredging tracking system.
Small barge/floats and small pushboat for deep water placement	15	Days	$1,500	$22,500		
GPS Dredge Tracking System	6	NA	$600	$3,600		
Small boat						
Post capping verification					$45,500	**Approach:** Cap will be sampled after placement to confirm placement thickness and lack of mixing.
Verification sampling	50	samples	$310	$15,500		**Assumptions:** Verification samples will be collected by hand core using boat present on-site; 10 samples per site analyzed for metals.
Topography survey/coring for cap thickness	1	LS	$30,000	$30,000		
Site Restoration					$80,000	**Approach:** Staging and dewatering areas and roads will be graded and revegetated
Grading and broadcasting seeding.	1	LS	$80,000	$80,000		**Assumptions:** Access road material can be re--used elsewhere on-site.
D. LONG TERM OPERATIONS AND MAINTENANCE (30 YEARS ON CURRENT NET WORTH BASIS)					**$1,295,589**	
Annual Sampling					$66,100	**Approach:** Yearly monitoring of cap stability, cap concentrations, and fish tissue concentrations will be conducted. Five year reviews will be conducted.
Cap stability survey	1	NA	$25,000	$25,000		**Assumptions:** Assumes yearly sampling will include collection of 5 fish and 10 cap material samples from each site. Cap stability surveys will consist of topographic survey. Assumes 3% inflation.
Sediment and fish tissue sampling field effort	1	NA	$2,000	$2,000		
Sediment and fish tissue analysis	94	Sample	$150	$14,100		
Reporting	1	NA	$15,000	$15,000		
Five year reviews (pro-rated per year)	1	NA	$10,000	$10,000		
E. IMPLEMENTATION COSTS					**$611,525**	
Administrative and Legal (5% of capital costs)	0	LS	$58,374	$0		
Remedial Design (10% of remediation cost)	1	LS	$246,306.44	$246,306		
Procurement and Construction Management (12% of capital cost)	1	NA	$140,097.03	$140,097		
Completion Report	1	NA	$50,000	$50,000		
Remedy Contingency (15% of capital costs)	1	LS	$175,121	$175,121		
O & M Contingency (15% of Operation and Maintenance)	0	LS	$23,320.61	$0		
TOTAL					**$3,132,179**	

NOTES: LS = Lump sum; NA = Not applicable.