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May 11, 2010

Mr. John Hill
U. S. Air Force Center for Engineering and the Environment
HQ AFCEE/IWP
3300 Sidney Brooks
Brooks City-Base, TX 78235-5112

SUBJECT: Draft Final Proposed Plan for Munitions Response Sites and Army Response to NYSDEC Comments on Draft Proposed Plan for Munitions Response Sites received on March 26, 2010 at the Seneca Army Depot, NY; Contract FA8903-04-D-8675, Delivery Order 0026, CDRL A001A

Dear Mr. Hill:

Parsons Infrastructure & Technology Group, Inc. (Parsons) is pleased to submit the Draft Final Proposed Plan for Munitions Response Sites at the Seneca Army Depot Activity (SEDA) in Romulus, New York. In addition, please find a copy of the Army's Response to NYSDEC's Comments received on the prior version of the Proposed Plan for Munitions Response Sites.

This work was performed in accordance with the Scope of Work (SOW) for Contract No. FA8903-04-D-8675, Task Order No. 0026.

Parsons appreciates the opportunity to provide you with the Draft Final Proposed Plan for this work. Should you have any questions, please do not hesitate to call me at (617) 449-1405 to discuss them.

Sincerely,

Todd Heino, P.E.
Project Manager

Enclosures

cc: S. Absolom, SEDA (3 paper copies, 1 electronic copy)
K. Hoddinott, USACHPPM (2 paper copies, 1 electronic copy)
R. Battaglia, USACE, NY District (1copy, electronic and paper)
T. Battaglia, USACE, NY District (1 copy, electronic and paper)
J. Chavez, HQ AFCEE/EXA (1 electronic copy)
Air Force CDL (letter only)

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May 11, 2010

Mr. Julio Vazquez
U.S. Environmental Protection Agency, Region II
Superfund Federal Facilities Section
290 Broadway, 18th Floor
New York, NY 10007-1866

Mr. Kuldeep K. Gupta, P.E.
New York State Department of Environmental Conservation (NYSDEC)
Division of Environmental Remediation
Remedial Bureau A, Section C
625 Broadway
Albany, NY 12233-7015

Mr. Mark Sergott
New York State Department of Health
Bureau of Environmental Exposure Investigation, Room 300
547 River Street, Flanigan Square
Troy, NY 12180

SUBJECT: Draft Final Proposed Plan for Munitions Response Sites and Army Response to NYSDEC's comments on the Draft Proposed Plan for the Munitions Response Sites at the Seneca Army Depot Activity; EPA Site ID# NY0213820830 and NY Site ID# 8-50-006

Dear Mr. Vazquez/Mr. Gupta/Mr. Sergott:

Parsons Infrastructure & Technology Group, Inc. (Parsons) is pleased to submit the Draft Final Proposed Plan for Munitions Response Sites at the Seneca Army Depot Activity (SEDA) in Seneca County, New York (EPA Site ID# NY0213820830 and NY Site ID# 8-50-006). The Draft Final Proposed Plan presents information supporting the Army's determination that no further remedial action is needed at SEAD 46 (3.5 inch Rocket Range), SEAD 57 (former Explosive Ordnance Disposal [EOD] Range), SEAD 002-R-01 (EOD Areas 2 and 3), SEAD 007-R-01 (Grenade Range) and SEAD 70 (Filled Area near Building T2110). In addition, please find a copy of the Army's response to NYSDEC Comments on the Draft Proposed Plan for Munitions Response Sites dated March 26, 2010. The Army's Response to NYSDEC Comments provides written responses to comments received on the prior version of the Proposed Plan. Electronic copies of these documents are enclosed with this submittal.

Should you have any questions, please do not hesitate to call me at (617) 449-1405 to discuss them.

Sincerely,

Todd Heino, P.E.
Program Manager

Enclosures

cc: M. Heaney, TechLaw
J. Chavez, AFCEE/EXA
R. Battaglia, USACE, NY
J. Hill AFCEE
S. Absolom, SEDA
T. Battaglia, USACE, NY
Air Force CDL (letter only)
K. Hoddinott, USACHPPM

US Army Corps of Engineers

Air Force Center for Engineering and the Environment

Seneca Army Depot Activity
Romulus, New York

DRAFT FINAL
PROPOSED PLAN

FOR NO FURTHER ACTION AT MUNITIONS RESPONSE SITES
SEAD-46, SEAD-57, SEAD-007-R-01, SEAD-002-R-01, and SEAD-70
SENECA ARMY DEPOT ACTIVITY

AFCEE CONTRACT NO. FA8903-04-D-8675
TASK ORDER NO. 0026
CDRL A001A
EPA SITE ID# NY0213820830
NY SITE ID# 8-50-006

PARSONS
MAY 2010

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Proposed Plan – Draft Final

No Further Action for
SWMUs SEAD-46, SEAD-57, SEAD-007-R-01,
SEAD-002-R-01, and SEAD-70 at
SENECA ARMY DEPOT ACTIVITY (SEDA) Romulus, New York

May 2010

##########

PURPOSE OF THIS DOCUMENT

This Proposed Plan describes the remedial alternatives selected for five areas of concern (AOCs):

- SEAD-46 (the former 3.5-inch Rocket Range),
- SEAD-57 (the former Explosive Ordnance Disposal [EOD] Range),
- SEAD-007-R-01 (the former Grenade Range),
- SEAD-002-R-01 (former EOD-2 and EOD-3), and
- SEAD-70 (Building T2110 – Filled Area)

at the Seneca Army Depot Activity (SEDA or Depot) Superfund Site in Seneca County, New York. This Proposed Plan was developed by the U.S. Army (Army) and the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Environmental Conservation (NYSDEC). The Army and the EPA are issuing this Proposed Plan as part of their public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Details of the munitions response, the CERCLA closure actions performed, and the current site conditions are presented in the *Completion Report (CR), Munitions Response, and CERCLA Closure*, Draft Final (Parsons, 2009). Additional information about the nature and extent of the hazardous substances and other contaminants found at SEAD-46 and SEAD-57 is presented in the *Remedial Investigation Report for SEAD-46 and SEAD-57* (Parsons, 2001) and the *Expanded Site Inspection (ESI), Three Moderate Priority SWMUs Report* (Parsons, 1995). Further information and data pertinent to the munitions response actions performed at the five AOCs is provided in the *Ordnance and Explosives Engineering Evaluation Cost Analysis Report (OE EE/CA),* Final (Parsons, 2004), the *Geophysical Investigation Munitions Destruction Areas SEADs 46 & 57* (Shaw, 2005), and the *Archives Search Report (ASR), Seneca Army Depot*, Final (USACE, 1998). Additional information for SEAD-70 is presented in the *Expanded Site Inspection Report, Seven Low Priority AOCs*, Draft Final (Parsons, 1996), *Decision Document, Mini-Risk Assessments* (Parsons, 2002), and *Risk Assessment: Munitions Response AOCs* (Parsons, 2009). The Army, EPA, and NYSDEC encourage the public to review these documents to gain an understanding of the AOCs and the Superfund and Munitions Response activities that have been completed.

This Proposed Plan is provided to supplement the aforementioned documents; to inform the public of the preferred remedy for each AOC as proposed by the Army, EPA, and NYSDEC; and to solicit public comments that are pertinent to the selected remedies. Each AOC is unique, and each remedy is being proposed after careful examination of the available information for the specific AOC. Based on the current conditions at the AOCs, the preferred remedy for each AOC is No Further Action.

The remedies described in this Proposed Plan are the preferred remedies for the AOCs. Changes to any of the preferred remedies, or changes from one preferred remedy to another, may be made if public comments or additional data indicate that such a change would result in a more appropriate remedial action. The final decision regarding the selection of remedies for the AOCs will be made after the Army and the EPA have taken into consideration all comments. The Army and the EPA are soliciting comments from the public because the Army, EPA, and NYSDEC may select a remedy other than the preferred remedy for any AOC discussed in this Proposed Plan.

COMMUNITY ROLE IN SELECTION PROCESS

The Army, EPA, and NYSDEC rely on public input to ensure that community concerns are considered in the selection of an effective remedy for all Superfund sites. To this end, documents in the Administrative Record for the identified Munitions Response AOCs (SEADs 46, 57, 007-R-001, 002-R-01, and 70) are available to the public during a public comment period which begins on (Date 1) and concludes on (Date 2). Key documents included in the Administrative Record for the Munitions Response AOCs include:

MARK YOUR CALENDAR

(DATE) – (DATE):

Public comment period related to this Proposed Plan.

(DATE) at 7:00PM: Public meeting at the Seneca County Office Building, Village of Waterloo, New York

- *Completion Report, Munitions Response, SEAD 002-R-01, SEAD 57, SEAD 46 and SEAD 007-R-01,* (Parsons[1], 2007) submitted to Department of Defense Explosive Safety Board;
- *Expanded Site Inspections, Three Moderate Priority SWMUs, SEADs 11, 13, and 57*, Final (Parsons, 1995);
- *Expanded Site Inspection, Seven Low Priority AOCs,* Draft Final (Parsons, 1996);
- *Archives Search Report (ASR), Conclusions and Recommendations, Seneca Army Depot*, Final (USACE, 1998);
- *Remedial Investigation Report for SEAD-46 and SEAD-57*, Draft (Parsons, 2001);
- *Decision Document, Mini-Risk Assessment*[2]*,* Final (Parsons, 2002);
- *Ordnance and Explosives Engineering Evaluation Cost Analysis Report (OE EE/CA)*, Final (Parsons, 2004);
- *Geophysical Investigation, Munitions Destruction Areas SEADs 46 & 57*, Final (Shaw, 2005);
- *Completion Report, Munitions Response, and CERCLA Closure*, Draft Final (Parsons, 2009); and
- *Risk Assessment: Munitions Response AOCs* (Parsons, 2009).

A public meeting will be held during the public comment period at the Seneca County Office Building on (Date 3) to present the conclusions of the Completion Report (CR), to elaborate further on the reasons for selecting the preferred remedy, and to receive public comments.

Written comments received at the public meeting or during the public comment period will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on the Proposed Plan should be addressed to:

Mr. Stephen M. Absolom
BRAC Environmental Coordinator
Seneca Army Depot Activity
Building 123, P.O. Box 9
5786 State Route 96
Romulus, NY 14541-0009

SCOPE AND ROLE OF ACTION

The Army's ultimate goal is to transfer all property previously occupied by the Depot to the community for beneficial reuse. Prior to the transfer of any Depot property, the Army is required to ensure that the property is protective of human health and the environment, and is suitable for release and subsequent reuse at a level that is consistent with its intended foreseeable future use. If information or evidence exists to indicate that hazardous substances

[1] "Parsons" is the abbreviation of Parson Corporation, an engineering and construction firm headquartered in Pasadena California. Parsons and several of its business entities (i.e., C.T. Main, Inc.; Parsons-Main, Inc.; Engineering –Science, Inc.; Parsons Engineering Science, Inc.; and Parsons Infrastructure & Technology Group) has performed environmental work at the Seneca Army Depot.
[2] Report Title incorrectly identifies SEAD-72; it should be SEAD-70, the filled Area near Building 2110.

may be present at any location slated for transfer, the Army is obligated to conduct additional work as needed to verify the presence or absence of hazardous substances, and to assess the potential risk that may exist due to the presence of hazardous substances if they are identified. These investigations and assessments are conducted under the oversight of, and are subject to the review and approval of, the EPA and the NYSDEC. The findings, results, and conclusions of the investigations and assessments, and the subsequent land use decisions are made available to the public for review and comment.

If the results of the investigations and assessments of the AOCs indicate that risk to human health or the environment exists on account of hazardous substances, the Army is obligated to propose, design, implement, monitor, inspect, and report on the remedial actions used to eliminate, mitigate, or control the risk. The remedial actions are subject to review and approval by all parties. Once the Army demonstrates that an AOC is suitable for transfer, such transfer may be approved if the oversight agencies concur.

SEDA HISTORY

Prior to the construction of the Depot, the land in the area was used for agricultural and residential purposes. In June of 1941 the U.S. Government purchased the land for the Seneca Army Depot from approximately 150 families. The Depot began its primary mission of receipt, maintenance, and supply of ammunition in 1943. After the end of World War II, the Depot's mission shifted from supply to receipt, storage, distribution, maintenance, and demilitarization of general supplies, conventional ammunition, explosives, and special weapons.

The SEDA was nominated for listing on the Federal Facilities National Priorities List (NPL) on July 13, 1989; the listing was finalized on August 30, 1990, when the SEDA was listed in Group 14 of the Federal Facilities portion of the NPL. Once the SEDA was listed on the NPL, the Army, EPA, and the NYSDEC negotiated a Federal Facilities Agreement (FFA) entitled *Federal Facility Agreement under CERCLA Section 120 in the matter of Seneca Army Depot, Romulus, New York, Docket Number: II-CERCLA-FFA-00202* that broadly defines and documents the scope of the remedial actions needed at the Depot and the obligations and responsibilities of each party to address environmental contamination identified at the SEDA.

Once the SEDA was listed on the NPL, the Army, EPA, and NYSDEC identified 57 solid waste management units (SWMUs) where data or evidence indicated that hazardous substances, hazardous wastes, or other hazardous material had been handled, and potentially released, into the environment. Each of these SWMUs was identified in the FFA which was signed by the three parties in 1993. The number of SWMUs was subsequently expanded to include 72 AOCs once the Army completed the required *SWMU Classification Report (Parsons, 1995).* Once the 72 AOCs were listed, the Army recommended that they be identified as areas requiring No Action or as AOCs requiring additional information or data.

In 1995, the SEDA was designated for closure under the U.S. Department of Defense's (DOD's) Base Realignment and Closure (BRAC) process. Once the SEDA was added to the 1995 BRAC list, the Army's primary objective expanded from performing remedial investigations and completing necessary remedial actions to releasing unaffected portions of the Depot to the surrounding community for reuse. The designated future use of land within the SEDA was first defined and approved by the Seneca County Local Redevelopment Authority in 1996. In 2005, the Seneca County Industrial Development Agency (SCIDA) revised the planned future use of property in the former Depot. Since 1995, approximately 8,000 acres of the former Depot have been released to the SCIDA. An additional 250 acres of land at the Depot have been transferred to the U.S. Coast Guard for continued operation of a LORAN (i.e., long range aid to navigation) Station.

DESCRIPTION OF SITE AND AOCS

The SEDA is a 10,587-acre former U.S. Army facility located in Seneca County New York in the towns of Romulus and Varick between Seneca Lake and Cayuga Lake (see **Figure 1**). The SEDA is located in an uplands area that

divides the two lakes. The SEDA was owned by the United States Government and operated by the Department of the Army between 1941 and 2000 when the Army's military mission ceased.

Ground surface elevations are generally higher along the eastern and southern borders of the Depot, and lower along the northern and western borders. Regionally, four hydrologic units have been identified in Seneca County. These include two distinct shale formations, a series of limestone units, and unconsolidated beds of Pleistocene glacial drift. The geologic material that comprises the overburden is generally Pleistocene till. Surface water primarily flows west toward Seneca Lake. Isolated portions of the Depot drain to the northeast toward the Seneca-Cayuga Canal and east toward Cayuga Lake. Reeder, Kendaia, Indian, and Silver Creeks form the primary surface water conduits to Seneca Lake. Kendig Creek flows to the northeast toward the Seneca-Cayuga Canal and an unnamed creek flows to the east toward Cayuga Lake.

Groundwater monitoring results from various locations at the SEDA indicate that the thickness of the shallow aquifer appears to be influenced by the hydrologic cycle in a seasonal variation. The over-burden aquifer is thickest during the spring recharge months and thinnest during summer and early fall. During late fall and early winter, the saturated thickness increases; however, many monitoring wells dry up during certain periods of the year.

SEAD-46 (3.5-inch Rocket Range)

SEAD-46, also known as the "3.5-inch Rocket Range", is a trapezoidal parcel of land that encompasses approximately 68 acres (see **Figure 2** and **3**). The southern east-west boundary of SEAD-46 is located approximately 6,000 feet north-northwest of the former Depot's main gate on State Highway 96. The area is comprised primarily of open grassland that is occasionally interrupted and bordered by areas of dense brush and trees. SEAD-46 is bisected by an unnamed dirt road that runs southeast to northwest. The predominant feature in the area is a man-made earthen berm that is situated near the northwest corner of the AOC; the most likely use of the berm was as a protective barrier during range operations. From the 1940s to the 1960s SEAD-46 was used for testing as a function test range for 3.5-inch rocket motors. The 1998 Archives Search Report (ASR) indicates that the berm is visible in a 1954 aerial photograph of the area. The OE EE/CA indicates that SEAD-46 was once used as a testing range for rocket motors. Review of historic files revealed at least one picture of a 3.5-inch motor fixed to a tripod in front of the berm at SEAD-46.

SEAD-57 (Explosive Ordnance Detonation Range)

SEAD-57, the former Explosive Ordnance Disposal Area (formerly EOD-1), is a rectangular parcel of land that encompasses approximately 72 acres in the west-northwest portion of the former Depot (see **Figure 2** and **4**). SEAD-57 is adjacent to the southernmost area of the Open Burning/Open Detonation Grounds that occupy most of the land in the northwestern corner of the former Depot. SEAD-57 is comprised primarily of open grassland. A few man-made structures are located in the center of the AOC and along its northern edge exist at SEAD-57. An open, reverse "C"-shaped berm, measuring 80 feet by 100 feet, is located in the center of the AOC. Equipment shelters, remote control shelters, and an EOD storage structure are located along the north-central edge of the AOC. An east-west oriented, unnamed dirt road transects the northern edge of the AOC, and a second, perpendicular, unnamed dirt road intersects the northern road roughly halfway across the AOC's edge. This road provides vehicular access to the area surrounding the earthen containment berm.

For more than 20 years the 143rd Ordnance Detachment, a Department of the Army tenant organization at the Depot, performed ordnance and explosives (OE) disposal at SEAD-57. The disposal area was used by EOD personnel for the disposal of conventional ammunition or explosives weighing less than 5 pounds.

SEAD-002-R-01 (EOD-2 and EOD-3)

SEAD-002-R-01 is comprised of two separate areas, EOD-2 and EOD-3, that are located in the northeastern portion of the former Depot in the vicinity of the Duck Pond and SEAD-46 (see **Figure 2, 5** and **6**).

EOD-2 encompasses approximately 3 acres of land on the southwestern shore of the Duck Pond. This area is west-northwest of SEAD-46 and southeast of the intersection of Fayette Road and East-West Baseline Road. EOD-2 is comprised primarily of open grassland with small areas of brush and tree cover. A portion of the eastern boundary of this site is defined by the shore of the Duck Pond. A portion of EOD-2 is collocated with the western portion of SEAD-13, the former Inhibited Red-fuming Nitric Acid disposal area. The ASR states that explosive devices were used in EOD-2, and that non-explosive projectiles were disposed near the Duck Pond.

EOD-3 encompasses approximately 4 acres of land approximately 250 feet north of the earthen protective barrier berm in SEAD-46. EOD-3 is mostly flat with the exception of a 100 foot by 200 foot depression in the middle of the site. The area surrounding the depression is wooded. The ASR describes the AOC as a former EOD disposal area, and indicates that in the 1950s and 1960s the area surrounding the depression was clear of brush and trees.

SEAD-007-R-01 (Grenade Range)

The Grenade Range, which was constructed in the mid-1980s, encompasses approximately 28 acres of land in the northwestern portion of the former Depot, to the west and southwest of SEAD-57 (see **Figure 2** and **7**). During its lifetime, the Grenade Range area contained wooden and armored vehicle targets, distance and boundary markers, and a range control tower. The Grenade Range is comprised primarily of open grassland that is surrounded by woods. The ASR states that 40mm M781 (40mm Low Velocity Practice Cartridge) and 35mm M73 sub-caliber practice rockets were used at the Grenade Range during security forces' training. There is no record (or indication at the targets) that high explosive (HE) rounds were used. Small arms (blanks) casings were reported to be present at the time of the ASR.

SEAD-70 (Former Building T2110 – Filled Area)

SEAD-70 is a historic fill area encompassing approximately 4.5 acres that are adjacent to the former Building T2110 in the northwestern portion of the Depot (see **Figure 2** and **8**). SEAD-70 is south of East-West Baseline Road approximately 1,000 feet west of the intersection of North-South Baseline Road and East-West Baseline Road, and approximately 15,000 feet northwest of the former Depot's main gate on State Highway 96. Prior to 2006, a wooden barn (Building T2110) was located at this AOC but it was demolished due to safety concerns about the aged, dilapidated structure. Building T2110 was identified as a potential ordnance, ammunition, explosives and other warfare materials storage shed at the time of the 1998 *Archives Search Report* effort, but once site inspections and interviews were completed, this area was dismissed from further consideration for munitions response actions.

SEAD-70 is currently vacant and undeveloped. The most noticeable feature in the undeveloped portion of SEAD-70 is a kidney-shaped landfill that forms a flat topographic high area. The landfill appears to originate near the former barn and expand southeasterly. A mound is located near the southeastern corner of the former barn and an elongated vegetated mound is present along the southern perimeter of the landfill. Immediately east of the landfill is a wet area beyond which is a large stand of deciduous trees.

The topography over the extent of the landfill is relatively flat; however the local and regional topography surrounding the landfill slopes west.

PREVIOUS INVESTIGATIONS AND ACTIVITIES AT THE AOCs

A discussion of previous geophysical and environmental investigations performed at the Munitions Response AOCs is provided in the discussion below. Previous work performed at the AOCs is described in detail in the following reports:

- *Completion Report, Munitions Response, SEAD 002-R-01, SEAD 57, SEAD 46 and SEAD 007-R-01,* (Parsons, 2007) submitted to Department of Defense Explosive Safety Board;
- *Expanded Site Inspections, Three Moderate Priority SWMUs, SEADs 11, 13, and 57*, Final (Parsons, 1995);
- *Expanded Site Inspection, Seven Low Priority AOCs,* Draft Final (Parsons, 1996);
- *Archives Search Report (ASR), Conclusions and Recommendations, Seneca Army Depot*, Final (USACE, 1998);
- *Remedial Investigation Report for SEAD-46 and SEAD-57*, Draft (Parsons, 2001);
- *Decision Document, Mini-Risk Assessment,* Final (Parsons, 2002);
- *Ordnance and Explosives Engineering Evaluation Cost Analysis Report (OE EE/CA)*, Final (Parsons, 2004);
- *Geophysical Investigation, Munitions Destruction Areas SEADs 46 & 57*, Final (Shaw, 2005);
- *Completion Report, Munitions Response, and CERCLA Closure*, Draft Final (Parsons, 2009); and
- *Risk Assessment: Munitions Response AOCs* (Parsons, 2009).

Level-of-contamination assessments in the hazardous substance and contaminant investigations summarized in the documents listed above are based on versions of state and federal soil clean-up objectives and guidance values that are no longer preferred by the governing authorities (i.e., EPA and NYSDEC). Therefore, summary presentations in this Proposed Plan were updated to reflect comparisons to the state and federal comparator guidance values that are currently preferred. This update is the source of differences between the data summaries presented in the aforementioned documents and those presented in this document. For example, the New York State Technical and Administrative Guidance Memorandum (TAGM) #4046 soil cleanup objectives (NYSDEC, Jan 1992) were used as comparator values prior to the issue of the NYSDEC Title 6 New York Code of Rules and Regulations (NYCRR) Part 375-6.8 (NYSDEC, Dec. 2006) soil cleanup objective (SCO) values. Similarly, in 2008 the EPA issued and adopted the use of Regional Screening Levels (RSLs) in place of preliminary remediation goals (PRGs) as comparator values for hazardous substances and contaminants at Superfund sites. The 2008 EPA RSLs for residential soils and the 2006 NYSDEC unrestricted use SCO values were used as the benchmarks for soil comparisons presented in this Plan.

In addition to the state and federal guidance values and standards, sample results for metal analytes were also compared to sets of approved background values that were developed for soil and groundwater for the Depot during the previous CERCLA investigations. Each of the background locations was identified in a work plan that was submitted to representatives of the EPA and the NYSDEC for review and approval prior to the initiation of the proposed work. Results from the approved group of background locations were combined to produce a background dataset for each medium of concern during risk management evaluations that are conducted within the risk assessment.

SEAD-46 (3.5-inch Rocket Range)

Soil Investigations

Remedial Investigation

SEAD-46 soil was characterized as part of the remedial investigation (RI) field activities conducted during 1999 and 2000. During the RI, soil from test pits, soil borings, surface soil locations, surface water drainage channels, and swales (i.e., ditch soil) was collected and characterized for Target Analyte List (TAL) and Target Compound List (TCL) hazardous substances. Based on the investigation, metals were identified as the principal chemicals of potential concern (COPCs) at the AOC. The collected data indicates that detected metal concentrations are generally consistent with concentrations found in native soil. Based on the analytical data collected during the RI,

the Army analyzed soil samples in locations where potential ordnance or explosive debris was found during the 2006 Munitions Response activities. (See section "Closure Sampling" for a discussion of sample analyses and detected compounds.)

OE EE/CA and Geophysical Investigation

As part of the OE EE/CA (Parsons, 2004), geophysical surveys and intrusive investigations were conducted over roughly 17.5 acres of SEAD-46. During the OE EE/CA investigation, 1,155 geophysical anomalies[3] were identified and investigated; this work resulted in the identification of 478 munitions debris[4] (MD) items; of which 10 were identified as material potentially presenting an explosive hazard (MPPEH)[5]. The majority of recovered M4071A 40mm practice grenades were located at the south boundary of the AOC, opposite the protective barrier berm.

During the Geophysical Investigation conducted by Shaw in April 2005, approximately 24 acres of SEAD-46 were digitally mapped using electromagnetic inductance and magnetometry. The digital geophysical mapping (DGM) survey identified one area in SEAD-46 where the anomaly density was greater than 600 anomalies per acre. Areas with more than 600 anomalies per acre are defined as "saturated response areas" (SRAs). In addition to the identification of the SRA, 98 anomalies were investigated by Shaw. The investigation found 32 pieces of aluminum MD, six ferrous MD pieces, and 60 cultural debris (CD) pieces[6].

Munitions Response – Munitions Clearance

The 2006 Munitions Response investigation of SEAD-46 detected 2,054 geophysical anomalies. Of the anomalies found, 16 were identified as suspected MPPEH. Upon further investigation however, all 16 MPPEH items were reclassified as MD and were assessed to pose no threat. No identifiable complete or partial 3.5-inch rockets or rocket motors were found during the 2006 investigation. Based on the results of this investigation and past investigations, SEAD-46 is considered to be clear of MPPEH and no further geophysical or munitions response action is needed.

Munitions Response – Closure Sampling

One foot of soil from the exterior surfaces of the berm at SEAD-46 was excavated and moved to a cleared location in SEAD-57. After the initial foot of soil was removed from the backstop berm, UXO personnel surveyed the berm and confirmed that only non-military items and cultural debris remained in the underlying soil. In addition, a test pit was excavated in the center of the berm structure, and the senior UXO supervisor (SUXOS) determined that no MPPEH was present in the remainder of the berm

The excavated soil from the SEAD-46 backstop berm was commingled with soil that was excavated from the SEAD-57 protective berm during the metal separation process, then laid out on the ground in a cleared area within SEAD-57 in a one-foot thick soil lift. This soil lift was surveyed and processed by UXO personnel to identify and remove MD and MPPEH. Samples of the remaining soil were collected and characterized to determine residual levels of metal contaminants. Please refer to the "Closure Sampling, SEAD-46 and SEAD-57 Stockpile Sample" section for further discussion of sample analyses and results for the processed lift soil.

[3] A geophysical anomaly is a deviation from the background as determined by an instrument. In Munitions Response, geophysical measurements are used to identify residual metal components that may be associated with ordnance or munitions. Magnetometry and electro-magnetic inductance are two of the primary detection methods used to find ferrous and non-ferrous metals.
[4] Remnants of munitions (i.e., fragments, penetrators, projectiles, shell casings, links, fins) remaining after use, demilitarization, or disposal.
[5] MPPEH includes munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; range-related debris; and equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production. Excluded from MPPEH are munitions established in the DOD's munitions management system and hazardous items that may present explosion hazards that are not munitions and are not intended for use as munitions (e.g., gasoline cans, compressed gas cylinders).
[6] Debris found on operational ranges or munitions response sites that may be removed to facilitate range clearance or munitions response, that is not related to munitions or range operations. Such debris includes, but is not limited to: rebar, household items, automobile parts, automobiles (not associated with range targets), fence posts, fence wire, and magnetic rocks.

Groundwater Investigations

Monitoring well installation and groundwater sampling at SEAD-46 took place as part of the RI. Investigations included the installation, development, testing, and sampling of six monitoring wells (MW46-1 to MW46-6). Monitoring well MW46-1 was installed as a background well; the remaining five wells were installed close to the earthen berm located at the northern end of the AOC. Two rounds of groundwater samples were collected in January and April of 2000 and analyzed for TCL volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), TAL metals and cyanide, explosives, herbicides, total recovered petroleum hydrocarbons (TRPH), fluoride, and nitrate. The resulting groundwater data were compared to the lower permissible concentration promulgated in New York State Class GA groundwater standards (NYS GA Standard) and EPA Maximum Contaminant Levels (MCLs).

Three metals were detected in SEAD-46 groundwater samples at concentrations above NYS GA Standards and/or EPA MCLs: antimony, iron, and thallium. Antimony and thallium were both found at concentrations above their respective MCLs once, in separate wells during the first RI sampling event. As such, these measurements are viewed as suspect, and are not presumed to be indicative of a groundwater plume. It is more likely that each of these occurrences are artifacts that occur during first sampling of newly installed and developed monitoring wells.

With respect to iron, it was detected in all of the groundwater samples collected at SEAD-46, but only four times at concentrations above New York's GA groundwater standard. All of the exceedances occurred in different wells (MW46-1, 46-2, 46-3, and 46-6). Three of the noted exceedances, including the two highest concentrations, occurred in the first RI sampling event and one occurred during the second sampling event at the well. However, the concentration of iron found in the groundwater at SEAD-46 is consistent with the regional groundwater quality in Seneca County and therefore cannot be distinguished from background contributions.

***SEAD-57** (Explosive Ordnance Disposal Range)*

Soil Investigations

ESI and RI

The soil at SEAD-57 was characterized during the 1999 and 2000 RI and the 1993 and 1994 ESI field activities. Soil sample types include: surface soils, subsurface soil from soil borings and test pits, and ditch soil from drainage gullies and swales. Metals were the principal hazardous substances detected at the AOC, but detected concentrations were generally consistent with the approved background soil concentration dataset values. See section "Closure Sampling" for a discussion of sample analyses and detected compounds.

OE EE/CA and Geophysical Investigation

Geophysical surveys and intrusive investigations were conducted at SEAD-57 as part of the OE EE/CA (Parsons, 2004). Approximately 15 acres were mapped, and 1,700 anomalies were investigated. Over 950 recovered items were classified as MD; of the investigated items, three were determined to be MEC (i.e., an MK2 grenade and two 20mm projectiles). During a surface sweep, a 37mm armor piercing high explosive (APHE) item was found near the abandoned ammunition disassembly area across the unpaved road at the northern end of the AOC. At the end of the OE EE/CA all MD and MEC items were disposed in accordance with approved procedures.

During Shaw's geophysical investigations in April 2005, 22.5 acres of the AOC were digitally mapped. The results identified six SRAs spanning approximately 13 acres of SEAD-57. In addition, 75 other anomalies were

investigated at the site. Four MPPEH items were identified including a 75mm, a 75mm AP, a 105mm, and an unknown bomb. Following venting[7], these items were classified as MD.

Munitions Response – Munitions Clearance

Of the 7,485 anomalies detected during the SEAD-57 Munitions Response investigation, 47 were classified as MPPEH items. Of these 47, all but two were classified as MD after venting the items during the disposal process. The two MPPEH items were a fused 37mm projectile and a MK2 grenade, and may have been EOD training items. This determination is supported by the fact that most ferrous MD items at SEAD-57 were found north of Building T011, a known EOD training area, and outside of the 400-foot high-density radius around the SEAD-57 berm.

Upon the completion of the 2006 Munitions Response action, SEAD-57 is considered to be free of MPPEH and no further geophysical investigation or munitions response action is required.

Munitions Response – Closure Sampling

During the Munitions Response action, soil samples from SEAD-57 were collected from two areas:

1) The walls and floor of an excavation that removed debris and residues found in a historic burn pit at the protective berm, and

2) The top foot of soil on the SEAD-57 protective berm.

The foot of soil removed from the top of the berm was combined with the foot of soil removed from the backstop berm at SEAD-46 for processing; the combined soil was laid out in a one-foot thick soil lift for further UXO processing and subsequent sampling. A post-excavation sweep of the berm was then performed by UXO personnel using metal detectors with evidence of Mk25 drift signals and an empty 155 mm projectile identified and recovered. These items were removed and secured, and then the protective berm was re-swept and cleared of MPPEH and residual debris by the SUXOS.

The soil and debris removed from the historic burn pit was separately processed by UXO personnel at another location in the SEAD-57 soil lay down area. See section “Closure Sampling, SEAD-46 and SEAD-57 Stockpile Samples” for a discussion of the combined soil removed from SEAD-46 and SEAD-57; see section “SEAD-57 Berm Pit Excavation” for a discussion of sample analyses and detected compounds for the material removed from the historic burn pit.

Groundwater Investigations

Three monitoring wells (MW57-1 to MW57-3), including one background well and two down gradient wells, were installed at SEAD-57 during the 1994 ESI. Four additional monitoring wells (MW57-4 to MW57-7) were installed at SEAD-57 during the 2000 RI. Three sets of samples were collected from the wells at SEAD-57: the three ESI wells were sampled at various times between 1993 and 2000, all seven monitoring wells were sampled in January 2000 and April 2000; and MW57-1 was sampled two additional times during the SEAD-12 RI in 2000. The discussion below summarizes the results found during the sampling events. The resulting groundwater data were compared to the lower permissible concentration promulgated in NYS GA Standards and EPA MCLs.

Five metals, antimony, iron, manganese, sodium, and thallium, were found in one or more of the groundwater samples at SEAD-57 at concentrations above NYS GA Standards and/or EPA MCLs. The two exceedances for antimony were detected in the ESI wells that were sampled prior to 2000; none of the groundwater samples from

[7] Exposing any internal cavities of MPPEH, to include training or practice munitions (e.g., concrete bombs), using DDESB- or DoD Component-approved procedures, to confirm that an explosive hazard is not present.

the RI exhibited any exceedances for antimony. TAL metals were analyzed at MW57-1 during the SEAD-12 RI sampling events. Iron was the only exceedance in the SEAD-12 RI data; and the detected iron concentrations are in line with accepted background concentrations. The single exceedance for manganese was detected in an ESI sampling event; all manganese concentrations from the RI were below the NYS GA standard. The highest iron concentration was detected in an ESI sampling event; lower exceeding iron concentrations were observed during the RI sampling event. Since these lower concentrations are similar to accepted background groundwater quality, no further groundwater investigations are necessary at SEAD-57.

SEAD-007-R-01 (Grenade Range)

Soil Investigations

OE EE/CA

A geophysical investigation was conducted at the Grenade Range as part of the OE EE/CA. Eight hundred and sixty-five geophysical anomalies were identified and 102 MPPEH items were recovered. Items classified as MPPEH were comprised of 101, 35mm sub-cal LAW M73s, and one M407A1 Rifle Grenade. All MPPEH, MD, and cultural debris (CD) were identified and disposed of appropriately.

Munitions Response – Munitions Clearance

During the 2006 Munitions Response, 218 potential MPPEH items were detected at SEAD-007-R-01. All potential MPPEH items were related to the M73 Practice LAW Rocket and 40mm practice grenade. Since none of the practice rockets found at SEAD-007-R-01 had its motor intact, the practice rockets were reclassified as MD. However, since the M73 Practice Rockets potentially contained small, smoke-emitting, bursting charges, all items were disposed by detonation as part of the final inerting process[8]. Based on the munitions response survey results, findings, quality control and quality assurance procedures performed at the AOC, SEAD-007-R-01 is considered to be cleared of MPPEH and no further action is required.

Munitions Response – Closure Sampling

Surface soil samples were collected at SEAD-007-R-01 as part of the Munitions Response and CERCLA closure activities. See the section “Closure Sampling” for a discussion of sample analyses and detected compounds.

SEAD-002-R-01 (EOD-2 and EOD-3)

Soil Investigations

OE EE/CA

A geophysical investigation was conducted at SEAD-002-R-01 as part of the OE EE/CA. Twenty-one items were recovered during the investigation; one item was classified as MEC. Any items that were classified as MD or CD were identified and disposed of appropriately.

Munitions Response – Munitions Clearance

Two MPPEH items were found during the investigation at EOD-2; these two items were classified as MD after they were vented. These two items were an expended electric squibb and the fuseless body of an M16 APERS[9]. No

[8] The process by which all energetic material (i.e., primers, fuses, explosive or incendiary fill) contained in munitions has been removed or rendered harmless (source: http://en.wikipedia.org/wiki/Inert).
[9] M16 anti-personnel landmine.

MPPEH items were found at EOD-3. SEAD-002-R-01 is considered to be clear of MPPEH.

Munitions Response – Closure Sampling

Surface soil samples were collected at SEAD-002-R-01 as part of the Munitions Response. See the section "Closure Sampling" for a discussion of sample analyses and detected compounds.

SEAD-70 (Building T2110 – Filled Area)

Soil Investigations

Shallow soil samples and subsurface soil samples were collected at SEAD-70 during the 1994 ESI sampling event. Data from the soil that was removed as part of the aforementioned removal actions was eliminated from the SEAD-70 soil dataset. Analytical results from sample duplicate pairs of soil data were presented as discreet samples.

Groundwater Investigations

Four monitoring wells (MW70-1 to MW70-4) were installed at SEAD-70 during the ESI; the wells were sampled during the ESI sampling event on July 7 and July 8, 1994. Collected samples were analyzed for TAL inorganic compounds and TCL VOCs, SVOCs, and pesticides/PCBs. Results of the groundwater sampling and analysis indicated that one VOC (acetone) and 17 metals were detected in one of more of the four samples collected, but only iron and manganese were found at levels that exceeded NYSDEC GA or federal MCL levels. Iron and manganese were each found once, in separate samples at levels that exceeded identified standard levels. However these samples were collected using bailers so it is likely that these exceedances result due to turbidity in the samples. The elevated concentrations found for iron and manganese in the SEAD-70 groundwater samples were within the range of comparable concentrations reported for iron and manganese in approved background wells.

Risk Assessment

The Army conducted a mini-risk assessment for SEAD-70 based on the results of the ESI sampling event, and determined that potential carcinogenic risks for conservation/recreational receptors evaluated (i.e., park worker, construction worker, recreational visitor) were within the EPA's recommended range (i.e., 10^{-4} to 10^{-6}). The cancer risk for the lifetime resident was estimated as 3×10^{-4} driven by arsenic.

The non-carcinogenic hazard indices (HIs) were the park worker and the recreational chilled were both estimated as lower than EPA's recommended threshold of 1, whereas the construction worker's HI was estimated at 2. The construction worker's estimated elevated HI is driven by the presence of arsenic in the soil. The mini-risk also indicated that the child resident's non-carcinogenic HI was 4, again driven by arsenic in soil.

Removal Action (2008)

Based on the results of the mini-risk assessment, during work associated with the demolition of Building T-2110, the Army excavated soil from the area at SEAD-70 where the highest concentrations of arsenic in soil were previously identified. The initial excavation encompassed an area measured approximately 50 feet wide by 100 feet long by six inches deep centered around the sample location where the single high value of arsenic (i.e., SB70-02, 0 to 0.2 ft bgs, 88.5 mg/Kg) had been found. Once this area was excavated, excavation perimeter, sidewall, and base confirmatory samples were collected and analyzed for arsenic content in soil. Analytical results from the confirmatory samples were compared to New York's unrestricted use SCO for arsenic (i.e., 13 mg/Kg), which was established as the removal action's cleanup goal. Results of the initial confirmatory samples did not confirm that all locations achieved the site cleanup goals so additional excavations were advanced and additional confirmatory

sampling and analyses were performed until cleanup goals were achieved. At the completion of the soil removal action, the SEAD-70 excavation expanded to encompass an area of approximately 19,250 square feet, with vertical depths varying from 1 to 6.5 feet below grade surface. In total, approximately, 720 cubic yards were excavated from the site and disposed off site at a licensed landfill. Analytical results from the removal action were then added to the ESI dataset, and the risk assessment was rerun for the site. The results of the revised risk assessment for SEAD-70 are presented below.

Closure Sampling

SEAD-46 (3.5-inch Rocket Range)

The soil data set for SEAD-46 has been modified to reflect the removal of several shallow soil samples that were collected from the former backstop berm at SEAD-46 during the RI. During the Munitions Response action, the top foot of soil was removed from the backstop berm and transported to the SEAD-57 lay down area for MEC/MPPEH surveying and processing. Once all MEC/MPPEH was removed, residual soil was sampled and analyzed. Please refer to the "SEAD-46 and SEAD-57 Stockpile Samples" section for further discussion.

The thirty-one confirmatory soil samples collected during the SEAD-46 RI were analyzed for TCL volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides and polychlorinated biphenyls (Pest\PCBs), TAL metals and cyanide, and nitroaromatic and nitroamine compounds. The data presented below includes constituent maximums, 95th upper confidence limits (UCLs) of the arithmetic mean[10] (hereafter referred to as 95th UCLs), comparison to NYSDEC SCO values and EPA RSLs, and the number of times concentrations exceed comparator values. For the complete set of sampling data see the Munitions Response Report. As shown in **Table 1**, nine compounds at SEAD-46 were detected at concentrations above guidance values: one VOC, one SVOC, three pesticides, and four metals.

Table 1
SEAD-46 Soil Data

				NYSDEC SCO Unrestricted Use		EPA RSL Residential Soil	
Parameter	**Units**	**Maximum Value**	**95th UCL Value**	**Value**	**# Samples Above**	**Value**	**# Samples Above**
Acetone	µg/Kg	410	245	50	27	61000000	--
Benzo(a)pyrene	µg/Kg	30	12.4	1000	--	15	2
4,4'-DDD	µg/Kg	12	12(*)	3.3	1	2000	--
4,4'-DDE	µg/Kg	3.7	3.7(*)	3.3	1	1400	--
Dieldrin	µg/Kg	46	5.1	40	2	30	2
Arsenic	mg/Kg	7.9	5.28	13	--	0.39	31
Lead	mg/Kg	73	31.9	63	1	400	--
Nickel	mg/Kg	47.4	31.9	30	12	1500	--
Zinc	mg/Kg	115	77.5	109	1	23000	--

(*) 95th UCL value set at maximum because the compound was detected in only one sample.

Arsenic was detected in all soil samples at SEAD-46 at concentrations that exceed the EPA RSL; however, arsenic concentrations in these samples are typical of the approved background levels and the NYSDEC SCO value for arsenic.

[10] Confidence limits for the mean (Snedecor and Cochran, 1989) are an interval estimate for the mean. Interval estimates are often desirable because the estimate of the mean varies from sample to sample. Instead of a single estimate for the mean, a confidence interval generates a lower and upper limit for the mean. The interval estimate gives an indication of how much uncertainty there is in the estimate of the true mean. The narrower the interval, the more precise is the estimate. The 95% upper confidence limit provide approximately 95% coverage for the unknown population mean (EPA, 2007). 95th UCLs were calculated for each chemical via EPA ProUCL version 4.00.02.

Acetone was detected in the majority of samples at concentrations that exceed the NYSDEC SCO value for acetone; however, this finding likely reflects the method of sample preservation and analysis rather than the presence of acetone at the site. Available technical literature[11] indicates that preserving soil samples with sodium bisulfate, which was done for SEAD-46 samples, generates acetone. Hence, the measured acetone in SEAD-46 samples is likely a result of the preservation protocol not an indication of acetone in site soil. Further, there is no historic information that indicates that acetone was ever used or stored at the SEDA, and its ubiquitous presence in surface samples throughout the site makes its detection suspect.

Nickel was detected twelve times in soil samples at SEAD-46 at concentrations that exceed the NYSDEC SCO value for nickel; however, the 95th UCL is only slightly above the NYSDEC SCO value of 30 mg/Kg these samples are below typical approved background levels. Further the 95th UCL is below the EPA RSL for residential soil.

The other compounds found at concentrations above comparator values were infrequently (i.e., 1 or 2 times) detected at elevated concentrations.

SEAD-57

Roughly 120 confirmatory soil samples were collected during the RI at SEAD-57 and were analyzed for TCL VOCs, SVOC, pesticides and PCBs, TAL metal and cyanide, and nitroaromatic and nitroamine compound content. As shown in **Table 2**, sixteen compounds were detected that exceeded one of the comparative guidance values: one VOC, one SVOC, four pesticides, and 10 metals.

Table 2
SEAD-57 Soil Sample Data

				NYSDEC SCO Unrestricted Use		EPA RSL Residential Soil	
Parameter	**Units**	**Maximum Value**	**95th UCL Value**	**Value**	**# Samples Above**	**Value**	**# Samples Above**
Acetone	µg/Kg	700	148.8	50	87	61000000	--
Benzo(a)pyrene	µg/Kg	76	28.57	1000	--	15	8
4,4'-DDD	µg/Kg	54	3.76	3.3	5	2000	--
4,4'-DDE	µg/Kg	32	3.80	3.3	7	1400	--
4,4'-DDT	µg/Kg	23	5.52	3.3	5	1700	--
Dieldrin	µg/Kg	27	10.21	5	5	30	--
Arsenic	mg/Kg	17.8	5.12	13	1	0.39	110
Cadmium	mg/Kg	28.6	1.91	2.5	6	70	--
Chromium	mg/Kg	32.1	20.6	30	2	120000	--
Cobalt	mg/Kg	29.7	11.0	NA	--	23	1
Copper	mg/Kg	2,930	95.14	50	2	3100	--
Lead	mg/Kg	1,860	103	63	2	400	1
Manganese	mg/Kg	2,580	625	1600	5	1800	3
Nickel	mg/Kg	54.1	28.1	30	37	1600	--
Thallium	mg/Kg	6.7	2.30	NA	--	5	4
Zinc	mg/Kg	1,250	108	109	11	23000	--

[11] See Nebelsick, John D., "USACE Sample Collection and Preparation strategies for Volatile Organic Compounds in Solids," http://www.environmental.usace.army.mil/pres_chem.htm. 1999. Also, see Clausen, Jay L., *et al.*, "Acetone Production as a result of Sodium Bisulfate Preservation Using EPA Method 5035," The 17th Annual International Conference on Contaminated Soils, Sediments, and Water, University of Massachusetts, Amherst October 18 & 19, 2000. Additionally, see Uhlfelder, M., "Study of Acetone Production in SW-846 Method 5035 (Low Level) Associated with Various Preservation and Storage Conditions," 16th Annual Waste Testing and Quality Assurance Symposium, August 5th – 10th, 2000.

Of all 87 samples, acetone has the most exceedances above the NYSDEC SCO value. Nevertheless, acetone was never found at a concentration above the EPA RSL for residential soil. As previously discussed, preserving soil samples with sodium bisulfate generates acetone that is not present in site soil. Therefore, it is believed that its presence in samples at elevated levels is an artifact of the preservation and analysis process used and not indicative of acetone in the SEDA soil.

Benzo(a)pyrene was detected in eight samples at levels above the EPA RSL for residential soil; the 95th UCL for benzo(a)pyrene is above the EPA residential soil RSL, as well. However, none of the sample concentrations were detected at levels above the NYS SCO of 1000 μg/Kg.

Arsenic had the most samples with concentrations above the EPA RSL for residential soil. Nevertheless, only one sample had a concentration above the NYSDEC SCO value. Also, the 95th UCL for arsenic at the site is less than the approved background for arsenic.

Nickel was detected 37 times in soil samples at SEAD-57 at concentrations that exceed the NYSDEC SCO value for nickel; however, the 95th UCL is below the NYSDEC SCO value. None of the nickel results exceeded the EPA RSL for residential soil; these samples are below typical regional background levels.

Zinc, cadmium, and manganese were found at concentrations that exceed their respective NYS SCOs, but the 95th UCL for each metal is lower than NYS SCOs. None of these metals were found at concentrations that exceed EPA RSLs for residential soil.

SEAD-46 and SEAD-57 Stockpile Samples

One foot of soil from the exterior surfaces of the backstop berm at SEAD-46 and the protective enclosure berm at SEAD-57 was excavated and processed by UXO personnel to remove MD and MPPEH. The excavated soils were laid out in a one foot lift on a cleared portion of SEAD-57. Once the soil was cleared of munitions, it was collected and analyzed for TCL and TAL analytes. As shown in **Table 3,** six metals exceed the guidance values.

Table 3
SEAD-46 and SEAD-57 Stockpile Soil Data

				NYSDEC SCO Unrestricted Use		**EPA RSL Residential Soil**	
Parameter	**Units**	**Maximum Value**	**95th UCL Value**	**Value**	**# Samples Above**	**Value**	**# Samples Above**
Arsenic	mg/Kg	8.9	7.3	13	--	0.39	6
Chromium	mg/Kg	30.1	27.7	30	1	120000	--
Copper	mg/Kg	58.2	45.0	50	1	3100	--
Lead	mg/Kg	132	99.4	63	1	400	--
Nickel	mg/Kg	45.7	39.4	30	4	1500	--
Zinc	mg//Kg	182	140	109	1	23000	--

Arsenic was detected in all soil samples at the SEAD-46 and SEAD-57 stockpile area at concentrations that exceed the EPA RSL for residential soil. However, all arsenic concentrations are consistent with or below approved background levels and below the NYSDEC SCO.

Nickel was detected in four samples at concentrations that exceed the NYS SCO; however, nickel concentrations do not exceed the EPA RSL for residential soil, these samples are below typical approved background levels.

Each of the other metals that exceed the NYSDEC SCO value does so only once; further, none of the metals exceeds its respective EPA RSL.

SEAD-57 Berm Pit Excavation

Six soil samples were collected from the walls and floor of the excavation required as part of the munitions response action that removed residue in a historic burn pit at SEAD-57. After sampling the soil from the burn pit, the soil was processed with the soil that was excavated from the SEAD-46 backstop berm and the SEAD-57 protective berm that was placed in the soil lay down area at SEAD-57.

Six samples were collected from the Burn Pit excavation at SEAD-57 and analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL metals, and nitroaromatics and nitramines. As shown in **Table 4**, four metals were detected in soil samples at concentrations that exceeded one of the comparative guidance values in one or more of the samples characterized.

Table 4
SEAD-57 Berm Pit Soil Data

				NYSDEC SCO Unrestricted Use		EPA RSL Residential Soil	
Parameter	**Units**	**Maximum Value**	**95th UCL Value**	**Value**	**# Samples Above**	**Value**	**# Samples Above**
Arsenic	mg/Kg	4.7	4.0	13	--	0.39	6
Chromium	mg/Kg	31.1	30.4	30	1	120000	--
Nickel	mg/Kg	59.2	53.0	30	6	1500	--
Zinc	mg/Kg	124	124$^{(\Phi)}$	109	6	23000	--

$^{(\Phi)}$ Recommended 95th UCL exceeds maximum detected concentration due to the limited number of available samples (6).

Arsenic was detected in all soil samples at the SEAD-57 berm pit area at concentrations that exceed the EPA RSL for residential soil. However, all arsenic concentrations are consistent with or below approved background levels and below the NYSDEC SCO value.

All six soil samples had concentrations of nickel that were above the NYSDEC SCO value but below the EPA RSL. Concentrations of nickel were consistent with the approved background values. Similarly, five of the six samples for zinc are above the NYSDEC SCO value but below the EPA RSL for residential soil.

SEAD-007-R-01

Soil samples were collected at SEAD-007-R-01 during the Munitions Response action. Forty-two samples were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL metals, and nitroaromatic and nitramine compounds. As shown in **Table 5**, seven compounds exceed the guidance values: one VOC, and six metals.

Table 5
SEAD-007-R-01 Soil Data

Parameter	Units	Maximum Value	95th UCL Value	NYSDEC SCO Unrestricted Use		EPA RSL Residential Soil	
				Value	# Samples Above	Value	# Samples Above
Acetone	µg/Kg	290	120.1	50	32	61000000	--
Arsenic	mg/Kg	9.3	3.9	13	--	0.39	42
Cobalt	mg/Kg	23.5	11.1	NA	--	23	1
Manganese	mg/Kg	1,880	632	1,600	1	1800	1
Nickel	mg/Kg	31.9	24.1	30	3	1500	--
Selenium	mg/Kg	4.4	2.5	3.9	2	390	--
Zinc	mg/Kg	110	83.1	109	1	23000	--

Acetone and arsenic had the most exceedances of any compound at SEAD-007-R-01. None of the acetone concentrations at SEAD-007-R-01 exceed the EPA RSL for residential soil, but 32 exceed the NYS SCO. As previously discussed, acetone is a known byproduct of sample preservation and analysis and the validity of the detected acetone concentrations is dubious.

Arsenic was detected in all soil samples at SEAD-007-R-01 at a concentration that exceeds the EPA RSL; however, arsenic concentrations in these samples are below approved background levels and the NYSDEC SCO value for arsenic.

Although other chemicals at SEAD-007-R-01 exceed state or federal comparator values, residual concentrations, as measured by the 95th UCL, are below established guidance concentrations.

SEAD-002-R-01 (EOD-2 and EOD-3)

EOD-2

Twelve surface soil samples were collected from EOD-2 during the 2006 Munitions Response actions. As shown in **Table 6**, eight compounds exceed the guidance values: one VOC, four SVOCs, and three metals.

Table 6
SEAD-002-R-01 (EOD-2) Soil Data

Parameter	Units	Maximum Value	95th UCL Value	NYSDEC SCO Unrestricted Use		EPA RSL Residential Soil	
				Value	# Samples Above	Value	# Samples Above
Acetone	µg/Kg	100	74	50	8	61000000	--
Benzo(a)anthracene	µg/Kg	410	358(Φ)	1000	--	150	1
Benzo(a)pyrene	µg/Kg	310	390(Φ)	1000	--	15	2
Benzo(b)fluoranthene	µg/Kg	230	282(Φ)	1000	--	150	1
Indeno(1,2,3-cd)pyrene	µg/Kg	150	187(Φ)	500	--	150	--
Arsenic	mg/Kg	4.5	3.6	13	--	0.39	12
Manganese	mg/Kg	2,770	1,512	1600	1	1800	1
Nickel	mg/Kg	49.9	30.8	30	3	1500	--

(Φ) Recommended 95th UCL exceeds maximum detected concentration due to limited number of samples and limited number of detected results.

Arsenic was detected in all soil samples at EOD-2 at concentrations that exceed the EPA RSL; however, arsenic concentrations in these samples are below approved background levels and the NYSDEC SCO value for arsenic.

Acetone was found in eight samples at concentrations above the NYS SCO; however, as previously discussed, acetone detected in these samples is likely a byproduct of sample preservation and analysis and not a contaminant of concern.

The remaining compounds exceed their respective comparator concentrations in fewer than one-quarter of the samples. Further, the exceedances for these compounds are above the NYS SCO or the EPA RSL, not both.

EOD-3

Nine surface soil samples were collected from EOD-3 during the Munitions Response actions. As shown in **Table 7**, two compounds exceed the guidance values: one VOC and one metal.

Table 7
SEAD-002-R-01 (EOD-3) Soil Data

				NYSDEC SCO Unrestricted Use		EPA RSL Residential Soil	
Parameter	**Units**	**Maximum Value**	**95th UCL Value**	**Value**	**# Samples Above**	**Value**	**# Samples Above**
Acetone	µg/Kg	260	138	50	6	61000000	--
Arsenic	mg/Kg	5.1	4.3	13	--	0.39	9

Arsenic was detected in all soil samples at EOD-3 at concentrations that exceed the EPA RSL; however, arsenic concentrations in these samples are below approved background levels and the NYSDEC SCO value for arsenic.

Acetone was detected in six samples at concentrations that exceed the NYSDEC SCO. As previously discussed however, acetone is a byproduct of the sample preservation and extraction procedure, and it is believed that the acetone in these samples does not result from releases that have occurred at EOD-3.

SEAD-70

Forty-six surface soil samples were collected from SEAD-70 during the 2006 Munitions Response actions. As shown in **Table 8**, four compounds exceed the guidance values: one VOC, and three metals.

Table 8
SEAD-70 Soil Data

				NYSDEC SCO Unrestricted Use		EPA Residential Soil	
Parameter	**Units**	**Maximum Value**	**95th UCL Value**	**Value**	**# Samples Above**	**Value**	**# Samples Above**
Acetone	mg/Kg	79	NA$^{(\Phi)}$	50	1	6100	--
Arsenic	mg/Kg	15.2	8.49	13	2	0.39	46
Nickel	mg/Kg	52.4	38.7	30	8	1500	--
Zinc	mg/Kg	116	80.1	109	1	2300	--

$^{(\Phi)}$ No 95th UCL is available for acetone because only one distinct detection exists.

Arsenic was detected in all soil samples at SEAD-70 at concentrations that exceed the EPA RSL; however, arsenic concentrations in these samples are below approved background levels and the NYSDEC SCO value for arsenic.

Acetone was detected in one sample at a concentration that exceeds the NYSDEC SCO value. As previously discussed however, acetone is a byproduct of the sample preservation and extraction procedure, and it is believed that the acetone in these samples does not result from releases that have occurred at SEAD-70.

Nickel and zinc were found at concentrations that exceed their respective NYS SCOs; however, neither of these metals was found at concentrations that exceed EPA RSLs for residential soil.

RISK SCREENING

To estimate potential harmful effects to humans that could result on account of remaining conditions at the AOCs, a human health risk assessment was conducted for SEAD-46, SEAD-57, EOD-2, EOD-3, the Grenade Range, and SEAD-70. Contaminants of potential concern (COPCs) evaluated in the risk assessment were selected because the contaminants regularly exceed regulatory reference values like the NYSDEC SCO values or the EPA RSLs for residential soil. Exposure point concentrations (EPCs) used in the risk assessment are equal to the maximum concentration at the AOC or the 95th UCL of the data. The reasonable maximum exposure (RME) was evaluated in each case. The key document documenting the risk characterization process and results for the Munitions Response AOCs is titled *Risk Assessment: Munitions Response AOCs* (Parsons, October 2009) and is available in the Administrative Record.

Risk Assessment Methodology

Risk assessments, which are performed at sites where hazardous substances have been detected, identify if the concentrations of the substances pose a threat to current or future human or ecological receptors at the site. Risk assessments are inherently conservative, purposely biased to prompt an action if risk is identified.

Human health risk assessments follow a four-step process that includes hazard identification, exposure assessment, toxicity assessment, and risk characterization. These four steps are used to assess potential site-related human health risk for RME scenarios that exist or could exist if no action were taken to eliminate or mitigate them.

1. Hazard Identification: Chemicals of Potential Concern in the various media at the site are identified and selected based on factors such as toxicity, concentration detected versus regulatory standards, frequency of detection, fate and transport in the environment, mobility, persistence, and bioaccumulation.

2. Exposure Assessment: Different exposure pathways through which existing or future receptors might be exposed to the COPCs are evaluated. Possible exposure pathways include ingestion, dermal contact, or inhalation. Factors relating to the exposure assessment include concentrations that receptors may encounter, and the duration and frequency of the potential exposure. The RME scenario is calculated to estimate the highest level that could be expected to occur at the site.

3. Toxicity Assessment: The types of adverse effects associated with exposure to COPCs, and the relationship between the magnitude of the exposure and the severity of potential effects, are determined. Potential effects are COPC-specific and may include risks of developing cancer or other changes in normal organ function (non-carcinogenic effects).

4. Risk Characterization: The level of risk is assessed by combining the outputs of the exposure assessment and toxicity assessment. Carcinogenic and non-carcinogenic risk is estimated. Current guidelines for acceptable individual lifetime excess cancer risk are established as 1 in 10,000 to 1 in 100,000 or less (i.e., $1x10^{-4}$ to $1x10^{-6}$). The non-cancer risk, expressed as a “hazard index” (HI), represents the sum of individual exposure levels to corresponding reference doses. A non-cancer HI threshold level of less than 1 is set as the reference point, and this level may be applied to the body as a whole or allocated amongst individual target organs (e.g., heart, lungs, etc.) or systems (e.g., endocrine system, central nervous system, etc.).

Land in each AOC is currently designated as either Conservation/Recreation (SEAD-57, SEAD-70, SEAD-007-R-01) or Residential/Resort (SEAD-46, SEAD-002-R-01 [EOD-2 and EOD-3]) as defined by the Seneca County Industrial Development Agency. Based on the current and foreseeable land use at the sites, five future human receptors were identified for this risk assessment: construction worker, park worker, recreational child visitor, adult resident, and child resident. Adult and child residents are included in the risk assessment to evaluate potential risks to receptors under the Residential/Resort and as the unrestricted use scenario.

Potential non-carcinogenic hazard and carcinogenic risk due to soil exposure and ambient air exposure was evaluated at all AOCs; potential carcinogenic and non-carcinogenic effects due to groundwater exposure were evaluated at SEAD-46, SEAD-57, and SEAD-70 only. Groundwater exposure was not evaluated at SEADs 002-R-01 (EOD Areas 2 and 3) or 007-R-01 (Grenade Range) because no groundwater wells are present at these sites and no groundwater data is available for these AOCs and soil concentrations do not indicate a potential for contamination.

Soil exposure pathways analyzed in the individual AOC risk assessments are the ingestion of soil, dermal contact with soil, and inhalation of ambient dust formed by soil resuspension. Groundwater exposure pathways analyzed in these risk assessments are the intake of groundwater, inhalation of groundwater, and dermal contact with groundwater. Although groundwater pathways are analyzed, it is unlikely that groundwater will be used as a potable water source at the Depot. The aquifer that underlies the Depot has been shown not to be productive enough to supply sufficient water to fulfill potential potable water needs of future occupants. Further, the Depot has an existing alternate potable water source that is currently in use. Nevertheless, as a conservative approach, the aforementioned groundwater exposure pathways were evaluated in the risk assessment.

SEAD-46

Projected non-carcinogenic HIs for the park worker and the recreational child visitor at SEAD-46 are below the EPA-recommended limit of 1; projected non-carcinogenic HIs for the construction worker, adult resident, and resident child are above 1. Projected carcinogenic risk for all receptors, with the exception of the lifetime resident, is within the EPA acceptable range (i.e., $1x10^{-4}$ to $1x10^{-6}$).

Table 9
SEAD-46 Summary of Human Health Risk Assessment

Receptor	Hazard Index	Cancer Risk
Park Worker	4.2E-01	1.8E-05
Construction Worker	1.1E00	1.3E-06
Recreational Child Visitor	2.4E-01	2.0E-06
Resident Adult	1.6E00	6.3E-05
Resident Child	6.0E00	6.1E-05
Lifetime Resident	NA	1.2E-04

Non-carcinogenic HIs for the construction worker and the adult and child residential receptors are estimated to be above the EPA limit; however, for each receptor the elevated HI estimated is attributed to SEAD-46 EPCs that are consistent with, and often below, state and federal guidance limits and standards for residential or unrestricted use and approved background concentrations. Therefore in each case, the estimated hazard index is attributable to COPC concentrations that can not be differentiated from levels that exist in native soils or that would be allowed under prevailing environmental laws and regulations as acceptable concentrations. Furthermore, for the construction worker and the adult resident, likely health effects to individual target organs or body systems are less than 1, and therefore allowable. Therefore, the Army believes that the reported HIs overestimate the likely non-carcinogenic health impacts present at SEAD-46.

Similarly, the carcinogenic risk estimated for the lifetime resident, which is above the EPA limit, results primarily (1.1E-04 out of 1.2E-04) from the intake of arsenic in groundwater. However, the concentration of arsenic in groundwater at SEAD-46 is below the EPA MCL. As such, the cancer risk level for the SEAD-46 lifetime resident overestimates the actual risk that exists at the site. Further, since the shallow overburden aquifer that underlies SEAD-46 will not yield sufficient water to support potable usage, this exposure pathway is considered incomplete.

Therefore, the Army believes that environmental conditions at SEAD-46 do not pose an unacceptable level of risk to future receptors.

As was reported earlier, three metals, antimony, iron, and thallium were detected in groundwater samples at concentrations that exceeded New York GA or federal MCL standard levels. Results of the SEAD-46 risk assessment indicate that neither antimony nor iron in groundwater contribute to the risk or hazards that are determined for potential receptors at the AOC, while thallium in groundwater does contribute roughly 10 to 11 percent to the noted HIs that are determined for the adult and child residents. At this level, thallium is not a significant component of the overall hazard measured.

SEAD-57

A review of all available analytical data was conducted prior to the performance of the risk assessment for SEAD-57. During this data evaluation step, inconsistencies were noted between the analytical results obtained during the ESI and RI groundwater sampling events. Further assessment indicated that elevated concentrations of certain key COPCs were present only during the ESI sampling event and were absent or significantly lower during the two subsequent RI sampling events. ESI groundwater samples were collected using bailers, whereas RI groundwater samples were collected using low flow bladder pumps. Since the repetitive raising and lowering of a bailer into a well during the sample collection sequence is a more invasive sampling technique than the one-time lowering of the bladder pump prior to sample collection, it is likely that the noted concentration discrepancies for several of the key COPCs result from their presence in the sediment and silt that exists at the bottom of monitoring wells prior to sampling. Based on this determination, inordinately high groundwater concentrations noted for bis(2-ethylhexyl)phthalate, antimony and cobalt during the ESI sampling events were eliminated from the data set prior to the performance of the final risk assessment.

A summary of the estimated risks and hazards is shown below. Estimated cancer risk levels for the park worker, the construction worker, and the recreational child visitor are all within the EPA acceptable range (i.e., $1x10^{-4}$ to $1x10^{-6}$). Estimated cancer risk levels for the adult, child, and lifetime residential receptors at SEAD-57 are also within the EPA acceptable range (i.e., $1x10^{-4}$ to $1x10^{-6}$) for carcinogenic risk.

Estimated non-carcinogenic HIs at SEAD-57 for the park worker, construction worker, and the recreational child visitor receptors are below the EPA preferred limit (i.e., 1). Estimated non-carcinogenic hazard indices for the adult and child residential receptors at SEAD-57 are above the EPA preferred limit of 1.

Table 10
SEAD-57 Summary of Human Health Risk Assessment

Receptor	Hazard Index	Cancer Risk
Park Worker	3.8E-01	1.4E-05
Construction Worker	9.5E-01	1.1E-06
Recreational Child Visitor	2.3E-01	1.6E-06
Resident Adult	1.3E00	5.0E-05
Resident Child	5.8E00	4.9E-05
Lifetime Resident	NA	9.8E-05

The evaluation of the potential adult and child residents' target organ or body system impacts due to exposure to SEAD-57 COPCs is summarized below.

Table 11 **Allocation of Adult/Child Resident's HI to Target Organs/Systems**		
Target Organ or Effect	**Estimated HI**	**Contributing COPCs**
Central Nervous System or Neuro Development	Adult, 0.33 | Child, 1.12	Aluminum and Manganese
Skin	Adult, 0.32 | Child, 1.20	Arsenic
Lungs	Adult, 0.13 | Child, 0.96	Cadmium and Cobalt
Heart	Adult, 0.19 | Child, 1.62	Cobalt and Iron
Liver	Adult, 0.30 | Child, 1.83	Cadmium, Iron, Thallium
Endocrine Glands	Adult, 0.11 | Child, 1.10	Iron
Enzymes	Adult, 0.42 | Child, 0.37	Vanadium
Gastro-intestinal	Adult, 0.41 | Child, 1.50	Antimony, Cadmium, Thallium

As is seen, none of the adult resident's target organs are subjected to an HI in excess of 1; therefore, the estimated aggregate HI for the adult is considered a conservative estimate of the potential non-carcinogenic hazard that is likely to exist at the site. However, several of the child's organs or body systems continue to show potential effects at levels in excess of 1.

Intake of groundwater represents approximately 40% of the child resident's overall non-carcinogenic HI. Further examination of the estimated hazard quotients contributing to the hazard projected for the child due to exposure to groundwater shows that intake of arsenic represents 43%, antimony 31%, and thallium 26% of the child's groundwater intake HI. The estimated effects due to intake of arsenic and antimony are associated with EPCs (i.e., 3.1 μg/L and 3.0 μg/L, respectively) that are below federal MCLs for drinking water (i.e., 10 μg/L and 6 μg/L, respectively) for these two analytes. As such, these values are considered conservative and likely to overestimate the HI that exists for the child's consumption of groundwater at the SEAD-57 site. Further, the groundwater pathway does not represent a complete exposure pathway at SEAD-57 as the shallow aquifer that underlies the site, and most of the Depot, does not yield a sufficient quantity of water to support potable water needs for a full-time residential application. Further, an alternative source of potable water exists within the Depot that is derived from a non-groundwater source, making use of the shallow aquifer unnecessary. The HI for the child resident drops to 3.4E00 if use of groundwater is eliminated as an exposure pathway.

After the elimination of the groundwater pathway, the estimated target organ/system HI for the child's neuro development/central nervous system, heart, liver, and endocrine glands remain above 1 due to their exposure to soil or dusts containing certain metals (i.e., aluminum, cobalt, iron and manganese) found at SEAD-57. The table below summarizes and compares the applicable EPCs for these metals versus guidance values and background concentrations seen in the vicinity of the Depot.

Table 12 **Comparison of SEAD-57 COPC EPCs to Guidance Values**				
Analyte	**EPC (mg/kg)**	**EPA RSL (mg/kg)**	**NYSDEC SCO (mg/kg)**	**95th UCL of Approved Background Dataset (mg/kg)**
Aluminum	14,450	77,000	NA	14,315
Cobalt	11	23	NA	13
Iron	24,890	55,000	NA	26,469
Manganese	679	1,800	1,600	701
NA = not available				

In each case, the metal's EPC is below the metal's respective EPA RSL for residential soil. Further, in the case where New York has identified an unrestricted use SCO value for the metal (i.e., manganese), the SCO value identified is higher than the EPC identified in the SEAD-57 soil. Finally, three (i.e., cobalt, iron, and manganese) of the EPCs used as the basis of the risk calculation for metals are below their respective 95th UCL background concentration. Further for aluminum, the site EPC concentration is less than 1 percent higher than its comparable 95th UCL background soil concentration indicating that risks from AOC-specific soils and background soils are indistinguishable. This suggests that the concentrations observed at SEAD-57 are just as likely to be associated with natural soil, and not attributable to contamination that has occurred at the site during its historic use. Therefore, the potential non-carcinogenic impact associated with exposure to these metals can not be separated from that which is likely to occur due to exposure to native soils.

SEAD-007-R-01 (Grenade Range)

Projected non-carcinogenic HIs for all receptors, with the exception of the resident child, at SEAD-007-R-01 are below the EPA-recommended limit of 1. Projected carcinogenic risk for all receptors is within the EPA acceptable range (i.e., $1x10^{-4}$ to $1x10^{-6}$).

Table 13
SEAD-007-R-01 Summary of Human Health Risk Assessment

Receptor	Hazard Index	Cancer Risk
Park Worker	2.6E-01	2.1E-06
Construction Worker	8.2E-01	3.2E-07
Recreational Child Visitor	1.4E-01	2.6E-07
Resident Adult	9.3E-01	4.7E-06
Resident Child	3.6E00	7.8E-06
Lifetime Resident	NA	1.3E-05

With reference to the child resident's elevated non-carcinogenic HI, the analysis of the potential impacts to target organs or body systems is summarized below. As is noted, there are estimated hazard indices in excess of 1 noted for the child's neuro-development/central nervous system and their heart.

Table 14
Allocation of Child Resident's HI to Target Organs/Systems

Target Organ or Effect	Estimated HI	Contributing COPCs
Central Nervous System or Neuro Development	Child, 1.82	Aluminum and Manganese
Skin	Child, 0.18	Arsenic
Lungs	Child, 0.62	Cobalt
Heart	Child, 1.61	Cobalt and Iron
Liver	Child, 0.99	Iron
Endocrine Glands	Child, 0.99	Iron

The ingestion of soil (60%) and the inhalation of dust (39%) primarily drive the elevated HI estimated for the child receptor. Five metals (aluminum, arsenic, cobalt, iron, and manganese) account for the elevated hazard; however, as is shown below, each metal is found at the site at an EPC that is below its respective EPA RSL for residential soil. The EPCs for arsenic and manganese are also below their respective New York State SCO value for unrestricted use.

Table 15 Comparison of SEAD-007-R-01 COPC EPCs to Guidance Values				
Analyte	**EPC (mg/kg)**	**RSL (mg/kg)**	**NYSDEC SCO (mg/kg)**	**95th UCL of Approved Background Dataset (mg/kg)**
Aluminum	15,771	77,000	NA	14,315
Arsenic	3.9	0.39	13	6.0
Cobalt	11.1	23	NA	13
Iron	23,107	55,000	NA	26,489
Manganese	632	1,800	1,600	701

Further, the EPC concentrations used for four of the metals of concern are lower than comparable background soil 95th UCL levels, while the EPC concentration used for aluminum is roughly 10 percent above its 95th UCL background level in soil and within the range of the approved background data set. Therefore, as was found for other sites discussed above, the child's potential impacts due to exposure to soil at SEAD-007-R-01 (Grenade Range) can not be differentiated from those that would occur due to soils at residential sites or to other background areas in the vicinity of the Depot.

Considering the above discussion, environmental conditions at the Grenade Range do not pose an unacceptable level of hazard or risk to Conservation/Recreation or Residential/Resort receptors.

SEAD-002-R-01 (EOD Area 2)

Projected non-carcinogenic HIs for the park worker and the recreational child visitor at SEAD-46 are below the EPA-recommended limit of 1; projected non-carcinogenic HIs for the construction worker, adult resident, and child resident are above the limit. Projected carcinogenic risk for all receptors is within the EPA acceptable range (i.e., $1x10^{-4}$ to $1x10^{-6}$).

Table 16 EOD Area 2 Summary of Human Health Risk Assessment		
Receptor	**Hazard Index**	**Cancer Risk**
Park Worker	3.8E-01	3.6E-06
Construction Worker	1.1E00	5.4E-07
Recreational Child Visitor	2.0E-01	4.3E-07
Resident Adult	1.4E00	7.0E-06
Resident Child	5.1E00	1.0E-05
Lifetime Resident	NA	2.0E-05

The construction worker's target organ distribution HI is summarized below. As is noted, there is no target organ or body system that is likely to be affected at a level in excess of the EPA's recommended limit of 1.

Table 17 **Allocation of Construction Worker's HI to Target Organs/Systems**		
Target Organ or Effect	**Estimated HI**	**Contributing COPCs**
Central Nervous System or Neuro Development	0.44	Aluminum and Manganese
Skin	0.04	Arsenic
Lungs	0.16	Cobalt
Heart	0.43	Cobalt and Iron
Liver	0.27	Iron
Endocrine Glands	0.27	Iron

The adult and child resident's target organ/body system HI distribution is summarized below. This summary indicates that hazard indices in excess of the EPA's limit of 1 are possible for the adult's and child's central nervous systems, and the child's heart, liver, and endocrine glands.

Table 18 **Allocation of Adult and Child Resident's HI to Target Organs/Systems**		
Target Organ or Effect	**Estimated HI**	**Contributing COPCs**
Central Nervous System or Neuro Development	Adult, 1.12 | Child, 3.21	Aluminum and Manganese
Skin	Adult, 0.18 | Child, 0.17	Arsenic
Lungs	Adult, 0.12 | Child, 0.65	Cobalt
Heart	Adult, 0.23 | Child, 1.75	Cobalt and Iron
Liver	Adult, 0.11 | Child, 1.10	Iron
Endocrine Glands	Adult, 0.11 | Child, 1.10	Iron

The largest components of the elevated hazard quotients are associated with soil that contains aluminum, cobalt, iron, and manganese. The soil EPCs generating the elevated hazard indices are summarized below.

Table 19 **Comparison of EOD Area 2 COPC EPCs to Guidance Values**				
Analyte	**EPC (mg/kg)**	**EPA RSL (mg/kg)**	**NYSDEC SCO (mg/kg)**	**95th UCL of Approved Background Dataset (mg/kg)**
Aluminum	16,097	77,000	NA	14,315
Cobalt	12	23	NA	13
Iron	25,037	55,000	NA	26,489
Manganese	1,512	1,800	1,600	701

Manganese is the COPC that is the largest contributor to both the adult's and child's elevated HI. Review of the EPC for manganese at EOD Area 2 suggests that the value used is elevated compared to soil concentrations found in approved background levels, but the EPC is still below the concentrations identified as acceptable by the EPA for residential soil and by the state for unrestricted use.

Inhalation of dusts containing manganese is also the largest individual hazard quotient estimated for both the adult and child resident's HI. The inhalation hazard quotient calculated for manganese is based on an Rfc that is derived from an industrial study of battery manufacturing workers that were exposed to manganese dioxide. While soil at EOD 2 may contain some amount of manganese dioxide, it is unlikely that all manganese found exists solely in the form of manganese dioxide. Furthermore the Rfc derived from this study is 4,000 times more stringent than the

ACGIH's recommended TLV for manganese in industrial applications which further highlights the extremely conservative nature of this calculation.

With reference to two other major COPCs (i.e., cobalt and iron), each of these is found in the soil at EOD-2 at concentrations that are below EPA residential soil RSL guidance values, and at concentrations that are below approved background levels. The EPC used for aluminum at EOD-2 is approximately 12.5 percent above the 95th UCL background soil concentration and still within the range of the dataset. This corresponds to an increased HI of 0.015 for the adult and 0.005 for the child resident. Both of these values are insignificant when compared to the level of uncertainty (probable over-estimation) that is associated with the reference dose used for manganese. This suggests that the concentrations observed at EOD-2 are just as likely to be associated with natural soil, and not attributable to contamination that has occurred at the site due to its historic use.

Based on these findings, it is the Army's conclusion that the environmental conditions that remain at EOD-2 pose no unacceptable non-carcinogenic hazard or carcinogenic risk to Conservation/Recreational receptors or Residential receptors.

SEAD-002-R-01 (EOD Area 3)

Non-carcinogenic HIs for all receptors, with the exception of the resident child, are below the EPA limit of 1. Projected carcinogenic risk for Conservation/Recreation receptors (i.e., parker worker, construction worker, and recreation child visitor) and Residential/Resort receptors (adult, child and lifetime resident) are within the EPA acceptable range (i.e., $1x10^{-4}$ to 1×10^{-6}).

Table 20
EOD Area 3 Summary of Human Health Risk Assessment

Receptor	Hazard Index	Cancer Risk
Park Worker	2.3E-01	2.1E-06
Construction Worker	7.3E-01	3.5E-07
Recreational Child Visitor	1.3E-01	2.7E-07
Resident Adult	7.8E-01	4.6E-06
Resident Child	3.2E00	8.2E-06
Lifetime Resident	NA	1.3E-05

The summary of potential effects to the child's target organs or body systems suggests that hazard indices in excess of EPA's preferred limit of 1 are estimated for the child's central nervous systems and for the heart. The largest components of the identified hazard quotients are associated with soil that contains aluminum, cobalt, iron, and manganese.

Table 21
Allocation of Child Resident's HI to Target Organs/Systems

Target Organ or Effect	Estimated HI	Contributing COPCs
Central Nervous System or Neuro Development	Child, 1.55	Aluminum and Manganese
Skin	Child, 0.20	Arsenic
Lungs	Child, 0.51	Cobalt
Heart	Child, 1.46	Cobalt and Iron
Liver	Child, 0.95	Iron
Endocrine Glands	Child, 0.95	Iron

The soil EPCs generating the elevated hazard indices are summarized below.

Table 22
Comparison of EOD Area 3 COPC EPCs to Guidance Values

Analyte	EPC (mg/kg)	RSL (mg/kg)	NYSDEC Soil Obj. (mg/kg)	95th UCL of Approved Background Dataset(mg/kg)
Aluminum	15,559	77,000	NA	14,315
Cobalt	9.5	23	NA	13
Iron	22,138	55,000	NA	26,489
Manganese	600	1,800	1,600	701

As is noted, the EPC for each of the identified metals is below its listed EPA RSL for residential soil. The EPC for manganese is also below its respective New York SCO value, and the EPC used for cobalt and iron agree are lower than approved 95th UCL background soil concentrations. The hazard quotient derived for manganese is overly conservative as it is based on inhalation of manganese dioxide, which is not the only form of manganese that is likely to be found at the site. Aluminum again is observed at an EPC that is about nine percent higher than its background soil 95th UCL concentration and again within the range of the dataset, but for the child resident this only amounts to a potential HI increase of 0.04, which is insignificant when compared to the uncertainty that is associated with the HI determined for manganese.

Therefore, the observed risk associated with metals at EOD-3 are due to approved background conditions and cannot be distinguished from effects that may be associated with the natural setting at the Depot.

Thus, it is likely that the elevated non-carcinogenic hazard for the resident child overestimates the hazards that actually exist at EOD-3. The observed risks associated with metals at EOD-3 are due to background conditions and are not associated with any site contamination.

SEAD-70

Projected HIs for all conservation/recreation receptors are below the EPA-recommended limit of 1; the projected HI for the residential adult is also below the limit whereas the projected HI for the residential child is above the limit. Projected cancer risk levels for all conservation/recreation and residential/resort receptors are within the EPA acceptable range (i.e., $1x10^{-4}$ to 1×10^{-6}).

Table 23
SEAD-70 Summary of Human Health Risk Assessment

Receptor	Hazard Index	Cancer Risk
Park Worker	2.7E-01	4.1E-06
Construction Worker	8.5E-01	6.6E-07
Recreational Child Visitor	1.6E-01	5.3E-07
Resident Adult	8.9E-01	8.2E-06
Resident Child	4.0E00	1.6E-05
Lifetime Resident	NA	2.4E-05

The potential effects to the child's target organs or systems are summarized below. As is seen, elevated effects are projected for the child's central nervous system, heart, liver and endocrine glands.

Table 24
Allocation of Child Resident's HI to Target Organs/Systems

Target Organ or Effect	Estimated HI	Contributing COPCs
Central Nervous System or Neuro Development	Child, 1.17	Aluminum and Manganese
Skin	Child, 0.39	Arsenic
Lungs	Child, 0.63	Cobalt
Heart	Child, 2.45	Cobalt and Iron
Liver	Child, 1.82	Iron
Endocrine Glands	Child, 1.82	Iron

Three exposure pathways, ingestion of soil, inhalation of dust in ambient air, and intake of groundwater account for 98% of the overall HI projected for the child receptor. The hazard quotients estimated due to exposure to groundwater via either ingestion or dermal contact are derived from a sample set that consists of four samples of groundwater. Each of these samples was collected during the ESI with a bailer. The iron EPC (2.14 mg/L) used for groundwater is the maximum concentration measured in the groundwater which was found in the sample that contained the highest level of turbidity (325 NTUs). Each of the other three samples contained lower levels of turbidity (less than 50 NTUs) and all of the other iron concentrations in groundwater were below the state's GA standard of 300 μg/L. Furthermore, as has been discussed previously, the shallow groundwater aquifer underlying the Seneca site is not productive enough to provide water for domestic purposes, so this exposure pathway is considered incomplete.

The ingestion of soil represents approximately 60% of the HI estimated for the child receptor, while the inhalation of dust accounts for approximately 22% of the estimated HI. As discussed for each of the other AOCs, five metal COPCs (aluminum, arsenic, cobalt, iron, and manganese) account for the ingestion hazard. As shown in the table below, each of the EPCs, exclusive of the one for arsenic, are below the EPA RSLs for residential soil. The EPCs for arsenic and manganese are also below their respective NYS SCO values. Further, the EPCs for aluminum, cobalt, iron, and manganese are less than their approved 95th UCL background soil concentrations at the Depot. Arsenic was found at an EPC that is slightly above its 95th UCL background soil level, but at a concentration that is within the range of concentrations that are in the Depot's background dataset. Furthermore, the estimated arsenic contribution to the child's HI is not at a level in excess of the EPA threshold of 1 at the target organ level.

Table 25
Comparison of SEAD-70 COPC EPCs to Guidance Values

Analyte	EPC (mg/kg)	RSL (mg/kg)	NYSDEC SCO (mg/kg)	95th UCL of Approved Background Dataset (mg/kg)
Aluminum	12,400	77,000	NA	14,315
Arsenic	8.5	0.39	13	6.0
Cobalt	12	23	NA	13
Iron	26,300	55,000	NA	26,489
Manganese	465	1,800	1,600	701

Summary

Although the risk assessment suggests that potential non-carcinogenic hazards are present for the construction worker and adult and child residential receptors, analysis of the conditions, as required as part of the RAGS guidance, indicate that the elevated hazard indices result from metals that are present in the environment beyond the Munitions Response AOCs at comparable levels, and thus are indicative of approved background levels. Many of the soil EPCs calculated at the individual AOCs are below comparable 95th UCL concentrations determined for an approved set of background soil locations at the Depot. As such, levels of potential risk and hazard calculated for these analytes at these concentrations are less than background levels. Further, as has been discussed, there is a very high degree of uncertainty associated, resulting in a very conservative (i.e., over-estimation) of the potential hazard that is associated with the inhalation of manganese ladened dust in air. As such, manganese is frequently determined to be a driver of hazard indices produces which again result in a probable overestimation of the actual risk that is present at an affected AOC. Finally, even though use of groundwater is unlikely at each of these AOCs, its possible effects have been included in risk and hazard calculations performed, based on one-time maximum sample concentrations which have not been verified. This adds significantly to the uncertainty and likely over-estimation of potential risks that exsit at each of the AOCs.

Considering the adjustments for contaminants below NYSDEC SCO values and EPA RSLs, the incomplete nature of the groundwater exposure pathway assumed, and the high degree of uncertainty that is associated with reference doses, it is the Army's position that SEAD-46, SEAD-57, EOD-2, EOD-3, SEAD-70, and the Grenade Range are acceptable for unrestricted use.

SUMMARY OF REMEDIAL GOALS AND PROPOSED ACTION

The remedy for any site should eliminate or, at a minimum, mitigate all significant threats to public health and the environment on account of hazardous substances present at the site.

The *Munitions Response Completion Report* documents that there is evidence that munitions and explosives of concern (MEC) were present on the property identified as AOCs SEAD-46 (3.5-inch Rocket Range), SEAD-57 (Explosive Ordnance Disposal Range), SEAD 002-R-01 (Explosive Ordnance Areas 2 and 3), and SEAD 007-R-01 (Grenade Range). During SEDA's military mission, these AOCs were used as a function test range for 3.5-inch rocket motors, for EOD training, and as a live-fire training of rifle grenades and Light Antitank Weapons (LAW) with training rounds only, respectively, each of which could result in the presence of MEC.

Between May through Nov 16, 2006, the Army conducted a munitions response to remove MEC to depth at each of the identified AOCs. During this work, each of the identified AOCs was mapped using digital geophysical techniques to identify and locate targets that could include MEC, and these targets were subsequently excavated, and each recovered item was evaluated. A total of 15,661 items were excavated and assessed. Only seven of these items were determined to pose an explosive safety hazard and were disposed by detonation. The remaining material was classified as munitions or cultural debris and disposed as recyclable solid waste.

Based on this work, the *Munitions Response Completion Report* concluded that after this munitions response, these AOCs are free of MEC, suitable for unrestricted use, and that no other action is necessary. This conclusion was reviewed, and approved by the Department of Defense Explosive Safety Board (DDESB). Notwithstanding this determination, there is a possibility given the prior use of these AOCs that MEC may be encountered on the property in the future. If any person should encounter MEC on the property, they shall immediately stop any intrusive or ground-disturbing work in the area or in any adjacent areas and shall not attempt to disturb, remove, or destroy it, but shall immediately notify the Local Police Department so that appropriate explosive ordnance disposal personnel can be dispatched to address such MEC as required under applicable law and regulations.

In addition, based on the CERCLA investigations (e.g., ESIs, RI, Munitions Response Closure Sampling activities) that have been performed at each of the AOCs, there are data that document that residual levels of hazardous substances, and other pollutants and contaminants of potential concern remain at each of the sites. However, based on risk assessments and risk management evaluations, performed in accordance with CERCLA guidance, that have been completed for each of the AOCs, it is the Army's determination that residual concentrations of hazardous substances, pollutants, and contaminants are such that they are either consistent with, and undistinguishable from background; associated with exposure pathways that are unlikely in the foreseeable future and therefore overly conservative (e.g., groundwater exposure pathways); or are present at levels that do not pose unacceptable risks or hazards to human health or the environment.

SEAD-46

Based on the findings of the investigation, the recommended remedy for SEAD-46 (3.5-inch Rocket Range) is NFA, with release of the property for unrestricted use and unlimited exposure.

SEAD-57

Based on the findings of the investigation, the recommended remedy of SEAD-57 (Explosive Ordnance Disposal Range) is NFA, with release of the property for unrestricted use and unlimited exposure.

SEAD-007-R-01

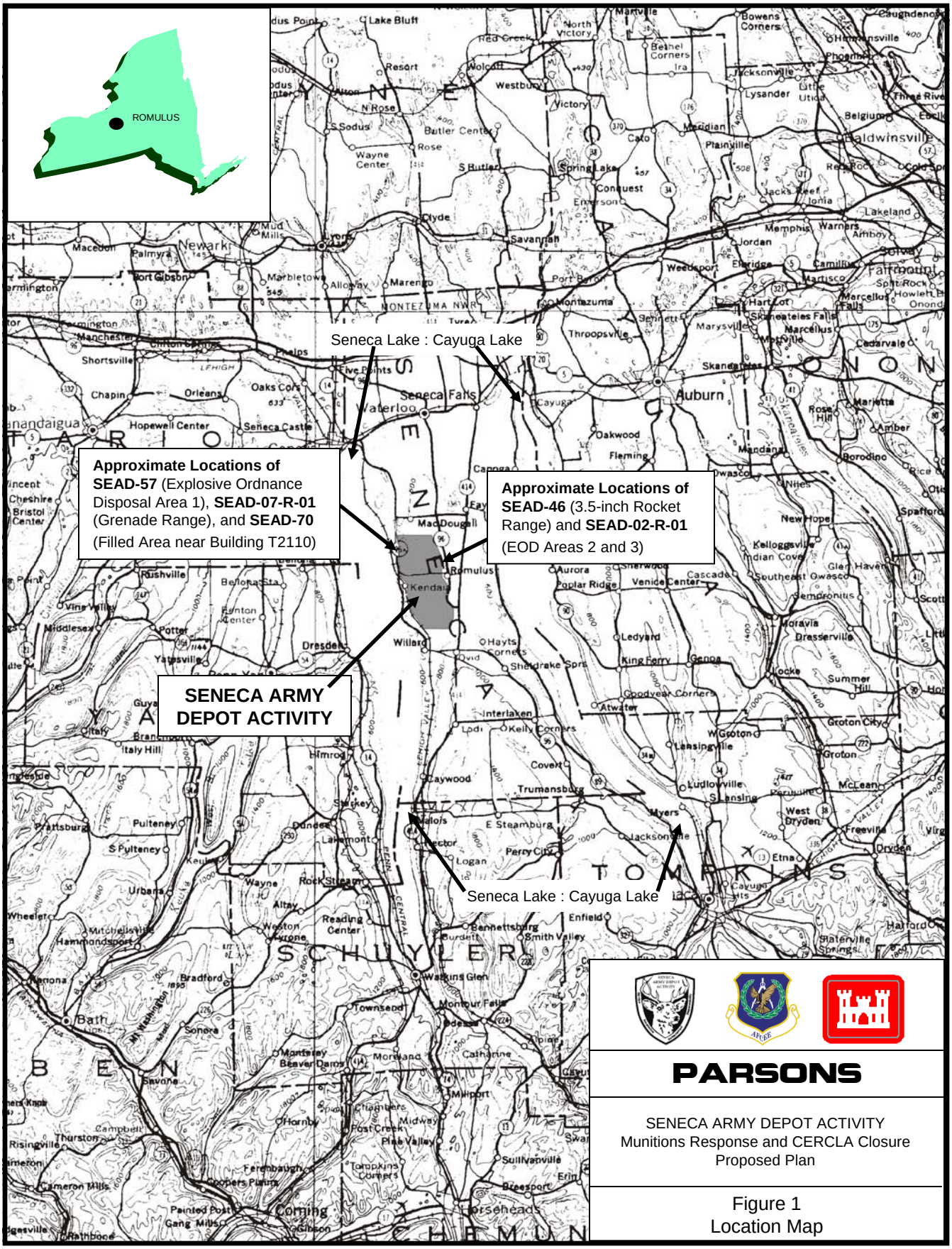
Based on the findings of the investigation, the recommended remedy of SEAD-007-R-01 (Grenade Range) is NFA, with release of the property for unrestricted use and unlimited exposure.

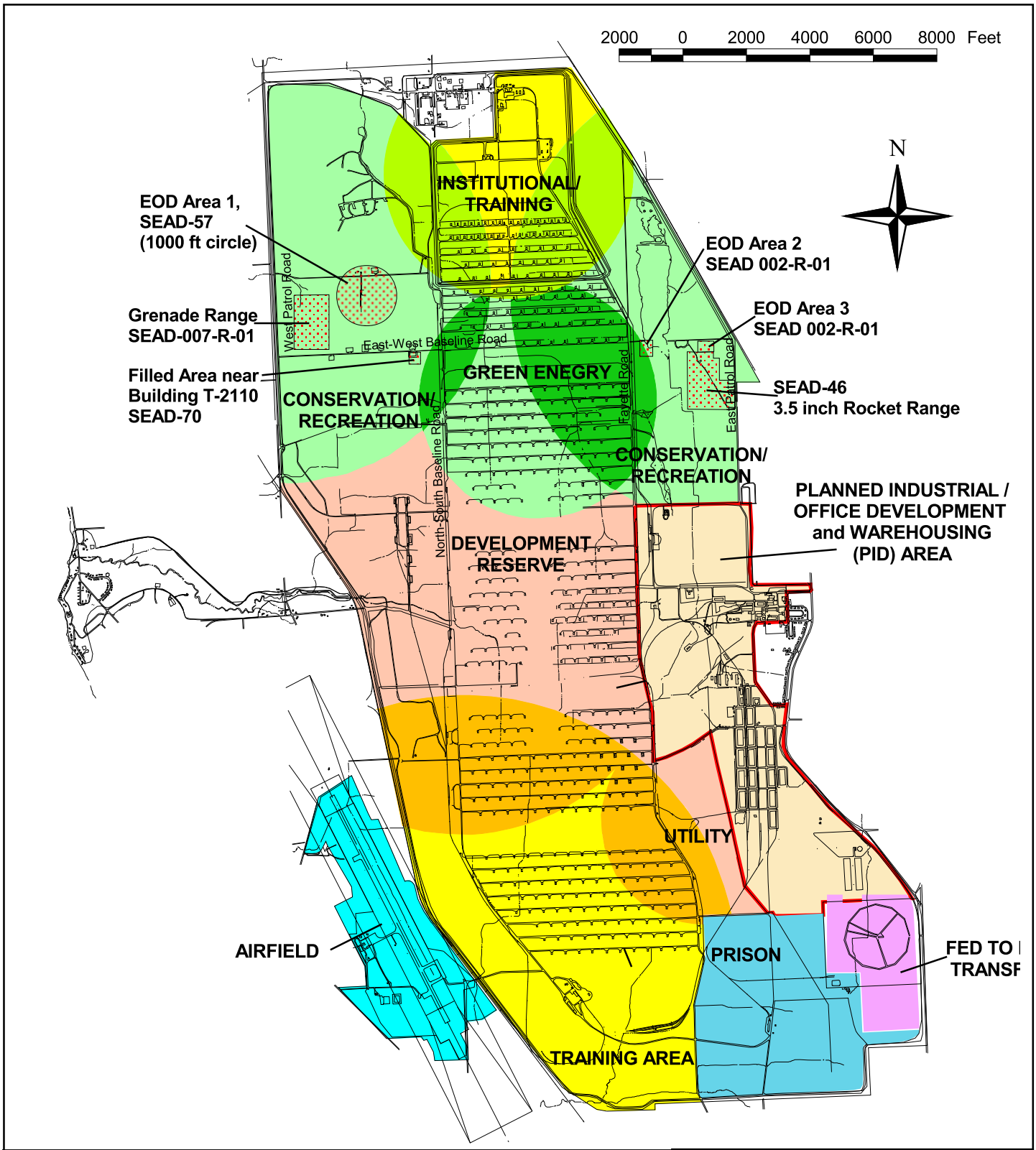
SEAD-002-R-01

Based on the findings of the investigation, the recommended remedy of SEAD-002-R-01 (EOD Areas 2 and 3) is NFA, with release of the property for unrestricted use and unlimited exposure.

SEAD-70

Based on the findings of the investigation, the recommended remedy for SEAD-70 (Building T2110 – Filled Area) is NFA, with release of the property for unrestricted use and unlimited exposure.


ROMULUS
Seneca Lake : Cayuga Lake
Approximate Locations of SEAD-57 (Explosive Ordnance Disposal Area 1), SEAD-07-R-01 (Grenade Range), and SEAD-70 (Filled Area near Building T2110)
Approximate Locations of SEAD-46 (3.5-inch Rocket Range) and SEAD-02-R-01 (EOD Areas 2 and 3)
SENECA ARMY DEPOT ACTIVITY
Seneca Lake : Cayuga Lake
PARSONS
SENECA ARMY DEPOT ACTIVITY
Munitions Response and CERCLA Closure
Proposed Plan
Figure 1
Location Map



Location of No Further Action SEADs

- SEAD-46, 3.5 inch Rocket Range
- SEAD-57, Explosive Ordnance Disposal (EOD) Area
- SEAD 002-R-01, EOD Areas 2 and 3
- SEAD 007-R-01, Grenade Range
- SEAD-70, Filled Area near Building T2110

PARSONS

SENECA ARMY DEPOT ACTIVITY
Munitions Response and CERCLA Closure
Proposed Plan

Figure 2
SEDA Future Land Use and Munitions Response Sites

May 2010

O:\Seneca\Munitions Response\munitions response sites.apr

748740 749240 749740 750240

1007788 1006788 1006288 1005788

Approximate Extent of SEAD-46

EOD # 3

Wooded Area

Wet Area

EARTHEN BERM

Wooded Area

Wooded Area

Wooded Area

SEAD 46 Limit of Work

997750 748750 Grid Coordinates (New York State Plane, Central)

N W E S

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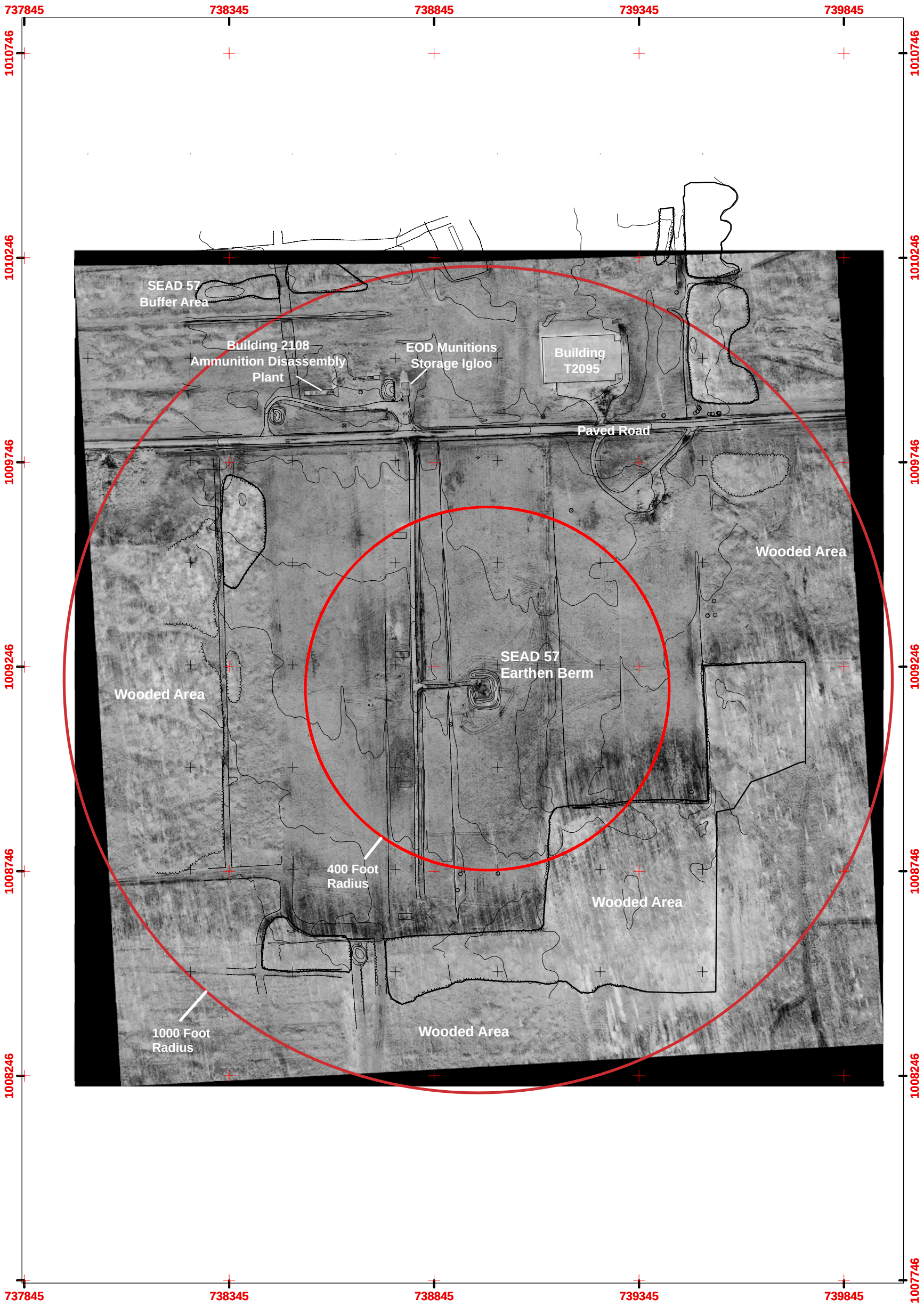
SENECA ARMY DEPOT ACTIVITY
Munitions Response and CERCLA Closure

Figure 3
3.5 inch Rocket Range, SEAD 46
Site Plan



SEAD 57 1000 foot radius

997750 748750 Grid Coordinates (New York State Plane, Central)

N W E S

100 50 0 100 200 Feet

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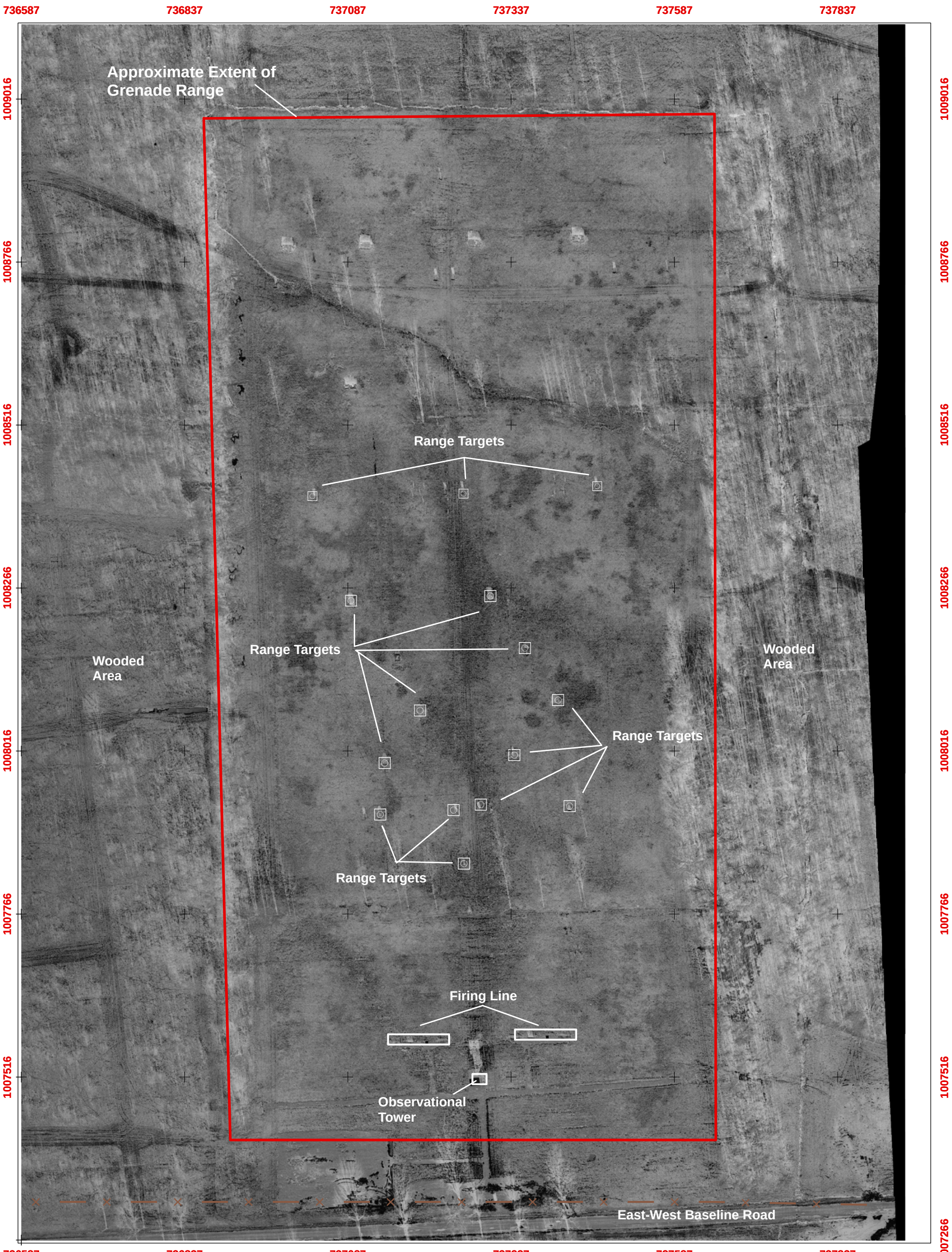
SENECA ARMY DEPOT ACTIVITY
Munitions Response and CERCLA Closure

Figure 4
EOD Area 1, SEAD 57
Site Plan



Grenade Range Limit of Work

Location of Target

Firing Point and Observation Tower

997750 748750 Grid Coordinates (New York State Plane, Central)

N W E S

110 55 0 110 220 Feet

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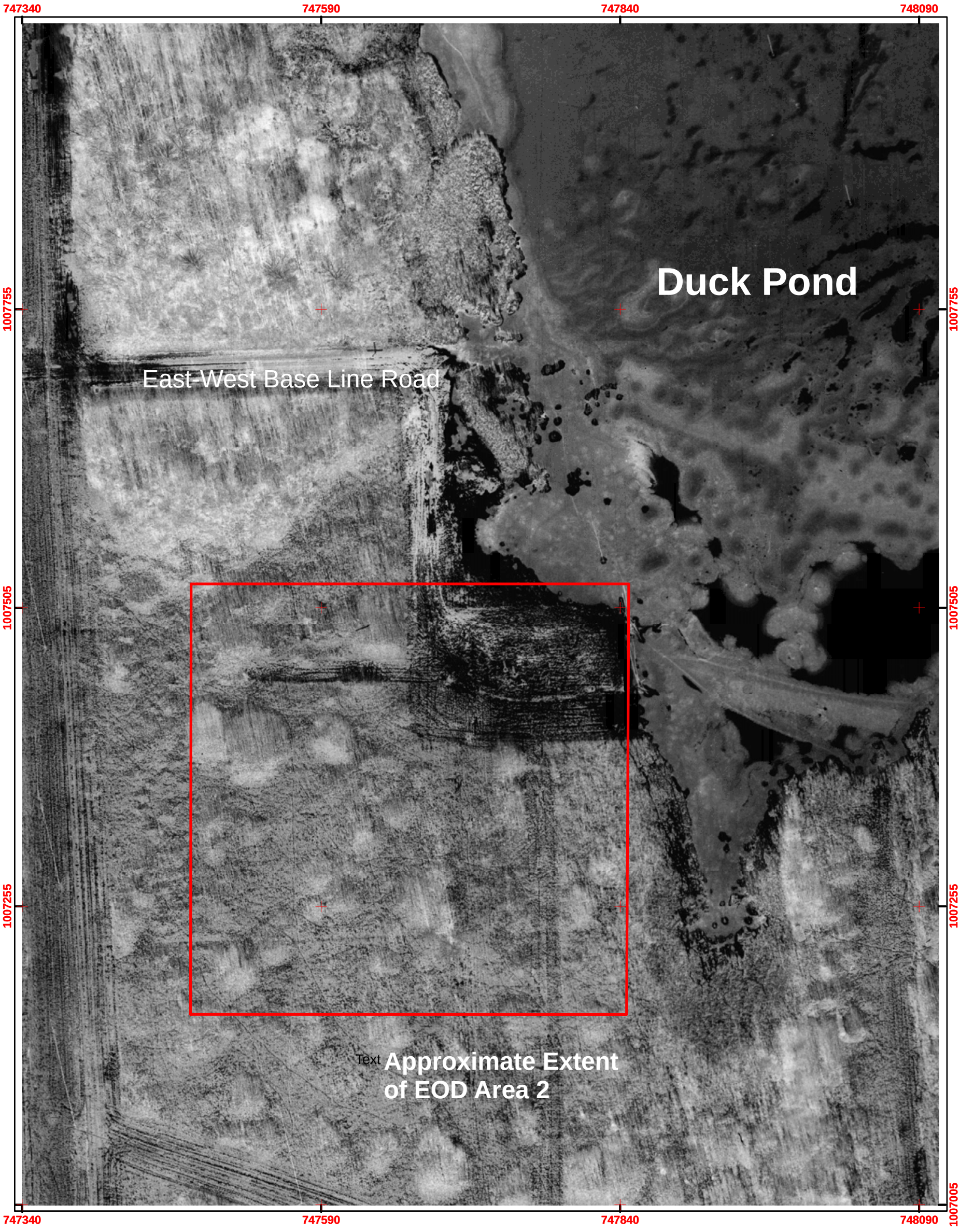
Munitions Response and CERCLA Closure

Figure 7

Grenade Range, SEAD 007-R-01
Site Plan



EOD Area 2 Limit of Work

997750
748750
Grid Coordinates
(New York State Plane, Central)

N
W E
S

80 40 0 80 Feet

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SENECA ARMY DEPOT ACTIVITY
Munitions Response and CERCLA Closure

Figure 5
EOD Area # 2, SEAD 002-R-01
Site Plan

EOD Area 3 Limit of Work

997750
748750
Grid Coordinates
(New York State Plane, Central)

50 25 0 50 100 150 Feet

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Munitions Response and CERCLA Closure

Figure 6
E0D Area # 3, SEAD002-R-01
Site Plan

Approximate Extent
Of Site

N
W E
S

PARSONS

SENECA ARMY DEPOT ACTIVITY
Munitions Response and CERCLA Closure

Figure 8
Filled Area near Building T-2110, SEAD-70