US Army, Engineering & Support Center
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Seneca Army Depot Activity
Romulus, NY

DRAFT FINAL

FEASIBILITY STUDY REPORT
RADIOLOGICAL WASTE BURIAL SITES (SEAD-12)

SENECA ARMY DEPOT ACTIVITY

EPA Site ID# NY0213820830
NY Site ID# 8-50-006
CONTRACT NO. DACA87-02-D-0005
DELIVERY ORDER NO. 0031

PARSONS
March 2007

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FOR THE RADIOACTIVE WASTE BURIAL SITES (SEAD-12)

SENECA ARMY DEPOT ACTIVITY, ROMULUS, NY

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ALARA	As Low as Reasonably Achievable
ANOVA	Analysis of Variance (Test)
ARAR	Applicable or Relevant and Appropriate Requirements
AWQS	Ambient Water Quality Standards
BALAT	Benthic Aquatic Life Acute Toxicity Criteria
BALCT	Benthic Aquatic Life Chronic Toxicity Criteria
Bi	Bismuth
BRA	Baseline Risk Assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm/sec	Centimeters per second
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CWA	Clean Water Act
DCE	Dichloroethylene
DCGL	Derived Concentration Guideline Levels
DDD	1.1-Dichloro - 2-(o-chlorophenyl) - 2-(p-chlorophenyl)
DDE	1.1-Dichloro - 2-(p-chlorophenyl) - 2-(o-chlorophenyl)
DDT	1.1.1-Trichloro - 2-(0-chlorophenyl) - 2-(p-chlorophenyl) ethane
DoD	Department of Defense
DOE	Department of Energy
DOT	Department of Transportation
ECL	Environmental Conservation Law
EM	Electromagnetic
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ESI	Expanded Site Inspection
FS	Feasibility Study
GA	Classification: The best usage of Class GA waters is as a source of potable water supply. Class GA waters are fresh groundwaters
GCL	Geocomposite Clay Liner
HDPE	High Density Polyethylene
HHB	Human Health Bioaccumulation Criteria
HQ	Hazard Quotient
IAG	Interagency Agreement
Koc	Organic carbon partition coefficient
L	Liter

LBR	Land Ban Restrictions
LEL	Lowest Effect Level
LRA	Local Redevelopment Authority
LUC	Land Use Control
MARSSIM	Multi-Agency Radiological Survey and Site Investigation Manual
MCACES	MicroComputer Aided Cost Engineering System
mg/Kg	milligram per Kilogram
ML	Inorganic Silt
mrem	milli roentgen equivalent man
MSL	Mean sea level
MW	Monitor Well
NCP	National Contingency Plan
NFA	No Further Action
NOAEL	No Observed Adverse Effect Level
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NYCRR	New York Code of Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
O & M	Operation and Maintenance
OSHA	Occupational Safety and Health Act
OSWER	Office of Solid Waste and Emergency Response
PAH	Polynuclear Aromatic Hydrocarbon
Parsons	Parsons Engineering Science
Parsons ES	Parsons Engineering Science, Inc.
Pb	Lead
PCB	Polychlorinated Biphenyls
POTW	Publicly Owned Treatment Work
ppm	parts per million
Ra	Radium
RAGS	EPA Risk Assessment Guidance for Superfund
RAO	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SCIDA	Seneca County Industrial Development Agency
SEAD	Seneca Army Depot (old name)
SEDA	Seneca Army Depot

SG	Soil gas
SI	Site Investigation
SMDP	Scientific Management Decision Point
SPDES	State Pollution Discharge Elimination System
SRI	Supplemental Remedial Investigation
SVOCs	Semi-Volatile Organic Compound
SW	Surface water
SWMU	Solid Waste Management Unit
TAGM	New York State Technical and Administrative Guidance Memorandum
TBC	To be Considered
TCE	Trichloroethylene
TCLP	Toxicity Characteristics Leaching Procedure
TEDE	Total Effective Dose Equivalent
TP	Test Pit
TRACES	Tri-Service Automated Cost Engineering System
U	Uranium
µg/L	Micrograms per liter
USACE	United States Army Corps of Engineers
USC	United States Code
USCS	Unified Soil Classification System
VOC	Volatile Organic Compound
WB	Wildlife Bioaccumulation
WRS	Wilcoxon Rank Sum
WSA	Weapons Storage Area

REFERENCES

Crain, L.J., 1974. Groundwater Resources of the Western Oswego River Basin, New York. U.S. Geological Survey and State of New York Basin Planning Report ORB-5, 1974.

Dragun, J., 1988. The Soil Chemistry of Hazardous Materials. The Hazardous Materials Control Research Institute.

Department of Defense (DOD). DoD Policy on Responsibility for Additional Environmental Cleanup after Transfer of Real Property. On-line resources available at https://www.denix.osd.mil/denix/Public/Library/Cleanup/CleanupOfc/Documents/BRAC/brac_flu-policy.html.

Environmental Protection Agency (EPA), 1988. Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA. October 1988.

Environmental Protection Agency (EPA), 1989. Risk Assessment Guidance for Superfund (RAGS), Vol. I: Human Health Evaluation Manual. EPA/40/1-89/001, 1989.

Environmental Protection Agency (EPA), 1990. Handbook on In Situ Treatment of Hazardous Waste - Contaminated Soils. January 1990.

Environmental Protection Agency (EPA), 1991a. Handbook on Remediation of Contaminated Sediments. April 1991.

Environmental Protection Agency (EPA), 1991b. Guide for Conducting Treatability Studies Under CERCLA. Interim Guidance, EPA/540/2-91/020A, September 1991.

Environmental Protection Agency (EPA), 1992. The Superfund Innovative Technology Evaluation Program. November 1992.

Environmental Protection Agency (EPA), 1993. Vendor Information System for Innovative Treatment Technologies. April 1993.

Environmental Protection Agency (EPA), 1995. Land Use in the CERCLA Remedy Selection Process. Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-04.

Environmental Protection Agency (EPA), 1997a. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Washington, D.C., EPA540-R-97-006, June 1997.

Environmental Protection Agency (EPA), 1997b. Multi-Agency Radiological Site and Survey Investigation Manual, (MARSSIM, NUREG-1575, EPA 402-R-97-016) December 1997.

Environmental Protection Agency (EPA), 1998. Guidelines for Ecological Risk Assessment. Washington, D.C., 1998.

Environmental Protection Agency (EPA), 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. Washington, D.C., 2000.

Environmental Protection Agency (EPA), 2001. The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessment.

LaSala, A.M. Jr., 1968. Groundwater Resources of the Erie-Niagra Basin, New York. Basic Planning Report ENB-3, State of New York Conservation Department with Resources Commission.

Marley, M., D.J. Hazenbronck, and M.T. Walsh. 1992. The application of in situ air sparging as an innovative soils and groundwater remediation technology. Ground Water Monitoring Review. Vol. 12, No. 2, pp. 137-145.

McLean, J.E. and Bledsoe B.E., 1992. Behavior of materials in soils. U.S. EPA, EPA/540/S-92/018. Robert S. Kerr Laboratory, Ada, OK.

Mozola, A.J., 1951, The Groundwater Resources of Seneca County, New York, Bulletin GW-26. Water, Power and Control Commission, Department of Conservation, State of New York, Albany, New York.

New York State Department of Environmental Conservation (NYSDEC). 1990, Technical and Administrative Guidance Memorandum (TAGM) 4030. Selection of Remedial Actions at Inactive Hazardous Waste Sites, May, 1990.

New York State Department of Environmental Conservation (NYSDEC). 1993. Technical and Administrative Guidance Memorandum (TAGM) 4003 - Cleanup Guideline for Soils Contaminated with Radioactive Material. RAD-05-01. September, 1993. Revised, April 2005.

New York State Department of Environmental Conservation (NYSDEC). 1994. Technical and Administrative Guidance Memorandum (TAGM) 4046 - Determination of Soil Cleanup Objectives and Cleanup Levels. HWR-94-4046. January, 1994.

New York State Department of Environmental Conservation (NYSDEC). 1994. Technical and Administrative Guidance Memorandum (TAGM): Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites, October, 1994.

New York State Department of Environmental Conservation (NYSDEC), 1999. Technical Guidance for Screening Contaminated Sediments. Division of Fish, Wildlife, and Marine Resources.

New York State Department of Environmental Conservation (NYSDEC), 2004. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Division of Water Technical and Operational Guidance Series (1.1.1).

Office of Management and Budget (OMB), 2003. Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs.

Parsons, 2002. Final Remedial Investigation at the Radiological Waste Burial Sites (SEAD-12), February 2002.

Parsons, 2003. Final Radiological Survey Report – SEAD-12 Phase I and Phase II Surveys. March.

Parsons, 2006a. Final Supplemental Remedial Investigation Report, Radiological Waste Burial Sites (SEAD-12). October.

Parsons. 2006b. Final Record of Decision – No Action/No Further Action for SWMUs SEAD-58 and SEAD-63. August.

Parsons Engineering Science, Inc. 1994. SWMU Classification Report, September.

Parsons Engineering Science, Inc. 1995. Expanded Site Inspection - Eight Moderately Low Priority AOCs SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59. December

United States Department of Agriculture, 2002. Hydric Soils of the United States. On-line database. http://www.Statlab.iastate.edu/soils/hydric

Wentsel, R.S., T.W. LaPoint, M. Simini, R.T. Checkai, D. Ludwig and L. Brewer, 1994. Procedural Guidelines for Ecological Risk Assessments at U.S. Army Sites, Volume I. Edgewood Research, Development & Engineering Center, U.S. Army Chemical and Biological Defense Command, Aberdeen Proving Ground, MD. ERDEC-TR-221.

EXECUTIVE SUMMARY

Parsons, on behalf of the US Army, is submitting this Feasibility Study (FS) Report for the Radiological Waste Burial Sites (SEAD-12) located at the Seneca Army Depot Activity (SEDA) in Romulus, New York. This FS considers the nature and extent of impacts that were characterized in the Remedial Investigation (RI; Parsons, 2002) and the Supplemental Remedial Investigation (SRI; Parsons, 2006a), evaluates remedial action alternatives, and selects an alternative that is most appropriate for SEAD-12. This report is part of the Remedial Investigation/Feasibility Study (RI/FS) process required for compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments Reauthorization Act (SARA) of 1986. SEDA has officially been closed by the Department of Defense (DoD) and the US Army since its historic mission was ceased in 2000. This document has been prepared for the US Army Corps of Engineers, Huntsville District, under Contract No. DACA87-02-D-0005, Task Order No. 0031.

Based on the RI and the SRI, it was determined that the following areas require further consideration:

- Disposal Pit A/B due to the presence of military debris.
- Disposal Pit C due to the presence of military debris.
- Buildings 813/814 due to the need to conduct indoor air monitoring prior to any future potential occupancy.

This FS presents the selected remedial actions that were developed in accordance with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA/540/G-89/004, 1988). Remedial alternatives were considered for Disposal Pit A/B, Disposal Pit C, and Buildings 813/814. Alternatives for the two disposal pit areas were combined since the impacts to these areas are similar in nature. Two alternatives were developed and evaluated using the US Environmental Protection Agency (EPA)'s nine evaluation criteria. These alternatives are:

- Alternative 1: No Action
- Alternative 2: Excavation and Disposal in Off-Site Landfill/Environmental Easement

The alternative that ranked the highest as a result of the evaluation conducted in this FS is:

Alternative 2, Excavation/Disposal in Off-Site Landfill/Environmental Easement: Approximately 4,700 cubic yards (including approximately 1,200 cubic yards of debris) will be excavated from Disposal Pit A/B and approximately 6,100 cubic yards (including approximately 1,000 cubic yards of debris) will be removed from Disposal Pit C. Because there are no contaminants of concern at these areas, the extent of excavation will be the limits of the debris encountered within the excavation area. All debris and soil removed from the excavation will be scanned for the presence of radionuclides. Although there were no radiological exceedences in the disposal pits, the soil and debris will be screened to ensure that all subsurface materials encountered are free from unacceptable levels of radioactivity. If elevated levels of radioactivity are found, further analytical testing would be performed to confirm and identify the radionulcides of concern. Such material would be disposed

properly off-site at a licensed facility. Once all military debris and radiologically-impacted soils have been removed, the remaining soil will be backfilled. Additional clean fill from off-site will be used, as needed. The excavated areas will be re-contoured to match the existing terrain characteristics.

In addition to the excavation of military debris, an environmental easement will be prepared to prohibit access to Buildings 813/814 and any newly constructed building in the area, prior to conducting an indoor air survey. This is needed due to the presence of TCE beneath the buildings foundation.

The total present worth cost for this alternative is \$3.37 million (± 25-50 percent).

1.0 INTRODUCTION

1.1 PURPOSE AND ORGANIZATION OF REPORT

Parsons, on behalf of the U.S. Army, is submitting this Feasibility Study (FS) Report for the Radiological Burial Sites (SEAD-12) located at the Seneca Army Depot Activity (SEDA) in Romulus, New York. This report is part of the Remedial Investigation/Feasibility Study (RI/FS) process required for compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 and the Superfund Amendments Reauthorization Act (SARA) of 1986. The RI/FS at SEAD-12 has been performed under the guidance of the US Environmental Protection Agency (EPA), Region II and the New York Department of Environmental Conservation (NYSDEC). This document has been prepared for the US Army Corps of Engineers, Huntsville District, under Contract No. DACA87-02-D-0005, Task Order No. 0031.

The Final Remedial Investigation (RI) Report was submitted to EPA and NYSDEC in February 2002 and the Final Supplemental Remedial Investigation (SRI) Report was submitted to EPA and NYSDEC in October 2006. The purpose of the RI and SRI was to characterize the nature and extent of impacts and to assess human health and environmental risks at SEAD-12. This FS considers the nature and extent of impacts that were characterized in the RI and the SRI, evaluates remedial action alternatives, and selects an alternative that is most appropriate for SEAD-12. This report is organized in accordance with the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, EPA/540/G-89/004, October 1988. The remedial alternatives developed in the FS were evaluated using the selection criteria in the NYSDEC (1990) Revised NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4030 - Selection of Remedial Actions at Inactive Hazardous Waste Sites.

Section 1.0 provides a brief overview of the RI and SRI, including background information, nature and extent of contamination, and the baseline risk assessment (BRA). **Section 2.0** presents the remedial action objectives for each medium of concern and considers general response actions that meet the remedial objectives. **Section 3.0** evaluates the alternatives for each medium by preliminary screening to determine their relative merit for use in the remedial action. **Section 4.0** evaluates the remedial action alternatives in detail and provides the basis for selection of a remedial action alternative for SEAD-12.

1.2 SEAD-12 BACKGROUND

1.2.1 SEAD-12 Description

The SEDA is located approximately 40 miles south of Lake Ontario, near Romulus, New York as shown in **Figure 1-1**. The facility is located in an uplands area, at an elevation of approximately 600 feet Mean Sea Level (MSL), that forms a divide separating two of the New York Finger Lakes; Cayuga Lake on the east and Seneca Lake on the west. Sparsely populated farmland covers most of the surrounding area. New York State Highways 96 and 96A adjoin SEDA on the east and west boundaries, respectively.

The SEDA previously occupied approximately 10,600 acres of land located in the Towns of Varick and Romulus in Seneca County, New York. The former military facility was owned by the U.S.

Government and operated by the Army between 1941 and approximately 2000, when the SEDA military mission ceased. The SEDA's historic military mission included receipt, storage, distribution, maintenance, and demilitarization of conventional ammunition, explosives, and special weapons. In 1995, the SEDA was designated for closure under the Department of Defense's (DoD's) Base Realignment and Closure (BRAC) process. With the SEDA's inclusion on the BRAC list, the Army's emphasis expanded from expediting necessary investigations and remedial actions at prioritized solid waste management units (SWMUs) to including the release of non-affected portions of the Depot to the surrounding community so that the land can be reused for non-military purposes (i.e., industrial, municipal, and residential). Since the inclusion of the SEDA in the BRAC program, approximately 8,000 acres have been released to the community. An additional 250 acres of land have been transferred to the U.S. Coast Guard for continued operation of a LORAN Station. SEAD-12 has been retained for the RI/FS process.

SEAD-12 is located in the northern portion of SEDA within the former Weapons Storage Area (WSA) facility known as the Q Area. Investigation of SEAD-12 originally began as the investigation of two separate areas, formerly designated as SEAD-12A (Radioactive Waste Burial Site – northeast corner of Q) and SEAD-12B (Radioactive Waste Burial Site – northeast of Buildings 803, 804, and 805). SEAD-12A encompassed an area of approximately 1,000 feet long by 1,000 feet wide that is suspected to have included up to five separate small burial pits. SEAD-12B was smaller, encompassing an area measuring 300 feet long by 300 feet wide, and it was suspected to have included a 5,000 gallon storage tank and a small dry waste pit. Locations of these two historic SEADs are shown in **Figure 1-2**.

After the completion of the Expanded Site Inspections (ESIs) of SEAD-12A and SEAD-12B and the submission of the report summarizing the findings of the ESIs at the two historic SEADs, the bounds of SEAD-12 were expanded in 1995. This decision was based on the similarity of the chemicals found at the two historic SEADs and the general history of the Q Area that suggested that similar constituents were likely to exist throughout the larger area. Also included in the RI/FS at SEAD-12 are Building 715 and the portion of Reeder Creek that is adjacent to SEAD-12. Building 715 used to be a wastewater treatment plant that is suspected to have received wastewater from the buildings within the Q Area. Reeder Creek receives the surface water runoff from SEAD-12 as well as any discharge from Building 715.

The northern portion of SEAD-12 was used for disposal of laboratory and maintenance wastes and military components. This area includes Buildings 802, 803, 804, 805, 806, 807, 810, 812, and 825, which were part of the WSA facility at SEDA. The eastern, western, and southern portions of SEAD-12 are primarily open fields and include Buildings 813 through 817, 819, and 823. These buildings were also part of the former WSA facility at SEDA.

The area designated as SEAD-12 excludes the area of SEAD-63, the Miscellaneous Components Burial Site, which is located along the western boundary of the former Q Area (see **Figure 1-2**). A non-time critical removal action was performed for SEAD-63 in 2004, resulting in the removal of

5,100 tons of soil and debris. A Record of Decision (ROD) for No Further Action (NFA) at SEAD-63 was submitted by Parsons in September 2006 and the SWMU is closed under CERCLA.

1.2.2 Future Land Uses

CERCLA guidance, Land Use in the CERCLA Remedy Selection Process, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-04, directs decision makers to achieve cleanup levels associated with the reasonably anticipated future land use over as much of the site as possible. As part of the 1995 BRAC process, a Local Redevelopment Authority (LRA) comprised of representatives from the local community was established. DoD policy described in Responsibility for Additional Environmental Cleanup after Transfer of Real Property also states that "For BRAC properties, the LRA's redevelopment and land use plan, will be the basis for the land use assumptions DoD will consider during the remedy selection process." A Land Reuse Plan was prepared and approved by the LRA in 1996 which designated parcels of land within the Depot for reuse into eight categories: Planned Industrial/Office Development, Warehousing, Prison, Conservation/Recreation, Institutional, Housing, Airfield/Special Events, and Federal to Federal Transfer. The area that encompasses SEAD-12 was determined to be "Conservation/Recreation Area". In 2005, the Seneca County Industrial Development Agency (SCIDA) revised the planned future use of property within the former Depot and added Institutional Training, Residential/Resort, Green Energy, Development Reserve, Training Area, and Utility uses. Under this revised future use plan, SEAD-12 is located in the Planned Institutional Training parcel of the former Depot (see **Figure 1-3**). That is, the planned future use for SEAD-12 is institutional training. In addition to the consideration of future land use during the remedy selection process, the State of New York regulations, NYCRR Title 6, Chapter IV, Subchapter B, Part 375, Subpart 375-2.8 Remedial Program, requires evaluation of remedies that will restore the site conditions to "pre-disposal conditions to the extent feasible." Since a remedial alternative for an unrestricted use scenario is included in this FS, it is the Army's opinion that this requirement has been satisfied.

1.2.3 Geological Setting

A detailed discussion of the SEDA geological setting is presented in the Parsons (1995) ESI report (Section 1.1.1.1). Below is a brief summary.

The SEDA is located within a distinct unit of glacial till that covers the entire area between the western shore of Lake Cayuga and the eastern shore of Lake Seneca. The till is consistent across the entire depot although it ranges in thickness from less than 2 feet to as much as 15 feet, with the average being a few feet thick. Larger diameter weathered shale clasts (as large as 6-inches in diameter) are more prevalent in basal portions of the till and are probably rip-up clasts removed by the active glacier during the late Pleistocene era. The general Unified Soil Classification System (USCS) description of the till on-site is as follows: Clay-silt, brown; slightly plastic, small percentage of fine to medium sand, small percentage of fine to coarse gravel-sized gray shale clasts, dense and mostly dry in place, till, (ML). The glacial tills in this area have a high percentage of silt and clay with trace amounts of fine gravel. A zone of gray weathered shale of variable thickness is present below the till in almost all locations at SEDA. This zone is characterized by fissile shale with a large amount of brown interstitial silt and clay.

The underlying bedrock below weathered shale is the Hamilton Group. The Hamilton Group, measuring from 600 to 1,500 feet thick, is divided into four formations. They are, from oldest to youngest, the Marcellus, Skaneateles, Ludlowville, and Moscow formations. The western portion of SEDA is generally located in the Ludlowville Formation while the eastern portion is located in the younger Moscow Formation. The Ludlowville and Moscow formations are characterized by gray, calcareous shales, mudstones and thin limestones with numerous zones of abundant invertebrate fossils. Locally, the shale is soft, gray, and fissile. **Figure 1-4** displays the stratigraphic section of Paleozoic rocks of Central New York. Three known predominant joint directions, N60^{o}E, N30^{o}W, and N20^{o}E are present within this unit (Mozola, 1951).

1.2.4 Hydrogeology

Available geologic information indicates that the upper portions of the shale formation would be expected to yield small supplies of water. Regionally, four distinct hydrologic water-bearing units have been identified (Mozola, 1951). These include two distinct shale formations, a series of limestone units, and unconsolidated beds of Pleistocene glacial drift.

For mid-Devonian shales such as those of the Hamilton Group, the average yields (which are less than 15 gallons per minute) are consistent with what would be expected for shales (LaSala, 1968). The deeper portions of the bedrock (at depths greater than 235 feet) have provided yields of up to 150 gallons per minute. At these depths, the high well yields may be attributed to the effect of solution on the Onondaga limestone that is at the base of the Hamilton Group. Based on well yield data, the degree of solution is affected by the type and thickness of overlying material (Mozola, 1951). Geologic cross-sections from Seneca Lake and Cayuga Lake have been constructed by the State of New York (Mozola, 1951, and Crain, 1974). This information suggests that a groundwater divide trending north south exists approximately half way between the two Finger Lakes. SEDA is located on the western slope of this divide and therefore regional groundwater flow is expected to be primarily westward toward Seneca Lake.

Surface drainage from SEDA flows to four creeks. In the southern portion of the depot, the surface drainage flows through ditches and streams into Indian and Silver Creeks. These creeks then flow into Seneca Lake just south of the SEDA airfield. The central part and administration area of SEDA drain into Kendaia Creek. Kendaia Creek discharges into Seneca Lake near the Lake Housing Area. The majority of the northwestern and north-central portion of SEDA drains into Reeder Creek. The northeastern portion of the depot, which includes a marshy area called the Duck Ponds, drains into Kendaia Creek and then flows north into the Cayuga-Seneca Canal and to Cayuga Lake.

Regional precipitation is derived principally from cyclonic storms that pass from the interior of the country through the St. Lawrence Valley with local influence derived from Lakes Seneca, Cayuga, and Ontario providing some lake effect snows, leading to a significant amount of the winter precipitation and a moderate local climate.

Data from SWMU groundwater monitoring programs indicate that the overburden aquifer water table elevations were influenced by the seasonal cycle and some monitoring wells dried up completely during portions of the year. Depth to groundwater ranged from about 2 ft (at MW12-39) to approximately 11 ft (at MW12-40) at SEAD-12. Groundwater flow is predominantly to the west and northwest across the majority of the SWMU.

1.2.5 SWMU History

SEDA has been owned by the United States Government and operated by the Department of the Army since 1941, when it was constructed. Prior to construction of the Depot, the SWMU was used for farming.

Activities within SEAD-12 between 1962 and the demilitarization of the base in 1996 are classified or unknown. Buildings and anomalies within SEAD-12 were classified as Class I, Class II, or Class III (Parsons, 2002, 2003), in accordance with the Multi-Agency Radiological Survey and Site Investigation Manual (MARSSIM, EPA, 1997b). Class I areas are areas that have, or had prior to remediation, a potential for radioactive contamination or known contamination. Class II areas are areas that have, or had prior to remediation, a potential for radioactive contamination or known contamination, but are not expected to exceed the Derived Concentration Guideline Levels (DCGLs) that correspond to allowable radiation dose standards. Class III areas are any impacted areas that are not expected to contain any residual radioactivity, or are expected to contain levels of residual radioactivity at a small fraction of the DCGL.

Nine potential release areas, shown in **Figure 1-2**, were defined within SEAD-12 as a result of the RI. The history and conditions for each of the potential release areas are presented in detail in the Final RI report (Parsons, 2002) and are summarized below.

- **Building 819/EM-27** (Class I & Class II) – During the operational period from 1957 to 1962, Building 819 was used by Sandia National Laboratories as a quality assurance inspection laboratory. Geophysical anomaly EM-27 was an anomaly identified during the RI and located adjacent to the building. Military-related debris consisting of metal wiring and plastic sheeting was found at the location of the anomaly during a test pit excavation.
- **Building 815, Building 816/EM-28** (Class I, II, & III) – Activities within the buildings up until 1962 included inspection and testing of non-radioactive mechanical and electrical systems. Geophysical anomaly EM-28 identified during the RI was determined to be associated with a metal fence post found during a test pit excavation.
- **Disposal Pit A/B** (Class I & II) **–**Test pit excavations found metal and fiberglass debris, and miscellaneous electronic components.
- **Disposal Pit C** (Class I & II) – Small disposal pits containing laboratory wastes were suspected to have been located in this area. Test pit investigations detected military debris.
- **Former Dry Waste Disposal Pit** – Wastes from this pit were periodically removed and shipped for disposal. No buried wastes were found in the area.
- **EM-5** (Class II) **–** The anomaly observed during the geophysical investigations was associated with debris remaining from an original farmstead which predates the SEDA.

- **EM-6** (Class II) **–** This area may have been a former disposal pit for construction-type debris.
- **Wastewater Treatment Plant** – The wastewater treatment plant is suspected to have received wastewater from buildings within the Weapons Storage Area.
- **Class III Area -** This area encompasses the remainder of SEAD-12 that is not assigned above and is not classified as a Class I or a Class II area.

A detailed description of all the buildings and their uses are presented in the Final RI Report (Parsons, 2002).

1.2.6 Previous Investigations and Activities

1.2.6.1 SWMU Classification

The SWMU Classification Report (Parsons, 1994) describes and evaluates all 72 of the SWMUs at SEDA and provides recommendations for future action at these SWMUs. This report describes SEAD-12 (Building 804 and Associated Radioactive Waste Sites), its physical make-up, the waste characteristics associated with it, as well as other information related to migration pathways and exposure potential. The report recommends that a CERCLA Site Inspection (SI) be performed at SEAD-12 as part of the investigation of Fifteen Solid Waste Management Units at SEDA. At the time of the preparation of the SWMU Classification Report, SEAD-12 was classified as a Moderately Low Priority Area of Concern.

1.2.6.2 Expanded Site Inspection

In accordance with the decision process outlined in the Interagency Agreement (IAG) between the United States Army Corps of Engineers (USACE), EPA, and NYSDEC, an ESI was performed at SEAD-12A and 12B in 1994. This investigation included sampling of surface and subsurface soils, groundwater, surface water, and sediment to identify hazardous constituents or wastes that may have been released to the environment. The sampling data were compared to state and federal guidelines and standards to determine whether this SWMU posed a potential threat or risk to human health and the environment. A summary of the findings of the ESIs at SEAD-12A and SEAD-12B are presented in **Section 1.3** below and the SEAD-12 RI report (Parsons, 2002).

1.2.6.3 Remedial Investigation

A remedial investigation was initiated at SEAD-12 in 1997 and the tasks completed during the RI include:

- Geophysical Investigations,
- Radiation Scanning,
- Soil Gas Survey,
- Soil (surface and subsurface) Screening, Descriptions, and Sampling,
- Groundwater Field Parameter Screening and Sampling,
- Aquifer Testing,

- Surface Water and Sediment Investigations,
- Baseline Human Health Risk Assessment,
- Screening-Level Ecological Risk Assessment, and
- Surveying.

The RI concluded that the following areas should be considered in the development of alternatives in the FS:

- Disposal Pit A/B – removal of remaining "military" debris associated with electromagnetic (EM) anomalies;
- Disposal Pit C – removal of remaining "military" debris associated with EM anomalies;
- EM-5 – investigation and debris removal address Pb-210 contamination issues;
- Class III area,
  - Additional well to define TCE source east of Building 814,
  - Additional groundwater monitoring to evaluate TCE movement near Buildings 813/814

Although surface water and sediment were originally identified as media with potential concern in Section 8 of the RI, further evaluation (presented in Section 7 of the RI report) indicates that aluminum is the only chemical of concern (COC) identified in sediment and surface water. Since sediment concentrations of aluminum are very similar to background concentrations, the Army's risk management position is that aluminum does not warrant further evaluation for the sediment and surface water.

Soil within Disposal Pit A/B was originally identified as a medium of concern for ecological receptors during the RI; but further evaluation (presented in Section 7 of the RI report) identifies no COCs and the Army's position is that no further action is warranted to mitigate potential ecological risks associated with Disposal Pit A/B soil. Disposal Pit C was identified during the RI as a medium of concern due to potential ecological risk. However, due to the future use change of SEAD-12 from Conservation/Recreation to Institutional Training, soil associated with Disposal Pits A/B and C are no longer considered to be of concern. Soils in these areas were flagged during a screening ecological risk assessment.

The investigation of groundwater at Buildings 813 and 814 and Pb-210 in the EM-5 area was conducted during the SRI and the findings are summarized below. The nature and extent and risk analysis conducted during the SEAD-12 RI are summarized in **Sections 1.3** and **1.4** below and in detail in the SEAD-12 RI report (Parsons, 2002). **Figures 1-5** and **1-6** show sample locations for all ESI and RI samples collected from SEAD-12.

1.2.6.4 Supplemental Remedial Investigation

Based on the findings of the RI, two additional investigations were recommended:

- The installation of additional wells at Buildings 813 and 814 to further characterize a TCE exceedance found in a single well, MW12-37, north of Building 813; and
- Additional soil sampling at EM-5 to confirm elevated levels of Pb-210 detected during the RI.

An SRI was performed in 2004 and 2005 to assess these two areas. The tasks completed during the SRI include:

- Installation of 13 temporary wells in the area adjacent to MW12-37 and sampling of the temporary wells and MW12-37 and MW12-40 for volatile organic compound (VOC) analysis to determine the extent of groundwater impacts in this area. Ten temporary wells were installed between 20 and 300 feet from MW12-37, the monitoring well having the elevated detection of TCE (1,600 µg/L).
- Sampling of surface water/ditch soil from seven locations from the drainage ditch adjacent to Buildings 813 and 814 to determine whether or not TCE detected in groundwater during the RI had impacted the adjacent ditch.
- Conducting of a test pit investigation in three phases north of the Buildings 813/814 area where TCE was detected in groundwater to investigate the extent of TCE contamination in soil.
- Periodic analysis of soil removed during the test pit investigation. Soil excavated from test pitting activities was initially stockpiled at the SWMU; samples were collected from this soil and analyzed for VOC. Over a period of approximately two years, as the soil weathered, VOC concentrations reduced to below the NYSDEC TAGM 4046 values. The soil was eventually backfilled within the test pits.
- Re-sampling and analysis of Ra-226 and Pb-210 in EM-5 soil using a Modified DOE EML HASL-300 Method to determine whether or not the levels observed during the RI were due to analytical uncertainty.

As a result of the SRI, the following conclusions were made as documented in the SRI report (Parsons, 2006a):

- TCE observed in groundwater at MW12-37 during the RI was determined to be localized and no groundwater plume was present. Adjacent temporary wells were not impacted.
- The drainage ditch adjacent to Buildings 813 and 814 was not impacted by TCE.
- The TCE-impacted soils near MW12-37 were located during the SRI and removed. TCE had not migrated in groundwater to within the range of any of the temporary wells installed during the SRI (i.e. between 20 and 300 feet of MW12-37). Levels of TCE in soil below the foundation of Building 813 were detected above the NYSDEC TAGM value of 700 µg/Kg

(1,000 µg/Kg and 4,800 µg/Kg at two locations at the building foundation). Soils in this area could not be removed without jeopardizing the integrity of the building and were left in place.

- There were no detections of Pb-210 within the EM-5 area using Modified DOE EML HASL-300 Method for soil analysis. The elevated levels detected during the RI were attributed to analytical uncertainty. The analytical uncertainties associated with the method used in the SRI were much lower than those from the original RI.

Based on the SRI findings, the Army proposed no further action for the groundwater near Buildings 813/814 and the soil at EM-5. Due to the presence of TCE in soil below the building foundation, NYSDEC and EPA raised concerns regarding the quality of indoor air in these buildings. However, it was argued that an environmental easement would be put in place to ensure that an indoor air quality assessment would be required before any future building occupancy. Currently, there is no future user designated for Buildings 813/814 and the building is uninhabitable in its current condition due to lack of power, water, and sewer.

1.3 NATURE AND EXTENT OF IMPACTS

1.3.1 Soil

During previous investigations, the soil cleanup levels proposed by the State of New York through TAGM under #HWR-94-4046 had been compared with the SEAD-12 soil data to evaluate soil conditions at SEAD-12. The soil concentrations provided in the TAGM 4046 are not promulgated standards and therefore were used as “To Be Considered” (TBC) guidelines for the RI at SEAD-12. Since completion of the RI and SRI, the New York State Environmental Board approved 6 NYCRR Subparts 375-1 through 375-4 and Subpart 375-6 under 6 NYCRR Part 375 - Environmental Remediation Programs (October 25, 2006). 6 NYCRR Subpart 375-6 includes the soil cleanup objective tables developed for unrestricted use and restricted use scenarios. The soil cleanup objectives in 6 NYCRR Subpart 375-6 did not exist during previous investigations and were not considered in the RI. However, these values are used in the FS in the process of developing remedial action objectives for SEAD-12.

Surface and subsurface soil chemical exceedances of NYSDEC TAGMs are summarized in **Table 1-1** and **Table 1-2**, respectively. The results of the chemical analysis of surface and subsurface soil show that semi-volatile organic compound (SVOC) exceedances are limited to a few samples in the area of Building 819/EM-27. Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chyrsene, and dibenz(a,h)anthracene are SVOCs that significantly exceeded their TAGMs. These SVOCs exceed their criteria in both surface soil and subsurface soil; however, these exceedances occur to a greater extent in the surface soil. In addition, there are metal exceedances throughout SEAD-12, but significant exceedances (values 2-5 times greater than TAGM values) are confined to Disposal Pit A/B and Disposal Pit C. In subsurface soil samples in these areas, metals that exceed their TAGMs by more than a factor of two include cadmium, chromium, copper, cyanide, lead, and zinc. Cadmium, chromium, and copper are found at maximum concentrations in Disposal Pit A/B. The maximum concentrations of lead and zinc, which are located in the Disposal Pit C area, are 431 and 6,080 ppm, respectively.

1.3.2 Groundwater

During the RI, the NYSDEC (2004) Ambient Water Quality Standards (AWQS) for Class GA groundwater were used to evaluate SEAD-12 groundwater conditions. A summary of groundwater exceedances based on the RI is presented in **Table 1-3**.

Groundwater metal exceedances include antimony, iron, manganese, and sodium. The iron, manganese, and sodium exceedances are spread across the SWMU and often vary with the season. The antimony standard was only exceeded during the December 1999 round of sampling. The antimony concentrations detected at MW12-26 (3.2 µg/L) and MW12-29 (3.6 µg/L) were slightly above the GA Standard (3 µg/L); the maximum antimony concentration (43.2 µg/L) was detected at monitoring well MW12-39. However, the maximum concentration of antimony detected in SEDA background wells is 52.7 µg/L. SVOC exceedances are limited to two relatively low exceedances of bis(2-ethylhexyl)phthalate. The most significant groundwater exceedance is for TCE, which was detected at 1,600 µg/L and 2,400 µg/L, respectively during the RI and the SRI in monitoring well MW12-37 near Building 813. However, TCE was not detected in either of the adjacent wells (MW12-38 and MW12-39) during the RI. The SRI further demonstrated that TCE at MW12-37 was isolated. Elevated TCE concentrations were detected in soil in the area adjacent to MW12-37 and to the northeast corner of Building 813; the soil was regarded as the source of TCE contamination in groundwater and was later excavated during the SRI.

There were no groundwater exceedances for pesticides/Polychlorinated Biphenyls (PCBs).

1.3.3 Surface Water

A summary of surface water exceedances based on the RI is presented in **Table 1-3**.

Bis(2-ethylhexyl)phthalate was detected above the NYSDEC AWQS for Class C surface water near the former Dry Waste Disposal Pit and near Building 819. No other SVOCs were detected above the Class C AWQS at SEAD-12.

On-site, six pesticides exceeded their respective AWQS Class C surface water standards: 4,4'-DDE, 4,4'-DDT, aldrin, heptachlor, heptachlor epoxide, and hexachlorobenzene; however, most of the pesticide exceedances that occurred in on-site samples were detected below laboratory reporting limits. Only a few of the pesticides were detected above the reporting limits and none were detected greater than two times the reporting limits. Downgradient of SEAD-12, the only parameter to exceed the AWQS Class C surface water standards was hexachlorobenzene at surface water sample location SW12-48; hexachlorobenzene was detected slightly above its laboratory reporting limit of 0.01 ug/L in this sample.

Based on the RI data, seven metals were found at concentrations above the respective NYSDEC AWQS standards for Class C surface water in the surface water samples. Of these seven metals, mercury and lead contamination are associated with the most significant exceedances. Three of the four locations where the mercury standard was exceeded (surface water sample locations SW12A-2, SW12A-1, and SW12-16) occur in the unnamed creek south of Disposal Pit A/B and Disposal Pit C, while the fourth location, surface water sample location SW12-35, is approximately 350 feet south of the creek.

1.3.4 Sediment

Sediment results were compared to the most conservative New York State guidelines for sediment including: New York State lowest effect level (NYS LEL), New York State human health bioaccumulation criteria (NYS HHB), New York State benthic aquatic life acute and chronic toxicity criteria (NYS BALAT and NYS BALCT, respectively), and New York State wildlife bioaccumulation criteria (NYS WB). Exceedances occur for SVOCs, pesticides/PCBs, and metals, both at the SWMU and downgradient of the SWMU.

A summary of sediment exceedances based on the RI is presented in **Table 1-3**. Exceedances occur for SVOCs, pesticides/PCBs, and metals, both onsite and downgradient. The incidence of exceedances in sediment decreases in the downgradient dataset. Benzo(a)pyrene is one of the SVOCs with exceedances of the greatest significance. The metals sediment exceedances within the SEAD-12 area do not correlate well with the locations of surface water exceedances for metals. The metal exceedances causing the greatest impact are cadmium, copper, manganese, mercury, and zinc. In sediment, the pesticides/PCBs of greatest concern is Aroclor-1254.

1.3.5 Radiological Impact

No significant presence of radiological elements were detected in the soil at SEAD-12.

Soil exceedances of radiological criteria were identified at EM-5 and EM-6 based on the RI report. Radiological exceedances are categorized by radionuclides that exceed background, background plus DCGL for residential criteria, and background plus DCGL for worker criteria. A DCGL is defined as the concentration of residual radioactivity distinguishable from background that, if uniformly distributed throughout a survey unit, would result in a defined total effective dose equivalent (TEDE) to an average member of a critical group. The TEDE selected for development of DCGLs at this site is the NYSDEC TAGM 4003 of 10 millirem per year (mrem/yr). Although EPA allows a TEDE of 15 mrem/yr and the Nuclear Regulatory Commission (NRC) allows a TEDE of 25mrem/yr, this total effective dose equivalent was selected since it is the most conservative. Exceedances of the residential criteria at EM-5 and EM-6 are generally related to four radionuclides: Bismuth-214 (Bi-214), Lead-210 (Pb-210), Lead-214 (Pb-214), and Radium-226 (Ra-226). All of these are natural daughters of Uranium-238 (U-238). According to the RI report (Parsons, 2002), there are no exceedances to the worker criteria for soils with the exception of EM-5 (Pb-210 and Ra-226) and EM-6 (Ra-226). Upon further investigation of the Ra-226 results at EM-5 and EM-6, an error was found in the Wilcoxon Rank Sum (WRS) analyses conducted during the RI for these two areas. The WRS analyses were redone during the FS and the data from EM-5 and EM-6 for Ra-226 are actually within background plus worker DCGL values and are not elevated according to this analysis. The updated WRS results are presented in **Appendix B**.

In order to address concerns of elevated Pb-210 levels detected during the RI at EM-5, the ten locations from the RI with the highest Pb-210 concentrations or highest uncertainties were re-sampled during the SRI. Re-sampling was performed based on historical activities at SEAD-12 and observations made during the RI; and re-sampling does not support the elevated levels found during the RI and analytical uncertainty associated with RI samples was suspected. The samples collected during the SRI were analyzed for Ra-226 and Pb-210 using Modified DOE EML HASL-300 Method to minimize the uncertainty of the results. The results of this analysis indicated that there were no detections of Pb-210 in the SRI samples.

Although radiological exceedances occur within the SWMU at locations within surface water, sediment, and groundwater, the exceedances are considered to be associated with the naturally occurring daughters of uranium and thorium.

1.4 FATE AND TRANSPORT

The metals, radionuclides, and organic compounds found in SEAD-12 occur in sufficiently low concentrations that natural processes control their mobility for further dispersion. TCE and cis-1,2-dichloroethene (cis-1,2-DCE) were the only VOCs detected in SEAD-12 groundwater above the Class GA Standards; the exceedances only occurred at monitoring well MW12-37. TCE and cis-1,2-DCE concentrations were not detected above the GA Standards in the adjacent groundwater monitoring wells (i.e., MW12-38 and MW12-39), nor were they detected in the 13 temporary monitoring wells installed in the vicinity of MW12-37 during the SRI. The low gradients and low hydraulic conductivity of the aquifer, in addition to the absence or low concentrations of TCE and cis-1,2-DCE in nearby wells, indicates that TCE observed at MW12-37 was localized and therefore the impact on groundwater is most likely limited. Further, soil in the area adjacent to MW12-37 was removed during the SRI. Therefore, TCE is not expected to pose significant impact to SEAD-12 groundwater.

There is a presence of Polycyclic Aromatic Hydrocarbons (PAHs), pesticides, and metals in sediment north of Building 815 near sediment sample SD12-32. PAHs are relatively immobile, having a high affinity for organic matter. This low mobility explains their primary presence in sediments. The immobile nature of the compounds and the lack of PAHs in groundwater indicate limited transport of these compounds. Pesticides are also detected primarily in the sediments due to their high organic carbon partition coefficient, K_{oc}, values which dictate low mobility.

While metals can be described by a range of mobilities, their transport abilities can generally be characterized by the same underlying principles. The mobility of metals within a soil system is primarily associated with the movement of water through that system. This mobility is affected by the solubility of the metal and its compounds, as well as chemical parameters affecting the oxidation state of the metal in solution. Metals associated with the aqueous phase of soil are subject to movement with soil water and may be transported through the vadose zone to groundwater. However, the rate of migration of the metal usually does not equal the rate of water movement through the soil due to fixation and adsorption reactions (Dragun, 1988). Metals, unlike organic compounds, cannot be degraded (McLean and Bledsoe, 1992). Metals become immobile due to mechanisms of adsorption and precipitation. Metal-soil interactions are such that when metals are introduced at the soil surface, downward transportation does not occur to any great extent unless the metal retention capacity of the soil is overloaded, or metal interaction with the associated waste matrix enhances mobility.

Statistical evaluation of radionuclide data in soil presented in Section 4.0 of the RI and in accordance with MARSSIM guidance, indicates that the NYSDEC TAGM of 10 mrem/yr is achieved in all areas of the SWMU, except for Pb-210 at EM-5. However, there was a large uncertainty associated with the laboratory results for Pb-210. Selected locations from the original RI were resampled and analyzed using Modified DOE EML HASL-300 Method to reduce the uncertainty. The SRI results indicate no detections of Pb-210 at EM-5. Overall, the SWMU is not impacted by radionuclides based on the RI and SRI results.

1.5 RISK ASSESSMENT

A baseline risk assessment was conducted for SEAD-12 and is presented in the RI (Parsons , 2002). The objectives of the baseline risk assessment were to:

- Assess SWMU conditions for protectiveness of human health and the environment;
- Determine whether additional response actions are necessary at the SWMU;
- Identify COC and provide a basis for determining levels of chemicals of concern that are adequately protective of human health and the environment; and
- Provide a basis for comparing potential health impacts of various remedial alternatives, and evaluate selection of the "No Action" remedial alternative, where appropriate.

To meet these objectives, the Risk Assessment Guidance for Superfund (RAGS) (EPA, 1989) was followed. The baseline risk assessment was divided into two components: the human health evaluation and the ecological evaluation. Separate risk calculations were presented for current and future land-use scenarios.

Although the size of SEAD-12 area is large, a large portion has not been impacted. Consequently, the human health and ecological BRA was completed on three of the nine potential release areas:

- Disposal Pit A/B;
- Disposal Pit C; and
- Former Dry Waste Disposal Pit.

These three areas were selected on the basis of area evaluation criteria, including areas of documented activity associated with WSA activities, areas where RI investigations confirmed significant "military" activity, and proximity to buildings associated with activities of potential concern. Overall, the Former Dry Waste Disposal Pit area, Disposal Pit A/B, and Disposal Pit C were impacted to the greatest extent by former activities in the WSA.

1.5.1 Baseline Human Health Risk Assessment

The exposure scenarios that are considered in the baseline human health risk assessment include:

- Exposure of a current worker to contaminants at the SWMU;

- Exposure of a future park worker to contaminants at the SWMU;
- Exposure of a current/future construction worker to contaminants at the SWMU;
- Exposure of a future recreational visitor (child) to contaminants at the SWMU;
- Exposure of a future resident to contaminants at the SWMU; and
- Exposure of a future wader to downstream contaminants.

It should be noted that due to the change of the future land use for SEAD-12 (i.e., from conservation/recreation to institutional training) in 2005, some receptors evaluated during the RI (e.g., park worker and recreational visitor) no longer represent future human receptors at the SWMU. However, the exposure assumptions for these receptors are still relevant and mimic those assumptions used for potential future human receptors under an institutional training scenario. For example, the exposure profile for a park worker is similar to that for an institutional worker and exposure assumptions for recreational visitors could be used as conservative estimates for trespassers. Therefore, the risk assessment results can still be used to assess potential human health risks at SEAD-12.

Separate sets of soil exposure point concentrations were derived for each area (the Former Dry Waste Disposal Pit area, Disposal Pit A/B, and Disposal Pit C) for evaluating risks associated with soil exposure pathways. For surface water, sediment, and groundwater, a single set of exposure point concentrations were derived from all SWMU data and added to the risk generated from the area-specific soil risk. For the wader, downgradient sediment and surface water data were used to generate a set of exposure point concentrations for this scenario.

The results of the human health risk assessment are summarized in **Table 1-4**. Only a future resident has the potential to be exposed to chemicals of concern at levels that are above those defined by the EPA. The future resident exhibits non-cancer risks and excess cancer risks above the EPA target risk range in all three potential release areas. However, the risks for future residents are considered highly uncertain and probably overestimates of risks as discussed below.

The Reasonable Maximum Exposure (RME) excess cancer risk for the future resident is 7×10^{-4} and it is primarily due to dermal contact with benzo(a)pyrene in groundwater and surface water. Benzo(a)pyrene was only detected twice in SEAD-12 groundwater out of 89 groundwater samples – 0.058 μg/L in MW12-39 and 0.097 μg/L in MW12-40 in April 1999. Benzo(a)pyrene was not detected in either of these wells during the December 1999 sampling event. Benzo(a)pyrene was only detected in one SEAD-12 surface water sample out of 52 surface water samples – 0.6 μg/L at SW12A-1 during the ESI. Benzo(a)pyrene was not detected in a field duplicate collected from the same location (i.e., SW12A-1). Further, benzo(a)pyrene was not detected in any surface water samples collected during the RI adjacent to SW12A-1 (e.g., SW12-14, which is immediately next to SW12A-1, and SW12-15, which is within 300 ft from SW12A-1). Overall, the groundwater and surface water data suggest that groundwater or surface water at SEAD-12 is not impacted by bezno(a)pyrene. Thus, including benzo(a)pyrene as a Chemical of Potential Concern (COPC) and using the maximum detected concentrations in groundwater and surface water for the risk assessment is an overly conservative approach. The risk assessment results are considered highly uncertain and probably overestimates of risks, as qualified in the Risk Characterization and Uncertainty sections in the RI.

The Reasonable Maximum Exposure non-cancer risk for the future resident is 2 and it is primarily due to dermal contact with Aroclor-1242 in surface water and di-n-octylphthalate in groundwater. Aroclor-1242 was only detected twice in SEAD-12 surface water out of 52 samples – 0.33 µg/L in SW12-6 and 0.44 µg/L in SW12-23. Di-n-octylphthalate was detected in six out of 89 SEAD-12 groundwater samples. All the detected di-n-octylphthalate concentrations were below the laboratory reporting limits; and none of the detects were confirmed by results from a different sampling round at the same locations. Overall, the groundwater and surface water data suggest that groundwater at SEAD-12 is not impacted by di-n-octylphthalate and surface water at SEAD-12 is not impacted by Aroclor-1242. Thus, including Aroclor-1242 as a COPC for surface water and di-n-octylphthalate as a COPC for groundwater, and using the maximum detected concentrations in groundwater and surface water for the risk assessment is an overly conservative approach. The risk assessment results are considered highly uncertain and probably overestimates of risks.

Both the carcinogenic (chemical and radiological combined) and the non-cancer health risks for all other receptors were within or below the EPA target levels. The potential risks from exposure to lead in soil were not assessed since this metal was not elevated above background levels based on WRS statistical analysis presented in Section 6 of the SEAD-12 RI (Parsons, 2002).

1.5.2 Baseline Ecological Risk Assessment

The ecological risk assessment (ERA) was performed following the guidance presented in the Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (NYSDEC, 1994a), Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA, 1997a), Guidelines for Ecological Risk Assessment (EPA, 1998), the Procedural Guidelines for Ecological Risk Assessment at U.S. Army Sites, Vol. 1 (Wentsel et al., 1994) and The Role of Screening – Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessment (EPA, 2001).

The current EPA ecological risk assessment paradigm includes eight general steps:

1. Screening-Level Problem Formulation and Effects Evaluation (toxicity);
2. Screening-Level Exposure Estimate and Risk Calculation;
3. Baseline Problem Formulation;
4. Study Design and Data Quality Objectives Process;
5. Field Verification of Sampling Design;
6. Site Investigation and Analysis of Exposure and Effects;
7. Risk Characterization; and
8. Risk Management (EPA, 1997b).

Upon completion of ERA Step 2, there is a Scientific Management Decision Point (SMDP) with three possible decisions:

- There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risks.
- The information is not adequate to make a decision at this point and the ERA process should continue to a baseline ERA.
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.

For Steps 1 and 2, No Observed Adverse Effect Level (NOAEL) toxicity values and default exposure assumptions were used to calculate screening level Hazard Quotients (HQs). Due to the conservative nature of these assumptions, additional evaluation was required to refine COCs and to help streamline the overall ERA process. In accordance with the EPA guidance, this additional evaluation was performed as part of the baseline problem formulation in Step 3 (EPA, 2001).

For soils, maximum detected concentrations were compared to screening criteria to identify COPCs (Step 1). Potential exposures and effects resulting from maximum concentrations of soil contaminants were then evaluated by estimating potential direct and indirect exposures for terrestrial wildlife (short-tailed shrew, red-tailed hawk, meadow vole, and mourning dove) and comparing exposures to NOAEL toxicity values (Step 2). In addition, invertebrate and amphibian screenings were completed for SWMU soil contaminants.

Potential exposures and effects resulting from the maximum concentrations of sediment/surface water contaminants were evaluated by estimating potential direct and indirect exposures for wetland species (great blue heron) and comparing exposures to NOAEL toxicity values. Potential impacts to invertebrates were qualitatively evaluated by comparing the maximum detected concentrations to screening benchmarks.

Potential exposures and effects resulting from the maximum concentrations of surface water contaminants were also evaluated by estimating potential direct and indirect exposures for aquatic wildlife (largemouth bass) and comparing exposures to NOAEL toxicity values. Surface water contaminants were additionally evaluated by comparing surface water concentrations to effect level concentrations for amphibians.

Based on Steps 1 and 2, Aroclor-1254 and several metals including aluminum, cadmium, copper, iron, lead, manganese, nickel, selenium, silver, thallium, and zinc were identified as potential soil contaminants of concern at Disposal Pit A/B. Based on Step 3 COC refinement with alternative exposure assumptions, potential soil COCs identified for the ecological receptors at Disposal Pit A/B included: iron, lead, nickel, vanadium, and zinc. All these metals were found to be present within the Seneca background ranges. Therefore, the Army’s risk management position is that no COCs were identified and that no further action is warranted at the Disposal Pit A/B based on the ecological risk assessment.

For the area designated as Disposal Pit C, the results suggest a potential for adverse ecological effects due to the presence of zinc. A further evaluation of the data indicates that the contamination is above background in three distinct areas represented by soil samples from locations TP12-7BA, TP12-7BB, and TP12A-7 for one area, TP12-7AA for another area, and TP12A-4 for the final area. Other samples for zinc in Disposal Pit C are below background and indicate that contamination outside these areas do not have the potential for adverse ecological effects. It should be noted that since the completion of the screening-level ecological risk assessment, the planned future use of SEAD-12 has been changed from conservation/recreation to institutional training. Based on the future use of the SWMU, SEAD-12 is not expected to support, sustain, or attract ecological receptors and therefore is not expected to be a wildlife habitat. The presence of ecological receptors is expected to be generally curtailed in these areas where habitat conditions are poor and human activity levels are sufficiently disruptive to discourage wildlife use. Therefore, it is the Army's position that no further action is warranted at Disposal Pit C to mitigate potential risks to ecological receptors.

For the area designated as former Dry Waste Disposal Pit, Steps 1 and 2 identified several metals as potential soil COCs: aluminum, iron, manganese, nickel, selenium, thallium, vanadium, and zinc. Based on the results of the further refinement of COCs (part of Step 3), no COCs were identified and therefore, no further action is recommended at the former Dry Waste Disposal Pit based on the ecological risk assessment.

The screening-level ERA identified bis(2-ethylhexyl)phthalate, 4-4'-DDD, 4-4'-DDE, 4-4'-DDT, Aroclor-1254, aluminum, chromium, iron, selenium and zinc as potential sediment/surface water COPCs. Based on the results of the screening-level ERA and further COC refinement (part of Step 3 ERA), only aluminum was identified as a potential COC in surface water and sediments at SEAD-12. Since sediment concentrations of aluminum are very similar to background concentrations, the Army's risk management position is that aluminum does not warrant further evaluation for the sediment and surface water. Therefore, no further action is proposed at SEAD-12 for sediment or surface water based on the ecological risk assessment.

1.6 SUMMARY

Nine potential release areas were identified at SEAD-12. After further investigation and analysis, most of the areas of potential release were eliminated due to the compliance with the relevant guidelines and regulations. Baseline human health and ecological risk assessments were completed for three areas (i.e., Disposal Pit A/B, Disposal Pit C, and Former Dry Waste Disposal Pit) as these areas were impacted to the greatest extent by former activities in the WSA. The risk assessments did not reveal any significant levels of risk associated with the identified contaminant release. Therefore, no further action is warranted at SEAD-12 based on the baseline human health and ecological risk assessments.

Test pit investigations at SEAD-12 indicate that Disposal Pit A/B, as well as Disposal Pit C, contain a significant quantity of debris and some of the debris can be characterized as military related components. As a result, the Army is proposing to remove military debris from Disposal Pit A/B and Disposal Pit C.

Based on the findings of the RI, additional investigation was warranted at Buildings 813/814 to investigate a groundwater exceedance of TCE and in the EM-5 area to investigate elevated levels of Pb-210 in soil. The groundwater exceedance of TCE was found to be isolated and soils impacted by TCE in the vicinity of the exceedance were removed. TCE concentrations above the NYSDEC TAGM do exist below the building foundation. As there is no future user designated for this building and the building is uninhabitable in its current condition due to lack of power, water, and sewer, the indoor air quality of these buildings was not assessed. Soil locations having elevated levels of Pb-210 were re-sampled; Pb-210 was not detected in the soil samples and earlier detections were found to be due to high analytical uncertainty.

2.0 REMEDIAL ACTION OBJECTIVES

2.1 INTRODUCTION

The purpose of this section is to develop remedial action objectives (RAOs) and general response actions for each medium of interest identified at SEAD-12. Based on the RAO and the general response actions, potential remedial technologies are identified and screened in **Section 2.0** and **3.0**, and a detailed analysis of remedial action alternatives is provided in **Section 4.0**. This process follows the USEPA and NYSDEC method of identifying and screening technologies/processes and consists of the following six steps:

- Develop RAOs that specify media of interest, chemical constituents of concern, and the results of the Baseline Risk Assessment (**Section 2.0**);
- Develop general response actions for each medium of interest that will satisfy each remedial action objective for the SWMU (**Section 2.0**);
- Estimate quantities of media to which general response actions will be applied to meet RAOs (**Section 2.0**);
- Identify remediation technologies/processes associated with each general response action. Screen and eliminate technologies/processes based on technical implementability (**Section 2.0**);
- Evaluate technologies/processes and retain processes that are representative of each technology (**Section 2.0**); and
- Assemble and further screen the retained technologies/processes into a range of alternatives as appropriate (**Section 3.0** and **4.0**).

2.2 MEDIA OF INTEREST

As discussed in **Section 1**, the RI and SRI conclude that further actions are warranted for the following areas at SEAD-12:

- Disposal Pit A/B,
- Disposal Pit C, and
- Buildings 813/814.

No further action is warranted at Disposal Pit A/B and Disposal Pit C based on the human health and ecological risk assessment results. However, as both disposal pit areas contain military debris, it is in the Army's interest to prevent public access to this debris.

The SRI conducted in the area of Buildings 813/814 concluded that TCE detected in groundwater was localized to MW12-37. TCE concentrations in the remaining surrounding soil were all below the TAGM values with the exception of two soil samples collected beneath the building footers. Since no indoor air investigation was conducted within the buildings, an indoor air quality assessment must be performed prior to occupancy of the buildings. An environmental easement is proposed in the SRI to restrict use of Buildings 813/814, until such investigation is performed. The easement will state that an investigation of vapor intrusion potential and indoor air quality must be performed before the buildings, or any newly constructed building in the area, is occupied. Currently, there is no future user designated for Buildings 813/814 and the building is uninhabitable in its current condition due to lack of power, water, and sewer.

2.3 GENERAL REMEDIAL ACTION OBJECTIVES

The CERCLA cleanup process is a risk-based process. The overall objective of any remedial response is to protect human health and the environment. Protection of human health and the environment is required where the risks from exposure to the chemicals or radiological materials present in the various environmental media exceed established EPA target ranges. RAOs have been developed to meet this overall objective. The objectives are then used as a basis for developing remedial alternatives.

CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, requires that a CERCLA remedial action:

- At minimum, attain federal and more stringent state applicable or relevant and appropriate requirements (ARARs) on completion of the remedial action for on-site remedial actions (unless an ARAR waiver becomes necessary).
- Use remedial alternatives that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances;
- Select remedial actions that protect human health and the environment, are cost effective, and involve permanent solutions, alternative solutions, and resource recovery technologies to the maximum extent possible;
- Avoid off-site transport and disposal of untreated hazardous substances or contaminated materials where practical technologies exist to treat these materials on-site.

The National Contingency Plan (NCP) regulations, which implement CERCLA, generally require ARAR compliance during remedial actions as well as at completion (40 CFR 300.435(b)(2)). However, a "no action" decision does not require compliance with ARARs.

The RAOs for SEAD-12 consist of media specific objectives designed to be protective of human health and the environment. Where applicable, consideration was given to the NCP preference for permanent solutions. The general RAOs for SEAD-12 are as follows:

- Prevent public or other persons from direct contact with military debris or exposure to indoor air that may present a health risk.
- Restore the area to a condition that would comply with the SEDA Local Redevelopment Authority's (LRA) determination that the future use of SEAD-12 would be for institutional training.

The following sections describe how these general RAOs were determined and describe the development of remedial actions to attain these general objectives. RAOs for this SWMU are based upon the current and intended future land use (institutional training) scenarios.

2.4 RISK-BASED REMEDIAL ACTION OBJECTIVES

The results of the BRA presented in the RI report (Parsons, 2002) were evaluated to determine the need for risk-based RAOs for Disposal Pit A/B and Disposal Pit C. As the areas do not pose significant risks to human health or the environment, risk-based remedial action objectives are not warranted for SEAD-12. Below presents a summary of the risk assessment results.

Based on the human health risk assessment, there is no unacceptable risk. The results of the human health risk assessment show initially that only a future resident has the potential to be exposed to chemicals of concern at levels that are above those defined by the EPA. The future resident exhibits non-cancer risks and excess cancer risks above the EPA target risk range due to dermal exposure to benzo(a)pyrene in surface water and groundwater and Aroclor-1242 in surface water and di-n-octylphthalate in groundwater. However, as discussed in **Section 1.5**, these results are considered highly uncertain and probable overestimates of risk. These results are also qualified in the Risk Characterization and Uncertainty sections (Section 6.5) of the RI (Parsons, 2002).

The quantitative ecological risk evaluation identified zinc as a contaminant of concern in the soil for Disposal Pit C. After the completion of the screening-level ecological risk assessment, the planned future use of SEAD-12 has been changed from conservation/recreation to institutional training. Based on the future use of the SWMU, SEAD-12 is not expected to support, sustain, or attract ecological receptors and therefore is not expected to be a wildlife habitat. The presence of ecological receptors is expected to be generally curtailed in these areas where habitat conditions are poor and human activity levels are sufficiently disruptive to discourage wildlife use. Therefore, it is the Army's position that no further action is warranted at Disposal Pit C to mitigate potential risks to ecological receptors.

Risk assessment was not performed to evaluate potential risks via indoor air exposure pathway at Buildings 813/814. Currently, there is no future user designated for Buildings 813/814 and the building is uninhabitable in its current condition due to lack of power, water, and sewer. An environmental easement is proposed to restrict use of Buildings 813/814, until an investigation of vapor intrusion potential and indoor air quality is performed.

In summary, the risk-based RAOs for SEAD-12 are to reduce any non-cancer and excess cancer risks to the levels protective of human health and the environment. As there are no significant risks expected for human or ecological receptors at SEAD-12, risk-based remedial action objectives are not warranted.

2.5 ARAR - BASED REMEDIAL ACTION OBJECTIVES

The investigation and remediation of SEAD-12 is subject to pertinent requirements of both federal environmental statutes or regulations (generally administered by EPA Region II for SEDA) and the State of New York environmental statutes and regulations (generally administered by the NYSDEC), determined in accordance with the CERCLA ARAR process. ARARs are promulgated standards that may be applicable to the site cleanup process after a remedial action has been selected for implementation.

Any standard, requirement, criterion, or limitation under any federal environmental or state environmental or facility siting law may be either applicable or relevant and appropriate to a specific action. The only state laws that may become ARARs are those promulgated such that they are legally enforceable and generally applicable and equivalent to or more stringent than federal laws. A determination of applicability is made for the requirements as a whole, whereas a determination of relevance and appropriateness may be made for only specific portions of a requirement. An action must comply with relevant and appropriate requirements to the same extent as an applicable requirement with regard to substantive conditions, but need not comply with the administrative conditions of the requirement.

Three categories of potentially applicable state and federal requirements were reviewed: (1) chemical-specific, (2) location-specific, and (3) action-specific. Chemical-specific ARARs address certain contaminants or class of contaminants and relate to the level of contamination allowed for a specific pollutant in various environmental media. Location-specific ARARs are based on the specific setting and nature of the site. Action-specific ARARs relate to specific actions proposed for implementation at a site. Both location-specific and action-specific ARARs are independent of the media. In addition to ARARs, advisories, criteria, or guidance may be evaluated as "To Be Considered" (TBC) regulatory items. The NCP provides that the TBC category may include advisories, criteria, or guidance that were developed by EPA, other federal agencies, or states that may be useful in devising CERCLA remedies. These advisories, criteria, and guidance are not promulgated and, therefore, are not legally enforceable standards such as ARARs.

2.5.1 Potential Chemical-Specific ARARs and TBCs

Chemical-specific ARARs are usually health-based or risk-based numerical values or methodologies, established by promulgated standards, that are required to be used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment. Chemical-specific ARARs may also include designated EPA, NRC, or Department of Energy (DOE) ARARs for radioactive waste.

Chemical-specific TBCs, such as NYSDEC TAGM values, can serve to indicate contaminant levels that may merit concern.

Potential federal and state chemical-specific ARARs and TBCs considered in connection with the RI at SEAD-12 are described in the following sections below.

2.5.1.1 Soil

Cleanup levels for hazardous constituents in soil have been proposed by the State of New York through TAGM under #HWR-94-4046. The soil concentrations provided in the TAGM 4046 are not promulgated standards and therefore are not ARARs but were used as TBC guidelines for the RI at SEAD-12. Surface and subsurface soil chemical exceedances of NYSDEC TAGMs, which were used as TBCs during the RI are summarized in **Table 1-1** and **Table 1-2** and discussed in **Section 1.3.1**.

Since completion of the RI and SRI, the New York State Environmental Board approved 6 NYCRR Subparts 375-1 through 375-4 and Subpart 375-6 under 6 NYCRR Part 375 - Environmental Remediation Programs (October 25, 2006). 6 NYCRR Subpart 375-6 includes the soil cleanup objective tables developed for unrestricted use and restricted use scenarios. The soil cleanup objectives in 6 NYCRR Subpart 375-6 did not exist while the previous investigations were conducted but are evaluated in this FS in the process of developing remedial action objectives for SEAD-12. These NYSDEC Soil Cleanup Objectives for unrestricted use are considered as TBCs for the SEAD-12 FS.

Surface and subsurface soil chemical exceedances of the soil cleanup objectives for unrestricted use presented in 6 NYCRR Subpart 375-6 are summarized in **Table 2-1** for Disposal Pit A/B and Disposal Pit C. As shown in the table, the soil results at Disposal Pit A/B and Disposal Pit C are all below the cleanup objectives for unrestricted use with a few exceptions. Those analytes with one or more detections exceeding the cleanup objectives are shown in **Table 2-2**. Most analytes have average concentrations below the cleanup objectives. Exceptions to this are as follows: 4,4'-DDT in surface soil at Disposal Pit A/B; 4,4'-DDE, Aroclor-1254, cadmium, and nickel in subsurface soil at Disposal Pit A/B; and zinc in subsurface soil at Disposal Pit C. These analytes have averages slightly above the cleanup objectives for unrestricted use scenario (within three times). 4,4'-DDT, 4,4'-DDE, and Aroclor-1254 exceedances in soil at Disposal Pit A/B were detected with low frequency (i.e., 4, 1, and 6 out of 43 total soil samples). The average nickel concentration in subsurface soil (35.1 mg/Kg) at Disposal Pit A/B is close to the average Seneca soil background value (31 mg/Kg) and less than the maximum background concentration (62.3 mg/kg). The average zinc concentration in subsurface soil at Disposal Pit C is within 15% of the average Seneca background value (88 mg/Kg vs. 72 mg/Kg). Average concentrations for all analytes are below the cleanup objectives for restricted industrial or commercial use scenarios. Therefore, it is concluded that soil conditions at SEAD-12 are in general consistent with the unrestricted use requirements presented in 6 NYCRR Subpart 375-6.

No radiological contamination was identified in soils at SEAD-12 at levels exceeding background. Therefore, consideration of any potential EPA, NRC, or DOE radioactive waste ARARs is unnecessary.

2.5.1.2 Groundwater

Groundwater at SEAD-12 is classified by NYSDEC as Class GA. As a result, the groundwater quality standards for a Class GA groundwater are potential ARARs for this SWMU.

A summary of groundwater exceedances based on the RI is presented in **Table 1-3** and summarized in **Section 1.3.2**. In summary, the most significant groundwater exceedance is TCE, which was detected at 1,600 µg/L and 2,400 µg/L, respectively during the RI and the SRI in monitoring well MW12-37 near Building 813. The SRI further demonstrated that TCE at MW12-37 was isolated and soils impacted by TCE in the surrounding area were excavated. TCE in groundwater is no longer considered to be of concern in this area.

There were no groundwater exceedances for pesticides/PCBs. SVOC exceedances are limited to two relatively low exceedances of bis(2-ethylhexyl)phthalate. Groundwater metal exceedances include antimony, iron, manganese, and sodium. The iron, manganese, and sodium exceedances are spread across the SWMU and often vary with the season. The antimony standard was only exceeded during the December 1999 round of sampling. The maximum detected concentrations of antimony and iron (43.2 µg/L and 20,700 µg/L, respectively) were below the maximum detected SEDA background concentrations (52.7 µg/L and 63400 µg/L, respectively). The average manganese concentration detected during the RI was below the average background concentration (209 µg/L vs. 224 µg/L). The average sodium concentration detected during the RI (30,126 µg/L) was slightly above two times of the average background concentration while the average sodium concentration detected during the ESI was below the average background concentration (10,400 µg/L vs. 14,600 µg/L).

Although ARAR exceedances exist in SEAD-12 groundwater for several metals and bis(2-ethylhexyl)phthalate, groundwater at SEAD-12 does not pose significant risks to either human health or the environment. As a result, chemical-specific ARARs need not to be designated for groundwater.

2.5.1.3 Surface Water

Surface water flows through an unnamed creek that begins in the area of the southeastern corner of SEAD-12 and flows northerly along the eastern edge of SEAD-12 before it turns to a more westerly path just south of Disposal Pit A/B. From this point it transects SEAD-12 and flows into Reeder Creek at a point that is south of SEAD-21, Sewage Treatment Plant No. 715. Surface water at SEAD-12 is also found in man-made drainage ditches that are tributaries to both the unnamed creek and Reeder Creek. The surface water in the ditches is not classified by NYSDEC because they are intermittent and not recognized as an established stream or creek. However, because the drainage ditches and the unnamed creek form the headwaters for Reeder Creek, the lower portion of which is designated as Class C surface water by NYSDEC, the Class C standards were used to provide a basis of comparison for the on-site chemical data. The Class C standards are not strictly applicable to all of the surface water found at SEAD-12.

A summary of surface water exceedances based on the RI is presented in **Table 1-3** and summarized in **Section 1.3.3**. One SVOC (bis(2-ethylhexyl)phthalate), several pesticides, and seven metals were found at concentrations above the respective NYSDEC AWQS for Class C surface water in the surface water samples. Although AWQS exceedances exist in SEAD-12 surface water, surface water at SEAD-12 does not pose significant risks to either human health or the environment. As a result, chemical-specific ARARs need not to be designated for SEAD-12 surface water.

2.5.1.4 Sediment

Sediment results were compared to the most conservative New York State guidelines for sediment including: NYS LEL, NYS HHB, NYS BALAT and NYS BALCT, and NYS WB. Sediment criteria are not ARARs but rather are TBCs because they are not promulgated standards.

A summary of sediment exceedances based on the RI is presented in **Table 1-3** and summarized in **Section 1.3.4**. Exceedances occur for SVOCs (e.g., benzo(a)pyrene), pesticides/PCBs (e.g., Aroclor-1254), and metals (e.g., cadmium, copper, manganese, mercury, and zinc). Sediment at SEAD-12 does not pose significant risks to either human health or the environment; therefore, chemical-specific ARARs need not to be designated for SEAD-12 sediment.

2.5.1.5 Radiological Impact

NYSDEC TAGM 4003 recommends a maximum dose limit of 10 mrem/yr above background to the general public for free release of a site following the cleanup of radioactively contaminated material. Based on the RI data, no significant presence of radiological elements were detected in the soil, surface water, sediment, or groundwater at SEAD-12. Therefore, radiological specific ARARs need not to be designated for SEAD-12. However, if radiological sources were encountered during a remedial action, NYSDEC TAGM 4003 would be applicable.

2.5.1.6 Summary of Chemical-Specific ARARs

ARARs were identified for SEAD-12 groundwater and TBCs were identified for SEAD-12 soil, sediment, and surface water. The ARARs and TBCs were used in the RI and FS to evaluate the SEAD-12 conditions. Although exceedances of ARARs and TBCs were observed at all the media, these media do not pose any significant risks to human health or the environment. No COCs were identified based on the baseline risk assessment performed for SEAD-12. As a result, chemical specific ARARs need not to be designated for SEAD-12.

2.5.2 Potential Location-Specific ARARs

Location-specific ARARs may serve to limit contaminant concentrations, or even to restrict or to require some forms of remedial action in environmentally or historically sensitive areas at a site, such as natural features (including wetlands, flood-plains, and sensitive ecosystems) and manmade features (including landfills, disposal areas, and places of historic or archaeological significance). These ARARs generally restrict the concentration of hazardous substances or the conduct of activities based solely on the particular characteristics or location of the site.

Potential federal and state location-specific ARARs considered in connection with this response action include the following:

<u>Federal:</u>

- Executive Orders 11593, Floodplain Management (May 24, 1977), and 11990, Protection of Wetlands (May 24, 1977).

- National Historic Preservation Act (16 USC 470) Section 106 and 110(f) and the associated regulations (i.e. 36 CFR part 800) (requires federal agencies to identify all affected properties on or eligible for the National Register of Historic Places and consult with the State Historic Preservation Office and Advisory Council on Historic Presentation)
- Resource Conservation and Recovery Act (RCRA) Location Requirements and 100-year Floodplains (40 CFR 264.18(b)).
- Clean Water Act (CWA), Section 404, and Rivers and Harbor Act, Section 10 (requirements for Dredge and Fill Activities) and the associated regulations (i.e. 40 CFR part 230).
- Wetlands Construction and Management Procedures (40 CFR part 6, Appendix A).

New York State:

- New York State Freshwater Wetlands Law (New York Environmental Conservation Law (ECL) articles 24 and 71).
- New York State Freshwater Wetlands Permit and Classification Requirements (6 NYCRR 663 and 664).
- New York State Floodplain Management Act, ECL, article 36, and Floodplain Management regulations (6 NYCRR part 500).
- Endangered and Threatened Species of Fish and Wildlife, Species of Special Concern Requirements (6 NYCRR part 182).
- New York State Flood Hazard Area Construction Standards.

Based on SEAD-12 conditions and the land use determination, further consideration of these location-specific ARARs does not appear warranted at this time.

2.5.3 Action-Specific ARARs

Action-specific ARARs are usually technology or activity-based requirements or limitations that control actions involving specific substances. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the development of all response action alternatives. The precise action-specific ARARs to be used for SEAD-12 will be subsequently determined by the Army based upon the technology chosen.

Potential federal and state action specific ARARs considered in connection with this response action include the following:

Federal:

- RCRA Subtitle C Hazardous Waste Treatment Facility Design and Operating Standards for Treatment and Disposal systems, (i.e., landfill, incinerators, tanks, containers, etc.) (40 CFR parts 264 and 265); RCRA section 3004(o), 42 USC 6924(o) (RCRA statutory minimum technology requirements.)

- RCRA, Subtitle C, Closure and Post-Closure Standards (40 CFR 264, Subpart G).
- RCRA Groundwater Monitoring and Protection Standards (40 CFR, Subpart F).
- RCRA Generator Requirements for Manifesting Waste for Off-site Disposal (40 CFR part 262, subpart B).
- RCRA Transporter Requirements for Off-Site Disposal (40 CFR part 263).
- RCRA, Subtitle D, Non-Hazardous Waste Management Standards (40 CFR part 257).
- Safe Drinking Water Act, Underground Injection Control Requirements (40 CFR parts 144 and 146).
- RCRA Land Disposal Restrictions (40 CFR part 268) (on and off-site disposal of excavated soil).
- CWA--NPDES Permitting Requirements for Discharge of Treatment System Effluent (40 CFR parts 122-125).
- CWA--Effluent Guidelines for Organic Chemicals, Plastics and Synthetic Fibers (discharge limits) (40 CFR part 414).
- CWA--Discharge to Public Owned Treatment Work (POTW)—general Pretreatment regulations (40 CFR part 403).
- Department of Transportation (DOT) Rules for Hazardous Materials Transport (49 CFR part 107, and 171.1-171.500).
- Occupational Safety and Health Act (OSHA) Standards for Hazardous Waste Operations and Emergency Response, 29 CFR 1910.120, and procedures for General Construction Activities (29 CFR parts 1910 and 1926).
- RCRA Air Emission Standards for Process Vents, Equipment Leaks, and Tanks, Surface Impoundments, and Containers (40 CFR subparts AA, BB, and CC.)

New York State:

- New York State Pollution Discharge Elimination System (SPDES) Permit Requirements (Standards for Stormwater Runoff, Surface Water, and Groundwater Discharges (6 NYCRR 750-757).
- New York State RCRA Hazardous Management Standards for Hazardous Waste Treatment Facilities (*i.e.*, landfills, incinerators, tanks, containers, etc.) and Minimum Technology Requirements (6 NYCRR 370-373).
- New York State Solid Waste Management and Siting Restrictions (6 NYCRR 360-361).
- New York State RCRA Generator and Transporter Requirements for Manifesting Waste for Off-Site Disposal (6 NYCRR 364 and 372).

Based on SEAD-12 conditions and the land use determination, further consideration of these action-specific ARARs does not appear warranted at this time.

2.6 SITE-SPECIFIC CLEANUP GOALS

Remedial action at SEAD-12 is guided by the cleanup goal of removing all military related debris, and the maximum dose limit of 10 mrem/yr above background according to NYSDEC TAGM 4003 value. These cleanup goals will have the effect of protecting human health and the environment, complying with ARARs, and meeting all other RAOs.

2.6.1 Groundwater Cleanup Goals

No further action is proposed for groundwater at SEAD-12 based on the following:

- Groundwater at SEAD-12 does not pose significant risk to potential receptors at SEAD-12 based on the planned future use of the SWMU.
- The SRI demonstrated that the TCE contamination detected at MW12-27 was isolated. Further, soil in the area with elevated TCE concentrations (i.e., above TAGM value) was excavated to the extent possible during the SRI. The SRI recommends no further action for groundwater.

As no further action is proposed for groundwater at SEAD-12, no cleanup goals need to be designated at this time.

2.6.2 Soil Cleanup Goals

Soil cleanup goals are not warranted and the rationale is presented below:

- Based on the RI, no significant risks to human health or the environment are expected at the three areas impacted to the greatest extent by former activities in the WSA - Former Dry Waste Disposal Pit area, Disposal Pit A/B, and Disposal Pit C.
- The purpose of the remedial action at Disposal Pit A/B and Disposal Pit C is solely to prevent access to military debris (the contents of the test pits in Disposal Pit A/B and Disposal Pit C are shown in **Table 2-3**).
- A comparison with the soil cleanup objectives presented under 6 NYCRR Subpart 375-6 indicates that soil conditions at Disposal Pit A/B and Disposal Pit C are consistent with the restricted industrial/commercial use requirements presented in 6 NYCRR Subpart 375-6. With a few exceptions, the average concentrations of all chemicals in these two areas are consistent with the unrestricted use requirements presented in 6 NYCRR Subpart 375-6. The few chemicals with exceedances all have average concentrations within three times of the soil cleanup objectives for unrestricted use under 6 NYCRR Subpart 375-6.
- TCE contaminated soil in the vicinity of Buildings 813/814 was excavated to the extent possible during the SRI. An environmental easement is proposed to require testing of indoor air prior to occupancy of these buildings or any new buildings in the vicinity.

Based on the above facts, it is the Army's position that the cleanup goal for soil is to remove military-related debris at Disposal Pit A/B and Disposal Pit C. No chemical-specific cleanup goals are warranted at this time.

2.6.3 Radiological Goals

There were no radiological exceedances at SEAD-12. However, due to presence of military debris and the nature of work conducted with SEAD-12, precautions will be taken when dealing with excavated soil and debris. Excavated soil and debris will be scanned for radiological contamination, with the goal of ensuring that residual radioactivity levels remain below background. If radiological level is detected above background, isotope-specific DCGLs will be derived during the remedial process such that soil remaining at the SWMU does not exceed the 10 mrem/year above background criteria, which is established under NYSDEC TAGM 4003. The process described in MARSSIM will be used to develop the DCGLs for the worker scenario. First, activity concentrations over time equivalent to 10 mreme/yr exposure plus background will be calculated for each specified radionuclide of concern. These values will then be divided by a safety factor of 10 to account for uncertainty associated with potential cumulative effects from multiple radionuclides.

Radiological screening activities will consist of scanning and segregating potentially elevated materials; the screening will be done in layers that are no deeper than the screening instrument can efficiently detect. Preliminary screening flag values will be based on background measurements and a gross activity DCGL. If necessary, potentially elevated materials will be further screened on-site using gamma spectroscopy or at an off-site analytical laboratory.

Pursuant to the preceding ARAR analysis, further consideration of any additional chemical-specific, location-specific, or action-specific radiological ARARs does not appear to be warranted.

2.7 REMEDIATION VOLUME ESTIMATES

The RAOs for SEAD-12 are to achieve acceptable human health and environmental risk levels for the intended land use (institutional training) and compliance with ARARs. The BRA concluded that the risks to human health and the environment are acceptable for the intended land use.

The purpose of the remedial action is to remove debris with a potentially adverse effect (specifically military components) from the SWMU. Test pit results indicate that Disposal Pit A/B, as well as Disposal Pit C, contain a significant quantity of debris. The majority of the debris is construction related; however, some of the debris can be characterized as military related components. **Table 2-3** shows the contents of the test pits in the disposal areas. The boundaries of the areas to be remediated were determined by including test pits that contained debris and by including area that contains EM anomalies based on the EM survey. The EM data map is presented in **Figure 2-1**.

According to the results of test pit logs for Disposal Pit A/B, debris was found in all of the test pits in the area: TP12A-1, TP12-1, and TP12-2, as shown in **Figure 2-2**. A significant portion of this debris consists of military components, and, consequently, should be removed. **Figure 2-3** shows the boundary of the area surrounding Disposal Pit A/B that will be remediated. This area includes the test pits and is defined by the electromagnetic survey results. It covers a surface area of 23,828 square feet with an average depth of 5.3 feet. The affected volume is approximately 4,677 cubic yards, and the volume of debris is 1,216 cubic yards. The southern most portion of Disposal Pit A/B (which is shaded gray in **Figure 2-2** but is not within the area to be excavated as indicated by the black line) does not require remediation since contaminants and debris were absent from the area, and no EM anomalies were detected.

Disposal Pit C contains fourteen test pits within this area, shown in **Figure 2-4**. Military components were only found in five of the test pits. Based on the locations of the military debris, two regions were highlighted for remedial action. The first area in the northern part of the disposal pit includes TP12-8, TP12A-7, TP12-7B, TP12A-6, TP12-7A, TP12A-5, TP12-5, and TP12-23. The second area includes TP12A-4, TP12-3 (North and South), TP12-4, and TP12A-3. The electromagnetic survey map, **Figure 2-5**, shows that EM anomalies overlap with the locations of the military debris. Combining the locations of the military debris and the EM anomalies, the area to be remediated is presented in **Figure 2-5**. Area 1 in the northern part of Disposal Pit C covers 11,332 square feet and is 2,015 cubic yards. In the southern portion of the disposal pit, Area 2 covers 23,071 square feet and has a volume of 4,102 cubic yards. The combined surface area of these two areas is 34,403 square feet and the average depth is 4.8 ft. The total volume affected in Disposal Pit C is approximately 6,117 cubic yards, and the volume of debris to be removed is approximately 983 cubic yards.

Table 2-4 summarizes the dimensions of soil and debris to be remediated in Disposal Pit A/B and in Disposal Pit C.

2.8 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.8.1 Identification of Technologies

Remedial action technologies and processes were identified for consideration as possible remedial options at SEAD-12. The list of technologies and processes presented was developed from several sources:

- Standard engineering handbooks;
- Vendor information;
- Best engineering estimates;
- EPA references:
  - Handbook on In Situ Treatment of Hazardous Waste - Contaminated Soils (EPA 1990),
  - The Superfund Innovative Technology Evaluation Program (EPA 1992), and
  - Vendor Information System for Innovative Treatment Technologies (EPA 1993).

2.8.2 Screening of Technologies

Table 2-5 shows the remedial action processes arranged according to categories for general response actions for soil/debris at SEAD-12 and provides the basis for screening out of the various technologies/processes. This table indicates which technologies/processes were retained for further evaluation in **Section 3.0**.

Screening criteria included: technical feasibility, effectiveness, and its ability to meet the RAOs and its suitability considering SEAD-12 conditions. Processes that are shaded were screened out for the reasons described under "screening comments." Only those technologies retained for further consideration are described below.

The following remedial technologies and processes were retained for further evaluation and use in the development of soil/debris remedial alternatives:

- No Action;
- Land Use Controls (LUCs);
- Capping and Containment;
- Excavation: earthmoving/excavation;
- Ex-situ treatment: physical separation;and
- Solids handling: RCRA Subtitle C and Subtitle D landfills.

No Action

The No Action response may be appropriate for sites where natural environmental mechanisms will result in degradation or immobilization of the constituents of concern or where the human health and environmental risks are acceptable. Although this remedial action will not meet the RAOs for preventing access to military debris and requiring indoor air testing at Buildings 813/814 prior to building occupancy, it provides the baseline against which other responses can be compared.

LUCs

LUCs that have been considered include:

- Access controls, such as fencing; and
- Land use restrictions (e.g., environmental easements).

LUCs are only applicable to the receptor and do not involve reductions in the volume, toxicity or control of wastes at the SWMU. Physical barriers that restrict access to the SWMU are feasible and effective in preventing humans from becoming exposed to on-site impacts. Since there are potential risks for human exposure to on-site media (e.g., exposure to indoor air that may potentially be impacted by TCE in soil underneath Buildings 813/814), access controls and land use restrictions have been retained but incorporated for use with other responses.

Based on the results of the SRI, an environmental easement to restrict occupancy of Buildings 813/814 was agreed upon by EPA, NYSDEC, and the Army. Elevated TCE concentrations (i.e., above TAGM values) were detected at the footers of Building 813. Because of this both EPA and NYSDEC were concerned about the quality of indoor air within the buildings. Since there are no utilities running to the building and no re-user has been identified for the building, an indoor air survey was not warranted. However, NYSDEC in its comments dated July 24, 2006 on the SRI report recommended an environmental easement to place a restriction on Building 813/814. The

Army agreed and proposed an environmental easement stating that an investigation of vapor intrusion potential and indoor air quality must be performed before Buildings 813/814, or any newly constructed building, is occupied. It will be the responsibility of the future owner to perform such testing and implement any required mitigation prior to use.

According to 6 NYCRR Subpart 375-1.2, an environmental easement "means an interest in real property, created under and subject to the provisions of ECL article 71, title 36 which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls; provided that no such easement shall be acquired or held by the State which is subject to the provisions of article fourteen of the constitution of the State of New York". NYSDEC Regulations 6 NYCRR Subpart 375-1.8 (h)(2)(i) states that

"Any institutional controls, engineering controls, use restrictions and/or any site management requirements applicable to the remedial site will be contained in an environmental easement, which shall be:

(a) created and recorded pursuant to ECL article 71, title 36;

(b) in a form and manner as prescribed by the Commissioner;

(c) in compliance with GOL 5-703(1) and ECL 71-3605(2); and

(d) recordable pursuant to RPL 291."

The environmental easement for SEAD-12 will be implemented in accordance with the NYSDEC regulations and will state that an investigation of vapor intrusion potential and indoor air quality must be performed before this building, or any newly constructed building in the area, is occupied

2.8.3 Capping and Containment

Capping involves placing a barrier over the impacted soils to prevent contact (i.e. exposure to soils via direct contact and dust) with human and ecological receptors, and surface water runoff. A soil cap and an impermeable cap were considered in the evaluation.

A soil cap involves placing a layer of soil over the affected areas. The cap would be of sufficient depth and quality to reduce infiltration and promote grass cover. The cap would control the exposure from inhalation of soil dust, prevent runoff of impacted particles and prevent exposure to humans and ecological receptors due to ingestion of soil. Therefore, a soil cap would be effective in reducing the risk to acceptable levels and therefore has been retained for further consideration.

Impermeable caps typically have permeabilities less than 1×10^{-7} cm/sec and substantially reduce the amount of water infiltration to the underlying soils. An impermeable material includes clay, geomembrane (such as High Density Polyethylene [HDPE]), geocomposite clay liner (GCL), and bentonite admixture. Impermeable caps typically include a drainage and a vegetative layer. Impermeable caps would be effective in reducing the exposure to military debris and therefore has been retained for further consideration.

2.8.4 Excavation: Earthmoving/Excavation

Removal of soils/debris can be accomplished using standard mechanical technologies or slurry methods. Heavy equipment such as backhoes, excavators, front-end loaders, scrapers, bulldozers, and draglines are commonly used for the mechanical excavation of soils. Because the soil/debris at SEAD-12 are readily accessible and can be easily removed using standard mechanical excavation techniques, this technology was retained for further consideration. Excavation would remove designated volumes of military debris and associated soil for disposal.

2.8.5 Ex-Situ Treatment: Physical Separation

Physical separation of military debris from soil will be achieved using standard construction equipment. After the separation, the military debris will be disposed off-site and soil will be backfilled to the excavated areas.

2.8.6 Solids Handling: RCRA Subtitle C and Subtitle D Landfills

Off-site disposal involves removal of material, consolidation into containers, and transportation off-site. All excavated areas will be backfilled with clean imported fill or excavated uncontaminated soil. This technology decreases continued on-site exposure by receptors. Off-site disposal is preferable when on-site disposal is precluded or limited by site characteristics, when unimpaired future use of the site is a high priority, and when the volume for disposal is too small to warrant construction of a landfill. The following two options were considered for off-site disposal:

1. State-permitted RCRA hazardous waste landfill; and
2. State-permitted solid waste landfill.

A permitted, off-site RCRA Subtitle C facility with the capacity and capability to handle the disposal material must be identified. Due to the RCRA Land Ban Restrictions (LBR), waste, if hazardous, will need to be treated prior to disposal in the facility. If the waste is a listed waste then the treated waste will still be required to be disposed of in a Subtitle C facility. However, if the soil is treated and is shown to be below the limits for toxicity as defined by the Toxicity Characteristics Leaching Procedure (TCLP) test, then it is no longer hazardous and does not need to be disposed of in a Subtitle C facility. Instead, it can be disposed of in a Subtitle D Landfill.

Off-site disposal of waste and soils from contaminated areas is a feasible option. Soils and debris that may be characteristic by toxicity would need to be treated to remove the characteristic prior to disposal in an off-site landfill. Disposal to both Subtitle C and Subtitle D landfills have been retained for inclusion with other technologies as remedial alternatives at this stage.

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

3.1 INTRODUCTION

This section summarizes the remedial action alternatives that were developed from the technologies screened in **Section 2.0**. Prior to the development of alternatives, an evaluation of general response actions and a technology screening was performed for inclusion into proposed remedial action alternatives for SEAD-12. Technologies were combined into alternatives considering potential waste-limiting and site-limiting factors unique to SEAD-12 and the level of technical development for each technology. This information was used to differentiate alternatives with respect to effectiveness and implementability.

3.2 ASSEMBLY OF ALTERNATIVES

The following general response actions were retained for SEAD-12:

- No-action;
- Excavation, off-site disposal, and an environmental easement; and
- On-site capping and containment and an environmental easement.

Technologies and processes associated with these actions were assembled into remedial action alternatives and are presented in **Table 3-1**.

3.3 DESCRIPTION OF ALTERNATIVES

3.3.1 Alternative 1, No-Action Alternative

Alternative 1 is the No-Action Alternative. CERCLA and NYSDEC guidance for conducting feasibility studies recommends that the no-action alternative be considered against all other alternatives.

The no-action response would leave the disposal pits undisturbed with continuation of existing site security measures, to prevent civilian access and direct contact with debris. In addition, Buildings 813/814 would remain accessible without prior indoor air testing.

3.3.2 Alternative 2, Excavation/Disposal in Off-Site Landfill/Environmental Easement

Alternative 2 involves either complete or partial excavation of the disposal areas and disposal in an off-site landfill. The rationale for this excavation alternative is that it is effective for achieving remedial action objectives, is readily implementable, and will be cost effective for managing the remaining military debris at SEAD-12. Off-site disposal at a Subtitle D landfill eliminates human access to the debris. Military items present could be potentially classified or sensitive and would need to be examined by appropriate military personnel for evaluation and declassification. Excavation, hauling, and disposal involve a combination of technologies that are readily available, proven, and effective at eliminating the debris from the area. Alternative 2 would remove and control the military items buried at the SWMU.

In addition, an environmental easement will be included in this alternative to place a restriction on Buildings 813/814. The easement will state that an investigation of vapor intrusion potential and indoor air quality must be performed before the buildings, or any newly constructed building in the vicinity, is occupied.

3.3.3 Alternative 3, Capping/Containment/Environmental Easement

Alternative 3 consists of the placement of a soil cap over the disposal areas. The soil cap would consist of the following:

- Six inches topsoil;
- Six inches common fill; and
- Filter fabric (*i.e.* separation layer).

Re-grading of the SWMU and the use of institutional controls (such as a permanent fence) will be required for this alternative.

The intent of this alternative is to isolate the debris from any receptors. This alternative would place limitations on the future land use. Long-term groundwater monitoring and operation and maintenance (O & M) would be required.

In addition, an environmental easement will be included in this alternative to place a restriction on Buildings 813/814. The easement will state that an investigation of vapor intrusion potential and indoor air quality must be performed before the buildings, or any newly constructed building in the vicinity, is occupied.

3.4 SCREENING CRITERIA

The alternatives assembled above were screened for short-term and long-term effectiveness and implementability. This screening process is used to select the most favorable alternatives for a detailed analysis. Although this is a qualitative screening, care has been taken to ensure that screening criteria are applied consistently to each alternative and that comparisons have been made on an equal basis, at approximately the same level of detail.

3.4.1 Effectiveness

A key aspect of the screening evaluation is the effectiveness of each alternative in protecting human health and the environment. This screening criterion includes the evaluation of each alternative for its relative protectiveness and reductions in toxicity and mobility. The following items are evaluated:

- Short-term human health and environmental protectiveness: Rating the potential for the remedial action to affect human health and the environment during remedial action. Both on- and off-site exposures are considered under this criterion. Exposure routes include inhalation, ingestion, and dermal absorption.
- Long-term human health and environmental protectiveness: Rating the effectiveness of the remedial action to alleviate adverse human health and environmental effects after the remedial action is complete. The ability of an alternative to minimize future exposures is considered under this criterion.

- Reduction of mobility, toxicity, or volume of waste: Rating of effectiveness in changing one or more characteristics of the medium by treatment to decrease risks associated with chemical constituents present.
- Permanence: Rating of the adequacy and suitability of controls, if any, that are used to manage treatment residuals or untreated wastes that remain at the site. Factors considered are the adequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, and the potential exposure pathways and risks posed should the remedial action need replacement.

3.4.2 Implementability

Implementability is a measure of both the technical and administrative feasibility of constructing and operating a remedial action alternative. The following items are evaluated:

- Technical feasibility: Rating of the ability to construct, reliably operate, and meet technology-specific regulations for process options until a remedial action is complete. That also includes monitoring of the alternative, if required, after the remedial action is complete.
- Administrative feasibility: Rating of the ability to obtain approvals from regulatory agencies and the Army; the availability of treatment, storage, and disposal services; and the requirements for, and availability of, specific equipment and technical specialists.
- Availability of services and materials: Rating of the availability of the materials and services required to implement an alternative. The following factors were taken into account for the screening: the availability of adequate offsite treatment, storage capacity, and disposal services; availability of personnel and technology; availability of prospective technologies; and availability of services and materials required to implement the technology.

3.4.3 Numeric Rating System

Alternatives were assigned a ranking from one (1) to six (6) for each screening criterion. A score of 1 represents the least favorable alternative and a 6 represents the most favorable alternative. The total score for all criterions served as the basis for the screening of all alternatives. The assigned rankings were based on professional engineering judgment, available technical information, and the inherent characteristics of each of the alternatives. The individual criterion values were summed for each alternative and the total score was then used as the basis for retaining alternatives for a detailed analysis.

3.5 ALTERNATIVES SCREENING

Table 3-2 summarize the assigned rankings for each of the alternatives considered. Screening was conducted by considering each alternative independently. The first step was to review each alternative and identify the alternatives that are considered the most and least favorable. The values were applied consistently to each alternative on a column-by-column basis. Other alternatives were then assigned values based on their relative ranking. The following subsections present the rationale used to assign values to each alternative.

3.5.1 Effectiveness

3.5.1.1 Short-Term Human Health and Environmental Protectiveness

Since risks for receptors under current and intended future land uses do not exceed EPA target risk criteria, the no-action alternative (Alternative 1) is considered the most protective of human health in the short term and was assigned a ranking of 6. Restricted access to the site would limit the potential for exposures to receptors from dermal contact, ingestion of soil, and the hazards associated with construction activities..

Alternative 2 involves excavation of soil/debris. Excavation would lower short-term worker protectiveness relative to no-action, even with use of dust controls and personal protection equipment, due to the increase in concentrations of airborne particulates for soils.

Alternatives 3 (capping/containment/easement) was given a higher ranking than Alternative 2 for these criteria because it does not expose the contaminated soils/debris to the atmosphere and therefore would not create airborne particulates. The soils would be capped in place and would prevent erosion and further exposure to airborne particulates. Some disturbance and potential release of surface soils may occur during the process of installing the cap.

3.5.1.2 Long-Term Human Health and Environmental Protectiveness

Alternative 1 (no-action) was given the lowest overall ranking in this category because it does not provide any active treatment or monitoring of contaminants or debris in soils. Likewise, access to Buildings 813/814 would not be prevented prior to indoor air testing.

Alternative 2 (excavation/off-site disposal/easement) was given the highest overall ranking in this category because it effectively removes military debris in soil, and provides pretreatment and disposal in a regulated landfill. In addition, the environmental easement would prevent access to Buildings 813/814 without indoor air testing.

Alternative 3 (capping/containment/easement) scored lower than Alternative 2 because it relies on a physical barrier to prevent potential exposures and further migration of contaminants to other media. The integrity of this barrier (cap) must be monitored and maintained to ensure its effectiveness. In addition, the environmental easement would prevent access to Buildings 813/814 without indoor air testing.

3.5.1.3 Reduction of Toxicity

All three alternatives were assigned a low score of 1 for this category because none of these remedial action alternatives would actually reduce the toxicity that may be associated with military debris. Likewise, an environmental easement would not reduce any potential toxicity present in the indoor air at Buildings 813/814.

3.5.1.4 Reduction of Mobility

The no-action alternative (Alternative 1) was ranked the lowest in this category because this alternative would not reduce the mobility of the military debris in soils.

The excavation/off-site disposal/easement alternative (Alternative 2) was ranked the highest overall in this category because it would remove the military debris and place it in a disposal facility designed for its containment. Any potential hazards associated with the debris, would be adequately contained and therefore the mobility of such hazards would be further decreased.

Capping in place using a soil cover with geotextiles (Alternative 3) would decrease the mobility to some degree by limiting the infiltration of precipitation and surface runoff to underlying soils. However, the permeability of this type of cover is not on the order of a RCRA type cap (10^{-7} cm/sec) and some infiltration would take place during heavier storm events. Consequently, this alternative was ranked lower than the excavation alternative.

3.5.1.5 Reduction of Volume

Both the no-action alternative (Alternative 1) and the capping/containment/easement alternative (Alternative 3) were assigned the lowest ranking for reductions of volume. Excavation/off-site disposal/easement (Alternative 2) was assigned a higher ranking because some reductions in volume would be realized from the consolidation steps.

3.5.1.6 Permanence

The no-action alternative (Alternative 1) ranked the lowest for permanence and the excavation/off-site disposal/easement alternative (Alternative 2) was assigned the highest ranking. While excavation does not satisfy the EPA and NYSDEC preference for a permanent and significant decrease in volume, toxicity or mobility, it does provide adequate and reliable controls through the landfilling of debris in a secure landfill. The capping/containment/easement alternative (Alternative 3) was ranked lower than Alternative 2 in this category because it does not provide the same level of controls or reductions.

3.5.2 ARAR Compliance

All alternatives would meet the chemical-specific, location-specific, and action-specific ARARs.

3.5.3 Implementability

3.5.3.1 Technical Feasibility

The no-action alternative (Alternative 1) was ranked the highest in this category because it requires no construction or operation activities, no monitoring, and is the easiest to implement. The capping/containment/easement alternative (Alternative 3) was ranked the lowest in this category because it has the least reliability and the greatest monitoring considerations. Alternative 2 (excavation/off-site disposal/easement) was ranked higher than Alternative 3 because it is considered more reliable in achieving the performance goals and has less monitoring considerations.

3.5.3.2 Administrative Feasibility

The no-action alternative (Alternative 1) was assigned the lowest ranking in this category because it would be the least likely to comply with applicable rules, regulations, and statutes and it would be least likely to receive approval from other offices and agencies. The excavation/off-site disposal/easement (Alternative 2) received the highest ranking because it would be the most likely to receive approval and, since the investigation has confirmed the presence of various military components, would be the most justifiable to the Army. From the Army's standpoint, the removal of items that may still be classified or sensitive is necessary and would only be accomplished through Alternative 2.

3.5.3.3 Availability of Services and Materials

The no-action alternative (Alternative 1) was assigned the highest ranking in this category and the capping/containment/easement (Alternative 3) was assigned the lowest ranking.

3.5.4 Screening Results

The excavation/off-site disposal/easement alternative (Alternative 2) received the highest overall ranking with a total score of 31 points. The no-action alternative (Alternative 1) received the next highest overall score of 24 and the capping/containment/easement alternative (Alternative 3) was ranked the lowest of the alternatives with a total score of 22. Since the capping/containment/easement alternative was ranked lower than the no-action alternative, it was screened out from further consideration. Alternatives 1 and 2 were retained for a detailed evaluation.

4.0 DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

4.1 INTRODUCTION

In this section, a more detailed description of the two retained alternatives is presented. A discussion of the alternatives with respect to overall protection of human health and the environment; ARAR compliance; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost is presented. The two modifying criteria of the remedy selection process (state/agency acceptance and community acceptance) will be fully assessed following the comment period for the FS report and the Proposed Plan. The selected alternative will be further refined as necessary during the design phase.

The analysis of each alternative with respect to overall protection of human health and the environment provides an evaluation of how the alternative reduces the risk from potential exposure pathways and meets the remedial action objectives. Cleanup goals presented in **Section 2.0** were proposed by the Army to protect human health and the environment. Final cleanup goals for SEAD-12 will be established among NYSDEC, the USEPA, and the Army.

The analysis of each alternative with respect to ARAR compliance provides an evaluation of whether the alternative complies with the list of ARARs presented in **Section 2.0**.

Long-term effectiveness and permanence are evaluated with respect to the magnitude of residual risk remaining from untreated waste or treated residuals after the remedial action is complete, and the adequacy and reliability of controls used to manage remaining waste (untreated waste and treatment residuals) over the long-term.

The discussion of the reduction of toxicity, mobility, or volume through treatment addresses the anticipated performance of the treatment technologies involved with an alternative. This evaluation relates to one of the requirements by CERCLA and NYSDEC that a selected remedial action employs treatment to reduce the toxicity, mobility, or volume of hazardous substances as a principle element. The evaluation will determine the amount of waste treated or destroyed, the expected degree of reduction of toxicity, mobility, or volume, and the type and quantity of treatment residuals that remain following treatment.

Evaluation of alternatives with respect to short-term effectiveness takes into account protection of workers and the community during the remedial action, environmental impacts from implementing the action, and the anticipated time required to achieve cleanup goals.

The analysis of implementability deals with the technical and administrative feasibility of implementing the alternatives and the availability of necessary materials and services. This criterion includes the ability to construct and operate components of the alternatives; the availability of adequate off-site treatment, storage, and disposal services; the availability of services, equipment, and specialists; the ability to monitor the effectiveness of remedial actions; and the ability to obtain necessary regulatory approvals.

Detailed cost estimates are presented in **Appendix A** for the retained alternatives. The costs are based on information from the MicroComputer Aided Cost Engineering System (MCACES, a component of the Tri-Service Automated Cost Engineering System, TRACES), Version 1.2 (copyright 1994-1997). Where appropriate, quotes from area suppliers, generic unit costs, vendor information, conventional cost estimating guides, and prior experience are used to supplement this information. The cost estimates presented have been prepared for guidance in project evaluation. The actual costs of the project will depend on true labor and costs of materials at the time of construction, actual SWMU conditions, competitive market condition, final project scope, and other variables.

Construction costs include those expenditures required to implement a remedial action. Both direct and indirect costs are considered in the development of construction cost estimates. Direct costs include construction costs or expenditures for equipment, labor, and materials required to implement a remedial action. Indirect costs include costs associated with engineering, permitting, construction management, and other services necessary to carry out a remedial action. Soil monitoring costs were also estimated.

4.2 ANALYSIS OF ALTERNATIVE 1: NO ACTION

4.2.1 Definition of Alternative 1

This alternative has been retained and will be used as a baseline for comparison with the other alternative developed as part of this feasibility study.

4.2.2 Short-Term Effectiveness and Protection of Human Health and the Environment

The no-action alternative would provide good short-term effectiveness and protection of human health and the environment because it does not involve any remedial response actions. Consequently, there would be no adverse human health or environmental impacts from the implementation of response actions.

4.2.3 Reduction of Toxicity, Mobility, or Volume

The no-action alternative would not significantly reduce the toxicity, mobility, or volume of wastes in soils at SEAD-12. This alternative does not meet the EPA and NYSDEC preference for treatment that significantly and permanently reduces toxicity, mobility, or volume of wastes as a principal element.

4.2.4 Long-Term Effectiveness and Permanence

The no-action alternative does not provide good long-term effectiveness and permanence because it does not reduce the level of risks and does not provide adequate or reliable controls for continued protection of human health or the environment. Although, the baseline human health risk assessment conducted under the RI did not show unacceptable risk, debris at Disposal Pit A/B and Disposal Pit C could pose a potential hazard if accessed in the future and should not remain at SEAD-12. Likewise, although there are no future users designated at Building 813/814 under the current plan for future land use, this alternative would not prevent users from occupying Buildings 813/814 without first conducting an indoor air assessment. This alternative would not significantly reduce the magnitude of these potential risks and would not provide the types of controls (institutional or removal) necessary to ensure that the residual risks would not exceed the risk criteria/goals established for this project.

4.2.5 Compliance with ARARs

This alternative would comply with all location specific ARARs listed in **Section 2.0**. The action-specific ARARs do not apply.

4.2.6 Implementability

This category considers the technical and administrative feasibility and availability of services and materials. The no-action alternative does not involve any construction or operation activities at the SWMU and consequently is not evaluated for these criteria.

4.2.7 Costs

There are no costs associated with the no-action alternative.

4.3 ANALYSIS OF ALTERNATIVE 2: EXCAVATION/DISPOSAL/EASEMENT

4.3.1 Definition of Alternative 2

This option consists of excavation of portions of Disposal Pit A/B and Disposal Pit C. **Figure 4-1** shows the decision process for how waste would be sorted and disposed once excavated from the SWMU. Soil and debris would be stockpiled in a bermed staging area. If necessary, debris will be segregated from the soils through use of a vibratory screen. All debris will be screened by Army personnel to determine if parts or components are classified. Classified parts will be disposed of at Army designated locations. In addition, debris will be scanned for the presence of radioisotopes. Any debris found to be radioactive during scanning or known to be a source of radioactivity would be sent to a facility authorized to accept such materials. Any debris free of radioactivity will be recycled or disposed of in a Subtitle D, industrial landfill. A Subtitle D landfill refers to a solid waste landfill that meets the NYSDEC and EPA Subtitle D landfill construction specifications.

An excavation plan will be developed using previous RI data to delineate the extent of removal. The data indicate that the soil/debris to be removed is limited to the areas described in **Section 2.7**. The volumes of soil to be excavated are described in **Table 2-4**. The maximum volume of soil to be excavated is approximately 8,595 cubic yards. The excavation will be accomplished with standard construction equipment, such as a front-end loader or backhoe.

Soils excavated from SEAD-12 would be scanned for high and low energy gamma radiation. Soil would be placed into one of two stockpiles and screened prior to stockpiling. If the soil exhibits radiation greater than the background it would be placed in one pile; soils exhibiting radiation equal to or less than background would be placed in a separate pile. Segregate the above background materials into suspect material (i.e., material that may fall below the actions levels) and materials significantly above background (i.e., material that will clearly be above the action level). Laboratory results of these suspect materials may also be used to justify the use of this material as fill rather than disposing of it as waste. Confirmatory soil sampling would be performed on the pile exhibiting radiation above background to determine if gamma radiation is above the background level. If levels of radionuclides meet the project clean up goals, soil would be backfilled into the excavation pit.

Although not anticipated, if soil samples indicate that radioisotopes exist in soil above the cleanup goal (i.e., 10 mrem/yr dose limit above background), they will be transported to a facility licensed to accept this material. For evaluation purposes, it is assumed that soil having elevated radioisotopes will be transported to a licensed radiological waste facility that accepts bulk waste shipments of low-level radioactive waste material.

The final step in this alternative is disposal of the excavated materials. These materials will be considered solid waste subject to RCRA Subtitle D and New York State solid waste regulations. In New York, all sanitary landfills are authorized to accept industrial wastes, and, therefore, would be able to accept the materials excavated from the SWMU. These landfills cannot accept hazardous waste or radiological waste, and therefore require extensive testing to assure that the waste is not a hazardous waste. The actual testing requirements vary from landfill to landfill, and the exact requirements for this remedial action will be specified once a landfill is selected.

Two landfills that may be used for this remedial action have been identified. The first is the Seneca Meadows landfill located in Waterloo, New York, approximately 10 to 15 miles from the SWMU. The second option is Ontario County Landfill in Flint, New York; approximately 30 miles from the SWMU. Other equivalent approved licensed off-site facility can be used for disposal of the excavated materials from the site.

In addition, an environmental easement will be included in this alternative to place a restriction on Buildings 813/814. The easement will state that an investigation of vapor intrusion potential and indoor air quality must be performed before this building, or any newly constructed building in the vicinity, is occupied.

4.3.2 Short-Term Effectiveness and Protection of Human Health and the Environment

Potential short-term impacts to the community from this alternative include:

- Off-site generation of dusts and particulates during excavation, treatment, and hauling; and
- Increased traffic in the area from hauling activities.

Continuous monitoring of airborne dusts and particulates will be performed during excavation and pre-treatment activities. The increase in truck traffic would increase the potential for off-site accidents and will be considered during the planning of the remedial action. This is not considered to be a significant issue since the area surrounding SEDA is primarily agricultural and sparsely populated. Care will be taken to assure that the trucks are not overloaded. The soil/debris will be covered with a tarp during transport to ensure that no dust is released.

The major routes of exposure to on-site workers during excavation are direct contact with the affected soil/debris and inhalation of particulates. Protection from exposure can be maximized through site access controls and the use of proper protective equipment for workers, such as dust masks (or other form of respiratory protection) and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of particulates. Standard wetting techniques or other dust suppression methods may be used to minimize airborne dusts and particulates.

Potential environmental impacts are surface runoff and airborne dusts and particulates. Silt fencing and/or hay bails may be used to minimize surface runoff from the excavation face and pre-treatment and stockpile areas. Standard dust suppression techniques include wetting and foam dust/vapor suppressants.

The time to complete the excavation, characterization, and disposal activities is not expected to be greater than 2 months.

4.3.3 Reduction of Toxicity, Mobility, or Volume

Overall, this alternative would be very effective in reducing the mobility of the constituents potentially present in the debris at the SWMU. The debris will be consolidated and placed in a secure off-site landfill. Toxicity and volume will be reduced to some degree by consolidating the hazardous and non-hazardous materials prior to disposal. This alternative does not satisfy the EPA and NYSDEC preference for treatment that significantly and permanently reduces toxicity, mobility, or volume of hazardous wastes as a principal element.

4.3.4 Long-Term Effectiveness and Permanence

The criteria for evaluating long-term effectiveness includes:

- Permanence;
- Magnitude of remaining risk;
- Adequacy of controls; and
- Reliability of controls.

This alternative is considered a permanent remedy since all debris would be removed from the soils and placed in a secure off-site landfill. The magnitude of remaining risk would be below acceptable criteria for human health and the environment. The adequacy and reliability of controls for continued protection of human health and the environment from the debris disposed off-site, are those monitoring controls required by the state of New York for secure Subtitle D solid waste landfills or from radiation licensed facilities.

Military items buried at the SWMU may be classified or sensitive. This alternative enables the Army to remove and examine these items so they may be properly evaluated, declassified, and disposed.

An environmental easement provides a control on access to Buildings 813/814 and ensures that any potential future land owner considering occupancy of these buildings, first conducts an indoor air assessment.

4.3.5 Compliance with ARARs

Alternative 2 will comply with all chemical-specific, action-specific, and location-specific ARARs identified in **Section 2.0**.

4.3.6 Implementability

4.3.6.1 Technical Feasibility

This technical feasibility of implementing this alternative is rated as high. This alternative uses standard and proven construction techniques and would have a high degree of reliability in meeting the technical specifications and construction and operating requirements.

4.3.6.2 Administrative Feasibility

The administrative feasibility of this alternative is considered good. The necessary permits and approvals required for this alternative should be attainable in a reasonable amount of time to implement the alternative.

Coordination with the various regulatory agencies is also important. The Army has coordinated the entire remedial program with both EPA and NYSDEC, and will consider input from both these agencies in the final remedy selection. It is anticipated that any issues arising with the regulatory agencies will be addressed prior to remedy selection.

4.3.6.3 Availability of Services and Materials

All of the equipment and services required for implementation of this alternative are currently readily available from a number of qualified contractors.

4.3.7 Costs

4.3.7.1 Capital Costs

Capital costs for excavation, off-site disposal of debris, on-site backfilling of soil, and establishment of an environmental easement were developed using TRACES/MCACES for Windows v1.2 software. **Appendix A** shows the cost backup detail and the MCACES cost summaries. The estimated capital cost is $3,369,500. This cost includes contractor markup costs as shown in **Table 4-1**.

4.3.7.2 O&M Costs

There are no O&M costs associated with this alternative.

4.3.7.3 Present Worth Costs

The total present worth costs for this alternative were estimated at $3,369,500.

4.3.8 Schedule

The soil/debris excavation and disposal will be performed in the fall of 2008. The remedial action will take approximately 2 months to complete.

4.4 COMPARATIVE ANALYSIS OF ALTERNATIVES

4.4.1 Introduction

This section provides a comparative analysis of the alternatives to the evaluation criteria and the relative advantages and disadvantages of each alternative. This comparison will provide additional information to help select the most appropriate remedial action alternative for SEAD-12.

The comparative analysis is divided into two categories. The first category is considered the threshold criteria and includes overall protection of human health and the environment and compliance with ARARs. The next category considers the long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, short-term effectiveness, implementability, and costs.

4.4.2 Threshold Criteria

The threshold criteria are overall protection of human health and the environment and compliance with ARARs. Each alternative must meet these criteria in order to be carried through the detailed evaluation process. All of the alternatives that were selected for a detailed evaluation meet these threshold criteria.

4.4.3 Other Considerations

4.4.3.1 Long Term Effectiveness and Permanence

The principal considerations of this evaluation criterion are:

- Permanence of remedial alternative;
- Magnitude of remaining risk after the remedial action is complete; and
- Adequacy and reliability of controls.

Alternative 2 (excavation/disposal/easement) was ranked higher than the no-action alternative (Alternative 1) for long-term effectiveness and permanence. The no-action alternative does not provide good long-term effectiveness and permanence because it does not reduce the magnitude of potential risks and does not provide adequate or reliable controls for continued protection of human health or the environment.

4.4.3.2 Reductions of Toxicity, Mobility, or Volume

This evaluation criterion focuses on the following factors:

- Amount of hazardous material destroyed or treated;
- The degree of expected reduction of toxicity, mobility, or volume;
- The degree to which the treatment is reversible; and
- The type and quantity of residuals remaining after treatment.

Neither Alternative 2 (excavation/disposal/easement) nor Alternative 1 (no-action) was ranked high for reduction of toxicity, volume or degree of reversibility. However, Alternative 2 would reduce the mobility and volume to a greater degree than Alternative 1 because it would remove the military debris from the SWMU and dispose of the material in an off-site secure landfill.

4.4.3.3 Short-Term Effectiveness

Alternative 1 (no-action) is ranked higher than Alternative 2 (excavation/disposal/easement) for short-term effectiveness, because it does not involve any disruption to the environment from implementation of a remedial action.

4.4.3.4 Implementability

Alternative 1 (no-action) is ranked higher than Alternative 2 (excavation/disposal/easement) for implementability because it does not involve construction and operation activities and administrative feasibility and availability of services and materials are not a factor. Alternative 2 was ranked high for implementability because it relies on a widely available and proven technology and the administrative requirements are not considered to be difficult to meet.

4.4.3.5 Costs

Alternative 1 (no-action) has no costs associated with it and is therefore ranked higher than Alternative 2 (excavation/disposal/easement) which is the only other alternative evaluated. The total estimated costs for Alternative 2 were $3,369,500. The accuracy of these cost estimates are expected to be on the order of ± 25-50%. These estimates were developed primarily for comparative purposes.

4.5 UNCERTAINTY ASSOCIATED WITH ALTERNATIVE

Alternatives discussed in this FS have been well defined. Nonetheless, uncertainties related to the alternatives remain. A significant uncertainty that would affect the alternative analysis and cost estimate is the actual volumes of debris present in the disposal pits. Other uncertainties (e.g., uncertainties with the definition of alternatives, uncertainties associated with land disposal, uncertainties related to construction) would also affect the alternative analysis and cost estimation. The focus of the alternative analysis presented in this FS is to make comparative estimates for alternatives with relative accuracy; uncertainties associated with the identified alternatives are not expected to impact the overall alternative comparison results.

4.6 SUMMARY AND CONCLUSIONS

Both of the identified remedial alternatives meet the threshold criteria of protectiveness of human health and the environment and compliance with ARARs based upon the results of the human health and ecological risk assessment and a comparison with ARARs. These alternatives are intended to address the presence of military-related debris identified during the Remedial Investigation in specific areas of SEAD-12. Alternative 2 was ranked higher for long-term effectiveness, permanence and reductions of toxicity, volume, or mobility. Alternative 1 was ranked higher for short-term effectiveness, implementability, and costs. The intended land-use for SEAD-12 is institutional training. The presence of military debris could potentially place restrictions on the use of SEAD-12 as a institutional training area. Based upon the lack of long-term effectiveness and permanence associated with military debris for the no-action alternative, Alternative 2 is the recommended alternative. A detailed screening process would be employed during the excavation and stockpiling stage to ensure that all materials classified as military or containing isotopes above the threshold criteria are disposed of properly. In addition, an environmental easement will be included in this alternative to place a restriction on Buildings 813/814. The easement will state that an investigation of vapor intrusion potential and indoor air quality must be performed before the buildings, or any newly constructed building in the vicinity, is occupied. The costs associated with this alternative assume that a percentage of the materials excavated would be classified for off-site disposal. The actual costs may be higher or lower depending upon the type and volume of material present in the areas identified for excavation.

Table 1-1
Exceedance Summary - Surface Soils
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Compound	TAGM [1]	Building 819/ EM27		Building 815-816/ EM-28		Disposal Pit A/B		Disposal Pit C		Former Dry Waste Disposal Pit		EM-5		EM-6		Class III		Former Wastewater Treatment Plant		Exeedances by Compound	Maximum Exceedance Factor (% Criteria)
		No. of TAGM Exceedances	Max. Value	No. of TAGM Exceedances	Max. Value	No. of TAGM Exceedances	Max. Value	No. of TAGM exceedances	Max. Value	No. of TAGM exceedances	Max. Value	No. of TAGM exceedances	Max. Value	No. of TAGM exceedances	Max. Value	No. of TAGM exceedances	Max. Value	No. of TAGM exceedances	Max. Value		
VOCs																					
Methylene chloride	100																			0	
SVOCs																					
4-Methylphenol	900															1	930			1	103%
Benzo(a)anthracene	224	4	6200													3	3500			7	2768%
Benzo(a)pyrene	61	4	5400													5	3200			9	8852%
Benzo(b)fluoranthene	1100	2	4800													1	2800			3	436%
Benzo(k)fluoranthene	1100	2	6100													1	2900			3	555%
Chrysene	400	3	6800													3	3600			6	1700%
Dibenz(a,h)anthracene	14	4	1500			1	16									5	680	1	110	11	10714%
Phenol	30															2	42			2	140%
Pesticides/PCBs																					
Heptachlor epoxide	20																			0	
Metals																					
Aluminum	19520	1	20800																	1	107%
Antimony	6																			0	
Arsenic	9.8																			0	
Cadmium	2.46			1	17.7	1	3.2													2	720%
Calcium	125300	1	202000													1	154000			2	161%
Chromium	30																			0	
Cobalt	30																			0	
Copper	33											1	37.3			3	35.4	3	60.3	7	183%
Cyanide	0.35					2	1.6									1	1.4			3	457%
Iron	37410																			0	0%
Lead	24.4	1	33.1	1	25			1	24.9			2	142			16	43.8	3	34.4	24	582%
Magnesium	21700	1	34800							1	23800									2	160%
Manganese	1100					1	1420							1	1120	4	2370	1	1240	7	215%
Mercury	0.1					1	0.11					1	0.27			6	0.17	3	0.48	11	480%
Nickel	50															2	57.4			2	
Potassium	2623	1	2660													4	2970			5	113%
Selenium	2					2	2.5									2	2.3			4	125%
Silver	0.8																			0	
Sodium	188					1	207			3	276							1	243	5	147%
Thallium	0.855	1	3			5	1.8	3	1.7	3	2			2	2	18	2.5	1	1.5	33	351%
Zinc	115											1	174			5	197	3	246	9	214%

Note:
1. NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046, Revised January 24, 1994.

Table 1-2
Exceedance Summary - Subsurface Soils
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Compound	TAGM [1]	Building 819/ EM27		Building 815-816/ EM-28		Disposal Pit A/B		Disposal Pit C		Former Dry Waste Disposal Pit		EM-5		EM-6		Class III		Former Wastewater Treatment Plant		Exeedances by Compound	Maximum Exceedance Factor (% Criteria)
		No. of exceed-ances	Max. Value	No. of exceed-ances	Max. Value	No. of exceed-ances	Max. Value	No. of exceed-ances	Max. Value	No. of exceed-ances	Max. Value	No. of exceed-ances	Max. Value	No. of exceed-ances	Max. Value	No. of exceed-ances	Max. Value	No. of exceed-ences	Max. Value		
VOCs																					
Methylene chloride	100							1	180											1	180%
SVOCs																					
4-Methylphenol	900																			0	0%
Benzo(a)anthracene	224											1	3500			1	760			2	1563%
Benzo(a)pyrene	61					1	180	4	180			1	2600			3	1000			9	4262%
Benzo(b)fluoranthene	1100											1	2200							1	200%
Benzo(k)fluoranthene	1100											1	2600							1	236%
Chrysene	400											1	3000			1	1000			2	750%
Dibenz(a,h)anthracene	14					1	57	4	99			1	710			4	300			10	5071%
Phenol	30					2	300													2	1000%
Pesticides/PCBs																					
Heptachlor epoxide	20					1	22													1	110%
Metals																					
Aluminum	19520	1	21200																	1	109%
Antimony	6					1	7.2													1	120%
Arsenic	8.9							1	11.1							1	9.8			2	125%
Cadmium	2.46					7	94.3	2	6							1	13.3			10	3833%
Calcium	125300	1	151000			1	142000	3	224000	1	132000									6	179%
Chromium	30					3	83.3													3	278%
Cobalt	30													1	36.3					1	121%
Copper	33	1	44.7			5	215	3	74.5	4	41.1	5	73.3			3	34			21	652%
Cyanide	0.35					2	1.5	1	2.2			6	112							9	32000%
Iron	37410	1	44500					1	51000	1	41100			1	40600	3	53400			7	143%
Lead	24.4	1	27.1			3	366	8	431					2	34	10	284			24	1766%
Magnesium	21700					1	34300	2	36100	2	34200									5	166%
Manganese	1100													1	4110	3	3200			4	374%
Mercury	0.1	2	0.2					3	0.15	4	0.5	3	1			8	0.2			20	1000%
Nickel	50	1	64.5	1	50.5	2	201			1	50.9	1	52			1	51.3			7	402%
Potassium	2623							2	3670			3	2810			2	3460			7	140%
Selenium	2									2	2.5									2	125%
Silver	0.8					2	11.9	1	1.8											3	1488%
Sodium	188							4	1420	2	252			1	197	3	748			10	755%
Thallium	0.855			1	1.1	5	1.7	12	1.7	7	2.2			7	3.8	10	1.6			42	444%
Zinc	115	3	143			3	424	7	6080	1	142	6	280	4	391	4	3370			28	5287%

Note:
1. NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR-94-4046, Revised January 24, 1994.

TABLE 1-3
Exceedance Summary-Surface Water, Sediment, and Groundwater
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Compound	Surface Water					Sediment						Groundwater		
		Downgradient		SEAD-12				Downgradient		SEAD-12			SEAD-12	
	Criteria [1]	No. of Criteria Exceedances	Max value (ug/L)	No. of Criteria Exceedances	Max value (ug/L)	Criteria [2]	Units	No. of Criteria Exceedances	Max value	No. of Criteria Exceedances	Max value	Criteria [3]	No. of Criteria Exceedances	Max value (ug/L)
VOCS														
1,2-Dichloroethene (total)							ug/Kg					5	1	30
Trichloroethene							ug/Kg					5	2	1600
SVOCS														
Bis(2-Ethylhexyl)phthalate	0.6			2	12							5	2	230
Benzo(a)anthracene						648 [a]	ug/Kg	1	1500	3	3100			
Benzo(a)pyrene						70.2 [b]	ug/Kg	3	1300	21	3300			
Benzo(b)fluoranthene						70.2 [b]	ug/Kg	4	1200	24	3200			
Benzo(k)fluoranthene						70.2 [b]	ug/Kg			15	2700			
Chrysene						70.2 [b]	ug/Kg	4	1400	23	3200			
Fluorene						43.2 [a]	ug/Kg	1	59	5	340			
Ideno(1,2,3-cd)pyrene						70.2 [b]	ug/Kg	2	670	18	2000			
Naphthalene						1.62 [a]	ug/Kg			7	49			
PESTICIDES/PCBS														
4,4'-DDD						0.54 [b]	ug/Kg	2	3.7	6	110			
4,4'-DDE	0.000007			1	0.0056	0.54 [b]	ug/Kg	2	4	10	76			
4,4'-DDT	0.00001			1	0.062	0.54 [b]	ug/Kg			7	200			
Aldrin	0.001			1	0.0041									
Arochlor-1254						0.0432 [b]	ug/Kg			4	1200			
Arochlor-1260						0.0432 [b]	ug/Kg			2	37			
Endosulfan I						1.62 [b]	ug/Kg			2	3.6			
Heptachlor	0.0002			3	0.0063	0.0432 [b]	ug/Kg			3	11			
Heptachlor epoxide	0.0003			2	0.0033									
Hexachlorobenzene	0.00003	1	0.013	3	0.02									

TABLE 1-3
Exceedance Summary-Surface Water, Sediment, and Groundwater
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Compound	Surface Water					Sediment						Groundwater		
		Downgradient		SEAD-12				Downgradient		SEAD-12			SEAD-12	
	Criteria [1]	No. of Criteria Exceedances	Max value (ug/L)	No. of Criteria Exceedances	Max value (ug/L)	Criteria [2]	Units	No. of Criteria Exceedances	Max value	No. of Criteria Exceedances	Max value	Criteria [3]	No. of Criteria Exceedances	Max value (ug/L)
METALS														
Aluminum	100			19	3430									
Antimony						2 [c]	mg/Kg			1	2.8	3	3	43.2
Arsenic						6 [c]	mg/Kg	3	7.6	10	19.1			
Cadmium						0.6 [c]	mg/Kg			8	9			
Chromium						26 [c]	mg/Kg	2	37.1	9	130			
Cobalt	5			1	6									
Copper	17.36			2	27.6	16 c	mg/Kg	9	36.8	49	1160			
Iron	300			12	6830	20000 [c]	mg/Kg	8	43000	38	85900	300	42	20700
Lead	1.462			4	35.4	31 [c]	mg/Kg			8	215			
Manganese						460 [c]	mg/Kg	4	947	25	14000	300	12	3280
Mercury	0.00007			5	0.11	0.15 [c]	mg/Kg	1	0.27	7	1.7			
Nickel						16 [c]	mg/Kg	9	58.9	51	126			
Silver	0.1			6	1.6	1 [c]	mg/Kg			1	1.5			
Sodium												20000	23	408000
Zinc						120 [c]	mg/Kg	3	196	35	2650			

Notes:
1. New York State Ambient Water Quality Standards, Class C for Surface Water
2. Criteria values for sediment were the lowest of:
   a. NYS Benthic Aquatic Life Chronic Toxicity Criteria
   b. NYS Human Health Bioaccumulation Criteria
   c. NYS Lowest Effect Level
3. Groundwater criteria was GA = NYSDEC Class GA Groundwater Standard (TOGS 1.1.1, June 1998, 1999, 2000, 2004)

Table 1-4
TOTAL CANCER RISK AND NON-CANCER RISK FOR CHEMICAL AND RADIOLOGICAL PATHWAYS
SEAD-12
Feasibility Study
Seneca Army Depot Activity

Potential Area of Concern	Risk Scenerio	Chemical Total Cancer Risk (1)	Radiological Total Cancer Risk	Chemical and Radiological Total Cancer Risk	Total Non-Cancer Hazard Index
Disposal Pits A/B	Current Worker	5.E-08	6.E-09	6.E-08	0.003
	Future Park Worker	2.E-05	2.E-05	4.E-05	0.09
	Future Recreational Child	2.E-05	1.E-06	2.E-05	0.3
	Current/Future Construction Worker	1.E-07	4.E-06	4.E-06	0.1
	Future Resident	7.E-04	3.E-05	7.E-04	2 (2)
Disposal Pits C	Current Worker	2.E-08	3.E-08	5.E-08	0.001
	Future Park Worker	2.E-05	2.E-05	4.E-05	0.08
	Future Recreational Child	2.E-05	1.E-06	2.E-05	0.2
	Current/Future Construction Worker	1.E-07	4.E-06	4.E-06	0.06
	Future Resident	7.E-04	4.E-05	7.E-04	2 (2)
Former Dry Waste Disposal Pit	Current Worker	2.E-08	<1E-15	2.E-08	0.002
	Future Park Worker	2.E-05	2.E-05	4.E-05	0.08
	Future Recreational Child	2.E-05	1.E-06	2.E-05	0.2
	Current/Future Construction Worker	4.E-08	3.E-06	3.E-06	0.07
	Future Resident - Adult	7.E-03	3.E-05	7.E-03	2 (2)
Downgradient	Off-Site Wader (Child)	1.E-06	6.E-09	1.00E.06	8.E-04

Notes:
(1) Chemical Reasonable Maximum Exposure risk values are presented.
(2) Hazard index for residential child is presented.

Table 2-1
Disposal Pit A/B and C Exceedances Compared to NYSDEC Soil Cleanup Objectives for Unrestricted Use Criteria
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Compound	Unit	NYSDEC Unrestricted Use [1]	Disposal Pit A/B						Disposal Pit C					
			Surface Soil			Subsurface Soil			Surface Soil			Subsurface Soil		
			No. of Exceedances [2]	No. Analyzed	Max Value [3]	No. of Exceedances [2]	No. Analyzed	Max Value [3]	No. of Exceedances [2]	No. Analyzed	Max Value [3]	No. of Exceedances [2]	No. Analyzed	Max Value [3]
VOCs														
Acetone	UG/KG	50	1	15	52		29	34		9	15	1	42	61
Chlorobenzene	UG/KG	1100		15			29			9			41	5
Ethyl benzene	UG/KG	1000		15			29	66		9			41	
Methyl butyl ketone	UG/KG			15	1		29			9			42	
Methylene chloride	UG/KG	50		15	1		29	3		9		1	42	180
Styrene	UG/KG			15			29	33		9			41	
Toluene	UG/KG	700		15	4		29	15		9			42	62
Total Xylenes	UG/KG	260		15		1	29	520		9			41	14
Trichloroethene	UG/KG	470		15			29	26		9			42	2
SVOCs														
2,4-Dimethylphenol	UG/KG			15			28	25		9			41	
2-Methylnaphthalene	UG/KG			15			28	56		9			41	22
4-Methylphenol	UG/KG	330		15			28	140		9			41	
Acenaphthene	UG/KG	20000		15			28	23		9			41	44
Acenaphthylene	UG/KG	100000		15			28	33		9			41	
Anthracene	UG/KG	100000		15			28	96		9	4.6		41	63
Benzo(a)anthracene	UG/KG	1000		15	27		28	180		9	20		41	200
Benzo(a)pyrene	UG/KG	1000		15	18		28	200		9	20		42	180
Benzo(b)fluoranthene	UG/KG	1000		15	36		28	190		9	28		41	320
Benzo(ghi)perylene	UG/KG	100000		15	23		28	120		9	18		42	98
Benzo(k)fluoranthene	UG/KG	800		15	26		28	160		9	19		41	170
Bis(2-Ethylhexyl)phthalate	UG/KG			15	210		28	930		9	5.8		42	16
Butylbenzylphthalate	UG/KG			15	6.7		28	5.1		9			41	30
Carbazole	UG/KG			15	16		28			9	6.4		41	40
Chrysene	UG/KG	1000		15	51		28	240		9	27		41	310
Di-n-butylphthalate	UG/KG			15	68		28	1700		9	4.5		41	52
Di-n-octylphthalate	UG/KG			15	7.8		28	54		9	7.3		41	20
Dibenz(a,h)anthracene	UG/KG	330		15	16		28	57		9	5.8		41	99
Dibenzofuran	UG/KG			15			28			9			41	4.1
Fluoranthene	UG/KG	100000		15	24		28	420		9	40		42	320
Fluorene	UG/KG	30000		15	5.4		28	52		9			41	35
Indeno(1,2,3-cd)pyrene	UG/KG	500		15	18		28	120		9	15		41	140
N-Nitrosodiphenylamine	UG/KG			15			28			9			41	9500
Naphthalene	UG/KG	12000		15			28	600		9			41	13
Phenanthrene	UG/KG	100000		15	8.5		28	340		9	21		41	280
Phenol	UG/KG	330		15	22		28	300		9			41	
Pyrene	UG/KG	100000		15			28	380		9	40		42	310
Pesticides/PCBs														
4,4'-DDD	UG/KG	3.3		15			28		1	9	8.6	2	42	25
4,4'-DDE	UG/KG	3.3	2	15	15	2	28	42		9		2	42	6.4
4,4'-DDT	UG/KG	3.3	1	15	42		28	2.1		9	2.2	4	42	4.9
Aldrin	UG/KG	5		15			28	0.79		9			42	
Alpha-BHC	UG/KG	20		15		1	28	24		9			42	5.8
Alpha-Chlordane	UG/KG	94		15			28	4.6		9			42	2.6

Table 2-1
Disposal Pit A/B and C Exceedances Compared to NYSDEC Soil Cleanup Objectives for Unrestricted Use Criteria
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Compound	Unit	NYSDEC Unrestricted Use [1]	Disposal Pit A/B						Disposal Pit C					
			Surface Soil			Subsurface Soil			Surface Soil			Subsurface Soil		
			No. of Exceedances [2]	No. Analyzed	Max Value [3]	No. of Exceedances [2]	No. Analyzed	Max Value [3]	No. of Exceedances [2]	No. Analyzed	Max Value [3]	No. of Exceedances [2]	No. Analyzed	Max Value [3]
Aroclor-1254	UG/KG	100	2	15	670	4	28	3000		9			42	28
Aroclor-1260	UG/KG	100		15		1	28	150		9			42	25
Beta-BHC	UG/KG	36		15			28	2.2		9			42	1.7
Dieldrin	UG/KG	5	2	15	14	2	28	40		9			42	
Endosulfan I	UG/KG	2400		15	1.8		28			9			42	
Endosulfan II	UG/KG	2400		15	2.7		28	19		9			42	
Endrin	UG/KG	14		15	4.2	2	28	20		9			42	
Endrin aldehyde	UG/KG			15	5.6		28			9			42	
Gamma-Chlordane	UG/KG			15	11		28	58		9			42	2.3
Heptachlor	UG/KG	42		15			28			9			42	8.4
Heptachlor epoxide	UG/KG			15	4.6		28			9			42	2
Metals														
Aluminum	MG/KG			15	15800		28	17100		9	14100		42	18600
Antimony	MG/KG			6	0.87		10	7.2					12	0.39
Arsenic	MG/KG	13		15	4.9		28	5.9		9	4.3		42	11.1
Barium	MG/KG	350		15	89.2		28	125		9	108		42	135
Beryllium	MG/KG	7.2		15	0.59		28	0.74		9	0.69		42	0.83
Cadmium	MG/KG	2.5	1	15	3.2	7	28	94.3				2	42	6
Calcium	MG/KG			15	77600		28	142000		9	75900		42	224000
Chromium	MG/KG	30 [4]		15	23.3	4	28	83.3		9	21.6		42	29.7
Cobalt	MG/KG			15	17.5		28	26.5		9	11		42	16.3
Copper	MG/KG	50		15	32.5	3	28	215		9	22.1	1	42	74.5
Cyanide	MG/KG	27		15	1.6		28	1.5					42	2.2
Iron	MG/KG			15	27100		28	35700		9	23200		42	51000
Lead	MG/KG	63		15	22.2	2	28	366		9	24.9	2	42	431
Magnesium	MG/KG			15	21500		28	34300		9	18600		42	36100
Manganese	MG/KG	1600		15	1420		28	631		9	700		42	857
Mercury	MG/KG	0.18		15	0.11		28	0.06		9	0.06		42	0.15
Nickel	MG/KG	30	2	15	39.9	9	28	201		9	27.6	6	42	45.5
Potassium	MG/KG			15	1740		28	2090		9	1980		42	3670
Selenium	MG/KG	3.9		15	2.5		28	1.2		9	0.95		42	1.9
Silver	MG/KG	2		15	0.2	1	28	11.9					42	1.8
Sodium	MG/KG			15	207		28	134		9	92.4		42	1420
Thallium	MG/KG			15	1.8		28	1.7		9	1.7		42	1.7
Vanadium	MG/KG			15	24		28	25.6		9	24.6		42	36.4
Zinc	MG/KG	109		15	83.7	4	28	424		9	97.3	8	42	6080

Notes:

1. NYSDEC Soil Cleanup Objectives for Unrestricted Use, Table 375-6.8(a), http://www.dec.state.ny.us/website/regs/subpart375_6.html
2. The number represents the number of compounds with exceedences.
3. Only maximum values that exceed the NYSDEC Soil Cleanup Objective for Unrestricted Use criteria are presented in this table.
4. Chromium value is for Trivalent form.

Table 2-2
Disposal Pit A/B and C Arithmetic Average and Appropriate UCL Values for Constituents that Exceed NYSDEC Unrestricted Use Criteria
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Compound	Units	NYSDEC Unrestricted Use [1]	SEDA Maximum Detected Background Concentration	Disposal Pit A/B		Disposal Pit C	
				Surface Soil Average Value	Subsurface Soil Average Value	Surface Soil Average Value	Subsurface Soil Average Value
VOCs							
Acetone	UG/KG	50		9.1			8.5
Methylene chloride	UG/KG	50					9.6
Total Xylenes	UG/KG	260			32.4		
Pesticides/PCBs							
4,4'-DDD	UG/KG	3.3				2.8	2.6
4,4'-DDE	UG/KG	3.3		3.0	4.3		2.2
4,4'-DDT	UG/KG	3.3		4.6			2.2
Alpha-BHC	UG/KG	20			2.0		
Aroclor-1254	UG/KG	100		91.4	294.1		
Aroclor-1260	UG/KG	100			25.6		
Dieldrin	UG/KG	5		3.0	4.2		
Endrin	UG/KG	14			3.3		
Metals							
Cadmium	MG/KG	2.5	2.9	0.4	6.6		0.4
Chromium	MG/KG	30 [2]	32.7		20.2		
Copper	MG/KG	50	62.8		35.8		21.5
Lead	MG/KG	63	266		26.1		26.7
Nickel	MG/KG	30	62.3	24.4	35.1		24.4
Silver	MG/KG	2	0.87		0.6		
Zinc	MG/KG	109	126		88.1		240.0

Notes:
1. NYSDEC Soil Cleanup Objectives for Unrestricted Use, Table 375-6.8(a), http://www.dec.state.ny.us/website/regs/subpart375_6.html
2. Chromium value is for trivalent form.

Table 2-3
TEST PIT CONTENTS OF DISPOSAL PIT A/B AND DISPOSAL PIT C
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Loc ID	Location	Debris/Contents	Removal Action
TP12A-1	Disposal Pit A	Misc. metal fragments	
TP12A-2	Disposal Pit A	[5-7] Instrument box [3-4] Empty drums [many] Tubes Pipe [3-4] Spool of wire Box of tools	
TP12-1	Disposal Pit A	Heavy sheet metal Broken fiberglass Electrical components Metal box with liquid – no VOCs	
TP12-2	Disposal Pit A	Large sheet metal object (maybe from a cabinet or shelving unit) (2) One gallon metal cans, with high VOCs – maybe paint cans? Electrical components Metal/fiberglass debris Light sheen on water at 6' Debris continues below the water table	Both cans and surrounding soil were drummed and removed
TP12A-3	Disposal Pit C	Foreign components – thermal battery? (4) SEAD "Trainer" – 1950's style	3 of the 4 Trainers were removed
TP12A-4	Disposal Pit C	Large cylindrical object composed of concrete and styrofoam	
TP12-3 (North)	Disposal Pit C	Cone-shaped objects above and below water table - gamma radiation screening – 8xbackground - paint on dial on cone likely source of rad Pocket of grease like material – no VOCs Metal lids Steel threaded pipes w/end caps Wood fragment with metal hasp Electrical components Sheet metal Styrofoam fiberglass	(6) cone-shaped objects were removed
TP12-3 (South)	Disposal Pit C	Electrical cable with connector Stacked sheet metal	
TP12-4	Disposal Pit C	Large cylindrical object (stainless steel?) (~4' in diameter, L>3')	Attempted, but unable to remove
TP12-5	Disposal Pit C (EM-23)	Small pieces of concrete with rebar Strands of insulated wire 1" diameter pipe	
TP12-6	Disposal Pit C (EM-23)	Concrete slab with rebar Small concrete pieces, asphalt	

Table 2-3
TEST PIT CONTENTS OF DISPOSAL PIT A/B AND DISPOSAL PIT C
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Loc ID	Location	Debris/Contents	Removal Action
TP12-7AA, 7BA, & 7BB	Disposal Pit C (EM-22, EM-21)	Steel drain pipe with wire inside Wire Culvert pipe Fired 7.62 NATO black casing Heavy gauge wire Aluminum foil	
TP12-8	Disposal Pit C (EM-21)	Railroad ties Nails 2' diameter culvert pipe sections concrete with rebar asphalt brush electrical tape	
TP12-23	Disposal Pit C (EM-23)	Pocket of ash 8" grinding disk posts and pipe pocket of black material	TP log is nondescript about location of debris
TP12A-5	Disposal Pit C	6" piece of glass	
TP12A-6	Disposal Pit C	None	
TP12A-7	Disposal Pit C	None	
TP12A-8	Disposal Pit C	None	

Table 2-4
VOLUME ESTIMATES FOR SOIL AND DEBRIS REMEDIATION
SEAD-12 Feasibility Study
Seneca Army Depot Activity

	Surface Area (SF)	Volume for Excavation (CY)	Soil Volume (CY)	Debris Volume (CY)
Disposal Pit A/B	23,828	4,677	3,461	1,216
Disposal Pit C (total)	34,403	6,117	5,134	983
Disposal Pit C (northern area)	11,332	2,015	1,976	40
Disposal Pit C (southern area)	23,071	4,102	3,158	943
Total	58,231	10,794	8,595	2,199

Table 2-5
TECHNOLOGY SCREENING FOR SOIL/DEBRIS REMEDIATION
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SOIL/ DEBRIS GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
No Action	None	Natural Degradation	No Action.	Applicable. Required as baseline response for comparison to other technologies.
Institutional controls	Access Control	Fencing	Access to SEAD-12 restricted by fencing at access points.	Applicable. Effective in reducing and eliminating human exposure.
		Wall and posting	Access to SEAD-12 is restricted by construction of a permanent, low-maintenance wall. Warning signs posted.	Applicable. Effective in reducing human exposure. Permanence dependent on design and materials of construction.
	Land Use Restrictions	Deed restrictions	Deed for property modified to restrict future sales and land use, or U.S. Government holds deed into perpetuity.	Applicable. May not restrict future resident exposure.
		Environmental Easement	Any institutional controls, engineering controls, use restrictions and/or any site management requirement requirements applicable to the site will be retained in an environmental easement according to NYSDEC regulations subpart 375-1.8 (h)(2).	Applicable. Effective in reducing human exposure.
	Monitoring	Soil Monitoring	Periodic sampling soils. Monitors changes in extent of soil/sediment affected by constituents.	Not Applicable. Not necessary because the condition of the SEAD-12 source area is not expected to change significantly in the near future.
	Alternative Water Supply	City water line or bottle water	Extend city supply line to area or provide trucked in water.	Not Applicable. No current drinking water supply is affected.
Containment	Horizontal barriers	Soil cap	Place two feet of clean fill on source areas, grade and seed.	Applicable. Will not prevent groundwater exposure to contaminated soils.
		Clay cap	Add one to two foot clay layer beneath soil cap.	Not Applicable. Water table at SEAD-12 too high to be effective—will not prevent groundwater exposure to contaminated soils.

(shaded box)	=	screened
(unshaded box)	=	retained

Table 2-5
TECHNOLOGY SCREENING FOR SOIL/DEBRIS REMEDIATION
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SOIL/ DEBRIS GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Containment (cont.)	Horizontal Barriers (cont.)	Asphalt cap	Highway-grade base and asphalt pavement over SEAD-12 source areas.	Not applicable. Not as reliable as a clay or soil cap, high maintenance.
	Vertical barriers	Sheet pile	Steel barrier wall driven into soil in sections using a drop-hammer or vibrating hammer.	Not Applicable. Impractical, area of concern too small to justify sheet pile.
		Slurry wall	Trench around affected area and fill trench with cement/bentonite or soil/bentonite slurry.	Not Applicable. Impractical, area of concern too small to justify a slurry wall..
		Grout Curtain	Pressure injection of grout in a regular pattern of drill holes.	Not applicable. Not as effective in low-permeability soils as slurry wall. Typically used if other treatment alternatives cannot be used.
		Vibrating beam	Drive steel beam into ground and inject slurry as beam is withdrawn.	Not applicable. Not as effective as slurry wall. Typically used if other treatment alternatives cannot be used.
In-Situ Treatment	Solidification	Pozzolan-portland cement	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Usually implemented for soils with inorganics contam. VOCs may cause high emissions.
		Pozzolan-lime/flyash	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Usually implemented for soils with inorganics contam. VOCs may cause high emissions.
		Microencapsulation	High density polyethylene is mixed with soil/sediment to form plastic frit	Not Applicable. Not practical for small volume of soil at SEAD-12.
		Vitrification	Additives mixed into soil, electrodes placed in-ground and energy applied to electrodes. Soil/sediment and additives form molten glass that cools to a stable non-crystalline solid.	Not Applicable. Innovative technology with some successful applications but not used widely.

[shaded box] = screened

[white box] = retained

Table 2-5
TECHNOLOGY SCREENING FOR SOIL/DEBRIS REMEDIATION
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SOIL/ DEBRIS GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
In-Situ Treatment (cont.)	Extraction	Soil flushing	Constituents are extracted using surfactants, solvent (polar or non-polar) or hot water.	Not Applicable. Not effective in meeting remedial objectives for metals and semi-volatiles. Low soil permeability will restrict effectiveness. Requires wastewater treatment plant and/or solvent recovery process.
	Biological	Bioventing	Soil is aerated to stimulate in situ biological activity and promote biodegradation of organic contaminants by enhancing/accelerating the natural biodegradation process.	Not Applicable for SEAD-12. Ineffective for metals.
		Vegetative uptake	Area is planted with coniferous and deciduous trees that uptake constituents through root system and incorporate them into wood mass.	Not Applicable. Effectiveness depends on solubility of constituents. Unproven and not a permanent solution.
	Soil Vapor Extraction	Vacuum extraction	Apply negative pressure to vadose zone well system and treat soil vapor off-gas (via carbon filter, biofilter, catalytic incinerator, chemical oxidation or plasma reactor	Not Applicable. Ineffective for metals.
		Radiowave volatilization	Apply radio frequency to soil, extract soil vapor and treat.	Not applicable. Not a proven technology.
Removal	Excavation	Earthmoving/Excavation	Wheeled, bulk scraper, removes surficial or subsurficial soil into storage compartment.	Applicable. Effective. Used for relatively large quantities of soil.
Ex-Situ Treatment	Biological	Aerobic	Microbes cultivated to degrade constituents under aerobic conditions. Includes composting, land farming and slurry reactors.	Not Applicable. Not effective for metals.
		Anaerobic	Microbes cultivated to degrade constituents under anaerobic conditions, typically an in-vessel process.	Not Applicable. Not practical for small volume of soil at SEAD-12.

[shaded box] = screened

[unshaded box] = retained

Table 2-5
TECHNOLOGY SCREENING FOR SOIL/DEBRIS REMEDIATION
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SOIL/ DEBRIS GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Ex-Situ Treatment (cont.)	Physical Solidification	Pozzolan-portland cement	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Wastes at Disposal Pits are not amenable.
		Pozzolan-lime/flyash	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Wastes at Disposal Pits are not amenable.
		Asphalt Batching	Asphalt mixed with soil/sediment using an auger type mechanism.	Not Applicable. Wastes at Disposal Pits are not amenable.
		Micro-encapsulation	High density polyethylene is mixed with soil/sediment to form plastic frit.	Not Applicable. Wastes at Disposal Pits are not amenable.
	Physical Separation	Soil/Debris separation	Standard construction equipment will be used for physical separation.	Applicable. May be used to classify soils/debris prior to treatment or disposal.
		Magnetic classification	Soils subjected to magnetic field to remove ferrous metals.	Not Applicable. Not practical for volume of soil at SEAD-12. No appreciable quantities of ferrous metals.
	Oxidation-thermal	High temperature processes	Includes: electric reactor, fluid bed incinerator, molten salt, multi-hearth incinerator, rotary kiln incinerator, plasma arc incinerator and catalytic incinerator.	Not Applicable. Effective for most organic constituents, however, not enough soil to justify construction of an on-site incinerator.
		Low temperature processes	Soils subjected to <800^{o} heat to drive off volatile organic compounds.	Not Applicable. Not effective for semi-volatile organic constituents.
	Oxidation-other	Supercritical air/water oxidation	Soil mixed with water and excess air under supercritical pressure and temperature.	Not Applicable. Not a proven technology. Heavy metals are not removed.
		Chemical	Oxidizing agent such as hydrogen peroxide or potassium permanganate solution mixed into soil.	Not Applicable. Not a proven technology.
		Microwave plasma	Microwave frequency electromagnetic radiation applied to soil.	Not Applicable. Not a proven technology.

[shaded box] = screened

[white box] = retained

Table 2-5
TECHNOLOGY SCREENING FOR SOIL/DEBRIS REMEDIATION
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SOIL/ DEBRIS GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Ex Situ Treatment (cont.)	Chemical-extraction	Supercritical extraction	Constituents extracted in countercurrent process using carbon dioxide, propane or other highly volatile solvent under supercritical temperature and pressure conditions. Solvent is separated from extracted constituents (flashed or distilled) and recycled.	Not Applicable. Not practical for volume of soil at SEAD-12. Site Demonstration report indicates PAH removals of 80 to 99% can be achieved. Sizing of materials is required. All materials must be less than 1/8 inch. High pressure (up to 300 psi) vessels are required. Costly for small volumes ($300 to $600/ton).
		Aqueous solvent	Constituents extracted using aqueous solvent such as acid, base, salt or surfactant solutions. Extracted soil is rinsed. Solvent and rinsewater treated and recycled.	Not Applicable. Not practical for volume of soil at SEAD-12. Volume reduction achieved. Acid extraction less effective for SVOCs. Surfactant solution more appropriate. Technology is used in mining operations: treatability study required.
		Amine Extraction	Constituents extracted using secondary or tertiary amines, usually triethyl amine (TEA). TEA is completely soluble in water below 20°C. Separation of TEA from solids is achieved by gravity and centrifuging. TEA is separated from water by heating causing the TEA to be insoluble. TEA is recycled by distillation, leaving the extracted organics, usually an oily sludge. The sludge is then incinerated.	Not Applicable. Not practical for volume of soil at SEAD-12. Volume reduction achieved, final extracted organic material requires additional final treatment. Material sizing to less than 1/4 inch as required prior to processing.
Disposal	Solids Handling	Backfill on-site	Reuse of non-contaminated soils as backfill in excavated areas.	Applicable.
		Subtitle D landfill	Disposal of non-hazardous. Local or regional landfill, that accepts industrial solid waste (off-site or constructed on-site)	Applicable. Must comply with EPA Subtitle D and 6 NYCRR Part 360 requirements.
		RCRA Landfill	Disposal of soil, treated to remove toxicity hazard, in a RCRA hazardous waste landfill (off-site).	Applicable. Required for RCRA listed and characteristic hazardous waste.

(shaded box)	=	screened
(unshaded box)	=	retained

Table 3-1
ASSEMBLED REMEDIAL ACTION ALTERNATIVES
SEAD-12 FEASIBILITY STUDY
Seneca Army Depot Activity

Alternatives	Technologies and Processes
1	No-Action.
2	Excavation of various areas of the Disposal Pits /Waste Consolidation/Characterization and Disposal in Off-Site Landfill
3	On-Site Capping and Containment

Table 3-2

SCREENING OF REMEDIAL ACTION ALTERNATIVES
SEAD-12 Feasibility Study
Seneca Army Depot Activity

ALT.	TECHNOLOGY AND PROCESS	EFFECTIVENESS						IMPLEMENTIBILITY			TOTAL SCORE	OVERALL RANKING
		SHORT-TERM HUMAN HEALTH AND ENVIRONMENTAL PROTECTIVENESS	LONG-TERM HUMAN HEALTH & ENVIRONMENTAL PROTECT-IVENESS	REDUCTION OF TOXICITY	REDUCTION OF MOBILITY	REDUCTION OF VOLUME	PERM-ANENCE	TECH-NICAL FEASI-BILITY.	ADMINIS-. TRATIVE FEASI-BILITY.	AVAI-. LABILITY OF SERVICES AND MATERIALS		
1	No Action Alternative	6	1	1	1	1	1	6	1	6	24	2
2	Excavation Pretreatment Off-Site Disposal Environmental Easement	2	4	1	3	3	4	4	5	5	31	1
3	Capping/Containment	3	3	1	2	1	2	2	4	4	22	3

Note: Alternatives were scored from 1 to 6 for each screening criterion. The score of 1 represents the least favorable score and 6 represents the most favorable score.
The alternative with the highest total score represents the most favorable alternative. Within each screening criterion, alternatives were scored from one to six for each subcategory.
The total score of all subcategories is the basis for the scoring for the screening criterion.

Table 4-1
COST ESTIMATE SUMMARY FOR REMEDIAL ACTION ALTERNATIVES
SEAD-12 Feasibility Study
Seneca Army Depot Activity

Capital Costs	**Alternative 2 Excavation of Soil/Debris, Off-site Disposal of Debris, and On-site Backfilling of Soils.**	
Mobilization and Preparation	$	3,800
Sampling and Testing	$	315,100
Air Monitoring & Sampling - Rad	$	11,600
Site Work	$	174,900
Fencing	$	147,900
Wastewater	$	16,000
Air Stripping	$	14,000
Rad Scanning	$	3,000
Soil Remediation (includes disposal)	$	1,384,200
Demobilization	$	12,400
Remedial Design	$	356,300
Cost to Prime	**$**	**2,439,300**
Field Office Support (5%)	$	122,000
Home Office Support (15%)	$	384,200
Profit (10%)	$	294,500
Bond (4%)	$	129,600
Cost to Owner	**$**	**3,369,500**
TOTAL PRESENT WORTH COST	**$**	**3,369,500**

PARSONS

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

FEASIBILITY STUDY
SEAD-12

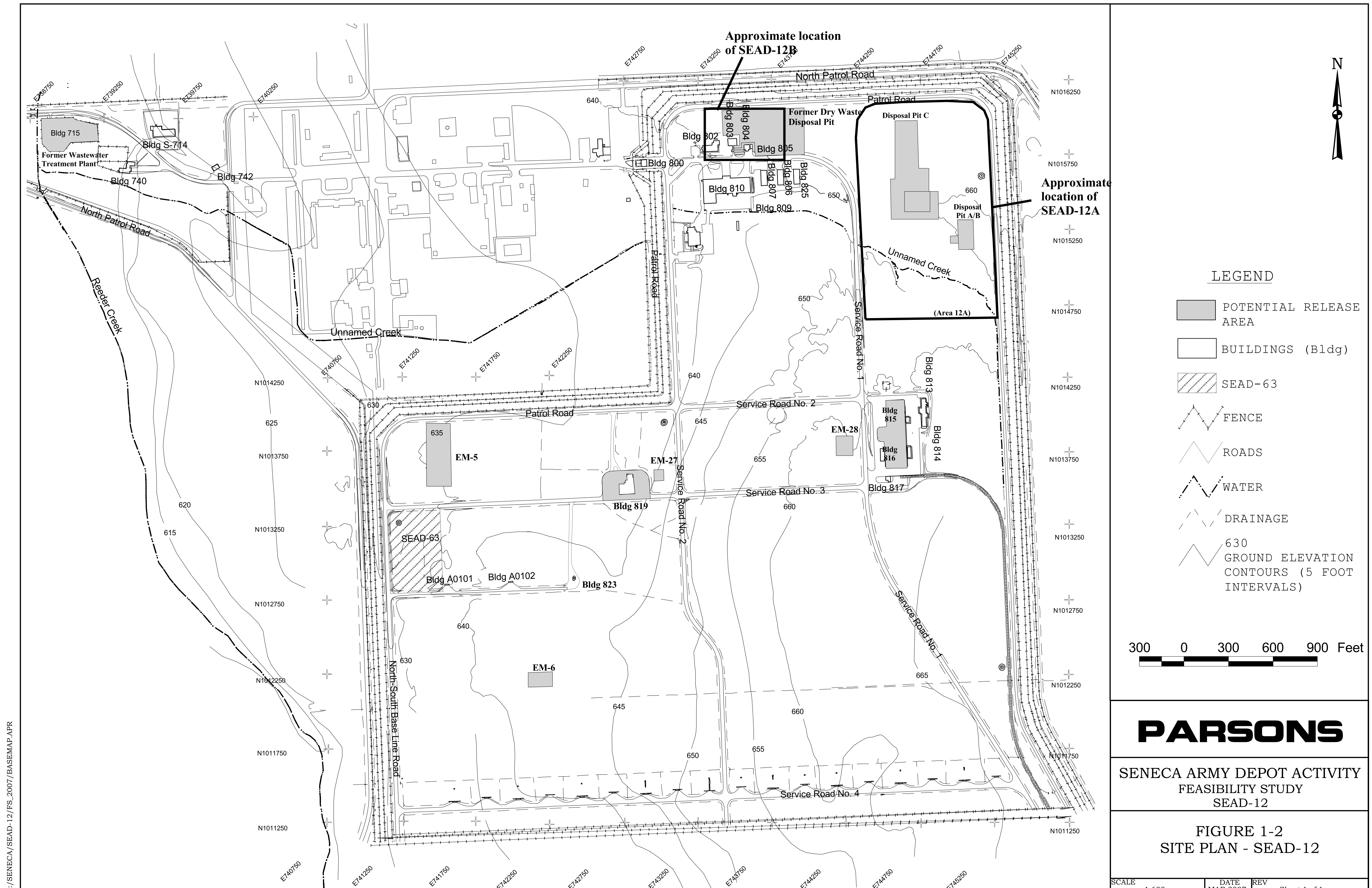
DEPT. ENVIRONMENTAL ENGINEERING	DWG NO. 729895-01002

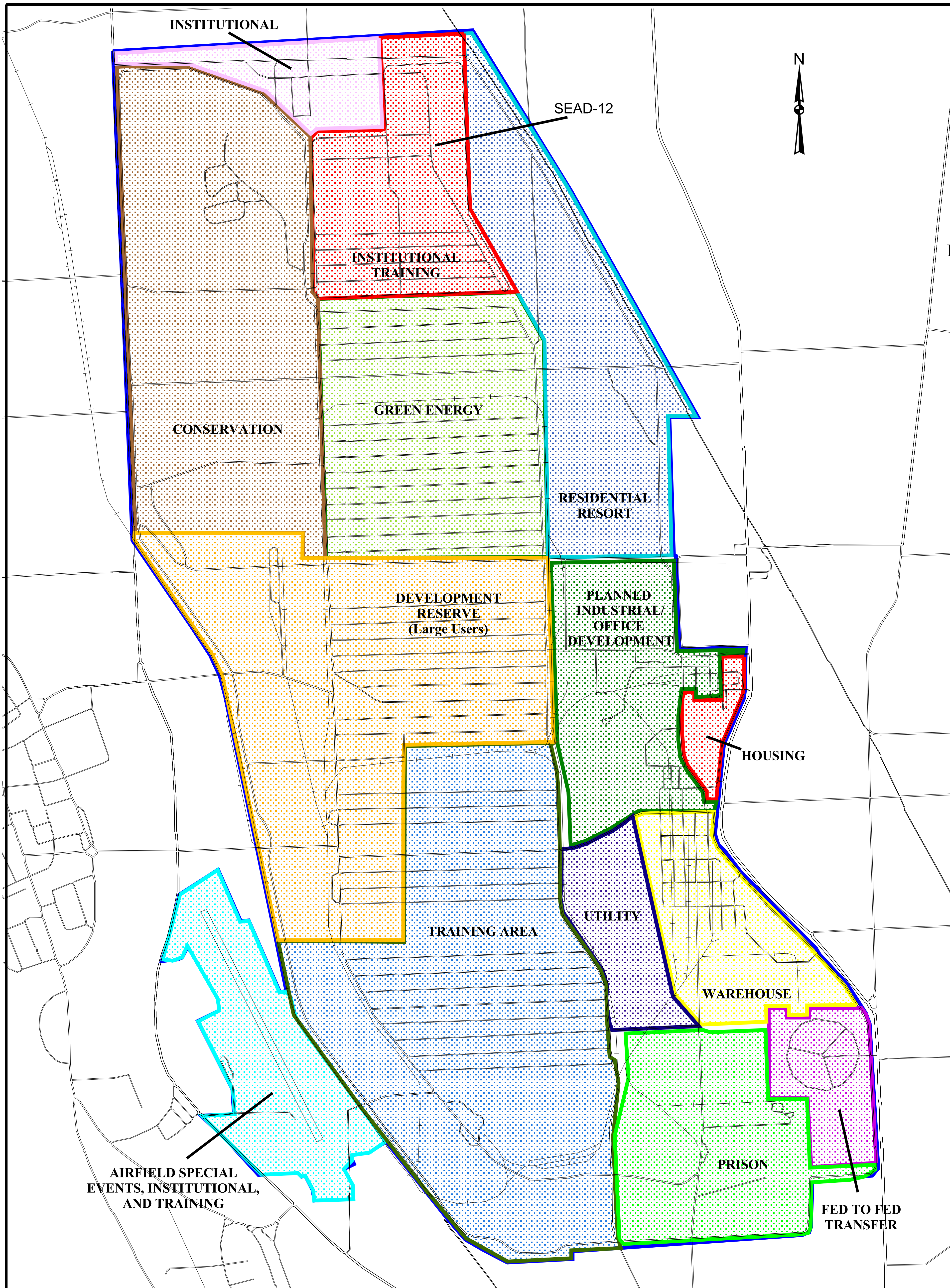
FIGURE 1-1

LOCATION MAP

SCALE 1"= 8 MILES APPROX.	DATE MARCH 2007

R:\PROJECT-GRAPHICS\SENECA\LOCMP1-1.CDR(CLD)


Approximate location of SEAD-12B
Approximate location of SEAD-12A
North Patrol Road
Patrol Road
Former Dry Waste Disposal Pit
Disposal Pit C
Disposal Pit A/B
(Area 12A)
Unnamed Creek
Reeder Creek
Former Wastewater Treatment Plant
Bldg 715
Bldg S-714
Bldg 740
Bldg 742
Bldg 800
Bldg 802
Bldg 803
Bldg 804
Bldg 805
Bldg 806
Bldg 807
Bldg 809
Bldg 810
Bldg 825
Bldg 813
Bldg 814
Bldg 815
Bldg 816
Bldg 817
Bldg 819
Bldg 823
Bldg A0101
Bldg A0102
EM-5
EM-6
EM-27
EM-28
SEAD-63
Service Road No. 1
Service Road No. 2
Service Road No. 3
Service Road No. 4
North-South Base Line Road
LEGEND
POTENTIAL RELEASE AREA
BUILDINGS (Bldg)
SEAD-63
FENCE
ROADS
WATER
DRAINAGE
630 GROUND ELEVATION CONTOURS (5 FOOT INTERVALS)
300 0 300 600 900 Feet
N
PARSONS
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12
FIGURE 1-2
SITE PLAN - SEAD-12
SCALE 1:600
DATE MAR 2007
REV
Sheet 1 of 1
O:/SENECA/SEAD-12/FS_2007/BASEMAP.APR



LEGEND

4000 0 4000 8000 Feet

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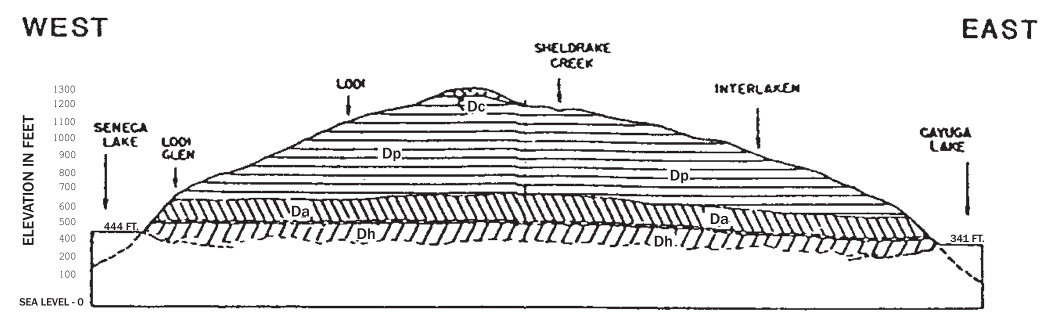
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

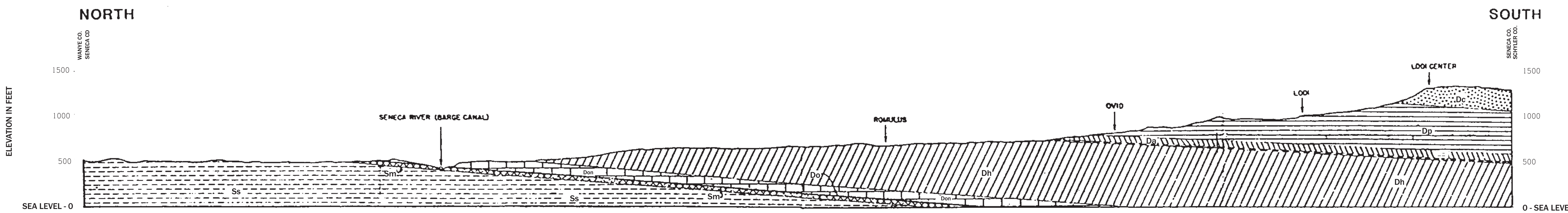
FIGURE 1-3
FUTURE LAND USE AND
SITE LOCATION

SEDA	March 2007

O:\Seneca\Sead-12\s-12_future_landuses.apr\Figure 1 - Land Use & Site Locations



EAST-WEST SECTION ALONG A- A'



NORTH-SOUTH SECTION ALONG 76°50' (B-B')

LEGEND

UPPER DEVONIAN		WISCOY SHALE NUNDA SANDSTONE WEST HILL FORMATION GRIMES SANDSTONE	DEVONIAN
		HATCH SHALE CASHAQUA SHALE	
	GENESEE GROUP	WEST RIVER SHALE GENESEO SHALE	
MIDDLE DEVONIAN		TULLY LIMESTONE	
	HAMILTON GROUP	MOSCOW SHALE LUDLOWVILLE SHALE SKANEATELES SHALE MARCELLUS SHALE	
MIDDLE OR LOWER DEVONIAN		ONONDAGA LIMESTONE	
LOWER DEVONIAN		ORISKANY SANDSTONE	
SILURIAN (UPPER)		MANLIUS AND RONDOUT LIMESTONES AND COBLESKILL DOLOMITE	SILURIAN
		SALINA FORMATION INCLUDING BERTIE LIMESTONE MEMBER AND CAMILLUSSHALE MEMBER	

SCALE
1 0 1 2 3 MILES

SOURCE:MODIFIED FROM-THE GROUND WATER RESOURCES OF SENECA COUNTY, NEW YORK: MOZOLA, A.J., BULLETIN GW-26, ALBANY, NY, 1951

PARSONS

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

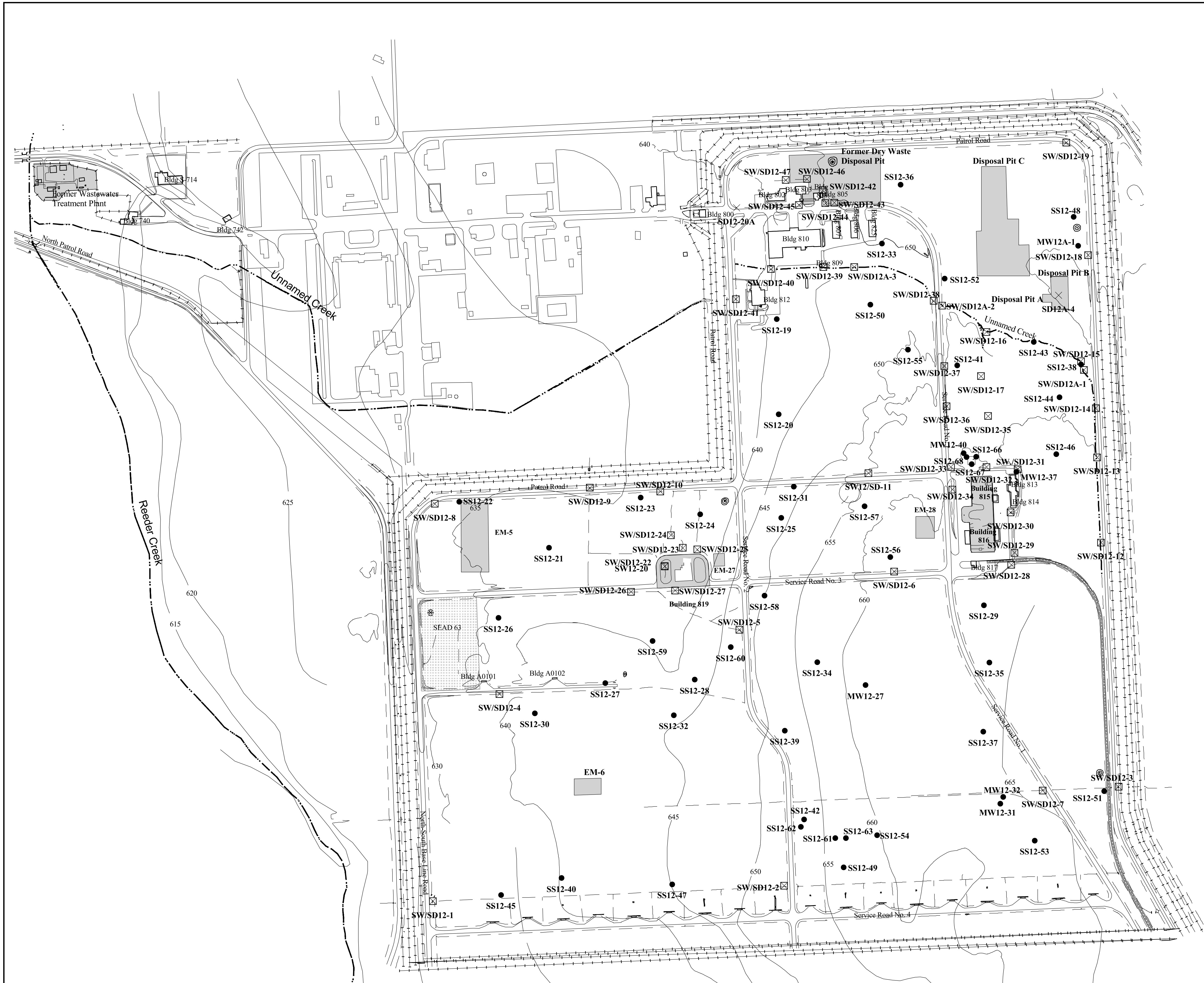
DEPT. ENVIRONMENTAL ENGINEERING
DWG NO. 7346026-01001

FIGURE 1-4

REGIONAL GEOLOGIC CROSS SECTIONS

SCALE AS NOTED
DATE MARCH 2007

R:\GRAPHICS\SENECA\SEAD-12\GEOXSEC.CDR(CVM)



LEGEND

SS12-153 ● Surface Soil sample with Loc_ID

SD12-153 × Sediment sample with Loc_ID

SW12-153 □ Surface Water sample with Loc_ID

Potential Release Area

N

300 0 300 600 Feet

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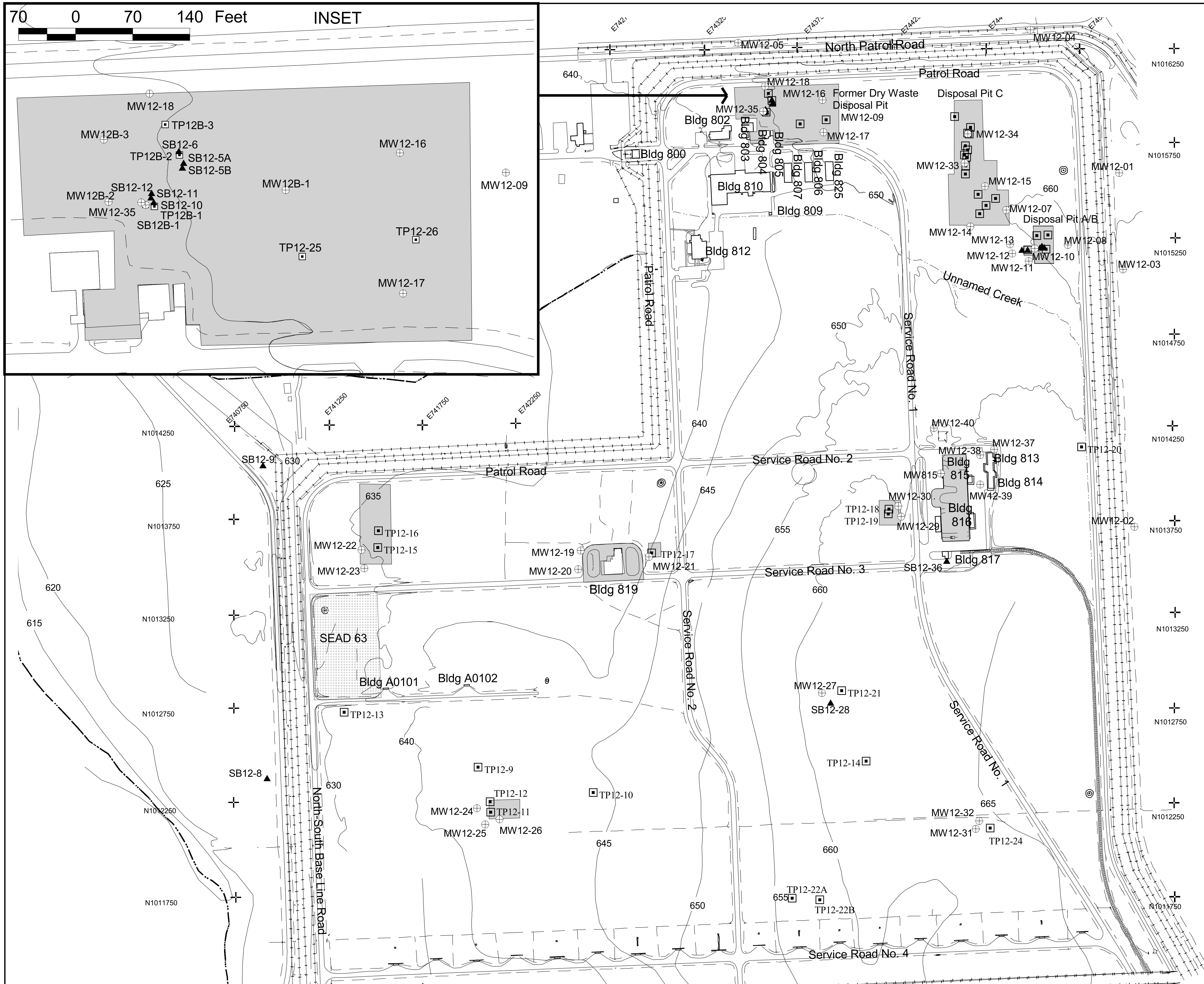
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

FIGURE 1-5
SURFACE SOIL, SEDIMENT, AND SURFACE WATER SAMPLING LOCATIONS

SCALE	DATE	REV	
SEE SCALE	MAR 2007		Sheet 1 of 1

O:\SENECA\SEAD-12\FS_2007\SS_LOCS.APR



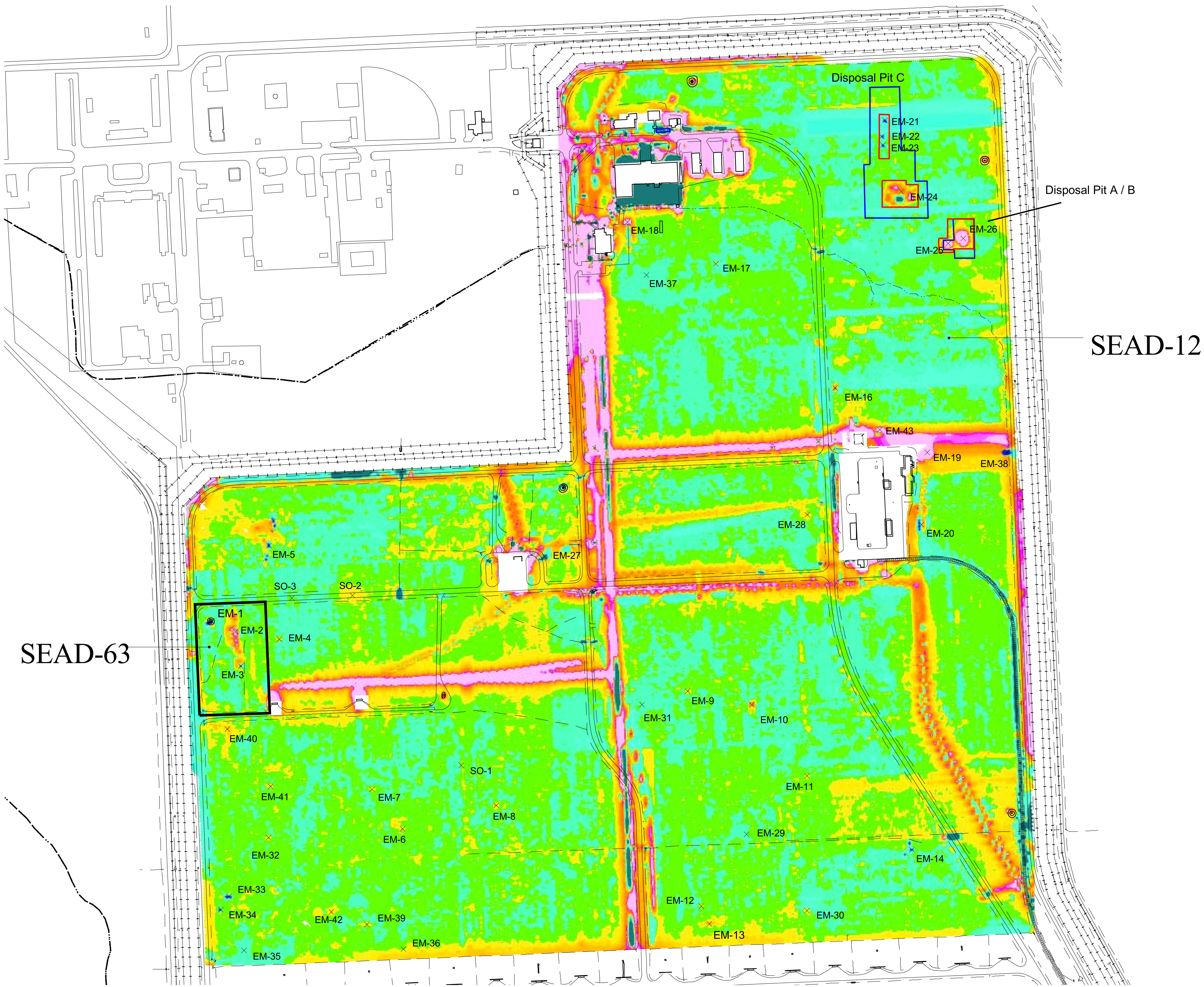
PARSONS

SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

FIGURE 1-6
SOIL BORING, MONITORING WELL, AND TEST PIT LOCATIONS

SCALE	DATE	REV	
1:500	MAR 2007		Sheet 1 of 1

O:\SENECA\SEAD-12\fs_2007\12-TP_SB_LOC.APR



LEGEND

× EM-24

INTERPRETED
EM-31 IN-PHASE
ELECTROMAGNETIC
ANOMALY

DISPOSAL PIT BOUNDARY

AREA TO BE EXCAVATED

500 0 500 Feet

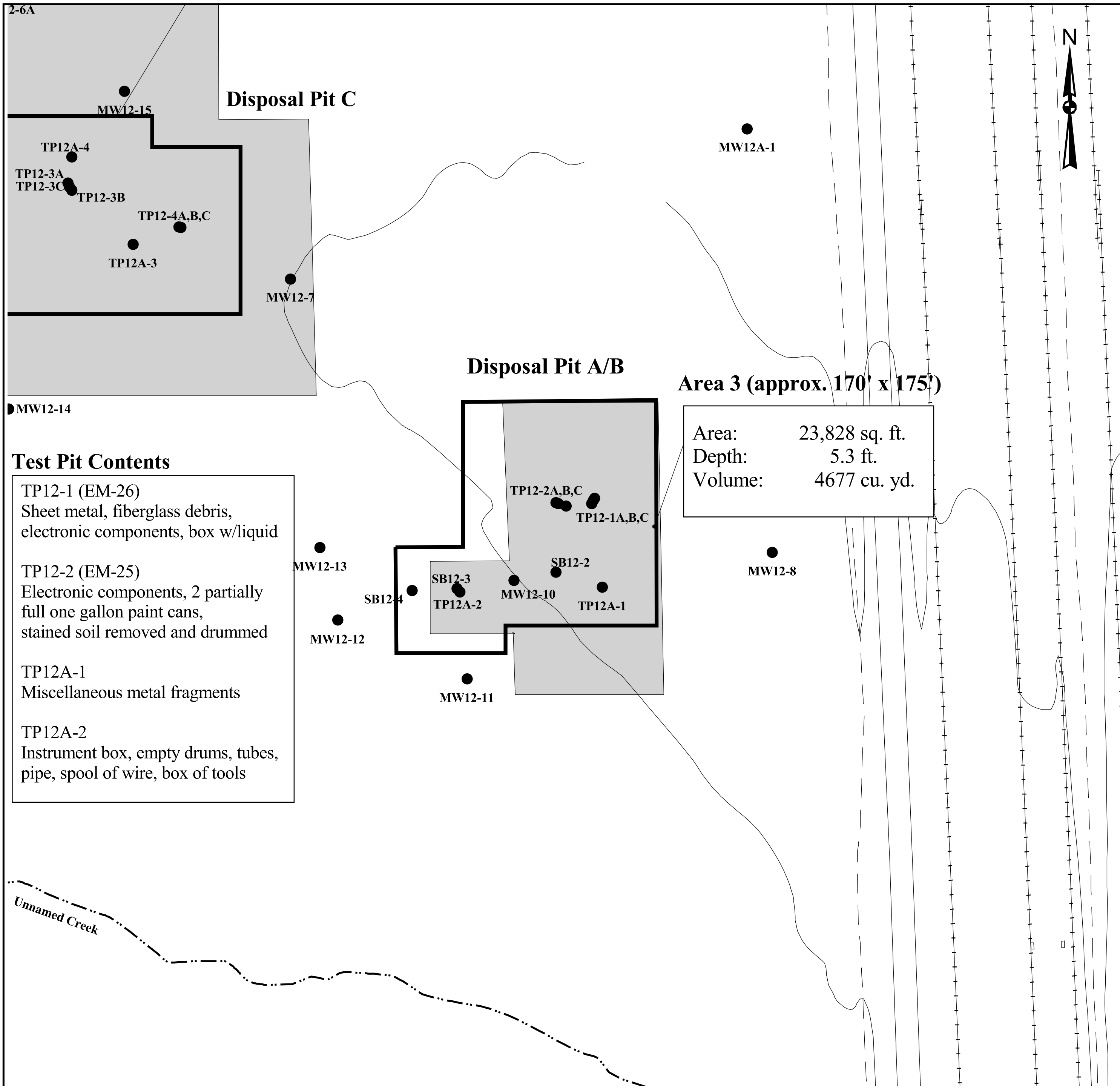
PARSONS

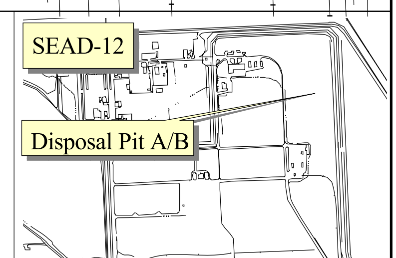
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

FIGURE 2-1
COLOR ELECTROMAGNETIC
DATA MAP FOR
SEAD-12 AND SEAD-63

SCALE	DATE	REV	
1:500	MAR 2007		Sheet 1 of 1

O:\AV_GIS30\SENECA\SEAD12\SAMPLELO\EM31BLOB.APR





LEGEND

● MW12-15 Sub-surface Soil sample with Loc_ID.

Potential Release Area

Area to be Excavated

100 0 100 Feet

PARSONS

SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

FIGURE 2-2
REMEDIATION VOLUME ESTIMATE
FOR SOIL AT DISPOSAL PIT A/B

SCALE	DATE	REV	
1:100	MAR 2007		Sheet 1 of 1

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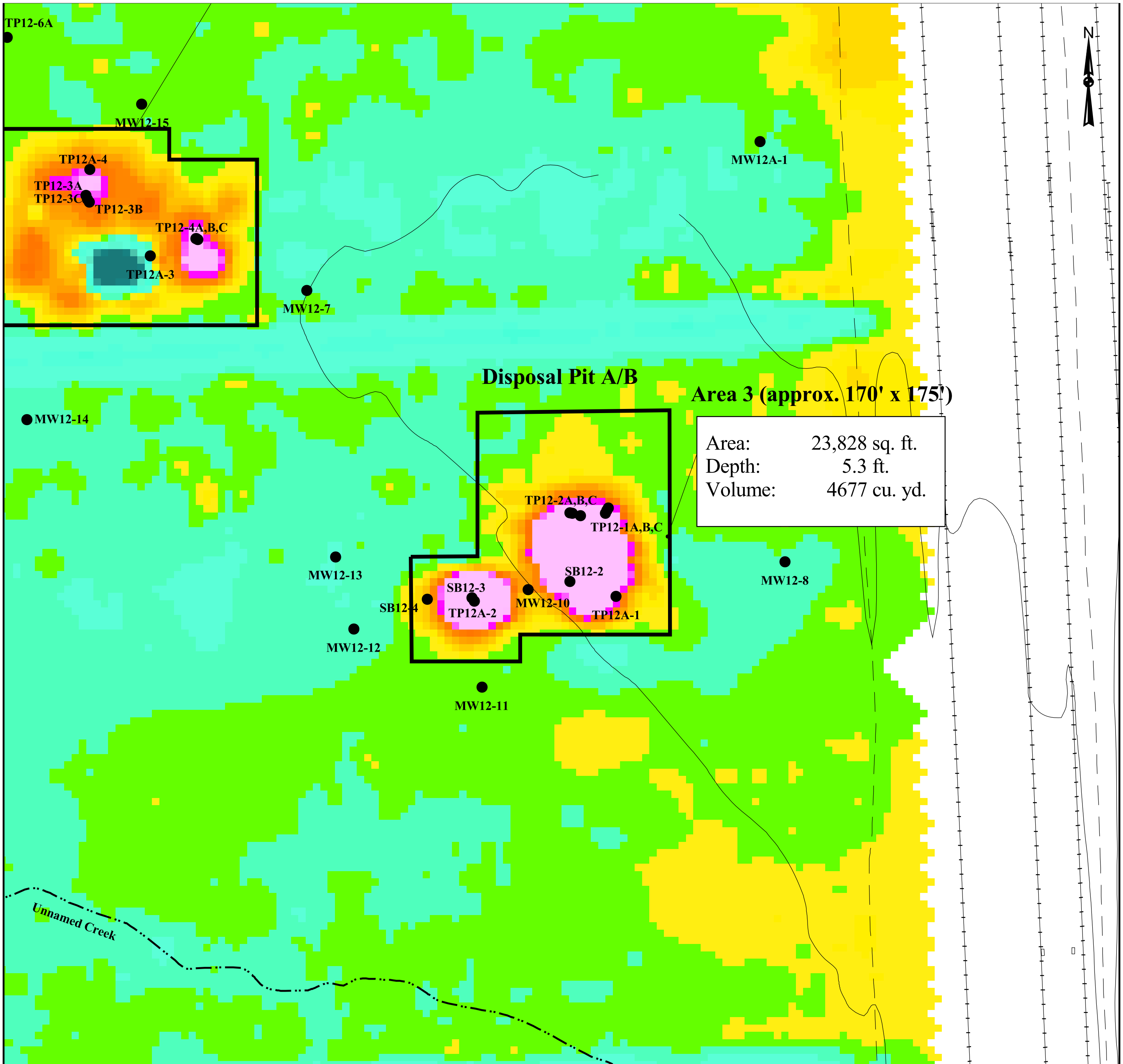

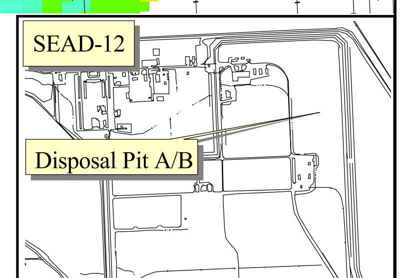

LEGEND

MW12-15 Sub-surface Soil sample with Loc_ID.

Area to be Excavated

100 0 100 Feet

PARSONS

SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

FIGURE 2-3
ELECTROMAGNETIC DATA AND
REMEDIATION VOLUME ESTIMATE
FOR SOIL AT DISPOSAL PIT A/B

SCALE	DATE	REV	
1:100	MAR 2007		Sheet 1 of 1

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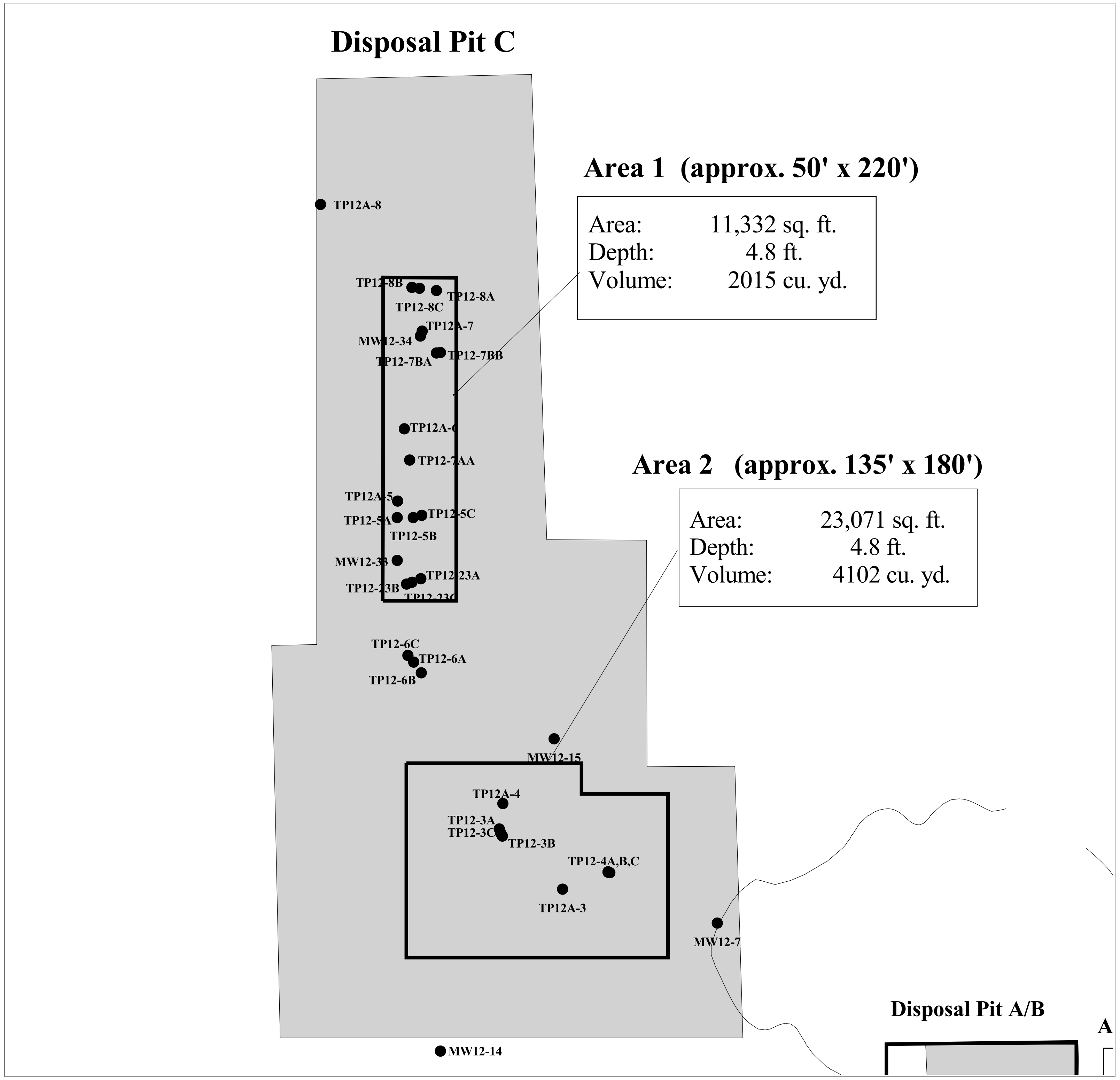


Test Pit Contents

TP12-8 (EM-21)
Concrete, rebar and wire construction debris

TP12-7A (EM-22)
Steel pipe, culvert sections

TP12-5 (EM-23)
Concrete and rebar construction debris

TP12-23 (EM-23)
Steel posts, pipe, lumber

TP12-6 (EM-23)
Concrete and rebar construction debris, asphalt road

TP12-3 (EM-24)
Sheet metal, fiberglass, styrofoam, electrical debris, cone shaped military items removed and drummed

TP12-4 (EM-24)
Large stainless steel cylinder found but not removed

TP12A-8
None

TP12A-7
None

TP12-7B
Culvert pipe, fired NATO 7.62 black casing, heavy gauge wire, aluminum foil

TP12A-6
None

TP12A-5
Piece of glass

TP12A-4
Large cylindrical object composed of concrete and styrofoam

TP12A-3
Foreign components, (4) SEAD 'Trainer' 1950's style

N

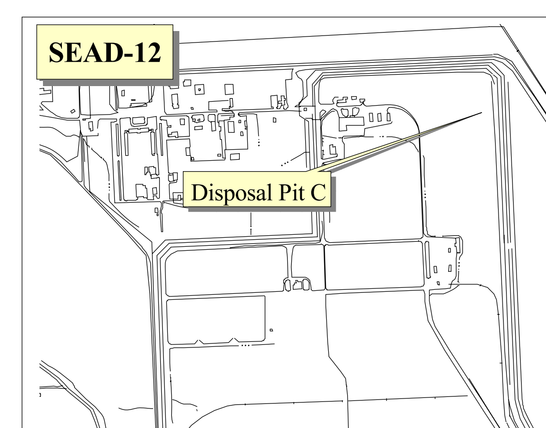
LEGEND

MW12-15 Sub-surface Soil sample with Loc_ID.

Potential Release Area

Area to be Excavated

100 0 100 Feet



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SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

FIGURE 2-4
REMEDIATION VOLUME ESTIMATE
FOR SOIL AT DISPOSAL PIT C

SCALE 1:100	DATE MAR 2007	REV	Sheet 1 of 1

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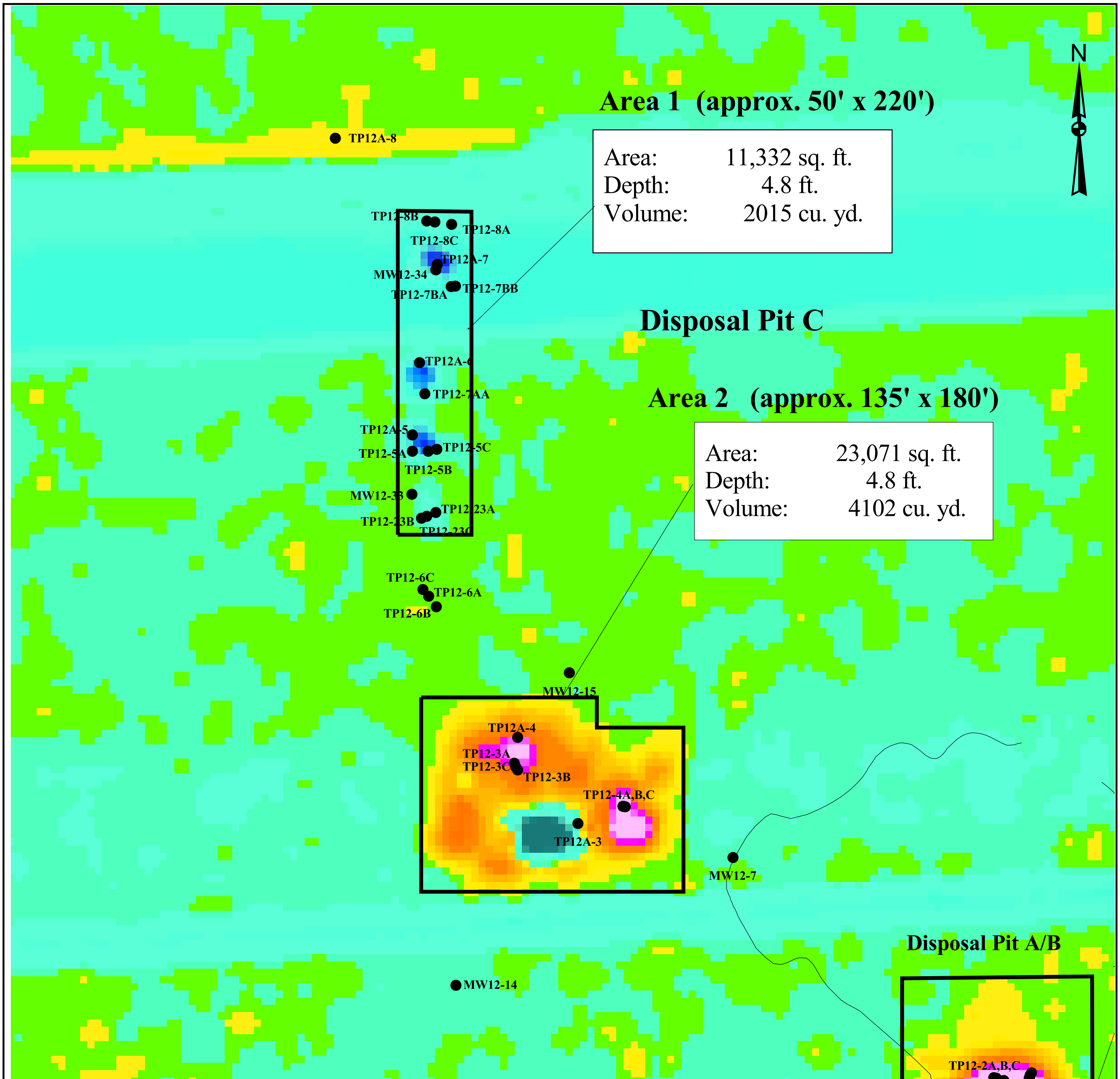

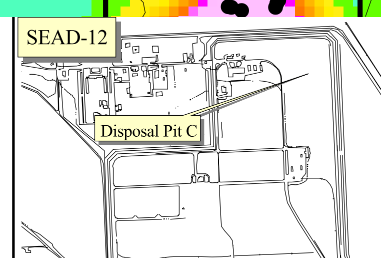

LEGEND

MW12-15 Sub-surface Soil sample with Loc_ID.

Area to be Excavated

100 0 100 Feet

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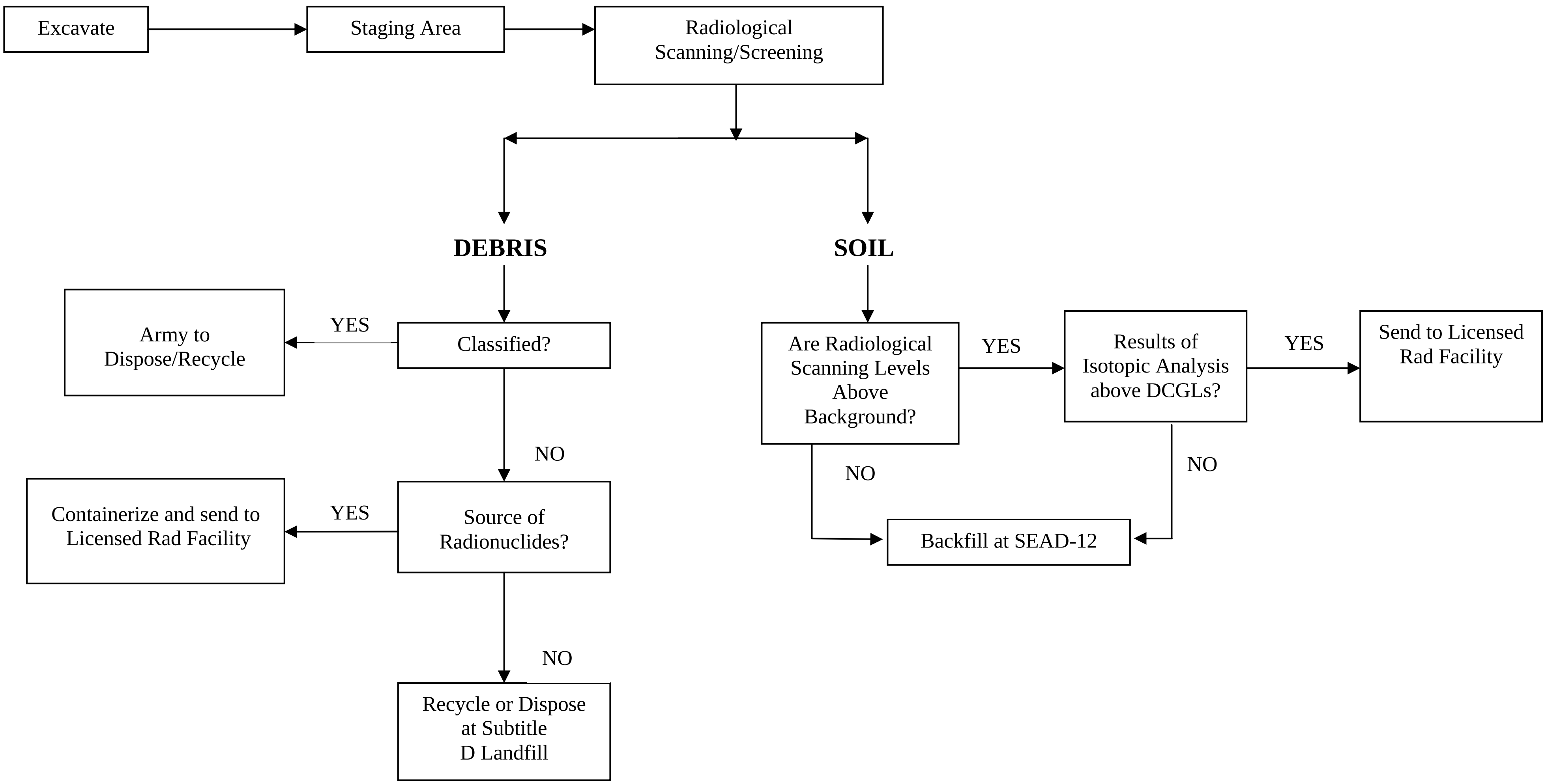
PARSONS

SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-12

FIGURE 2-5
ELECTROMAGNETIC DATA AND
REMEDIAL VOLUME ESTIMATE
FOR SOIL AT DISPOSAL PIT C

SCALE	DATE	REV	
1:100	MAR 2007		Sheet 1 of 1

FIGURE 4-1
DISPOSAL DECISION FLOW CHART
SEAD-12 FINAL FEASIBILITY STUDY
SENECA ARMY DEPOT ACTIVITY, ROMULUS, N.Y.



APPENDIX A

DETAILED COST ESTIMATE FOR REMEDIAL ACTION ALTERNATIVE 2

- Table A-1 Volume Estimates for Disposal Area
- Table A-2 Cost Estimate Backup for Alternative 2
- Figure A-1 Disposal Decision Flow Chart
- MCACES Output for Alternative 2

TABLE A-1

Volume Estimates for Disposal Areas

Cost Estimate Backup for Alternative 2

SEAD-12 Feasibility Study

Seneca Army Depot Activity

Cost Components	Duration/Unit	Basis
Excavation		
Backhoe	1.5 mos	
Staging/Sorting		
Bermed staging area		
Vibrating Screen	1.5 mos	
Stockpile area for rad soil	430 cy	
Stockpile area for non-rad soil	8164 cy	
Debris stockpile area for classified	1100 cy	
Debris stockpile area for non-classified	1100 cy	
Debris Disposal		
Disposal of rad debris - Envirocare	38 cy	
Transportation of rad debris - Envirocare	38 cy	
Disposal of Classified Debris (Army)	1100 cy	
Transportation of Classified Debris	1100 cy	
Disposal of non-rad, non-class debris (High Acres)	1061 cy	
Transportation to High Acres	1061 cy	
Soil Disposal		
Non-rad soil (keep on site)	8164 cy	Balance
Amount of Fill Needed (=quantity of debris)	2200 cy	
Transportation of non-rad soil	0 cy	
Non-rad over TAGM soil - High Acres or stabilize	0 cy	
Transportation to High Acres	0 cy	
Disposal of rad soil (Envirocare)	430 cy	
Transporatation of rad soil (Envirocare)	430 cy	
Extraction of GW		
Installation of 4 wells to be used as mw		
Frac tanks	140000 gal	
Pumps	4	
Analytical		
Confirmatory soil samples	20	
GW sampling	11	7 wells x 4 QA/QC samples
Frac tank sampling	14	assume 21,000 gall tanks - 7 tank fulls x 2 samples each tank full.
Soil Pile sampling	43	1 per 200 cy/ - round up to 25
TCLP	12	

Total Quantity		10793 cy
Quantity of soil		8594 cy
	100 lbs/cu.ft.	
	1.35 tons/cy	11601 tons
Amount of debris		2200 cy
	200 lbs/cu. ft	
	2.7 tons/cy	5939 tons

Assume 5% soil elevated rad levels
Assume 50% classified parts
Assume 3.5% classified debris rad levels

* Note that this estimates do not include expansion or contigency factors.

TABLE A-2
Cost Estimate Backup for Alternative 2
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SEAD-12: EXCAVATE/DISPOSE OFF-SITE

Description of Activity:
Excavate Disposal Pits A/B and C around anomalies. Screen out full military debris and C&D
identify any rad soil or debris
Segregate drums, cans, construction debris.
Dispose of drums/paint cans and sludge as haz. waste.
Dispose of soils (exceeding cleanup goals) and debris as non-haz waste. It appears that concentrations in soils are below TCLP.

soil volume (CY)	8594	12289
soil (tons)	11601	15082
debris volume (CY)	2200	3146
debris (tons)	5939	

Item	Qty.	Unit Cost	Source	Notes
Mobilization and Prep Work	1	3827.72		
Fencing				
Install CL fence	6500 LF			approximate perimeter around excavation area in disposal pits
Install CL gate	1			
Install 4 corner posts	4			
Remove fence	6500 LF			
Remedial Design				
Construction QA/QC, Chem. Data Acquisition Plan	200 hrs		SCG cost estimate	
Remedial Design	750 hrs			
Submittals, tech plans, requires indl. Hygenist, site safety & health	400 hrs			
Remedial Design Workplan		$30,000	FFA	
Preliminary Design Report		$50,000		
Pre-final/Final Design Report, including		$175,000		
O&M Plan				
S&A Plan				
QA Plan				
Contingency Plan				
Waste Management Plan				
Final design, specs, performance standards	750	hrs		
Remedial Action Workplan, including		$50,000		
QA/C Plan	200 hrs			
H&S Plan	200 hrs			
Project Closeout Plan		$50,000		

TABLE A-2
Cost Estimate Backup for Alternative 2
SEAD-12 Feasibility Study
Seneca Army Depot Activity

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soil volume (CY)	8594	12289
soil (tons)	11601	15082
debris volume (CY)	2200	3146
debris (tons)	5939	

Item	Qty.	Unit Cost	Source	Notes	
Confirmatory soil sampling (of all Areas)				(1 samp from walls and floor of excavation plus 20% QC)	
Analysis					
Tal Metals	90	155	STL (9/98)	15 tp	
PCBs	90	175			
Rad	90		Refer to MCACES output for SC-2 for price		
Disposal: soil sampling (of areas to be excavated (Area 2 and Others)--every 150 cy + QC)				TCLP required for non-haz. landfill disposal. ***Check how frequently!!!!	
Analysis (soil)				(1 samp every 150cy plus 20% QC)	239.46
TCLP Metals	98	120	STL (9/98)	Volume of excavation calculated as 8,594 cy	
TCLP PCBs	98	120	STL (9/98)	10% added.	
TCLP rad	98		Refer to MCACES output for SC-2 for price	volume (cy) x 1.30 x 1.10= 12,289 cy/150 = 82 82 x 1.20 = 98	
Sampling water from excavation (1 sample/holding tank)					
Analysis (water from excavation)					
TAL Metals	10	155	STL (9/98)		
PCBs	10	175	STL (9/98)		
rad	10		Refer to MCACES output for SC-2 for price		
Sampling groundwater (1 round) from 4 wells for closure					
TAL Metals	5	155	STL (9/98)	4 existing wells + 1	
VOCs	5	175	STL (9/98)		
rad	5		Refer to MCACES output for SC-2 for price		
Health Physicist	1	$7,200/mo.		approx. 16hr/wk over 3 mo.	
rad technician	1	$11,250/mo.		approx. 50hr/wk over 3 mo.	
Air sampling for rad			Refer to MCACES output for SC-2 for price		
Clearing and Grubbing					
Clearing site	1.3 acre	1061.54/acre	MCACES (NAT97C database)	Clearing, brush w/dozer & brush rake, light brush .000023 acres/SF - just for disposal pits	
Survey Remediation Area	10 days	$2,017.50/day			
Erosion Control					
Silt fence	16000lf	7.11/LF	MCACES (NAT97C database)	MCACES description: Erosion control, w/7.5' posts, silt fence, 3' high, polypropylene	
Hay bales	16000	1.24/LF			
Maintain silt fence and remove	16000	1.24/LF			

TABLE A-2
Cost Estimate Backup for Alternative 2
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SEAD-12: EXCAVATE/DISPOSE OFF-SITE

Description of Activity:
Excavate Disposal Pits A/B and C around anomalies. Screen out full military debris and C&D
identify any rad soil or debris
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soil volume (CY)	8594	12289
soil (tons)	11601	15082
debris volume (CY)	2200	3146
debris (tons)	5939	

Item	Qty.	Unit Cost	Source		Notes	
Site Work - Excavate areas related to Disposal Pits A/B and C					30% expansion factor and 10% contingency	
Excavate, Stockpile (10,793 cy)	15,434 cy	$35/cy		15434	(tot soil and debris vol.) x 1.30 x 1.10 = [cy]	
Screen soil, and re-stockpile			Sessler updated quote in letter 7/01		SES01	
Plastic sheeting for ground and cover	514,500	sf	.09/SF		(tot vol.) cy x (30% + 10%) = expanded vol (cy)	
Cover stockpiles with plastic					assume 1 pile or 150 cy occupies 5000 sf (recalculated) 103 piles x 5000 sf = 514,500 sf	
Clean fill	5969 tons	4.65/TON	DeWitt (Sept 1999)		amt of debris + offsite soil = (2200 cy + 1,632 cy) x 1.1 x 1.2 x 1.18 = 5969 tons	
Loam or topsoil, furnish and place	2850 cy	23.57/CY	MCACES (NAT97C database)		(to cover disp Areas - 1 ft deep); Area = 58,231 sf x 1 ft x 1.10 = 64,054 cf x 1.20 for compaction = 2847 cy	3070.7778
Dozer (to backfill)	2904 cy	1.01/CY	MCACES (NAT97C database)		amt of debris = 2200 cy*1.1*1.2 = 2904 cy	
Compaction	2904 cy	0.35/cy	MCACES (NAT97C database)		MCACES description: Compaction, steel wheel tandem roller, 5 ton	
Seeding, athletic field mix for Area 1	64.1 msf	69.79/SF	MCACES (NAT97C database)		58231 sf x 1.10 = 64,054 sf	9212
				2889.48		
Excavate drums						
Excavate drums	10 ea	38.40/ea	ECHOS		see worksheet: Drumrem	not in mcac
Hydraulic excavator	10 ea	38.40/ea	ECHOS		to move drums	not in mcac
Level B PPE	4 persons	500/ea	ECHOS			not in mcac
Dewater Excavation						
Holding Tanks	4	1,323.00	MCACES (NAT97C database)		21,000 Gallon (500Bbl), Steel, Open, Stationary, Monthly Rental	
Pump	160hr	16.32/hr	MCACES (NAT97C database)		PUMP,CENTRF,DW,6"D, 100GPM/40'HD	
Confirmatory soil sampling (1 per soil boring)					(1 samp from each soil boring plus 20% QC)	
Analysis						
Tal Metals	60	155	STL (9/98)		40*1.2=60	
PCBs	60	175	STL (9/98)			
rad	60		Refer to MCACES output for SC-2 for price			
IDW soil sampling (1 per drum)					(1 samp from each soil boring plus 20% QC)	
Analysis						
Tal Metals	20	155	STL (9/98)		15*1.2=18	
PCBs	20	175	STL (9/98)			
rad	20		Refer to MCACES output for SC-2 for price			
In Situ Gamma Spec		$1000/mo				

TABLE A-2
Cost Estimate Backup for Alternative 2
SEAD-12 Feasibility Study
Seneca Army Depot Activity

SEAD-12: EXCAVATE/DISPOSE OFF-SITE

Description of Activity:

Excavate Disposal Pits A/B and C around anomalies. Screen out full military debris and C&D
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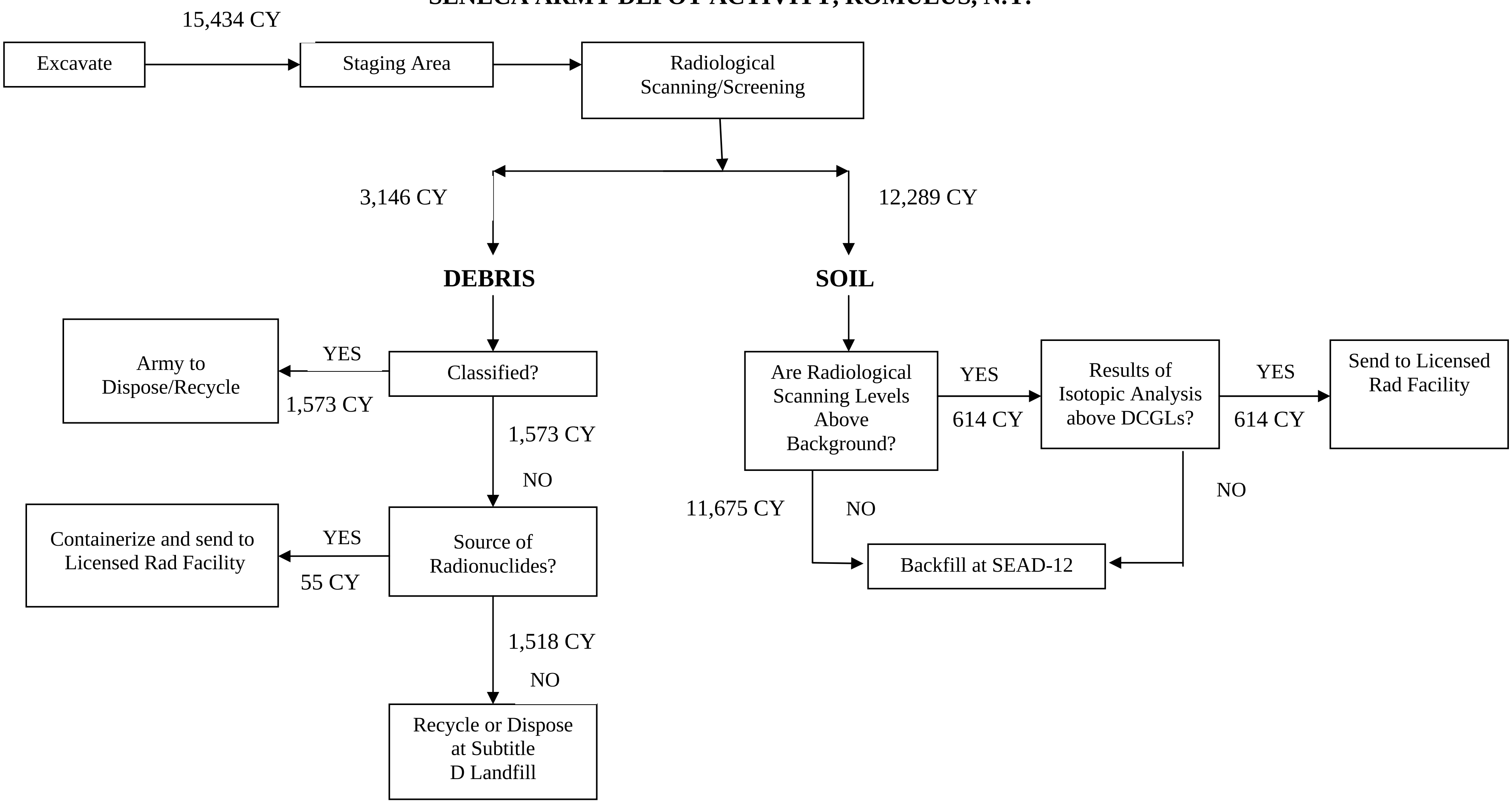
soil volume (CY)	8594	12289
soil (tons)	11601	15082
debris volume (CY)	2200	3146
debris (tons)	5939	

Item	Qty.	Unit Cost	Source	Notes
Disposal: Drums/paint containers (haz waste)				
Overpack	20 drums	38.58ea	MCACES (NAT97C database)	HW packaging, overpacks, 18"dia x 34"H, 16ga stl drum, 55gal
Disposal of rad soil	614	149.5	Envirocare	(cy) vol rad soil x 1.1 x 1.2
Disposal of rad debris	55	427.5	Envirocare	(cy)
transportation of rad waste	1004		Refer to MCACES output for SC-2 for price	
Transportation (haz waste)	5 drums	545.70/van	Waste Management Inc. (5/99)	(includes 7% state taxes) (quote based on 1 van to transport drums)
Disposal Fees (haz waste)	5 drums	133.75ea	Waste Management Inc. (5/99)	(includes 7% state taxes) (quote based on drums containing an oil liquid, low-viscosity, NO-PCBs)
Extra Fees for Overpack Disposal	5 drums	40ea	Waste Management Inc. (5/99)	charge for disposing overpack
Disposal: Debris/Soils (non-haz waste)				20% of volume exceeds the cleanup goals
Transport and dispose(excavated soil)	3502	31.50/ton	Earthwatch (7/00)	8,164 cy x 20% x 1.1 x 1.3 x 1.5 t/cy = 3502 tons
Transport and dispose (debris)	2276	31.50/ton	Earthwatch (7/00)	tons
Demobilization				
Decomtamination	1	8821.2		
Demob	1	3528.48		

FIGURE A-1
DISPOSAL DECISION FLOW CHART
SEAD-12 FEASIBILITY STUDY
SENECA ARMY DEPOT ACTIVITY, ROMULUS, N.Y.



NOTE: (1) Volumes shown on this figure include soil expansion or contingency factors.

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SC-2; SEAD-12
SC-2; EXCAVATION/OFF-SITE
DISPOSAL
Risk-based Cleanup Goals

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 11/10/01
Effective Date of Pricing: 10/03/96
Est Construction Time: 120 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

The estimate is structured as follows and uses a 2 digit number at each level. The 2 digit numbers for the first 3 title levels are taken from the HTRW Remedial Action Work Breakdown Structure. The 2 digit numbers for the remaining title levels are user defined. The detail items are at LEVEL 6.

LEVEL 1 - WBS Level 1 (Account)
LEVEL 2 - WBS Level 2 (System)
LEVEL 3 - WBS Level 3 (Subsystem)
LEVEL 4 - User Defined (Assembly Category or Other)
LEVEL 5 - User Defined (Assembly or Other)

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative SC-2.

Off-Site Disposal: Excavate/Off-site Disposal
- Mobilize, site prep, clear/grub, erosion control, and survey
- Excavate Disposal Pits A/B and C around anomalies.
- Screen out full militiary debris and C&D.
- Identify any rad soil or debris.
- Segregate drums, cans, construction debris.
- Treat water by air stripping.
- Dispose of drums in off-site hazardous waste landfill and construction debris in off-site solid waste landfill.
- Dispose soils with concentrations > Cleanup Goals at off site landfill.
- Backfill excavations with excavated soils with concentrations < goals.
- Cover Area 1 with 2' vegetative cover.
- Demobilize
- Groundwater monitoring for 5 years (costed separately)

PRODUCTIVITY:

Productivity, as a baseline and as taken from the Unit Price Book (UPB) Database, assumes a non-contaminated working environment with no level of protection productivity reduction factors. When required, productivity for appropriate activities will be adjusted for this project as follows:

1. Level of Protection A - Productivity ___%
2. Level of Protection B - Productivity ___%
3. Level of Protection C - Productivity ___%
4. Level of Protection D - Productivity 85%.

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

Level A Level B Level C Level D

Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
* Break time ranges (minutes)	60-140	60-140	40-140	30-70

The following list are the areas where there is the biggest potential for changes in cost due to uncertainties:

- Quantities of soil over TAGMs could increase based on the results of the confirmatory sampling done in the excavation.
- The quantities of soil requiring disposal as hazardous waste could increase based on the results of the confirmatory sampling done in the soil piles.

Contractor costs are calculated as a percentage of running total as

5 % for field office support
15 % for home office support
10 % for profit
4 %for bond

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

*Engineering and Design During Construction (EDC)	1.5%
As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.5%

33.01. Mobilization	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action								
33.01. Mobilization								
USR AA <PAR06 > Mobilization	1.00 EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing								
33.02.06. Groundwater								
Groundwater - from holding tanks								
AFH AA <STL11 > For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	10.00 EA	0	0	0	0	1,750	1,750	175.00
AFH AA <STL01 > For Disposal: NYSDEC TAL - Inorganics, groundwater (Severn Trent Lab, 9/98) (Assume 1 sample per tank)	10.00 EA	0	0	0	0	1,550	1,550	155.00
33.02.11. Soil								
For disposal; TCLP analysis required for non hazardous landfill disposal. Assuming 1 sample every 150 cy: 23,025 cy x 1.40/150 = 215 x 1.2 = 260 samples								
AFH AA <STL11 > For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	98.00 EA	0	0	0	0	11,760	11,760	120.00
AFH AA <STL06 > For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	98.00 EA	0	0	0	0	11,760	11,760	120.00
33.02.12. Confirmatory Soil - Rad								
Includes all laboratory analysis cost for the soil sampling (20 confirmatory and 23 soil pile samples (1 per 200 cy). 45 day turnaround time. Confirmatory samples analyzed for radionuclides and TAL metals only.								
RAD AA <01954 8238 > Testing, LAS, uranium-total, radn analy veg/sed/soil, gamma spect	90.00 EA	0	0	0	0	6,075	6,075	67.50
RAD AA <01954 8214 > Testing, LAS, plutonium isotopic, radn analy veg/sed/soil, alpha	90.00 EA	0	0	0	0	12,900	12,900	143.33
RAD AA <01954 8236 > Testing, LAS, radium-226, 228, radn analy veg/sed/soil, gamma spect	90.00 EA	0	0	0	0	11,100	11,100	123.33
AFH AA <01954 7628 > Testing, LAS, S&SA, semivolatile organics (8270)	90.00 EA	0	0	0	0	41,100	41,100	456.67
AFH AA <01954 7630 > Testing, LAS, S&SA, TAL metals (6010/7000s).	90.00 EA	0	0	0	0	17,325	17,325	192.50
HTW AA <01954 7423 > Testing, LAS, HW RCRA eval, TCLP - total list	90.00 EA	0	0	0	0	135,000	135,000	1500.00
RAD AA <01954 8211 > Testing, LAS, americium isotopic, radn analy veg/sed/soil, alpha	90.00 EA	0	0	0	0	12,600	12,600	140.00

33.02. Sampling, & Testing		QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
RAD AA <01954 8221 >	Testing, LAS,gross beta-tot, radn analy veg/sed/soil,gas flow prop cnt	90.00	EA	0	0	0	0	4,500	4,500	50.00
RAD AA <01954 8243 >	Testing, LAS, liquid scintillation, tritium, radn analy veg/sed/soil	90.00	EA	0	0	0	0	5,400	5,400	60.00
RAD AA <01954 8215 >	Testing, LAS, thorium isotopic, radn analy veg/sed/soil, alpha	90.00	EA	0	0	0	0	12,600	12,600	140.00
33.02.13. Confirmatory-Soil - No Rad										
AFH AA <STL12 >	Confirmatory: NYSDEC CLP-Pest/PCBs , soil (Severn Trent Lab, 9/99) (Assume 1 sample every 100 lf + 20% QC	90.00	EA	0	0	0	0	15,750	15,750	175.00
AFH AA <STL06 >	Confirmatory: NYSDEC CLP TAL - Metals , soil (Severn Trent	90.00	EA	0	0	0	0	13,950	13,950	155.00
33.05. Air Monitoring & Sampling - Rad										
USR AA <01954 4114 >	Digital Dust Sampler (Monthly Rental)	2.00	EA	0	0	0	1,621	0	1,621	810.53
USR AA <01954 4121 >	Ambient Air Monitor (Monthly Rental)	2.00	EA	0	0	0	3,345	0	3,345	1672.41
USR AB <01954 4466 >	Micro-R, Gas Prop detector, Gas Prop floor detector, Fidler	10.00	WK	0	0	6,650	0	0	6,650	665.00
33.08. Site Work										
33.08.02. Clearing and Grubbing										
AF AA <02110 0500 >	Clearing, brush w/dozer & brush rake, light brush	1.30	ACR	21	562	818	0	0	1,380	1061.54
33.08.08. Survey Remediation Area										
Survey remediation area										
USR AA <PAR04 >	Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.08.11. Erosion control										
B MIL AA <PAR08 >	Silt Fence: Installation and materials high, polypropylene	16000	LF	3,360	80,000	8,000	25,680	0	113,680	7.11
B HTW AA <PAR01 >	Hay bales - stalked	16000	LF	5	2,720	0	17,120	0	19,840	1.24
B MIL AA <PAR07 >	Maintain silt fence and remove	16000	LF	107	2,720	0	17,120	0	19,840	1.24
33.10. Fencing										
MIL AA <02046 0752 >	Site dml, chain link fence, remove & salvage for reuse	6500.00	LF	335	8,450	0	0	0	8,450	1.30
MIL AA <02833 4620 >	Fence, CL scty, std FE-6, 6' high, no gates/signs	6500.00	LF	312	9,165	0	129,502	0	138,667	21.33
MIL AA <02835 6715 >	Fence, CL, set in conc, 6' H, indl, corner post, galv stl, 4" OD	4.00	EA	2	55	9	295	0	358	89.48
MIL AA <02835 7105 >	Fence, CL, double, 24' W, indl, gates, swing, 6' high	1.00	EA	0	0	0	435	0	435	435.38

33.11. Wastewater

		QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.11. Wastewater										
33.11. 1. Wastewater										
L MIL AA <15288 4260 >	Pump, cntfgl,6"D, horiz mtd, horiz splt, sgl stg,1500GPM,50HP	1.00	EA	0	0	0	10,767	0	10,767	10766.88
M HTW AA <PAR16 >	21,000 Gal, Steel, hold tank stationary	4.00	EA	0	0	0	5,264	0	5,264	1316.10
33.12. Air Stripping										
HTW AA <13273 4111 >	HTRW,PTTU,1'dia,14.5'pkng hgt, 30GPM,850CFM,FRP shell	1.00	EA	97	3,257	0	7,009	0	10,265	10265.47
AFH AA <13273 4137 >	HTRW,PTTU, >= 12' high, install air strip tower, 1'- 3' diam.	1.00	EA	91	3,035	226	0	0	3,261	3261.05
HTW AA <13273 4161 >	HTRW, PT opt, air flow switch (loss of air flow - motor failure)	1.00	EA	0	0	0	512	0	512	511.81
33.15. Rad Scanning										
B HTW AA < >	In Situ Gamma Spec	3.00	MN	0	0	3,000	0	0	3,000	1000.00
33.20. Soil Remediation										
33.20.02. Sitework - Soils	Excavating Areas 1,2,3,4, Others Volumes are increased by 30% for expansion and 10% contingency. For weight calculations, the volume is increased by 10% only. All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Soils category.									
USR AA <SES01 >	Excavate, stockpile, screen soil	15434	CY	15,434	390,172	0	0	540,190	930,362	60.28
USR AA <PAR09 >	Plastic sheeting for ground: 6mil polyethylene liner (1000sf	514500	SF	0	0	0	44,041	0	44,041	0.09
MIL AA <02241 0805 >	Loam or topsoil, furnish & place, imported, 6" deep	2850.00	CY	251	7,610	3,962	55,592	0	67,163	23.57
USR AA <DEW01 >	Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt, 1999) For this option, excavated material with concentrations of COCs less than Clean up Goals will be used as backfill.	5969.00	TON	0	0	0	27,783	0	27,783	4.65
AF AA <02240 0030 >	Fill, spread borrow w/dozer	2904.00	CY	35	1,045	1,888	0	0	2,933	1.01
AF <02220 5800 >	Compaction, steel wheel tandem roller, 5 ton	2904.00	CY	21	610	523	0	0	1,133	0.39
RSM AA <02932 0010 >	Seeding, athletic field mix, 8#/MSFpush spreader	64.10	MSF	64	1,620	0	2,853	0	4,474	69.79

33.20. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.20.04. Drum Removal									
Approx. 20 drums in Area 1									
L MIL AA <ECHOS 02 > Excavator for drum removal at Level B	10.00	EA	1	162	223	0	0	384	38.40
L MIL AA <ECHOS 02 > Excavator for drum moving at Level B	10.00	EA	1	162	223	0	0	384	38.40
L MIL AA <ECHOS 03 > Level B breathing unit, suit, overboots, gloves	4.00	EA	0	0	2,000	0	0	2,000	500.00
33.20.05. Disposal: Rad									
Disposal and Transportation of drums to hazardous waste landfill; disposal of debris and soil in solid waste landfill.									
HTW AA <SM01/ SM02 > Soils: Disposal of rad soil (Envirocare) 7/00)	614.00	CY	0	0	0	0	91,793	91,793	149.50
USR AA <SM01/ SM02 > Debris: Disposal of rad debris (Envirocare)	55.00	CY	0	0	0	0	23,513	23,513	427.50
USR AA <WM01 > Transportation of rad waste	1004.00	TON	0	0	0	0	3,223	3,223	3.21
33.20.06. Disposal: Non Rad									
Disposal and Transportation of drums to hazardous waste landfill; disposal of debris and soil in solid waste landfill.									
HTW AA <02083 5114 > HW packaging, overpacks, 18"dia x 34"H, 16ga stl drum, 55gal, DOT 17C	20.00	EA	0	0	0	1,583	0	1,583	79.13
USR AA <WM01 > Transportation of drums by dedicated van (Price quoted by Waste Management, Inc. 5/99. Includes 7% NY tax. Does not include overpack.)	1.00	EA	0	0	0	0	546	546	545.70
USR AA <WM02 > Disposal of drums (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	5.00	DR	0	0	0	0	669	669	133.75
USR AA <WM03 > Extra fees for overpack use	5.00	EA	0	0	0	0	200	200	40.00
HTW AA <SM01/ SM02 > Transport and Dispose nonhaz waste, bulk (debris)	2276.00	TON	0	0	0	0	71,694	71,694	31.50
HTW AA <SM01/ SM02 > Transport and Dispose nonhaz waste, bulk (soil)	3502.00	TON	0	0	0	0	110,313	110,313	31.50
33.26. Demobilization									
TOTAL Decontaminate Equipment	1.00	EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00	EA	0	528	2,500	500	0	3,528	3528.48

33.31. Remedial Design		QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.31. Remedial Design										
B HTW AA <PAR20	> Remedial Design Workplan	1.00	EA	0	27,600	0	2,568	0	30,168	30168.00
B HTW AA <PAR21	> Preliminary Design Report	1.00	EA	0	46,000	0	4,280	0	50,280	50280.00
B HTW AA <PAR22	> Pre-final/Final Design Report, Including O&M Plan, S&A Plan, QA Plan, Contingency Plan, Waste	1.00	EA	0	168,000	0	7,490	0	175,490	175490.00
B HTW AA <PAR23	> Remedial Action Workplan, including QA/QC Plan, H&S Plan	1.00	EA	0	47,500	0	2,675	0	50,175	50175.00
B HTW AA <PAR24	> Project Closeout Plan	1.00	EA	0	48,000	0	2,140	0	50,140	50140.00
	TOTAL SC-2; SEAD-12			20,137	866,086	40,019	375,885	1,157,259	2,439,249	

** PROJECT INDIRECT SUMMARY - ACCOUNT (Rounded to 10's) **

		QUANTY	UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT COST
33	Remedial Action	1.00	EA	2,439,250	121,910	383,280	294,020	129,290	3,367,750	3367747.70

** PROJECT INDIRECT SUMMARY - SYSTEM (Rounded to 10's) **

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT COST
33 Remedial Action								
33.01 Mobilization	1.00 EA	3,830	190	600	460	200	5,290	5287.54
33.02 Sampling, & Testing	1.00 EA	315,120	15,760	49,630	38,050	16,740	435,300	435300.05
33.05 Air Monitoring & Sampling - Rad	1.00 EA	11,620	580	1,100	1,020	370	14,700	14695.25
33.08 Site Work	1.00 EA	174,910	8,750	27,550	21,120	9,290	241,620	241624.08
33.10 Fencing	1.00 EA	147,910	7,400	23,300	17,860	7,860	204,320	204320.48
33.11 Wastewater	1.00 EA	16,030	800	2,520	1,940	850	22,150	22145.28
33.12 Air Stripping	1.00 EA	14,040	700	2,210	1,700	750	19,390	19392.27
33.15 Rad Scanning	1.00 EA	3,000	150	470	360	160	4,140	4144.14
33.20 Soil Remediation	1.00 EA	1,384,190	69,150	217,830	167,000	73,480	1,911,660	1911658.24
33.26 Demobilization	1.00 EA	12,350	620	1,950	1,490	660	17,060	17059.60
33.31 Remedial Design	1.00 EA	356,250	17,810	56,110	43,020	18,930	492,120	492120.77
TOTAL Remedial Action	1.00 EA	2,439,250	121,910	383,280	294,020	129,290	3,367,750	3367747.70

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT COST
33 Remedial Action								
33.01 Mobilization	1.00 EA	3,830	190	600	460	200	5,290	5287.54
TOTAL Mobilization	1.00 EA	3,830	190	600	460	200	5,290	5287.54
33.02 Sampling, & Testing								
33.02.06 Groundwater	1.00 EA	3,300	170	520	400	180	4,560	4558.55
33.02.11 Soil	1.00 EA	23,520	1,180	3,700	2,840	1,250	32,490	32490.06
33.02.12 Confirmatory Soil - Rad	1.00 EA	258,600	12,930	40,730	31,230	13,740	357,220	357224.45
33.02.13 Confirmatory-Soil - No Rad	1.00 EA	29,700	1,490	4,680	3,590	1,580	41,030	41026.99
TOTAL Sampling, & Testing	1.00 EA	315,120	15,760	49,630	38,050	16,740	435,300	435300.05
33.05 Air Monitoring & Sampling - Rad	1.00 EA	11,620	580	1,100	1,020	370	14,700	14695.25
33.08 Site Work								
33.08.02 Clearing and Grubbing	3.00 ACR	1,380	70	220	170	70	1,910	635.43
33.08.08 Survey Remediation Area	1.00 ACR	20,180	1,010	3,180	2,440	1,070	27,870	27869.34
33.08.11 Erosion control	1.00 LF	153,360	7,670	24,150	18,520	8,150	211,850	211848.44
TOTAL Site Work	1.00 EA	174,910	8,750	27,550	21,120	9,290	241,620	241624.08
33.10 Fencing	1.00 EA	147,910	7,400	23,300	17,860	7,860	204,320	204320.48
33.11 Wastewater								
33.11. 1 Wastewater	1.00 EA	16,030	800	2,520	1,940	850	22,150	22145.28
TOTAL Wastewater	1.00 EA	16,030	800	2,520	1,940	850	22,150	22145.28
33.12 Air Stripping	1.00 EA	14,040	700	2,210	1,700	750	19,390	19392.27
33.15 Rad Scanning	1.00 EA	3,000	150	470	360	160	4,140	4144.14
33.20 Soil Remediation								
33.20.02 Sitework - Soils	1.00 EA	1,077,890	53,840	169,590	130,020	57,210	1,488,540	1488541.10
33.20.04 Drum Removal	1.00 EA	2,770	140	440	330	150	3,820	3823.66
33.20.05 Disposal: Rad	1.00 EA	118,530	5,930	18,670	14,310	6,300	163,730	163732.68
33.20.06 Disposal: Non Rad	1.00 EA	185,000	9,250	29,140	22,340	9,830	255,560	255560.80
TOTAL Soil Remediation	1.00 EA	1,384,190	69,150	217,830	167,000	73,480	1,911,660	1911658.24
33.26 Demobilization								
33.26.04 Decontaminate Equipment	1.00 EA	8,820	440	1,390	1,070	470	12,190	12185.43

	QUANTY UOM	DIRECT	FIELD OH	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT COST
33.26.06 Demobilization	1.00 EA	3,530	180	560	430	190	4,870	4874.17
TOTAL Demobilization	1.00 EA	12,350	620	1,950	1,490	660	17,060	17059.60
33.31 Remedial Design	1.00 EA	356,250	17,810	56,110	43,020	18,930	492,120	492120.77
TOTAL Remedial Action	1.00 EA	2,439,250	121,910	383,280	294,020	129,290	3,367,750	3367747.70

No errors detected...

* * * END OF ERROR REPORT * * *

SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

APPENDIX B

RESPONSE TO COMMENTS

RESPONSE TO USEPA COMMENTS

- Response (dated 5/21/2003) to USEPA Comments Dated 8/15/2002
- Table - Summary Statistics of Comparison between EM-5 and Background and Resident/Worker Criteria for Radionuclides in Soil
- Table - Summary Statistics of Comparison between EM-6 and Background and Resident/Worker Criteria for Radionuclides in Soil
- Addendum Response (dated 3/30/2007) to USEPA Comments Dated 8/15/2002

Response to Comments from the U.S. Environmental Protection Agency

Subject: Draft FS Report for SEAD-12
Seneca Army Depot
Romulus, New York

Comments Dated: August 15, 2002

Date of Comment Response: May 21, 2003

General Comments:

Comment 1: The Feasibility Study (FS) states that the high levels of Pb-210 at EM-5 are naturally occurring, and presents a different statistical test (i.e., ANOVA) to demonstrate this position. However, EM-5 failed the non-parametric statistical test performed (i.e., WRS), and according to MARSSIM additional site-specific information should be provided to fully evaluate all the possible reasons for failure, their causes, and their remedies. Another alternative recommended by MARSSIM is to increase the scanning area and provide the reasons for why the survey unit was mis-classified. The parametric ANOVA test does not provide enough justification to disqualify EM-5 as an Area of Concern (AOC).

Response 1: In responding to this comment, the Army would first like to clarify one thing in EPA's comment. The Analysis of Variance (ANOVA) test was used to demonstrate that potentially elevated levels of Radium-226, not Lead-210, in soils at EM-5 are within background levels and are not associated with military activities at the site. During the remedial investigation, comparison of Ra-226 data from EM-5 (as well as EM-6) and the worker DCGL using the Wilcoxon Rank Sum (WRS) test indicated that the site levels of Ra-226 were above the DCGL levels. Upon further investigation of the Ra-226 results at EM-5, an error was found in the WRS analyses for these two areas. The site data from EM-5 and EM-6 for Ra-226 are actually within background plus worker DCGL values and are not elevated according to this analysis. Therefore, the ANOVA analysis is no longer necessary and reference to this test will be removed from the text of the FS.

Although the ANOVA test results were used as justification for eliminating EM-5 as an area of concern (AOC) with respect to Ra-226, an additional rationale was provided in Section 1.3 of the FS with respect to elevated levels Pb-210 observed at EM-5. They are as follows:

- A source of naturally-occurring uranium (native shale) is present.
- The region has a history of elevated radon (and consequently elevated amounts of radon progeny, including Pb-210).
- It is reasonable to assume that radon gas emanations from the subsurface may become trapped in localized areas within the soil matrix. This trapped gas may then decay and result in localized elevated areas of radon progeny (including Pb-210, Pb-214, and Bi-214). With a

half-life of 22.3 years, Pb-210 is more likely to accumulate within the soil matrix than the shorter-lived progeny.

- There is no known source of military items containing radioactive materials in EM-5.

In addition, the likelihood of uranium progeny such as Ra-226 and Pb-210 being present in significant amounts as a result of military items (if they were present) is quite small. Both enriched and depleted uranium initially are stripped of impurities (i.e., progeny) as a result of the enrichment/depletion process. Although in-growth does start immediately after enrichment/depletion, the long half-lives of U-238 and U-235 would limit the buildup of significant amounts of progeny in the last 50 years. The same is true for processed radium used in military items.

It is not believed that EM-5 was mis-classified and additional scanning is not necessary. Rather than reclassifying this area, the Army will re-sample the surface soil samples originally collected from this area and analyze them for Pb-210 using longer count times to reduce the detection limit. In responding to NYSDEC comments regarding the same issue, the State was concerned that perhaps analytical error may be the cause of some of the elevated readings found at EM-5. This is outlined in the Supplemental Remedial Investigation (RI) Workplan.

Comment 2: The FS provides remediation alternatives and supporting information for elevated levels of trichloroethene (TCE) in groundwater near Building 813. The horizontal and vertical extent of this plume, however, has not been adequately determined. One well is located within the plume and one well is presumably located downgradient. While the source area is presumed to be in the vicinity of Building 813, the exact location (e.g., a leach field or septic tank) is not known. Therefore, it is premature to propose remediation technologies until the plume has been completely characterized and the source area has been better defined. This supplemental investigation is proposed in the FS to be done under Section 4.0 Treatability Study. However, EPA found no information in this Section regarding such investigation. EPA is performing further evaluation on the proposed Treatability Study, and a comment letter will be forwarded to you under a separate cover.

Response 2: There will be a supplemental remedial investigation (RI) performed to acquire information to further characterize specific areas within SEAD-12. Please refer to the Supplemental RI Workplan submitted simultaneously with these comments for complete details on the information to be collected in the vicinity of Building 813 and 814 that will assist in the determination of the horizontal and vertical extent of the TCE groundwater plume. Additional activities proposed and detailed in the workplan pertaining to defining the TCE plume near Buildings 813 and 814 include:

- Installation and groundwater sampling of 15 temporary monitoring wells;
- Installation of 7 permanent overburden monitoring wells;
- Groundwater sampling of the 7 new permanent wells and the 4 existing wells;
- Land surveying of new temporary and permanent monitoring wells, and

- Surface water sampling.

Comment 3: The summary of the human health risk assessment provided in section 2.5.1 indicates that cancer risks are above the EPA target range of 10^{-4} to 10^{-6} for Disposal Pit A/B, Disposal Pit C, and the former dry waste disposal pit for the future resident. The excess cancer risk was due to dermal contact with surface water and groundwater. Several concerns should be addressed:

- The clean-up goals provided in Table 2-5 indicate that the source removal is driven by the need to remove military debris, and not to reduce risk. The discussion of these alternatives should be based on reducing the cancer risk via contact with groundwater and surface water to acceptable levels. In addition, text on page 2-8 indicates that metals in subsurbace soil are two to five times above the TAGM values. Remedial alternatives should be adequate to reduce the concentrations of metals in subsurface soil to meet TAGMs and remove soils that may be impacting groundwater. The clean-up goals should be revised.

- The alternatives for Disposal Pit A/B and C include no action, excavation, and capping. It is not clear how the selected alternative(s) will reduce risks associated with surface water and groundwater. A discussion should be added to the text.

In addition, it is not clear why the Former Dry Waste Disposal Pit was not part of this FS. The human health risk assessment indicates an unacceptable risk to the future resident. Justification for not including this area in the FS should be provided.

Response 3: Although cancer risks calculated for a future resident were above the EPA target range of 1 x 10^{-4} and 1 x 10^{-6} for Disposal Pit A/B, Disposal Pit C, and the former dry waste disposal pit, alternatives considered in the FS did not address reduction of this risk for the following reason. The excess cancer risk for the future resident was due to dermal contact with surface water and groundwater, which are believed to be grossly overestimated. Surface water and groundwater were evaluated on a site wide basis and any risk from these media were added to site specific risks for each area of concern (i.e. risk generated from soil at Disposal Pit A/B, Disposal Pit C, and the former dry waste disposal pit). The cancer risk for dermal contact to groundwater is 4 x 10^{-4} and the cancer risk for dermal contact to surface water is 2 x 10^{-4}. Specifically, the contaminant that drives this risk level is benzo(a)pyrene. Below is an excerpt from Section 6.5.2.1 of the Revised Final Remedial Investigation Report (August 2002) that explains why the calculated risk from exposure to benzo(a)pyrene was considered highly uncertain and overestimated.

"The reader is cautioned that the cancer risk values attributed to benzo(a)pyrene due to dermal contact with water are highly uncertain and may grossly overestimate actual risks. In groundwater this compound was detected in two wells during the same sampling event and was not confirmed during the second round of groundwater sampling (i.e. results were non detect for this compound). In both cases, the reported concentration was a very low estimated value, lower than the quantitation limit for the samples. In surface water this compound was detected in one sample during the ESI study phase; the compound was not detected during the RI study phase. Therefore, it is highly unlikely that the compound is pervasive in either groundwater or surface water across SEAD-12, and it is possible that the detections were analytical artifacts associated with the laboratory's effort to identify and semi-quantify compounds at very low concentrations. Also, in "Dermal Exposure Assessment: Principals and Applications", EPA warns that its exposure assessment method for dermal contact with water during showering may yield seemingly unreasonable (i.e., counterintuitive) results. For instance, the absorbed dose due to dermal contact may exceed the dose received by direct ingestion of the same water. This was the case for benzo(a)pyrene in groundwater at SEAD-12. It should also be noted that the single detected benzo(a)pyrene concentrations were below the applicable New York drinking water standard."

Based on the reasons provided above, reduction of the excess cancer risk due to exposure to benzo(a)pyrene in the groundwater and surface water was not considered in developing remedial alternatives at SEAD-12. In eliminating the risk from benzo(a)pyrene, risk levels for a future resident are within acceptable ranges. Additional text will be added to Section 2.5.1 of the FS to explain why this risk is believed to be overestimated and reduction of the excess cancer risk was not considered in development of alternatives.

With respect to establishing cleanup goals for metals at the site, although there are some exceedances of metals above the TAGM, human health risk is not exhibited, and, therefore, cleanup goals for these metals will not be established. However, please note that the remedial actions proposed would address the majority of areas where these exceedances occur by removing military debris.

Comment 4: Potential adverse short-term effects on the environment that may be caused by the remediation effort (e.g., interceptor trench increasing the vertical extent of contamination) were not adequately discussed. In addition, any uncertainties concerning the alternatives were not discussed. Following EPA 1988 Guidance for Conducting RI and FS, the uncertainties of alternatives as well as and their effects on remedy performance should be discussed in the text.

Response 4: Short-term effects on the environment that may be caused by the remediation effort, as well as uncertainties concerning the alternatives, will be added to the text once additional data are gathered in the Building 813/814 area and the alternatives may be more fully developed.

Comment 5: Recent EPA guidance, EPA 2000, recommends using a discount rate of 7% rather than the 5% used in the document. Additional analysis at the higher discount rate is needed to evaluate uncertainty in future economic conditions.

Response 5: According to EPA Guidance *A Guide to Developing and Documenting cost Estimates During the Feasibility* Study (EPA 2000), "the 7% discount rate should generally be used in calculating net present value costs for all non-federal facility sites." The guidance recommends that for federal facility sites "it is generally appropriate to apply the real discount rates found in Appendix C of OMB [Office of Management and Budget] Circular A-94", *Guidelines and Discount Rates for Benefit-Cost Analyses of Federal Programs*. The current real interest rate for a 30-year period is 3.2% (OMB 2003). The Army has complied with EPA's request and recalculated the present worth costs based on the 2000 EPA guidance using the 3.2% discount rate. Table 5-2 and related text have been revised accordingly. Please note that use of a different rate has no effect on the cost ranking of the analyses.

Comment 6: The FS does not include a general schedule for the remediation activities. The schedule should include estimated start and completion times.

Response 6: Section 5.6 has been added to the FS, which includes a general schedule for the remediation activities, including an estimated start date and an estimated date of completion.

Comment 7: It is unclear why Building 804 was singled out on the submittal letter. Different titles are found on the outside cover, cover sheet and submittal letter.

Response 7: In future correspondence, the title "Radioactive Waste Burial Sites – SEAD-12" will be used.

<u>Specific Comments</u>:

Comment 1: <u>Section 1.3, page 1-7</u>. This section provides a discussion of radiation present at EM-5. No further action is proposed for this area. This determination was based on an extra statistical evaluation of radiation in samples compared to background radiation levels. This procedure is not supported by MARSSIM (Section 8.5.3). SEDA must show that the samples with elevated levels of Pb-210 also have elevated levels of stable lead.

Response 1: Please refer to the response to General Comment #1 for a discussion of the statistics involved in the evaluation of EM-5 and for a justification of the use of the ANOVA test for statistical analysis following the guidance of MARSSIM.

It may not be appropriate to make a comparison between stable lead concentrations and radioactive lead concentrations because of the small contribution of radioactive lead to the overall lead profile. Based on a specific activity for Pb-210 of 7.65E13 pCi/g (per *The Health Physics and Radiological Health Handbook, 3rd Edition*), the highest Pb-210 concentration at EM-5 (76.9 pCi/g from sample TP12-15C) would be equivalent to about 1E-6 mg/kg of Pb-210, which is a negligible fraction of the

63.9 mg/kg lead concentration determined chemically at that location. Therefore, it is unlikely that a correlation between chemical lead concentrations and radioactive lead concentrations could be established.

Comment 2: Section 1.5.2, page 1-12. This section provides soil sample designations for areas with elevated zinc content in Disposal Area C and indicates that a limited removal action may be warranted. The areas of elevated zinc should be depicted on a figure to determine whether the excavation alternative for this area will remove this soil.

Response 2: Such a figure already exists in Section 2.8, "Remediation Volume Estimates", that depicts the zinc concentrations at Disposal Pit C. Figure 2-4 posts the sampling locations, the concentrations that exceeded criteria levels, and an outline of the proposed area of excavation at Disposal Pit C.

Comment 3: Section 2.7.3, page 2-13. This section states that excavated soil and debris will be "scanned" for radiological contamination, with the goal of ensuring that the DCGLs remain below the level presented in Table 2-5. Table 2-5 presents specific radionuclides, implying that the debris/soil will be sampled. According to Table 2-6, some of the debris removed from the test pits in Disposal Pit C had gamma radiation levels of eight times above background. Soil/debris should be screened using an appropriate real-time radiation detecting device that identifies individual nuclides. The text should be revised.

Response 3: Radiological screening activities will consist of scanning and segregating potentially elevated materials. Preliminary screening flag values will be based on background measurements and a gross activity DCGL (calculated per Section 4.3.4 of MARSSIM using the isotopic DCGLs listed in Table 2-5). Using a conservative flag value as the basis for separating unaffected soil from potentially contaminated soil or debris ensures on a real-time basis that elevated material is being segregated. If necessary, materials having potentially elevated levels of radiation will be further characterized on-site using gamma spectroscopy or at an off-site analytical laboratory.

The text in Section 2.7.3 will be clarified, and will read:

"…Throughout the remedial process, excavated soil and debris will be scanned for radiological contamination, with the goal of ensuring that residual radioactivity levels are below the DCGLs (plus background) presented in Table 2.5. Radiological screening activities will consist of scanning and segregating potentially elevated materials; the screening will be done in situ in layers that are no deeper then the screening instrument can efficiently detect. Preliminary screening flag values will be based on background measurements and a gross activity DCGL. If necessary, materials having potentially elevated levels of radiation will be further screened on-site using gamma spectroscopy or at an off-site analytical laboratory. Pursuant to the preceding ARARs analysis, further consideration of any additional chemical-specific, location-specific, or action-specific radiological ARARs does not appear to be warranted."

It is indicated in Table 2-6 that there were "cone-shaped objects" found in test pit TP12-3 (North) that had gamma radiation screening measurements at eight times background levels. The table also indicates in the column titled "Removal Action?" that these objects were removed. Section 4.3.4.2 from the SEAD-12 Remedial Investigation Report (Parsons, August 2002) provides a more detailed explanation of the objects found in the test pits at Disposal Pit C. With these objects removed from Disposal Pit C, there are no known remaining locations within the excavation area that are expected to exceed screening levels.

Comment 4: Section 2.8.2, page 2-13. This section states that the southernmost portion of Disposal Pit A/B does not require remediation because contaminants and debris were absent from the area, and no electromagnetic (EM) anomalies were detected. The area to which this statement refers is not clear. The area should be further clarified by providing additional text or locating it on a figure.

Response 4: The text has been modified to clarify that the southern most portion of Disposal Pit A/B refers to the "potential release area" that is shaded in gray in Figure 2-2 to indicate the boundary of the area, but is not within the boxed area that indicates the "area to be excavated" for Disposal Pit A/B.

Comment 5: Table 2-9. This table provides the technology screening for groundwater remediation. The table indicates that air stripping would be retained for further study. While air sparging is a form of in-situ air stripping, ex-situ air stripping was not discussed in the FS. Justification should be provided in the text.

In addition, soil vapor extraction (SV) was not evaluated in the table. SVE is a proven technology that has demonstrated effectiveness at removing TCE from the vadose zone. Justification for not evaluating SVE should be provided in the text.

Response 5: Ex-situ air stripping will be added as a final treatment option in place under groundwater alternative GW-4. This alternative will now include the option to either use liquid-phase activated carbon or ex-situ air stripping to treat groundwater once it is collected.

Soil Vapor Extraction (SVE) is not evaluated in Table 2-9 because the table relates to technology screening for groundwater remediation. However, SVE is discussed as an alternative in Table 2-8 that relates to technology screening for soil/debris remediation. This technology was eliminated from further consideration since no TCE has been detected at this point within the vadose zone. In addition, both NYSDEC and EPA challenged the implementation of bioventing at SEAD-25 and 26 at SEDA due to the tight formation. The Army would anticipate similar resistance to implementation of soil vapor extraction at SEAD-12 due similar geological nature. SVE will not be considered in the assembly of alternatives.

Comment 6: Section 3.5 and Tables 3-2 and 3-3. This portion of the text describes the screening criteria for the remedial alternatives while the tables provide the actual screening. There are several discrepancies between the tables and the text. A discussion of the columns entitled permanence and availability were not included in the text. These discrepancies should be addressed.

Response 6: Both the tables (Tables 3-2 and 3-3) along with the corresponding text in Section 3.5 have been revised. The column in Tables 3-2 and 3-3 entitled "availability" has been changed to "availability of services and materials". An explanation of what is considered under this factor has been added to the text in Section 3.5.3. Text in Section 3.5.2 has been added, clarifying the factors considered in the category of permanence.

Comment 7: Section 3.6.2.6, page 3-10. This section states that air sparging and interceptor trenches were ranked highest for permanence. Table 3-3, however, indicates that excavation provided the highest level of permanence. This discrepancy should be addressed.

Response 7: Table 3-3 had been revised to indicate that air sparging (GW-3) and interceptor trenches (GW-4) were both ranked the highest for permanence.

Comment 8: Section 4.3.1, page 4-4. This section outlines the data requirements to define the extent of the TCE plume near Building 813. At present, one well is within the plume and one well presumably downgradient. Six new wells of unspecified depth are proposed to define the plume. Several issues should be addressed:

- The source of the contamination has not been located. The EM survey that appears to cover this area (Figure 2-1) should be evaluated to determine whether a possible source structure is present (e.g., a leach field or septic tank) is present. The anomaly EM-19 appears to be near the expected source area. Text should be revised to address this anomaly.
- Horizontal and vertical extent of contamination is required. Efforts should be made to determine whether the bedrock (shale) aquifer has been impacted. Information provided in this report indicates that the shale is fractured. The depth of the six wells to be installed was not provided. The text should be revised to include a detailed evaluation of the structural characteristics of the bedrock in this area. In addition, the text should indicate that the vertical extent of contamination will be defined. If contamination is present in the bedrock aquifer, several of the remedial alternatives proposed would not be applicable.
- If only six wells are to be used to delineate the plume horizontally and vertically, it is suggested that a soil gas or direct-push membrane interface probe (MIP) investigation be undertaken to properly locate the wells at the fringes of the plume. MIP can provide

information on lithology as well as vertical segregation of TCE within the till aquifer. Consideration should be provided to conducting one of these investigations.

Figure 2-6 provides an extrapolation of the TCE plume. The drainage ditch and surface water sample 12-31 are mentioned in the text. These features are not provided on the figure. These features, including the flow direction of water in the drainage ditch, should be provided on the figure.

Response 8: Information pertaining to the extent and characterization of the TCE plume by Building 813 will be addressed when the additional information collected during the supplemental remedial investigation is analyzed. This will include correlation of the source areas and the EM anomalies and details of the horizontal and vertical extents of the contamination. Please refer to the supplemental workplan for details of the additional activities to be performed.

In response to concerns noted above, the source of the TCE contamination will be investigated as part of the supplemental RI investigation. According to Table 4-2 in the RI, the EM-19 anomaly is due to a backhoe. This anomaly will not be investigated further. However, potential outlets from Buildings 813/814 will be investigated further in order to locate a source. In order to determine the horizontal and vertical extent of contamination, 15 temporary wells will be used in conjunction with previously collected soil gas survey data to locate the extent of the contamination. No bedrock wells are proposed. Although a weathered shale layer is present, a competent shale layer exists below this. Extensive studies at the Ash Landfill have shown no communication between the upper and lower aquifers and therefore, no bedrock investigation will be conducted.

Figure 2-6 has been updated to include the drainage ditch sample, surface water sample SW12-31, and the direction of groundwater flow in the drainage ditch.

Comment 9: Section 4.3.2, page 4-4. This section provides data requirements for natural attenuation. According to EPA (1998) additional parameters are required:

1. Temperature;
2. Optional confirmation of biological activity;
3. Hydraulic gradient;
4. An estimate of hydraulic conductivity; and
5. An estimate of the heterogeneity of aquifer material.

These parameters should be added to the text.

Response 9: Agreed. Based on guidance set forth in the *Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater* (EPA, September 1998), text describing the evaluation of temperature, hydraulic gradient, hydraulic conductivity, and aquifer heterogeneity has been added to Section 4.3.2. In terms of biological activity, the Army believes that the updated list of parameters listed in Section 4.3.2 will provide adequate information to evaluate the presence or absence of biological activity and chlorinated compound degradation. To compliment the additional parameters recommended by EPA listed above, text has been added to clarify that the fraction of organic carbon in soils will also be measured as part of the monitored natural attenuation (MNA) evaluation. Fraction organic carbon, when used in combination with estimates for porosity and bulk mass density, can be used to evaluate the effects of sorption on chlorinated ethane fate and transport. Appropriate text has also been added to the Supplementary RI Workplan for SEAD-12 to indicate that sample collection and analysis for the aforementioned parameters will be performed as part of supplemental RI field activities.

Comment 10: <u>Section 4.4.1, page 4-5</u>. This section discussed the treatability study and data needs for air sparging. Additional data needs include:

1. Vadose zone gas permeability;
2. Aquifer permeability and heterogeneities; and
3. Evaluate the presence of low-permeability layers.

In addition, it is also useful to collect air saturation data in the saturated zone using a neutron probe. This information should be added to the study.

Response 10: Text has been modified in Section 4.4.1 to include the above listed parameters to the potential list of data needs. A detailed description of the additional data to be collected can be found in the Supplemental RI Workplan.

Comment 11: <u>Section 4.4.4, page 4-8</u>. This section describes the in-situ permeable reactive wall remedial alternative, including the bench-scale test. Additional data needs include buffering capacity and permeability of the aquifer material. Investigation of these parameters should be added to the text.

Response 11: Text has been added to Section 4.4.4 to indicate that the local groundwater velocity and buffering capacity will be estimated as part of the treatability study evaluation for in-situ chemical reaction with zero-valance iron. The Army has included a further recommendation that major cation species (potassium, manganese, magnesium, calcium, sodium) be added to the analyte list for the purpose of evaluating potential long-term effects of chemical precipitation on barrier performance. Appropriate text has also been added to the Supplementary RI Workplan for SEAD-12 to indicate that sample collection and analysis for the aforementioned parameters will be performed as part of supplemental RI field activities.

Comment 12: <u>Section 5.2.2, page 5-3</u>. This section discusses the excavation alternative for Disposal Pits A/B and C. The text does not take into account the potential for the presence of unexploded ordnance (UXO) or ordnance and explosives (OE) in the pits. Test pit information indicates that inert (fired) munitions were uncovered in the disposal pits. The likelihood of UXO or OE presence in the pits should be evaluated and discussed in the text.

Response 12: Nothing found in the test pits constitutes UXO or OE, and according to the Army, it is not believed that UXO or OE was ever used, buried, destroyed, or found at SEAD-12. Consequently, the work planned at SEAD-12 does not take into account UXO or OE because it is not believed to be a hazard.

Comment 13: Section 5.2.2.1, page 5-4. This section states that material excavated from the disposal pits will be segregated into two piles, one with radiation levels lower than background and one with radiation levels above background. The above background pile would be further separated into materials below action levels and those above action levels at a later time. This discussion appears to pertain to waste materials and not soil. It may be difficult to separate soil above action levels from that below action levels once the soil has been placed in one pile. The text should provide provisions for separating soil above action levels from that below action levels.

Response 13: The discussion in Section 5.2.2.1 applies to all materials removed during the excavation, including debris and soil. Initially, soil will be screened in situ and separated as discussed in the response to Specific Comment #3 above. Two piles of soil and debris will result from the screening: soil equal or below background and soil above background.

It is acknowledged that soil may be difficult to segregate if residual contamination is present in a distributed form. With the excavated soils, localized hotspots or “chunks” of elevated material (and adjacent soils) will be removed when possible. If hotspots are not present or if their locations cannot be determined within the above-background soils, confirmation sampling will be performed at the location of the highest scanning measurement, and the whole soil pile may be classified based on the concentrations present in that sample.

Excavated materials (soil and debris) will be considered solid waste subject to RCRA Subtitle D and New York State solid waste regulations. In New York, all sanitary landfills are authorized to accept industrial wastes, and, therefore, would be able to accept the materials excavated from SEAD-12. These landfills cannot accept hazardous waste or radiological waste, and therefore require extensive testing to assure that the waste is not a hazardous waste. The actual testing requirements vary for each landfill. Once the landfill is selected, these requirements will be specified.

Comment 14: Section 5.3.1.7, page 5-9. This section states that one 5-year review will be conducted for the natural attenuation alternative. This remedy is expected to require 30 to 40 years to complete. Therefore, at least six 5-year reviews should be budgeted; one for each 5 years of remediation. These costs should be added to the text and associated tables.

Response 14: The text in Section 5.3.1.7 discussing the O&M cost associated with the GW-2 natural attenuation alternative has been modified to clearly indicate that six 5-year reviews at $9,000 apiece and a discount rate of 3.2%, for a present worth value of $32,300, are included in the cost. The present value for six 5-year reviews were estimated by using a compounded interest rate of 0.171 (1.032^5-1) for 5, 10, 15, 20, 25, and 30 years. The modification has also been made in Table 5-2.

Comment 15: Section 5.3.3.1, page 5-13. This section provides an analysis of the interceptor trench/liquid-phase carbon alternative. The estimated time for remediation completion was not provided. This information should be provided in the text.

Response 15: As indicated in Section 5.3.3.7, the there is an estimated 5-year treatment time. Once the groundwater at the site meets the treatment criteria, the remedial action would be considered permanent. The estimated length of treatment time will be added to Section 5.3.3.1, Definition of Alternative GW-4, for clarification.

Comment 16: Section 5.5, page 5-23. This section states that natural attenuation is the recommended groundwater remedial alternative. The time-frame for remediation by natural attenuation is expected to be 30 to 40 years. The text indicates that the other technologies screened would take from 4 to 10 years for remediation of the groundwater plume. EPA (1997) states that "Monitored natural attenuation is appropriate as a remedial approach only when it can be demonstrated capable of achieving a site's remedial objectives within a time-frame that is reasonable compared to that offered by other methods…". Justification should be provided that the time-frame for remediation by natural attenuation is comparable to remediation times for other alternatives.

Because the time-frame is generally not comparable, natural attenuation is typically used in conjunction with other technologies, such as source removal or air sparging. Consideration should be given to combining natural attenuation with other alternatives.

Response 16: It is acknowledged that the estimated time frame monitored natural attenuation should be comparable to that of alternate methods. As indicated in Section 5.3.1.1, additional information will be collected during the supplemental investigation to further define the area of VOC impacts for improved characterization of the area. The primary objective of this site modeling would be to demonstrate whether natural degradation processes would reduce contaminants concentrations below the Class GA groundwater standards for TCE, and associated degradation products. The natural biodegradation process would also be evaluated during the pilot study phase; the effects of addition of nutrients and reducing agents on degradation rates and the capacity of the aquifer to degrade the VOCs will be assessed. The ability to more precisely define the time frame for the alternative will be improved upon the collection of the additional information because natural attenuation is extremely dependent on site conditions.

Table
Summary Statistics of Comparison Between EM-5 and Background and Resident/Worker Criteria for Radionuclides in Soil
SEAD-12 Feasibility Study
Seneca Army Depot Activity

	Valid N EM-5	Valid N Background	Rank Sum EM-5	Rank Sum Background	U	Z	Pass/Fail	Greater if Fail
Bi-214	30	37	1301.5	976.5	273.5	3.6	Fail	Site
Bi-214 Res	30	37	1268	1010	307	3.1	Fail	Site
Bi-214 Worker	30	37	1067	1211	508	0.6		
Cs-137	30	37	1222	1056	353	2.6	Fail	Site
Cs-137 Res	30	37	465	1813	0	-7.0	Fail	Background
Co-57	30	37	1019	1259	554	0.0		
Co-57 Res	30	37	465	1813	0	-7.4	Fail	Background
Co-60	30	37	974	1304	509	-0.6		
Co-60 Res	30	37	590	1688	125	-5.5	Fail	Background
Pb-210	30	37	1326	952	249	3.9	Fail	Site
Pb-210 Res	30	37	1313	965	262	3.7	Fail	Site
Pb-210 Worker	30	37	1167	1111	408	1.9	Fail	Site
Pb-211	30	37	1039	1239	536	0.2		
Pb-211 Res	30	37	998	1280	533	-0.3		
Pb-211 Worker	30	37	954	1324	489	-0.8		
Pb-214	30	37	1170	1108	405	1.9	Fail	Site
Pb-214 Res	30	37	1132	1146	443	1.4		
Pb-214 Worker	30	37	863	1415	398	-2.0	Fail	Background
Pu-239	30	37	707.5	1570.5	242.5	-4.2	Fail	Background
Pu-239 Res	30	37	465	1813	0	-7.1	Fail	Background
Ra-223	30	37	1274	1004	301	3.4	Fail	Site
Ra-223 Res	30	37	629	1649	164	-5.0	Fail	Background
Ra-226	30	37	1301.5	976.5	273.5	3.6	Fail	Site
Ra-226 Res	30	37	1268	1010	307	3.1	Fail	Site
Ra-226 Worker	30	37	1067	1211	508	0.6		
Ra-228	30	37	1196.5	1081.5	378.5	2.2	Fail	Site
Ra-228 Res	30	37	1056	1222	519	0.5		
Ra-228 Worker	30	37	921	1357	456	-1.2		
Th-230	30	37	933	1345	468	-1.1		
Th-230 Res	30	37	929	1349	464	-1.1		
Th-230 Worker	30	37	794	1484	329	-2.9	Fail	Background
Th-232	30	37	1106.5	1171.5	468.5	1.1		
Th-232 Res	30	37	949	1329	484	-0.9		
H-3	30	37	1386.5	891.5	188.5	5.0	Fail	Site
H-3 Res	30	37	644	1634	179	-5.0	Fail	Background
U-233/234	30	37	1300	978	275	3.6	Fail	Site
U-233 Res	30	37	465	1813	0	-7.0	Fail	Background
U-235	30	37	963.5	1314.5	498.5	-0.8		
U-235 Res	30	37	465	1813	0	-7.1	Fail	Background
U-238	30	37	1158.5	1119.5	416.5	1.8	Fail	Site
U-238 Res	30	37	465	1813	0	-7.0	Fail	Background

Table
Summary Statistics of Comparison Between EM-6 and Background and Resident/Worker Criteria for Radionuclides in Soil
SEAD-12 Feasibility Study
Seneca Army Depot Activity

	Valid N EM-6	Valid N Background	Rank Sum EM-6	Rank Sum Background	U	Z	Pass/Fail	Greater if Fail
Bi-214	27	37	1101.5	978.5	275.5	3.1	Fail	Site
Bi-214 Res	27	37	1073	1007	304	2.7	Fail	Site
Bi-214 Worker	27	37	857	1223	479	-0.3		
Cs-137	27	37	836.5	1243.5	458.5	-0.6		
Cs-137 Res	27	37	378	1702	0	-6.8	Fail	Background
Co-57	27	37	954.5	1125.5	422.5	1.3		
Co-57 Res	27	37	378	1702	0	-7.2	Fail	Background
Co-60	27	37	943	1137	434	0.9		
Co-60 Res	27	37	552	1528	174	-4.5	Fail	Background
Pb-210	27	37	889	1191	488	0.2		
Pb-210 Res	27	37	858	1222	480	-0.3		
Pb-210 Worker	27	37	618	1462	240	-3.5	Fail	Background
Pb-211	27	37	1036.5	1043.5	340.5	2.2	Fail	Site
Pb-211 Res	27	37	1006	1074	371	1.7	Fail	Site
Pb-211 Worker	27	37	981	1099	396	1.4		
Pb-214	27	37	999	1081	378	1.7	Fail	Site
Pb-214 Res	27	37	968	1112	409	1.2		
Pb-214 Worker	27	37	701	1379	323	-2.4	Fail	Background
Pu-239	27	37	496.5	1583.5	118.5	-5.4	Fail	Background
Pu-239 Res	27	37	378	1702	0	-7.0	Fail	Background
Pm-147	6	31	153	550	54	1.6		
PM147res	6	31	21	682	0	-3.9	Fail	Background
Ra-223	27	37	1109	971	268	3.3	Fail	Site
Ra-223 Res	27	37	484	1596	106	-5.4	Fail	Background
Ra-226	27	37	1101.5	978.5	275.5	3.1	Fail	Site
Ra-226 Res	27	37	1073	1007	304	2.7	Fail	Site
Ra-226 Worker	27	37	857	1223	479	-0.3		
Ra-228	27	37	1150.5	929.5	226.5	3.7	Fail	Site
Ra-228 Res	27	37	1035	1045	342	2.1	Fail	Site
Ra-228 Worker	27	37	917	1163	460	0.5		
Th-230	27	37	814	1266	436	-0.9		
Th-230 Res	27	37	811	1269	433	-0.9		
Th-230 Worker	27	37	610	1470	232	-3.6	Fail	Background
Th-232	27	37	1119	961	258	3.3	Fail	Site
Th-232 Res	27	37	986	1094	391	1.5		
H-3	27	37	938.5	1141.5	438.5	1.1		
H-3 Res	27	37	378	1702	0	-7.3	Fail	Background
U-233/234	27	37	1070.5	1009.5	306.5	2.7	Fail	Site
U-233 Res	27	37	378	1702	0	-6.8	Fail	Background
U-235	27	37	700.5	1379.5	322.5	-2.7	Fail	Background
U-235 Res	27	37	378	1702	0	-7.0	Fail	Background
U-238	27	37	953	1127	424	1.0		
U-238 Res	27	37	378	1702	0	-6.8	Fail	Background

Addendum Response to Comments from the U.S. Environmental Protection Agency

Subject: Draft FS Report for SEAD-12
Seneca Army Depot
Romulus, New York

Comments Dated: August 15, 2002

Date of Addendum Response: March 30, 2007

A draft Feasibility Study (FS) for SEAD-12 was submitted in May 2002. Comments dated on August 15, 2002 were received from USEPA and Parsons submitted a response to the comments in May 2003. In order to address certain comments from USEPA and NYSDEC concerning the groundwater in the vicinity of Buildings 813/814 and some anomalous radiation readings in the EM-5 area, a supplemental remedial investigation (SRI) was conducted. This addendum response is to update those responses addressed by the SRI; all the other responses not referred in this addendum are still valid (it should be noted that the sections of the FS report may have been renumbered and therefore may be different from those referred in the original response).

Details of the SRI investigation, analytical results, and findings are presented in the SRI report (Parsons, 2006). A summary of the major changes in the FS based on the SRI findings is presented below.

- The SRI showed that trichloroethene (TCE) contamination in SEAD-12 groundwater was isolated to MW12-37 and the adjacent area (groundwater was not impacted within 20 ft of MW12-37). Furthermore, soil having TCE concentrations greater than the NYSDEC TAGM (700 mg/kg) that was co-located with MW12-37, was removed during the SRI. Groundwater remediation is no longer warranted for SEAD-12. The comments related to groundwater remediation and treatability study are no longer applicable, since this portion has been removed from the FS. Responses to comments associated with groundwater remediation and treatability study are updated in this addendum response.
- Based on the additional soil sampling conducted during the SRI in the EM-5 area, Pb-210 was not detected in any samples collected from EM-5 area. Therefore, no further action is proposed for EM-5 area. Response to comments related to the EM-5 area is updated in this addendum.

Presented below are the updated responses to the comments regarding groundwater at Building 813/814 and the EM-5 area.

General Comments:

Comment 1: The Feasibility Study (FS) states that the high levels of Pb-210 at EM-5 are naturally occurring, and presents a different statistical test (i.e., ANOVA) to demonstrate this position. However, EM-5 failed the non-parametric statistical test performed (i.e., WRS), and according to MARSSIM additional site-specific information should be provided to fully evaluate all the possible reasons for failure, their causes, and their remedies. Another alternative recommended by MARSSIM is to increase the scanning area and provide the reasons for why the survey unit was mis-classified. The parametric ANOVA test does not provide enough justification to disqualify EM-5 as an Area of Concern (AOC).

Response 1: During the SRI conducted in October 2006, ten soil sample locations within the EM-5 area were re-sampled and analyzed for Pb-210 using a modified DOE EML HASL-300 method which was intended to lower uncertainty levels found in the RI results. Based on the SRI findings, Pb-210 was not detected in any samples collected from the EM-5 area using the modified method Elevated levels detected during the RI are attributed to the large analytical uncertainty associated with an alternate method. Uncertainty in the results was reduced from approximately 38 pCi/g to 4 pCi/g, using the modified method. Therefore, no further action is proposed for EM-5 area.

Comment 2: The FS provides remediation alternatives and supporting information for elevated levels of trichloroethene (TCE) in groundwater near Building 813. The horizontal and vertical extent of this plume, however, has not been adequately determined. One well is located within the plume and one well is presumably located downgradient. While the source area is presumed to be in the vicinity of Building 813, the exact location (e.g., a leach field or septic tank) is not known. Therefore, it is premature to propose remediation technologies until the plume has been completely characterized and the source area has been better defined. This supplemental investigation is proposed in the FS to be done under Section 4.0 Treatability Study. However, EPA found no information in this Section regarding such investigation. EPA is performing further evaluation on the proposed Treatability Study, and a comment letter will be forwarded to you under a separate cover.

Response 2: The SRI showed that trichloroethene (TCE) contamination in SEAD-12 groundwater was isolated to MW12-37 and the adjacent area (groundwater was not impacted within 20 ft of MW12-37). Furthermore, soil having TCE concentrations greater than the NYSDEC TAGM (700 mg/kg) that was co-located with MW12-37, was removed during the SRI. Therefore, groundwater remediation is no longer warranted for SEAD-12 and Section 4.0 Treatability Study has been removed from the FS report.

Comment 4: Potential adverse short-term effects on the environment that may be caused by the remediation effort (e.g., interceptor trench increasing the vertical extent of contamination) were not adequately discussed. In addition, any uncertainties concerning the alternatives were not discussed. Following EPA 1988 Guidance for Conducting RI and FS, the uncertainties of alternatives as well as and their effects on remedy performance should be discussed in the text.

Response 4: Groundwater remediation is no longer warranted based on the SRI findings. Therefore, discussion of groundwater remedial alternatives has been removed from the report. Uncertainties associated with soil/debris remedial action alternatives and their effects on remedy performance has been included in the Draft Final FS report (Section 4.5).

Comment 5: Recent EPA guidance, EPA 2000, recommends using a discount rate of 7% rather than the 5% used in the document. Additional analysis at the higher discount rate is needed to evaluate uncertainty in future economic conditions.

Response 5: Acknowledged. Interest rate is no longer needed for the cost calculation as groundwater remediation is no longer included in the FS report.

Specific Comments:

Comment 1: Section 1.3, page 1-7. This section provides a discussion of radiation present at EM-5. No further action is proposed for this area. This determination was based on an extra statistical evaluation of radiation in samples compared to background radiation levels. This procedure is not supported by MARSSIM (Section 8.5.3). SEDA must show that the samples with elevated levels of Pb-210 also have elevated levels of stable lead.

Response 1: Please refer to response to General Comment 1 above. EM-5 has been eliminated as an area of concern based on re-sampling analyses performed during the SRI.

Comment 8: Section 4.3.1, page 4-4. This section outlines the data requirements to define the extent of the TCE plume near Building 813. At present, one well is within the plume and one well presumably downgradient. Six new wells of unspecified depth are proposed to define the plume. Several issues should be addressed:

- The source of the contamination has not been located. The EM survey that appears to cover this area (Figure 2-1) should be evaluated to determine whether a possible source structure is present (e.g., a leach field or septic tank) is present. The anomaly EM-19 appears to be near the expected source area. Text should be revised to address this anomaly.
- Horizontal and vertical extent of contamination is required. Efforts should be made to determine whether the bedrock (shale) aquifer has been impacted. Information provided in this report indicates that the shale is fractured. The depth of the six wells to be installed was not provided. The text should be revised to include a detailed evaluation of the structural characteristics of the bedrock in this area. In addition, the text should indicate that the vertical extent of contamination will be defined. If contamination is present in the bedrock aquifer, several of the remedial alternatives proposed would not be applicable.
- If only six wells are to be used to delineate the plume horizontally and vertically, it is suggested that a soil gas or direct-push membrane interface probe (MIP) investigation be undertaken to properly locate the wells at the fringes of the plume. MIP can provide information on lithology as well as vertical segregation of TCE within the till aquifer. Consideration should be provided to conducting one of these investigations.

Figure 2-6 provides an extrapolation of the TCE plume. The drainage ditch and surface water sample 12-31 are mentioned in the text. These features are not provided on the figure. These features, including the flow direction of water in the drainage ditch, should be provided on the figure.

Response 8: Investigation of TCE plume near Building 813 has been completed during the SRI. The detailed discussion of the investigation and results is presented in the SRI report (Parsons, 2006). Based on the SRI findings, groundwater remedial action is no longer warranted at SEAD-12. Figure 2-6 has been removed from the report.

The following specific comments are no longer applicable to the FS report due to the fact that groundwater remedial action is no longer warranted based on the SRI findings. The sections, figures, and tables associated with groundwater remediation have been removed from the FS report.

Comment 5: Table 2-9. This table provides the technology screening for groundwater remediation. The table indicates that air stripping would be retained for further study. While air sparging is a form of in-situ air stripping, ex-situ air stripping was not discussed in the FS. Justification should be provided in the text.

In addition, soil vapor extraction (SV) was not evaluated in the table. SVE is a proven technology that has demonstrated effectiveness at removing TCE from the vadose zone. Justification for not evaluating SVE should be provided in the text.

Comment 7: Section 3.6.2.6, page 3-10. This section states that air sparging and interceptor trenches were ranked highest for permanence. Table 3-3, however, indicates that excavation provided the highest level of permanence. This discrepancy should be addressed.

Comment 9: Section 4.3.2, page 4-4. This section provides data requirements for natural attenuation. According to EPA (1998) additional parameters are required:

1. Temperature;
2. Optional confirmation of biological activity;
3. Hydraulic gradient;
4. An estimate of hydraulic conductivity; and
5. An estimate of the heterogeneity of aquifer material.

These parameters should be added to the text.

Comment 10: Section 4.4.1, page 4-5. This section discussed the treatability study and data needs for air sparging. Additional data needs include:

1. Vadose zone gas permeability;
2. Aquifer permeability and heterogeneities; and
3. Evaluate the presence of low-permeability layers.

In addition, it is also useful to collect air saturation data in the saturated zone using a neutron probe. This information should be added to the study.

Comment 11: Section 4.4.4, page 4-8. This section describes the in-situ permeable reactive wall remedial alternative, including the bench-scale test. Additional data needs include buffering capacity and permeability of the aquifer material. Investigation of these parameters should be added to the text.

Comment 14: Section 5.3.1.7, page 5-9. This section states that one 5-year review will be conducted for the natural attenuation alternative. This remedy is expected to require 30 to 40 years to complete. Therefore, at least six 5-year reviews should be budgeted; one for each 5 years of remediation. These costs should be added to the text and associated tables.

Comment 15: Section 5.3.3.1, page 5-13. This section provides an analysis of the interceptor trench/liquid-phase carbon alternative. The estimated time for remediation completion was not provided. This information should be provided in the text.

Comment 16: Section 5.5, page 5-23. This section states that natural attenuation is the recommended groundwater remedial alternative. The time-frame for remediation by natural attenuation is expected to be 30 to 40 years. The text indicates that the other technologies screened would take from 4 to 10 years for remediation of the groundwater plume. EPA (1997) states that "Monitored natural attenuation is appropriate as a remedial approach only when it can be demonstrated capable of achieving a site's remedial objectives within a time-frame that is reasonable compared to that offered by other methods…". Justification should be provided that the time-frame for remediation by natural attenuation is comparable to remediation times for other alternatives.

Because the time-frame is generally not comparable, natural attenuation is typically used in conjunction with other technologies, such as source removal or air sparging. Consideration should be given to combining natural attenuation with other alternatives.

RESPONSE TO NYSDEC COMMENTS

- Response (dated 5/21/2003) to NYSDEC Comments Dated 8/22/2002
- Response Related to Radiological Data in the Class III Area (dated 5/21/2003)
- Addendum Response (dated 3/30/2007) to NYSDEC Comments Dated 8/22/2002

Response to Comments from the New York State Department of Environmental Conservation

Subject: Draft Feasibility Study Report at the
Radiological Waste Burial Sites (SEAD-12)
Seneca Army Depot
Romulus, New York

Comments Dated: August 22, 2002

Date of Comment Response: May 21, 2003

General Comments:

Comment A: In Section 8.8 of the summary of the RI Report, the Army states that "installation and monitoring of groundwater monitoring wells near Building 814 to define the source of TCE (including monitoring MW12-37 and existing downgradient wells to confirm limited extent of transport)" should be included in the FS. However, there is a disconnect between what was said in the RI and in the Draft FS, where the Army proposes monitored natural attenuation (MNA) as the proposed alternative. As stated in Section 8.8 of the RI Report, additional work is needed to define the groundwater contaminant plume and the soil source. Only by ensuring that the soil source has been defined can the Army proceed with an FS for this area.

To aid in determining the source of TCE groundwater contamination and the extent of the plume, the Department recommends, in addition to that which was stated in Section 8.8 of RI Report, the following: an inspection of the floor drains, integrity of the lines, and outfalls of Buildings 813/814; soil sampling (in the vicinity of the relatively elevated soil gas samples and detection of TCE in surface water sample SW12-30) performed on the southern and southeastern side of Buildings 813/814; and the installation and sampling of additional groundwater monitoring wells. During the investigation of the source, it would be beneficial to attain additional hydraulic data and analysis to better define the nature of the groundwater flow. The extent of sampling necessary to define the source and determine the extent of groundwater contamination could be discussed at a BCT meeting.

As stated in Section 8.8 of the RI Report, "a human health BRA and ERA were not conducted on the soils" at Buildings 813/814, and the "only human health risk calculated was due to dermal contact of benzo(a)pyrene in the groundwater." Also, "(N)o human health BRA or ERA was conducted on the soils from Building EM-5," or Building EM-6. However the Army based the Remedial Action Objectives (RAOs) on the BRA. Therefore the Army did not take into account the human health and ecological risks associated with these sites during the development of the RAOs. Language in the FS should be revised to reflect this.

Response A: It is agreed that additional investigation is necessary to be able to properly characterize the TCE plume located near Buildings 813 and 814. Please refer to the Supplemental Remedial Investigation Workplan for details of the work to be performed.

The text will be revised to acknowledge that a BRA was not conducted for all areas within SEAD-12. The Remedial Action Objectives were based on the results of the risk assessment, which was only performed on the areas with documented activity associated with WSA activities, areas where RI investigations confirmed significant "military" activity, or proximity to buildings associated with activities of greatest potential concern.

Comment B: Section 8.8 of the RI Report stated that "the FS will include further evaluation of the elevated Pb-210 levels associated with the archeological debris at EM-5." However, in Section 8.10 of the RI, it is summarized for EM-5, "investigation and debris removal address Pb-210 contamination issues." However, the draft FS provides an insufficient evaluation by simply presenting a theory. The draft FS should follow the recommendations of the RI, in that the elevated levels of Pb-210 should be further evaluated, and if necessary, investigation and debris removal should be performed to address the Pb-210 contamination.

During the evaluation, additional work may be beneficial in determining the best remedial alternative for EM-5. Also, as discussed at our August 21, 2002 teleconference, several aspects of the RI Report should be clarified. The samples should be reanalyzed using appropriate methodology for Radium-226 which uses the ingrowth of daughter products Pb-214 and Bi-214 as surrogates. Ra-226 has an interfering gamma from Uranium-235, and can lead to overestimates of the Ra-226 concentration. The Pb-210 results may be caused by an insufficient count time, which can lead to elevated detection limits. Parsons has set the DCGL's for this site and should adhere to them. Placing caveats on results is not appropriate since there may be no definitive way to determine a radionuclide's origin as natural or man-made. Also, it is not appropriate to compare the radiological exceedances at SEAD-12 to industrial worker DCGLs. If the site is to be as is planned, i.e. conservation/recreation, then the most conservative DCGLs (residential DCGLs?) should be used for comparison.

Response B: Elevated levels of Pb-210 found at EM-5 are believe to be caused to the buried archeological debris found in the area that dates back to before SEDA existed and there was a farmstead in the area, as explained in Section 1.3 of the FS. In order to further justify and determine the cause of the elevated Pb-210 measurements, additional surface and subsurface soil samples will be collected at EM-5 as part of the Supplemental RI; see the workplan for details of the work to be performed.

DCGLs previously presented are preliminary goals, which will be re-evaluated once additional data are collected.

Comment C: In re-reviewing the RI Report, in conjunction with the draft FS, a few issues arose that should be clarified in the next iteration of the FS. Please explain why there are different background results for the various locations for each radionuclide. Were there multiple background areas? For instance, in the Class 3 soils, it shows a background of 10.75 pCi/g for Pb-211, and a maximum value of 20.10 pCi/g. 10.75 pCi/g of Pb-211 would not be considered background. Please explain how the Army derived these results. The sample results are only as good as the associated QA/QC. The actual lab result forms do not appear to be included in the RI report. This information would be useful in determining the level of confidence in all sample results. Please provide QA/QC for the associated EM-5 and Class 3 data.

Response C: Site specific radiological background samples were collected in locations specified in Section 2.6 of the RI (Parsons, August, 2002). There were not multiple background areas for radionuclides. The above referenced table of summary statistics comparing Background soil to Class III soil, **Table 4-20** in the RI (Parsons, August 2002), presents the minimum, maximum, average, median, and standard deviation of both the background data set and the site area data set. 10.75 pCi/g is the maximum value of Pb-211 in background and 20.10 pCi/g is the maximum value of Pb-211 in the Class III soils; the data is presented side-by-side for comparison. In **Tables 4-4**, **4-6**, **4-16**, **4-18**, **4-20**, and **4-23** of the RI where the summary statistics are present with the results of the Wilcoxon Rank Sum (WRS) statistical analysis, for the data values presented the duplicates and the samples were averaged together, the detects (no qualifier or "J" qualifier) were taken at full value, and all non-detect values (U or UJ qualifier) were taken at half value (see the footnote in each of the tables); this is the protocol for setting up data to evaluate with WRS statistics. With the above information taken into account, the background dataset in the above listed tables corresponds with the background radiological analytical results presented in Table G-19 in Appendix G of the RI

The actual lab result forms (the laboratory narrative, the chain-of-custody reports), and the laboratory electronic deliverables for the samples collected from EM-5 and Class III areas are attached.

In addition, the supplemental workplan proposes reanalyzing the background soil samples, which have been stored for radionuclides, for Pb-210 and Pb-211.

Comment D: Also, the Class 3 area has several radionuclides well above DCGLs, including Tritium, Pb-210, Pb-211 and Cs-137. It would seem that the areas where these samples were taken need further investigation. For example, a Tritium detection at 418 pCi/g is especially of interest, and Pb-211 is from the Actinium series (U-235) and 20.10 pCi/g would not be considered natural levels. Uranium-235 and is progeny are naturally found at levels several times lower than the Uranium-238 chain concentrations in normal background.

Response D: Upon reviewing the Cs-137 data and the DCGLs, the Army determined that Cs-137 is not a radionuclide that requires further investigation. The maximum detection of Cs-137 in the Class III area, 1.5 pCi/g, does not exceed the derived DCGL for the Class III area (13.4 pCi/g). The preliminary radiological cleanup goal for Cs-137 (based on the minimum worker DCGL/10), 1.35 pCi/g, is a conservative value predicated on the assumption that ten hotspots could exist near that level before the radionuclide becomes a concern. There are only three detections of Cs-137 in the Class III area that were greater than the conservative limit: 1.4 pCi/g, 1.4 pCi/g, and 1.5 pCi/g. Therefore, Cs-137 is not considered a COC.

In the supplemental workplan for SEAD-12, additional soil sampling in the Class III area is proposed. Eight surface samples and five subsurface sample locations are proposed for analysis for Pb-210, Pb-211, and Tritium. The sampling locations were selected based on the locations of highest detections of Pb-210, Pb-211, and Tritium during previous sampling. Refer to Table 5 in the Supplemental Workplan for the rationale for the selection of each sampling location. These samples will be analyzed using a longer counting time, which should decrease the error associated with the sample result. in each reported detection.

<u>Specific Comments</u>:

Comment 1: <u>Page TOC-xii, Table of Contents</u>: TAGM stands for Technical and Administrative Guidance Memorandum, not Chemical. Please correct.

Response 1: Agreed. The text has been corrected.

Comment 2: <u>Page 1-2, Section 1.1, Purpose and Organization of Report</u>: The statement that “(A)fter further investigation and analysis, most of the areas of potential release were eliminated due to the sites’ compliance with the relevant guidelines and regulations” is misleading. Is there a threat to human health and or the environment at these eliminated sites, or were they ruled out from further evaluation due to the lack of hazardous waste? Please explain.

Response 2: Many of the eliminated areas were not included in the baseline risk assessment since there was no evidence of military activity or related debris in that portion of SEAD-12. A risk assessment was conducted at the Former Dry Waste Disposal Pit, however it was determined that no significant human health or ecological risks were present. None of the eliminated sites had significant exceedances of ARARs.

Comment 3: Page 1-3, Section 1.1, Purpose and Organization of Report: The statement that "(W)hen the control of a parcel is released or transferred and/or the site-use changes, the Army will implement additional cleanup actions if it is determined that the selected remedy is no longer protective of human health and the environment," seems to infer that the Army is uncertain whether institutional controls are a viable means of maintaining the planned future use. Institutional controls are implemented as part of a remedial action to ensure the protection of future users by deed restricting the use of the site. These restrictions would prevent the site from being used as a daycare facility, in a residential use scenario, etc. The Army's statement seems to contradict this notion.

Response 3: The statement has been revised to express that, if necessary, land use controls would be used to protect human health and the environment. The goals and objectives of these land use controls would be outlined in the ROD, and detailed implementation would be specified in the Remedial Design Plan. The text has been revised.

Comment 4: Page 1-3, Section 1.1, Purpose and Organization of Report: The last statement in this section states that the evaluation of remedial action alternatives "includes a comparison of the nine selection criteria and costs for each alternative." One of the nine selection criteria is cost, therefore the statement should be revised.

Response 4: Agreed. The text has been revised to indicate that cost is included as one of the nine evaluation criteria used in the assessment of each alternative.

Comment 5: Page 1-4, Section 1.2.1, Site Description: There is no information in this document summarizing the site's hydrologic information, such as groundwater flow, depth to groundwater, etc. This information needs to be included in the FS.

Response 5: A section on the hydrogeology of the site has been added to Section 1.2.1.

Comment 6: Page 1-7, Section 1.3, Nature and Extent of Constituents of Concern: It should be noted that regardless of whether the debris on-site is military or non-military related, it is the Army's responsibility to ensure that the site is protective of human health and the environment prior to transfer for re-use.

Response 6: The text has been modified in Section 1.3 to indicate that although there is no evidence that any of the debris found at EM-5 was military, the area will be evaluated to make sure that is it protective of human health and the environment.

Comment 7: Page 1-9, Section 1.4, Fate and Transport: The statement that "(T)he presence of radionuclides appears to be limited to low level point-source contamination with an overprint of naturally occurring radionuclides and those associated with fallout from historical weapons testing," should be clarified. Did the Army ever perform weapons testing at SEDA that may have resulted in the detected levels of contamination?

Response 7: The reference to "historical weapons testing" refers to global weapons testing that has occurred; weapons testing was not conducted at SEDA. The text in Section 1.4 has been clarified.

Comment 8: Page 1-10, Section 1.5.1, Baseline Human Health Risk Assessment: Potential risks from exposure to lead in soil were not assessed since the metal was not elevated above background levels. For informational purposes, please include in the text what this background level is for lead.

Response 8: The Wilcoxon Rank Sum (WRS) statistical analysis was used to compare the site areas against background to determine if the area exceeded background. The WRS test is a statistical method for determining if two data-sets have similar distributions by ranking and then summing the data. Consequently, there is not a single background value for lead, the entire data-set is used for comparison. The basis of this statistical comparison was obtained from the USEPA Guidance document *Statistical Methods for Evaluating the Attainment of Cleanup Standards* (USEPA, 1994) and *Statistical Methods for Environmental Pollution Monitoring* (Gilbert, 1987) and is consistent with guidance cited in RAGS (USEPA, 1989a). Please refer to Section 6.2.3 of the SEAD-12 RI Report (Parsons, August 2002) for additional details on how the WRS analysis was performed to determine if a site data set was elevated above background.

It will be clarified in Section 1.5.1 of the FS that the potential risks from exposure to lead in soil was not assess because lead was not elevated above background levels based on the WRS statistical analysis presented in Section 6 of the SEAD-12 RI (Parsons. August, 2002).

Comment 9: Page 2-4, Section 2.5.1: Risk calculations presented in the RI Report and presented in Table 2-1, indicated that under the current and intended future land use scenarios, the total hazard index is below 1. Although this is true, it does not indicate that the hazard index for future resident (child) exceeds 1. Future residential risk is referred to in the total cancer risks discussion but is omitted in the hazard index discussion and should be included.

Response 9: The text will be clarified to state that the hazard index for the future resident (child) exceeds 1. This information will be added to Table 2-1.

Comment 10: Page 2-9, Section 2.6.1.2, Groundwater: The text states that "(T)he most significant groundwater exceedence is the VOC trichlorethane (TCE), which is detected at 1600 ug/L in MW12-37 near Building 813. However, TCE was not detected in either of the wells downgradient (MW12-38 and MW12-39) to MW12-37 or the soil gas anomalies of Building 813 or Building 814." These two statements are erroneous in a few ways. Firstly, trichloroethane is abbreviated "TCA" and trichloroethane was detected in MW-37 at 1.7 ug/L; trichloroethene or TCE was detected in MW-37 at 1600 ug/L in addition to it's degradation product cis 1,2-dichloroethene at 30 ug/L. Secondly, TCE was detected in the soil gas samples of Buildings 813 and 814 (see Remedial Investigation (RI) report, Section 4.3.8.6, Table 4-22 and Appendix K). Unfortunately the chromatography method and limited standards utilized in the RI do not evaluate for all possible soil gas contaminants. TCA may have been a soil gas contaminant but was not calibrated for in the method and therefore not detected as such. Thirdly, it is unclear how MW-38 and MW-39 are considered "downgradient" monitoring wells when the Army's representation of groundwater flow is to the northwest while MW-38 and MW-39 are southwest of MW-37.

Response 10: The error in the statement was not in the abbreviation of the chemical, but in the spelling of the chemical. It was trichloroethene (TCE) that had a maximum exceedence of 1600 ug/L in MW12-37 near Building 813. The text in Section 2.6.1.2 has been corrected.

In the SEAD-12 Supplemental RI investigation additional soil gas samples will be collected near Buildings 813 and 814 to collect additional data. Details of the work to be performed can be found in the SEAD-12 Supplemental RI Workplan.

Groundwater elevation contour figures (See Figures 3-8 and 3-9 from the SEAD-12 RI Report, Parsons, August 2002) indicate that groundwater flow in that area is to the northwest. Based on the locations of the wells, it is more appropriate to state that monitoring wells MW12-38 and MW12-39 are cross-gradient to MW12-37, not down-gradient. The text has been corrected.

Comment 11: Page 2-9, Section 2.6.1.3, Surface Water: "Hexochlorobenzene is the only pesticide/PCB to exceed the NYSDEC standard for downgradient surface water. There are a few pesticide/PCB exceedences onsite." Is there a different standard for downgradient surface water versus surface water in general? The onsite pesticide/PCB exceedences should be discussed further.

Response 11: The same regulatory standard, NYS AWQS Class C, was used for comparison of up-gradient, site, and down-gradient surface water. The text will be revised to state this more clearly.

Most of the on-site pesticide/PCB exceedences were detected below laboratory quantification limits, only a few were detected above that quantification limit, and none were detected at a concentration greater then two-times the quantification limit. This information has been added to the text.

Comment 12: Table 2-5: It's stated on page 2-12 that TAGM values will be used as the SEAD-12 soil cleanup goals, however this is not listed as site specific cleanup goals for surface and subsurface soil in this table. Please reconcile. Also, if this area is to be as is designated (i.e., conservation/recreation) then the most conservative DCGLs should be applied, not the industrial worker DCGLs as presented in this table. An explanation of why cis-1,2-dichloroethene is not included as a constituent of concern in groundwater on this table is needed.

Response 12: The text has been revised to clearly state that the cleanup goal for soil is the removal of military-related debris.

As noted on Table 2-5, the radiological cleanup goals are preliminary. Additional radiological investigations are proposed in the Supplemental RI Workplan. The DCGLs will be re-evaluated once the supplemental work is completed.

Table 2-5 has been further revised to include 1,2-dichloroethene as a contaminant of concern for groundwater.

Additional Comments:

Although additional data may be necessary before a full analysis of the remedial alternatives be performed at this time, comments on the analysis of alternatives follow below. These comments should be incorporated in the next iteration of the FS.

Comment 13: Figure 2-6: The direction of groundwater flow should be indicated. Also, the VOC volume estimates are preliminary and misleading. Because the source area is unknown, it is difficult to interpret and estimate the isocontours and the total mass of VOCs. This figure should either be revised or removed from the report.

Response 13: The source of VOCs near Building 813/814 are being investigated further, as indicated in the Supplemental RI Workplan, which will provide additional information to more accurately interpret and estimate the isocontours and the total mass of VOCs. A note will be added to the figure to indicate that the current figure is based on minimal data and that a revised figure with updated isocontours and VOC mass estimations will be provided when the supplemental data has been collected and analyzed. It has already been stated in the text in Section 2.8.3 that the isocontours presented in Figure 2-6 "are considered to be preliminary pending collection of additional groundwater monitoring data in this area". In addition, the groundwater flow direction has been added to Figure 2-6.

Comment 14: Page 3-6, Section 3.5.3, Implementability: As stated in NYSDEC TAGM #4030, "(A)dministrative feasibility refers to compliance with applicable rules, regulations, and statutes and the ability to obtain approvals from other offices and agencies." It is my understanding that administrative feasibility does not include the NYSDEC, USEPA or Army. Accordingly, the analysis in Section 3.8.2, Section 5.2.2.6, Section 5.3.2.6, Section 5.3.3.6, and anywhere else in the document that is based on this notion may need to be revised.

Response 14: Agreed. Administrative feasibility refers to coordination with other agencies. The text has been revised accordingly in all subsequent sections.

Comment 15: Page 5-1, Section 5.0, Detailed Analysis of Remedial Action Alternatives: It is NYSDEC policy to evaluate an unrestricted use alternative in the detailed analysis of alternatives to present a full comparison of the advantages and disadvantages of a range of alternatives. The Army needs to include an unrestricted use alternative in this analysis.

Response 15: The proposed alternatives are for unrestricted use since no long term land use controls would be required. Each alternative will be fully evaluated under the nine criteria.

Comment 16: Page 5-3, Section 5.2.2.1, Definition of Alternative SC-2: From the descriptions in the RI and FS reports, the Department assumes that the Army is proposing to leave behind C&D debris that is "exempt" as defined in 6 NYCRR Part 360 Subpart 360-7. If so, the Army must remove all other debris to depth, military or non-military related.

Response 16: All debris encountered within the defined areas-of-excavation would be removed and properly disposed of, as described in Section 5.2.2.1. Classified Army material will be disposed of in an Army designated location; all other debris will be disposed of at a Subtitle D industrial landfill, provided that no radioisotopes are present at levels above the cleanup goals established in Table 2-5.

Comment 17: Page 5-7, Section 5.3.3.1, Definition of Alternative GW-2: This alternative calls for an evaluation of contaminant degradation rates including the "collection of additional groundwater data needed to further define the area of VOC impacts." It is unclear whether the Army plans on performing the other data collection outlined in Section 4.3.1 which lists additional surface soil sampling, soil gas sampling and surface water samples as data requirements for defining the extent of the plume. The Army should consider doing this sampling in conjunction with that requested in the general comments above.

Response 17: The pilot study that would be required with this alternative will not be performed unless this is the chosen alternative. However, as outlined in the Supplemental RI Workplan, additional sampling will be performed to further define the area of VOC impacts near Building 813 and 814.

Comment 18: Page 4-1, Section 4.0, Treatability Studies: The purpose of this treatability study section is unclear. Is it the Army's contention to perform each of the discussed treatability studies at this site? The Department feels that this could potentially be wasteful, and we suggest that it would be more beneficial to obtain the data requirements to define the extent of the plume as stated in Section 4.3.1.

Response 18: Additional work, outlined in the Supplemental Workplan, will be conducted in order to further define the plume. Once additional data has been collected, all alternatives will be evaluated. The treatability study would then be refined, as the state suggests, once this additional data has been collected.

Comment 19: Page 5-22, Section 5.5, Summary and Conclusions: It is stated in earlier sections of this document that there are data requirements to determine the extent of the plume. However, the summary does not reflect this. It should be clearly stated in this section exactly what the Army is proposing.

Response 19: The additional data requirements to determine the extent of the TCE plume are outlined in the Supplemental RI Workplan. A reference to the Supplemental RI Workplan has been added to Section 5.5

Revised Response to Comments from the New York State Department of Environmental Conservation

Subject: Draft Feasibility Study Report at the
Radiological Waste Burial Sites (SEAD-12)
Seneca Army Depot
Romulus, New York

Comments Dated: August 22, 2002

Date of Comment Response: May 21, 2003

Only comments related to radiological data in the Class III area are presented here.

General Comments:

Comment C: In re-reviewing the RI Report, in conjunction with the draft FS, a few issues arose that should be clarified in the next iteration of the FS. Please explain why there are different background results for the various locations for each radionuclide. Were there multiple background areas? For instance, in the Class 3 soils, it shows a background of 10.75 pCi/g for Pb-211, and a maximum value of 20.10 pCi/g. 10.75 pCi/g of Pb-211 would not be considered background. Please explain how the Army derived these results. The sample results are only as good as the associated QA/QC. The actual lab result forms do not appear to be included in the RI report. This information would be useful in determining the level of confidence in all sample results. Please provide QA/QC for the associated EM-5 and Class 3 data.

Revised Response C *(this response is revised from the May 21, 2003 submittal)*: Site-specific radiological background samples were collected in locations specified in Section 2.6 of the RI (Parsons, August, 2002). There were not multiple background areas for radionuclides. The above referenced table of summary statistics comparing Background soil to Class III soil, **Table 4-20** in the RI (Parsons, August 2002), presents the minimum, maximum, average, median, and standard deviation of both the background data set and the site area data set. 10.75 pCi/g is the maximum value of Pb-211 in background and 20.10 pCi/g is the maximum value of Pb-211 in the Class III soils; the data is presented side-by-side for comparison. In **Tables 4-4**, **4-6**, **4-16**, **4-18**, **4-20**, and **4-23** of the RI where the summary statistics are present with the results of the Wilcoxon Rank Sum (WRS) statistical analysis, for the data values presented the duplicates and the samples were averaged together, the detects (no qualifier or "J" qualifier) were taken at full value, and all non-detect values (U or UJ qualifier) were taken at half value (see the footnote in each of the tables); this is the protocol for setting up data to evaluate with WRS statistics. With the above information taken into account, the background dataset in the above listed tables corresponds with the background radiological analytical results presented in Table G-19 in Appendix G of the RI.

The actual lab result forms (the laboratory narrative, the chain-of-custody reports), and the laboratory electronic deliverables for the samples collected from EM-5 and Class III areas are attached *(these were included in the May 21, 2003 submittal*).

Comment D: Also, the Class 3 area has several radionuclides well above DCGLs, including Tritium, Pb-210, Pb-211 and Cs-137. It would seem that the areas where these samples were taken need further investigation. For example, a Tritium detection at 418 pCi/g is especially of interest, and Pb-211 is from the Actinium series (U-235) and 20.10 pCi/g would not be considered natural levels. Uranium-235 and its progeny are naturally found at levels several times lower than the Uranium-238 chain concentrations in normal background.

Response D *(this response is revised from the May 21, 2003 submittal)*: This response addresses each radionuclide (Tritium, Pb-210, Pb-211 and Cs-137) separately below. Laboratory data packages containing the data referenced above were submitted with the May 21, 2003 submittal of these responses to comments.

Upon reviewing the Cs-137 data and the DCGLs, the Army determined that Cs-137 is not a radionuclide that requires further investigation. The maximum detection of Cs-137 in the Class III area, 1.5 pCi/g, does not exceed the derived DCGL for the Class III area (13.4 pCi/g). The preliminary radiological cleanup goal for Cs-137 shown in Table 2-5 of the FS and Table 4-1 of the RI (based on $1/10^{th}$ of the minimum residential DCGL derived for Class III), 1.35 pCi/g is a conservative value assuming that Cs-137 contributes $1/10^{th}$ of the allowable 10 merm/yr exposure above background. When the Class III data set is compared to background dataset adjusted by the residential DCGL in accordance with MARSSIM, the Class III dataset for Cs-137 is below the adjusted background dataset (as shown in Table 4-20 of the RI Report). There are only three detections of Cs-137 in the Class III area that were greater than the conservative limit (out of a total of 64 samples): 1.4 pCi/g, 1.4 pCi/g, and 1.5 pCi/g. Therefore, Cs-137 is not considered a COC.

With respect to Tritium, although there are isolated detections of Tritium above background levels, the results of the Wilcoxon Rank Sum (WRS) test performed in accordance with MARSSIM indicated that when compared to the background data set, the Class III area does not exceed residential DCGLs for Tritium at this site. Please note that in performing the MARSSIM analysis, $1/10^{th}$ of the DCGL generated for Tritium was used in order to perform the analysis and therefore is very conservative. Therefore, the Army does not feel that additional investigation is warranted for Tritium at this site.

With respect to Pb-211, again, there were isolated detections of Pb-211 above background levels. However, according to the WRS test results shown on Table 4-20 of the RI, the Pb-211 levels in the Class III area does not exceed DCGLs derived for a worker. The WRS test results for comparison to residential DCGLs were exceeded. However, the DCGL used in the RI report was actually 1/10th of the DCGL derived for Pb-211. The actual Pb-211 DCGL for a resident was 20.4 pCi/g (equivalent of an exposure to 10 mrem/yr), which is higher than the maximum site hit of 20.1 pCi/g within the Class III area. The Army does not feel that this isolated detection constitutes a hot spot and does not require additional investigation.

With respect to Pb-210, when the Class III data set is compared to background using WRS, worker DCGLs are not exceeded. Using WRS, the conservative DCGL (1/10th of derived DCGL) generated for exposure to Pb-210 in a residential scenario is exceeded. The actual Pb-210 DCGL for a resident was 39.5 pCi/g (equivalent of an exposure to 10 mrem/yr). The maximum hit in the Class III area is 72.3JpCi/g. The Army proposes further investigation of surface soil locations within the Class III area where levels of Pb-210 exceed the residential DCGL of 39.5 pCi/g. The locations include surface soil sample locations SS12-41 (72.3J ± 36.1 pCi/g); SS12-60 (51.6J ± 45.5 pCi/g); and SS12-66 (44.4J ± 26 pCi/g). The Army proposes to use the NaI 3x3 meter and collect direct measurements at these locations to determine if local hot spots exist at these locations. The NaI detector is capable of seeing the high-energy gamma emissions from Pb-210. We would like to take measurements with the State during your next visit to the site to ensure that NYSDEC's concerns are addressed. In light of pending land transfer issues, we believe this approach to addressing NYSDEC's concerns will expedite efforts for all parties involved.

Addendum Response to Comments from the New York State Department of Environmental Conservation

Subject: Draft Feasibility Study Report at the
Radiological Waste Burial Sites (SEAD-12)
Seneca Army Depot
Romulus, New York

Comments Dated: August 22, 2002

Date of Addendum Response: March 30, 2007

A draft Feasibility Study (FS) for SEAD-12 was submitted in May 2002. Comments dated on August 22, 2002 were received from NYSDEC and Parsons submitted a response to the comments in May 2003. In order to address certain comments from NYSDEC and USEPA concerning the groundwater in the vicinity of Buildings 813/814 and some anomalous radiation readings in the EM-5 area, a supplemental remedial investigation (SRI) was conducted. This addendum response is to update those responses addressed by the SRI; all the other responses not referred in this addendum are still valid (it should be noted that the sections of the FS report may have been renumbered and therefore may be different from those referred in the original response).

Details of the SRI investigation, analytical results, and findings are presented in the SRI report (Parsons, 2006). A summary of the major changes in the FS based on the SRI findings is presented below.

- The SRI showed that trichloroethene (TCE) contamination in SEAD-12 groundwater was isolated to MW12-37 and the adjacent area (groundwater was not impacted within 20 ft of MW12-37). Furthermore, soil having TCE concentrations greater than the NYSDEC TAGM (700 mg/kg) that was co-located with MW12-37, was removed during the SRI. Groundwater remediation is no longer warranted for SEAD-12. The comments related to groundwater remediation and treatability study are no longer applicable, since this portion has been removed from the FS. Responses to comments associated with groundwater remediation and treatability study are updated in this addendum response.
- Based on the additional soil sampling conducted during the SRI in the EM-5 area, Pb-210 was not detected in any samples collected from EM-5 area. Therefore, no further action is proposed for EM-5 area. Response to comments related to the EM-5 area is updated in this addendum.

Presented below are the updated responses to the comments regarding groundwater at Building 813/814 and the EM-5 area.

General Comments:

Comment A: In Section 8.8 of the summary of the RI Report, the Army states that "installation and monitoring of groundwater monitoring wells near Building 814 to define the source of TCE (including monitoring MW12-37 and existing downgradient wells to confirm limited extent of transport)" should be included in the FS. However, there is a disconnect between what was said in the RI and in the Draft FS, where the Army proposes monitored natural attenuation (MNA) as the proposed alternative. As stated in Section 8.8 of the RI Report, additional work is needed to define the groundwater contaminant plume and the soil source. Only by ensuring that the soil source has been defined can the Army proceed with an FS for this area.

To aid in determining the source of TCE groundwater contamination and the extent of the plume, the Department recommends, in addition to that which was stated in Section 8.8 of RI Report, the following: an inspection of the floor drains, integrity of the lines, and outfalls of Buildings 813/814; soil sampling (in the vicinity of the relatively elevated soil gas samples and detection of TCE in surface water sample SW12-30) performed on the southern and southeastern side of Buildings 813/814; and the installation and sampling of additional groundwater monitoring wells. During the investigation of the source, it would be beneficial to attain additional hydraulic data and analysis to better define the nature of the groundwater flow. The extent of sampling necessary to define the source and determine the extent of groundwater contamination could be discussed at a BCT meeting.

As stated in Section 8.8 of the RI Report, "a human health BRA and ERA were not conducted on the soils" at Buildings 813/814, and the "only human health risk calculated was due to dermal contact of benzo(a)pyrene in the groundwater." Also, "(N)o human health BRA or ERA was conducted on the soils from Building EM-5," or Building EM-6. However the Army based the Remedial Action Objectives (RAOs) on the BRA. Therefore the Army did not take into account the human health and ecological risks associated with these sites during the development of the RAOs. Language in the FS should be revised to reflect this.

Response A: The additional investigation requested in this comment was conducted as part of the SRI. Suggestions presented in this comment regarding TCE contamination investigation around MW12-37 have been incorporated into the SRI. Based on the SRI findings, groundwater remediation is no longer warranted for SEAD-12.

The FS has been revised to reflect that the results of the BRA presented in the RI report were used to develop the risk-based RAOs for Disposal Pit A/B, Disposal Pit C, and Former Dry Waste Disposal Pit, which were impacted to the greatest extent by former activities in the WSA at SEAD-12.

Comment B: Section 8.8 of the RI Report stated that "the FS will include further evaluation of the elevated Pb-210 levels associated with the archeological debris at EM-5." However, in Section 8.10 of the RI, it is summarized for EM-5, "investigation and debris removal address Pb-210 contamination issues." However, the draft FS provides an insufficient evaluation by simply presenting a theory. The draft FS should follow the recommendations of the RI, in that the elevated levels of Pb-210 should be further evaluated, and if necessary, investigation and debris removal should be performed to address the Pb-210 contamination.

During the evaluation, additional work may be beneficial in determining the best remedial alternative for EM-5. Also, as discussed at our August 21, 2002 teleconference, several aspects of the RI Report should be clarified. The samples should be reanalyzed using appropriate methodology for Radium-226 which uses the ingrowth of daughter products Pb-214 and Bi-214 as surrogates. Ra-226 has an interfering gamma from Uranium-235, and can lead to overestimates of the Ra-226 concentration. The Pb-210 results may be caused by an insufficient count time, which can lead to elevated detection limits. Parsons has set the DCGL's for this site and should adhere to them. Placing caveats on results is not appropriate since there may be no definitive way to determine a radionuclide's origin as natural or man-made. Also, it is not appropriate to compare the radiological exceedances at SEAD-12 to industrial worker DCGLs. If the site is to be as is planned, i.e. conservation/recreation, then the most conservative DCGLs (residential DCGLs?) should be used for comparison.

Response B: The suggestions presented in this comment regarding Pb-210 evaluation in EM-5 area have been incorporated into the SRI. Based on the SRI findings, Pb-210 was not detected in any samples collected from EM-5 area. Therefore, no further action is proposed for EM-5 area.

The following specific comments are no longer applicable to the FS report due to the fact that groundwater remedial action is no longer warranted based on the SRI findings. The sections, figures, and tables associated with groundwater remediation have been removed from the FS report.

<u>Specific Comments</u>:

Comment 13: <u>Figure 2-6</u>: The direction of groundwater flow should be indicated. Also, the VOC volume estimates are preliminary and misleading. Because the source area is unknown, it is difficult to interpret and estimate the isocontours and the total mass of VOCs. This figure should either be revised or removed from the report.

Comment 17: <u>Page 5-7, Section 5.3.3.1, Definition of Alternative GW-2</u>: This alternative calls for an evaluation of contaminant degradation rates including the "collection of additional groundwater data needed to further define the area of VOC impacts." It is unclear whether the Army plans on performing the other data collection outlined in Section 4.3.1 which lists additional surface soil sampling, soil gas sampling and surface water samples as data requirements for defining the extent of the plume. The Army should consider doing this sampling in conjunction with that requested in the general comments above.

Comment 18: Page 4-1, Section 4.0, Treatability Studies: The purpose of this treatability study section is unclear. Is it the Army's contention to perform each of the discussed treatability studies at this site? The Department feels that this could potentially be wasteful, and we suggest that it would be more beneficial to obtain the data requirements to define the extent of the plume as stated in Section 4.3.1.

Comment 19: Page 5-22, Section 5.5, Summary and Conclusions: It is stated in earlier sections of this document that there are data requirements to determine the extent of the plume. However, the summary does not reflect this. It should be clearly stated in this section exactly what the Army is proposing.