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March 14, 2005

Mr. Scott Bradley
U.S. Army Corps of Engineers
Engineering and Support Center, Huntsville
Attn: CEHNC-ED-CS-P
4820 University Square
Huntsville, AL 35816-1822

Subject: **Final Feasibility Study for the Munitions Washout Facility (SEAD-4), Seneca Army Depot Activity**

Dear Mr. Bradley:

Parsons is pleased to submit the Final Feasibility Study at the Munitions Washout Facility (SEAD-4) at the Seneca Army Depot Activity (SEDA) located in Romulus, New York. The Final Feasibility Study incorporates (1) results from test pitting and groundwater sampling completed during 2004 supplemental field activities, and (2) results of the sensitivity analysis conducted, which compared the mass of soil removed to its relative cost for a range of soil cleanup goals. Please find enclosed replacement pages and update instructions. A CD is enclosed which includes the Final Feasibility Study in its entirety.

This work was performed in accordance with the Scope of Work (SOW) for Delivery Order 0016 under Contract DACA87-95-D-0031.

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

Sincerely,

Todd Heino, P.E.
Program Manager

Enclosures

cc: Mr. S. Absolom, SEDA
Mr. T. Enroth, USACE
Mr. K. Hoddinott, USACHPPM (PROV)
Mr. C. Boes, USAEC

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March 14, 2005

Mr. Julio Vazquez
USEPA Region II
Superfund Federal Facilities Section
290 Broadway, 18th Floor
New York, NY 10007-1866

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

Subject: **Final Feasibility Study for the Munitions Washout Facility (SEAD-4), Seneca Army Depot Activity**
EPA Site ID: NY0213820830 - NY Site ID: 8-50-006;

Dear Mr. Vazquez/Mr. Gupta:

Parsons is pleased to submit the Final Feasibility Study at the Munitions Washout Facility (SEAD-4) at the Seneca Army Depot Activity (SEDA) located in Romulus, New York. The Final Feasibility Study incorporates (1) results from test pitting and groundwater sampling completed during 2004 supplemental field activities, and (2) results of the sensitivity analysis conducted, which compared the mass of soil removed to its relative cost for a range of soil cleanup goals. Please find enclosed replacement pages and update instructions. A CD is enclosed which includes the Final Feasibility Study in its entirety.

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Sincerely,

Todd Heino, P.E.
Program Manager

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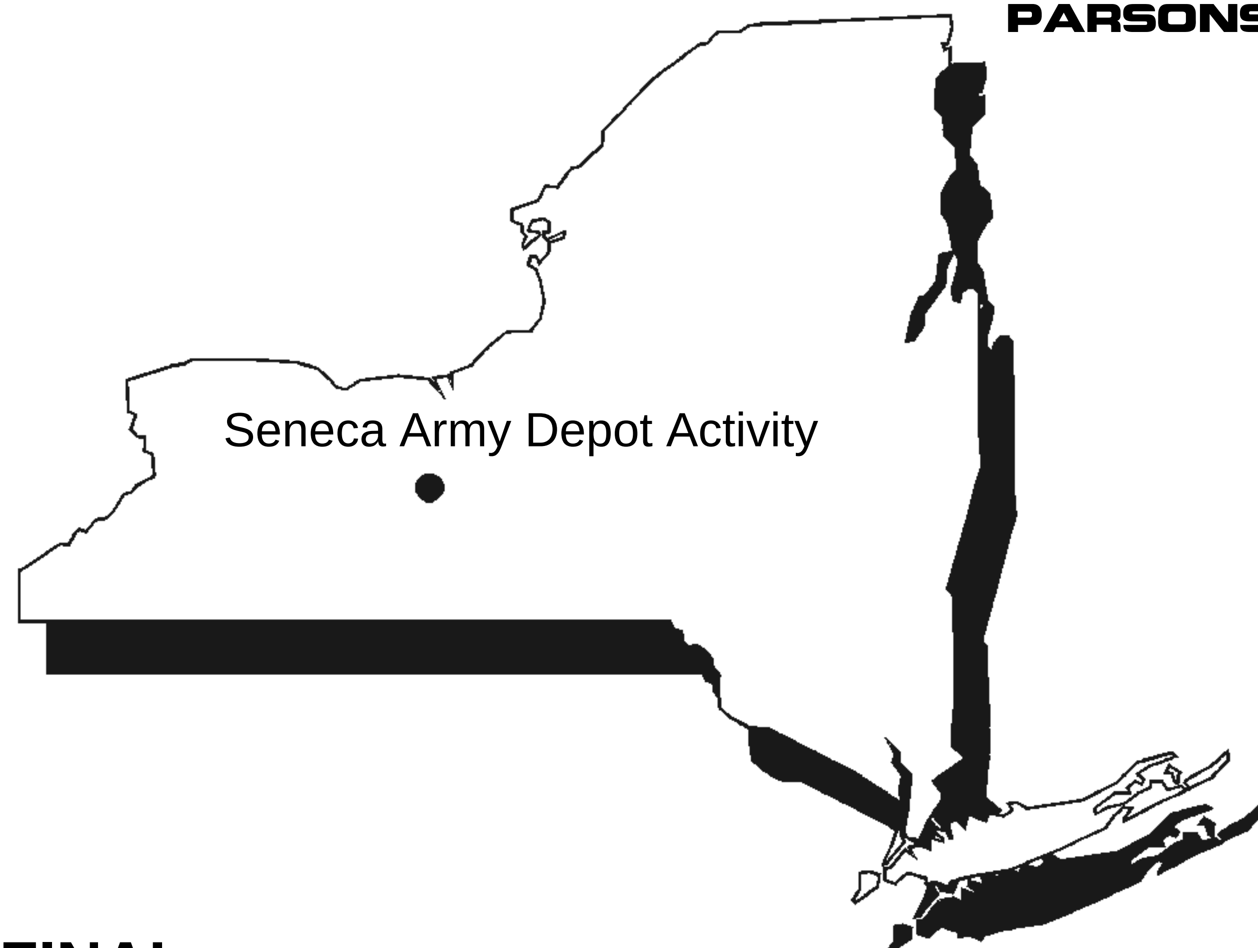

FINAL

FEASIBILITY STUDY
AT THE MUNITIONS WASHOUT FACILITY (SEAD-4)

SENECA ARMY DEPOT ACTIVITY

EPA Site ID# NY0213820830
NY Site ID# 8-50-006
CONTRACT NO. DACA87-95-D-0031
DELIVERY ORDER NO. 0016

March 2005

FINAL
FEASIBILITY STUDY
AT SEAD-4
SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

Prepared for:

SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

and

UNITED STATES ARMY CORPS OF ENGINEERS
4820 UNIVERSITY SQUARE
HUNTSVILLE, ALABAMA

Prepared By:

PARSONS
150 Federal St.
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Boston, Massachusetts

Contract Number: DACA87-95-D-0031 **March 2005**
Delivery Order 0016
USEPA Site ID: NY0213820830; NY Site ID: 8-50-006;

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1.0 INTRODUCTION

1.1 PURPOSE AND ORGANIZATION OF REPORT

Parsons Engineering Science is submitting this Feasibility Study Report (FS) for the Munitions Washout Facility (SEAD-4) site 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 and Compensation Liability Act (CERCLA) of 1980 and the Superfund Amendments Reauthorization Act (SARA) of 1986. This remedial program has been performed under the guidance of the US Environmental Protection Agency (EPA), Region II and the New York Department of Environmental Conservation (NYSDEC). The Final Remedial Investigation Report (RI) was submitted to EPA and NYSDEC in January 2001. The purpose of the RI was to fully characterize the nature and extent of human health and environmental risks at SEAD-4.

SEDA is under the command control of the Tobyhanna Army Depot in Tobyhanna, Pennsylvania. The military mission of the Seneca Army Depot Activity has been storage and management of military items, including munitions. SEDA is no longer an active Army facility; the military mission of SEDA ended in the year 2000. Environmental clean-up activities will continue past this date until all sites have reached closure. Since being placed on the BRAC 95 base closure list, the Depot has begun the process of base closure, which has included the transfer of Depot missions to other active military installations.

SEAD-4 is the Munitions Washout Facility located in the southwestern portion of SEDA. The Munitions Washout Facility was part of the Ammunition Workshop Facility.

CERCLA guidance, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.7-04, *Land Use in the CERCLA Remedy Selection Process*, directs decision makers to achieve cleanup levels associated with the reasonably anticipated future land use over as much of the site as possible. Army 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.” The intended future land use of the area that encompasses SEAD-4 has been determined by the LRA, in conjunction with the Army, to be “Conservation/Recreation Area.” 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 375-1.10 Remedy Selection, sets as a goal evaluation of remedies that will restore the site conditions to “pre-disposal conditions, to the extent feasible and authorized by law.” This study has considered both the pre-determined and a hypothetical future land use in the process of evaluating remedial alternatives.

The RI determined that unacceptable health risks are present at SEAD-4 from the presence of Aroclor-1254 and lead in the debris present in the interior of the on-site buildings. Human health risks were also calculated from contact with groundwater and surface water, however, the results of these calculations are considered uncertain. Ecological risks were also found due to the presence of metals in soils and sediments. The FS was developed specifically to address these risks.

The approach used in this FS to evaluate remedial alternatives involves consideration of two levels of protection. The first level of protection evaluated is for conservation and recreational use. This is the projected future use of the area of the Depot where SEAD-4 is located. This use was identified by the community representative group during the BRAC process. The second level of protectiveness evaluated is hypothetical residential use. Future residential use was included for evaluation in consideration of the goal in 6 NYCRR 375-1.10 (b) that site remediation “restore the site to pre-disposal conditions, to the extent feasible and authorized by law.” Prior to use by the Depot, the area surrounding the base supported residential use and the evaluation of alternatives for residential use more than satisfies the Army’s obligation to give appropriate weight to pre-disposal conditions.

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 New York State Department of Conservation’s “Revised NYSDEC TAGM - Selection of Remedial Actions at Inactive Hazardous Waste Sites.”

To streamline the feasibility study process, a “focused feasibility study” was performed using the guidelines established by the USEPA as part of the Superfund Accelerated Cleanup Model (SACM) (Directive 9355.0-47FS). Under this initiative, the EPA established a Presumptive Remedy Approach to speed up the selection of cleanup actions. The Presumptive Remedy Approach uses a series of directives or presumptive remedies for various types of sites. Presumptive Remedies are preferred technologies for common categories of sites based on historical patterns of remedy selection and EPA’s scientific and engineering evaluation of performance data on technology implementation. The use of Presumptive Remedies streamlines the alternatives analysis more than any other phase of the remedy selection process by eliminating the technology identification and screening step. The study would limit its consideration to the no-action alternative and one or more presumptive technologies. This presumptive remedy approach is consistent with all the requirements of the NCP. The EPA has developed presumptive remedy guidance for several types of sites including “Metals-in-Soil Sites” (EPA 540-F-98-054).

Section 1.0 provides a brief overview of the RI, including background information, nature and extent of contamination and the baseline risk assessment. **Section 2.0** presents the remedial action objectives for each media of concern and considers general response actions that meet the remedial objectives. **Section 3.0** describes the basis for the selection of the presumptive remedies for the site. **Section 4.0** evaluates the presumptive remedial action alternatives in detail and provides the basis for selection of a remedial action alternative for SEAD-4. This includes a comparison of the nine selection criteria and costs for each alternative.

1.2 SITE BACKGROUND

1.2.1 Site Description

SEDA was an active military facility which was constructed in 1941. The depot has been subject to closure and its operation ceased in September 2000. The site 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 Elevatedways 96 and 96A adjoin SEDA on the east and west boundaries, respectively. Since its inception in 1941, SEDA's primary mission has been the receipt, storage, maintenance, and supply of military items.

As shown in **Figure 1-2**, SEAD-4 is the Munitions Washout Facility located in the southwestern portion of SEDA. The Munitions Washout Facility was part of the Ammunition Workshop Facility. The workshop facility is approximately 30 acres in size and is characterized by developed and undeveloped areas (**Figure 1-3**). It is surrounded by open grassland and low, thick brush on all sides. North South Baseline Road is the main access road to the facility and bisects the site running from south-southeast to north-northwest. There is also a network of minor paved driveways in the eastern half of the site. The SEDA railroad tracks lead into the site from the southeast and terminate in the vicinity of Buildings 2078 and 2085.

The Ammunition Workshop Facility is almost entirely surrounded by two drainage ditches, which are both approximately 3 feet deep. One of the ditches forms the eastern boundary of the site, originates in the southeastern part of the site, and circles around to the north where it joins the drainage ditch alongside North South Baseline Road. The second drainage ditch forms the southwestern boundary. It originates south of the site next to North South Baseline Road, circles to the northwest, and discharges into the man-made lagoon that lies on the western edge of the site.

The man-made lagoon is approximately 150 feet in diameter and was created for the purpose of containing wastewater. Within the past 8 years, the pond was widened and deepened with a bulldozer. Pond sediment was pushed southwest of the pond to a 400-foot by 150-foot area adjacent to the pond. There are no known records of its full excavation beyond this dredging and it is assumed not to have a liner.

Eleven buildings existed at the Ammunition Workshop Facility during the years that the Munitions Washout Building was operating. Four buildings were demolished. The buildings at the Ammunition Workshop Facility are listed below with their original designation:

1. Munitions Washout Building, which was used in the washout process (demolished);
2. “Decontamination building”, which was used in the washout process (demolished);
3. Unnamed Building, which was used in the washout process (demolished)**;**
4. Building T30, which was used to prepare the packing material (demolished);
5. Building 2073, Rocket Overhaul Shop, was used for testing of powder (this building is still active);
6. Building 2076, Lunch Room, was the employee break room and laundry facility;
7. Building 2077, General Purpose Storage, was a steam condensate return station (The washout process involved the use of steam or hot water to remove the solid explosives from munitions);
8. Building 2078, Ammo Renovation Shop, was a workshop used for munitions renovations;
9. Building 2079, Boiler House, was a steam generation building;
10. Building 2084, Ammo Renovation Shop, was used to prepare packing material for shipment of the renovated munitions (a paint booth and drying oven were also located in this building); and

11. Building 2085, Ammo Renovation Building, was a receiving building for munitions.

A more detailed description of the site is provided in the Remedial Investigation Report (Parsons, January 2001).

1.2.2 Site History

SEDA was constructed in 1941 and has been owned by the United States Government and operated by the Department of the Army since this time. Prior to construction of the Depot, the site was used for farming. The Munitions Washout Facility was active between 1948 and 1963. Eleven buildings existed at the facility; four of the buildings have been demolished including the Munitions Washout Building, Building T30, the “decontamination building”, and an unnamed building. At present, only the foundations of the Munitions Washout Building, “decontamination building”, and Building T30 are visible as shown on the site map in **Figure 1-3**.

A detailed description of all the buildings and their uses are presented in the Remedial Investigation Report (Parsons, January 2001).

1.2.3 Previous Investigations

SEAD-4 is described in three previous reports. The first report is a SWMU Classification Report (Parsons ES, 1994a) that describes and evaluates the Solid Waste Management Units at SEDA. This report was an initial step to provide a cursory evaluation of all of the SWMUs at SEDA. The second report is the Work Plan for CERCLA Expanded Site Inspection (ESI) of Ten Solid Waste Management Units (SWMUs) written by Parsons Main, Inc. in 1993. This report detailed the site work and sampling to be performed for the ESI. The third report is an Expanded Site Inspection Report (Parsons ES, 1995a) that presents the results of a more detailed investigation of SEAD-4.

SWMU Classification Report

The SWMU Classification Report (Parsons ES, 1994a) provides limited information about SEAD-4, as this report was designed to briefly describe and evaluate all 72 of the SWMUs at SEDA while also providing recommendations for future action at these sites. This report describes SEAD-4 (the Munitions Washout Facility), its physical make-up, the waste characteristics associated with it, as well as other information related to migration pathways and exposure potential. The report recommended that a CERCLA Site Inspection (SI) be performed at SEAD-4 as part of the investigation of 10 Solid Waste Management Units at SEDA. At the time of the preparation of the SWMU Classification Report, SEAD-4 was classified as an Elevated Priority Area of Concern.

Expanded Site Inspection Report

The fieldwork for the ESI was conducted according to the Work Plan for CERCLA Expanded Site Inspection (ESI) of Ten Solid Waste Management Units (SWMUs) (Parsons Main, Inc., 1993). Based on this work, a report entitled Expanded Site Inspection, Seven Elevated Priority SWMUs, SEAD-4, -16, -17, -24, -25, -26, and -45 was prepared by Parsons ES, (May 1995a), and submitted to both NYSDEC and the USEPA.

The ESI conducted at SEAD-4 consisted of geophysics, soil sampling, test pitting, monitoring well installation, groundwater sampling, surface water and sediment sampling. These investigations were used to initially characterize the physical setting of the site and determine whether soil and/or groundwater had been impacted by releases of chemicals from past site activities. Seismic profiles performed on the site were successful in determining that the bedrock surface slopes to the west or southwest, generally following the slope of the ground surface, and that groundwater flow is also likely to be in this direction.

The ESI conducted at SEAD-4 indicated that the subsurface soils have been impacted primarily by metals. Antimony, copper, chromium, and zinc were detected at concentrations significantly above their respective NYSDEC TAGM values in the subsurface soil samples. The results of the chemical analysis show that surface soils at SEAD-4 have been impacted primarily by semivolatile organic compounds (SVOCs) and metals. The compounds benzo(a)anthracene, chrysene, benzo(a)pyrene, and dibenz(a,h)anthracene were reported in three surface soil samples at concentrations exceeding their associated NYSDEC TAGM values. Of the 22 metals reported in the surface soils, 17 were found in one or more samples at concentrations above the NYSDEC TAGM value. A large percentage of the samples contained the metals antimony, chromium, copper, and zinc at concentrations exceeding the NYSDEC TAGM values.

The results of the groundwater investigation at SEAD-4 identified concentrations of antimony, beryllium, cadmium, iron, magnesium, manganese, and sodium in one or more of the groundwater samples at concentrations above the drinking water standards. It should be noted that comparisons of the concentrations of metals in the background well with those in downgradient wells show that in some instances where the NY AWQS Class GA values were exceeded in one or more downgradient wells, the concentration measured in the background well exceeded as well. This is true for iron, magnesium, manganese, and sodium.

In the surface water samples, three metals, aluminum, copper, and iron, were found at concentrations above the most stringent state or federal criteria. The nitroaromatic compound 1,3-dinitrobenzene was detected in the sample from the vertical pipe associated with the concrete tank adjacent to the leaching field on the northern section of the site. Sediment at the site has been impacted by SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals.

Additional Investigations – 2004

In the summer and fall of 2004, additional field investigations were completed to verify previous analytical results. During the July 1999 (Round 2) groundwater sampling event, Aroclor-1260 was detected in one well (MW4-10) at a concentration of 0.079 J μg/L, which is below the NYS Class GA standard. It should be noted that no PCBs were detected in the groundwater at MW4-10 in the first round of groundwater sampling in March 1999. Low level concentrations of PCBs (up to 360 μg/Kg), which are within the applicable standards, were detected in the surface soils near Building 2084. NYSDEC was concerned that there was a PCB source area in the vicinity of Building 2084 and requested additional investigations to verify the existence of a source.

On June 7, 2004, a supplemental round of groundwater data was collected from monitoring well MW4-10 to confirm the presence of any PCBs in the groundwater. One sample and one duplicate were collected and analyzed for PCBs by SW-846 Method 8082. No PCBs were detected above the method detection limits (MDLs). The results are included in **Appendix A** in **Table A-12**.

To investigate the presence of a PCB source area, the Army excavated four test pits in the vicinity of Building 2084 in September 2004. The test pit locations are shown in **Figure 1-4**. Three test pits (TP4-1, TP4-2, and TP4-3) were excavated to a depth of approximately 6 feet (ft.). The width of the test pits was the size of the backhoe bucket, approximately 3 ft., and the length of the test pits ranged from approximately 7 ft. to 8 ft. Three samples were collected from each of the three test pits at depths of approximately 0 to 2 ft. below ground surface (bgs), 2 ft. bgs., and 6 ft. bgs.; and these samples were analyzed for PCBs by method EPA CLP and NYSDEC ASP OLM 4.2. In addition, a soil inspection point, TP4-4-04A, was excavated to a depth of 1 ft. at the northwest corner of the Building 2084 (refer to **Figure 1-4**). The observed soil was stained black, and one sample was collected and analyzed for volatile organic compounds (VOCs), SVOCs, PCBs, pesticides, and metals by EPA Method SW-846 8260B, EPA Method SW-846 8270C, OLM 4.2, and EPA Method

SW-846 6010B, respectively. Two additional soil inspection points, TP4-4-04B and TP4-4-04C, were excavated at locations 10 ft. and 30 ft. due north of TP4-4-04A, respectively, running along a pipe exiting the building. These two points were excavated to a depth of 1 ft. and visual observations noting black stained soil were recorded; no soil samples were collected for analysis from TP4-4-04B and TP4-4-04C.

The analytical results of the test pitting are presented in **Appendix A** in **Table A-13**. No PCBs were detected in any of the soil samples collected from the test pits. In the soils collected at TP4-4-04A, 18 SVOCs and 17 metals were detected. Five carcinogenic PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, and dibenz(a,h)anthracene] exceeded their respective TAGM values. No metals exceeded TAGM values (SEDA specific site background concentrations).

1.2.4 <u>Geologic Setting</u>

The Finger Lakes uplands area is underlain by a broad north-to-south trending series of rock terraces mantled by glacial till. As part of the Appalachian Plateau, the region is underlain by a tectonically undisturbed sequence of Paleozoic rocks consisting of shales, sandstones, conglomerates, limestones and dolostones.

The Hamilton Group, 600 to 1500 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 and mudstones and thin limestones with numerous zones of abundant invertebrate fossils that form geographically widespread encrinites, coral-rich layers, and complex shell beds. The Ludlowville Formation is known to contain brachiopods, bivalves, trilobites, corals and bryozoans (Gray, 1991). In contrast, the lower two formations (Skaneateles and Marcellus) consist largely of black and dark gray sparsely fossiliferous shales (Brett et al., 1991). Locally, the shale is soft, gray, and fissile.

The predominant surficial geologic unit present at the site is dense till. The till is distributed across the entire Depot and generally ranges in thickness from 3 feet to approximately 15 feet, although it is generally between 6 and 10 feet thick; at a few locations the thickness of the till is greater than 30 feet. The till is generally characterized as brown to olive-gray silt and clay, with little fine sand and variable amounts of fine to coarse gravel-sized inclusions of dark gray shale.

Larger diameter clasts of shale (as large as 6 inches in diameter) are sometimes present in the basal portion of the till and are probably rip-up clasts removed from the weathered shale zone and incorporated into the till by the once-active glacier. Grain size analyses of the till show a wide distribution of particle sizes within the till (Metcalf & Eddie, 1989), however, there is an elevated percentage of silt and clay with the balance comprised of coarser particles. The porosity of five gray-brown silt clay (i.e. till) samples ranged from 34.0 percent to 44.2 percent with an average of 37.3 percent (USAEHA, 1985).

Darien silt-loam soils, 0 to 18 inches thick, have developed over the Wisconsin age till at SEAD-4. These soils are poorly drained and have a silt clay loam and a clay subsoil. In general, the topographic relief associated with these soils is 3 to 8 percent.

Regionally, four distinct hydrologic units have been identified within Seneca County (Mozola, 1951). These include two distinct shale formations, a series of limestone units, and unconsolidated beds of Pleistocene glacial drift. Overall, the groundwater in the county is very hard, and therefore, the quality is minimally acceptable for use as potable water. Regionally, the water table aquifer of the unconsolidated surficial glacial deposits of the region would be expected to flow in a direction consistent with the dropping ground surface elevations. Geologic cross-sections from Seneca Lake to Cayuga Lake have been constructed by the State of New York, (Mozola, 1951). This cross-section information, along with groundwater flow directions established at numerous sites on SEDA and stream drainage patterns in the area, suggests that a groundwater divide exists approximately half way between the two Finger Lakes. The divide is believed to run approximately parallel to Route 96 near the eastern boundary of SEDA. Further evidence for the divide is provided in Parsons ES, 1995. SEDA is located on the western slope of this divide and, therefore, regional groundwater flow on the Depot is expected to be west toward Seneca Lake.

The geologic information reviewed indicates that the upper portions of the shale formation would be expected to yield small, yet adequate, supplies of water for domestic use. For mid-Devonian shales such as those of the Hamilton group, the average yields, (which are less than 15 gpm), are consistent with what would be expected for shales (LaSala, 1968). The deeper portions of the bedrock, (i.e., at depths greater than 235 feet) have provided yields up to 150 gpm. At these depths the elevated well yields may be attributed to the effect of solutioning on the Onondaga limestone, which is at the base of the Hamilton Group. Based on well yield data, the degree of solutioning is affected by the type and thickness of overlying material (Mozola, 1951). Solution effects on limestones (and on shales, which contain gypsum) in the Erie-Niagara have been reported by LaSala (1968). This source of water is considered to comprise a separate source of groundwater for the area. Very few wells in the region adjacent to SEDA utilize the limestone as a source of water, which may be due to the drilling depths required to intercept this water.

1.2.5 Drainage Ditch Soil Characterization

Subsequent to the submittal of the Final RI Report and during preparation of the Draft Final FS Report, a site visit was conducted at SEAD-4 on November 29, 2001 for the purpose of characterizing the drainage ditch soils at the site. This visit was conducted to determine the ecological receptors in the drainage ditches for the screening level ecological risk assessment and to determine the appropriate criteria to be used to compare chemical concentrations within the ditches. In general, any sample collected from drainage ditches has been considered sediment and has been used to assess risk to aquatic receptors during the remedial investigation.

A combination of NYSDEC's sediment definition and the USACE wetlands definition has been used in the field investigation at SEAD-4 to determine:

1) if the NYSDEC's Technical Guidance for Screening Contaminated Sediments is applicable to the drainage ditch soils at the site;
2) if aquatic receptors or exposure via preying aquatic biota should be evaluated in the ecological risk assessment.

The findings of these investigations follow.

According to the NYSDEC, Division of Fish, Wildlife, and Marine Resources document entitled *Technical Guidance for Screening Contaminated Sediments* (January 1999), sediment is defined as:

> *minerals and organic particles found at the bottom of lakes (and ponds), rivers (and streams), bays estuaries, and oceans.*

Importantly, the section further states that sediments are essential components of aquatic ecosystems; that they provide habitat for benthic organisms; and that some evaluation must be made to estimate the potential risk to aquatic life or human health. According to this definition, the NYSDEC sediment guidance is only applicable to the man-made lagoon sediment at SEAD-4.

In order to characterize the drainage ditch ecosystem, the USACE definition of wetlands found in the *Corps of Engineers Wetland Delineation Manual* (USACE, 1987) was used. The USACE distinguishes environments that are wetlands versus those that are terrestrial based on three factors: (1) the percentage of wetland vegetation, (2) whether soils are hydric or non-hydric, and (3) the presence of a source of hydrology. Using these three factors, the areas at SEAD-4 were placed into one of the following three categories:

(1) Upland areas (i.e., areas that possess less than 50% wetland vegetation, have non-hydric soils, and do not possess a source of hydrology). Samples collected from these areas are “soil samples” rather than “sediment samples”.
(2) Sediment areas. The bottoms of wetland areas, ponds, and streams on site, which are perennially wet would be considered “sediment areas”.
(3) Intermittently wet transition areas. These areas would be examined individually to see if there were a preponderance of evidence that these areas could support the living, feeding, and breeding activities of benthic organisms, i.e., macroinvertebrate and allow them to complete their life cycles.

Only the man-made lagoon at SEAD-4 has permanent water and may support aquatic life; therefore, the Technical Guidance for Screening Contaminated Sediments (NYSDEC, 1999) is applicable to the sediment at the pond bottom. All the other drainage ditch areas are nonwetlands or not regulated as wetlands. The detailed discussion follows.

1.2.5.1 Soils are non-hydric or not regulated as wetlands

The USDA Soil Conservation Service Soil Survey for Seneca County was consulted. Two soil types are found at SEAD-4: Angola (AnA and AnB) and Darien (DaA). Though both soils are classified as ‘Somewhat Poorly Drained’, neither soil type is listed as hydric in the USDA NRCS list of Hydric soils of the United States (www.Statlab.iastate.edu/soils/hydric), the reference list used by the USACE in the revised 1987 Delineation Manual. Some areas where the ditches have been excavated into groundwater possess some hydric features. However, stormwater management is a necessary and beneficial activity that can create wetlands where none existed before. Nationwide Wetlands Permit #41 (Reshaping Existing Drainage Ditches) of the Code of Federal Regulations 33 Part 330 reads: “This nationwide permit does not apply to reshaping drainage ditches constructed in uplands, since these areas are not waters of the United States, and thus no permit from the Corps is required.” The ditches at SEAD-4 were carved into upland soils Angola and Darien. The US Fish and Wildlife Service’s National Wetland Inventory map for this area was also reviewed. The map identified wetlands only in the northern portion of SEAD-4 (the swale area associated with samples SWSD4-14 through SWSD4-11) (**Figure 2-12**).

1.2.5.2 Vegetation generally consists of plant species that occur predominantly in nonwetland habitats

At SEAD-4, vegetation on the whole site is dominated by autumn olive (*Elaeagnus umbellate*) and poverty grass (*Aristida dichotomy*). Autumn olive was once extensively planted for erosion control, but today it is used less due to its tendency to spread over a site, limiting species diversity. Both autumn olive and poverty grass inhabit dry, disturbed soils. In the majority of ditches at SEAD-4, the vegetation was dominated by upland species of grasses and forbs as rated by Reed, P.B., Jr. (1988)in The National List of Plant Species that Occur in Wetlands: Northeast (Region1). In some places, the ditches had been excavated down into the seasonal high groundwater table and supported wetland communities dominated by cattails and rushes. However, as described above, wetlands that form in stormwater drainage ditches that were carved into upland soils are not regulated under 33 CFR Part 330.

SEAD-4 was found to have excellent stormwater management. The water migrates down almost level ditches that essentially act as level spreaders for stormwater runoff. Dug sumps are generally present at roadway culverts. These small sumps sometimes support a limited wetland community (about 5 feet or less in diameter at SEAD-4), but these sump areas are isolated and are not part of larger wetlands ecosystems.

1.2.5.3 Hydrology of the ditches does not supply a dependable habitat for benthic macroinvertebrates

Though the Angola and Darien soils are not listed as hydric, the seasonal high groundwater is close to the surface (0.5 to 1.5 feet). In some locations, the stormwater ditches were excavated down to the groundwater, enabling these areas to sustain wetland vegetation. However, none of the ditches at SEAD-4 represent adequate habitat for benthic macroinvertebrate organisms.

Information contained in Dates and Byrne (1997) *Living Waters, Using Benthic Macroinvertebrates and Habitat to Assess Your River's Health*, River Network, Montpelier, VT is useful in assessing the habitat value of the SEAD-4 drainage ditches for benthic macroinvertebrates. Benthic organisms are generally found in flowing waters. A current velocity of 0.5 to 2.5 feet per second supports the most diverse communities. Their habitat ranges from shallow, fast moving, rocky bottom areas known as riffles; to deeper, slower moving sandy and gravely bottom areas known as runs; to deep, slow moving muddy-bottom areas known as pools. The cobbly condition of riffles supports the widest variety of macroinvertebrates. Runs contain a smaller variety. And, the uniform bottoms of pools, with smaller soil particle sizes like sands and silts, provide very limited living spaces and surfaces for macroinvertebrates to hold onto. Thus, pools support only a very limited variety of macroinvertebrates. Some macroinvertebrates are very sensitive to temperature levels and fluctuations. Temperature also affects the amount of dissolved oxygen that the water can hold, with cold water holding the most. Macroinvertebrates are sensitive to water level fluctuations, since dry areas are no longer available for living, feeding, and breeding areas for aquatic organisms.

The stormwater ditches at SEAD-4 (including the swale area associated with samples SWSD4-14 through SWSD4-11) do not contain waters moving at a current velocity of 0.5 to 2.5 feet per second. No riffles or cobble bottoms are present. The ditch bottoms are, generally, well vegetated with grasses and rushes. The soils in the ditches are composed of smaller soil particle sizes like loam and clay. When present, the shallow nature of the water in the ditches provides little insulation against temperature fluctuations. In addition, the intermittent nature of the water supply (rainfall) in most of the ditches would cause the ditches to be an undependable living, feeding, and breeding ground for benthic organisms.

The SEAD-4 swales currently provide groundwater recharge, stormwater storage, nutrient removal, and sediment stabilization. They could likely act as a “treatment area” for potential on site contamination. The drainage ditch systems appears to be providing excellent stormwater management, and are likely keeping most stormwater runoff from leaving the site, by allowing the water to slowly infiltrate into the soils and back into the groundwater as the water migrates slowly down the nearly level ditch system.

Figure 1-5 shows the characterization of the ditch areas based on the observations at SEAD-4.

The screening criteria for sediments in New York State are the Lowest Effect Level and the Severe Effect Level, which are based on the toxic effects on benthic organisms (mainly macroinvertebrates, if not all). As discussed above, the drainage swales at SEAD-4 (except the man-made lagoon pond) do not support benthic macroinvertebrates. Therefore, the sediment screening levels established by NYSDEC are not applicable to the stormwater ditches, only the lagoon.

As a result of the recent site visit, the following conclusions were made for SEAD-4:

(1) Only the lagoon at SEAD-4 has permanent water and may support aquatic life; therefore, the NYSDEC's Technical Guidance for Screening Contaminated Sediments (1999) is applicable to the sediment at the pond bottom. Aquatic receptors should be assessed for the area.

(2) All the other drainage swale areas at SEAD-4 are nonwetlands or are not regulated as wetlands. There is no evidence that the areas support the living, feeding, and breeding activities of benthic organisms, i.e., aquatic macroinvertebrates, and that the areas would allow them to complete their life cycles. In addition, the sediment screening levels established by NYSDEC are based on toxic effects for benthic macroinvertebrates. Therefore the NYSDEC's guidance should not be applied to these areas. Additionally, no aquatic receptors or exposure via preying aquatic/benthic biota should be evaluated.

1.2.6 Nature and Extent of Constituents of Concern

The subsurface soils at SEAD-4 have been impacted primarily by metals (**Table A-1**, **Appendix A**). Chromium and copper were the two metals that had the greatest frequency of detection above their respective NYSDEC TAGM. Chromium exceeded the NYSDEC TAGM value of 30 mg/Kg in 17 subsurface soil samples. A maximum concentration of 3,820 mg/Kg was detected in SB4-25 at a depth of 2-3.5 feet. SB4-25 is located on the southern edge of the pond. The soil sample from MW4-8 (6-6.5 feet) contained elevated concentrations of chromium. MW4-8 is also located south of the pond. Elevated concentrations of chromium were also detected at SB4-10 (adjacent to former Building T-30) at depths of 2-4 feet and 4-6 feet. In addition, elevated concentrations of copper were detected in the samples from SB4-10 and SB4-25. On the basis of the subsurface soil data, the highest concentrations of metals were found in the soil samples from SB4-10, SB4-14, and SB4-25. SB4-14 is located near Building 2084. Impacts from the remaining organic and inorganic constituents detected in the subsurface soil samples are not considered significant because of either the low frequency of detection or the relatively low number of samples exceeding the NYSDEC TAGMs, or both.

The surface soils at SEAD-4 have been impacted primarily by metals and SVOCs (**Table A-2, Appendix A**). The four metals that had the greatest number of exceedences of either their respective NYSDEC TAGM or 95th percentile background values, whichever is higher, are chromium (43%), copper (34%), lead (45%), and zinc (33%). These four metals were also detected in 90-100% of the total number of soils samples collected. Antimony was detected at a frequency of 45% above the 95th percentile background value, but was only detected in approximately 40% of the total number of samples collected. Thallium was detected at a frequency of 84% above the 95th percentile background value, but was only detected in approximately 22% of the total number of samples collected. Mercury was detected at a frequency of 35% above the NYSDEC TAGM value, but was only detected in approximately 52% of the total number of samples collected. All other metals were detected at either very low frequencies in the total number of samples collected, or exceeded their respective NYSDEC TAGMs or 95th percentile background values at very low frequencies. Nine of the maximum concentrations of metals were detected in surface soil sample SB4-25, which is located at the southern edge of the pond.

Although there were detections of chromium in surface soil samples collected throughout the site, the majority of the elevated concentrations of chromium were detected in surface soil samples from areas surrounding the lagoon, southwest of the lagoon, southwest of the former building T30, and a drainage ditch connecting the areas (**Figure 1-3**). Elevated concentrations of copper were also found in the same locations as the elevated chromium concentrations.

Hexavalent chromium was analyzed at 15 surface soil locations with elevated concentrations of total chromium (**Table A-3**, **Appendix A**). The maximum concentration of 14.7 mg/Kg was found in soil sample SS4-9, which is in Area 1. The total chromium concentration for soil sample SS4-9 was 6590 mg/Kg.

Four SVOCs were detected in the surface soils at concentrations above their associated NYSDEC TAGM values; however, the maximum value of carcinogenic PAHs are well below the NYSDEC suggested threshold value of 10 ppm benzo(a)pyrene equivalence. The highest concentrations of benzo(a)anthracene, chrysene, benzo(a)pyrene, and dibenz(a,h)anthracene in surface soils were detected in samples collected from SS4-54 SS4-55 and SS4-56. These samples are all located in the vicinity of Building 2084.

Although NYSDEC guidelines for sediment were used in the RI to evaluate the nature and extent of contamination of sediments/soil found in the ditches, the nature of the soil found in the ditches surrounding SEAD-4 has not been found to support the living, feeding, and breeding activities of aquatic macroinvertebrates. This is discussed in more detail in **Section 1.2.5** of this report. For this FS Report, the analytical results for the soil in the ditches have been compared to the NYSDEC TAGM values.

The soil in the ditches at the site has been impacted by SVOCs, pesticides, PCBs, and metals (**Table A-5, Appendix A**). The SVOC compounds benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, hexachlorobenzene, and phenol were detected in the ditch soils at concentrations above their associated NYSDEC TAGM values. No ditch soil locations exceeded the NYSDEC suggested threshold value of 10 ppm benzo(a)pyrene equivalence. The metals, chromium, copper, lead, mercury, and zinc, had the largest percentage of samples exceeding the respective TAGM criteria.

Eight metals, aluminum, antimony, chromium, iron, manganese, selenium, sodium, and thallium, were found in one or more of the groundwater samples at concentrations above the NYS Class GA or EPA MCL standards (**Table A-6**, **Appendix A**). Chromium was detected in one monitoring well at concentration above the NYS Class GA standard. The concentration of chromium (260 μg/L) was detected in MW4-9, which is located west and downgradient of former Building T-30.

Benzene was detected in one groundwater sample from MW4-10 at a concentration of 2 μg/L, which is above the NYS Class GA standard of 1.0 μg/L. Ethyl benzene was also detected from MW4-10 at a concentration of 6 μg/L, which is above the NYS Class GA standard of 5 μg/L. Both compounds were not detected in the groundwater samples during the second round of sampling.

Generally, surface water impacts were from metals, nine of which were found at concentrations that exceeded their respective standards (**Table A-7**, **Appendix A**).

Sediment in the man-made lagoon has been impacted by PCBs and metals (**Table A-8**, **Appendix A**). Aroclor-1254 was detected in two of the three samples, with the concentrations in two samples exceeding the NYS criteria. Elevated concentrations of antimony, arsenic, chromium, copper, iron, nickel, and zinc were detected at concentrations exceeding the NYSDEC sediment criteria.

In the building material samples collected from six buildings at SEAD-4, metals, SVOCs, pesticides, PCBs, and nitroaromatics were detected at elevated concentrations (**Table A-9, Appendix A**).

1.3 BASELINE RISK ASSESSMENT

A baseline risk assessment (BRA) was conducted for SEAD-4 and is presented in the RI (Parsons ES, January 2001). The ecological risk assessment was revised in January 2002. The objectives of the baseline risk assessment were to:

- assess site conditions for protectiveness of human health and the environment;
- determine whether additional response actions are necessary at the site;
- 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) (USEPA, 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 on-site land-use scenarios.

1.3.1 Baseline Human Health Risk Assessment

The human health risk assessment was conducted for the conservation and recreation land use scenario for the following six receptors:

1) current site worker,
2) future outdoor park worker;
3) future indoor park worker;
4) future construction worker;
5) future recreational visitor (child); and
6) future resident.

Of these receptors, the future indoor park worker and future resident exhibit risks that exceed the EPA defined targets (lifetime cancer risk of 10^{-4} to 10^{-6}; non-cancer hazard index less than 1). Both the carcinogenic and non-cancer health risks were within or below the USEPA target levels for all other receptors including the current site worker, future outdoor park worker, future construction worker and future recreational visitor (**Appendix B**).

The excess cancer and non-cancer risks for the indoor park worker are due primarily to dermal contact and ingestion of indoor dust. The excess cancer and non-cancer risks for the resident identified in the RI were due primarily to dermal contact with groundwater and surface water. The RI showed the combined ingestion of soil and sediment also poses a non-cancer risk which results in a hazard index greater than 1. These initial results were due to exposures estimated from the detection of very low levels of Aroclor-1260 in one groundwater sample and benzo(a)pyrene in one surface water sample. The Aroclor-1260 detection was found in the groundwater sample from MW4-10, which is located adjacent to Building 2084. To verify the presence of the PCB in the site groundwater, MW4-10 was resampled in June 2004 and analyzed for PCBs using an analytical method with a lower detection limit. The results, included in **Appendix A**, show that no PCBs were detected in the groundwater and demonstrate that Aroclor-1260 is not a COC. The risk for a resident from dermal exposure to groundwater was due solely to the presence of Aroclor-1260. Since it has been confirmed that the PCB is not present in the groundwater, there is now no risk due to dermal contact to groundwater. The cancer and non-cancer risk values attributed to benzo(a)pyrene due to dermal contact with water are considered highly uncertain and probable overestimates of risk.

The potential risks from exposure to lead in soil were assessed separately from other compounds. The soil and sediment results were compared with USEPA screening levels for residential and occupational exposures. The SEAD-4 average lead concentrations were all less than the applicable screening levels. Therefore, there are no expected health risks to future resident children or working adults from exposure to lead at the site.

1.3.2 Baseline Ecological Risk Assessment

The ecological risk assessment (ERA) was performed following the guidance presented in the New York State Division of Fish and Wildlife "Impact Analysis for Inactive Hazardous Waste Sites" (NYSDEC 1994), the "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments" (EPA, 1997), and the "Guidelines for Ecological Risk Assessment (EPA, 1998).

The current USEPA 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 DQO Process.
5. Verification of Field Sampling Design.
6. Site Investigation and Data Analysis.
7. Risk Characterization.
8. Risk Management (USEPA 1997).

Upon completion of ERA Step 3, 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 there is 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, or
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted.

The screening-level ERA (Steps 1, 2, and 3) was performed to evaluate soil, surface water, and sediment at SEAD-4. The ERA included both qualitative and quantitative assessments of the ecological status of SEAD-4. Field evaluations, including a characterization and description of the local wildlife habitat and ecological conditions within the study area, were initially conducted. Based on these studies, the short-tailed shrew, meadow vole, mourning dove, and red-tailed hawk were chosen to represent the terrestrial vertebrae populations in the quantitative assessment and a largemouth bass was selected to represent the aquatic community. In addition, the great blue heron was chosen as a higher trophic level wetland species whose prey could be exposed to contaminated sediment or surface water. An amphibian was also chosen to evaluate risk associated with exposure to surface water.

In Step 2, the no observable adverse effects level (NOAEL) hazard quotient (HQ) was calculated for each contaminant of potential concern (COPC) using maximum detected concentrations. An HQ is a ratio of the estimated exposure dose (for mammal and bird receptors) or exposure concentration (for fish) of a contaminant to the Toxicity Reference Value (TRV). The greater this ratio, the greater the likelihood of an effect. A quotient equal to one is considered the threshold level at which effects may occur. An HQ greater than one indicates that a compound is a potential contaminant of concern and additional evaluation may be required.

Surface and subsurface soil COPCs generating NOAEL HQs greater than 1 include benzo(a)pyrene, bis(2-ethylhexyl)phthalate, di-n-octylphthalate, Total PCBs, 4,4'-DDT, antimony, chromium (total), copper, lead, thallium, and zinc (**Appendix B**). Ditch soil COPCs generating NOAEL HQs greater than 1 include benzo(a)pyrene, bis(2-thylhexyl)phthalate, Aroclor-1254, Aroclor-1260, antimony, chromium (total), chromium VI, copper, lead, mercury, vanadium, and zinc. Sediment COPCs generating NOAEL HQs greater than 1 for the fish-eating bird (great blue heron) include aluminum, chromium (total), and zinc. Surface water COPCs for fish include aluminum, cadmium, cobalt, iron, manganese, vanadium, and zinc. The surface water COPC for the amphibian includes aluminum and copper.

Due to the conservative nature of the default exposure assumptions used in Step 2, an additional evaluation was conducted in Step 3 (Problem Formulation) to more fully characterize and focus on potential ecological risks and to determine if further evaluation was required. Surface water data were re-evaluated to reflect actual conditions at the site and only those samples collected from the man-made lagoon were included in the evaluation of the fish and amphibian receptors. HQs for the hawk were recalculated using a conservative estimate of the site foraging factor of 10% based on a site size of 30 acres and a foraging range of 576 acres. The foraging range and time factor of the great blue heron were considered in the evaluation of sediment. The foraging range of the great blue heron is approximately 1.6 acres, which is twice the size of the man-made lagoon (0.7 acres). The great blue heron is a seasonal resident of New York State, spending approximately half the year at the site. Therefore, a foraging factor of approximately 0.5 was used for the heron.

The results of Step 3 identified chromium (total) and lead as contaminants of concern (COC) for surface and subsurface soil. The receptor with the highest HQ for chromium was the dove and the receptor with the highest HQ for lead was the shrew. Chromium (total) was identified as a COC for the ditch soils. In addition, an elevated vanadium concentration at SD4-28 raised a concern for the terrestrial ecological receptors. Chromium (total) was identified as the COC for sediment. For surface water, only one compound (aluminum) with an HQ of 6 was calculated for the amphibian. The ERA concluded that no further study is required for surface water.

2.0 REMEDIAL ACTION OBJECTIVES

2.1 INTRODUCTION

This section describes the remedial action objectives (RAOs) and general response actions for each media of interest at SEAD-4. The EPA method of identifying and screening technologies/processes consists of the following:

1. Develop RAOs that specify media of interest, chemical constituents of concern, and the results of the BRA;
2. Develop general response actions for each medium of interest that will satisfy each remedial action objective for the site;
3. Estimate quantities of media to which general response actions will be applied to meet remedial action objectives;
4. Identify remediation technologies/processes associated with each general response action. Screen and eliminate technologies/processes based on technical implementibility;
5. Evaluate technologies/processes and retain processes that are representative of each technology; and
6. Assemble and further screen the retained technologies/processes into a range of alternatives as appropriate.

To accelerate cleanups at certain categories of sites, the EPA developed a program known as the Superfund Accelerated Cleanup Model (SACM). One directive under this program is the presumptive remedy approach. Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection. Presumptive remedies have been developed for several categories of sites including “metals-in-soil” sites. The use of presumptive remedies is consistent with all of the requirements of CERCLA and the NCP. The use of presumptive remedies helps to focus data collection efforts during site investigations, and significantly reduce the technology evaluation and feasibility study phases. **Section 3.0** discusses the presumptive remedy approach in more detail and describes the presumptive remedies for metals-in-soils sites.

2.2 GENERAL REMEDIAL ACTION OBJECTIVES

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) clean-up 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 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 (SARA) of 1986, requires that a CERCLA remedial action:

- At least 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. However, a “no-action” decision does not require compliance with ARARs. Where off-site remedial actions are necessary, these off-site response actions only must comply with applicable federal and state environmental laws.

RAOs were developed for SEAD-4. The objectives consist of media specific objectives designed to be protective of human health and the environment. Where appropriate, consideration was given to the NCP preference for permanent solutions. The RAOs for SEAD-4 are as follows:

- The SEDA Local Redevelopment Authority has determined that the future use of SEAD-4 will be wildlife conservation/recreation, and thus cleanup of this site and the following additional RAOs will be performed in a manner consistent with this wildlife conservation/recreation land use determination.

- Prevention of direct contact by public or other persons with adversely impacted soils, sediments, solid waste and surface water that may present a health risk.

- Elimination or minimization of the migration of hazardous constituents from soil to groundwater and downgradient surface water.

- Prevention of off-site migration of constituents above levels protective of public health and the environment.

- Restoration of soil and sediments to levels that are protective of public health and the environment.

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

2.3 RISK-BASED REMEDIAL ACTION OBJECTIVES

The results of the Baseline Risk Assessment (BRA) presented in the RI report (Parsons ES, Final, January 2001) were used to develop the risk-based remedial action objectives. EPA considers that a site exhibits unacceptable risk if the Hazard Index (HI) is greater than 1, or if the cancer risk is greater than the target range of 1 x 10^{-4} to 1 x 10^{-6}.

2.3.1 Human Health Risk Assessment

A hazard index and cancer risk was calculated for SEAD-4 based on the reasonable maximum exposure (RME) for each of the six exposure scenarios (discussed in **Section 1.3.1**). A total receptor risk was also calculated. The risk calculations presented in the RI Report indicate that under the current and intended future land-use scenarios (pre-remediation case), the total hazard index is below the EPA acceptable level of 1 for the current site worker (HI=0.006), the future outdoor park worker (HI=0.01), the future recreational visitor (0.4), and the future construction worker (0.2). However, the total hazard indices for the future indoor park worker (HI=20) and the future resident (HI=3 for adult and HI=7 for child) exceed the acceptable EPA level of HI=1 (note that the hazard indices for the resident have been reduced due to further groundwater sampling for PCBs). Results of the RME risk calculations are presented in **Appendix B**.

The total cancer risks for all receptors except the future indoor park worker and the future resident are below the EPA target range. For the future indoor park worker, the total cancer risk is 3 x 10^{-4}. For the future resident, the total cancer risk is 2 x 10^{-4}.

For the future indoor park worker, the excess RME cancer risk and hazard index of 20 are due primarily to dermal contact with indoor dust. Ingestion of indoor dust also poses a non-cancer risk. The chemical that drives these risks is Aroclor-1254. Inhalation of indoor dust was also an exposure pathway for the indoor park worker, however, there was no calculated excess risk from this exposure.

For the future resident, the excess RME cancer risk and hazard indices of 7 (child) and 3 (adult) are due primarily to dermal contact with groundwater and surface water. These results are due to exposures estimated from the detection of a very low level of Aroclor-1260 in one groundwater sample (0.079 J μg/L in MW4-10) and benzo(a)pyrene in one surface water sample (0.15 J μg/L in SW4-13). The presence of Aroclor-1260 in groundwater was questionable since Aroclor-1260 was only detected in one well (MW4-10) at a concentration below the detection limit in only one of the two groundwater sampling rounds completed during the ESI. To verify the presence of the PCB in the site groundwater, MW4-10 was resampled in June 2004 and analyzed for PCBs using an analytical method with a lower detection limit. The results, presented in **Appendix A**, show that no PCBs were detected in the groundwater and demonstrate that Aroclor-1260 is not a COC. The risk for a resident from dermal exposure to groundwater was due solely to the presence of Aroclor-1260. Since the PCB is not present in the groundwater, there is no risk due to dermal contact to groundwater. In addition, the PAH results are considered highly uncertain due to the low number of samples containing this compound and the low concentration encountered in the sample.

Potential risks from lead in soils were not assessed in the quantitative risk assessment since no approved RfD, RfC, slope factor or inhalation unit risk factors are currently available. Lead was considered by comparing site data to levels established by the EPA.

To qualitatively assess risks from child residential lead exposure, the site concentrations were compared with the screening level presented in the OSWER Interim Directive #9355-12. In this Directive, EPA presents a screening level of 400 mg/kg lead in soil based on the agency’s running of the Integrated Exposure Uptake Biokinetic (IEUBK) Model with default parameters. This directive indicates that this screening level may be used as a tool to determine which sites or portions of sites require further study.

To qualitatively assess risks from adult occupational lead exposure, the site concentrations were compared with risk-based remediation goals (RBRGs) presented in "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (EPA, December 1996). In this report, EPA presents a model to calculate target soil concentrations of lead (RBRGs) at which the exposure for a woman of child-bearing age would minimize risk to her fetus.

EPA has calculated RBRGs for lead in soil using their recommended default parameters as inputs to the model. For a worker population exposed for 219 days per year, EPA suggests an RBRG in the range of 750 - 1750 mg/kg lead in soil.

At SEAD-4 the average lead concentrations measured in total soils is 94 mg/kg; surface soils, 163 mg/kg; and sediment 77 mg/kg. These values are below the most stringent standard screening level of 400 mg/kg. The average lead concentration in interior building debris is 3800 mg/kg, which is higher than the EPA recommended screening levels for soils. The Exposure Point Concentration (EPC) for indoor air is 0.2 $\mu g/m^3$ and the highest outdoor air EPC is 0.006 $\mu g/m^3$. These values are lower than the National Ambient Air Quality Standard for lead, which is 1.5 $\mu g/m^3$ (based on a 3-month rolling average).

These results suggest that lead may pose a human health risk upon regular exposure to the interior building debris. However, the soils, indoor air, and ambient air do not appear to pose unacceptable risk from lead. The most susceptible receptor would be the future indoor park worker.

2.3.2 Ecological Risk Assessment

In accordance with EPA guidance, a screening level ERA was performed to evaluate soil, surface water, and sediment contaminants at the SEAD-4 site. This ERA was completed in three steps as described in Section 1.3.2.

In Step 1, maximum detected concentrations were compared to screening criteria to identify contaminants of potential concern (COPCs). In Step 2, the no observable adverse effects level (NOAEL) hazard quotient (HQ) was calculated for each COPC using maximum detected concentrations. An HQ is a ratio of the estimated exposure dose (for mammal and bird receptors) or exposure concentration (for fish) of a contaminant to the Toxicity Reference Value. The greater this ratio, the greater the likelihood of an effect. A quotient equal to 1 is considered the threshold level at which effects may occur. An HQ greater than 1 indicates that a compound is a COPC and additional evaluation is required. Results of the ERA are presented in **Appendix B**.

Potential exposures and effects resulting from maximum concentrations of contaminants for soil were evaluated by estimating potential direct and indirect exposures for terrestrial wildlife (short-tailed shrew, meadow vole, red-tailed hawk, and mourning dove). These estimated exposure doses were compared to NOAEL toxicity reference values to calculate an HQ. Surface and mixed soil COPCs generating a NOAEL HQ greater than 1 include benzo(a)pyrene, bis(2-ethylhexyl)phthalate, di-n-octylphthalate, total PCBs, 4,4'-DDT, antimony, chromium (total), copper, lead, thallium, and zinc. Ditch soil COPCs generating NOAEL HQs greater than 1 include benzo(a)pyrene, bis(2-thylhexyl)phthalate, Aroclor-1254, Aroclor-1260, antimony, chromium (total), chromium VI, copper, lead, mercury, vanadium, and zinc.

Potential exposures and effects resulting from maximum concentrations of sediment contaminants were evaluated by estimating potential direct and indirect exposures for aquatic wildlife (great blue heron) and comparing exposures to NOAEL toxicity reference values. Sediment COPCs generating NOAEL HQs greater than 1 for the great blue heron include aluminum, chromium (total), and zinc.

Potential exposures and effects resulting from maximum concentrations of surface water contaminants were also evaluated by estimating potential direct and indirect exposures for aquatic wildlife (largemouth bass and amphibians) and comparing exposures to NOAEL toxicity values. Surface water COPCs generating HQs greater than 1 include aluminum, cadmium, cobalt, iron, manganese, vanadium, and zinc.

Due to the conservative nature of the assumptions in Step 2, additional evaluation was required to more fully characterize potential ecological risks and to determine if further evaluation is warranted. In accordance with EPA guidance, this additional evaluation was performed as part of the problem formulation in Step 3. Alternative toxicity values and mean exposures based on mean concentrations were considered when evaluating contaminants of concern (COC). Surface water data were re-evaluated to reflect actual conditions at the site and only those samples collected from the man-made lagoon were included in the evaluation of the fish and amphibian receptors. For all soils, HQs for the hawk were recalculated using a conservative estimate of the site foraging factor of 10% based on a site size of 30 acres and a foraging range of 576 acres

(**Table B-4, Appendix B**). The foraging range and time factor of the great blue heron were considered in the evaluation of sediment. The foraging range of the great blue heron is approximately 1.6 acres which is twice the size of the man-made lagoon (0.7 acres).

The results of the Step 3 evaluation identified chromium (total) and lead as contaminants of concern (COC) for surface and mixed soils and chromium (total) for the ditch soils. Chromium (total) was identified as the COC for sediment.

For Step 2, it was assumed that all surface water samples collected represented areas that could support fish species. Initial exposure calculations using the largemouth bass receptor identified seven metals with NOAEL max HQs greater than one. However, a majority of the surface water samples were taken from areas that only have intermittent surface water present. To more realistically evaluate surface water contaminants, a re-evaluation was performed using only those data representing standing water at the site (i.e., SW4-1 and SW4-2). The results indicate that all contaminants in surface water from the lagoon evaluated using the largemouth bass either were not detected (cadmium, cobalt, and vanadium) or had NOAEL HQs less than 1 (aluminum, iron, manganese, and zinc). Using these data to screen against amphibian effects concentration resulted in only one compound (aluminum) with an HQ greater than 1. All other chemicals were either not detected, had no data for the effects concentration, or had calculated HQs less than 1. The ERA concluded that no further study is required for surface water.

2.3.3 Risk-Based Remedial Action Objective Summary

The risk-based remedial objectives for SEAD-4 are to reduce any non-carcinogenic and carcinogenic risks to acceptable levels considered to be protective of human health and the environment. The human health risk assessment indicates that indoor dust, surface water, and groundwater at SEAD-4 may pose a potential risk to the future indoor worker and future resident.

The excess cancer risk and elevated hazard indices for dermal exposure to surface water and groundwater at SEAD-4 are primarily due to Aroclor-1260 and benzo(a)pyrene. These results are based upon exposures estimated from the detection of a very low level of Aroclor-1260 in one groundwater sample and benzo(a)pyrene in one surface water sample. The concentration of Aroclor-1260 (0.079 J μg/L) was below the NYS GA standard of 0.09 μg/L. To verify the presence of the PCB in the site groundwater, MW4-10 was resampled in June 2004 and analyzed for PCBs with a lower detection limit. The results, included in **Appendix A**, show that no PCBs were detected in the groundwater and demonstrate that Aroclor-1260 is not a COC. The risk for a resident from dermal exposure to groundwater was due solely to the presence of Aroclor-1260. Since the PCB is not present in the groundwater, there is no risk due to dermal contact to groundwater. These risk results are considered highly uncertain and probable overestimates of risk, as qualified in the Risk Characterization and Uncertainty sections of the Remedial Investigation Report.

The quantitative ecological risk evaluation, which involved comparisons of the ecological assessment endpoint exposures with the toxicity reference values, initially suggested that that the COPCs may potentially cause adverse environmental effects. Based on the results of Step 3 (Problem Formulation) analysis, chromium (total) and lead were identified as COCs for surface and mixed soils and chromium (total) was the COC for ditch soils. Chromium (total) was identified as the COC for sediments in the lagoon. The ERA concluded that no further study was required for the surface water media.

Cleanup goals for SEAD-4 will be established such that human health risk from dermal contact with and ingestion of indoor dust to the future indoor park worker will be reduced to within EPA criteria values. Clean-up goals for soils will be established so that ecological risks will be reduced to within calculated ecological risk-based criteria. ARARs will also be considered prior to developing an overall remedial action plan for SEAD-4.

2.4 ARAR-BASED REMEDIAL ACTION OBJECTIVES

The investigation and remediation of SEAD-4 is subject to the pertinent requirements of both federal environmental statutes and regulations (generally administered by EPA Region II for SEDA) and the State of New York environmental statutes and regulations (generally administered by NYSDEC for SEDA) as 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 chosen 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 (water, soil, sediment, and air). 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 guidance. 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 developing CERCLA remedies. These advisories, criteria, or guidance are not promulgated and, therefore, are not legally enforceable standards like ARARs.

2.4.1 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 (*e.g.*, maximum contaminant levels (MCLs) that establish safe levels for drinking water.)

Chemical-specific TBCs (such as NYSDEC Technical and Administrative Guidance Manuals (TAGMs)) can serve to indicate contaminant levels that may merit concern, and also as cleanup goals.

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

2.4.1.1 Potential Chemical-Specific ARARs--Surface and Subsurface Soils

Cleanup levels for chemical hazardous constituents in soil have been developed by the State of New York as TAGMs under #HWR-92-4045. The NYSDEC TAGM manual for cleanup levels for soils is #HWR-94-4046 and has been used as guidance for this remedial action. The soil concentrations provided in the TAGM 4046 are not promulgated standards, and therefore are not ARARs, but rather are TBC guidelines for SEDA. For metals in soil, the TAGM values are either site background or a risk-derived value, whichever is higher. Although the TAGM values are not ARARs they have been given appropriate weight in this context.

The results of the chemical analyses show that subsurface soils at SEAD-4 have been impacted primarily by metals. Antimony, copper, chromium, and zinc were detected at concentrations above their respective TAGM values in subsurface soil samples. The remaining organic and inorganic constituents which were detected in the subsurface soil samples are considered to pose no human health or environmental risk due to their detection at concentrations which were below or only slightly above their respective TAGM values.

The results of the chemical analyses show that surface soil at the site has been impacted primarily by SVOCs and metals. Four SVOCs and several metals exceed their respective TAGM values. Chromium, copper, lead, and zinc had the largest percentage of samples exceeding the TAGM values. Other constituents that were detected, but are considered to pose no human health or environmental risk, include volatile organic compounds, pesticides and PCBs, herbicides, nitroaromatic compounds and nitrate/nitrite nitrogen.

A total of 26 SVOCs were detected at varying concentrations in surface soil samples. The compounds benzo(a)anthracene, chrysene, benzo(a)pyrene, and dibenz(a,h)anthracene were reported in surface soil samples at concentrations exceeding their TAGM values. The four compounds were found at maximum concentrations of 560 μg/kg, 570 μg/kg, 450 μg/kg, and 130 μg/kg, respectively, in the surface soil sample SS4-55, located adjacent to Building 2084.

Of the 24 metals reported in surface soil, 19 of these were found in one or more samples at concentrations above their respective TAGM values. While the majority of these exceedances were found in only one or two samples, or were only marginally above the TAGM values, several metals were identified at concentrations that were significantly above the TAGM values. Of particular note are the metals antimony, chromium, copper, and zinc, where a large percentage of the samples exceeded the TAGM values. The highest concentrations of these metals (antimony at 148 J mg/kg, chromium at 18,600 mg/kg, copper at 7,330 mg/kg, and zinc at 2,020 mg/kg) were found in surface soil sample SB4-25, located at the southern edge of the pond, in an area where sediment was previously dredged from the pond. Other metals frequently detected above their respective TAGM values are lead, thallium, and mercury.

2.4.1.2 Potential Chemical-Specific ARARs--Soil in Ditches

Chemical hazardous constituents in soil in SEAD-4 ditches were also evaluated in light of the New York soil TAGMs as TBCs.

Based on the information provided in Section 1.2.5, the NYSDEC sediment criteria are not applicable for the soils found in the ditches at the site. For the remainder of this FS report, the sediment/soil found in the drainage ditches will be referred to as soil.

SVOCs, pesticides, PCBs, and metals were detected in the soils sampled in the drainage ditches. Other constituents that were detected, but are not considered to present a health or environmental risk, include volatile organic compounds, nitroaromatics, and nitrate/nitrite nitrogen. These constituents were detected at low concentrations and/or in only a small number of samples. Twenty metals were found at concentrations above the NYSDEC TAGM criteria. Of these metals, chromium, copper, lead, mercury, and zinc are present in the largest number of samples at concentrations greater than the criteria value (**Table A-5, Appendix A**)

2.4.1.3 Potential Chemical-Specific ARARs--Groundwater

Groundwater at SEAD-4 is classified by NYSDEC as Class GA. As a result, the groundwater quality standards for a Class GA groundwater are potential ARARs for this site.

Aluminum, antimony, chromium, iron, manganese, selenium, sodium, and thallium, were found in one or more of the groundwater samples at concentrations above the NYS Class GA or EPA MCL standard.

Chromium was detected in one monitoring well (MW4-9) at a concentration of 260 μg/L (Round 1), which is above the NYS Class GA standard of 50 μg/L. MW4-9 is located west of former Building T-30. The turbidity of the groundwater sample was 31. However, the concentration of chromium from the Round 2 Sampling Program was 21.8 μg/L and the turbidity of the sample was 3.7.

Benzene was detected in one groundwater sample from MW4-10 at a concentration of 2 μg/L, which is above the NYS Class GA standard of 1.0 μg/L. Ethyl benzene was also detected from MW4-10 at a concentration of 6 μg/L, which is above the NYS Class GA standard of 5 μg/L. Both compounds were not detected in the groundwater samples during the second round of sampling.

Aroclor-1260 was detected in one groundwater sample from MW4-10 at a concentration of 0.079 J μg/L in Round 2 of groundwater sampling. Aroclor-1260 was not detected in Round 1 of sampling. The NYS GA for Aroclor-1260 is 0.09 μg/L. Additional groundwater sampling at MW4-10 in June 2004 confirmed that PCBs are not present in the groundwater and are not considered COCs.

A comparison to background groundwater samples collected from SEDA indicates that maximum concentrations of aluminum, antimony, iron, and manganese in background groundwater samples were greater than maximum concentrations in the groundwater samples from SEAD-4. In addition, concentrations of sodium and thallium in background groundwater samples exceeded the respective NYS Class GA or EPA MCL standards.

2.4.1.4 Potential Chemical-Specific ARARs--Surface Water

Surface water at SEAD-4 is found in two man-made drainage ditches and a man-made lagoon on the site. The surface water in the ditches and the lagoon are not classified by NYSDEC because they are intermittent and/or not recognized as an established stream or creek. However, because the drainage ditches form the headwaters for Indian 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 the surface water in the drainage ditches and the lagoon found at SEAD-4, and thus are treated as TBCs here.

Based on the RI data, nine metals were found at concentrations above the respective NYSDEC AWQS Class C surface water standard in the surface water samples. The majority of concentrations of metals exceeding the Class C standards were found in samples from SW4-13, which is located in the drainage ditch at the northwestern corner of the site. Other constituents that were detected, but are not considered to present a health or environmental risk, are volatile organic compounds, SVOCs, pesticides, and nitrate/nitrite nitrogen.

2.4.1.5 Potential Chemical-Specific ARARs--Sediment in Lagoon

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). The criteria were developed based on an average organic carbon level of 3.91% in the sediment. This is the SEDA-wide organic carbon level. These sediment criteria are not ARARs, but rather TBCs because they are not promulgated standards. According to the January 1999 update to the "Technical Guidance for Screening Contaminated Sediment" (NYSDEC, 1993), these values "do not necessarily represent the final concentrations that must be achieved through sediment remediation. Comprehensive sediment testing and risk management are necessary to establish when remediation is appropriate and what final contaminant concentrations the sediment remediation efforts should achieve."

PCBs and metals were detected in the sediment sampled in the man-made lagoon at SEAD-4. Other constituents that were detected, but are not considered to present a health or environmental risk, include volatile organic compounds, SVOCs, pesticides, and herbicides. These constituents were detected at low concentrations and/or in only a small number of samples. Nine metals were found at concentrations above the NYSDEC LEL criteria. Of these metals, antimony, arsenic, chromium, copper, iron, nickel, and zinc are present in a large number of samples and/or at concentrations greater than the criteria value.

2.4.1.6 Building Material and Debris

Metals, SVOCs, pesticides, PCBs, and nitroaromatics were detected at elevated concentrations in the building material samples collected from the six buildings at SEAD-4. There are no chemical-specific ARARs or TBCs for the buildings at SEAD-4.

2.4.2 Potential Location-Specific ARARs

Location-specific ARARs may serve to limit contaminant concentrations, or even restrict or 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 the SEAD-4 response action include the following:

2.4.2.1 Potential Federal Location-Specific ARARs

- 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).
- RCRA Location and 100-year Floodplains Requirements (40 CFR 264.18(b)).
- Clean Water Act, 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).
- Endangered Species Act of 1973 (16 USC 1531 - 1544).
- Fish and Wildlife Coordination Act of 1934 (16 USC 661).
- Wilderness Act of 1964 (16 USC 1131 - 1136).

2.4.2.2 Potential New York Location-Specific ARARs

- 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 Inactive Hazardous Waste Disposal Sites—Remedy Selection (6 NYCRR 375.10(b)(“goal of the program for a specific site is to restore that site to pre-disposal conditions, to the extent feasible and authorized by law.”).
- New York State Flood Hazard Area Construction Standards.

Based on site conditions and the site land use determination (*i.e.*, wildlife conservation/recreational), further consideration of these location-specific ARARs does not appear warranted at this time.

2.4.3 <u>Potential Action-Specific ARARs</u>

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.

Potential federal and state action-specific ARARs considered in connection with the SEAD-4 response action include the following:

2.4.3.1 Federal Action-Specific ARARs

- RCRA subtitle C, Hazardous Waste Treatment Facility Design and Operating Standards for Treatment and Disposal systems, (*i.e.*, landfill, incinerators, tanks, containers, etc.) (*i.e.*, 40 CFR part 264); RCRA section 3004(o), 42 USC 6924(o) (RCRA statutory minimum technology requirements.)
- RCRA, Closure and Post-Closure Standards (40 CFR 264, subpart G).
- RCRA Groundwater Monitoring and Protection Standards (40 CFR 264.92 and 264.97 – 264.99).
- 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).
- 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 POTW—general Pretreatment regulations (40 CFR part 403).
- DOT Rules for Hazardous Materials Transport (49 CFR part 107, and 171.1-171.500).
- 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 part 264, subparts AA, BB, and CC.)

2.4.3.2 Potential New York Action-Specific ARARs

- 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 Hazardous Waste Regulations—identification, generators, transportation, treatment/storage/disposal, land disposal restrictions, and minimum technology requirements (6 NYCRR 370-376)
- New York State Solid Waste Management and Siting Restrictions (6 NYCRR 360-361).
- New York State Hazardous Waste Generator and Transporter Requirements for Manifesting Waste for Off-Site Disposal (6 NYCRR 364 and 372).
- New York State Inactive Hazardous Waste Disposal Sites—Remedy Selection (6 NYCRR 375.10(b)("At a minimum, the remedy selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by hazardous waste disposed at the site through the proper application of scientific and engineering principles.").
- New York State Inactive Hazardous Waste Disposal Sites--Interim Remedial Measures (IRMs) (6 NYCRR 375-1.3(n) and 375.1.11)

Based on site conditions and the site land use determination (*i.e.,* wildlife conservation/recreational), further consideration of these action-specific ARARs does not appear warranted at this time. However, precise action-specific ARARs to be used for SEAD-4 will be subsequently determined by the Army once it selects the technology for attaining chemical-specific ARARs and TBCs for any IRM or final remedial action for this site.

2.5 MEDIA SPECIFIC REMEDIATION GOALS

The selection of the media of interest was based upon those media that cause exceedance of an EPA target risk level (**Section 2.3**), and the media that fail to attain ARARs or relevant TBCs (**Section 2.4**). The remedial investigation examined all environmental media at SEAD-4. Discrete samples of surface water, sediment in the lagoon, soils in drainage ditches, surface and subsurface soils, groundwater, and interior building surfaces were collected and analyzed using EPA and NYSDEC approved analytical techniques. The analytical data meets the established Data Quality Objectives (DQO's) and was used as the basis for this report.

The media of interest and locations that may require a remedial action were selected by evaluating the benefits gained by implementing such an action. The benefit of a CERCLA remedial effort is defined by the extent that a proposed action will eliminate risk or decrease the risk to acceptable levels. Decisions are then possible regarding the media and the extent of specific areas that need to be addressed. In this manner, if the conclusion is reached to perform a remedial action then the volume of material to be treated and the benefits produced by such an action can be quantified by the reduction in risk.

In addition, in accordance with 6 NYCRR 375-1.10, which establishes a goal for site remediation to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law", cost associated with the remediation of soils and sediment to pre-disposal (or residential) conditions were also estimated. Remediating the site to residential use levels would enable the site to be classified for unrestricted future use. To comply with this theoretical residential use scenario, the metals and SVOCs in soil would be remediated to the relevant TAGM or site background. While the currant land use determination for this site is conservation/recreation, the residential use cleanup scenario received further theoretical consideration in this process for cost comparison purposes.

Based on the results of the BRA and an evaluation of metals concentrations, RAOs were developed for surface and subsurface soil, soils in drainage ditches, sediment in the lagoon, groundwater, and surface water at SEAD-4. In addition, debris inside the abandoned buildings will require remedial actions to meet the risk-based RAOs. **Table 2-1** summarizes the RAOs for SEAD-4. A discussion of the selection of the media of interest is presented below.

2.5.1 Building Material and Debris

The material and debris in the interior of the buildings at SEAD-4 is a media of interest because the total cancer risks for the future indoor park worker exceeded the EPA allowable range due to dermal contact with indoor dust and ingestion of indoor dust. The primary compound responsible for the exceedences is Aroclor-1254. In addition, concentrations of lead in the interior building debris exceed the EPA risk based remediation goals for lead for the worker population. Elevated concentrations of other metals and SVOCs were also found in the interior of the abandoned buildings. The RAO for this media of interest is to remove the debris present in Buildings 2073, 2076, 2078, 2079, 2084, and 2085 to eliminate the risks associated with the compounds present in this material. This RAO is evaluated as Case 1 in **Table 2-1**.

2.5.2 Soil

Surface and subsurface soils are a media of interest based upon the potential ecological risk to terrestrial wildlife from metals in soils. In addition, metals and SVOCs were detected at concentrations above their respective TAGM values.

TABLE 2-1
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
REMEDIAL ACTION OBJECTIVES

Case	Remedial Action Objectives	Basis	Clean Up Criteria	Description of Media	Area (sq. ft.)	Ave. Depth (ft.)	In-Situ Volume (cu. yds.)	Sampling Locations Exceeding Cleanup Criteria
1	a) Protection of future indoor park worker	Human health risk Assessment showed excess carcinogenic and non-carcinogenic risks due to dermal contact and inhalation of indoor dusts. Concentrations of lead exceeded the RBRG for a worker.	Carcinogenic range of 1×10^{-4} to 1×10^{-6} Non-carcinogenic Harzard Index (HI) <1	Materials and debris inside Buildings 2084, 2085, 2073, 2078, 2076, and 2079.	5000	NA	20	See Figures 2-1 through 2-6
2	a) Protection of ecological receptors; b) Prevent ingestion/direct contact with metals in soils; c) Prevent/minimize migration of metals to groundwater.	Ecological soils cleanup values established using a Hazard Quotient = 1 [(1)]	Lead < 167 mg/kg Chromium < 324 mg/kg	Surface soils	73,225	1	2712	See Figures 2-7 and 2-8
				Subsurface soils	14,627	2	1083	
			Hotspot removal at SD4-28 (vanadium)	Ditch soils (chromium only)	10,736	1	400	
3	a) Restore site to pre-disposal conditions; b) Prevent ingestion/direct contact with metals in soils; c) Prevent/minimize migration of metals to groundwater.	Statutory Requirement to Restore site to pre-disposal conditions if feasible under 6 NYCRR 275-1.10 [(2)]	Antimony < 6 mg/kg Chromium < 30 mg/kg Copper < 33 mg/kg Lead < 24.8 mg/kg Mercury < 0.1 mg/kg Thallium < 0.7 mg/kg Zinc < 110 mg/kg Benzo(a)anthracene < 224 ug/kg or MDL Benzo(a)pyrene < 61 ug/kg or MDL Chrysene < 400 ug/kg Dibenzo(a,h)anthracene < 14 ug/kg or MDL	Surface soils	260,545	1	9650	See Figures 2-9 and 2-10
				Subsurface soils	43,778	2	3243	
				Ditch soils	110,906	1	4108	
4	a) Protection of ecological receptors; b) Prevent ingestion/direct contact with metals in sediments; c) Prevent/minimize migration of metals to groundwater.	Sediment Criteria adopted from NYSDEC Technical Guidance for Screening Contaminated Sediments, January 1999. [(3)]	Chromium < 26 mg/kg	Sediment in Pond	21,234	2	1,573	SD4-1, SD4-2, SD4-3
5	a) Protection of potential future on-site receptors.	NYSDEC Class C	Aluminum < 100 ug/L	Surface Water	NA	NA	NA	SW4-13

TABLE 2-1
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
REMEDIAL ACTION OBJECTIVES

Case	Remedial Action Objectives	Basis	Clean Up Criteria	Description of Media	Area (sq. ft.)	Ave. Depth (ft.)	In-Situ Volume (cu. yds.)	Sampling Locations Exceeding Cleanup Criteria
		Surface Water Standards (ARAR) Human health risk asessment showed excess risk to future resident to dermal contact with groundwater.	Lead < 7 ug/L Cadmium < 2 ug/L Chromium < 347 ug/L Cobalt < 5 ug/L Copper < 20 ug/L Vanadium < 14 ug/L Zinc < 141 ug/L Benzo(a)pyrene (risk based - SW4-13 only)					SW4-12 and SW4-14 (adj. locations) SW4-32 (background location)
6	a) Protection of potential future on-site receptors.	40 CFR Part 141.11 and 6 NYCRR Subpart 703 GA Groundwater Standards (ARAR) Human health risk asessment showed excess risk to future resident to dermal contact with surface water.	Benzene < 1 ug/L (NYS GA) Ethylbenzene < 5 ug/L (NYS GA) Antimony < 3 ug/L (EPA MCL) Chromium < 50 ug/L (NYS GA) Selenium < 50 ug/L (NYS GA) Thallium < 2 ug/L (EPA MCL) Aroclor-1260 (risk based - MW4-7 only)	Groundwater	NA	NA	NA	MW4-7, MW4-8, MW4-9, MW4-10, MW4-11, MW4-12, and MW4-13 (background)

Notes:
1) Cleanup goals for Case 2 are back-calculated ecological values.
2) Cleanup goals for Case 3 are established 95% background values for metals in soils at SEDA and NYSDEC TAGM values or Method Detection Limits for semi-volatiles.
3) Cleanup goals for Case 4 are from NYSDEC Technical Guidance for Screening Contaminated Sediments.
organic carbon value of 3.91%.

The results of the baseline ecological risk assessment at SEAD-4 indicated that chromium and lead in surface and subsurface soil may pose adverse ecological effects. The remedial action objective is to remediate the surface and subsurface soils with concentrations of chromium and lead that exceed the proposed ecological cleanup goals. This RAO is included as Case 2 in **Table 2-1**. Remediation of soils to these values is considered adequate to provide protection to potential ecological receptors at SEAD-4.

The development of cleanup goals for SEAD-4 was based on the assumptions used in the screening level ERA. As stated in the Uncertainty Section of the screening level ERA, the assumptions used for the risk assessment were very conservative in accordance with Ecological Risk Assessment Guidance for Superfund (ERAGS) process (EPA, 1997). Due to the conservative nature of the assumptions in Step 2 of the ERA, additional evaluation was required to more fully characterize potential ecological risks and to determine if further evaluation is warranted. In accordance with EPA guidance, this additional evaluation was performed as part of the problem formulation in Step 3. Alternative toxicity values and mean exposures based on mean concentrations were considered when evaluating contaminants of concern. For all soil, HQs for the hawk were recalculated using a conservative estimate of the site foraging factor of 10% based on a site size of 30 acres and a foraging range of 576 acres (**Table B-5**, **Appendix B**). The results of the Step 3 problem formulation concluded that chromium and lead are the COCs for surface and subsurface soils. Furthermore, the results indicated that the terrestrial receptors with the highest HQs for lead and chromium due to exposure to site soils are the short-tailed shrew and the mourning dove, respectively. Concentrations of chromium and lead that would yield a hazard quotient equivalent to 1 were calculated using the relationship shown in **Table 2-2**. A quotient equal to one is considered the threshold level for adverse effects. The LOAEL was used in the calculation.

Another RAO evaluated is the restoration of the site "pre-disposal" conditions (Case 3 in **Table 2-1**). This evaluation is conducted to satisfy the statutory requirement under NYCRR 375-1.10 to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law." This RAO uses a combination of established background concentrations for metals and TAGMs for SVOCs.

The cost of cleaning up soils to "pre-disposal" conditions was also evaluated. This evaluation satisfies the statutory requirement under NYCRR 375-1.10 that: "The goal of the program for a

TABLE 2-2
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
CALCULATED ECOLOGICAL SOIL CLEANUP GOALS
FOR CHROMIUM AND LEAD
(based upon toxicity data for short-tailed shrew and mourning dove)

Parameter	Toxicological Reference Value [1] (mg/kg/day)	HQ	SP	BAF	Ip	Ia	Is	SFF	BW	Calculated Soil Concentration [2] (mg/kg)
Metals										
Chromium (dove)	5.00E+00	1	7.50E-03	7.75E-01	9.25E-03	1.50E-03	1.25E-03	1	1.57E-01	324
Lead (shrew)	1.76E+02	1	5.80E-03	2.10E+00	1.55E-03	7.51E-03	2.20E-05	1	1.50E-02	167

(1) LOAEL Toxicity Values for Short-tailed Shrew or Mourning Dove
(2) Soil concentration calculated as:
Cs = [(HQ * TRV * BW)/(SFF)[(SP * CF * Ip) + (BAF * Ia) + Is]
(3) Bolded concentrations are clean up goals.

Where:

Cs = RME conc in soil (mg/kg)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (kg/day)
BAF = bioaccumulation factor (unitless)
HQ = Hazard Quotient
CF = plant dry-to-wet weight conversion factor (0.2) (inorganics only)
Ia = animal-matter intake rate (kg/day)
Is = incidental soil intake rate (kg/day)
SFF = site foraging factor (unitless)
BW = body weight (kg)

specific site is to restore that site to pre-disposal conditions, to the extent feasible and authorized by law. At a minimum, the remedy selected shall eliminate or mitigate all significant threats to the public health and to the environment presented by hazardous waste disposed at the site through the proper application of scientific and engineering principles." Remediating the site to "pre-disposal" conditions also allows the site to be classified for unrestricted future use.

2.5.3 Soil in the Ditches

As discussed in Section 1.2.5, the nature of the soil in the ditches is considered to be terrestrial rather than aquatic. The soil found in the ditches does not support an aquatic ecosystem, nor does it provide quality habitat for benthic organisms. There is no unacceptable human health risk due to ingestion of or dermal contact with the on site soil in the ditches. Chromium (total) was identified as a COC for the ditch soils based on the results of the screening-level ERA. In addition, an elevated vanadium concentration at SD4-28 raised a concern for the ecological receptors. Therefore, the cleanup goal for the soils in the ditches will be the same as that developed for chromium (total) for the surface and subsurface soils. In addition, a hotspot removal will be conducted at SD4-28 to remove the vanadium.

2.5.4 Groundwater

Groundwater at SEAD-4 is currently not used as a source of potable water, and has not been used for this purpose in the past. Ingestion of groundwater was not considered in the assessment of risk for the current receptors pathways (current site worker). Potential risks associated with ingestion of groundwater were evaluated for the future outdoor park worker, future indoor park worker, future recreational visitor, and future resident. Under these scenarios, it was assumed that the adult future resident receptors ingested 2 liters of water per day, 350 days per year for 24 years; the adult future park worker receptor ingested 1 liter of water per day, 175 days per year for 25 years; and the future recreational visitor (child) receptor consumed 1 liter of groundwater per day 14 days per year for 5 years. The resulting carcinogenic and non-carcinogenic risks (hazard index) for these exposure routes were all found to be within acceptable ranges.

Potential risk associated with dermal contact to groundwater and inhalation of groundwater were evaluated for the future recreational visitor and future resident. The hazard index for dermal contact to groundwater for the future resident exceeded the hazard index of 1 for both the child and adult receptors. This was primarily due to the compound Aroclor-1260. This compound was detected in only one groundwater sample at a very low concentration (below the NYS GA standard). In addition, the model used to assess the dermal exposures is considered highly conservative for lipophilic compounds and may grossly exaggerate risks (RI Report, Parsons January 2001). As previously stated, additional groundwater sampling at MW4-10 conducted in June 2004 confirmed that PCBs are not present in the groundwater and are not COCs. The risk for a resident from dermal exposure to groundwater was due solely to the presence of Aroclor-1260. Since the PCB is not present in the groundwater, there is no risk due to dermal contact to groundwater.

As discussed in Section 2.4.3, chromium and several other metals were detected in one or more wells at concentrations exceeding either the NYS Class GA or EPA MCLs. However, the majority of these metals were detected at lower concentrations than the background concentrations established for SEDA. In addition, the maximum chromium concentration (260 μg/L) was detected in the first round of sampling in MW4-9. In Round 2 of sampling, the concentration of chromium was 21.8 μg/L, which is below the NYS GA standard of 50 μg/L.

Benzene and ethylbenzene were also detected in MW4-10 at concentrations above their respective NYS GA standards.

The remedial action objective for groundwater is to monitor the groundwater for metals and VOCs on a semi-annual basis for a period of one year prior to any remedial actions for soil or sediments (Case 6 in **Table 2-1**). After the completion of any remedial actions for soils and sediments, an additional semi-annual round of groundwater samples will be collected for a period of one year. The data will then be used to establish potential trends in groundwater quality and establish if the concentrations present in groundwater at SEAD-4 require any further actions. Long-term groundwater monitoring or groundwater use restrictions may be required if additional data show exceedances of the NYSDEC GA or EPA MCL criteria. Only selected wells will be sampled based upon the maximum concentrations of metals and VOCs detected and the direction of groundwater flow established for the site. The proposed monitoring wells and the compounds of concern are the following:

- MW4-8 (24 μg/L selenium in round 1),
- MW4-9 (260 μg/L chromium in round 1),
- MW4-10 (2 μg/L benzene and 6 μg/L ethylbenzene in round 1),
- MW4-11 (13.8 μg/L antimony in round 1),
- MW4-12 (4.9 μg/L thallium in round 1), and

- MW4-13 (background well).

2.5.5 Surface Water

The total cancer risk for dermal contact with surface water exceeded the EPA target range for the future resident. This was primarily due to the compound benzo(a)pyrene that was detected at a concentration of 0.15 J μg/L in one surface water sample (SW4-13). This result is considered to be highly suspect due to the reasons cited above for groundwater. Consequently, surface water is not considered a media of concern based on the results of the BRA. Even though the Class C surface water standards are not considered strictly applicable to the site, all surface water sample results were compared to the NYSDEC Class C surface water standards. The majority of the concentrations of metals that exceeded Class C standards were detected in the surface water sample SW4-13. This sampling location is located in the northwestern corner of the site in the upper drainage ditch that eventually drains to Indian Creek. Four surface water samples were collected from off-site locations in Indian Creek. Of these samples, the only two metals concentrations that exceeded the Class C standards were aluminum and iron.

Based on the results of the RI surface water sampling at SEAD-4, the remedial action objective is to institute a monitoring program that consists of collecting surface water samples prior to conducting any remedial action for soils and sediments and post-remediation (Case 5 in **Table 2-1**). These surface water samples would be collected at the same frequency as the proposed groundwater sampling (semi-annually for one year). The proposed locations for sampling are SW4-13 and two adjacent locations, SW4-12, and SW-14. An additional up-gradient surface water sample would be collected at SW4-32 for a background sample. The surface water sampling results would be compared to the Class C surface water standards for selected metals and benzo(a)pyrene to assess if any trends (either increasing or decreasing) in surface water quality are evident and to assess the effects of potential remedial actions performed on soils and sediments.

2.5.6 Sediment

Sediment in the lagoon is considered a media of interest because concentrations of several metals and PCBs exceeded the New York State guidelines for sediments. The ecological risk assessment concluded that there is also potential ecological risk from chromium (total) in the sediment. The RAO for sediment is to reduce the concentration of chromium (total) in sediments to below the New York State criteria for sediments. This RAO is included in **Table 2-1** as Case 4.

2.5.7 Air

As part of the BRA, inhalation of dust in both ambient and indoor air was evaluated for several of the exposure pathways. All the cancer and non-carcinogenic risk numbers were within the range of acceptable values established by the EPA. As a result, air was eliminated as a media of interest for the development of RAOs.

2.6 REMEDIAL ACTION OBJECTIVE SUMMARY AND SITE SPECIFIC GOALS

As described in the BRA in Sections 6 and 7 of the RI and summarized above, unacceptable human health risks at SEAD-4 are due primarily to ingestion of indoor dust and dermal contact with indoor dust. These risks impact the future indoor park worker. There are also potential risks to terrestrial and aquatic wildlife from exposure to soils and sediments at the site.

Table 2-1 summarizes the RAOs and cleanup goals. The RAOs are the following:

- Because ingestion and inhalation of dust in Buildings 2073, 2076, 2078, 2079, 2084, and 2085 at SEAD-4 contribute significantly to risk to future industrial workers, removal of debris from these buildings to decrease hazardous dust particles causing unacceptable risk is warranted. There are no chemical-specific cleanup standards for the buildings. Confirmatory sampling will be included in the remedial alternatives to ensure that removal is effective in reducing risk to acceptable levels in the buildings.

- The remedial action objective for soil is to remediate soils with concentrations of chromium and lead that exceed the soil cleanup goals listed in **Table 2-2.**

- Cleanup of soils to "pre-disposal conditions" will be evaluated as a RAO consistent with the goals of NYCRR 375-1.10.

- The remedial action objective for sediment is to reduce the concentrations of chromium (total) to below the New York State guideline for sediments.

- The RAOs for groundwater and surface water are to conduct a monitoring program to assess trends in concentrations of select metals and VOCs in groundwater and metals and benzo(a)pyrene in surface water and to assess the benefits of potential remedial action on soils and sediments.

2.7 REMEDIATION VOLUME ESTIMATES

RAOs for SEAD-4 are based upon the requirement to achieve acceptable human health and environmental risks for the current and future land use scenarios and to evaluate the restoration of the site to pre-disposal conditions, as required in 6 NYCRR 375-1.10. As previously discussed, the BRA has concluded that for the intended future land use (conservation and recreation), the excess risks to human health are from material and debris inside the buildings. The potential risks associated with groundwater and surface water will be addressed by additional monitoring as discussed in **Section 2.5.4** and **2.5.5**. Potential ecological risks were also identified in soils and sediments from metals including chromium, and lead.

Four cases are considered in determining the areas and volumes of material that may require remedial action at SEAD-4. Case 1 addresses the debris sampled in the SEAD-4 buildings. Case 2 addresses soils with concentrations of chromium and lead that exceed soil cleanup goals for protection of terrestrial ecological receptors. Case 3 (pre-disposal conditions) addresses soils with concentrations of select metals that exceed background soil concentrations and semi-volatile organics that exceed the TAGM values. Case 4 addresses the sediment samples exceeding the NYSDEC guidance values for contaminated sediments.

The objective of Case 1 is to remove the sampled building materials and debris from abandoned Buildings 2073, 2076, 2078, 2079, 2084, and 2085 at SEAD-4. The volume of material to be removed is estimated to be approximately 20 cubic yards (cy) based on visual inspections during field investigations. **Figures 2-1** through **2-6** show the areas of concern and the method used to calculate volumes of material for each building. Confirmation sampling will be performed inside the buildings to establish the resulting decrease in risk to future indoor park workers.

The objective of Case 2 is to remediate soil with concentrations of chromium and lead exceeding the soil cleanup goals established for protection of ecological receptors. The horizontal limit of the surface and subsurface soil area is shown on **Figures 2-7**, **2-8**, and **2-9** and described in **Table 2-1**. The vertical limit of surface soil excavation is 12 inches and is based on the depths of the surface soil samples (depths 0 to 2 inches). An average value of 2 feet was used for the limit of vertical excavation for subsurface soils. The in situ volume of soils exceeding the ecological cleanup values was estimated at 2,712 cubic yards for surface soils, 1,083 cubic yards for subsurface soils, and 400 cubic yards for soil in the ditches.

The objective of Case 3 is to estimate the extent of surface and subsurface with metals concentrations greater than the established background values (95% percentile) and semi-volatiles with concentrations exceeding the respective TAGM values. The horizontal limit of the surface and subsurface soil area is shown on **Figures 2-10, 2-11, and 2-12** and described in **Table 2-1**. The vertical limit of surface soil excavation is 12 inches and is based on the depths of the surface soil samples (depths 0 to 2 inches). An average value of 2 feet was used for the limit of vertical excavation for subsurface soils. An in situ volume of 9,650 cubic yards was calculated for surface soils, 3,243 cubic yards for subsurface soils, and 708 cubic yards for soil in the ditches to meet this criteria.

The objective of Case 4 is to remove the extent of sediments that exceed the NYSDEC guidance value for chromium and to assess the cost to remediate the sediments to meet the guidance value. Guidance values were developed by the NYS Division of Fish and Wildlife and the NYS Division of Marine Resources for the protection of marine and aquatic ecosystems. **Figure 2-13** shows the areal extent of sediment samples exceeding the NYSDEC guidance value for chromium. An in situ volume of 1,573 cubic yards of sediment was calculated using a vertical depth of 2 feet.

The objective of Cases 5 and 6 is to monitor groundwater and surface water prior to and after any remedial actions for soil and sediment. **Figure 2-14** shows the locations of the seven groundwater monitoring wells and four surface water sampling points.

3.0 SUMMARY OF PRESUMPTIVE REMEDIAL ALTERNATIVES

3.1 INTRODUCTION

The EPA has developed presumptive remedies to accelerate cleanups at certain categories of sites. The objective of this initiative is to develop preferred technologies for common categories of sites based upon the evaluation and implementation of technologies selected at past sites using the remedy selection criteria under the National Contingency Plan (NCP). The EPA has also reviewed available performance data on these technologies to determine a remedy, or set of remedies, that are presumptively, the most appropriate for a particular type of site. The use of presumptive remedies will ensure consistency in remedy selection and speed up the selection of cleanup actions. This approach also streamlines or eliminates certain phases of the cleanup evaluation process. If the site is confirmed as being a type for which presumptive remedies exist, a "focused Feasibility Study" or EE/CA may be prepared without going through the time-consuming technology identification and screening process. The "focused feasibility study" would be limited to the no-action alternative and the presumptive remedy technology(s). The EPA has conducted an analysis of potentially available technologies for the presumptive remedies site categories and has determined that certain technologies are routinely and appropriately screened out either on the basis of effectiveness, implementability, or costs, or have not been selected under the nine evaluation criteria in the NCP. This analysis serves as the basis for eliminating the identification and screening step. The use of presumptive remedies does not preclude the consideration of innovative technologies if the innovative technologies are demonstrated to offer comparable or superior performance and implementability, or if they have fewer impacts and are lower in cost for the same level of performance.

Since the principal COPCs at SEAD-4 are metals in soils and sediments, the "Presumptive Remedy for Metals-In-Soil Sites" directive (EPA 540-F-98-054) has been used for this site. The presumptive remedy is intended for use at sites where metals contamination in soils or related media (sediments and sludges) is a primary problem. This directive establishes preferred treatment technologies for metals-in-soil sites and summarizes technical factors that should be considered when selecting a presumptive remedy based on site-specific factors.

3.2 DETERMINATION OF APPLICABILITY

This section provides a determination of the applicability of the use of the presumptive remedy for SEAD-4 and addresses site-specific factors that determine if the presumptive remedy approach is viable.

3.2.1 Contaminants at Metals-in-Soils Sites

The EPA based the development of the presumptive remedy for Metals-in-Soils directive on a national feasibility study analysis conducted on 51 sites. These 51 sites contained primarily metals in soils or related media. The metals that were detected at the 51 sites and the frequency at which they were detected are shown below. These metals are considered in the scope of the "Presumptive Remedy for Metals-in-Soils" directive with the exception of mercury, which is discussed separately below.

Frequency of Detection of Metals Present at the 51 Sites Evaluated for the Presumptive Remedy for Metals-in-Soils Site

Metal	Frequency of Detection (%)
Lead	73
Arsenic	69
Cadmium	51
Zinc	47
Copper	39
Chromium	39
Mercury	29
Nickel	25
Antimony	18
Manganese	18
Selenium	16
Iron	14
Barium	12
Beryllium	10

The frequency of detection of metals identified above reflects the number of times a metal was detected and not necessarily the concentration at which it was detected.

The RI Report summary statistics for metals detected in surface soils at SEAD-4 is shown below.

Frequency of Metals Detected in Surface Soils at SEAD-4

Metals	Frequency of Detection (%)
Arsenic	100%
Barium	100%
Beryllium	100%
Chromium	100%
Copper	100%
Iron	100%
Manganese	100%
Nickel	100%
Zinc	100%
Lead	91.9%
Mercury	52.3%
Antimony	39.5%
Selenium	23.3%
Cadmium	12.8%

Mercury is not addressed by this directive if it is present at concentrations that are considered "principal threat wastes." The definition of a principal threat waste is discussed in **Section 3.3**. The EPA Office of Research and Development (ORD) has determined that soils with higher concentrations of mercury may not be amenable to the technologies selected as the presumptive remedy for other metals. If mercury is present at concentrations constituting a principal threat waste, then site-specific consideration of mercury remedial technologies should be considered. Remedial technologies for mercury may be combined with presumptive remedy technologies for metals.

Mercury was detected at a frequency of 52 out of a total of 86 surface soil samples collected during the RI at SEAD-4. The maximum concentration of mercury detected was 1.2 mg/kg. Both the

NYSDEC TAGM (0.1 mg/kg) and the 95% percentile of background (0.09 mg/kg) were exceeded in 16 out of the 86 samples collected. Mercury is not considered a COPC at SEAD-4 due to the relatively low concentrations and low frequency of detection. Mercury also does not constitute a principal threat waste at SEAD-4 (see discussion in **Section 3.3)**. As a result, site-specific remedial technologies for mercury will not be given special consideration.

3.2.2 Definition of Soils and Sediment

The presumptive remedies in this directive are for sites with metals in soils, and also sediments and sludges. The directive describes soils as loose material on the surface and subsurface consisting of mineral grains and organic materials in varying proportions. The overburden soils at SEAD-4 are generally described in the RI as topsoil in the 0-1 foot zone underlain with varying amounts of gray shale, clay and glacial till down to approximately 8-10 feet below grade. Sediment grain size analysis data indicates that the sediments collected from the drainage ditches and the pond consist of a mixture of fine-medium sand, silts and clays.

3.2.3 Groundwater Considerations

The presumptive remedies are directed at sites with metals in soils, though the directive recommends that they be integrated with the overall remediation strategy for the site. This may include the remediation of contaminated groundwater or it may include minimizing the migration of metals to the groundwater.

The summary of groundwater analyses, presented in Section 2, has concluded that remediation of groundwater is not immediately necessary. The remedial action objective proposed is to conduct a groundwater monitoring program, prior to any remedial actions for soils and sediments. This program will assess trends in concentrations of selected metals and SVOCs and will assess the benefits of potential remedial action on soils and sediments. The program will be continued after the completion of soil and sediment remedial actions and will establish whether the concentrations of metals present in the groundwater warrant any future actions.

3.3 PRESUMPTIVE REMEDY SELECTION PROCESS

3.3.1 General

Implementation of the presumptive remedy process at SEAD-4 consists of four steps which are discussed below.

1. Identify Principal and Low Level Threat Wastes

This step involves characterizing the nature and extent of contamination at the site and determining if the wastes should be characterized as either principal threat wastes or low-level threat wastes. The technologies included in the presumptive remedy approach are categorized according to whether or not the wastes are principal threat wastes. If principle threat wastes are present, the preferential remedial technologies rely on treatment such as separation/reduction (soil washing) or reclamation/recovery. Low-level threat wastes remedial technologies rely principally on containment or isolation such as capping in place.

The EPA classifies principal threat wastes as "source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur". No threshold level of toxicity or risk has been established for a principal threat waste. A general rule is that when the toxicity and/or mobility of source material combine to pose a potential risk of 10^{-3} or greater. In this case, treatment alternatives rather than containment should be evaluated. Low-level threat wastes are classified as materials with low to moderate toxicity that are generally immobile in air or groundwater, non-liquid, low volatility, low leachability compounds, that are present in soils or other media at concentrations that are near the acceptable risk range.

The highest calculated total carcinogenic risk values calculated for all potential receptors at SEAD-4 were 3×10^{-4} for the future indoor park worker and 2×10^{-4} for the future resident. All other total risk numbers were in the range of 1×10^{-5} to 8×10^{-8}. The principal compounds of concern are metals in soils and sediments because of their frequency of detection and the magnitude at which TAGMs were exceeded. Metals generally have low volatility, leachability and mobility in most media, and moderate toxicity. Based on this information, the wastes at SEAD-4 should be considered low-level wastes in accordance with the EPA classification.

2. Select appropriate presumptive remedy based upon technical considerations.

Because the metal wastes present at SEAD-4 may be classified as "low-level threat wastes" and in accordance with the presumptive remedy process, containment/isolation technology is evaluated under this scenario. The containment/isolation technology can provide isolation of contaminants and prevent mobilization of soluble compounds over a long period of time. Surface water infiltration is reduced and direct contact to the source mterial is prevented.

Technical considerations for containment/isolation include:

- proximity of water table to wastes;
- depth and extent of metal wastes;
- conformance of barriers to ARARs (such as RCRA landfill cap requirements);
- waste compatibility, and
- cap design.

The majority of the metal wastes in soils at SEAD-4 that are being evaluated under this presumptive remedy process are present in surface soils (0-2"). Remedial actions for these metals are being evaluated for the 0-1 foot zone of topsoil. Some sub-surface soils (1-3 foot zone) are also being evaluated under this presumptive remedy process. The groundwater table fluctuates between 3-8 feet below ground surface over the site.

The presence of co-mingled wastes (organics or other contaminants present in high enough concentrations) may require special consideration. Technical considerations for co-mingled wastes include whether the presence of these wastes will limit the effectiveness of the presumptive remedy, if the wastes will be treated by the presumptive remedy, or if other treatment technologies are required for these wastes.

Volatile organics and semi-volatile organics were generally detected at low concentrations in soils and do not present issues associated with co-mingled wastes. A total of eight volatile organics were detected in surface soils at SEAD-4, all at concentrations below their respective TAGMs. Six VOCs were detected in 34 subsurface soil samples collected. All were detected at concentrations well below their respective TAGMs. Semi-volatile organics, principally PAHs, were detected in surface and subsurface soil samples. The PAHs exceeded their respective TAGMs in discrete locations. Phthalates were also detected at concentrations below their respective TAGMs. Other wastes that were analyzed for but only found in a very small number of samples includes nitroaromatics, explosives, and pesticides/PCBs.

3. Identify waste handling issues.

Waste handling issues are associated with both on and off-site handling of metals-in-soils wastes. For SEAD-4, off-site disposal of soils will be evaluated as a remedial action alternative. Out of the 51 sites surveyed for developing the metals-in-soil presumptive remedy, off-site disposal was selected at seven sites as the remedial action. Even though the presumptive remedy directive does not choose this option as one of the presumptive remedies for metal-in-soil sites, it does allow consideration of this remedial action alternative on a site-specific basis. Off-site disposal will require compliance with the RCRA Land Disposal Restrictions (LDRs) if the soil is a RCRA characteristic waste or if the soil contains a listed RCRA waste. Compliance with LDRs includes the Universal Treatment Standards (UTSs) for soil (40 CFR 268.48) or debris (40 CFR 268.45). LDRs may also be triggered if RCRA hazardous wastes are “placed” or “land disposed” outside the area of contamination. The EPA promulgated the final LDR treatment standards for soil in May 1998. The final rule requires all hazardous contaminated soil including soil, contaminated by listed hazardous waste, to be treated for each underlying hazardous constituent reasonably expected to be present when such constituents are initially found at concentrations greater than ten times the universal treatment standard. For on-site containment, RCRA closure requirements may be considered as ARARs.

4. Document the selected remedy.

Use of the presumptive remedy approach requires that an explanation of how the presumptive remedy process affects the selection of a remedial action is included in the feasibility study report. This includes a discussion of site-specific factors that significantly affected the selection of a remedial action.

3.3.2 Remedial Action Alternatives

3.3.2.1 Alternative 1 - No Action

This alternative is used as a basis for comparison against all other remedial action alternatives. This alternative is evaluated to determine the overall impacts if no additional remedial actions are implemented at the site. It compares the use of this alternative against the remedy selection criteria under 40 CFR 300.430 and 6 NYCRR 375-1.10.

3.3.2.2 Alternative 2 - On-site Containment

Alternative 2 consists of isolating and containing surface and subsurface soils containing chromium and lead concentrations exceeding the established cleanup goals with a vegetative soil cover and limiting site access through the use of institutional controls. Ditch soils exceeding the cleanup goals will be excavated and disposed of off-site. The intent of this alternative is to isolate the waste from receptors and to prevent migration of surface soil to surface water via soil erosion. Long-term groundwater monitoring and O & M will be required. This alternative will be evaluated for Case 2 (cleanup to protect ecological receptors) and Case 3 (cleanup to “pre-disposal” conditions).

Sediments exceeding the established cleanup criteria under Case 5 will be excavated and disposed of off-site. The material will be tested for hazardous waste characteristics prior to disposal. If the material is subject to the LDR standards for soils, treatment requirements will be established as part of the RD/RA. For the purposes of this study, it will be assumed that the sediments will be subject to the LDR requirements and will be treated prior to disposal in an off site landfill.

As part of this alternative, debris from the on-site buildings will be removed and characterized prior to disposal. If the material is subject to the Universal Treatment Standards under the LDR requirements for debris, pretreatment requirements will be established as part of the RDA/RA. For the purposes of this study, it will be assumed that the debris will be subject to the LDR requirements and will be treated prior to disposal in an offsite landfill.

The soil cover design consists of the following, from top to bottom:

- 6-inches topsoil
- 6-inches common fill
- Filter fabric

Re-grading of the site and installation of institutional controls (such as a permanent fence) will be required prior to placement of the soil cover. Ditches will be backfilled with topsoil and vegetative growth re-established. Long-term groundwater monitoring, long-term operations and maintenance will be required.

3.3.2.3 Alternative 3 - Off-Site Disposal

Alternative 3 involves excavating soils exceeding the cleanup standards established under Case 2 (protection of ecological receptors) and Case 3 (restore site to "pre-disposal" conditions) and disposing the excavated material in an off-site landfill. Sediments will be excavated and disposed of as described in Alternative 2. Debris/soils from Buildings 2073, 2076, 2078, 2079, 2084, and 2085 will also be removed and disposed of in an off-site landfill under this alternative.

Excavated soils would be stockpiled and tested prior to being transported off-site for disposal. Excavated material passing the TCLP criteria will be transported and disposed of in a Subtitle D Landfill. Excavated soil and sediment that exceeds the TCLP criteria will be stabilized and rendered non-hazardous. This alternative assumes 25% of the excavated soil will be transported off-site for both treatment and disposal.

Excavated areas will be backfilled to restore the area to original conditions and to provide proper runoff control. Common fill and topsoil will be placed and vegetative growth will be re-established. The intent of this alternative is to remove the waste from the site to prevent contact with receptors and migration to surface water and groundwater. Long-term groundwater monitoring, operations and maintenance will not be necessary.

4.0 DETAILED ANALYSIS OF PRESUMPTIVE REMEDIES

4.1 INTRODUCTION

This section provides a detailed analysis of the presumptive remedies that represent the EPA's preferred technologies for sites that meet the characteristics of low-level threat metals-in-soil sites. The "Presumptive Remedy for Metals-in-Soils Sites" directive, requires that the presumptive remedies along with any other site-specific remedies (e.g. pre-treatment steps, groundwater remedies, institutional controls) be evaluated against the evaluation criteria set forth in 40 CFR 300.430(e)(9). The detailed analysis is intended to provide the rationale for selection of a remedial action alternative or combination of alternatives. The detailed analysis provides sufficient information to understand the significant aspects and uncertainties of each alternative.

Each of the remedial alternatives was subjected to a detailed analysis using seven different evaluation criteria:

- Short-term impacts and effectiveness
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume
- Implementability
- ARAR compliance
- Overall protection of human health and the environment
- Cost

The two modifying criteria of the 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 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 site-specific cleanup goals established between NYSDEC, the EPA, and the Army through treatment, engineering, or institutional controls. These goals, presented in **Table 2-1** were developed for on-site soils, sediments, and building material/debris.

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 time required to achieve cleanup goals.

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 that a selected remedial action employ treatment to reduce the toxicity, mobility, or volume of hazardous substances. The evaluation will determine the amount of waste treated or destroyed, the reduction in toxicity, mobility, or volume, and the type and quantity of treatment residuals that will remain.

The analysis of implementability deals with the technical and administrative feasibility of implementing the alternatives and the availability of necessary materials and services. This criteria 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 approvals from agencies.

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 2.4**.**

Detailed cost estimates are presented in this report for the remedial alternatives. The costs are based on information from the Micro Computer Aided Cost Engineering System (MCACES, a component of the Tri-Service Automated Cost Engineering System, TRACES), Version 1.2 (copyright 1994-1997). 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 materials costs at the time of construction, actual site 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 those associated with engineering, permitting, construction management, and other services necessary to carry out a remedial action. Groundwater and surface water monitoring as well as O & M costs, which include labor, maintenance materials, and purchased services, have also been estimated.

The detailed analysis of alternatives considers the exposure scenarios and the six receptors presented in **Section 1**:

1) current site worker,
2) future outdoor park worker,
3) future indoor park worker,
4) future recreational visitor,
5) future construction worker, and
6) future resident.

SEDA has been placed on the base closure list for BRAC95 and the intended future use is "conservation/recreation area." Therefore, the purpose of the remedial action objectives established in **Section 2** is to protect human health as appropriate to the intended future use of SEAD-4. Based on the presumptive remedy process discussed in Section 3.0, Alternatives 1, 2, and 3 have been developed for detailed analysis in this section because containment (Alternative 2) is the presumptive remedy for "low-level threat waste" at metals-in-soil sites and off-site disposal (Alternative 3) is one of the preferred technologies at metals-in-soil sites. Alternative 1 (No Action) has been included for comparison purposes. The primary components of each alternative are shown in **Table 4-1**. The cost to remediate soils and sediments under each alternative will be estimated for two cases. Case 2 is for cleanup of soils and sediments to protect potential ecological receptors and Case 3 is for cleanup of soils and sediments to "pre-disposal" conditions.

TABLE 4-1
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
REMEDIAL ALTERNATIVES RETAINED FOR DETAILED ANALYSIS

ALTERNATIVE	TECHNOLOGIES AND PROCESSES
1	**No Action**
2	**On-site Containment: Institutional Controls/Soil Cover** - Mobilize, site prep, clear/grub, erosion control, access roads, and survey - Construct permanent fence (institutional controls) - Remove material/debris from abandoned buildings at SEAD-4 - Excavate sediments exceeding sediment criteria (Case 4) - Excavate soil in the ditches exceeding criteria (Case 2 and Case 3) - Stockpile soil and sediments and building debris and perform TCLP testing - Perform cleanup verification testing - Transport sediments and debris failing TCLP criteria to stabilization area (off-site) - Stabilize sediments and debris exceeding TCLP criteria (off-site) - Transport and dispose soil, sediment and debris in an off-site landfill - Place soil cover (6 inch topsoil, 6 inch common fill & filter fabric) over soils and hydroseed - Backfill ditches with common fill and topsoil and hydroseed. - Install four new monitoring wells. - Demobilize - Long-term O & M and monitoring
3	**Off-Site Disposal: Excavate/Stabilize/Off-site Disposal** - Mobilize, site prep, clear/grub, erosion control, access roads, and survey - Remove material/debris from abandoned buildings at SEAD-4 - Excavate sediments exceeding cleanup criteria (Case 4) - Excavate soils exceeding criteria (Case 2 and Case 3) - Stockpile and perform TCLP testing - Perform cleanup verification testing - Transport soil, sediment, and debris failing TCLP criteria to stabilization area (off-site) - Stabilize soil, sediment, and debris exceeding TCLP criteria (off-site) - Transport and dispose soil, sediment, and debris in an off-site landfill - Backfill excavated areas with common fill & topsoil and hydroseed - Demobilize

4.2 ANALYSIS OF ALTERNATIVE 1: NO ACTION

4.2.1 Definition of Alternative 1

The no-action alternative is used as the baseline for comparison to all other alternatives. This alternative is evaluated to determine the overall impacts if no additional remedial actions are implemented at the site. It takes into account any remedial actions completed to-date, any on-going remedial actions, any current site controls such as security or fencing, and other site uses or activities.

4.2.2 Protection of Human Health and the Environment

An evaluation of the protectiveness of human health and the environment includes an assessment of the short-term and long-term effectiveness as well as permanence. Assessment of the short-term effectiveness addresses the effects of an alternative during construction and implementation of a remedial action. Since Alternative 1 is a no action alternative, which does not require construction or disturbances to the site, analysis of short term effectiveness is not applicable.

4.2.2.1 Long-Term Effectiveness and Permanence

The no-action alternative would not provide either long-term effectiveness or permanence because the metals present in soils and sediments would not be removed, permanently eliminated or reduced by this remedial action alternative.

The no action alternative does not provide a permanent solution since no treatment, engineering or institutional controls are provided to prevent exposure to constituents of concern in on-site soils and sediments.

4.2.3 Reduction of Toxicity, Mobility, and Volume

The no-action alternative would not reduce the toxicity, mobility or volume of affected media at the site to any significant degree.

4.2.4 Implementability

The criteria of technical feasibility or availability of services and materials is not applicable since no activities will be performed as part of this alternative. The administrative feasibility of the no-action alternative is not considered favorable since extensive coordination with local and state agencies would be required in the attempt to support and justify no remedial actions at the site.

4.2.5 Compliance with ARARs

This alternative would not comply with chemical-specific ARARs and TBCs. Location-specific and action-specific ARARs do not apply.

4.2.6 Cost

There are no costs associated with the no action alternative.

4.3 COMMON COMPONENTS OF ALTERNATIVES 2 AND 3

The remaining alternatives have several general remedial action components in common. These components will be conducted regardless of which alternative is selected.

- The contractor(s) will mobilize to the site, clear and grub the areas of work, establish access roads and survey the areas to be remediated.

- Erosion control (such as silt fence and haybales) will be installed and maintained around excavation areas and drainage swales. Erosion control is necessary to prevent soil particles from migrating off-site and into drainage swales during construction.

- Material and debris from Buildings 2073, 2076, 2078, 2079, 2084, and 2085 will be removed and the surfaces cleaned. Confirmatory sampling will be conducted. As presented in **Section 2**, it is estimated that approximately 20 cubic yards (cy) of material and debris will be removed. It is anticipated that the buildings will be cleaned using techniques such as sweeping and steam cleaning. The material and debris will be collected, tested, and disposed of at an off-site landfill. If the material is subject to the Universal Standards under the LDR requirements for debris, treatment requirements will be established. For the purposes of this study, it is assumed that the debris will be subject to the LDR requirements and will be treated and disposed of at an offsite facility. Any water used in the treatment process will be collected and treated, prior to disposal.

- Sediment with concentrations of chromium exceeding the NYSDEC screening criteria for sediments will be excavated from the man-made lagoon and stockpiled on-site. The material will be tested for hazardous waste characteristics prior to disposal. If the sediment is subject to the LDR standards for soil, treatment requirements will be established. This alternative assumes all of the excavated sediment will be transported to an offsite facility for both treatment and disposal. Cleanup verification testing will be performed in the drainage swales to confirm that the excavation has attained the specified cleanup goals.

- Site groundwater will be monitored on a semi-annual basis from seven monitoring wells and analyzed for VOCs and metals.

- Surface water sampling will be conducted on a semi-annual basis at four locations within the drainage ditches and analyzed for benzo(a)pyrene and metals. The purpose of the sampling is to assess if any trends in surface water quality are evident and to assess the effects of potential remedial actions performed on soils and sediments. The sampling will be conducted for one year prior to and one year after remediation of soil and sediment.

- Land Use Controls (LUCs) or institutional controls (ICs), including: (1) access controls, such as fencing; and (2) land use restrictions, such as legal/proprietary controls (i*.e.*, modifications to the deed, legal/government controls, legal/permit tools, and/or administrative/informational devices.) will be used.

  LUCs are only applicable to the receptor and do not involve reductions in the volume, toxicity or control of wastes at the site and do not meet the RAOs. But physical barriers that restrict access to the site are feasible and effective in preventing humans from becoming exposed to on-site impacts. Since there are potential risks for ecological receptors to exposure to on-site media, access controls have been retained but incorporated for use with other responses. It should be noted that wildlife such as migrating birds will still have access to the site and will not be protected.

  Land use restrictions, such as deed modifications, are also feasible and effective in restricting exposure to humans, particularly due to residential development. Although deed modifications do not decrease ecological risks nor protect the groundwater, LUCs will be implemented to help prevent future use of the property for industrial or residential purposes, and to possibly prevent use of site groundwater for drinking water purposes.

4.4 ANALYSIS OF ALTERNATIVE 2: ON-SITE CONTAINMENT

4.4.1 Definition of Alternative 2

4.4.1.1 Description

Alternative 2 consists of placing a soil cover over surface and subsurface soils with concentrations of chromium and lead exceeding the cleanup levels for either Case 2 or Case 3; excavating soil in the ditches for Case 2 or Case 3; excavating sediments in the man-made lagoon with concentrations of chromium (total) exceeding the Case 4 cleanup level; and removing building debris. The sediment and building debris will be treated and disposed of in an offsite facility.

Ditch soil and sediment excavation can be accomplished with standard construction equipment, such as front end loaders and backhoes. The excavated material will be loaded into trucks and transported to an on-site stockpile area. The soil and sediment will be placed in separate piles and samples will be collected for TCLP testing. Based on the results, soil and sediment that pass the TCLP test will be transported and disposed of as a solid waste in an off-site Subtitle D Landfill. The soil and sediment that fail the TCLP will be transported, stabilized, and then disposed of in an off-site landfill. Because of the relative small volume of material to be treated at SEAD-4, it is expected that off-site stabilization will be more cost effective than on-site stabilization. For discussion purposes, this alternative assumes all excavated soil and sediment is transported off-site for treatment and/or disposal.

Stabilized soil and sediment is not considered a characteristic RCRA hazardous waste but is considered a 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 accept the stabilized sediment. The landfills cannot accept hazardous waste, and extensive testing is required to assure that the waste is not classified as a hazardous waste. The actual testing requirements vary between landfills, and the exact requirements for this remedial action will be specified once a landfill is selected. Several landfills have been identified for disposal including Model City located in New York, Ontario County Landfill, Stuben County Landfill, High Acres, and EQ located in Michigan. The EQ facility has the capacity and capability to treat and dispose hazardous material.

Upon completion of ditch soil and sediment excavation, cleanup verification will be performed on the excavated areas. A cleanup verification work plan will be developed as part of the final design. Excavation will be continued in those areas where concentrations in sediment are greater than the stated cleanup goal for Case 4. Sample location and frequency will be determined as part of the cleanup verification work plan. Excavated areas will be backfilled with clean fill to restore the area to its original elevation for proper stormwater runoff control. Topsoil will be used to re-establish vegetative growth.

Surface soil requiring a soil cover is shown in **Figure 2-7** for Case 2 and **Figure 2-10** for Case 3. The soil cover will consist of the following, from top to bottom:

- 6-inches topsoil
- 6-inches common fill
- Filter fabric

Re-grading of the site to promote proper stormwater drainage will be included as part of the design. Long-term operations and maintenance will be necessary to maintain the vegetation as well as the integrity of the soil cover. Four new monitoring wells will be installed and semi-annual groundwater monitoring will performed. A permanent fence will be constructed around the soil cover area. A detailed analysis of how this option meets the selection criteria and a budgetary cost estimate are provided below.

In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years. At this time, modification may be implemented to the monitoring program, if appropriate.

4.4.1.2 Process Flow and Site Layout

Ditch soil and sediment will be excavated, stockpiled, and tested for TCLP as described above. Excavated material meeting the TCLP criteria will be transported and disposed of at an off-site Subtitle D landfill. Excavated material exceeding the TCLP criteria will require stabilization. Since the material will be stabilized off-site, the soil and sediment will be transported off-site, stabilized, and disposed of in an appropriate landfill. **Figure 4-1** presents a generalized process flow diagram for the sediment remediation. TCLP testing will be performed on the material at a rate required by the landfill accepting the waste.

This alternative requires an area sufficient for the stockpiles for the excavated material as well as the soil cover material. The proposed area for the stockpile area is shown on **Figure 4-2**. This will provide a central location for the dump trucks to transport the excavated sediment to the stockpile area.

Trucks will be loaded directly from the stockpiles, after receiving the TCLP test results. A small staging area and equipment decontamination area will be set up as necessary.

4.4.2 Protection of Human Health and the Environment

An evaluation of the protectiveness of human health and the environment includes the assessment of short- and long-term effectiveness as well as permanence.

4.4.2.1 Short-term Protectiveness

This alternative will be evaluated with respect to the effect on human health and the environment during the implementation of the remedial action. Four items are included in an assessment of the short-term protectiveness of Alternative 2. The first issue is protection of the community during the remedial action. Since off-site treatment will be performed, hazardous material will be transported off-site. Precautionary measures must be taken to assure that the trucks are not overloaded and are properly covered with a tarp to ensure that no material is released. However, it should be noted that only the sediment will be disposed of off-site, resulting in a relatively small volume compared to Alternative 3. All waste, which is disposed in the off-site landfill, will no longer be considered hazardous waste.

There is also a minor threat from dust released during the excavation. The site is located approximately 1750 feet away from the SEDA boundary, so the likelihood of any hazardous dust migrating off-site is negligible. As discussed in Sections 6 and 7 of the RI report as well as in Section 2, fugitive dust migration (from soil) is not a major migration pathway. Placement of the soil cover may also generate dust, however, the soil cover components are assumed to be clean material.

The short-term protectiveness to site workers is also considered. The major routes of exposure during remediation are direct contact with the excavated sediment and inhalation of particulates. Exposure can be minimized through the use of site access controls and proper protective equipment for site workers, such as dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of particulate. Dust generation at the excavation can be minimized by using water or other dust suppression techniques. It should also be noted that all the site workers are required to meet all the OSHA training and medical monitoring requirements.

Another criterion of short-term protectiveness is environmental impacts during the remedial action. Impacts to the site will result from excavation, stockpiling, and truck traffic. In addition, since the hazardous material is primarily in the sediment, there is little or no risk of a spill or release during the remedial action.

The last item to be considered is the duration of the remedial action. It is estimated that Alternative 2 can be completed in a short time period. Since stabilization will be conducted off-site, then it is estimated that the alternative may take approximately two months to complete, depending on the weather and turnaround time on the TCLP test results. This duration includes one week of mobilization, one week of building remediation, two weeks of excavation, two weeks to backfill and hydroseed, two weeks to test and dispose the material offsite, and one week to demobilize. This alternative is essentially an earthmoving operation, with little mobilization and specialty equipment.

4.4.2.2 Long-term Effectiveness and Permanence

The assessment of the long-term effectiveness can be divided into two categories, an assessment of the magnitude of the residual risk, and an evaluation of the adequacy and reliability of the controls used for the waste residuals and untreated sediment.

The remedial action is designed such that the remaining sediment has concentrations of chromium below the proposed cleanup goal for Case 4. The excavated sediment will be transported off-site for disposal and no residual sediment will remain on site. The long-term management of the excavated material will be the responsibility of the off-site landfill. For this reason, it is important to select a landfill that is operated in full accordance with State and Federal requirements.

Ditch soils with concentrations greater than the proposed cleanup goals for both Case 2 (protection of ecological receptors) and Case 3 (cleanup to "pre-disposal" conditions) will be excavated and transported off-site for disposal. The long-term management of the excavated material will be the responsibility of the off-site landfill.

Surface and subsurface soils with concentrations greater than the proposed cleanup goals for both Case 2 (protection of ecological receptors) and Case 3 (cleanup to “pre-disposal” conditions) will remain on site under this alternative. A cover will be placed over the soil to control the exposure from inhalation of soil dust, to prevent runoff of impacted particles and to prevent exposure to humans and ecological receptors due to ingestion of soil. In addition, institutional controls will be implemented to prevent access to the containment area. Long term management of the soil cover is necessary to maintain vegetative growth and the integrity of the cover. Semi-annual groundwater monitoring will also be required at SEAD-4.

The remedial action would be considered permanent upon the completion of ditch soil and sediment excavation, placement of the soil cover, and implementation of the selected institutional controls.

4.4.2.3 Conclusion

Alternative 2 is considered to be protective of human health and the environment. The alternative protects against ingestion and direct contact with soils having concentrations of chromium and lead exceeding the cleanup goals for both Case 2 and Case 3. Sediments with concentrations of chromium above the cleanup criteria would be removed, which meets the RAO for sediment.

4.4.3 Reduction in Toxicity, Mobility, and Volume

Alternative 2 would be effective in reducing the toxicity, mobility, and volume of the hazardous constituents present in the soil and sediment at the site. The material and debris from SEAD-4 buildings will be removed as well as the sediment and ditch soils exceeding the proposed cleanup levels. The soil cover will contain the surface and subsurface soil and prevent migration of soil to surface water via erosion, thus reducing the mobility of the soil.

The excavated sediment and ditch soil will be treated in order to meet the TCLP criteria prior to disposal. The treated material will no longer be hazardous and will exhibit lower toxicity and mobility than the untreated waste. By disposing the stabilized material to a landfill, the mobility of the hazardous constituents will effectively be eliminated. A properly managed landfill does not allow for uncontrolled releases from the landfill. The stabilized soil will have a larger volume than the untreated soil, but the stabilized soil will no longer be a hazardous waste.

In addition, by placing a soil cover and stabilizing the ditch soil and sediment, the overall site risk (toxicity) will be reduced to acceptable levels.

4.4.4 Implementability

An assessment of the implementability of a remedial action includes the technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility is construction and operation, reliability of the technology, and monitoring considerations. Administrative feasibility addresses issues such as permitting, interaction with NYSDEC and EPA, and community relations. Availability of services and materials describes the ease of obtaining vendors and equipment, and the availability of offsite disposal capacity.

4.4.4.1 Technical Feasibility

The technical feasibility of Alternative 2 is considered to be good. It involves routine earth moving work, including excavation, stockpiling, transportation, and backfilling, and the remediation areas have been well delineated. It is possible that some minor weather delays may be encountered.

Sediment and soil that fails the TCLP criteria will require stabilization. Stabilization is a technology that has been frequently used to treat similar soils, and it is not anticipated that problems will be encountered during construction. Since off-site treatment will be conducted, most of the TSD facilities in the region have accepted similar wastes for a number of years. These facilities are capable of treating and disposing of the site soils.

Another aspect of technical feasibility is the ease with which additional work may be conducted. At this time, it is anticipated that this remedial action will preclude the necessity of any additional remedial efforts at SEAD-4. However, if additional work is required, the soil cover integrity and the underlying soil would need to be considered as part of the remedial action.

4.4.4.2 Administrative Feasibility

The administrative feasibility of Alternative 2 is favorable. If off-site treatment is performed, the landfills that may be used are fully permitted for disposal and stabilization, if necessary. There will be some transport of hazardous waste, and proper manifests will be required. All of the contractors used for excavation and hauling will be experienced in preparing manifests.

Coordination with the various regulatory agencies is also important. As previously described, 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.

4.4.4.3 Availability of Services and Materials

Alternative 2 relies primarily on standard construction equipment that is readily available in the Romulus area. The equipment includes backhoes, bulldozers, front-end loaders, and standard size dump trucks. Backfill material, such as common fill, top soil, and filter fabric, is also readily available in the Romulus area. Several landfills have been identified that are capable of accepting the sediment for treatment and/or disposal, as discussed earlier in this section.

4.4.5 Compliance with ARARs

This alternative will comply with all chemical-specific, location-specific, and action-specific ARARs considered in Section 2.4.

4.4.6 Cost

4.4.6.1 Capital Costs

Capital costs were estimated to remediate the soils for both Case 2 (protection of ecological receptors) and Case 3 (cleanup to “pre-disposal” conditions). The detail cost estimate and a description of the assumptions used are presented in **Appendix C**. The total capital costs (i.e. owner costs) are estimated at $1,666,790 for Case 2 and $2,671,570 for Case 3. **Table 4-2** presents a summary of the cost estimate for both remediation cases.

4.4.6.2 O & M Costs

Annual monitoring costs associated with Alternative 2 include costs for semi-annual groundwater sampling. The annual monitoring cost is estimated to be $39,400 for both Case 2 and Case 3. The annual O & M costs (i.e. soil cover maintenance) is estimated to be $5000 and $6000, respectively for Case 2 and Case 3. In accordance with the Federal Facility Agreement CERCLA SECTION

120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years. At this time, modification may be implemented to the monitoring program, if appropriate.

4.4.6.3 Present Worth Costs

The present worth cost (total evaluated price) to remediate the site for both Case 2 and Case 3 were estimated to be $2,434,555 and $3,456,627 respectively.

4.5 ANALYSIS OF ALTERNATIVE 3: OFF-SITE DISPOSAL

4.5.1 Definition of Alternative 3

4.5.1.1 Description

Alternative 3 entails excavating surface, subsurface, and ditch soils with concentrations of chromium and lead exceeding the cleanup criteria established under both Case 2 (protection of ecological receptors) and Case 3 (cleanup to "pre-disposal conditions") and disposing the excavated material in an off-site landfill. Sediment in the man-made lagoon with concentrations of chromium exceeding the Case 4 cleanup goal will be excavated. The building debris will be removed (Case 1). Excavated soil, sediment, and building debris would be stockpiled and tested prior to being transported off-site for disposal. Material that exceeds the TCLP limits will be stabilized prior to disposal.

TABLE 4-2
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
COST ESTIMATE SUMMARY

	ALTERNATIVE 2 On-site Containment		ALTERNATIVE 3 Excavation/Off-site Disposal	
Soil Remedial Action Goals	**Case 2: Ecological Protection (7)**	**Case 3: Pre-Disposal Conditions(8)**	**Case 2: Ecological Protection (7)**	**Case 3: Pre-Disposal Conditions(8)**
Owner Costs of:				
Remedial Design	$492,120	$492,120	$423,050	$423,050
Mobilization/Demobilization	$22,350	$22,350	$22,350	$22,350
Sampling and Testing	$61,930	$92,900	$99,920	$199,180
Site Work	$221,060	$221,060	$169,150	$169,150
Well Installation	$5,420	$5,420	--	--
Case 1 (Removal of Soil/Debris from Buildings)	$31,200	$31,200	$31,200	$31,200
Case 2 (Ecological Protection - Soil)	$190,620	--	$814,230	--
Case 3 ("Pre-disposal" conditions - Soil)	--	$1,164,430	--	$3,274,750
Case 4 (Sediment in Lagoon)	$557,990	$557,990	$557,990	$557,990
Cases 5 and 6 (Semi-annual groundwater and surface water monitoring)	$84,100	$84,100	$84,100	$84,100
Owners Cost Total (1) and (2)	$1,666,790	$2,671,570	$2,201,990	$4,761,770
Annual O&M Costs (3)	$5,000	$6,000	NA	NA
Annual Post Remediation Monitoring Costs (4)	$39,400	$39,400	NA	NA
Present Worth O&M and Monitoring Cost (30 year) (5)	$767,765	$785,057	NA	NA
Total Evaluated Price (6)	$2,434,555	$3,456,627	$2,201,990	$4,761,770

NOTES:
1. Cost to Owner is the sum of the Cost to Prime (Contractor) plus prime contractor Indirect Cost. Also known as the bid amount or construction contract cost.
2. Cost to Prime (Contractor) is the sum of the direct costs plus any sales tax, subcontractor markups, and adjust pricing that have been applied in the project.
3. Annual Costs are costs that will occur yearly due to activities such as maintenance or monitoring.
4. Post Remediation Monitoring consists of semi-annual groundwater monitoring.
5. Present Worth Cost is based on a 4% interest rate over the number of years specified above.
6. Total Evaluated Price is the sum of the Project Cost and Present Worth Cost.
7. Soil remediated to ecological cleanup values based upon an HQ=1 for chromium and lead. Soil in ditches considered as soils. Sediment in lagoon remediated to NYSDEC Sediment Criteria.
8. Pre-disposal conditions are metals to background levels and semi-volatiles to TAGM values. Sediment in ditches and lagoon remediated to NYSDEC Sediment Criteria.

Excavated areas will be backfilled or regraded as necessary to restore the area to original conditions. Common fill and topsoil will be used as backfill and vegetative growth will be re-established. The intent of this alternative is to remove the waste from the site to prevent contact with receptors.

Each step involved with this alternative will be described briefly in this section. A detailed analysis of how this option meets the selection criteria and a budgetary cost estimate are provided below.

An excavation plan, which delineates the extent of remediation, will be finalized using data from the RI and the figures showing metals and SVOC exceedences presented in **Section 2**. For Case 2, surface, subsurface, and ditch soils with concentrations of chromium and lead exceeding the cleanup standards developed for protection of ecological receptors would be excavated. **Figure 2-7** through **Figure 2-9** show the estimated areal extent of excavation under this scenario. The surface soils will be removed to a depth of 12 inches below ground surface yielding an in situ volume of 2,712 cy. It is estimated that the vertical limit of subsurface soils to be excavated will extend approximately three feet below grade yielding an in situ volume of approximately 1,083 cy. The soil in the ditches will be removed to a depth of two feet below ground surface yielding an in situ volume of 400 cy.

For Case 3, surface and subsurface soils with selected metals concentrations exceeding the cleanup standards developed for restoration to "pre-disposal" conditions would be excavated. **Figures 2-10** through **Figure 2-12** show the estimated areal extent of excavation under this scenario. Surface soil will be removed to 12 inches below ground surface yielding an in situ volume of 9,650 cy. It is estimated that the vertical limit of subsurface soils to be excavated will extend approximately three feet below grade yielding an in situ volume of approximately 3243 cy. The in situ volume of ditch soils to be removed is 4,108 cy.

The excavation can be accomplished with standard construction equipment, such as front-end loaders, bulldozers, and backhoes. The excavated soil and sediment (refer to **Section 4.4**) will be loaded into trucks and transported to an on-site stockpile area. The soil and sediment will be placed in separate piles and samples will be obtained for TCLP testing. Based on the results, soil and sediment that pass the TCLP test will be transported and disposed of as a solid waste in an off-site Subtitle D Landfill. The soil and sediment that fail the TCLP will be transported to an offsite facility for stabilization and disposal. Based on conversations with stabilization contractors it is expected that off-site treatment may be more cost effective than on-site treatment. Therefore, for screening purposes presented later in this section and for conservative cost comparison purposes, this alternative assumes all excavated soil is transported off-site for treatment and/or disposal.

Stabilized soil is not considered a characteristic RCRA hazardous waste but is considered a 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 stabilized soil. The landfills cannot accept hazardous waste, and require extensive testing to assure that the waste is not a hazardous waste. The actual testing requirements vary between landfills, and the exact requirements for this remedial action will be specified once a landfill is selected. Several landfills have been identified for disposal, as discussed in **Section 4.4.1.1.**

Upon completion of excavation, cleanup verification will be performed on the excavated areas. A cleanup verification work plan will be developed as part of the final design. Excavation will continue further in those areas where concentrations of contaminants in soil and sediment are greater than the cleanup goals. Sample location and frequency will be determined as part of the cleanup verification work plan.

Excavated areas will be backfilled to restore the area to original conditions and to provide proper stormwater control. Common fill and topsoil will be used to bring the excavated areas back to original grade and vegetative growth will be re-established.

4.5.1.2 Process Flow and Site Layout

Figure 4-1 presents a process flow diagram for Alternative 3. Soil and sediment are excavated, stockpiled, and tested for TCLP as described above. Soils meeting the TCLP criteria will be transported and disposed of at an off-site landfill. Soils exceeding the TCLP criteria require stabilization. Since the material will be stabilized off-site, the soil and sediment will be transported off-site, stabilized, and disposed of in an appropriate landfill.

This alternative requires an area sufficient for the stockpiles. It is estimated that the stockpile area will be located as shown on **Figure 4-2**. This will provide a central location for the dump trucks to transport the excavated soil to the stockpile area.

Trucks will be loaded directly from the stockpiles, after receiving the TCLP test results. A small staging area and equipment decontamination area will be set up as necessary.

4.5.2 <u>Protection of Human Health and the Environment</u>

An evaluation of the protectiveness of human health and the environment includes the assessment of short- and long-term effectiveness as well as permanence.

4.5.2.1 Short-term Protectiveness

This alternative will be evaluated with respect to the effect on human health and the environment during the implementation of the remedial action. Four items are included in an assessment of the short-term protectiveness of Alternative 3. The first issue is protection of the community during the remedial action. If off-site treatment is performed, hazardous material will be transported off-site. Precautionary measures must be taken to assure that the trucks are not overloaded and are properly covered with a tarp to ensure that no material is released. All waste, which is disposed in the off-site landfill, will no longer be considered hazardous waste.

There is also a minor threat from dust released during the excavation. The site is located away from the SEDA boundary, so the likelihood of any hazardous dust migrating off-site is negligible. Fugitive dust migration (in soil) is not a major migration pathway. Fugitive dust is further minimized by the makeup of the soil to be excavated, which is primarily shale fill, a material that has a fairly large particle size, and is less subject to dust formation.

The short-term protectiveness to site workers is also considered. The major routes of exposure during remediation are direct contact with the excavated soil and inhalation of particulate. Exposure can be minimized through the use of site access controls and proper protective equipment for site workers, such as dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of particulate. Dust generation at the excavation can be minimized by using water or other dust suppression techniques. It should also be noted that all the site workers are required to meet all the OSHA training and medical monitoring requirements.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. Impacts to the site will result from excavation, stockpiling, and truck traffic. In addition, since the hazardous material is primarily in the soil, there is little or no risk of a spill or release during the remedial action.

The last item to be considered is the duration of the remedial action. It is estimated that Alternative 3 can be completed in a short time period. If stabilization is conducted off-site, then it is estimated that the alternative may take approximately two to three months to complete, depending on the weather and turnaround time on the TCLP test results. This duration includes one week of mobilization, one week of building remediation, two to four weeks of excavation, three weeks to backfill and hydroseed, three weeks to test and dispose the material offsite, and one week to demobilize. This alternative is an earthmoving operation, with little mobilization and specialty equipment.

4.5.2.2 Long-term Effectiveness and Permanence

The assessment of the long-term effectiveness is divided into two categories, an assessment of the magnitude of the residual risk, and an evaluation of the adequacy and reliability of the controls used for the waste residuals and untreated soil.

The remedial action is designed so that any residual risk remaining in soils and sediments would be from concentrations of metals, SVOCs, and PCBs below the cleanup levels established for either protection of ecological receptors or for restoration to “pre-disposal” conditions. The excavated soil and sediment will be excavated and transported off-site for disposal and no treatment residuals will be left on the site.

The long-term management of the excavated material will be the responsibility of the selected off-site landfill. For this reason, it is important to perform the necessary checks to assure that the landfill is operated in accordance with State and Federal requirements. Although the excavated areas at the site will be backfilled and graded to promote stormwater run-off and minimize erosion, maintenance activities will not be required upon the re-establishment of vegetative growth.

Once the excavated soil and sediment are removed from the site, the remedial action would be considered permanent. There will no longer be soil and sediment on site that poses an unacceptable threat to human health or the environment.

4.5.2.3 Conclusion

Alternative 3 would be protective of human health and the environment using the criteria of short and long-term effectiveness and permanence. This alternative protects against ingestion and direct contact with surface and subsurface soils and sediments having concentrations of metals that exceed the cleanup criteria for either Case 2 (protection of ecological receptors) or Case 3 (restoration to “pre-disposal” conditions).

4.5.3 Reduction in Toxicity, Mobility, and Volume

Alternative 3 would be effective in reducing the toxicity and mobility of the hazardous constituents present in the soil and sediment at the site. The material and debris from SEAD-4 buildings will be removed as well as the soil and sediment exceeding the proposed cleanup levels. The TCLP test provides an assessment of the toxicity and mobility of the hazardous constituents in the soil. The larger the leaching fraction, the greater the mobility and the greater the toxicity. Since some of the excavated soil and sediment may be treated in order to meet the TCLP criteria prior to disposal, the treated material will be rendered non-hazardous and as a result, exhibit lower toxicity and mobility than the untreated waste.

Also, by treating the soil that contains the highest concentrations of hazardous constituents, the overall site risk (toxicity) will be reduced to acceptable levels. By stabilizing the soil and sediment and then transferring it to a landfill, the mobility of the hazardous constituents will be effectively eliminated from the site.

The stabilized soil represents a larger volume of material than the untreated soil, but is offset by the reduction in toxicity and mobility of the stabilized soil, which will render it a non-hazardous waste.

4.5.4 Implementability

4.5.4.1 Technical Feasibility

The technical feasibility of Alternative 3 is favorable. It involves routine construction work, including excavation, stockpiling, transportation, and backfilling. The extent of metals in soils and sediments that exceed the established cleanup criteria has been fully delineated. Minor weather delays may be encountered but should not adversely impact completion of the remedial operations.

Excavated material that fails the TCLP testing will require stabilization. Stabilization is a technology that has been frequently used to treat similar soils, and it is not anticipated that problems will be encountered during treatment. Many of the TSD facilities in the region have accepted similar wastes for a number of years, and these facilities are capable of treating and disposing of the site soils.

Technical feasibility also encompasses the relative ease with which additional work may be conducted. It is anticipated that this remedial action will prevent the necessity of conducting additional remedial actions at SEAD-4. This remedial alternative should not affect any potential future remedial actions at SEAD-4, if required.

4.5.4.2 Administrative Feasibility

The administrative feasibility of Alternative 3 is favorable. If off-site treatment is performed, several landfills have been identified that are fully permitted for disposal and stabilization, if required. Proper manifests will be required for transport of hazardous waste. All of the contractors used for excavation and hauling will be experienced in preparing manifests.

Administrative feasibility also considers coordination with regulatory agencies. As previously described, 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.

4.5.4.3 Availability of Services and Materials

Alternative 3 relies primarily on standard construction equipment that is readily available in the Romulus area. The equipment includes backhoes, bulldozers, front-end loaders, scrapers, and standard size dump trucks. Backfill material, such as common fill and topsoil, is also readily available in the Romulus area.

Several landfills have been identified that are capable of accepting the soil and sediment for disposal, as discussed in **Section 4.4.1.1**.

4.5.5 Compliance with ARARs

This alternative will comply with all chemical-specific, location-specific, and action-specific ARARs identified in **Section 2.4**.

4.5.6 Cost

4.5.6.1 Capital Costs

Capital costs were estimated for Alternative 3 for both Case 2 (protection of ecological receptors) and Case 3 (restoration to "pre-disposal" conditions). The detailed cost estimate and a description of the assumptions used are presented in **Appendix C**. The total capital costs (owner cost) are estimated to be $2,201,990 for Case 2 and $4,761,770 for Case 3.

4.5.6.2 O & M Costs

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

4.5.6.3 Present Worth Costs

The present worth cost (total evaluated price) for Case 2 was estimated to be $2,201,990 for Case 2 and $4,761,770 for Case 3.

4.6 COMPARATIVE ANALYSIS OF ALTERNATIVES

4.6.1 Introduction

This section compares the alternatives presented above with respect to the specific evaluation criteria. The following discussion will rank each of the alternatives with regard to the evaluation criteria and identify the relative advantages and disadvantages of each. The tradeoffs among the different alternatives will be discussed. This comparison will provide the information necessary to decide the appropriate remediation alternative for this site.

The discussion is divided into two groups. The first group, the threshold criteria, include the overall protection of human health and the environment. The next group includes the remainder of the evaluation criteria: long term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, short-term effectiveness, implementability, and cost.

4.6.2 Threshold Criteria

Each alternative is assessed against the threshold criteria, which include overall protection of human health and the environment and compliance with ARARs. The alternative must satisfy both criteria for it to be eligible for selection.

Only Alternatives 2 and 3 provide protection of human health and the environment. The building material and debris from SEAD-4 will be removed and disposed off-site. Sediment with chromium concentrations exceeding the NYS sediment criteria will be removed from the site. Soil with chromium and lead concentrations exceeding the proposed cleanup criteria for Case 2 and metals and SVOCs for Case 3 will be removed from the site, or capped in place. Removing or capping these materials will prevent dermal contact and ingestion, which have been identified by the BRA as the major exposure pathways for dust, soil and sediment at SEAD-4. Alternatives 2 and 3 would reduce risk to acceptable levels (refer to discussion in **Section 2.0**). Additionally, removing contaminated surface and subsurface soil (Alternative 3) or placing a soil cover over these areas (Alternative 2) will decrease any potential for migration to groundwater.

Removal of sediments in the man-made lagoon will protect environmental receptors by preventing exposure to sediments with metals on site and by preventing migration to Indian Creek, which is downgradient of SEAD-4.

Alternatives 2 and 3 remove sediments with chromium exceeding the NYS sediment criteria. Therefore, the No-Action alternative is the only alternative that does not comply with ARARs.

4.6.3 Other Considerations

4.6.3.1 Long Term Effectiveness and Permanence

The criteria of long-term effectiveness addresses the long-term protectiveness to human health and the environment. Alternatives 2 and 3 demonstrate long-term effectiveness because they rely on disposal or containment to reduce the hazardous constituents in the soils and sediments. Alternative 3 ranks higher for long-term effectiveness since no contaminated materials will remain on site, thereby eliminating the potential contact with humans or ecological receptors. Alternative 2 involves possible treatment of the ditch soil and sediment and disposal in an off-site landfill as well as a soil cover for the surface soils. Alternative 2 is considered less effective because although the soil cover will prevent contact with the underlying soil and reduce risk to acceptable levels, the long-term effectiveness relies on maintaining the cap integrity to ensure that it functions as a barrier for releases to the air and groundwater. Both alternatives are considered to provide effective long-term protection. Alternative 1, the no action alternative, does not provide long-term protection of human health and the environment.

The relative rankings of the alternatives based on permanence are the same as the rankings for long-term protectiveness. Alternative 3 reduces the volume of the soil on site and is considered more permanent than Alternative 2, which requires soil to remain on-site. Alternative 1, the no action alternative, is not permanent since no treatment or soil cover is used.

4.6.3.2 Reduction of Toxicity, Mobility, or Volume

The alternatives are also compared with respect to the relative decreases in the toxicity, mobility, and volume of the hazardous constituents present at the site. Both Alternatives 2 and 3 decrease the toxicity in the soil and/or sediment, which may be treated by stabilization. The stabilization process decreases the toxicity of the metals because the metals are converted to less soluble forms. Once the soil and/or sediment is treated and landfilled, the hazardous constituents are essentially immobile.

Alternative 3 ranked highest in reduction of toxicity since some soils as well as sediments will be treated. Alternative 2 was assigned a lower score since only sediments will be treated. Alternative 1 was assigned the lowest score since there is no reduction in the toxicity of soil or sediment.

Alternative 3 was assigned the highest score in reduction of mobility. Landfilling is a containment and isolation remediation approach and will reduce mobility of the waste. Alternative 2 was assigned a lower score since it does not involve treatment or reduction in mobility, other than the physical restriction of mobility resulting from the soil cover. Alternative 1 was assigned the lowest score since there is no treatment, reduction in the mobility, or remediation of the on site buildings.

Alternative 2 ranks highest in the reduction of volume since this alternative will not disturb the surface and subsurface soil, and the excavated ditch soil and sediments will be disposed and compacted in a landfill. Alternative 1 was assigned the next highest score since there is no volume reduction or increase. Alternative 3, which relies on stabilization and disposal, ranks the lowest on volume reduction. The treated soils typically have a greater volume than the initial untreated soil. Furthermore, the remaining soils, which will be excavated and landfilled, will increase in volume by approximately 30 percent as a result of the excavation process.

4.6.3.3 Short-term Effectiveness

Alternative 1 ranked highest since no construction or transportation is performed. Alternative 2 was assigned next highest score since this alternative does not involve a large amount of excavation and can be implemented relatively quickly, considering that it does not require specialized equipment or vendors. Off-site transportation is limited and includes sediment excavated from the man-made lagoon, building material and debris, and materials for the cap (top soil, common fill, and filter fabric.) The latter factor can be limited through the use of on-site borrow soils. Alternative 3 scored the lowest since this alternative require off-site disposal of soils and sediment.

4.6.3.4 Implementability

Implementability is a measure of both the technical and administrative ease and likelihood that an alternative will be implemented. Site factors, such as access around wetlands, dewatering, weather, and wildlife nesting, are examples of construction difficulties that reduce the implementability of an alternative. Long-term monitoring requirements and continued attention are also considered as negative factors. The ability of an alternative to obtain necessary regulatory permits and the availability of vendors to implement an alternative are additional factors that could affect the ease of an alternative to be implemented. Implementability has been separated into three subcategories: technical feasibility, administrative feasibility, and availability.

Technical Feasibility. Alternative 1 was assigned the highest score since it would be the easiest to implement and require no long term monitoring. Alternative 3 scored next highest and Alternative 2 scored lowest. Alternative 3 will remove all source material from the site and dispose of it in an off-site landfill. The off-site landfill will be monitored by the landfill itself, and not SEDA. Alternative 2 involves leaving soils in place and constructing a soil cover. From a construction point of view, this will involve routine earthmoving work, such as hauling, spreading, and compacting soils. However, Alternative 2 requires long-term groundwater monitoring and O&M.

Administrative Feasibility. In general, alternatives that meet remedial action objectives, comply with ARARs, reduce human health and ecological risk, minimize off-site disposal, are permanent and reduce the toxicity, mobility and volume of pollutants will meet the goals of the NCP and are considered to be the agency preferred alternatives.

Alternative 2 was assigned the highest score since it involves minimal off-site disposal. Alternative 3 was lower since it involves a larger volume of material for off-site disposal.

Alternative 1 was assigned the lowest score since it does not meet the remedial action objectives for the site and is considered to be the least permanent alternative.

Availability

The evaluation of availability considers the availability of vendors, equipment and space for implementing an alternative. Alternatives that involve highly specialized equipment or vendors that tend to delay the construction schedule were considered to be negative factors.

Alternative 1 assigned highest score for availability since it is readily available. Alternative 2 was assigned the next highest score since it involves leaving soils in place and constructing a soil cover. The construction of the soil cover involves routine earthmoving work, such as hauling, spreading and compacting soils, which numerous contractors are available and qualified to perform. Alternative 3 was assigned the lowest score. Alternative 3 can also be constructed easily; however, it involves more excavation, stockpiling, testing, and transportation.

4.6.3.5 Cost

This comparison will evaluate the present worth costs of the alternatives, which are presented in **Table 4-2**. Alternative 1 ranked highest since there are no costs involved with this alternative. Alternative 2 scored next highest since this alternative is the least expensive alternative with an average cost of $2,945,591 (costs vary from $2,434,555 to $3,456,627, depending on the cleanup level used). The average cost for Alternative 3 is $3,481,880 (costs vary from $2,201,990 to $4,761,770 depending on the cleanup level).

4.7 CONCLUSIONS

The baseline human health risk assessment indicates that the current cancer and hazardous risk is above acceptable levels for SEAD-4. In addition, the ecological risk assessment indicates that concentrations of metals in the soil and sediment may adversely affect ecological receptors. Alternatives 2 and 3 address remediating the soil, sediment, and building material and debris and will be effective to reduce the human health and ecological risk as well as to meet the remedial action objects. In summary, the remedial action objectives are to protect against ingestion of and dermal contact with (1) soils having concentrations of chromium and lead above soil cleanup goals for the protection of terrestrial ecological receptors; (2) sediments having concentrations of chromium above NYSDEC sediment guidelines; and (3) dust caused by excess debris and materials that are currently inside the abandoned buildings at SEAD-4.

The evaluation of alternatives was based on the intended conservation/recreational use scenario. This use was identified by the community representative group, the LRA, during the BRAC process. This level of protectiveness has been used as a basis for the screening and the selection of remedial alternatives. In addition, future residential use was also included for cost comparison purposes as provided in the State of New York goal, 6 NYCRR 375-1.10, that site remediation endeavor to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law." Prior to construction of the Depot, the area surrounding the base supported residential use and the evaluation of alternatives for residential use is sufficient to comply with the requirement for pre-disposal conditions. To avoid the redundancy of evaluating each alternative three separate times, one for each level of protectiveness, all alternatives were evaluated for the intended future land use, which is conservation and recreation. Following the evaluation, the costs required to achieve a level of protectiveness that would be sufficient for use under the NYSDEC requirement for pre-disposal were developed.

Alternative 1 has the lowest ranking. Alternative 2 ranks the highest for reduction in volume and administrative feasibility. However, this alternative ranks lowest for technical feasibility. Alternative 3 ranks highest for long-term protectiveness of human health and the environment, permanence, and reduction in toxicity and mobility. Alternative 2 ranks higher than Alternative 3 in cost.

The Army considers Alternative 3 to be the preferred remedy due to the weighted importance of technical feasibility, long-term protectiveness of human health and the environment, permanence, and reduction in toxicity and mobility.

NYSDEC requested that the Army recommend a cleanup goal that would be the most cost effective for mass of contaminant removed. Subsequently, a range of soil cleanup goals were evaluated in a sensitivity analysis, presented in **Appendix D**. Based on the results of the sensitivity analysis, the recommended cleanup goals for soils at SEAD-4 are 60 mg/Kg for chromium and 167 mg/Kg for lead.

Figures

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PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

FEASIBILITY STUDY
SEAD-4 - MUNITIONS WASHOUT FACILITY

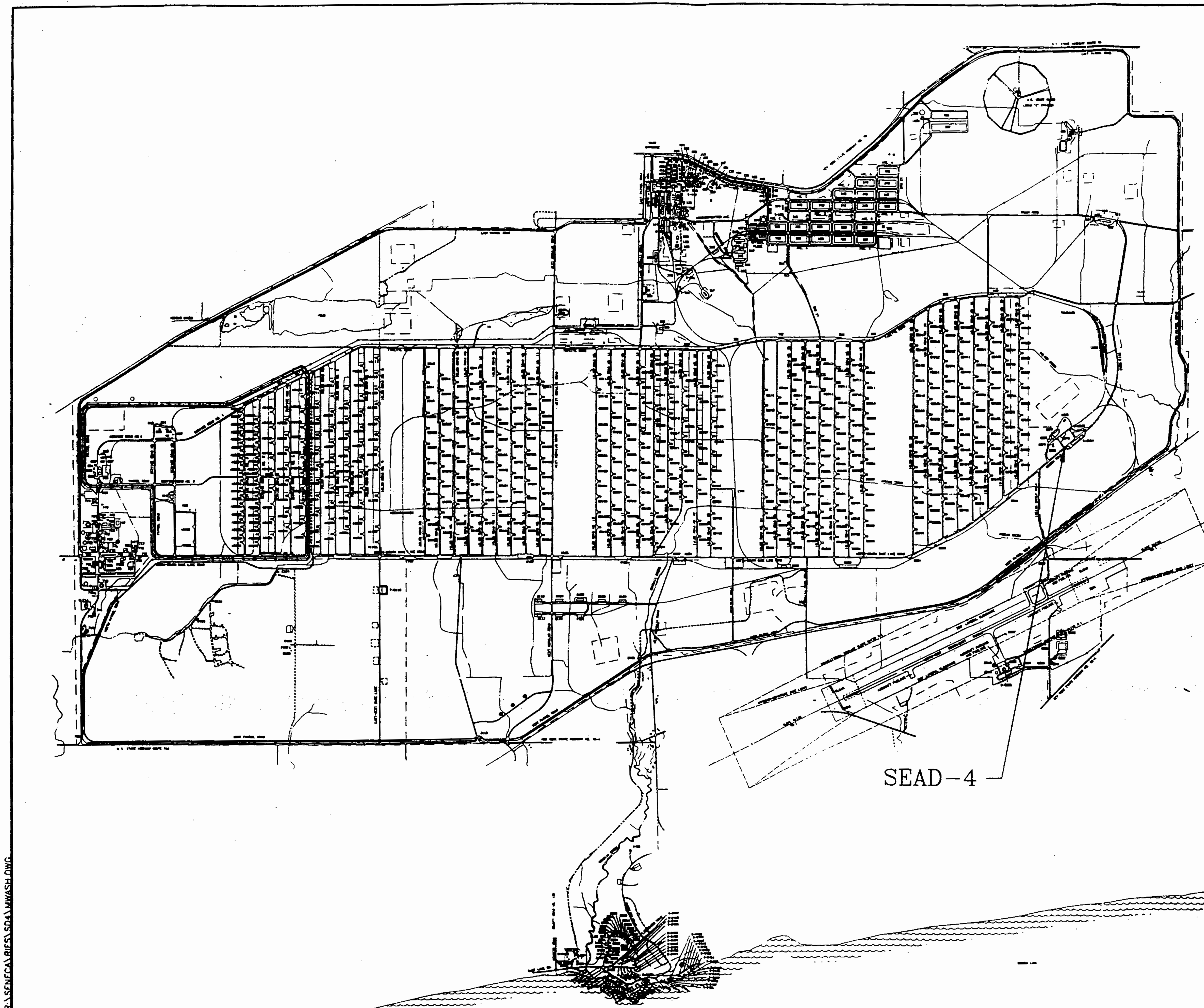
DEPT: ENVIRONMENTAL ENGINEERING | DWG NO. 734516-01001

FIGURE 1-1

LOCATION MAP

SCALE: 1"= 8 MILES APPROX. | DATE: APRIL 2001

R:\PROJECTS-GRAPHICS\SENECA\LOCMAP1.CDR



N

LEGEND:

S-2085 BUILDING NUMBER

-2800 0 2800

SCALE: 1' = 2800'

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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

FEASIBILITY STUDY
SEAD-4 - MUNITIONS WASHOUT FACILITY

DEPT. ENVIRONMENTAL ENGINEERING DWG NO.

FIGURE 1-2

SENECA ARMY DEPOT ACTIVITY

SCALE 1"= 2000'. DATE APRIL 2001

R:\SENECA\RIFS\SD4\MWASH.DWG

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SENECA ARMY DEPOT ACTIVITY

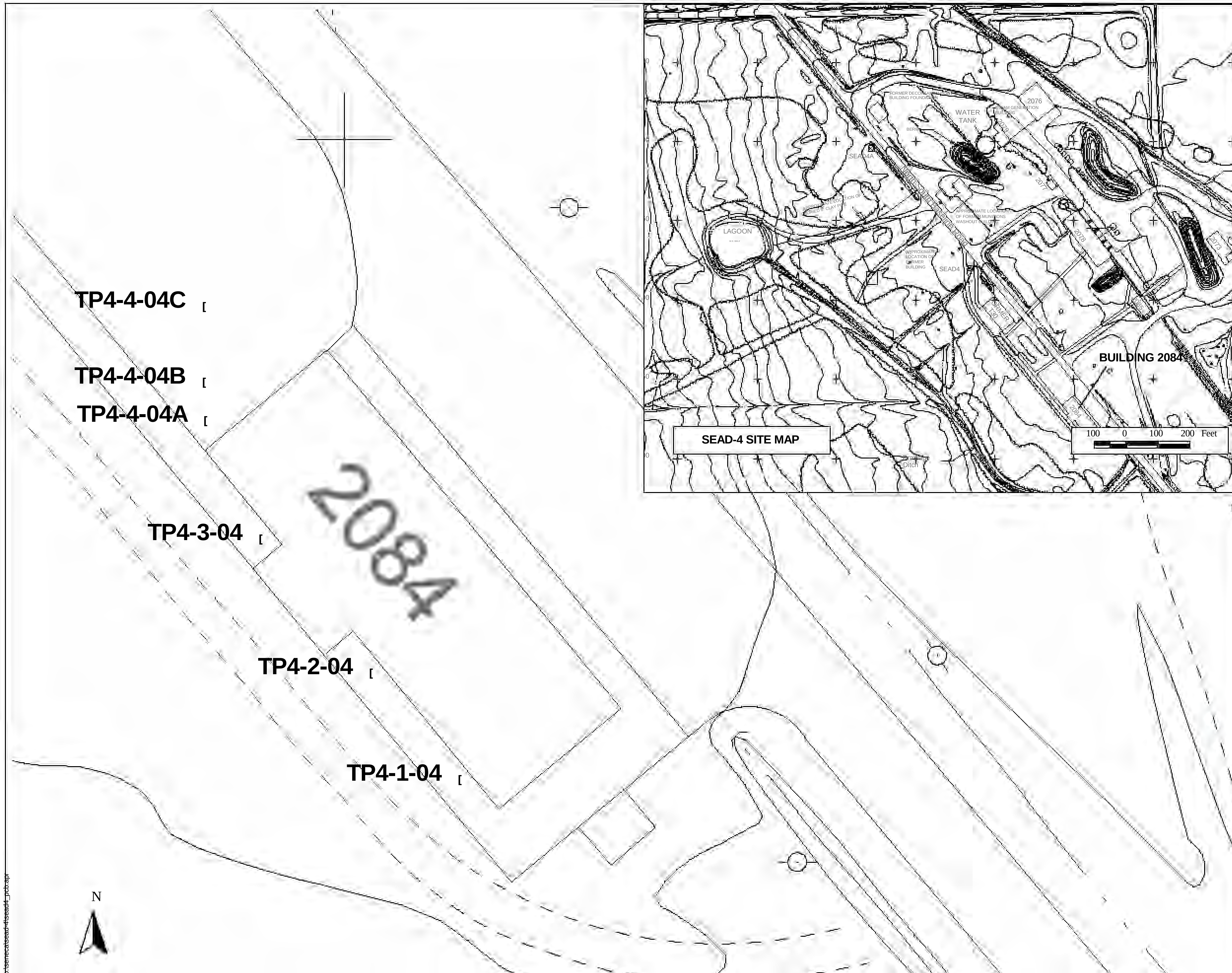
FEASIBILITY STUDY
SEAD-4 - MUNITIONS WASHOUT FACILITY

DEPT. ENVIRONMENTAL ENGINEERING | DWG NO.

FIGURE 1-3

SEAD-4 MUNITIONS WASHOUT FACILITY SITE MAP

SCALE 1" = 200' | DATE APRIL 2001



LEGEND

TP4-1-04

[Approximate Test Pit Location

Note: Test pits TP4-4-04A, B, and C were all approximately 1-ft deep surface soil inspection points. No samples were collected at points B or C

Test pit locations were approximated based on notes and observations made in the field

N

20 0 20 40 Feet

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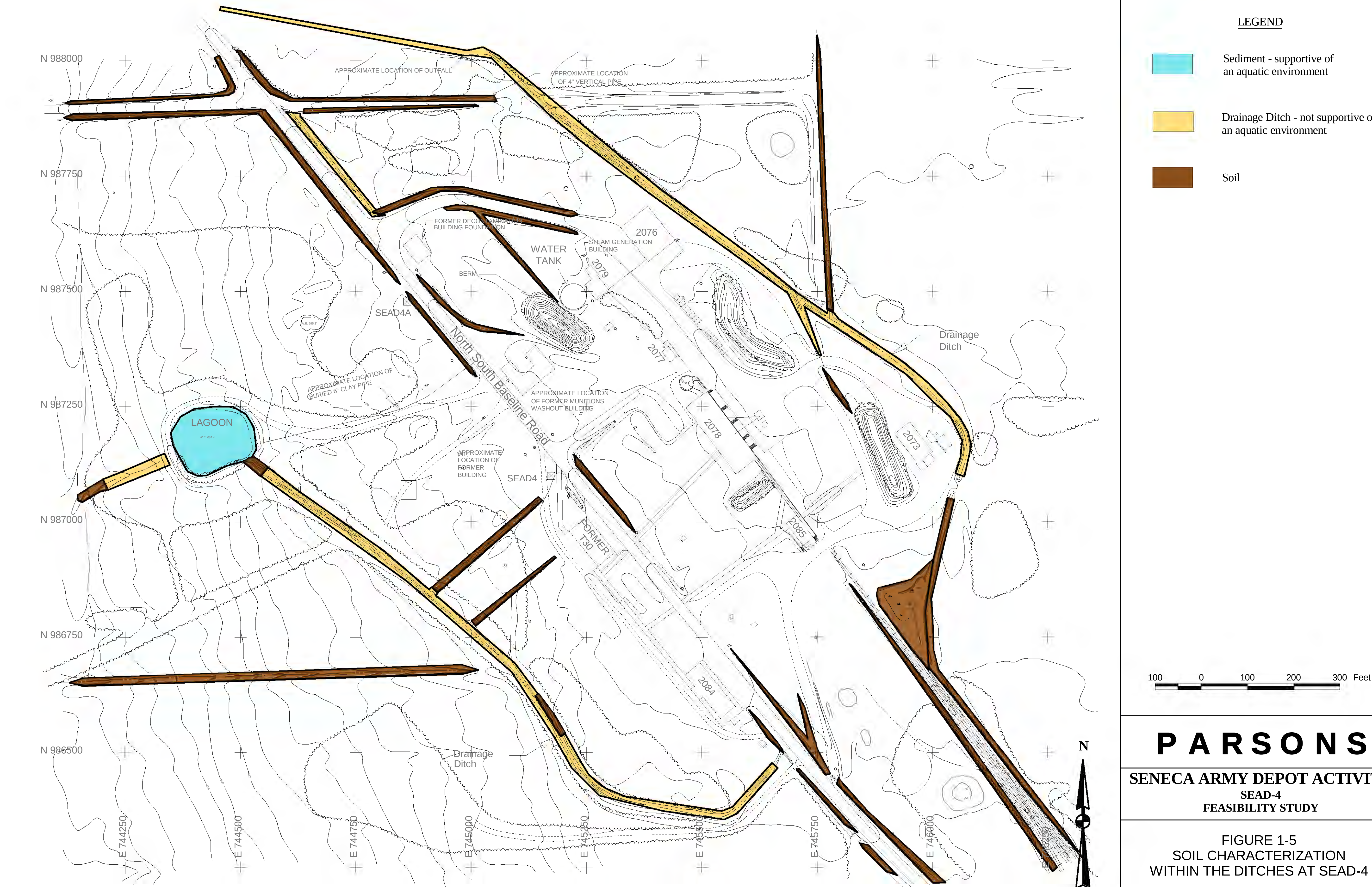
SENECA ARMY DEPOT ACTIVITY

SEAD-4
FEASIBILITY STUDY

FIGURE 1-4
TEST PIT LOCATIONS
2004

1" = 25'	FEBRUARY 2005



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SENECA ARMY DEPOT ACTIVITY

SEAD-4

FEASIBILITY STUDY

FIGURE 1-5
SOIL CHARACTERIZATION WITHIN THE DITCHES AT SEAD-4

SCALE 1:200	DATE FEBRUARY 2005

O:\Seneca\Sead-4\Sead4-fs115.apr

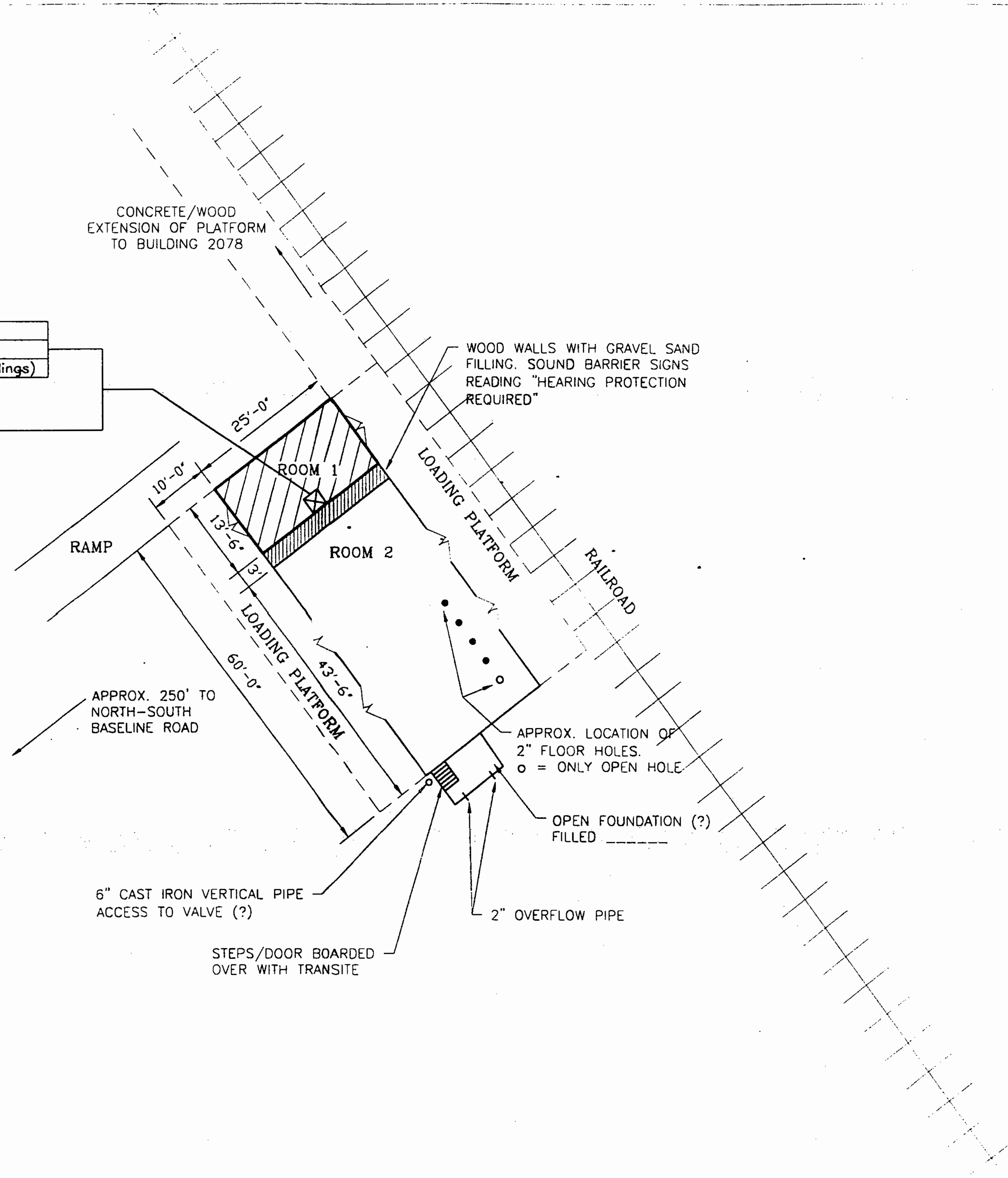
DATA FROM COMPOSITE SAMPLE

ug/kg	COMPOUND
4,700	Bis(2-ethylhexyl)phthalate
780	Alpha chlordane (max. of all buildings)

mg/kg	COMPOUND
150	Chromium
4800	Lead

Area of Room No.1
$14' \times 25' = 350ft^2$
Apprrox. 2" depth of soil/debris
$350\ ft^2 \times 0.82ft^2 = 29ft^3$

Volume of material on floor
Assume removal of material
from complete room:
$29ft^3 \times 0.037 = 1.073 \approx 1yd^3$



NOTE(S):

BUILDING APPEARS TO HAVE BEEN USED FOR TRANSFER OF MATERIALS

LEGEND:

⊠ 1 COMPOSITE SAMPLE COLLECTED FROM DEBRIS NEAR THE WALL AND THE CORNERS OF ROOM 1.

▨ AREA OF PROPOSED CLEANUP.

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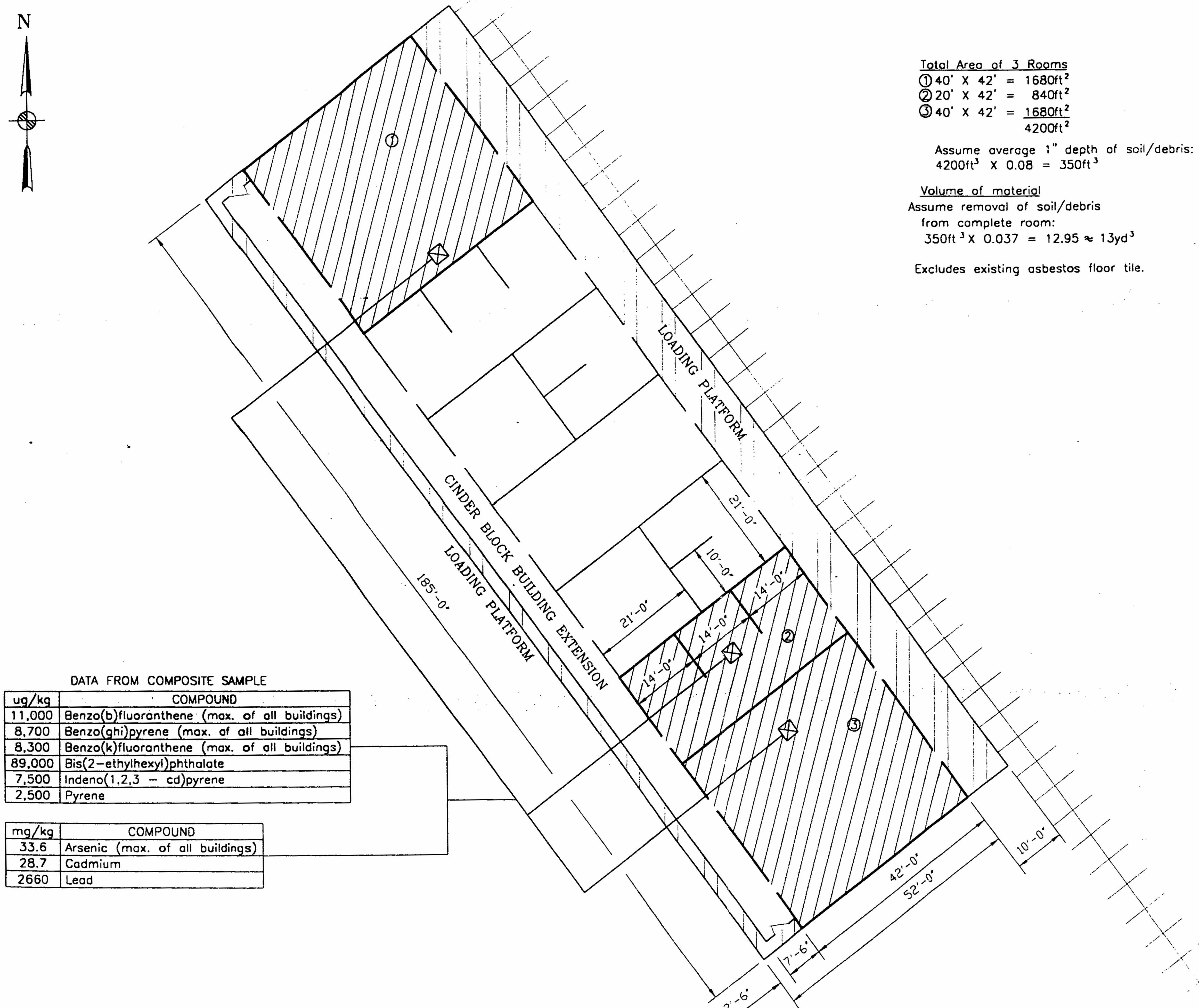
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-4 MUNITIONS WASHOUT FACILITY

DEPT. ENVIRONMENTAL ENGINEERING | Dwg. No 734520-01000

FIGURE 2-1
BUILDING 2085
AREA OF PROPOSED CLEANUP

SCALE 1" = 20'-0" | DATE APRIL 2001 | REV A



Total Area of 3 Rooms

① 40' X 42' = 1680ft²
② 20' X 42' = 840ft²
③ 40' X 42' = 1680ft²
4200ft²

Assume average 1" depth of soil/debris:
4200ft³ X 0.08 = 350ft³

Volume of material
Assume removal of soil/debris from complete room:
350ft³ X 0.037 = 12.95 ≈ 13yd³

Excludes existing asbestos floor tile.

DATA FROM COMPOSITE SAMPLE

ug/kg	COMPOUND
11,000	Benzo(b)fluoranthene (max. of all buildings)
8,700	Benzo(ghi)pyrene (max. of all buildings)
8,300	Benzo(k)fluoranthene (max. of all buildings)
89,000	Bis(2-ethylhexyl)phthalate
7,500	Indeno(1,2,3 - cd)pyrene
2,500	Pyrene

mg/kg	COMPOUND
33.6	Arsenic (max. of all buildings)
28.7	Cadmium
2660	Lead

NOTE(S):

BUILDING APPEARS TO HAVE BEEN USED FOR RE-PACKAGING EXPLOSIVES. WALLS THROUGHOUT THE BUILDING ARE 1' THICK WITH STEEL DOOR, HOLES FOR A CONVEYOR SYSTEM.

LEGEND:

☒ 1 COMPOSITE SAMPLE COLLECTED FROM THESE 3 LOCATIONS.

▨ AREA OF PROPOSED CLEANUP.

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SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-4 MUNITIONS WASHOUT FACILITY

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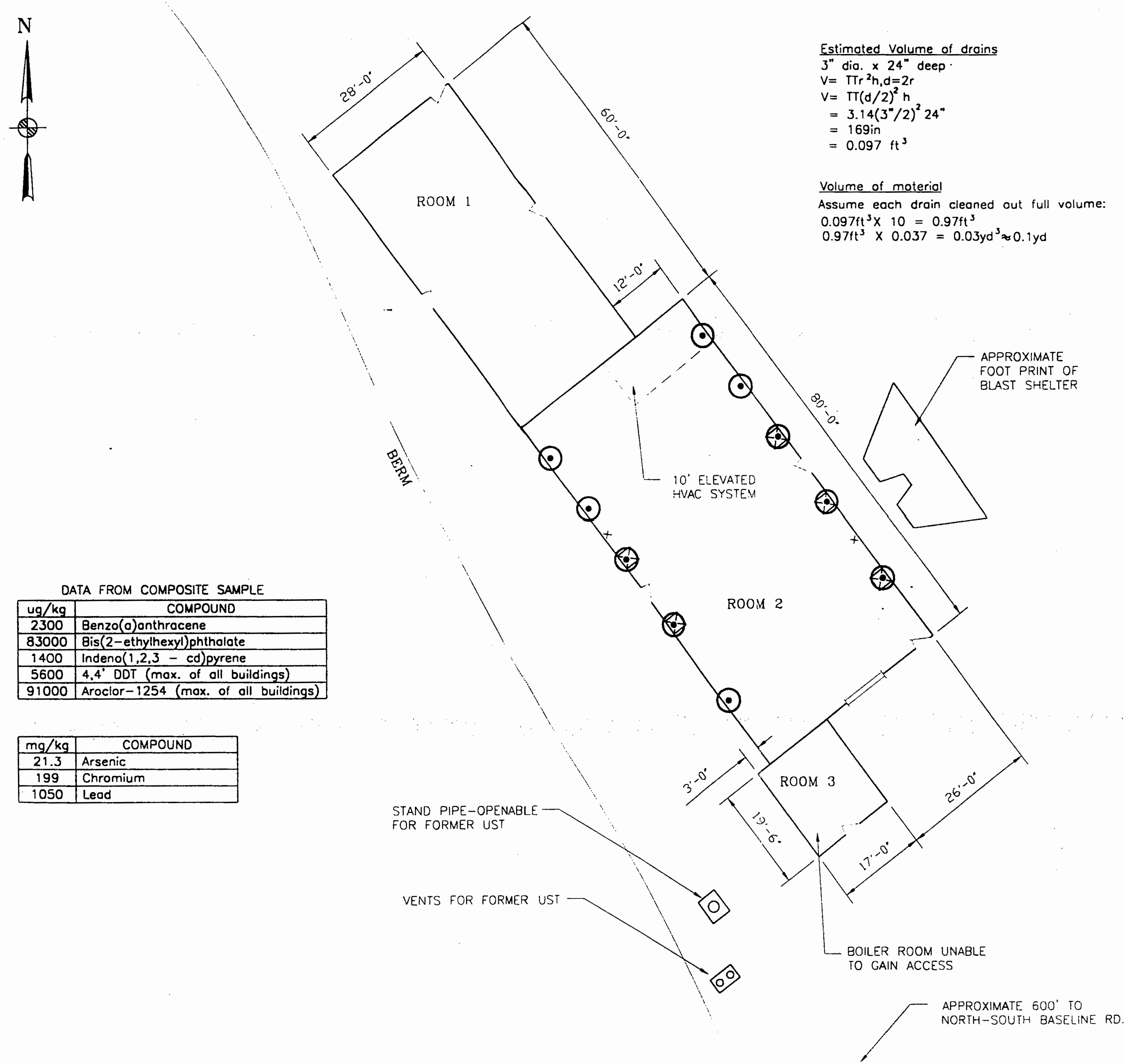
FIGURE 2-2
BUILDING 2078
AREA OF PROPOSED CLEANUP

SCALE 1" = 20'-0" | DATE APRIL 2001 | REV A



Estimated Volume of drains

3" dia. x 24" deep

$V = \pi r^2 h, d = 2r$

$V = \pi (d/2)^2 h$

$= 3.14(3"/2)^2 24"$

$= 169 in$

$= 0.097 ft^3$

Volume of material

Assume each drain cleaned out full volume:

$0.097 ft^3 \times 10 = 0.97 ft^3$

$0.97 ft^3 \times 0.037 = 0.03 yd^3 \approx 0.1 yd$

DATA FROM COMPOSITE SAMPLE

ug/kg	COMPOUND
2300	Benzo(a)anthracene
83000	Bis(2-ethylhexyl)phthalate
1400	Indeno(1,2,3 - cd)pyrene
5600	4,4' DDT (max. of all buildings)
91000	Aroclor-1254 (max. of all buildings)

mg/kg	COMPOUND
21.3	Arsenic
199	Chromium
1050	Lead

LEGEND:

- ◉ FLOOR DRAIN LOCATIONS & AREA OF PROPOSED CLEANUP.
- × FLAMABLE STORAGE LOCKERS (CURRENTLY CONTAINING PAINTS AND SOLVENTS)
- ☒ 1 COMPOSITE SAMPLE COLLECTED FROM THE FLOOR DRAINS.

NOTE(S):

APPROXIMATELY 90% OF ROOM 1 FLOOR SPACE IS COVERED BY PALLETS.

APPROXIMATELY 70% OF ROOM 2 FLOOR SPACE IS COVERED BY PALLETS.

APPARENT USE IS FOR STORAGE OF CONTAINERS (CURRENTLY ~200 PALLETS STORED) AND SUPPLIES.

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SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD-4 MUNITIONS WASHOUT FACILITY

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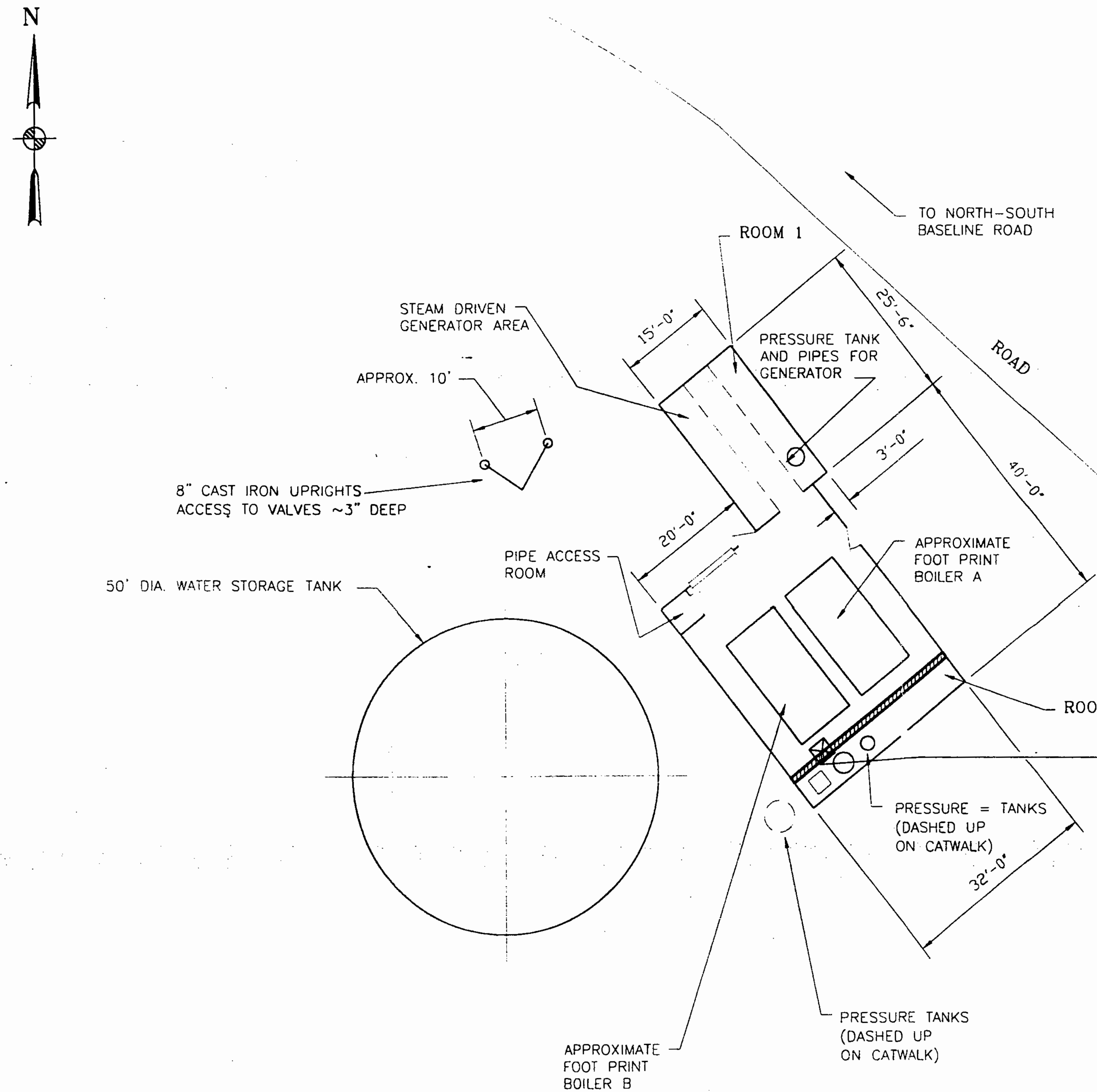
FIGURE 2-3
BUILDING 2073
AREA OF PROPOSED CLEANUP

SCALE 1" = 30'-0" | DATE APRIL 2001 | REV A



<u>Volume of droin</u>
2' X 32' = $64ft^2$
Assume drain 2' deep
64^2 x 2 = $128ft^3$

<u>Volume of material</u>
Assume each droin cleaned out 1/2 volume:
$128ft^3$X 1/2 = $64ft^3$
$64ft^3$ X 0.037 = $2.36yd^3 \approx 2.5.yd^3$
(Excludes pipe insulation that moy include asbestos)

COMPOSITE SAMPLE DATA

ug/kg	COMPOUND
780	Benzo(a)anthracene
550	Indeno(1,2,3 – cd)pyrene
950	Pyrene
3500	Aroclor–1254
3100	Aroclor–1260

mg/kg	COMPOUND
136	Chromium
993	Lead

LEGEND:

☒ 1 COMPOSITE SAMPLE COLLECTED FROM THE BOTTOM OF TRENCH.

▨ AREA OF PROPOSED CLEANUP.

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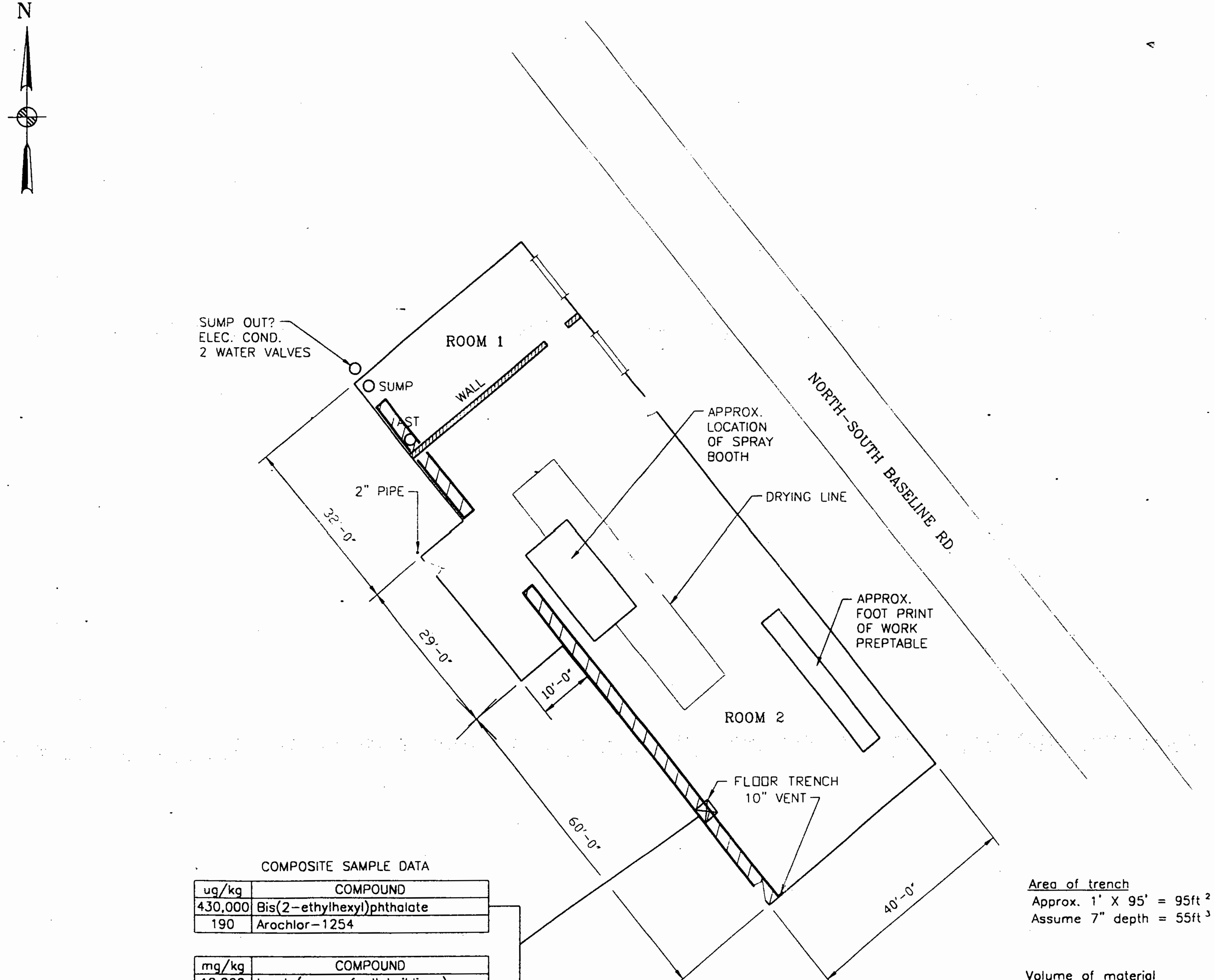
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
FEASIBILITY STUDY
SEAD–4 MUNITIONS WASHOUT FACILITY

DEPT. ENVIRONMENTAL ENGINEERING | Dwg. No 734520-01000

FIGURE 2-4
BUILDING 2079
AREA OF PROPOSED CLEANUP

SCALE 1" = 20'-0" | DATE APRIL 2001 | REV A



COMPOSITE SAMPLE DATA

ug/kg	COMPOUND
430,000	Bis(2-ethylhexyl)phthalate
190	Arochlor-1254

mg/kg	COMPOUND
12,000	Lead (max. of all buildings)
1840	Chromium (max. of all buildings)

Area of trench
Approx. 1' X 95' = 95ft^2
Assume 7" depth = 55ft^3

Volume of material
Assume removal of material from complete trench:
55ft^3 X 0.037 = 2.05 ≈ 2.0yd^3

NOTE(S):

BUILDING APPEARS TO HAVE BEEN USED FOR RE-PAINTING ORDINACE SHELLS

LEGEND:

☒ 1 COMPOSITE SAMPLE COLLECTED FROM FLOOR TRENCH.

▨ AREA OF PROPOSED CLEANUP.

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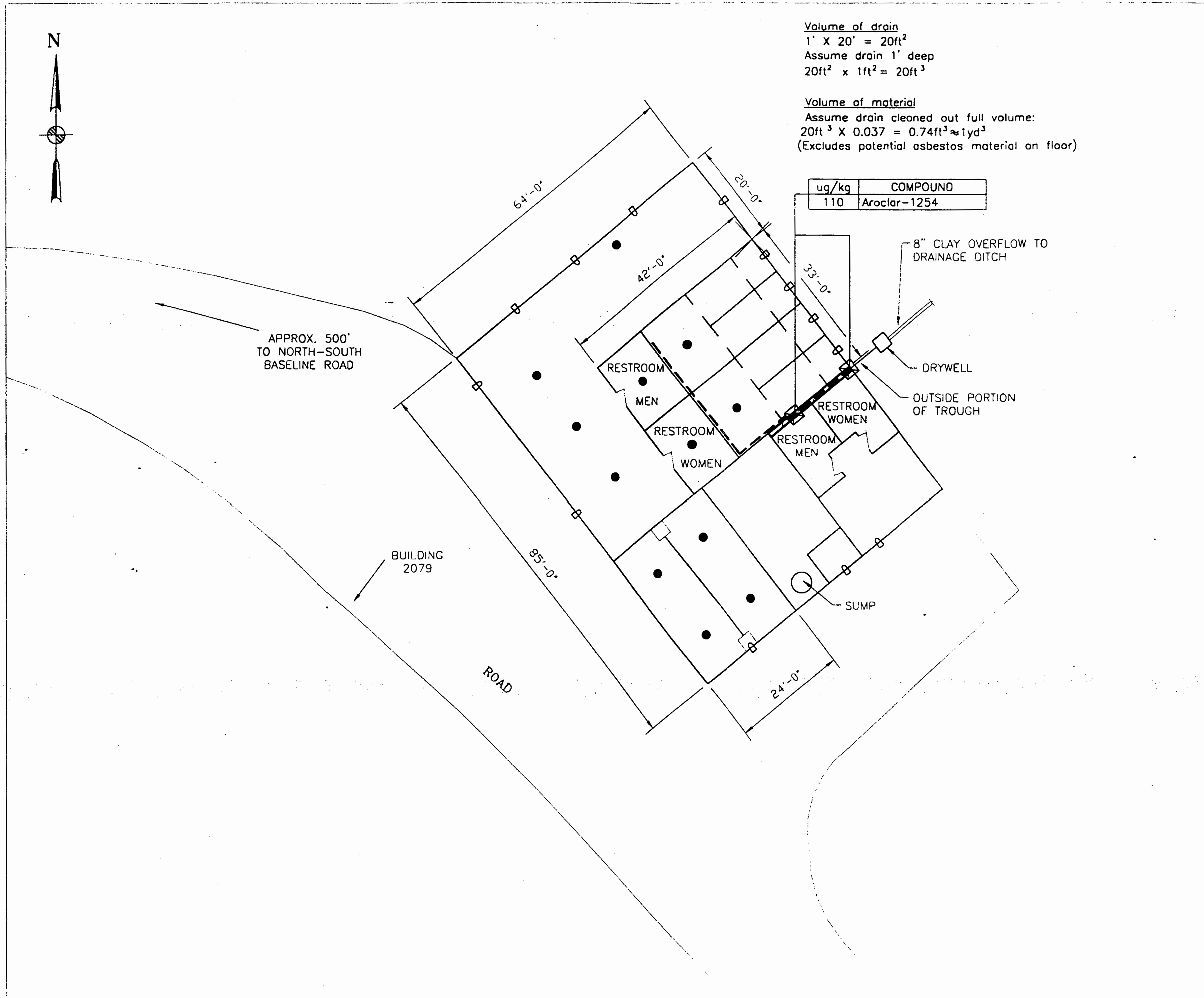
SEAD-4 MUNITIONS WASHOUT FACILITY

DEPT. ENVIRONMENTAL ENGINEERING | DWG. No 734650-01000

FIGURE 2-5
BUILDING 2084
AREA OF PROPOSED CLEANUP

SCALE 1" = 20'-0" | DATE APRIL 2001 | REV A



ug/kg	COMPOUND
110	Aroclar-1254

LEGEND:

- ● APPROXIMATE FLOOR DRAIN LOCATIONS
- OUTSIDE DOORS (SOME ARE BOARDED)
- — — — LOCATION OF FLOOR TROUGH/DRAINS
- ☒ 1 COMPOSITE SAMPLE COLLECTED FROM THESE LOCATIONS.
- AREA OF PROPOSED CLEANUP.

NOTE(S):

ROOF OVERHANGS ~6' AROUND ENTIRE BUILDING

APPARENT USE – LUNCHROOM AND LAUNDRY FACILITIES

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SEAD-4 MUNITIONS WASHOUT FACILITY

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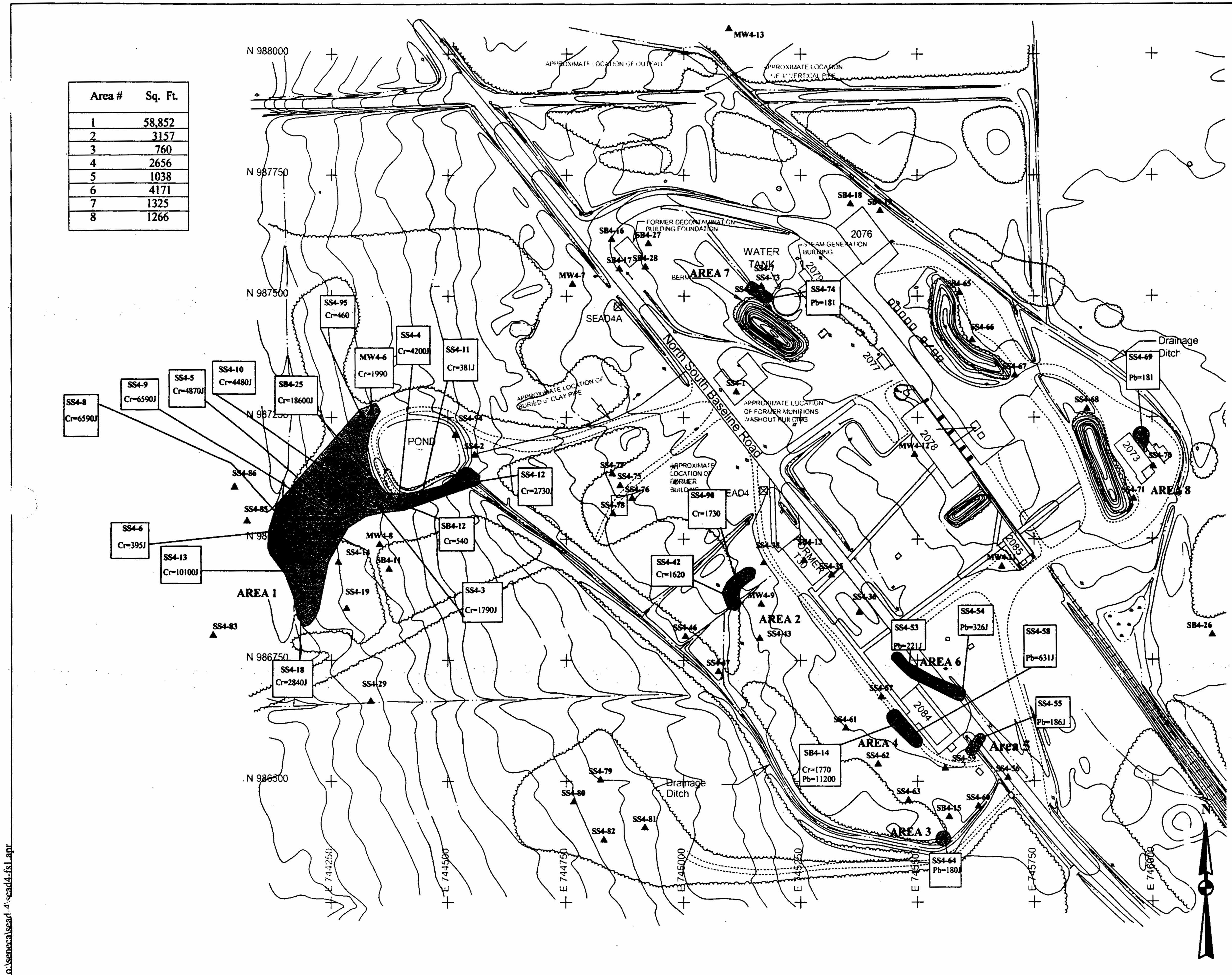
FIGURE 2-6
BUILDING 2076
AREA OF PROPOSED CLEANUP

SCALE 1" = 30'-0" | DATE APRIL 2001 | REV A



Area #	Sq. Ft.
1	58,852
2	3157
3	760
4	2656
5	1038
6	4171
7	1325
8	1266

LEGEND

SB4-14 Cu=1770 Pb=11200 — Surface Soil Sample Location with LOC_ID and Case 2 exceedance analyte with value

AREA 1 — Extent of contaminated surface soil according to Case 2 remedial action with area number

Total area of Case 2 surface soil contamination= 73,225 sq ft

Analyte	Units	Eco Goals
Lead	MG/KG	167
Chromium	MG/KG	324

Note:

The metals are reported in units of MG/KG.
The higher value between a sample and duplicate sample was reported.

200 0 200 (feet)

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FIGURE 2-7
CASE 2 REMEDIAL ACTION OBJECTIVE
SURFACE SOIL (0 - 1 FEET)

SCALE 1:200 | DATE MAY 2001 | REV SHEET 1 OF 1

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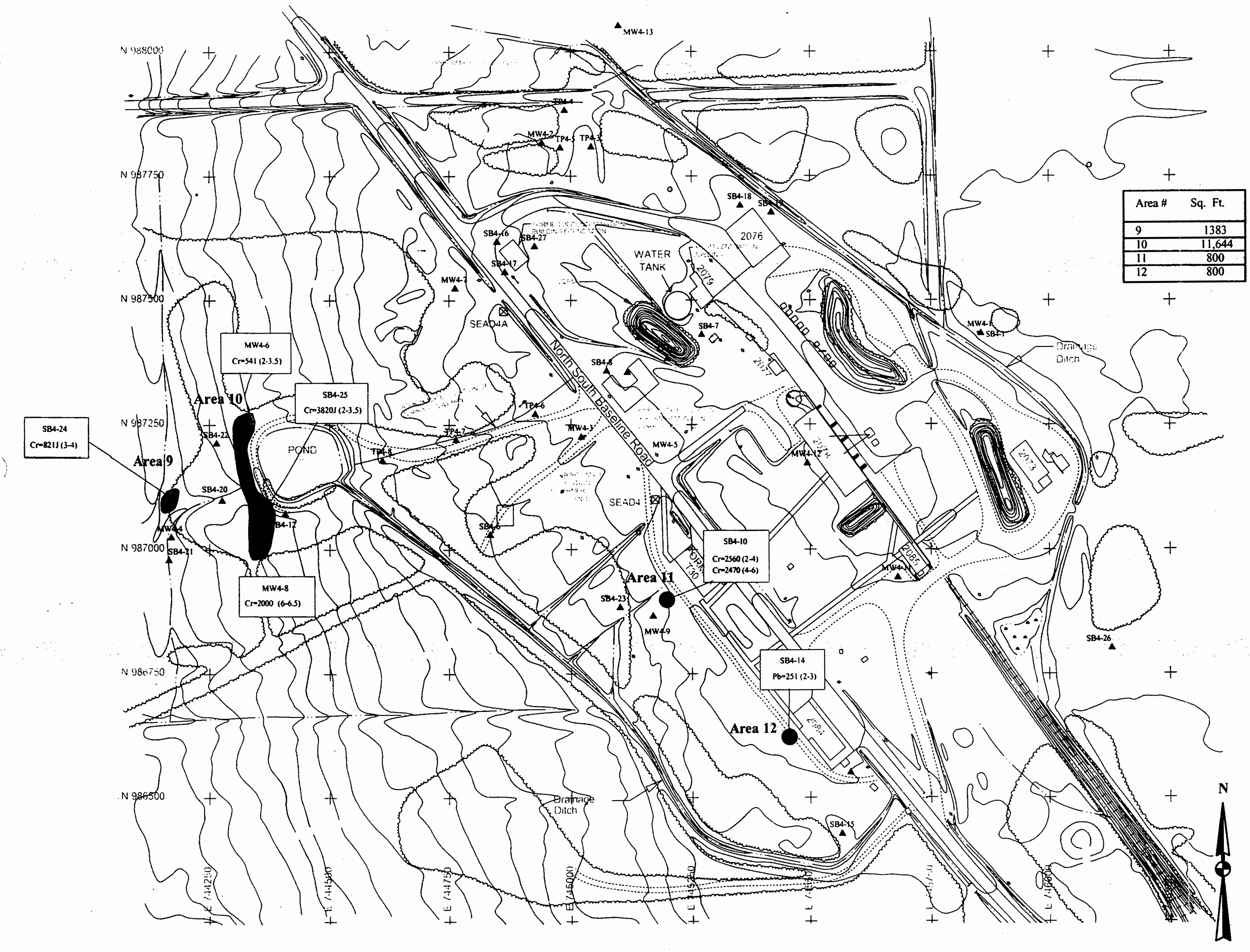

Area #	Sq. Ft.
9	1383
10	11,644
11	800
12	800

LEGEND

SB4-10 Cu=2560 (2-4) — Subsurface Soil Sample Location with LOC_ID and Case 2 exceedance analyte with value (in mg/kg) and depth interval (feet)

AREA 1 — Extent of contaminated subsurface soil according to Case 2 remedial action with area number

Total area of Case 2 subsurface soil contamination= 14,627 sq ft

Analyte	Units	Eco Goals
Lead	MG/KG	167
Chromium	MG/KG	324

Note:

The higher value between a sample and duplicate sample was reported.
No exceedances of SVOC criteria in subsurface soils.

200 0 200
(feet)

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SEAD-4 MUNITIONS WASHOUT FACILITY

FIGURE 2-8
CASE 2 REMEDIAL ACTION OBJECTIVE
SUBSURFACE SOIL (1 - 3 FEET)

SCALE	DATE	REV
1:200	MAY 2001	SHEET 1 OF 1

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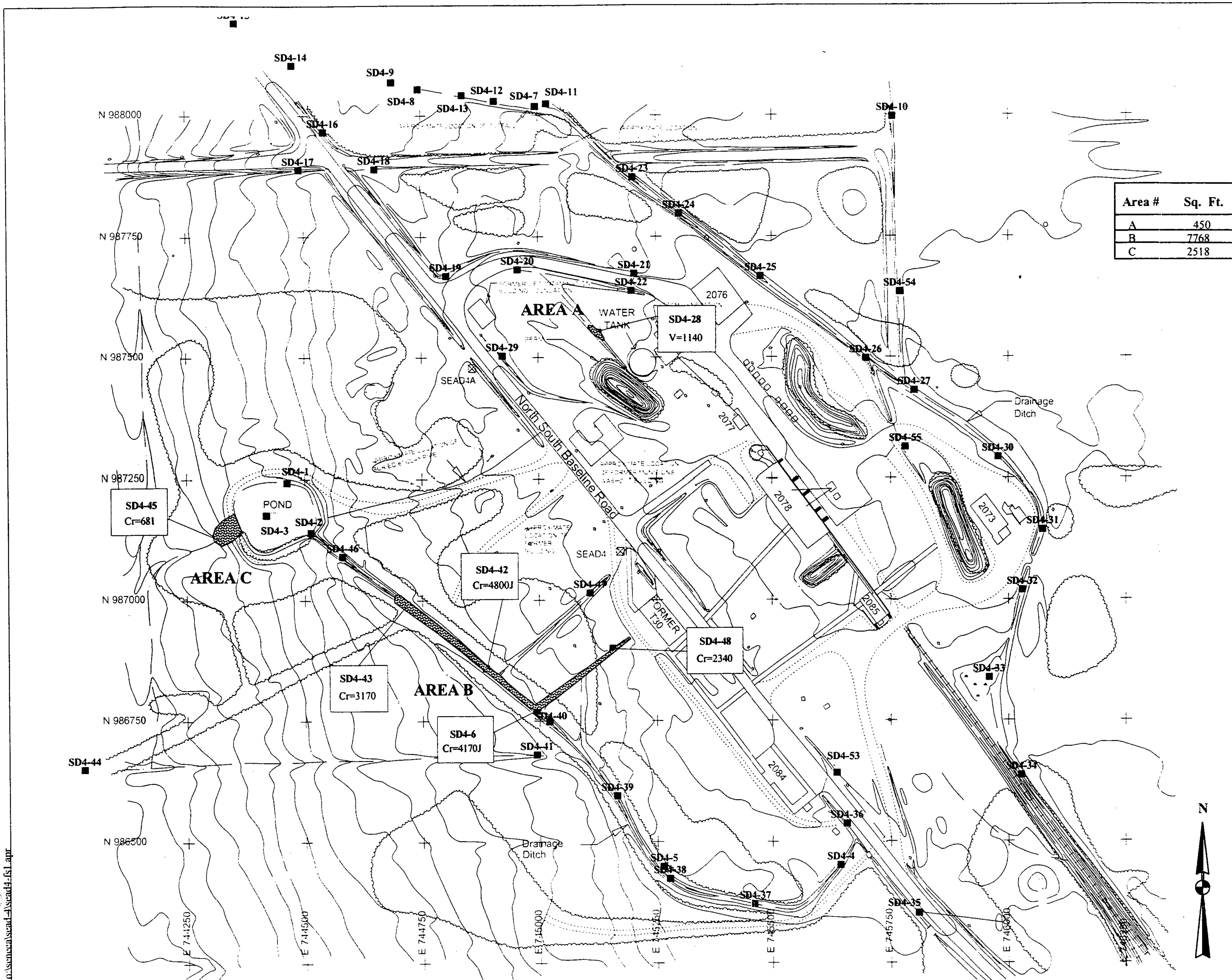

LEGEND

SD4-14 Cu=1770 Pb=11200 — Surface Soil Sample Location with LOC_ID and Case 2 exceedance analyte with value

Extent of contaminated surface soil according to Case 2 remedial action with area number

AREA 1

Total area of Case 2 soil in ditches = 10,736 sq ft

Analyte	Units	Eco Goals
Chromium	MG/KG	324

Notes:

The metals are reported in units of MG/KG.

The higher value between a sample and duplicate sample was reported.

Hotspot removal at SD4-28 for Vandium

200 0 200 (feet)

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SEAD-4 MUNITIONS WASHOUT FACILITY

FIGURE 2-9
CASE 2 REMEDIAL ACTION OBJECTIVE
SOIL IN DITCHES

SCALE	DATE	REV
1:200	FEB 2002	SHEET 1 OF 1

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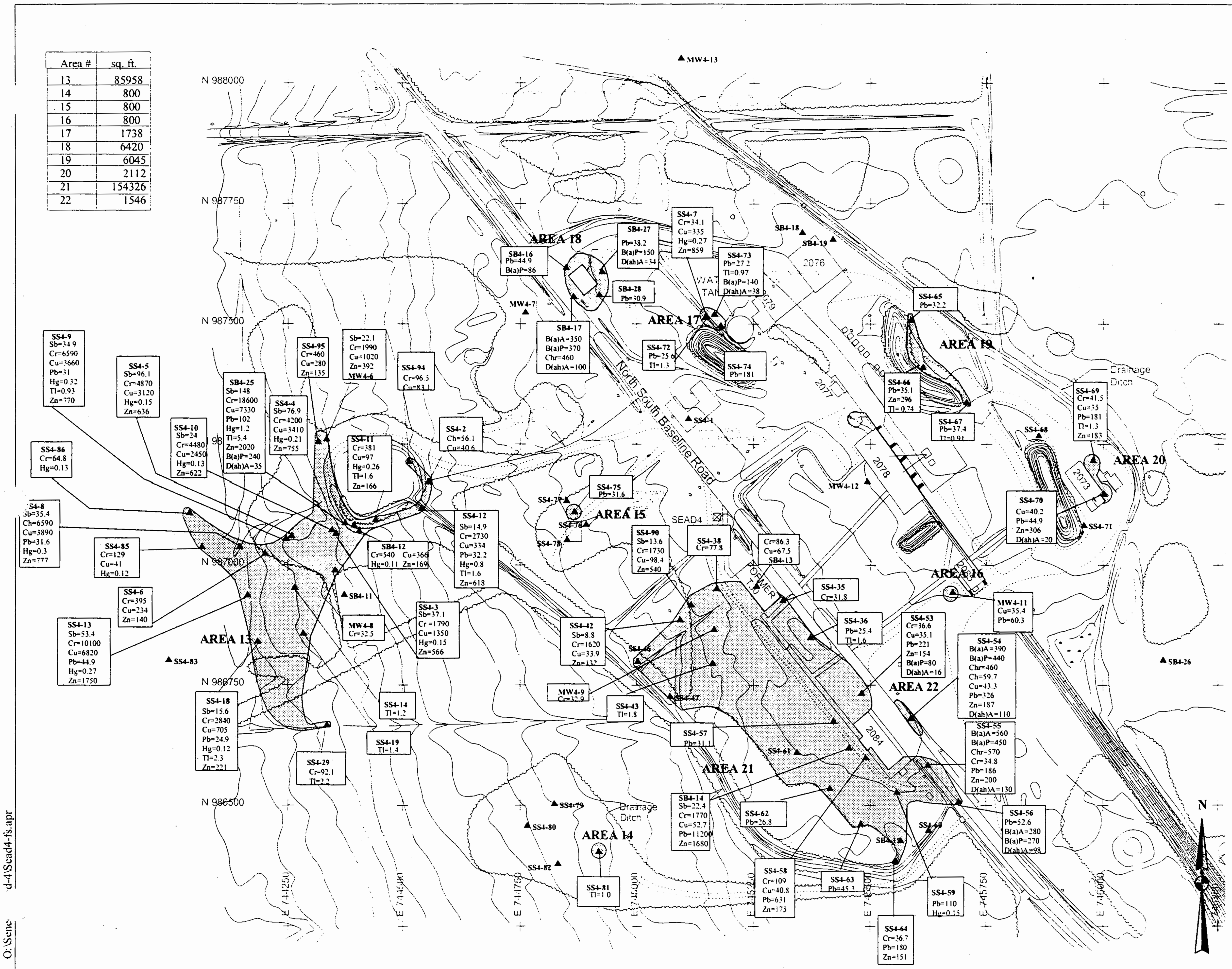

Area #	sq. ft.
13	85958
14	800
15	800
16	800
17	1738
18	6420
19	6045
20	2112
21	154326
22	1546

LEGEND

SS4-20 Cu=35.4 Pb=60.3 — Surface Soil Sample Location with LOC_ID and Case 3 exceedance analyte with value

Extent of contaminated surface soil according to Case 3 remedial action with area number

AREA 1

Total area of Case 3 surface soil contamination= 260,545 sq ft

Analyte	Units	Background or TAGM
Lead	MG/KG	24.8
Zinc	MG/KG	110
Copper	MG/KG	33
Antimony	MG/KG	6
Thallium	MG/KG	0.7
Mercury	MG/KG	0.1
Chromium	MG/KG	30
Benzo(a)anthracene	UG/KG	224 or MDL
Benzo(a)pyrene	UG/KG	61 or MDL
Chrysene	UG/KG	400
Dibenzo(a,h)anthracene	UG/KG	14 or MDL

Note:
Benzo(a)anthracene= B(a)A
Benzo(a)pyrene= B(a)P
Chrysene= Chr
Dibenz(a,h)anthracene= D(a,h)A

Benzo(a)anthracene, Benzo(a)pyrene, Chrysene and Dibenz(a,h)anthracene are reported in units of UG/KG. The metals are reported in units of MG/KG.

The higher value between a sample and duplicate sample was reported.

200 0 200 (feet)

N

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FIGURE 2-10
CASE 3 REMEDIAL ACTION OBJECTIVE SURFACE SOIL

SCALE	DATE	REV
1:200	JAN 2002	SHEET 1 OF 1

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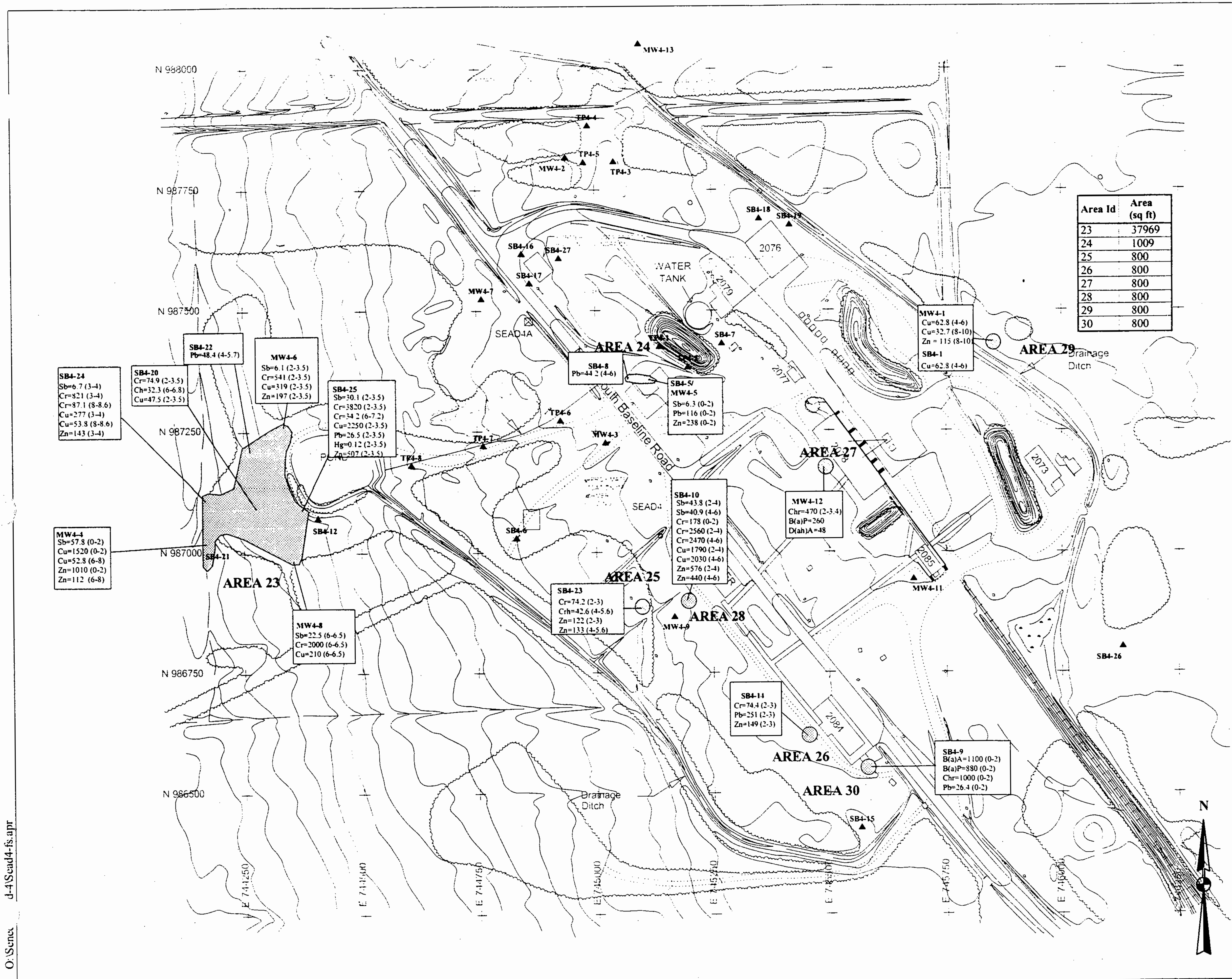

Area Id	Area (sq ft)
23	37969
24	1009
25	800
26	800
27	800
28	800
29	800
30	800

LEGEND

SS4-20 Cu=35.4 (4-6) Pb=60.3 (4-6) — Subsurface Soil Sample Location with LOC_ID and Case 3 exceedance analyte with value and depth interval (feet)

AREA 1 — Extent of contaminted subsurface soil according to Case 3 remedial action with area number

Total area of Case 3 subsurface soil contamination= 43,778 sq ft

Analyte	Units	Background or TAGM
Lead	MG/KG	24.8
Zinc	MG/KG	110
Copper	MG/KG	33
Antimony	MG/KG	6
Thallium	MG/KG	0.7
Mercury	MG/KG	0.1
Chromium	MG/KG	30
Benzo(a)anthracene	UG/KG	224 or MDL
Benzo(a)pyrene	UG/KG	61 or MDL
Chrysene	UG/KG	400
Dibenzo(a,h)anthracene	UG/KG	14 or MDL

Note:
Benzo(a)anthracene= B(a)A
Benzo(a)pyrene= B(a)P
Chrysene= Chr
Dibenz(a,h)anthrancene= D(a,h)A

Benzo(a)anthracene, Benzo(a)pyrene, Chrysene and Dibenz(a,h)anthracene are reported in units of UG/KG. The metals are reported in units of MG/KG.

The higher value between a sample and duplicate sample was reported.

200 0 200
(feet)

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SEAD-4 MUNITIONS WASHOUT FACILITY

FIGURE 2-11
CASE 3 REMEDIAL ACTION OBJECTIVE SUBSURFACE SOIL

SCALE	DATE	REV
1:200	JAN 2002	SHEET 1 OF 1

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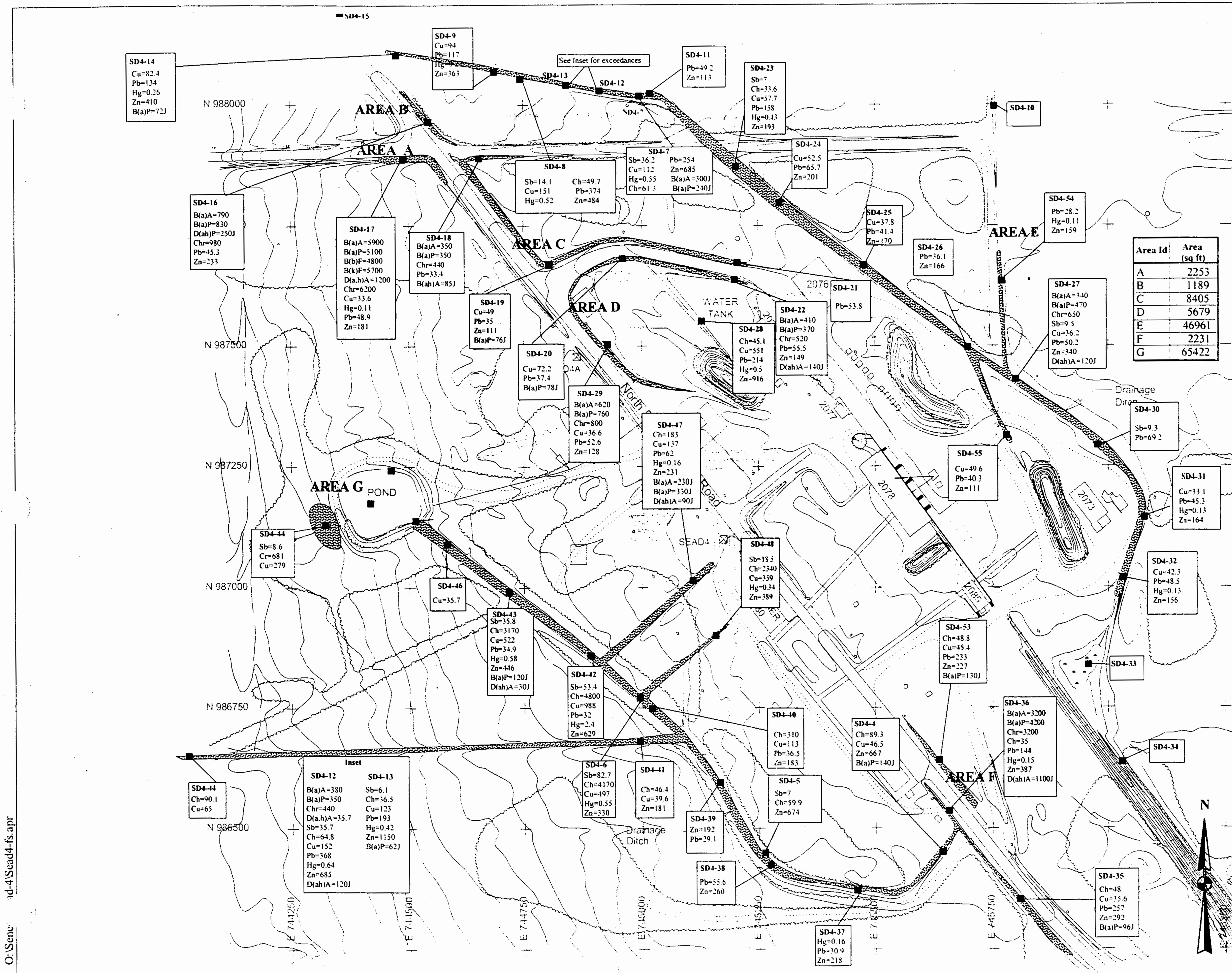

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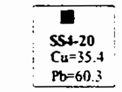
LEGEND



Sediment Sample Location with LOC_ID and Case 3 exceedance analyte with value

Extent of contaminated sediment according to Case 3 remedial action with area number

Total area of Case 3 soil contamination= 110,906 sq ft

Area Id	Area (sq ft)
A	2253
B	1189
C	8405
D	5679
E	46961
F	2231
G	65422

Analyte	Units	Background or TAGM
Lead	MG/KG	24.8
Zinc	MG/KG	110
Copper	MG/KG	33
Antimony	MG/KG	6
Thallium	MG/KG	0.7
Mercury	MG/KG	0.1
Chromium	MG/KG	30
Benzo(a)anthracene	UG/KG	224 or MDL
Benzo(a)pyrene	UG/KG	61 or MDL
Chrysene	UG/KG	400
Dibenzo(a,h)anthracene	UG/KG	14 or MDL

Note:
Benzo(a)anthracene= B(a)A
Benzo(a)pyrene= B(a)P
Chrysene= Chr
Dibenz(a,h)anthracene= D(a,h)A

Benzo(a)anthracene, Benzo(a)pyrene, Chrysene and Dibenz(a,h)anthracene are reported in units of UG/KG. The metals are reported in units of MG/KG.

The higher value between a sample and duplicate sample was reported.

200 0 200
(feet)

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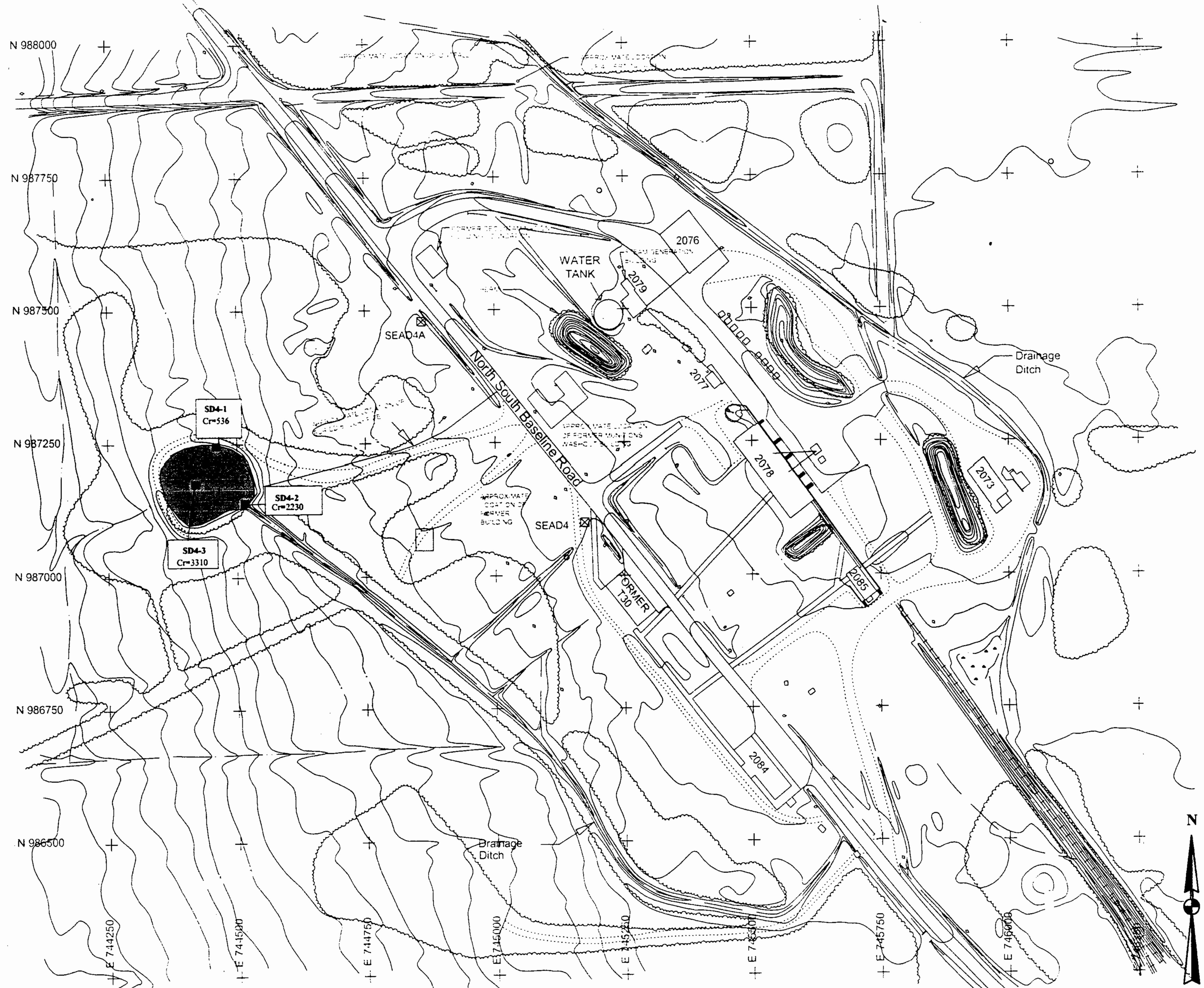
SEAD-4 MUNITIONS WASHOUT FACILITY

FIGURE 2-12
CASE 3 REMEDIAL ACTION OBJECTIVE SOIL IN DITCHES

SCALE	DATE	REV
1:200	JANUARY 2002	SHEET 1 OF 1



LEGEND

■ SS4-20 Cu=35.4 Pb=60.3 — Sediment Sample Location with LOC_ID and Case 4 exceedance analyte with value

Extent of contaminated sediment according to Case 4 remedial action with area number

AREA 1

Total area of Case 4 sediment contamination= 21,234 sq ft

Analyte	Unit	Criteria
Chromium	MG/KG	26

The metals are reported in units of MG/KG.

The higher value between a sample and duplicate sample was reported.

Criteria for metals are NYSDEC LEL; criteria for all other parameters is NYSDEC HHB.

200 0 200 (feet)

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SEAD-4 MUNITIONS WASHOUT FACILITY

FIGURE 2-13

CASE 4 REMEDIAL ACTION OBJECTIVE

SEDIMENT LAGOON AREA

SCALE	DATE	REV
1:200	JANUARY 2002	SHEET 1 OF 1

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SEAD-4 MUNITIONS WASHOUT FACILITY

FIGURE 2-14
CASES 5 AND 6 REMEDIAL ACTION OBJECTIVES GROUNDWATER AND SURFACE WATER

SCALE 1:200	DATE JANUARY 2002	REV SHEET 1 OF 1

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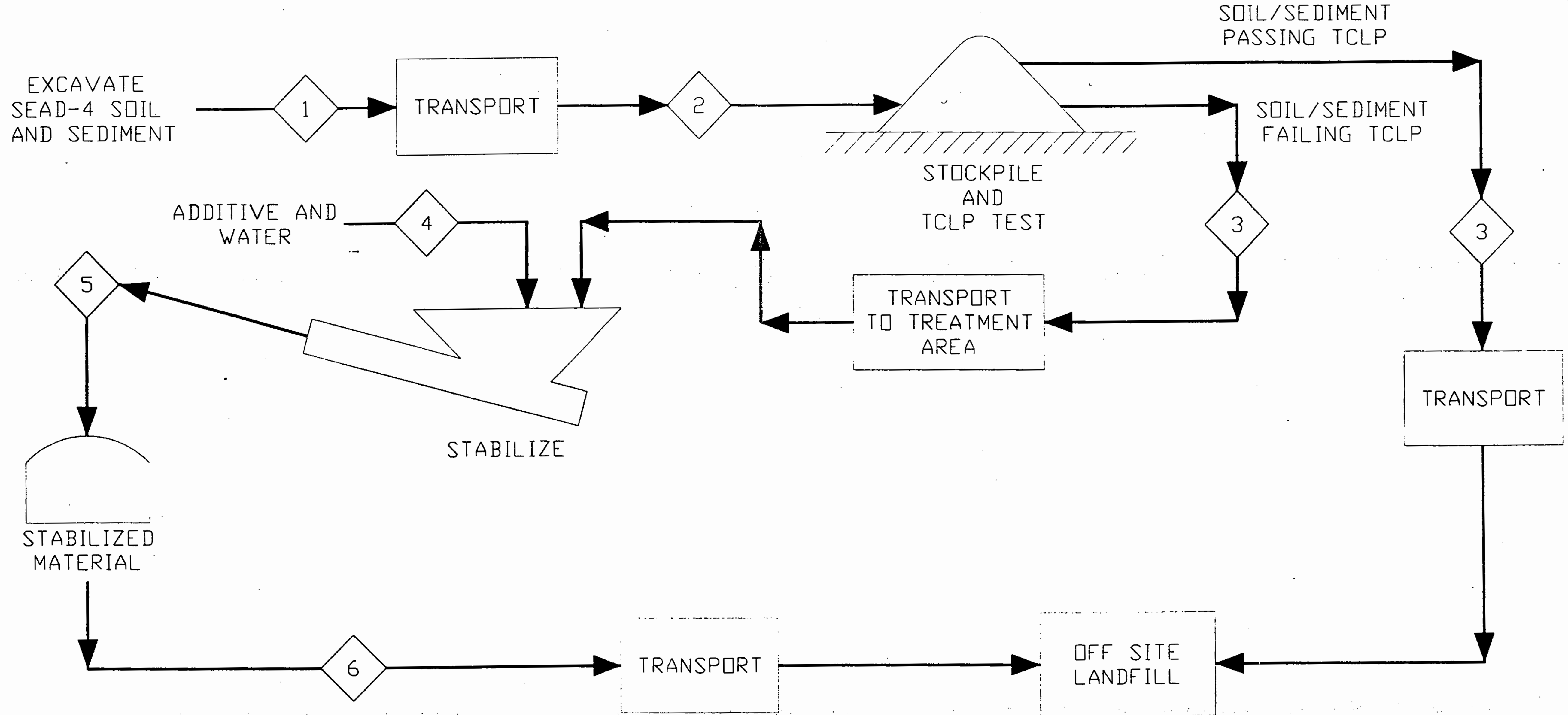

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FEASIBILITY STUDY
SEAD-4 MUNITIONS WASHOUT FACILITY

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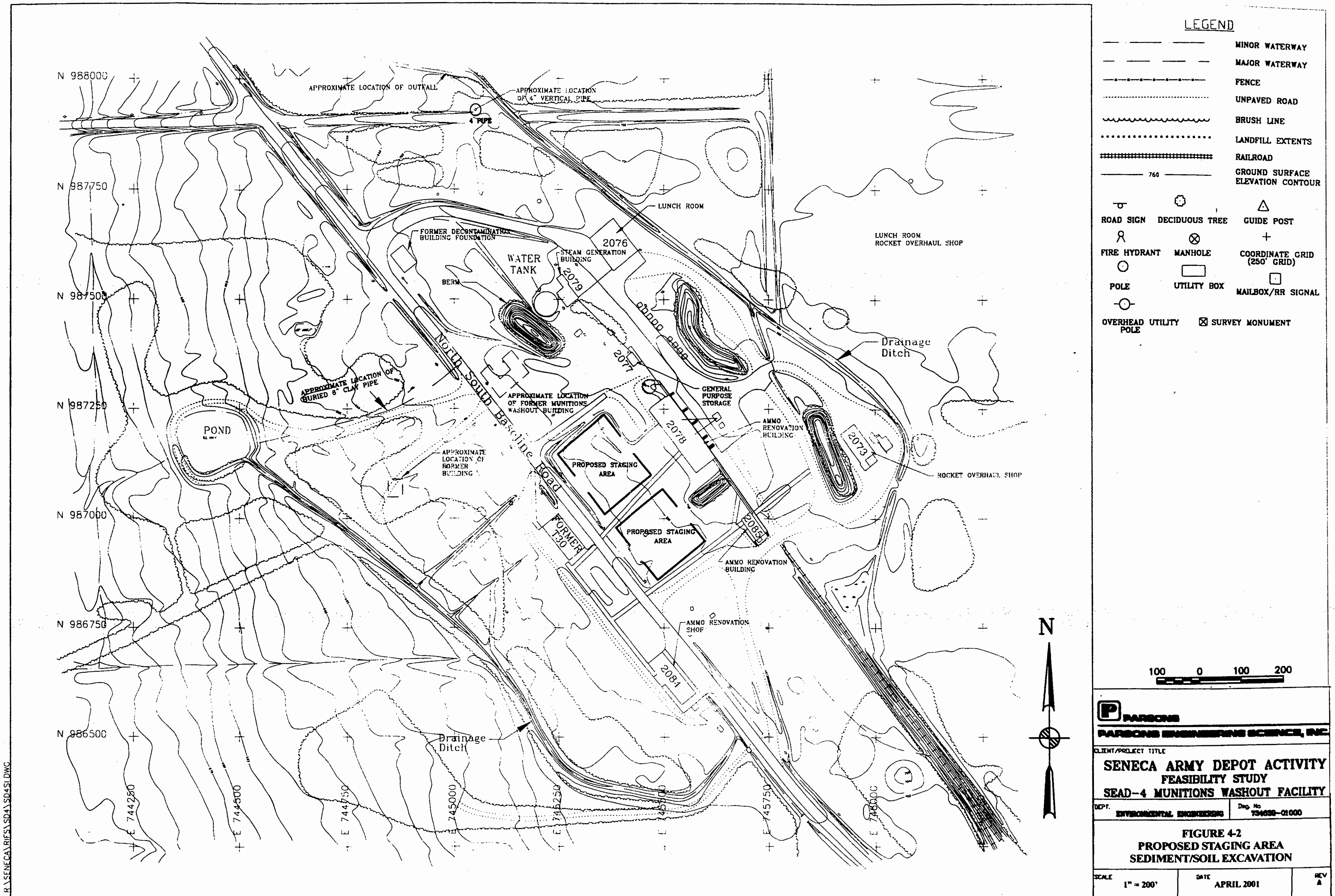
FIGURE 4-1
ALTERNATIVE 2 AND 3
GENERALIZED PROCESS FLOW SCHEMATIC

SCALE 1" = 100'-0" | DATE APRIL 2001 | REV A

R:\SENECA\SIFS\SD16-17\FIGS-1.DWG


LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENTS
RAILROAD
GROUND SURFACE ELEVATION CONTOUR
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SURVEY MONUMENT
N 988000
N 987750
N 987500
N 987250
N 987000
N 986750
N 986500
E 744250
E 744500
E 744750
E 745000
E 745250
E 745500
E 745750
E 746000
APPROXIMATE LOCATION OF OUTFALL
APPROXIMATE LOCATION OF 4" VERTICAL PIPE
4" PIPE
LUNCH ROOM
LUNCH ROOM
ROCKET OVERHAUL SHOP
FORMER DECONTAMINATION BUILDING FOUNDATION
WATER TANK
STEAM GENERATION BUILDING
2076
2079
BERM
2077
Drainage Ditch
North South Baseline Road
APPROXIMATE LOCATION OF BURIED 6" CLAY PIPE
APPROXIMATE LOCATION OF FORMER MUNITIONS WASHOUT BUILDING
GENERAL PURPOSE STORAGE
AMMO RENOVATION BUILDING
2078
2073
POND
APPROXIMATE LOCATION OF FORMER BUILDING
PROPOSED STAGING AREA
ROCKET OVERHAUL SHOP
PROPOSED STAGING AREA
FORMER T30
2085
AMMO RENOVATION BUILDING
AMMO RENOVATION SHOP
2084
Drainage Ditch
N
100 0 100 200
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FEASIBILITY STUDY
SEAD-4 MUNITIONS WASHOUT FACILITY
DEPT. ENVIRONMENTAL ENGINEERING
FIGURE 4-2
PROPOSED STAGING AREA
SEDIMENT/SOIL EXCAVATION
SCALE 1" = 200'
DATE APRIL 2001
REV A
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Appendix A

Analytical Results – Summary Statistics

- Subsurface Soil Summary Statistics
- Surface Soil Summary Statistics
- Hexavalent Chromium Results
- Chromium Screening Results
- Soil in Ditches Summary Statistics
- Groundwater Summary Statistics
- Surface Water Summary Statistics
- Sediment Summary Statistics
- Building Materials/Debris Summary Statistics
- SEDA Background Soil Data
- SEDA Background Groundwater Data
- Soil Results from Pond Area - June 28, 1990
- Groundwater Results MW4-10 PCB Resample – June 9, 2004
- Soil Results from Test Pits – September 22, 2004

Table A-1
Summary Statistics for Subsurface Soil Samples
SEAD-4 Feasibility Study
Seneca Army Depot Activity

	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECT	NUMBER OF ANALYSES
Volatiles							
Acetone	UG/KG	31	9%	200	0	7	76
Chloroform	UG/KG	15	8%	300	0	6	76
Ethyl benzene	UG/KG	1	1%	5500	0	1	76
Methylene chloride	UG/KG	2	3%	100	0	2	76
Toluene	UG/KG	13	28%	1500	0	21	76
Total Xylenes	UG/KG	8	4%	1200	0	3	76
Semivolatile Organics							
2-Methylnaphthalene	UG/KG	260	4%	36400	0	3	76
Acenaphthene	UG/KG	88	3%	50000	0	2	76
Acenaphthylene	UG/KG	170	4%	41000	0	3	76
Anthracene	UG/KG	340	4%	50000	0	3	76
Benzo(a)anthracene	UG/KG	1100	7%	224	2	5	76
Benzo(a)pyrene	UG/KG	880	8%	61	2	6	76
Benzo(b)fluoranthene	UG/KG	730	9%	1100	0	7	76
Benzo(ghi)perylene	UG/KG	270	3%	50000	0	2	76
Benzo(k)fluoranthene	UG/KG	890	5%	1100	0	4	76
Bis(2-Ethylhexyl)phthalate	UG/KG	2000	11%	50000	0	8	76
Butylbenzylphthalate	UG/KG	120	1%	50000	0	1	76
Carbazole	UG/KG	160	1%		0	1	76
Chrysene	UG/KG	1000	11%	400	2	8	76
Di-n-butylphthalate	UG/KG	63	24%	8100	0	18	76
Di-n-octylphthalate	UG/KG	37	21%	50000	0	16	76
Dibenz(a,h)anthracene	UG/KG	48	1%	14	1	1	76
Dibenzofuran	UG/KG	33	1%	6200	0	1	76
Fluoranthene	UG/KG	2400	11%	50000	0	8	76
Fluorene	UG/KG	330	4%	50000	0	3	76
Indeno(1,2,3-cd)pyrene	UG/KG	260	3%	3200	0	2	76
Naphthalene	UG/KG	130	3%	13000	0	2	76
Phenanthrene	UG/KG	1400	8%	50000	0	6	76
Pyrene	UG/KG	1800	9%	50000	0	7	76
Nitroaromatics							
Tetryl	UG/KG	67	1%		0	1	76
Pesticides/PCBs							
4,4'-DDE	UG/KG	21	4%	2100	0	3	76
4,4'-DDT	UG/KG	2.9	1%	2100	0	1	76
Aldrin	UG/KG	8.2	1%	41	0	1	76
Alpha-Chlordane	UG/KG	10	1%		0	1	76
Total PCBs	UG/KG	1600	7%	10000	0	5	76
Beta-BHC	UG/KG	1.4	1%	200	0	1	76
Delta-BHC	UG/KG	5.9	1%	300	0	1	76
Endosulfan I	UG/KG	11	1%	900	0	1	76
Endrin	UG/KG	34	1%	100	0	1	76
Endrin aldehyde	UG/KG	3.7	1%		0	1	76
Herbicides							
Dicamba	UG/KG	23	3%		0	1	39
Metals							
Aluminum	MG/KG	21000	100%	19520 *	3	76	76
Antimony	MG/KG	57.8	28%	6 *	10	21	76
Arsenic	MG/KG	21.5	100%	8.9 *	4	76	76
Barium	MG/KG	133	100%	300	0	76	76

Table A-1
Summary Statistics for Subsurface Soil Samples
SEAD-4 Feasibility Study
Seneca Army Depot Activity

	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECT	NUMBER OF ANALYSES
Beryllium	MG/KG	1	99%	1.13 *	0	75	76
Cadmium	MG/KG	1.5	4%	2.46 *	0	3	76
Calcium	MG/KG	102000	100%	125300 *	0	76	76
Chromium	MG/KG	3820	80%	30 *	17	61	76
Cobalt	MG/KG	29.1	100%	30	0	76	76
Copper	MG/KG	2250	100%	33 *	14	76	76
Iron	MG/KG	40900	100%	37410 *	6	76	76
Lead	MG/KG	251	100%	24.4 *	6	76	76
Magnesium	MG/KG	32000	100%	21700 *	3	76	76
Manganese	MG/KG	2100	78%	1100 *	5	59	76
Mercury	MG/KG	0.12	45%	0.1	1	34	76
Nickel	MG/KG	62.3	100%	50 *	8	76	76
Potassium	MG/KG	2490	100%	2623 *	0	76	76
Selenium	MG/KG	0.86	33%	2	0	25	76
Silver	MG/KG	1.2	8%	0.8 *	4	6	76
Sodium	MG/KG	134	61%	188 *	0	46	76
Vanadium	MG/KG	31	100%	150	0	76	76
Zinc	MG/KG	1010	100%	115 *	12	76	76
Nitrate/Nitrite	MG/KG	2.7	100%			37	37

* The soil criteria for these inorganics are the 95th percentile site background values.

Table A-2
Summary Statistics for Surface Soil Samples
SEAD-4 Feasibility Study
Seneca Army Depot Activity

ANALYTE	UNITS	MAXIMUM	FREQUENCY OF DETCTION	NYSDEC TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES
Volatile Organic Compounds							
1,1-Dichloroethane	UG/KG	2	2.33%	200	0	2	86
1,2-Dichloroethene (total)	UG/KG	4	3.49%		0	3	86
Acetone	UG/KG	140	31.40%	200	0	27	86
Benzene	UG/KG	1	1.16%	60	0	1	86
Methyl butyl ketone	UG/KG	9	1.16%		0	1	86
Methylene chloride	UG/KG	3	1.16%	100	0	1	86
Toluene	UG/KG	14	29.07%	1500	0	25	86
Trichloroethene	UG/KG	3	3.49%	700	0	3	86
Semivolatile Organic Compounds							
2-Methylnaphthalene	UG/KG	35	16.28%	36400	0	14	86
Acenaphthene	UG/KG	78	9.30%	50000	0	8	86
Acenaphthylene	UG/KG	32	9.30%	41000	0	8	86
Anthracene	UG/KG	110	17.44%	50000	0	15	86
Benzo(a)anthracene	UG/KG	560	82.56%	224	5	71	86
Benzo(a)pyrene	UG/KG	450	80.23%	61	11	69	86
Benzo(b)fluoranthene	UG/KG	890	80.23%	1100	0	69	86
Benzo(ghi)perylene	UG/KG	310	54.65%	50000	0	47	86
Benzo(k)fluoranthene	UG/KG	510	50.00%	1100	0	43	86
Bis(2-Ethylhexyl)phthalate	UG/KG	13000	59.30%	50000	0	51	86
Butylbenzylphthalate	UG/KG	12000	11.63%	50000	0	10	86
Carbazole	UG/KG	120	22.09%		0	19	86
Chrysene	UG/KG	570	86.05%	400	4	74	86
Di-n-butylphthalate	UG/KG	220	44.19%	8100	0	38	86
Di-n-octylphthalate	UG/KG	44	8.14%	50000	0	7	86
Dibenz(a,h)anthracene	UG/KG	130	22.09%	14	12	19	86
Dibenzofuran	UG/KG	58	16.28%	6200	0	14	86
Diethyl phthalate	UG/KG	22	16.28%	7100	0	14	86
Fluoranthene	UG/KG	1100	93.02%	50000	0	80	86
Fluorene	UG/KG	74	5.81%	50000	0	5	86
Indeno(1,2,3-cd)pyrene	UG/KG	320	53.49%	3200	0	46	86
N-Nitrosodiphenylamine	UG/KG	19	1.16%		0	1	86
Naphthalene	UG/KG	74	12.79%	13000	0	11	86
Phenanthrene	UG/KG	640	87.21%	50000	0	75	86
Phenol	UG/KG	17	2.33%	30	0	2	86
Pyrene	UG/KG	990	88.37%	50000	0	76	86
Explosives							
1,3,5-Trinitrobenzene	UG/KG	120	1.16%		0	1	86
2,4,6-Trinitrotoluene	UG/KG	72	1.16%		0	1	86
2,4-Dinitrotoluene	UG/KG	330	2.33%		0	2	86
2-amino-4,6-Dinitrotoluene	UG/KG	90	1.16%		0	1	86
4-Nitrotoluene	UG/KG	390	1.27%		0	1	79
Pesticides/PCBs							
4,4'-DDD	UG/KG	190	23.26%	2900	0	20	86
4,4'-DDE	UG/KG	160	31.40%	2100	0	27	86
4,4'-DDT	UG/KG	760	33.72%	2100	0	29	86
Aldrin	UG/KG	2.2	1.16%	41	0	1	86

Table A-2
Summary Statistics for Surface Soil Samples
SEAD-4 Feasibility Study
Seneca Army Depot Activity

ANALYTE	UNITS	MAXIMUM	FREQUENCY OF DETCTION	NYSDEC TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES
Alpha-BHC	UG/KG	2.4	5.81%	110	0	5	86
Alpha-Chlordane	UG/KG	4.9	9.30%		0	8	86
Total PCBs	UG/KG	360	27%	1000	0	23	86
Beta-BHC	UG/KG	7.6	11.63%	200	0	10	86
Dieldrin	UG/KG	7.4	5.81%	44	0	5	86
Endosulfan I	UG/KG	1.7	4.65%	900	0	4	86
Endosulfan II	UG/KG	5.2	3.49%	900	0	3	86
Endosulfan sulfate	UG/KG	3.8	1.16%	1000	0	1	86
Endrin	UG/KG	27	3.49%	100	0	3	86
Endrin aldehyde	UG/KG	20	11.63%		0	10	86
Endrin ketone	UG/KG	4.2	3.49%		0	3	86
Gamma-Chlordane	UG/KG	7.4	9.30%	540	0	8	86
Heptachlor	UG/KG	4.2	3.49%	100	0	3	86
Heptachlor epoxide	UG/KG	3.6	4.65%	20	0	4	86
Metals							
Aluminum	MG/KG	18800	100.00%	19520 *	0	86	86
Antimony	MG/KG	148	39.53%	6 *	15	34	86
Arsenic	MG/KG	14.6	100.00%	8.9 *	4	86	86
Barium	MG/KG	278	100.00%	300	0	86	86
Beryllium	MG/KG	1.8	100.00%	1.13 *	1	86	86
Cadmium	MG/KG	2.3	12.79%	2.46 *	0	11	86
Calcium	MG/KG	196000	100.00%	125300 *	3	86	86
Chromium	MG/KG	18600	100.00%	30 *	37	86	86
Chromium, Hexavalent	MG/KG	14.7	26.67%		0	4	15
Cobalt	MG/KG	19.9	100.00%	30	0	86	86
Copper	MG/KG	7330	100.00%	33 *	30	86	86
Cyanide	MG/KG	0.87	2.33%	0.35	2	2	86
Iron	MG/KG	64600	100.00%	37410 *	2	86	86
Lead	MG/KG	11200	91.86%	24.4 *	36	79	86
Magnesium	MG/KG	35300	100.00%	21700 *	1	86	86
Manganese	MG/KG	1540	100.00%	1100 *	3	86	86
Mercury	MG/KG	1.2	52.33%	0.1	16	45	86
Nickel	MG/KG	228	100.00%	50 *	1	86	86
Potassium	MG/KG	2340	100.00%	2623 *	0	86	86
Selenium	MG/KG	3.4	23.26%	2	1	20	86
Silver	MG/KG	1.7	5.81%	0.8 *	1	5	86
Sodium	MG/KG	1270	33.72%	188 *	2	29	86
Thallium	MG/KG	5.4	22.09%	0.855 *	16	19	86
Vanadium	MG/KG	1250	100.00%	150	1	86	86
Zinc	MG/KG	2020	100.00%	115 *	29	86	86
Nitrate/Nitrite	MG/KG	8.06	100.00%			66	66

* The soil criteria for these inorganics are 95 th percentile site background values.

TABLE A-3
HEXAVALENT CHROMIUM RESULTS

SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY

Sampling Location ID	Sample Number	Concentration of Hexavalent Chromium (mg/Kg)
SS4-3	43201	5.9 U
SS4-4	43181	6 U
SS4-5	43188	12.4 U
SS4-8	43183	11.7 U
SS4-9	43180	14.7
SS4-10	43197	7.4
SS4-12	43190	11
SS4-13	43200	14.9 U
SS4-13 Duplicate	43185	37 U
SS4-18	43186	33 U
SS4-42	43198	29.6 U
SS4-90	43199	10.5
SS4-94	43104	1.12 U
SS4-95	43105	3.24 U
SB4-14/MW4-10	43191	12.2 U
SB4-25	43196	12.1 U
MW4-6	43195	5.8 U
SD4-2	43189	7 U
SD4-6	43187	13.4 U
SD4-42	43194	12.9 U
SD4-43	43184	163
SD4-48	43193	12.4 U

TABLE A-4
CHROMIUM SCREENING RESULTS

SEAD-4 FEASIBILITY STUDY
SENECA ARMY DEPOT ACTIVITY

LOCATION ID	SAMPLE NUMBER	CHROMIUM SCREENING (mg/Kg)	LEVEL IV RESULT (mg/Kg)	AREA	RPD @ (%)
SS4-8	043001	5400	6590	1	19.8
SS4-8 *	043002	5300	NA	1	NA
SS4-9	043003	6600	6590	1	0.2
SS4-10	043004	3600	4480	1	21.8
SS4-11	043005	380	381	1	0.3
SS4-12	043006	1280	2730	1	72.3
SS4-13	043007	4800	10100	1	71.1
SS4-14	043008	18	20.9	1	14.9
SS4-15	043009	17.3	NA	1	NA
SS4-16	043010	15.1	NA	1	NA
SS4-17	043011	18.8	NA	1	NA
SS4-18	043012	1710	2840	1	49.7
SS4-19	043013	21	23.5	1	11.2
SS4-20	043014	17.3	NA	1	NA
SS4-21	043015	16.3	NA	1	NA
SS4-22	043016	14.7	NA	1	NA
SS4-23	043017	13.5	NA	1	NA
SS4-24	043018	14.6	NA	1	NA
SS4-25	043019	14.1	NA	1	NA
SS4-26	043020	15.3	NA	1	NA
SS4-27	043021	14.2	NA	1	NA
SS4-28	043022	15.4	NA	1	NA
SS4-29	043023	78	92.1	1	16.6
SS4-30	043024	24	NA	1	NA
SS4-31	043025	21	NA	1	NA
SS4-32	043026	23	NA	1	NA

Note:

NA = Not Applicable

* This is a duplicate sample.

@ RPD = Relative Percent Difference

TABLE A-4
CHROMIUM SCREENING RESULTS

SEAD-4 FEASIBILITY STUDY
SENECA ARMY DEPOT ACTIVITY

LOCATION ID	SAMPLE NUMBER	CHROMIUM SCREENING (mg/Kg)	LEVEL IV RESULT (mg/Kg)	AREA	RPD @ (%)
SS4-33	043027	14.3	NA	2	NA
SS4-34	043028	27	NA	2	NA
SS4-35	043029	25	31.8	2	23.9
SS4-36	043030	14.7	19	2	25.5
SS4-37	043031	15.9	NA	2	NA
SS4-38	043032	67	77.8	2	14.9
SS4-39	043033	22	NA	2	NA
SS4-40	043034	15.2	NA	2	NA
SS4-41	043035	17.4	NA	2	NA
SS4-42	043036	1320	1620	2	20.4
SS4-44	043039	17.9	NA	2	NA
SS4-45	043040	17.7	NA	2	NA
SS4-46	043041	13.5	18.4	2	30.7
SS4-47	043042	19.4	26.8	2	32.0
SS4-48	043043	11.2	NA	2	NA
SS4-49	043044	12.4	NA	2	NA
SS4-50	043045	14.2	NA	2	NA
SS4-51	043046	13.4	NA	2	NA
SS4-52	043047	10.8	NA	2	NA
SS4-84	043094	24	NA	1	NA
SS4-85	043095	84	129	1	42.3
SS4-86	043096	43	64.8	1	40.4
SS4-87	043097	17.6	NA	1	NA
SS4-88	043098	12.6	NA	1	NA
SS4-89	043099	23	NA	1	NA
SS4-90	043100	2300	1730	2	28.3

Note:

NA = Not Applicable

* This is a duplicate sample.

@ RPD = Relative Percent Difference

TABLE A-4
CHROMIUM SCREENING RESULTS

SEAD-4 FEASIBILITY STUDY
SENECA ARMY DEPOT ACTIVITY

LOCATION ID	SAMPLE NUMBER	CHROMIUM SCREENING (mg/Kg)	LEVEL IV RESULT (mg/Kg)	AREA	RPD @ (%)
SS4-91	043101	16.2	NA	2	NA
SS4-93	043103	44	NA	1	NA
SS4-94	043104	123	96.5	1	24.1
SS4-95	043105	280	460	1	48.6
SS4-96	043106	18.8	NA	1	NA
SS4-97	043107	13.3	NA	1	NA
SS4-98	043108	16.3	NA	1	NA
SS4-99	043147	18.4	NA	1	NA

Note:

NA = Not Applicable

* This is a duplicate sample.

@ RPD = Relative Percent Difference

Table A-5
Summary Statistics for Ditch Soil
SEAD-4 Feasibility Study
Seneca Army Depot Activity

ANALYTE	UNIT	MAX	FREQUENCY	NYSDEC TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES
Volatiles Organics							
Acetone	UG/KG	180	24%	200	0	12	50
Carbon disulfide	UG/KG	18	6%	2700	0	3	50
Chloroform	UG/KG	14	4%	300	0	2	50
Methylene chloride	UG/KG	11	6%	100	0	3	50
Styrene	UG/KG	3	4%		0	2	50
Toluene	UG/KG	42	10%	1500	0	5	50
Total Xylenes	UG/KG	7	4%	1200	0	2	50
Semivolatile Organics							
1,4-Dichlorobenzene	UG/KG	73	2%	8500	0	1	50
2-Methylnaphthalene	UG/KG	31	8%	36400	0	4	50
4-Methylphenol	UG/KG	23	10%	900	0	5	50
Acenaphthene	UG/KG	610	16%	50000	0	8	50
Acenaphthylene	UG/KG	130	16%	41000	0	8	50
Anthracene	UG/KG	1700	44%	50000	0	22	50
Benzo(a)anthracene	UG/KG	5900	88%	224	11	44	50
Benzo(a)pyrene	UG/KG	5100	88%	61	19	44	50
Benzo(b)fluoranthene	UG/KG	4800	92%	1100	3	46	50
Benzo(ghi)perylene	UG/KG	3200	80%	50000	0	40	50
Benzo(k)fluoranthene	UG/KG	5700	40%	1100	2	20	50
Bis(2-Ethylhexyl)phthalate	UG/KG	42000	46%	50000	0	23	50
Butylbenzylphthalate	UG/KG	16	10%	50000	0	5	50
Carbazole	UG/KG	500	36%		0	18	50
Chrysene	UG/KG	6200	94%	400	8	47	50
Di-n-butylphthalate	UG/KG	250	52%	8100	0	26	50
Di-n-octylphthalate	UG/KG	12	4%	50000	0	2	50
Dibenz(a,h)anthracene	UG/KG	1200	52%	14	17	26	50
Dibenzofuran	UG/KG	230	18%	6200	0	9	50
Diethyl phthalate	UG/KG	17	4%	7100	0	2	50
Fluoranthene	UG/KG	16000	96%	50000	0	48	50
Fluorene	UG/KG	660	18%	50000	0	9	50
Hexachlorobenzene	UG/KG	840	4%	410	1	2	50
Indeno(1,2,3-cd)pyrene	UG/KG	3100	76%	3200	0	38	50
N-Nitrosodiphenylamine	UG/KG	760	2%		0	1	50
Naphthalene	UG/KG	13	12%	13000	0	6	50
Phenanthrene	UG/KG	7900	92%	50000	0	46	50
Phenol	UG/KG	210	8%	30	4	4	50
Pyrene	UG/KG	12000	96%	50000	0	48	50
Nitroaromatics							
2-Nitrotoluene	UG/KG	450	2%		0	1	44
2-amino-4,6-Dinitrotoluene	UG/KG	200	2%		0	1	50

Table A-5

Summary Statistics for Ditch Soil
SEAD-4 Feasibility Study
Seneca Army Depot Activity

ANALYTE	UNIT	MAX	FREQUENCY	NYSDEC TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES
Pesticides/PCBs							
4,4'-DDD	UG/KG	90	26%	2900	0	13	50
4,4'-DDE	UG/KG	86	36%	2100	0	18	50
4,4'-DDT	UG/KG	45	32%	2100	0	16	50
Aldrin	UG/KG	2.8	6%	41	0	3	50
Alpha-Chlordane	UG/KG	44	16%		0	8	50
Aroclor-1254	UG/KG	580	48%	10000	0	24	50
Aroclor-1260	UG/KG	250	18%	10000	0	9	50
Beta-BHC	UG/KG	3.3	8%	200	0	4	50
Dieldrin	UG/KG	18	8%	44	0	4	50
Endosulfan I	UG/KG	1.9	2%	900	0	1	50
Endosulfan II	UG/KG	6.8	4%	900	0	2	50
Endosulfan sulfate	UG/KG	12	8%	1000	0	4	50
Endrin aldehyde	UG/KG	15	10%		0	5	50
Endrin ketone	UG/KG	62	6%		0	3	50
Gamma-Chlordane	UG/KG	40	20%	540	0	10	50
Heptachlor	UG/KG	2.4	2%	100	0	1	50
Heptachlor epoxide	UG/KG	10	12%	20	0	6	50
Methoxychlor	UG/KG	68	4%		0	2	50
Metals							
Aluminum	MG/KG	22100	100%	19520	3	50	50
Antimony	MG/KG	82.7	54%	6	14	27	50
Arsenic	MG/KG	37.7	98%	8.9	7	49	50
Barium	MG/KG	488	100%	300	3	50	50
Beryllium	MG/KG	1.1	100%	1.13	0	50	50
Cadmium	MG/KG	34.1	54%	2.46	12	27	50
Calcium	MG/KG	140000	100%	125300	3	50	50
Chromium	MG/KG	4800	100%	30	21	50	50
Cobalt	MG/KG	28.4	100%	30	0	50	50
Copper	MG/KG	988	100%	33	32	50	50
Iron	MG/KG	87900	100%	37410	7	50	50
Lead	MG/KG	374	94%	24.4	40	47	50
Magnesium	MG/KG	27900	100%	21700	1	50	50
Manganese	MG/KG	5480	100%	1100	8	50	50
Mercury	MG/KG	2.4	60%	0.1	21	30	50
Nickel	MG/KG	453	100%	50	10	50	50
Potassium	MG/KG	3460	100%	2623	5	50	50
Selenium	MG/KG	6.1	48%	2	7	24	50
Silver	MG/KG	1.7	50%	0.8	6	25	50
Sodium	MG/KG	1370	68%	188	12	34	50
Vanadium	MG/KG	1140	100%	150	1	50	50
Zinc	MG/KG	1150	100%	115	36	50	50

Note: The soil criteria for the inorganics are the 95th percentile site background values.

Table A-6A
Summary Statistics for Groundwater Samples
Round 1
SEAD-4 Feasibility Study
Seneca Army Depot Activity

ANALYTE	UNIT	MAXIMUM	FREQUENCY OF DETECTION	GW CRITERIA	CRITERIA USED	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES
Volatile Organic Compounds								
Acetone	UG/L	8	7%			0	1	14
Benzene	UG/L	2	7%	1	NYS GA	1	1	14
Ethyl benzene	UG/L	6	7%	5	NYS GA	1	1	14
Toluene	UG/L	0.4	7%	5	NYS GA	0	1	14
Total Xylenes	UG/L	4	7%	5	NYS GA	0	1	14
Semivolatile Organic Compounds								
4-Methylphenol	UG/L	2.2	7%	1	NYS GA	1	1	14
Bis(2-Ethylhexyl)phthalate	UG/L	1.1	7%	5	NYS GA	0	1	14
Di-n-butylphthalate	UG/L	0.15	7%	50	NYS GA	0	1	14
Diethyl phthalate	UG/L	0.072	14%			0	2	14
Naphthalene	UG/L	2.2	7%			0	1	14
Phenol	UG/L	0.4	7%	1	NYS GA	0	1	14
Nitroaromatics								
2-Nitrotoluene	UG/L	0.87	7%	5	NYS GA	0	1	14
3-Nitrotoluene	UG/L	2.6	7%	5	NYS GA	0	1	14
4-Nitrotoluene	UG/L	10	7%	5	NYS GA	1	1	14
Nitrobenzene	UG/L	0.89	7%	0.4	NYS GA	1	1	14
Pesticides/PCBs								
Aldrin	UG/L	0.0036	7%	0	NYS GA	1	1	14
Alpha-BHC	UG/L	0.0028	7%	0.01	NYS GA	0	1	14
Gamma-Chlordane	UG/L	0.0054	7%	0.05	NYS GA	0	1	14
Heptachlor	UG/L	0.0038	7%	0.04	NYS GA	0	1	14
Metals								
Aluminum	UG/L	2430	92%	50	EPA SEC. MCL	11	12	13
Antimony	UG/L	13.8	38%	3	EPA MCL	3	5	13
Barium	UG/L	53.8	100%	1000	NYS GA	0	13	13
Beryllium	UG/L	0.26	15%	4	EPA MCL	0	2	13
Calcium	UG/L	134000	100%			0	13	13
Chromium	UG/L	260	62%	50	NYS GA	1	8	13
Cobalt	UG/L	1.5	8%			0	1	13
Copper	UG/L	4.3	15%	200	NYS GA	0	2	13
Iron	UG/L	2310	85%	300	NYS GA	4	11	13
Magnesium	UG/L	51700	100%			0	13	13
Manganese	UG/L	378	85%	300	NYS GA	1	11	13
Nickel	UG/L	6	62%	100	NYS GA	0	8	13
Potassium	UG/L	4570	100%			0	13	13
Selenium	UG/L	24	46%	10	NYS GA	3	6	13
Silver	UG/L	1.2	23%	50	NYS GA	0	3	13
Sodium	UG/L	82600	100%	20000	NYS GA	3	13	13
Thallium	UG/L	4.9	23%	2	EPA MCL	3	3	13
Vanadium	UG/L	4.3	38%			0	5	13
Zinc	UG/L	82.8	100%			0	13	13
Nitrate/Nitrite	MG/L	0.09		10		0		4

Table A-6B
Summary of Statistics for Groundwater Samples
Round 2
SEAD-4 Feasibility Study
Seneca Army Depot Activity

ANALYTE	UNIT	MAXIMUM	FREQUENCY OF DETECTION	GW CRITERIA	CRITERIA USED	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES
Semivolatile Organic Compounds								
4-Methylphenol	UG/L	0.53	9%	1	NYS GA	0	1	11
Pesticides/PCBs								
Aroclor-1260	UG/L	0.079	9%	0.09	NYS GA	0	1	11
Delta-BHC	UG/L	0.0041	9%	0.04	NYS GA	0	1	11
Heptachlor	UG/L	0.0056	9%	0.04	NYS GA	0	1	11
Metals								
Aluminum	UG/L	3820	92%	50	EPA SEC. MCL	10	11	12
Arsenic	UG/L	6.5	25%	10	EPA MCL	0	3	12
Barium	UG/L	121	100%	1000	NYS GA	0	12	12
Cadmium	UG/L	0.55	8%	5	NYS GA	0	1	12
Calcium	UG/L	128000	100%			0	12	12
Chromium	UG/L	21.8	67%	50	NYS GA	0	8	12
Cobalt	UG/L	3.9	8%			0	1	12
Copper	UG/L	10.2	42%	200	NYS GA	0	5	12
Iron	UG/L	6900	92%	300	NYS GA	7	11	12
Lead	UG/L	1	8%	15	EPA MCL	0	1	12
Magnesium	UG/L	49000	100%			0	12	12
Manganese	UG/L	855	100%	300	NYS GA	2	12	12
Nickel	UG/L	9.9	17%	100	NYS GA	0	2	12
Potassium	UG/L	14400	100%			0	12	12
Selenium	UG/L	3.9	17%	10	NYS GA	0	2	12
Silver	UG/L	2.5	8%	50	NYS GA	0	1	12
Sodium	UG/L	63100	100%	20000	NYS GA	3	12	12
Vanadium	UG/L	11.4	17%			0	2	12
Zinc	UG/L	81.1	67%			0	8	12
Nitrate/Nitrite	MG/L	0.15		10		0		5

Table A-7
Summary Statistics for Surface Water Samples
SEAD-4 Feasibility Study
Seneca Army Depot Activity

		MAXIMUM	FREQUENCY OF DETECTION	NYS CLASS C	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES
Volatile Organic Compounds							
Acetone	UG/L	4	30.77%		0	4	13
Semivolatile Organic Compounds							
Anthracene	UG/L	0.068	7.69%		0	1	13
Benzo(a)anthracene	UG/L	0.18	7.69%		0	1	13
Benzo(a)pyrene	UG/L	0.15	7.69%		0	1	13
Benzo(b)fluoranthene	UG/L	0.15	7.69%		0	1	13
Benzo(ghi)perylene	UG/L	0.073	7.69%		0	1	13
Benzo(k)fluoranthene	UG/L	0.16	7.69%		0	1	13
Bis(2-Ethylhexyl)phth	UG/L	0.22	23.08%	0.6	0	3	13
Butylbenzylphthalate	UG/L	0.076	7.69%		0	1	13
Carbazole	UG/L	0.054	7.69%		0	1	13
Chrysene	UG/L	0.18	7.69%		0	1	13
Fluoranthene	UG/L	0.41	15.38%		0	2	13
Indeno(1,2,3-cd)pyre	UG/L	0.069	7.69%		0	1	13
Phenanthrene	UG/L	0.35	7.69%		0	1	13
Pyrene	UG/L	0.25	15.38%		0	2	13
Explosives							
1,3-Dinitrobenzene	UG/L	0.07	7.69%		0	1	13
Pesticides/PCBs							
Alpha-Chlordane	UG/L	0.0077	7.69%		0	1	13
Beta-BHC	UG/L	0.0041	7.69%		0	1	13
Gamma-Chlordane	UG/L	0.0064	7.69%		0	1	13
Metals							
Aluminum	UG/L	7350	100.00%	100	7	13	13
Antimony	UG/L	6.6	38.46%		0	5	13
Arsenic	UG/L	4.2	7.69%	150	0	1	13
Barium	UG/L	213	100.00%		0	13	13
Cadmium	UG/L	11.6	46.15%	1.862822	1	6	13
Calcium	UG/L	159000	100.00%		0	13	13
Chromium	UG/L	44.8	30.77%	347.2701	0	4	13
Cobalt	UG/L	19.6	7.69%	5	1	1	13
Copper	UG/L	97	76.92%	20.28773	4	10	13
Iron	UG/L	16600	100.00%	300	7	13	13
Lead	UG/L	117	30.77%	7.16381	2	4	13
Magnesium	UG/L	32700	100.00%		0	13	13
Manganese	UG/L	2350	100.00%		0	13	13
Nickel	UG/L	32.6	15.38%	154.4886	0	2	13
Potassium	UG/L	4790	100.00%		0	13	13
Silver	UG/L	1.7	15.38%	0.1	2	2	13
Sodium	UG/L	36200	100.00%		0	13	13
Thallium	UG/L	2.4	7.69%	8	0	1	13
Vanadium	UG/L	22.5	30.77%	14	1	4	13
Zinc	UG/L	492	100.00%	141.3798	1	13	13
Nitrate/Nitrite	MG/L	0.25	100.00%			9	9

Table A-8
Summary Statistics for Sediment Samples in Lagoon
SEAD-4 Feasibility Study
Seneca Army Depot Activity

ANALYTE	UNIT	MAX	FREQUENCY	NYS CRITERIA (1)	SPECIFIC CRITERIA (2)	NUMBER ABOVE CRITERIA	NUMBER OF DETECTS	NUMBER OF ANALYSES
Volatiles								
Acetone	UG/KG	210	67%			0	2	3
Carbon disulfide	UG/KG	12	67%			0	2	3
Methyl ethyl ketone	UG/KG	49	33%			0	1	3
Semivolatile Organics								
4-Methylphenol	UG/KG	140	33%	19.5525	BENTHIC-CHRONIC	1	1	3
Di-n-octylphthalate	UG/KG	46	33%			0	1	3
Fluoranthene	UG/KG	31	33%	39887.1	BENTHIC-CHRONIC	0	1	3
Fluorene	UG/KG	29	33%	312.84	BENTHIC-CHRONIC	0	1	3
N-Nitrosodipropylamine	UG/KG	410	33%			0	1	3
Pyrene	UG/KG	26	33%	37579.905	BENTHIC-CHRONIC	0	1	3
Nitroaromatics								
4-amino-2,6-Dinitrotoluene	UG/KG	140	33%			0	1	3
Pesticides/PCBs								
4,4'-DDE	UG/KG	4.1	33%	0.39105	NYDEC HHB	1	1	3
Aroclor-1254	UG/KG	280	67%	0.031284	NYDEC HHB	2	2	3
Endrin aldehyde	UG/KG	3	33%			0	1	3
Herbicides								
2,4,5-T	UG/KG	21	33%			0	1	3
Metals								
Aluminum	MG/KG	17500	100%			0	3	3
Antimony	MG/KG	50.4	67%	2	NYS LEL	2	2	3
Arsenic	MG/KG	8.1	100%	6	NYS LEL	2	3	3
Barium	MG/KG	102	100%			0	3	3
Beryllium	MG/KG	0.65	100%			0	3	3
Calcium	MG/KG	68100	100%			0	3	3
Chromium	MG/KG	3310	100%	26	NYS LEL	3	3	3
Cobalt	MG/KG	14.1	100%			0	3	3
Copper	MG/KG	2640	100%	16	NYS LEL	3	3	3
Iron	MG/KG	29200	100%	20000	NYS LEL	3	3	3
Lead	MG/KG	18.6	100%	31	NYS LEL	0	3	3
Magnesium	MG/KG	7630	100%			0	3	3
Manganese	MG/KG	569	100%	460	NYS LEL	1	3	3
Mercury	MG/KG	0.16	100%	0.15	NYS LEL	1	3	3
Nickel	MG/KG	33.4	100%	16	NYS LEL	3	3	3
Potassium	MG/KG	2760	100%			0	3	3
Sodium	MG/KG	207	100%			0	3	3
Vanadium	MG/KG	28.2	100%			0	3	3
Zinc	MG/KG	630	100%	120	NYS LEL	3	3	3

Notes:
(1) Criteria calculated using a TOC of 3.91%. This is a site wide TOC value.

(2) NYSDEC HHB = NYS HUMAN HEALTH BIOACCUMULATION CRITERIA
BENTHIC-CHRONIC = NYS BENTHIC AQUATIC LIFE CHRONIC TOXICITY CRITERIA
NYDEC W/H = NYS WILD/HUMAN BIOACCUM CRITERIA
NYS LEL = NYS LOWEST EFFECT LEVEL

Table A-9
Summary Statistics for Building Material Samples
SEAD-4 Feasibility Study
Seneca Army Depot Activity

	UNITS	MAXIMUM	FREQUENCY OF DETECTION	NUMBER OF DETECTS	NUMBER OF ANALYSES
Volatile Organic Compounds					
Acetone	UG/KG	40	100%	6	6
Semivolatile Organic Compounds					
2,4-Dinitrotoluene	UG/KG	360	33%	2	6
2-Methylnaphthalene	UG/KG	1500	33%	2	6
Acenaphthene	UG/KG	1400	67%	4	6
Anthracene	UG/KG	690	83%	5	6
Benzo(a)anthracene	UG/KG	5200	83%	5	6
Benzo(a)pyrene	UG/KG	8500	100%	6	6
Benzo(b)fluoranthene	UG/KG	11000	100%	6	6
Benzo(ghi)perylene	UG/KG	8700	100%	6	6
Benzo(k)fluoranthene	UG/KG	8300	50%	3	6
Bis(2-Ethylhexyl)phthalate	UG/KG	890000	100%	6	6
Butylbenzylphthalate	UG/KG	1600	50%	3	6
Carbazole	UG/KG	5800	67%	4	6
Chrysene	UG/KG	13000	100%	6	6
Di-n-butylphthalate	UG/KG	32000	100%	6	6
Dibenz(a,h)anthracene	UG/KG	3000	67%	4	6
Dibenzofuran	UG/KG	1500	33%	2	6
Diethyl phthalate	UG/KG	130	33%	2	6
Fluoranthene	UG/KG	25000	100%	6	6
Fluorene	UG/KG	760	50%	3	6
Indeno(1,2,3-cd)pyrene	UG/KG	7500	83%	5	6
N-Nitrosodiphenylamine	UG/KG	66	17%	1	6
Naphthalene	UG/KG	1300	50%	3	6
Pentachlorophenol	UG/KG	4900	33%	2	6
Phenanthrene	UG/KG	23000	100%	6	6
Pyrene	UG/KG	25000	100%	6	6
Explosives					
1,3-Dinitrobenzene	UG/KG	180	33%	2	6
2,4,6-Trinitrotoluene	UG/KG	260	17%	1	6
2,4-Dinitrotoluene	UG/KG	1900	50%	3	6
2-amino-4,6-Dinitrotoluene	UG/KG	320	33%	2	6
4-amino-2,6-Dinitrotoluene	UG/KG	300	17%	1	6
RDX	UG/KG	200	17%	1	6
Tetryl	UG/KG	820	17%	1	6
Pesticides/PCBs					
4,4'-DDD	UG/KG	35	67%	4	6
4,4'-DDE	UG/KG	1200	100%	6	6
4,4'-DDT	UG/KG	5600	100%	6	6
Alpha-Chlordane	UG/KG	780	67%	4	6
Aroclor-1254	UG/KG	91000	83%	5	6
Aroclor-1260	UG/KG	3100	67%	4	6
Beta-BHC	UG/KG	31	17%	1	6
Dieldrin	UG/KG	1100	83%	5	6
Endosulfan I	UG/KG	160	33%	2	6
Endosulfan II	UG/KG	30	33%	2	6
Endosulfan sulfate	UG/KG	200	33%	2	6
Endrin	UG/KG	320	50%	3	6
Endrin aldehyde	UG/KG	390	83%	5	6
Endrin ketone	UG/KG	370	50%	3	6
Gamma-Chlordane	UG/KG	95	83%	5	6
Heptachlor	UG/KG	34	17%	1	6
Heptachlor epoxide	UG/KG	360	83%	5	6

Table A-9
Summary Statistics for Building Material Samples
SEAD-4 Feasibility Study
Seneca Army Depot Activity

	UNITS	MAXIMUM	FREQUENCY OF DETECTION	NUMBER OF DETECTS	NUMBER OF ANALYSES
Methoxychlor	UG/KG	390	50%	3	6
Metals					
Aluminum	MG/KG	6110	100%	6	6
Antimony	MG/KG	26.1	100%	6	6
Arsenic	MG/KG	33.6	100%	6	6
Barium	MG/KG	3560	100%	6	6
Beryllium	MG/KG	0.46	33%	2	6
Cadmium	MG/KG	132	83%	5	6
Calcium	MG/KG	253000	100%	6	6
Chromium	MG/KG	1840	100%	6	6
Cobalt	MG/KG	37.1	100%	6	6
Copper	MG/KG	1220	100%	6	6
Cyanide	MG/KG	28.7	67%	4	6
Iron	MG/KG	362000	100%	6	6
Lead	MG/KG	12000	100%	6	6
Magnesium	MG/KG	17600	100%	6	6
Manganese	MG/KG	1630	100%	6	6
Mercury	MG/KG	62.8	100%	6	6
Nickel	MG/KG	1330	100%	6	6
Potassium	MG/KG	3750	100%	6	6
Silver	MG/KG	0.57	100%	6	6
Sodium	MG/KG	1530	100%	6	6
Thallium	MG/KG	7	83%	5	6
Vanadium	MG/KG	948	100%	6	6
Zinc	MG/KG	6100	100%	6	6

TABLE A-10
SOIL BACKGROUND DATA - SUMMARY STATISTICS
SEAD-4 Feasibility Study
Seneca Army Depot Activity

METALS	UNIT	MAXIMUM	FREQUENCY OF DETECTION	TAGM	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES
Aluminum	MG/KG	21000	100%	19520	3	57	57
Antimony	MG/KG	6.8	18%	6	2	10	57
Arsenic	MG/KG	21.5	95%	8.9	2	54	57
Barium	MG/KG	159	100%	300	0	57	57
Beryllium	MG/KG	1.4	100%	1.13	2	57	57
Cadmium	MG/KG	2.9	35%	2.46	2	20	57
Calcium	MG/KG	293000	100%	125300	2	57	57
Chromium	MG/KG	32.7	100%	30	2	57	57
Cobalt	MG/KG	29.1	100%	30	0	57	57
Copper	MG/KG	62.8	100%	33	3	57	57
Cyanide	MG/KG	0	0%	0.35	0	0	51
Iron	MG/KG	38600	100%	37410	2	57	57
Lead	MG/KG	266	95%	24.4	3	54	57
Magnesium	MG/KG	29100	100%	21700	2	54	54
Manganese	MG/KG	2380	95%	1100	2	54	57
Mercury	MG/KG	0.13	72%	0.1	2	41	57
Nickel	MG/KG	62.3	98%	50	2	56	57
Potassium	MG/KG	3160	100%	2623	2	57	57
Selenium	MG/KG	1.7	40%	2	0	23	57
Silver	MG/KG	0.87	4%	0.8	1	2	54
Sodium	MG/KG	269	82%	188	2	47	57
Thallium	MG/KG	1.2	17%	0.855	3	9	54
Vanadium	MG/KG	32.7	100%	150	0	57	57
Zinc	MG/KG	126	95%	115	2	54	57

TABLE A-11
GROUNDWATER BACKGROUND DATA
SEAD-4 Feasibility Study
Seneca Army Depot Activity

PARAMETER	UNIT	MAXIMUM	FREQUENCY OF DETECTION	CRITERIA VALUE	TYPE OF CRITERIA	NUMBER OF EXCEEDENCES	NUMBER OF DETECTS	NUMBER OF ANALYSES
METALS								
Aluminum	UG/L	42400	87%	50	MCL	25	27	31
Antimony	UG/L	52.7	13%	3	GA	3	4	31
Arsenic	UG/L	10	13%	5	MCL	2	4	31
Barium	UG/L	337	94%	1000	GA	0	29	31
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31
Cadmium	UG/L	0	0%	5	GA	0	0	31
Calcium	UG/L	181000	100%			0	31	31
Chromium	UG/L	69.4	48%	50	GA	1	15	31
Cobalt	UG/L	34.6	45%			0	14	31
Copper	UG/L	32.5	48%	200	GA	0	15	31
Cyanide	UG/L	2.8	3%	200	GA	0	1	31
Iron	UG/L	69400	100%	300	GA	22	31	31
Lead	UG/L	34.8	32%	15	MCL	1	10	31
Magnesium	UG/L	58200	100%			0	31	31
Manganese	UG/L	1120	97%	50	SEC	22	30	31
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31
Nickel	UG/L	99.8	61%	100	GA	0	19	31
Potassium	UG/L	10200	94%			0	29	31
Selenium	UG/L	3.6	19%	10	GA	0	6	31
Silver	UG/L	0.98	6%	50	GA	0	2	31
Sodium	UG/L	59400	97%	20000	GA	7	30	31
Thallium	UG/L	4.7	13%	2	MCL	4	4	31
Vanadium	UG/L	70.8	52%			0	16	31
Zinc	UG/L	143	84%	5000	MCL	0	26	31

GA = NYSDEC Ambient Water Quality Standards for a source of Drinking Water from Groundwater (TOGS 1.1.1)
MCL = Maximum Contaminant Level - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)
SEC = Secondary Drinking Water Regulations - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)

TABLE A-4

SOIL ANALYSIS RESULTS FROM POND AREA

JUNE 28, 1990

TABLE A-4
SOIL ANALYSIS RESULTS FROM POND AREA

Sample Number	Units	Explosives		
		2,4,6-TNT	2,4-DNT	2,6-DNT
1	ug/g	U	U	U
2	ug/g	U	U	U
3	ug/g	U	U	U
4	ug/g	U	U	U
5	ug/g	U	U	U
6	ug/g	U	U	U
7	ug/g	U	U	U
8	ug/g	U	U	U
9	ug/g	U	U	U
10	ug/g	U	U	U
11	ug/g	U	U	U
12	ug/g	U	U	U
13	ug/g	U	U	U
14	ug/g	U	U	U
15	ug/g	U	U	U
16	ug/g	U	U	U
17	ug/g	U	U	U
18	ug/g	U	U	U
19	ug/g	U	U	U
20	ug/g	U	U	U
21	ug/g	U	U	U
22	ug/g	U	U	U
23	ug/g	U	U	U
24	ug/g	U	U	U
25	ug/g	U	U	U
26	ug/g	U	U	U
27	ug/g	U	U	U
28	ug/g	U	U	U
29	ug/g	U	U	U
30	ug/g	U	U	U
31	ug/g	U	U	U

TABLE A-4 (CONTINUED)
SOIL ANALYSIS RESULTS FROM POND AREA

Sample Number	Units	Explosives		
		2,4,6-TNT	2,4-DNT	2,6-DNT
32	ug/g	U	U	U
36 (surface)	ug/g	U	U	U
34	ug/g	U	U	U
35	ug/g	U	U	U
36 (surface to 6")	ug/g	U	U	U
37	ug/g	U	U	U
38	ug/g	U	U	U
39	ug/g	U	U	U
40	ug/g	U	U	U
41	ug/g	U	U	U
42	ug/g	U	U	U
43	ug/g	U	U	U
44	ug/g	U	U	U
45	ug/g	U	U	U
46	ug/g	U	U	U
47	ug/g	U	U	U
48	ug/g	U	U	U
49	ug/g	U	U	U
50	ug/g	U	U	U
51	ug/g	U	U	U
52	ug/g	U	U	U
53	ug/g	U	U	U
54	ug/g	U	U	U
55	ug/g	U	U	U
56	ug/g	U	U	U
57	ug/g	U	U	U
58 (surface to 10")	ug/g	U	U	U
58 (surface)	ug/g	U	U	U

TABLE A-4 (CONTINUED)
SOIL ANALYSIS RESULTS FROM POND AREA

Sample Number	Units	Explosives		
		2.4,6-TNT	2,4-DNT	2,6-DNT
60	ug/g	U	U	U
61	ug/g	U	U	U
62	ug/g	U	U	U
63	ug/g	U	U	U
64	ug/g	U	U	U
65	ug/g	U	U	U
66	ug/g	U	U	U
67	ug/g	U	U	U
68	ug/g	U	U	U
69	ug/g	U	U	U
70	ug/g	U	U	U

NOTES:
1. U = analyzed, not detected
2. Samples collected June 28, 1990.

Table A-12
PCB Groundwater Data - June 2004
SEAD-4 Feasibility Study
Seneca Army Depot Activity

							Facility	SEAD-4		SEAD-4	
							Location ID	MW4-10		MW4-10	
							Matrix	GW		GW	
							Sample ID	42043		42044	
							Sample Date	6/9/2004		6/9/2004	
							QC Code	SA		SA	
							Study ID	PCB resamp		PCB resamp	
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Criteria Level**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	Value	(Q)	Value	(Q)
Aroclor-1016	UG/L	0	0%	0.09	0	0	2	1	U	1	U
Aroclor-1221	UG/L	0	0%	0.09	0	0	2	1	U	1	U
Aroclor-1232	UG/L	0	0%	0.09	0	0	2	1	U	1	U
Aroclor-1242	UG/L	0	0%	0.09	0	0	2	1	U	1	U
Aroclor-1248	UG/L	0	0%	0.09	0	0	2	1	U	1	U
Aroclor-1254	UG/L	0	0%	0.09	0	0	2	1	U	1	U
Aroclor-1260	UG/L	0	0%	0.09	0	0	2	1	U	1	U

Notes:
The method detection limit for each analysis was less than 0.060 ug/L and the reporting limit was 1.0 ug/L.
The criteria level of 0.09 ug/L is the GA Standard.
U = Compound was not detected

Table A-13
Test Pit Data - September 2004
SEAD-4 Feasibility Study
Seneca Army Depot Activity

								SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
								TP4-1-04	TP4-1-04	TP4-1-04	TP4-2-04	TP4-2-04	TP4-2-04
								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
								49007	49008	49009	49004	49005	49006
								0	2.3	6	0	2	6.2
								2	2.3	6	2	2.5	6.2
								9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004
								SA	SA	SA	SA	SA	SA
								Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Criteria Level**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
1,1,1-Trichloroethane	UG/KG	0	0%	800	0	0	1						
1,1,2,2-Tetrachloroethane	UG/KG	0	0%	600	0	0	1						
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/KG	0	0%		0	0	1						
1,1,2-Trichloroethane	UG/KG	0	0%		0	0	1						
1,1-Dichloroethane	UG/KG	0	0%	200	0	0	1						
1,1-Dichloroethene	UG/KG	0	0%	400	0	0	1						
1,2,4-Trichlorobenzene	UG/KG	0	0%	3400	0	0	1						
1,2-Dibromo-3-chloropropane	UG/KG	0	0%		0	0	1						
1,2-Dibromoethane	UG/KG	0	0%		0	0	1						
1,2-Dichlorobenzene	UG/KG	0	0%	7900	0	0	1						
1,2-Dichloroethane	UG/KG	0	0%	100	0	0	1						
1,2-Dichloropropane	UG/KG	0	0%		0	0	1						
1,3-Dichlorobenzene	UG/KG	0	0%	1600	0	0	1						
1,4-Dichlorobenzene	UG/KG	0	0%	8500	0	0	1						
Acetone	UG/KG	0	0%	200	0	0	1						
Benzene	UG/KG	0	0%	60	0	0	1						
Bromodichloromethane	UG/KG	0	0%		0	0	1						
Bromoform	UG/KG	0	0%		0	0	1						
Carbon disulfide	UG/KG	0	0%	2700	0	0	1						
Carbon tetrachloride	UG/KG	0	0%	600	0	0	1						
Chlorobenzene	UG/KG	0	0%	1700	0	0	1						
Chlorodibromomethane	UG/KG	0	0%		0	0	1						
Chloroethane	UG/KG	0	0%	1900	0	0	1						
Chloroform	UG/KG	0	0%	300	0	0	1						
Cis-1,2-Dichloroethene	UG/KG	0	0%		0	0	1						
Cis-1,3-Dichloropropene	UG/KG	0	0%		0	0	1						
Cyclohexane	UG/KG	0	0%		0	0	1						
Dichlorodifluoromethane	UG/KG	0	0%		0	0	1						
Ethyl benzene	UG/KG	0	0%	5500	0	0	1						
Isopropylbenzene	UG/KG	0	0%		0	0	1						
Meta/Para Xylene	UG/KG	0	0%		0	0	1						
Methyl Acetate	UG/KG	0	0%		0	0	1						
Methyl Tertbutyl Ether	UG/KG	0	0%		0	0	1						
Methyl bromide	UG/KG	0	0%		0	0	1						
Methyl butyl ketone	UG/KG	0	0%		0	0	1						
Methyl chloride	UG/KG	0	0%		0	0	1						
Methyl cyclohexane	UG/KG	0	0%		0	0	1						
Methyl ethyl ketone	UG/KG	0	0%	300	0	0	1						
Methyl isobutyl ketone	UG/KG	0	0%	1000	0	0	1						
Methylene chloride	UG/KG	0	0%	100	0	0	1						
Ortho Xylene	UG/KG	0	0%		0	0	1						
Styrene	UG/KG	0	0%		0	0	1						
Tetrachloroethene	UG/KG	0	0%	1400	0	0	1						
Toluene	UG/KG	0	0%	1500	0	0	1						
Trans-1,2-Dichloroethene	UG/KG	0	0%	300	0	0	1						
Trans-1,3-Dichloropropene	UG/KG	0	0%		0	0	1						
Trichloroethene	UG/KG	0	0%	700	0	0	1						

Table A-13
Test Pit Data - September 2004
SEAD-4 Feasibility Study
Seneca Army Depot Activity

								SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
								TP4-1-04	TP4-1-04	TP4-1-04	TP4-2-04	TP4-2-04	TP4-2-04
								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
								49007	49008	49009	49004	49005	49006
								0	2.3	6	0	2	6.2
								2	2.3	6	2	2.5	6.2
								9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004
								SA	SA	SA	SA	SA	SA
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Criteria Level**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	Aug 04 TP Value (Q)	Aug 04 TP Value (Q)	Aug 04 TP Value (Q)	Aug 04 TP Value (Q)	Aug 04 TP Value (Q)	Aug 04 TP Value (Q)
Trichlorofluoromethane	UG/KG	0	0%		0	0	1						
Vinyl chloride	UG/KG	0	0%	200	0	0	1						
Semivolatile Organic Compounds													
1,1'-Biphenyl	UG/KG	530	100%		0	1	1						
2,4,5-Trichlorophenol	UG/KG	0	0%	100	0	0	1						
2,4,6-Trichlorophenol	UG/KG	0	0%		0	0	1						
2,4-Dichlorophenol	UG/KG	0	0%	400	0	0	1						
2,4-Dimethylphenol	UG/KG	0	0%		0	0	1						
2,4-Dinitrophenol	UG/KG	0	0%	200	0	0	1						
2,4-Dinitrotoluene	UG/KG	0	0%		0	0	1						
2,6-Dinitrotoluene	UG/KG	0	0%	1000	0	0	1						
2-Chloronaphthalene	UG/KG	0	0%		0	0	1						
2-Chlorophenol	UG/KG	0	0%	800	0	0	1						
2-Methylnaphthalene	UG/KG	5800	100%	36400	0	1	1						
2-Methylphenol	UG/KG	0	0%	100	0	0	1						
2-Nitroaniline	UG/KG	0	0%	430	0	0	1						
2-Nitrophenol	UG/KG	0	0%	330	0	0	1						
3,3'-Dichlorobenzidine	UG/KG	0	0%		0	0	1						
3-Nitroaniline	UG/KG	0	0%	500	0	0	1						
4,6-Dinitro-2-methylphenol	UG/KG	0	0%		0	0	1						
4-Bromophenyl phenyl ether	UG/KG	0	0%		0	0	1						
4-Chloro-3-methylphenol	UG/KG	0	0%	240	0	0	1						
4-Chloroaniline	UG/KG	0	0%	220	0	0	1						
4-Chlorophenyl phenyl ether	UG/KG	0	0%		0	0	1						
4-Methylphenol	UG/KG	0	0%	900	0	0	1						
4-Nitroaniline	UG/KG	0	0%		0	0	1						
4-Nitrophenol	UG/KG	0	0%	100	0	0	1						
Acenaphthene	UG/KG	0	0%	50000	0	0	1						
Acenaphthylene	UG/KG	0	0%	41000	0	0	1						
Acetophenone	UG/KG	0	0%		0	0	1						
Anthracene	UG/KG	160	100%	50000	0	1	1						
Atrazine	UG/KG	0	0%		0	0	1						
Benzaldehyde	UG/KG	0	0%		0	0	1						
Benzo(a)anthracene	UG/KG	940	100%	224	1	1	1						
Benzo(a)pyrene	UG/KG	980	100%	61	1	1	1						
Benzo(b)fluoranthene	UG/KG	2000	100%	1100	1	1	1						
Benzo(ghi)perylene	UG/KG	450	100%	50000	0	1	1						
Benzo(k)fluoranthene	UG/KG	560	100%	1100	0	1	1						
Bis(2-Chloroethoxy)methane	UG/KG	0	0%		0	0	1						
Bis(2-Chloroethyl)ether	UG/KG	0	0%		0	0	1						
Bis(2-Chloroisopropyl)ether	UG/KG	0	0%		0	0	1						
Bis(2-Ethylhexyl)phthalate	UG/KG	0	0%	50000	0	0	1						
Butylbenzylphthalate	UG/KG	0	0%	50000	0	0	1						
Caprolactam	UG/KG	0	0%		0	0	1						
Carbazole	UG/KG	200	100%		0	1	1						
Chrysene	UG/KG	1300	100%	400	1	1	1						
Di-n-butylphthalate	UG/KG	0	0%	8100	0	0	1						

Table A-13
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SEAD-4 Feasibility Study
Seneca Army Depot Activity

Parameter	Units	Maximum Value	Frequency of Detection	Criteria Level	Number of Exceedances	Number of Times Detected	Number of Samples Collected	SEAD-4 TP4-1-04 SOIL 49007 0 2 9/22/2004 SA Aug 04 TP Value (Q)	SEAD-4 TP4-1-04 SOIL 49008 2.3 2.3 9/22/2004 SA Aug 04 TP Value (Q)	SEAD-4 TP4-1-04 SOIL 49009 6 6 9/22/2004 SA Aug 04 TP Value (Q)	SEAD-4 TP4-2-04 SOIL 49004 0 2 9/22/2004 SA Aug 04 TP Value (Q)	SEAD-4 TP4-2-04 SOIL 49005 2 2.5 9/22/2004 SA Aug 04 TP Value (Q)	SEAD-4 TP4-2-04 SOIL 49006 6.2 6.2 9/22/2004 SA Aug 04 TP Value (Q)
Di-n-octylphthalate	UG/KG	0	0%	50000	0	0	1						
Dibenz(a,h)anthracene	UG/KG	87	100%	14	1	1	1						
Dibenzofuran	UG/KG	1100	100%	6200	0	1	1						
Diethyl phthalate	UG/KG	0	0%	7100	0	0	1						
Dimethylphthalate	UG/KG	0	0%	2000	0	0	1						
Fluoranthene	UG/KG	1200	100%	50000	0	1	1						
Fluorene	UG/KG	150	100%	50000	0	1	1						
Hexachlorobenzene	UG/KG	0	0%	410	0	0	1						
Hexachlorobutadiene	UG/KG	0	0%		0	0	1						
Hexachlorocyclopentadiene	UG/KG	0	0%		0	0	1						
Hexachloroethane	UG/KG	0	0%		0	0	1						
Indeno(1,2,3-cd)pyrene	UG/KG	740	100%	3200	0	1	1						
Isophorone	UG/KG	0	0%	4400	0	0	1						
N-Nitrosodiphenylamine	UG/KG	0	0%		0	0	1						
N-Nitrosodipropylamine	UG/KG	0	0%		0	0	1						
Naphthalene	UG/KG	5500	100%	13000	0	1	1						
Nitrobenzene	UG/KG	0	0%	200	0	0	1						
Pentachlorophenol	UG/KG	0	0%	1000	0	0	1						
Phenanthrene	UG/KG	1500	100%	50000	0	1	1						
Phenol	UG/KG	0	0%	30	0	0	1						
Pyrene	UG/KG	940	100%	50000	0	1	1						
Pesticides													
4,4'-DDD	UG/KG	0	0%	2900	0	0	1						
4,4'-DDE	UG/KG	0	0%	2100	0	0	1						
4,4'-DDT	UG/KG	0	0%	2100	0	0	1						
Aldrin	UG/KG	0	0%	41	0	0	1						
Alpha-BHC	UG/KG	0	0%	110	0	0	1						
Beta-BHC	UG/KG	0	0%	200	0	0	1						
Delta-BHC	UG/KG	0	0%	300	0	0	1						
Dieldrin	UG/KG	0	0%	44	0	0	1						
Endosulfan I	UG/KG	0	0%	900	0	0	1						
Endosulfan II	UG/KG	0	0%	900	0	0	1						
Endosulfan sulfate	UG/KG	0	0%	1000	0	0	1						
Endrin	UG/KG	0	0%	100	0	0	1						
Endrin aldehyde	UG/KG	0	0%		0	0	1						
Endrin ketone	UG/KG	0	0%		0	0	1						
Gamma-BHC/Lindane	UG/KG	0	0%	60	0	0	1						
Heptachlor	UG/KG	0	0%	100	0	0	1						
Heptachlor epoxide	UG/KG	0	0%	20	0	0	1						
Methoxychlor	UG/KG	0	0%		0	0	1						
Toxaphene	UG/KG	0	0%		0	0	1						
PCBs													
Aroclor-1016	UG/KG	0	0%		0	0	11	6 U	6.1 U	5.6 U	5.9 U	5.8 U	5.7 U
Aroclor-1221	UG/KG	0	0%		0	0	11	1.5 U	1.5 U	1.4 U	1.5 U	1.4 U	1.4 U
Aroclor-1232	UG/KG	0	0%		0	0	11	9.3 U	9.4 U	8.7 U	9.1 U	8.9 U	8.8 U
Aroclor-1242	UG/KG	0	0%		0	0	11	2.6 U	2.6 U	2.4 U	2.5 U	2.4 U	2.4 U
Aroclor-1248	UG/KG	0	0%		0	0	11	6.4 U	6.5 U	6 U	6.2 U	6.1 U	6 U

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SEAD-4 Feasibility Study
Seneca Army Depot Activity

								SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
								TP4-1-04	TP4-1-04	TP4-1-04	TP4-2-04	TP4-2-04	TP4-2-04
								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
								49007	49008	49009	49004	49005	49006
								0	2.3	6	0	2	6.2
								2	2.3	6	2	2.5	6.2
								9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004
								SA	SA	SA	SA	SA	SA
								Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP
Parameter	**Units**	**Maximum Value**	**Frequency of Detection**	**Criteria Level**	**Number of Exceedances**	**Number of Times Detected**	**Number of Samples Collected**	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Aroclor-1254	UG/KG	0	0%	10000	0	0	11	12 U	12 U	12 U	12 U	12 U	12 U
Aroclor-1260	UG/KG	0	0%	10000	0	0	11	2.3 U	2.4 U	2.2 U	2.3 U	2.2 U	2.2 U
Metals													
Aluminum	MG/KG	8780	100%	19300	0	1	1						
Antimony	MG/KG	1.2	100%	5.9	0	1	1						
Arsenic	MG/KG	3.2	100%	8.2	0	1	1						
Barium	MG/KG	67.1	100%	300	0	1	1						
Beryllium	MG/KG	0.71	100%	1.1	0	1	1						
Cadmium	MG/KG	0	0%	2.3	0	0	1						
Calcium	MG/KG	5190	100%	121000	0	1	1						
Chromium	MG/KG	15.7	100%	29.6	0	1	1						
Cobalt	MG/KG	7.3	100%	30	0	1	1						
Copper	MG/KG	12.4	100%	33	0	1	1						
Iron	MG/KG	15900	100%	36500	0	1	1						
Lead	MG/KG	18.3	100%	24.8	0	1	1						
Magnesium	MG/KG	3410	100%	21500	0	1	1						
Manganese	MG/KG	350	100%	1060	0	1	1						
Mercury	MG/KG	0	0%	0.1	0	0	1						
Nickel	MG/KG	20.7	100%	49	0	1	1						
Potassium	MG/KG	646	100%	2380	0	1	1						
Selenium	MG/KG	0	0%	2	0	0	1						
Silver	MG/KG	0	0%	0.75	0	0	1						
Sodium	MG/KG	0	0%	172	0	0	1						
Thallium	MG/KG	0	0%	0.7	0	0	1						
Vanadium	MG/KG	18.8	100%	150	0	1	1						
Zinc	MG/KG	51.6	100%	110	0	1	1						

Table A-13
Test Pit Data - September 2004
SEAD-4 Feasibility Study
Seneca Army Depot Activity

								SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
								TP4-3-04	TP4-3-04	TP4-3-04	TP4-4-04	TP4-4-04
								SOIL	SOIL	SOIL	SOIL	SOIL
								49001	49002	49003	49010	49011
								0	2.5	5.5	1	1
								0.5	5	6	1	1
								9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004
								SA	SA	SA	SA	SA
			Frequency		Number	Number	Number	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP
		Maximum	of	Criteria	of	of Times	of Samples					
Parameter	**Units**	**Value**	**Detection**	**Level**	**Exceedances**	**Detected**	**Collected**	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
1,1,1-Trichloroethane	UG/KG	0	0%	800	0	0	1				1.3 U	
1,1,2,2-Tetrachloroethane	UG/KG	0	0%	600	0	0	1				1.3 U	
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/KG	0	0%		0	0	1				1.5 UJ	
1,1,2-Trichloroethane	UG/KG	0	0%		0	0	1				1.4 U	
1,1-Dichloroethane	UG/KG	0	0%	200	0	0	1				1.2 U	
1,1-Dichloroethene	UG/KG	0	0%	400	0	0	1				1.4 U	
1,2,4-Trichlorobenzene	UG/KG	0	0%	3400	0	0	1				1.8 U	
1,2-Dibromo-3-chloropropane	UG/KG	0	0%		0	0	1				1.3 U	
1,2-Dibromoethane	UG/KG	0	0%		0	0	1				1.3 U	
1,2-Dichlorobenzene	UG/KG	0	0%	7900	0	0	1				1.1 U	
1,2-Dichloroethane	UG/KG	0	0%	100	0	0	1				1.4 U	
1,2-Dichloropropane	UG/KG	0	0%		0	0	1				0.99 U	
1,3-Dichlorobenzene	UG/KG	0	0%	1600	0	0	1				1.3 U	
1,4-Dichlorobenzene	UG/KG	0	0%	8500	0	0	1				1.1 U	
Acetone	UG/KG	0	0%	200	0	0	1				4.5 U	
Benzene	UG/KG	0	0%	60	0	0	1				1.3 U	
Bromodichloromethane	UG/KG	0	0%		0	0	1				1 U	
Bromoform	UG/KG	0	0%		0	0	1				1.4 U	
Carbon disulfide	UG/KG	0	0%	2700	0	0	1				1.6 U	
Carbon tetrachloride	UG/KG	0	0%	600	0	0	1				2.6 U	
Chlorobenzene	UG/KG	0	0%	1700	0	0	1				1.3 U	
Chlorodibromomethane	UG/KG	0	0%		0	0	1				1.1 U	
Chloroethane	UG/KG	0	0%	1900	0	0	1				1.6 U	
Chloroform	UG/KG	0	0%	300	0	0	1				1.2 U	
Cis-1,2-Dichloroethene	UG/KG	0	0%		0	0	1				1.1 U	
Cis-1,3-Dichloropropene	UG/KG	0	0%		0	0	1				1.1 U	
Cyclohexane	UG/KG	0	0%		0	0	1				1.7 U	
Dichlorodifluoromethane	UG/KG	0	0%		0	0	1				1.1 U	
Ethyl benzene	UG/KG	0	0%	5500	0	0	1				1.3 U	
Isopropylbenzene	UG/KG	0	0%		0	0	1				1.4 U	
Meta/Para Xylene	UG/KG	0	0%		0	0	1				3.5 U	
Methyl Acetate	UG/KG	0	0%		0	0	1				1.4 U	
Methyl Tertbutyl Ether	UG/KG	0	0%		0	0	1				1.2 U	
Methyl bromide	UG/KG	0	0%		0	0	1				1.3 U	
Methyl butyl ketone	UG/KG	0	0%		0	0	1				7.6 U	
Methyl chloride	UG/KG	0	0%		0	0	1				2.2 U	
Methyl cyclohexane	UG/KG	0	0%		0	0	1				1.2 U	
Methyl ethyl ketone	UG/KG	0	0%	300	0	0	1				6.8 U	
Methyl isobutyl ketone	UG/KG	0	0%	1000	0	0	1				5.1 U	
Methylene chloride	UG/KG	0	0%	100	0	0	1				13 U	
Ortho Xylene	UG/KG	0	0%		0	0	1				1.3 U	
Styrene	UG/KG	0	0%		0	0	1				1.8 U	
Tetrachloroethene	UG/KG	0	0%	1400	0	0	1				1.5 UJ	
Toluene	UG/KG	0	0%	1500	0	0	1				1.4 U	
Trans-1,2-Dichloroethene	UG/KG	0	0%	300	0	0	1				1.3 U	
Trans-1,3-Dichloropropene	UG/KG	0	0%		0	0	1				1.3 U	
Trichloroethene	UG/KG	0	0%	700	0	0	1				1.3 U	

								SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
								TP4-3-04	TP4-3-04	TP4-3-04	TP4-4-04	TP4-4-04
								SOIL	SOIL	SOIL	SOIL	SOIL
								49001	49002	49003	49010	49011
								0	2.5	5.5	1	1
								0.5	5	6	1	1
								9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004
								SA	SA	SA	SA	SA
			Frequency		**Number**	**Number**	**Number**	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP
		Maximum	**of**	**Criteria**	**of**	**of Times**	**of Samples**					
Parameter	**Units**	**Value**	**Detection**	**Level**	**Exceedances**	**Detected**	**Collected**	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Trichlorofluoromethane	UG/KG	0	0%		0	0	1				1.6 U	
Vinyl chloride	UG/KG	0	0%	200	0	0	1				1.2 U	
Semivolatile Organic Compounds												
1,1'-Biphenyl	UG/KG	530	100%		0	1	1				530	
2,4,5-Trichlorophenol	UG/KG	0	0%	100	0	0	1				37 U	
2,4,6-Trichlorophenol	UG/KG	0	0%		0	0	1				40 U	
2,4-Dichlorophenol	UG/KG	0	0%	400	0	0	1				63 U	
2,4-Dimethylphenol	UG/KG	0	0%		0	0	1				150 U	
2,4-Dinitrophenol	UG/KG	0	0%	200	0	0	1				140 U	
2,4-Dinitrotoluene	UG/KG	0	0%		0	0	1				34 U	
2,6-Dinitrotoluene	UG/KG	0	0%	1000	0	0	1				16 U	
2-Chloronaphthalene	UG/KG	0	0%		0	0	1				23 U	
2-Chlorophenol	UG/KG	0	0%	800	0	0	1				23 U	
2-Methylnaphthalene	UG/KG	5800	100%	36400	0	1	1				5800 J	
2-Methylphenol	UG/KG	0	0%	100	0	0	1				71 U	
2-Nitroaniline	UG/KG	0	0%	430	0	0	1				16 U	
2-Nitrophenol	UG/KG	0	0%	330	0	0	1				92 U	
3,3'-Dichlorobenzidine	UG/KG	0	0%		0	0	1				190 U	
3-Nitroaniline	UG/KG	0	0%	500	0	0	1				96 U	
4,6-Dinitro-2-methylphenol	UG/KG	0	0%		0	0	1				160 U	
4-Bromophenyl phenyl ether	UG/KG	0	0%		0	0	1				56 U	
4-Chloro-3-methylphenol	UG/KG	0	0%	240	0	0	1				81 U	
4-Chloroaniline	UG/KG	0	0%	220	0	0	1				91 U	
4-Chlorophenyl phenyl ether	UG/KG	0	0%		0	0	1				27 U	
4-Methylphenol	UG/KG	0	0%	900	0	0	1				88 U	
4-Nitroaniline	UG/KG	0	0%		0	0	1				66 U	
4-Nitrophenol	UG/KG	0	0%	100	0	0	1				170 U	
Acenaphthene	UG/KG	0	0%	50000	0	0	1				19 U	
Acenaphthylene	UG/KG	0	0%	41000	0	0	1				18 U	
Acetophenone	UG/KG	0	0%		0	0	1				91 U	
Anthracene	UG/KG	160	100%	50000	0	1	1				160 J	
Atrazine	UG/KG	0	0%		0	0	1				91 U	
Benzaldehyde	UG/KG	0	0%		0	0	1				45 U	
Benzo(a)anthracene	UG/KG	940	100%	224	1	1	1				**940**	
Benzo(a)pyrene	UG/KG	980	100%	61	1	1	1				**980**	
Benzo(b)fluoranthene	UG/KG	2000	100%	1100	1	1	1				**2000** J	
Benzo(ghi)perylene	UG/KG	450	100%	50000	0	1	1				450	
Benzo(k)fluoranthene	UG/KG	560	100%	1100	0	1	1				560	
Bis(2-Chloroethoxy)methane	UG/KG	0	0%		0	0	1				52 U	
Bis(2-Chloroethyl)ether	UG/KG	0	0%		0	0	1				35 U	
Bis(2-Chloroisopropyl)ether	UG/KG	0	0%		0	0	1				47 U	
Bis(2-Ethylhexyl)phthalate	UG/KG	0	0%	50000	0	0	1				20 U	
Butylbenzylphthalate	UG/KG	0	0%	50000	0	0	1				81 U	
Caprolactam	UG/KG	0	0%		0	0	1				91 U	
Carbazole	UG/KG	200	100%		0	1	1				200 J	
Chrysene	UG/KG	1300	100%	400	1	1	1				**1300**	
Di-n-butylphthalate	UG/KG	0	0%	8100	0	0	1				37 U	

Table A-13
Test Pit Data - September 2004
SEAD-4 Feasibility Study
Seneca Army Depot Activity

								SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
								TP4-3-04	TP4-3-04	TP4-3-04	TP4-4-04	TP4-4-04
								SOIL	SOIL	SOIL	SOIL	SOIL
								49001	49002	49003	49010	49011
								0	2.5	5.5	1	1
								0.5	5	6	1	1
								9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004
								SA	SA	SA	SA	SA
			Frequency		**Number**	**Number**	**Number**	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP
		Maximum	**of**	**Criteria**	**of**	**of Times**	**of Samples**					
Parameter	**Units**	**Value**	**Detection**	**Level**	**Exceedances**	**Detected**	**Collected**	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Di-n-octylphthalate	UG/KG	0	0%	50000	0	0	1				80 U	
Dibenz(a,h)anthracene	UG/KG	87	100%	14	1	1	1				87 J	
Dibenzofuran	UG/KG	1100	100%	6200	0	1	1				1100	
Diethyl phthalate	UG/KG	0	0%	7100	0	0	1				35 U	
Dimethylphthalate	UG/KG	0	0%	2000	0	0	1				15 U	
Fluoranthene	UG/KG	1200	100%	50000	0	1	1				1200	
Fluorene	UG/KG	150	100%	50000	0	1	1				150 J	
Hexachlorobenzene	UG/KG	0	0%	410	0	0	1				45 U	
Hexachlorobutadiene	UG/KG	0	0%		0	0	1				91 U	
Hexachlorocyclopentadiene	UG/KG	0	0%		0	0	1				120 UJ	
Hexachloroethane	UG/KG	0	0%		0	0	1				45 U	
Indeno(1,2,3-cd)pyrene	UG/KG	740	100%	3200	0	1	1				740 J	
Isophorone	UG/KG	0	0%	4400	0	0	1				49 U	
N-Nitrosodiphenylamine	UG/KG	0	0%		0	0	1				75 U	
N-Nitrosodipropylamine	UG/KG	0	0%		0	0	1				51 U	
Naphthalene	UG/KG	5500	100%	13000	0	1	1				5500	
Nitrobenzene	UG/KG	0	0%	200	0	0	1				59 U	
Pentachlorophenol	UG/KG	0	0%	1000	0	0	1				91 U	
Phenanthrene	UG/KG	1500	100%	50000	0	1	1				1500 J	
Phenol	UG/KG	0	0%	30	0	0	1				40 U	
Pyrene	UG/KG	940	100%	50000	0	1	1				940	
Pesticides												
4,4'-DDD	UG/KG	0	0%	2900	0	0	1				4.2 U	
4,4'-DDE	UG/KG	0	0%	2100	0	0	1				4.2 U	
4,4'-DDT	UG/KG	0	0%	2100	0	0	1				4.2 U	
Aldrin	UG/KG	0	0%	41	0	0	1				2.1 U	
Alpha-BHC	UG/KG	0	0%	110	0	0	1				2.1 U	
Beta-BHC	UG/KG	0	0%	200	0	0	1				2.1 U	
Delta-BHC	UG/KG	0	0%	300	0	0	1				2.1 U	
Dieldrin	UG/KG	0	0%	44	0	0	1				4.2 UJ	
Endosulfan I	UG/KG	0	0%	900	0	0	1				2.1 U	
Endosulfan II	UG/KG	0	0%	900	0	0	1				4.2 U	
Endosulfan sulfate	UG/KG	0	0%	1000	0	0	1				4.2 U	
Endrin	UG/KG	0	0%	100	0	0	1				4.2 U	
Endrin aldehyde	UG/KG	0	0%		0	0	1				4.2 UJ	
Endrin ketone	UG/KG	0	0%		0	0	1				4.2 U	
Gamma-BHC/Lindane	UG/KG	0	0%	60	0	0	1				2.1 U	
Heptachlor	UG/KG	0	0%	100	0	0	1				2.1 U	
Heptachlor epoxide	UG/KG	0	0%	20	0	0	1				2.1 U	
Methoxychlor	UG/KG	0	0%		0	0	1				21 U	
Toxaphene	UG/KG	0	0%		0	0	1				210 U	
PCBs												
Aroclor-1016	UG/KG	0	0%		0	0	11	6.1 U	6.8 U	5.6 U	6.6 U	6.6 U
Aroclor-1221	UG/KG	0	0%		0	0	11	1.5 U	1.7 U	1.4 U	1.6 U	1.6 U
Aroclor-1232	UG/KG	0	0%		0	0	11	9.4 U	10 U	8.6 U	10 U	10 U
Aroclor-1242	UG/KG	0	0%		0	0	11	2.6 U	2.9 U	2.4 U	2.8 U	2.8 U
Aroclor-1248	UG/KG	0	0%		0	0	11	6.5 U	7.1 U	5.9 U	6.9 U	7 U

Table A-13
Test Pit Data - September 2004
SEAD-4 Feasibility Study
Seneca Army Depot Activity

								SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
								TP4-3-04	TP4-3-04	TP4-3-04	TP4-4-04	TP4-4-04
								SOIL	SOIL	SOIL	SOIL	SOIL
								49001	49002	49003	49010	49011
								0	2.5	5.5	1	1
								0.5	5	6	1	1
								9/22/2004	9/22/2004	9/22/2004	9/22/2004	9/22/2004
								SA	SA	SA	SA	SA
			Frequency		**Number**	**Number**	**Number**	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP	Aug 04 TP
		Maximum	**of**	**Criteria**	**of**	**of Times**	**of Samples**					
Parameter	**Units**	**Value**	**Detection**	**Level**	**Exceedances**	**Detected**	**Collected**	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Aroclor-1254	UG/KG	0	0%	10000	0	0	11	12 U	14 U	11 U	13 U	13 U
Aroclor-1260	UG/KG	0	0%	10000	0	0	11	2.4 U	2.6 U	2.1 U	2.5 U	2.5 U
Metals												
Aluminum	MG/KG	8780	100%	19300	0	1	1				8780 J	
Antimony	MG/KG	1.2	100%	5.9	0	1	1				1.2 J	
Arsenic	MG/KG	3.2	100%	8.2	0	1	1				3.2	
Barium	MG/KG	67.1	100%	300	0	1	1				67.1 J	
Beryllium	MG/KG	0.71	100%	1.1	0	1	1				0.71 J	
Cadmium	MG/KG	0	0%	2.3	0	0	1				0.25 U	
Calcium	MG/KG	5190	100%	121000	0	1	1				5190 J	
Chromium	MG/KG	15.7	100%	29.6	0	1	1				15.7 J	
Cobalt	MG/KG	7.3	100%	30	0	1	1				7.3 J	
Copper	MG/KG	12.4	100%	33	0	1	1				12.4 J	
Iron	MG/KG	15900	100%	36500	0	1	1				15900 J	
Lead	MG/KG	18.3	100%	24.8	0	1	1				18.3 J	
Magnesium	MG/KG	3410	100%	21500	0	1	1				3410 J	
Manganese	MG/KG	350	100%	1060	0	1	1				350 J	
Mercury	MG/KG	0	0%	0.1	0	0	1				0.13 U	
Nickel	MG/KG	20.7	100%	49	0	1	1				20.7 J	
Potassium	MG/KG	646	100%	2380	0	1	1				646 J	
Selenium	MG/KG	0	0%	2	0	0	1				0.66 U	
Silver	MG/KG	0	0%	0.75	0	0	1				0.43 U	
Sodium	MG/KG	0	0%	172	0	0	1				48.5 UJ	
Thallium	MG/KG	0	0%	0.7	0	0	1				1.1 U	
Vanadium	MG/KG	18.8	100%	150	0	1	1				18.8 J	
Zinc	MG/KG	51.6	100%	110	0	1	1				51.6	

Appendix B

Risk Assessment Tables

TABLE B-1
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-4
SEAD- 4 Feasibility Study
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number*	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	RI Table G-2	5E-005	2E-008
	Ingestion of Soil	RI Table G-11	5E-003	5E-008
	Dermal Contact to Soil	RI Table G-13	1E-003	1E-008
	TOTAL RECEPTOR RISK (Nc & Car)		*6E-003*	*8E-008*
FUTURE OUTDOOR PARK WORKER	Inhalation of Dust in Ambient Air	RI Table G-2	3E-004	1E-007
	Ingestion of Soil	RI Table G-11	4E-002	4E-007
	Dermal Contact to Soil	RI Table G-13	9E-003	1E-007
	Ingestion of Ground Water	RI Table G-19	5E-002	8E-007
	Dermal Contact to Surface Water	RI Table G-23	4E-003	9E-006
	Dermal Contact to Sediment	RI Table G-27	3E-003	2E-008
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-001*	*1E-005*
FUTURE INDOOR PARK WORKER	Inhalation of Dust in Indoor Air	RI Table G-5	1E-001	5E-007
	Ingestion of Indoor Dust/Dirt	RI Table G-7	5E+000	9E-005
	Dermal Contact to Indoor Dust/Dirt	RI Table G-9	2E+001	3E-004
	Ingestion of Ground Water	RI Table G-19	5E-002	8E-007
	TOTAL RECEPTOR RISK (Nc & Car)		*2E+001*	*3E-004*
FUTURE RECREATIONAL VISITOR (CHILD)	Inhalation of Dust Ambient Air	RI Table G-2	1E-004	1E-008
	Ingestion of Soil	RI Table G-11	3E-002	6E-008
	Dermal Contact to Soil	RI Table G-13	1E-003	4E-009
	Inhalation of Ground Water	RI Table G-17	6E-004	2E-009
	Ingestion of Ground Water	RI Table G-19	2E-002	6E-008
	Dermal Contact to Ground Water	RI Table G-21	2E-001	6E-007
	Dermal Contact to Surface Water	RI Table G-23	2E-002	6E-006
	Dermal Contact to Sediment	RI Table G-27	1E-002	1E-008
	Ingestion of Sediment	RI Table G-25	6E-002	4E-007
	TOTAL RECEPTOR RISK (Nc & Car)		*4E-001*	*7E-006*
FUTURE CONSTRUCTION WORKER	Inhalation of Dust in Ambient Air	RI Table G-2	6E-003	1E-007
	Ingestion of Soil	RI Table G-11	2E-001	1E-007
	Dermal Contact to Soil	RI Table G-13	1E-002	6E-009
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-001*	*3E-007*

* Tables appear in the SEAD-4 Remedial Investigation Report (RI), Appendix G.

TABLE B-1 (cont.)
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-4
SEAD- 4 Feasibility Study
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number*	ADULT HAZARD INDEX	CHILD HAZARD INDEX	LIFETIME CANCER RISK
FUTURE RESIDENT	Inhalation of Dust in Ambient Air	RI Table G-2	2E-003	3E-003	1E-006
	Ingestion of Soil	RI Table G-11	8E-002	8E-001	3E-006
	Dermal Contact to Soil	RI Table G-13	2E-002	3E-002	4E-007
	Inhalation of Ground Water	RI Table G-17	5E-003	2E-002	2E-007
	Ingestion of Ground Water	RI Table G-19	2E-001	5E-001	5E-006
	Dermal Contact to Ground Water	RI Table G-21	3E+000 **	6E+000 **	6E-005
	Dermal Contact to Surface Water	RI Table G-23	4E-002	5E-002	1E-004 ***
	Ingestion of Sediment	RI Table G-25	4E-002	4E-001	4E-006
	Dermal Contact to Sediment	RI Table G-27	3E-002	3E-002	2E-007
	TOTAL RECEPTOR RISK (Nc & Car)		*3E+000*	*7E+000*	*2E-004*

Notes:
* Tables appear in the SEAD-4 Remedial Investigation Report (RI), Appendix G.
** Risk via this route are driven by Aroclor-1260. The reader is cautioned that these values grossly overestimate the risk due to low frequency of detection and excessive conservatism in the dermal absorption model for highly lipophilic compounds, such as PCBs. See Sections 6.5.2.6 and 6.5.4 for further discussion.
***Risk via this route are driven by PAHs. The reader is cautioned that these values grossly overestimate the risk due to low frequency of detection and excessive conservatism in the dermal absorption model for highly lipophilic compounds, such as PAHs. See Sections 6.5.2.6 and 6.5.4 for further discussion.

TABLE B-2
Summary of Ecological Hazard Quotients > 1 - Surface Soil (0-1' bls)
SEAD 4
Seneca Army Depot, NY

	Herbivorous Mammal (Vole)				Carnivorous Mammal (Shrew)				Grainivorous Bird (Dove)				Carnivorous Bird (Hawk) (1)			
Constituent	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ
Semi-volatiles																
Bis(2-ethylhexyl)phthalate	0.0	0.0	0.0	0.0	3.6	0.2	0.4	0.0	1.4	0.1	1.4	0.1	1.9	0.1	1.9	0.1
Di-n-octylphthalate	0.0	NR	0.0	NR	1.7	NR	1.7	NR	--	--	--	--	--	--	--	--
PCBs/Pesticides																
Total PCBs	0.0	0.0	0.0	0.0	12	1.8	1.2	0.2	0.1	0.0	0.0	0.0	1.8	0.3	0.2	0.0
4,4'-DDT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.3	0.0	0.4	0.0	0.0	0.0
Metals																
Antimony	1.9	0.1	0.2	0.0	499	28	50	2.8	--	--	--	--	--	--	--	--
Chromium (total)	0.0	0.0	0.0	0.0	1.2	0.1	1.2	0.1	287	14	57	2.8	1581	78	316	16
Chromium VI	0.0	0.0	0.0	0.0	0.8	0.4	0.2	0.1	0.2	0.1	0.0	0.0	1.2	0.7	0.2	0.1
Copper	0.4	0.0	0.3	0.0	77	4.9	59	3.7	3.0	0.2	2.3	0.1	12	0.7	8.9	0.6
Lead	1.2	0.0	0.1	0.0	556	9.7	56	1.0	231	4.0	23	0.4	555	10	555	10
Mercury	0.0	0.0	0.0	0.0	0.9	0.1	0.9	0.1	0.6	0.1	0.3	0.0	1.1	0.1	1.1	0.1
Thallium	0.5	0.1	0.1	0.0	40	8.4	3.9	0.8	0.6	0.1	0.6	0.1	1.5	0.3	1.5	0.3
Zinc	0.0	0.0	0.0	0.0	29	3.2	14	1.6	17	1.9	1.8	0.2	151	17	17	1.9

NOAEL - No Observed Adverse Effect Level.
LOAEL - Lowest Observed Adverse Effect Level.
HQ - Hazard quotient, calculated as HQ = exposure rate based on maximum or mean soil concentration / NOAEL or LOAEL value
"--" Incalculable due to lack of toxicity values.
1 - See text for explanation
NR - Not Reported, mean concentration larger than max because of using 1/2 detection limit to calculate
(1) HQs for the hawk were re-calculated using a SFF of 10%. Se Table B-4.

TABLE B-3
Summary of Ecological Hazard Quotients > 1 - Mixed Soil (0-4' bls)
SEAD 4
Seneca Army Depot, NY

Constituent	Herbivorous Mammal (Vole)				Carnivorous Mammal (Shrew)				Grainivorous Bird (Dove)				Carnivorous Bird (Hawk)[(1)]			
	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ
PAHs																
Benzo(a)pyrene	0.0	0.0	0.0	0.0	1.7	0.2	0.2	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Semi-volatiles																
Bis(2-ethylhexyl)phthalate	0.0	0.0	0.0	0.0	3.6	0.1	0.4	0	1.4	0.1	1.4	0.1	1.9	0.1	1.9	0.1
Di-n-octylphthalate	0.0	NR	0.0	NR	1.7	NR	1.7	NR	--	--	--	--	--	--	--	--
PCBs/Pesticides																
Total PCBs	0.1	0.0	0.0	0.0	54	1.5	5.4	0.2	0.5	0.0	0.0	0.0	7.9	0.3	0.8	0.0
4,4'-DDT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.3	0.0	0.4	0.0	0.0	0.0
Metals																
Chromium (total)	0.0	0.0	0.0	0.0	1.2	0.0	1.2	0.0	287	11	57	2.1	1581	58	316	12
Chromium VI	0.0	0.0	0.0	0.0	0.8	0.4	0.2	0.1	0.2	0.1	0.0	0.0	1.2	0.7	0.2	0.1
Copper	0.4	0.0	0.3	0.0	77	3.8	59	2.9	3.0	0.1	2.3	0.1	12	0.6	8.9	0.4
Lead	1.2	0.0	0.1	0.0	556	6.8	56	0.7	231	2.8	23	0.3	555	6.8	555	6.8
Mercury	0.0	0.0	0.0	0.0	0.9	0.1	0.9	0.1	0.6	0.0	0.3	0.0	1.1	0.1	1.1	0.1
Zinc	0.0	0.0	0.0	0.0	29	2.7	14	1.4	17	1.6	1.8	0.2	151	14	17	1.6

NOAEL - No Observed Adverse Effect Level.
LOAEL - Lowest Observed Adverse Effect Level.
HQ - Hazard quotient, calculated as HQ = exposure rate based on maximum or mean soil concentration / NOAEL or LOAEL value
"--" Incalculable to to lack of toxicity values.
1 - See text for explanation
NR - Not Reported, mean concentration larger than max because of using 1/2 detection limit to calculate
(1) HQs for the hawk were re-calculated using a SFF of 10%. Se Table B-4.

TABLE B-4
Summary of Ecological Hazard Quotients > 1 - Ditch Soil
SEAD 4
Seneca Army Depot, NY

Constituent	Herbivorous Mammal (Vole)				Carnivorous Mammal (Shrew)				Grainivorous Bird (Dove)				Carnivorous Bird (Hawk)			
	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ
PAHs																
Benzo(a)pyrene	0.0	0.0	0.0	0.0	**10**	0.8	**1.0**	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Semi-volatiles																
Bis(2-ethylhexyl)phthalate	0.0	0.0	0.0	0.0	**12**	0.3	**1.2**	0.0	**4.7**	0.1	**4.7**	0.1	**6.2**	0.2	**6.2**	0.2
PCBs/Pesticides																
Aroclor-1254	0.0	0.0	0.0	0.0	**20**	**2.6**	**2.0**	0.3	0.2	0.0	0.0	0.0	**2.5**	0.3	0.2	0.0
Aroclor-1260	0.0	0.0	0.0	0.0	**8.4**	**1.6**	0.8	0.2	0.1	0.0	0.0	0.0	**1.1**	0.2	0.1	0.0
Metals																
Antimony	**1.0**	0.1	0.1	0.0	**279**	**26**	**28**	**2.6**	--	--	--	--	--	--	--	--
Chromium (total)	0.0	0.0	0.0	0.0	0.3	0.0	0.3	0.0	**74**	**5.5**	**15**	**1.1**	**408**	**30**	**82**	**6.0**
Chromium VI	0.0	0.0	0.0	0.0	**8.8**	**2.0**	**2.2**	0.5	**2.5**	0.6	0.5	0.1	**13.9**	**3.2**	**2.8**	0.6
Copper	0.1	0.0	0.0	0.0	**10**	**1.2**	**7.9**	0.88	0.4	0.0	0.3	0.0	**1.6**	0.2	**1.2**	0.1
Lead	0.0	0.0	0.0	0.0	**22**	**5.1**	**2.2**	0.5	**9.3**	**2.1**	0.9	0.2	**22**	**5.1**	**22**	**5.1**
Mercury	0.0	0.0	0.0	0.0	**1.8**	0.2	**2.1**	0.2	**1.3**	0.1	0.6	0.1	**2.1**	0.2	**2.1**	0.2
Vanadium	**5.0**	0.2	0.4	0.0	**1338**	**63**	**134**	**6.3**	**1.8**	0.1	**1.8**	0.1	**11**	0.5	**11**	0.5
Zinc	0.0	0.0	0.0	0.0	**16**	**4.0**	**8.2**	**2.0**	**9.4**	**2.3**	**1.0**	0.3	**86**	**21.0**	**9.5**	**2.3**

NOAEL - No Observed Adverse Effect Level.
LOAEL - Lowest Observed Adverse Effect Level.
HQ - Hazard quotient, calculated as HQ = exposure rate based on maximum or mean soil concentration / NOAEL or LOAEL value
"--" Incalculable due to lack of toxicity values.
NR - Not Reported. mean concentration larger than max because of using 1/2 detection limit to calculate

TABLE B-5
Summary of Ecological Hazard Quotients > 1 - Hawk SFF = 10%
SEAD 4
Seneca Army Depot, NY

Constituent	Hawk - Surface Soils				Hawk - Mixed Soils				Hawk - Ditch Soils			
	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ	NOAEL Max HQ	NOAEL Mean HQ	LOAEL Max HQ	LOAEL Mean HQ
PAHs												
Benzo(a)pyrene	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Semi-volatiles												
Bis(2-ethylhexyl)phthalate	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.6	0.0	0.6	0.0
Di-n-octylphthalate	--	--	--	--	--	--	--	--	na	na	na	na
PCBs/Pesticides												
Total PCBs[1]	0.2	0.0	0.0	0.0	0.8	0.0	0.1	0.0	na	na	na	na
Aroclor-1254	na	na	na	na	na	na	na	na	0.2	0.0	0.0	0.0
Aroclor-1260	na	na	na	na	na	na	na	na	0.1	0.0	0.0	0.0
4,4'-DDT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Metals												
Chromium (total)	**158**	**7.8**	**32**	**1.6**	**158**	**5.8**	**32**	**1.2**	**40.8**	**3.0**	**8.2**	**0.6**
Chromium VI	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	**1.4**	0.3	0.3	0.1
Copper	**1.2**	0.1	0.9	0.1	**1.2**	0.1	0.9	0.0	0.2	0.0	0.1	0.0
Lead	**56**	**1.0**	**56**	**1.0**	**56**	**0.7**	**56**	**0.7**	**2.2**	0.5	**2.2**	0.5
Mercury	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.2	0.0	0.2	0.0
Thallium	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	na	na	na	na
Vanadium	**1.2**	0.0	**1.2**	0.0	**1.2**	0.0	**1.2**	0.0	**1.1**	0.1	**1.1**	0.1
Zinc	**15**	**1.7**	**1.7**	0.2	**15**	**1.4**	**1.7**	0.2	**8.6**	**2.1**	**1.0**	0.2

NOAEL - No Observed Adverse Effect Level.
LOAEL - Lowest Observed Adverse Effect Level.
HQ - Hazard quotient, calculated as HQ = exposure rate based on maximum or mean soil concentration / NOAEL or LOAEL value
"--" Incalculable due to lack of toxicity values.
1 - The ecological risk assessment for the surface and mixed soils considered all PCBs together as "total PCBs".
na - not a COPC in this media.

TABLE B-6
Summary of Ecological Hazard Quotients > 1 - Sediment and Surface Water
SEAD 4
Seneca Army Depot, NY

Constituent	Great Blue Heron				Largemouth Bass		Northern Leopard Frog	
	NOAEL Max Hazard Quotient	NOAEL Mean Hazard Quotient	LOAEL Max Hazard Quotient	LOAEL Mean Hazard Quotient	Max Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	Mean Hazard Quotient
Metals								
Aluminum	**4.8**	**2.1**	**4.8**	**2.1**	**6.6**	0.8	**147**	**17**
Cadmium	na	na	na	na	**23**	**3.7**	0.3	0.0
Chromium (total)	**42.5**	**26.0**	**8.5**	**5.2**	na	na	na	na
Cobalt	--	--	--	--	**3.3**	0.5	--	--
Copper	0.8	0.4	0.6	0.3	0.1	0.0	**1.9**	0.5
Iron	--	--	--	--	**11**	**1.3**	--	--
Manganese	0.0	0.0	0.0	0.0	**1.8**	0.2	--	--
Vanadium	0.0	0.0	0.0	0.0	**14**	**2.6**	--	--
Zinc	**6.5**	**1.2**	0.7	0.1	**4.1**	0.5	0.2	0.0

"--" Incalculable to to lack of toxicity values.
na - Not a COPC in this media.

Appendix C

MCACES Cost Estimates

APPENDIX C
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
PRELIMINARY DETAILED COST ESTIMATES FOR ALTERNATIVES 2 AND 3

TABLE OF CONTENTS

APPENDIX C
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
DETAILED COST ESTIMATES FOR ALTERNATIVES 2 AND 3

Introduction

A detailed cost estimate has been developed for the following alternatives:

Alternative 2 - On-site Containment: Institutional Controls/Soil Cover
Alternative 3 - Off-site Disposal: Excavate/Stabilize/Off-site disposal

The cost estimate was developed using the scope of work outlined in Section 4. Volumes of material requiring treatment were based on the figures presented in Section 2. Costs were based on information from the Micro Computer Aided Cost Engineering System (MCACES, a component of the Tri-Service Automated Cost Engineering System, TRACES), Version 1.2 (copyright 1994-1997). Quotes from area suppliers, generic unit costs, vendor information, conventional cost estimating guides and prior experience were 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 materials costs at the time of construction, actual site conditions, competitive market conditions, 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 those associated with engineering, construction management, and other services necessary to carry out a remedial action. O & M and monitoring costs, which include labor, maintenance materials, and purchased services, have also been estimated.

Costs of the following remediation cases have been estimated for each alternative:

- Remediate soils with chromium and lead concentrations exceeding ecological cleanup values;
- Remediate soils with metals and semi-volatile organics concentrations exceeding established background values for metals and NYSDEC TAGM values for semi-volatiles;

- Remediate sediments with chromium exceeding NYSDEC sediment criteria.

Assumptions

The following assumptions were used to develop the cost estimates for Alternatives 2 and 3:

- The contractor(s) will mobilize to the site, clear and grub the areas of work, establish access roads and survey the areas to be remediated. For Alternatives 2 and 3, it was estimated that 20 acres of land will require light clearing and grubbing. Clearing and grubbing is necessary to perform soil capping, soil excavation, sediment excavation, and stockpiling.
- Erosion control (silt fence and haybales) will be installed around drainage swales, excavation areas, and stockpile areas. Erosion control is necessary to prevent soil particles from migrating off-site and into drainage swales during construction. The erosion control will be maintained throughout construction.
- A permanent fence will be installed around the containment area at SEAD-4 for Alternative 2. A temporary fence is required only during construction for Alternative 3.
- The contractor will construct approximately 3,000 linear feet of access roads. The roads will be used to access the excavation and stockpile areas as well as to prepare the stockpile areas.
- A surveyor will be on site for approximately 10 days to layout the excavation areas and survey record information.
- In situ volumes of material are based on the areas and proposed excavation depths presented in Table 2-1 and Figure 2-7 through Figure 2-11. For stockpiling and hauling costs (which are based on cubic yards), an expansion factor of 30 percent was used to estimate ex situ volumes for soil, sediments, and building material. An additional 10% was used to address the uncertainty of the volume estimation. For transportation and disposal costs (based on weight rather than volume), only the 10% contingency factor was used. See Table C-1 for a breakdown of volumes. A conversion factor of 1 cubic yard equals 1.5 tons of moist material was used for estimating purposes. The delineated areas presented in Figure 2-7 through Figure 2-11 are based on the analytical data in the SEAD-4 Remedial Investigation Report (Parson ES, June 2000). The volume of material requiring excavation, or soil covering may vary depending on the results of the cleanup verification sampling.
- Cleanup verification sampling of the soil will be conducted at a frequency of one sample every 2500 square feet (i.e. 50 ft by 50 ft grids). This frequency will be revised based on the actual cleanup verification work plan.
- Cleanup verification sampling of the sediment will be conducted at a frequency of one sample every 100 linear feet. This frequency will be revised based on the actual cleanup verification work plan.

- Building material, excavated sediment and soil will be placed in a stockpile area prior to treatment and/or disposal. The stockpile areas will be lined (and covered) with a 6-mil polyethylene liner. Each pile will consist of 150 cubic yards and will use approximately 5000 square feet of liner. Prior to off-site disposal, one composite sample from each pile will be obtained and submitted for TCLP analysis.
- TCLP testing for off-site disposal will be conducted at a frequency of one sample every 150 cubic yards. This value will be revised during final design after selection of the off-site landfill.
- Transportation and disposal costs are based on quotes from Earthwatch Waste Systems, Inc. and CWM Chemical Services, L.L.C. Based on these quotes, transportation and disposal of RCRA Hazardous Soil (i.e. soil which fails the TCLP test and requires stabilization) will cost $117/ton (includes 6% hazardous waste tax.) In addition, transportation and disposal of non-hazardous soil (i.e. soil which passes the TCLP test and does not require stabilization) can be disposed of in an off-site Subtitle D landfill for $31.50/ton. For cost estimating purposes, it was assumed that 25% of the soil and all of the sediment and building debris will fail the TCLP test and will require stabilization prior to off-site disposal.
- Material and debris from the Buildings 2084, 2085, 2073, 2078, 2076, and 2079 will be removed and the surfaces will be cleaned. The buildings will not be demolished as part of this remediation. It is estimated that approximately 20 cubic yards (cy) of material and debris will require removal. Because of the limited quantity, it is anticipated that the buildings will be cleaned using techniques such as sweeping and steam cleaning. The material and debris will be collected, tested, and disposed of at an off-site landfill. Any water used in the treatment process will be collected and treated, prior to disposal. All the alternatives assume that the building material and debris will require treatment prior to disposal in an off-site landfill. Drums for collection of misc. debris as well as health and safety personal protective equipment and drum disposal are included in the cost.
- Sediment with concentrations of chromium exceeding the respective cleanup levels will be excavated from the lagoon and stockpiled on-site for Alternatives 2 and 3. As presented in Section 2 and on Tables 2-1, sediment will be excavated to a depth of 2 feet, resulting in an estimated in situ volume of 1,573 cubic yards. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of sediment is estimated to be 2,249 cubic yards.
- The sediment will be tested and transported off-site for treatment (as necessary) and disposal.
- Cost estimates were developed for Alternatives 2 and 3 based on the intended future land use of SEAD-4 (conservation land). This criterion is based on remediating soils with chromium and lead concentrations exceeding ecological cleanup values. In addition, costs required to achieve the NYSDEC statutory requirement for restoring the site to pre-disposal conditions were developed. These criteria were based on remediating soil with metals concentrations

greater than site-specific background concentrations and semi-volatile organics concentrations greater than TAGM values. Surface soils will be excavated to a depth of 12 inches and subsurface soils will be excavated to an average depth of 3 feet.

- The total in situ volume of surface soil with chromium and lead concentrations greater than ecological cleanup values (Case 2) and metals concentrations exceeding site-specific background or semi-volatile organics concentrations exceeding the TAGM values (Case 3) is estimated to be 2,712 and 9,650 cubic yards, respectively. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of surface soil is estimated to be 3,878 and 13,799 cubic yards, respectively for the two cases.
- The total in situ volume of subsurface soil with chromium and lead concentrations greater ecological cleanup values (Case 2) and metals concentrations exceeding site-specific background or semi-volatile organics concentrations exceeding the TAGM values (Case 3) is estimated to be 1,083 and 3,243 cubic yards, respectively. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of subsurface soil is estimated to be 1,549 and 4,637 cubic yards, respectively for the two cases.
- Building Material, excavated soil and sediment would be stockpiled and tested for Toxicity Characteristic Leaching Procedure (TCLP) prior to being disposed. Material passing the TCLP criteria will be transported and disposed off-site in a Subtitle D Landfill. Material exceeding the TCLP criteria will be stabilized off-site and then disposed of off-site.
- For Alternative 2, a soil cover consisting of top soil, common fill, and filter fabric will be placed over the soil with chromium and lead concentrations exceeding the ecological cleanup values, and soil with metals concentrations exceeding site-specific background values or semi-volatile organics TAGM values. The areas are estimated to be 73,225 sf, and 260,545 sf, respectively. For Alternative 3, these areas would be backfilled using common fill and topsoil.

Post-Closure Monitoring

- Site groundwater will be monitored on a semi-annual basis. Currently, there are 13 groundwater monitoring wells at SEAD-4. New wells will be installed as necessary to ensure that the monitoring program is sufficient to detect any migration from the area.
- Surface water sampling will be conducted on a semi-annual basis at four locations within the drainage ditches at SEAD-4.

Operation and Maintenance (O & M)

- Alternative 2 requires O & M, such as maintaining the integrity of the soil cover that may become compromised due to erosion, runoff and freeze/thaw conditions. Periodic re-seeding may also be necessary to minimize soil lose due to surface erosion. There are no O&M activities associated with Alternative 3.

Markups and Contingencies

The following markups were used to develop the detail cost estimates for Alternatives 2 and 3.

Contractor Costs (cost to owner)

The contractor costs shown below are the costs to the owner for markup on the direct costs to the prime contractor for implementation of the remedial action. The prime contractors' direct costs include all materials, equipment, and labor for management of all subcontractors and field construction work. The prime contractor is typically contracted directly to the owner (COE NE/NY SEDA).

Contractor costs are calculated as a percentage of the running total of the contractors direct costs as:

- 5% for field office support. Field office support includes items such as supervision at the job, site, temporary facilities, temporary material storage, temporary utilities, operation and maintenance of temporary job-site facilities, preparatory work, health and safety supplies and requirements, transportation vehicles, cleanup, and equipment costs not chargeable to a specific task.
- 15% for home office support. Home office support includes items such as management and office staff salary and expense, main office building furniture and equipment, utilities, general communications and travel, supplies, general business insurance, and taxes. It also includes job specific items such as engineering and shop drawings/surveys, insurance (project coverage), schedules & reports, and quality control.
- 10% for profit. Profit provides the contractor with an incentive to perform the work as efficiently as possible. The profit used in the cost estimates is based on the current average profit for contractors in the Syracuse area.
- 4% for bond. The bond rate is based on recommendations from the USACE Engineering Instructions – Construction Cost Estimates (September 1997) for hazardous, toxic and radioactive waste (HTRW) projects.

TABLE C-1
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
FACTORS USED IN COST ESTIMATES

Medium	Notes	Estimates Used in Cost Analysis	Units	Alternative 2 On-site Containment		ALTERNATIVE 3 Excavation/Off-site Disposal	
				Case 2: Ecological Protection (4)	Case 3: Pre-Disposal Conditions(5)	Case 2: Ecological Protection (4)	Case 3: Pre-Disposal Conditions(5)
Surface Soil	Table 2-1	Area to be Excavated (sq. ft.)/Covered	sq ft	73,225	260,545	73,225	260,545
	Table 2-1	Average Depth (ft.)	ft			1	1
	Table 2-1	Volume (cu. ft.)	cu ft			73,225	260,545
	Table 2-1	Volume (cu. yd.)	cu yd			2,712	9,650
	Estimate used for excavation and stockpiling and sampling	Volume including Expansion and Contingency Factors (cu. yd.) (2)	cu yd			3,878	13,799
		Volume including Contingency Factor (cu. yd.) (1)	cu yd			2,983	10,615
	Estimate used for transportation/disposal cost	Weight (using Contingency Factor only) (tons) (3)	tons			4,475	15,922
	Estimate used for disposal of hazardous material (25% of total weight based on Kevin's comments)	Weight of Hazardous Portion (using Volume including Contingency Factor only) (tons) (3)	tons			1,119	3,981
		Weight of Non-Hazardous Portion (using Volume including Contingency Factor only) (tons) (3)	tons			3,356	11,942
Subsurface Soil	Table 2-1	Area to be Excavated (sq. ft.)	sq ft	NA	NA	14,627	43,778
	Table 2-1	Average Depth (ft.)	ft			2	2
	Table 2-1	Volume (cu. ft.)	cu ft			29,254	87,556
	Table 2-1	Volume (cu. yd.)	cu yd			1,083	3,243
	Estimate used for excavation and stockpiling and sampling	Volume including Expansion and Contingency Factors (cu. yd.) (2)	cu yd			1,549	4,637
		Volume including Contingency Factor (cu. yd.) (1)	cu yd			1,192	3,567
	Estimate used for transportation/disposal cost	Weight (using Volume including Contingency Factor only) (tons) (3)				1,788	5,351
	Estimate used for disposal of hazardous material (25% of total weight based on Kevin's comments)	Weight of Hazardous Portion (using Volume including Contingency Factor only) (tons) (3)	tons			447	1,338
		Weight of Non-Hazardous Portion (using Volume including Contingency Factor only) (tons) (3)	tons			1,341	4,013

TABLE C-1
SENECA ARMY DEPOT ACTIVITY
SEAD-4 FEASIBILITY STUDY
FACTORS USED IN COST ESTIMATES

Medium	Notes	Estimates Used in Cost Analysis	Units	Alternative 2 On-site Containment		ALTERNATIVE 3 Excavation/Off-site Disposal	
				Case 2: Ecological Protection (4)	Case 3: Pre-Disposal Conditions(5)	Case 2: Ecological Protection (4)	Case 3: Pre-Disposal Conditions(5)
Soil in Ditches		Area to be Excavated (sq. ft.)	sq ft	10,736	110,906	10,736	110,906
		Average Depth (ft.)	ft			1	1
		Volume (cu. ft.)	cu ft			10,736	110,906
		Volume (cu. yd.)	cu yd			400	4,108
	Estimate used for excavation and stockpiling and sampling	Volume including Expansion and Contingency Factors (cu. yd.) (2)	cu yd			572	5,874
		Volume including Contingency Factor (cu. yd.) (1)	cu yd			440	4,518
	Estimate used for transportation/disposal cost	Weight (using Contingency Factor only) (tons) (3)	tons			660	6,778
	Estimate used for disposal of hazardous material (25% of total weight based on Kevin's comments)	Weight of Hazardous Portion (using Volume including Contingency Factor only) (tons) (3)	tons			165	1,694
		Weight of Non-Hazardous Portion (using Volume including Contingency Factor only) (tons) (3)	tons			495	5,083
Sediment in Lagoon	Table 2-1	Area to be Excavated (sq. ft.)	sq ft	21,234	21,234	21,234	21,234
	Table 2-1	Average Depth (ft.)	ft	2.0	2.0	2.0	2.0
	Table 2-1	Volume (cu. ft.)	cu ft	42,468	42,468	42,468	42,468
	Table 2-1	Volume (cu. yd.)	cu yd	1,573	1,573	1,573	1,573
	Estimate used for excavation and stockpiling	Volume including Expansion and Contingency Factors (cu. yd.) (2)	cu yd	2,249	2,249	2,249	2,249
	Estimate used for transportation/disposal cost	Volume including Contingency Factor (cu. yd.) (1)	cu yd	1,730	1,730	1,730	1,730
	Estimate used for transportation/disposal cost (all sediment assumed to be hazardous)	Weight (using Volume including Contingency Factor only) (tons) (3)	tons	2,595	2,595	2,595	2,595

NOTES:

1. Contingency factor of 10% used in estimate.
2. Combined Expansion and Contingency factor of 30%*10% used in estimate.
3. Assumed soil density of 1.5 tons/cy. (Peurifoy, Robert. *Construction Planning, Equipment & Methods*. McGraw-Hill Book Company. 1985.)
4. Soil remediated to ecological cleanup values based upon an HQ=1 for chromium and lead.
5. Pre-disposal conditions are metals background levels and semi-volatile TAGMs.
6. Area of pond sediment is 21,234 sf. Ditch soils for pre-disposal is 132,140 sf - 21,234 sf = 110,906 sf.
7. Area of ditches that exceed TAGM criteria is approximately the same as area that exceeds NYSDEC sediment criteria.

SEAD-4
ON-SITE CONTAINMENT
(SOIL > ecological cleanup
values
(Case 2)REV_2

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 01/26/02
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 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 3.

On-site Containment: Institutional Controls/Soil Cover

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Construct permanent fence (institutional controls)
- Remove material/debris from abandoned buildings at SEAD-4
- Excavate sediment in lagoon with concentrations of metals and PCBs > NYSDEC sediment values
- Excavate ditch soils with chromium and lead > eco goals
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport sediment and debris failing TCLP criteria offsite for stabilization and disposal
- Transport and dispose remaining soil and material in an off-site landfill
- Place soil cover (topsoil, common fill & geogrid) over soil areas and hydroseed
- Demobilize
- Long-term O & M and monitoring

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:

1. The area requiring the soil cover could vary based on the results of the cleanup verification sampling.

2. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

3. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

4. The duration and effort to remediate SEAD-4 could vary depending on actual condition of building.

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

Owner's cost are calculated as a percentage of running total as
- 2 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

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 Mobilization	1.00 EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing								
33.02.06. Sediment								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00 EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00 EA	0	0	0	0	4,600	4,600	230.00
AFH AA For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	20.00 EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy:)	20.00 EA	0	0	0	0	2,400	2,400	120.00
33.02.08. Soil in Ditches								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	9.00 EA	0	0	0	0	1,080	1,080	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	9.00 EA	0	0	0	0	2,070	2,070	230.00
AFH AA For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	9.00 EA	0	0	0	0	1,080	1,080	120.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy:)	9.00 EA	0	0	0	0	1,080	1,080	120.00
33.02.10. Confirmatory								
AFH AA Confirmatory: NYSDEC CLP-Pest/PCBs , soil (Severn Trent Lab, 9/99) (Assume 1 sample every 100 lf + 20% QC	84.00 EA	0	0	0	0	14,700	14,700	175.00

33.02. Sampling, & Testing	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF plus 20% for QC)	84.00 EA	0	0	0	0	13,020	13,020	155.00
33.03. Site Work								
33.03.02. Clearing, Grubbing, and Fence								
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00 LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	20.00 ACR	320	8,653	12,578	0	0	21,231	1061.54
MIL AA Corner Posts: Fence, CL, set i n conc, 6' H, indl, corner post, galv stl, 4"	12.00 EA	6	164	26	884	0	1,074	89.48
MIL AA Swing Gates: Fence, CL, double , 24' W, indl, gates, swing, 6' high	4.00 EA	0	0	0	1,742	0	1,742	435.38
MIL AA Barbed Wire: Fence, CL, indl, barbed wire, galv, cost per strand	2600.00 LF	27	702	130	195	0	1,027	0.39
MIL AA Chain Link Fence: Fence, CL, 6 ' H, galv, line post, 9g mesh, 1-5/8" top rail,	2600.00 LF	547	14,690	2,314	19,613	0	36,617	14.08
33.03.06. Roadways								
USR AA Grade 20ft wide roadway	3000.00 LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00 LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.08. Survey Remediation Area								
USR AA Survey remediation area	10.00 DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.11. Erosion control								
B MIL AA Silt Fence: Installation and materials high, polypropylene	5200.00 LF	1,092	26,000	2,600	8,346	0	36,946	7.11
B HTW AA Hay bales - stalked	5200.00 LF	2	884	0	5,564	0	6,448	1.24
B MIL AA Maintain silt fence and remove	5200.00 LF	35	884	0	5,564	0	6,448	1.24
33.07. Building Remediation								
MIL AA Clean up hazardous material within building: Cleanup, floor area, final	47.00 CSF	8	190	15	13	0	218	4.63

33.07. Building Remediation		QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
HTW	HW packaging, overpacks, 18"dia x 34"H, 16ga stl drum, 55gal, DOT 17C	80.00	EA	0	0	0	6,330	0	6,330	79.13
USR AA	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	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).)	80.00	DR	0	0	0	0	10,700	10,700	133.75
USR AA	Extra fees for overpack use	80.00	EA	0	0	0	0	3,200	3,200	40.00
HTW AA	Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99)	20.00	TON	0	0	0	0	2,340	2,340	117.00
USR AA	Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
	33.09. Sediment Remediation									
	33.09.04. Sitework									
L MIL AA	Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	2249.00	CY	0	0	0	0	44,980	44,980	20.00
USR AA	Plastic sheeting for ground an d cover: 6mil polyethylene liner	75000	SF	0	0	0	6,420	0	6,420	0.09
MIL AA	Loam or topsoil, furnish & place, imported, 6" deep	2076.00	CY	183	5,543	2,886	40,495	0	48,923	23.57
	33.09.09. Disposal									
HTW AA	Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99) Assuming all sediment is hazardous.	2595.00	TON	0	0	0	0	303,615	303,615	117.00

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10. 5. Cover									
RSM AA Filter fabric (includes materia l and installation): Drainage, fabric, ideal conditions, laid in trench, polypropylene	8950.00	SY	60	1,522	0	11,971	0	13,492	1.51
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	2112.00	TON	0	0	0	9,830	0	9,830	4.65
AF AA Fill, spread borrow w/dozer	1790.00	CY	21	644	1,164	0	0	1,808	1.01
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	1790.00	CY	158	4,779	2,488	34,916	0	42,183	23.57
AF AA Compaction, steel wheel tandem roller, 5 ton	1790.00	CY	13	376	322	0	0	698	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	73.00	MSF	73	1,845	0	3,249	0	5,095	69.79
33.18. Soil in Ditch Remediation									
33.18.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	572.00	CY	0	0	0	0	11,440	11,440	20.00
USR AA Plastic sheeting for ground an d cover: 6mil polyethylene liner	35000	SF	0	0	0	2,996	0	2,996	0.09
USR AA Common fill (6") - Material for Backfill, includes cost material (bank sand) and delivery (DeWitt 1999)	551.00	TON	0	0	0	2,565	0	2,565	4.65
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	467.00	CY	41	1,247	649	9,109	0	11,005	23.57
AF AA Fill, spread borrow w/dozer	467.00	CY	6	168	304	0	0	472	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	467.00	CY	3	98	84	0	0	182	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	19.00	MSF	19	480	0	846	0	1,326	69.79
33.18.09. Disposal									
HTW AA Transport and Dispose nonhaz waste, bulk	495.00	TON	0	0	0	0	15,593	15,593	31.50
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99) Assuming all sediment is hazardous.	165.00	TON	0	0	0	0	19,305	19,305	117.00

33.26. Demobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
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
33.28. Remedial Design									
B HTW AA Remedial Design Workplan	1.00	EA	0	27,600	0	2,568	0	30,168	30168.00
B HTW AA Preliminary Design Report	1.00	EA	0	46,000	0	4,280	0	50,280	50280.00
B HTW AA 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 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 Project Closeout Plan	1.00	EA	0	48,000	0	2,140	0	50,140	50140.00
33.31. Well Installation									
B CIV AB Mob/Demob facility	1.00	EA	0	0	0	0	600	600	600.00
L AFH Decon Pad	1.00	EA	0	0	0	0	150	150	150.00
B HTW Installation of Monitoring well threaded	6.00	EA	0	0	0	0	3,480	3,480	580.00
L HTW Monitor well, drilling, HS auger, 4.25" ID x 8" OD	60.00	LF	0	0	0	0	1,080	1,080	18.00
TOTAL SEAD-4			2,665	428,272	44,388	213,345	462,858	1,148,863	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
TOTAL Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
33.02 Sampling, & Testing									
33.02.06 Sediment	1.00 EA	16,300	330	500	4,280	750	1,770	23,930	23928.02
33.02.08 Soil in Ditches	1.00 EA	7,340	150	220	1,930	340	800	10,770	10767.61
33.02.10 Confirmatory	1.00 EA	38,290	770	1,170	10,060	1,760	4,160	56,210	56210.56
TOTAL Sampling, & Testi	1.00 EA	61,930	1,240	1,890	16,270	2,850	6,730	90,910	90906.18
33.03 Site Work									
33.03.02 Clearing, Grubbin	3.00 ACR	87,010	1,740	2,660	22,850	4,000	9,460	127,730	42576.92
33.03.06 Roadways	1.00 ACR	37,330	750	1,140	9,800	1,720	4,060	54,800	54799.21
33.03.08 Survey Remediatio	1.00 ACR	27,870	560	850	7,320	1,280	3,030	40,910	40910.82
33.03.11 Erosion control	1.00 LF	68,850	1,380	2,110	18,080	3,160	7,490	101,070	101069.51
TOTAL Site Work	1.00 EA	221,060	4,420	6,760	58,060	10,160	24,040	324,510	324510.30
33.07 Building Remediation	1.00 EA	31,200	620	950	8,190	1,430	3,390	45,800	45799.21
33.09 Sediment Remediation									
33.09.04 Sitework	1.00 EA	138,580	2,770	4,240	36,400	6,370	15,070	203,440	203435.23
33.09.09 Disposal	1.00 EA	419,410	8,390	12,830	110,160	19,280	45,610	615,670	615669.87
TOTAL Sediment Remediat	1.00 EA	557,990	11,160	17,070	146,560	25,650	60,670	819,110	819105.10
33.10 Soil Remediation									
33.10. 5 Cover	1.00 EA	100,990	2,020	3,090	26,520	4,640	10,980	148,250	148245.34
TOTAL Soil Remediation	1.00 EA	100,990	2,020	3,090	26,520	4,640	10,980	148,250	148245.34
33.18 Soil in Ditch Remedi									
33.18.04 Sitework	1.00 EA	41,420	830	1,270	10,880	1,900	4,500	60,810	60805.24
33.18.09 Disposal	1.00 EA	48,210	960	1,480	12,660	2,220	5,240	70,770	70765.08
TOTAL Soil in Ditch Rem	1.00 EA	89,630	1,790	2,740	23,540	4,120	9,750	131,570	131570.32

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33.26 Demobilization									
33.26.04 Decontaminate Equ	1.00 EA	12,190	240	370	3,200	560	1,330	17,890	17887.61
33.26.06 Demobilization	1.00 EA	4,870	100	150	1,280	220	530	7,160	7155.04
TOTAL Demobilization	1.00 EA	17,060	340	520	4,480	780	1,860	25,040	25042.66
33.28 Remedial Design	1.00 EA	492,120	0	14,760	0	17,740	41,970	566,600	566595.37
33.31 Well Installation	1.00 EA	5,420	0	0	0	0	0	5,420	5416.96
TOTAL Remedial Action	1.00 EA	1,582,680	21,700	47,970	285,010	67,620	159,970	2,164,950	2164953.28

SEAD-4
ON-SITE CONTAINMENT
(SOIL > Metals background and
semi-volatile TAGMs)
(Case 3) REV_1

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 06/05/01
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 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 3.

On-site Containment: Institutional Controls/Soil Cover

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Construct permanent fence (institutional controls)
- Remove material/debris from abandoned buildings at SEAD-4
- Excavate sediment with PCBs and metals > NYSDEC sediment values
- Excavate soil in ditches with chromium and lead > eco goals
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport sediment and debris failing TCLP criteria to stabilization area (off-site)
- Stabilize sediment and debris exceeding TCLP criteria (off-site)
- Transport and dispose sediment and debris in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Place soil cover (topsoil, common fill & geogrid) over soil and hydroseed
- Demobilize
- Long-term O & M and monitoring

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:

1. The area requiring the soil cover could vary based on the results of the cleanup verification sampling.

2. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

3. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

4. The duration and effort to remediate SEAD-4 could vary depending on actual condition of building.

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

Owner's cost are calculated as a percentage of running total as
- 2 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

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 Mobilization	1.00 EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing								
33.02.06. Sediment								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00 EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00 EA	0	0	0	0	4,600	4,600	230.00
AFH AA For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	20.00 EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00 EA	0	0	0	0	2,400	2,400	120.00
33.02.08. Soil in Ditches								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	47.00 EA	0	0	0	0	5,640	5,640	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	47.00 EA	0	0	0	0	10,810	10,810	230.00
AFH AA For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	47.00 EA	0	0	0	0	5,640	5,640	120.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy:)	47.00 EA	0	0	0	0	5,640	5,640	120.00
33.02.10. Confirmatory								
AFH AA Confirmatory: NYSDEC CLP-Pest/PCBs , soil (Severn Trent Lab, 9/99) (Assume 1 sample every 100 lf + 20% QC	84.00 EA	0	0	0	0	14,700	14,700	175.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF plus 20% for QC)	84.00	EA	0	0	0	0	13,020	13,020	155.00
33.03. Site Work									
33.03.02. Clearing, Grubbing, and Fence									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	20.00	ACR	320	8,653	12,578	0	0	21,231	1061.54
MIL AA Corner Posts: Fence, CL, set i n conc, 6' H, indl, corner post, galv stl, 4"	12.00	EA	6	164	26	884	0	1,074	89.48
MIL AA Swing Gates: Fence, CL, double , 24' W, indl, gates, swing, 6' high	4.00	EA	0	0	0	1,742	0	1,742	435.38
MIL AA Barbed Wire: Fence, CL, indl, barbed wire, galv, cost per strand	2600.00	LF	27	702	130	195	0	1,027	0.39
MIL AA Chain Link Fence: Fence, CL, 6 ' H, galv, line post, 9g mesh, 1-5/8" top rail,	2600.00	LF	547	14,690	2,314	19,613	0	36,617	14.08
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.08. Survey Remediation Area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	5200.00	LF	1,092	26,000	2,600	8,346	0	36,946	7.11
B HTW AA Hay bales - stalked	5200.00	LF	2	884	0	5,564	0	6,448	1.24
B MIL AA Maintain silt fence and remove	5200.00	LF	35	884	0	5,564	0	6,448	1.24
33.07. Building Remediation									
MIL AA Clean up hazardous material within building: Cleanup, floor area, final	47.00	CSF	8	190	15	13	0	218	4.63

33.07. Building Remediation		QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
HTW	HW packaging, overpacks, 18"dia x 34"H, 16ga stl drum, 55gal, DOT 17C	80.00	EA	0	0	0	6,330	0	6,330	79.13
USR AA	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	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).)	80.00	DR	0	0	0	0	10,700	10,700	133.75
USR AA	Extra fees for overpack use	80.00	EA	0	0	0	0	3,200	3,200	40.00
HTW AA	Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99)	20.00	TON	0	0	0	0	2,340	2,340	117.00
USR AA	Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
	33.09. Sediment Remediation									
	33.09.04. Sitework									
L MIL AA	Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	2249.00	CY	0	0	0	0	44,980	44,980	20.00
USR AA	Plastic sheeting for ground an d cover: 6mil polyethylene liner	75000	SF	0	0	0	6,420	0	6,420	0.09
MIL AA	Loam or topsoil, furnish & place, imported, 6" deep	2076.00	CY	183	5,543	2,886	40,495	0	48,923	23.57
	33.09.09. Disposal									
HTW AA	Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99) Assuming all sediment is hazardous material	2595.00	TON	0	0	0	0	303,615	303,615	117.00

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10. 5. Cover									
RSM AA Filter fabric (includes materia l and installation): Drainage, fabric, ideal conditions, laid in trench, polypropylene	31845	SY	213	5,414	0	42,593	0	48,006	1.51
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	7517.00	TON	0	0	0	34,988	0	34,988	4.65
AF AA Fill, spread borrow w/dozer	6370.00	CY	76	2,293	4,141	0	0	6,434	1.01
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	6370.00	CY	562	17,008	8,854	124,254	0	150,116	23.57
AF AA Compaction, steel wheel tandem roller, 5 ton	6370.00	CY	45	1,338	1,147	0	0	2,484	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	260.50	MSF	261	6,585	0	11,595	0	18,181	69.79
33.18. Soil in Ditch Remediation									
33.18.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	5874.00	CY	0	0	0	0	117,480	117,480	20.00
USR AA Plastic sheeting for ground an d cover: 6mil polyethylene liner	195000	SF	0	0	0	16,692	0	16,692	0.09
USR AA Common fill (6") - Material for Backfill, includes cost material (bank sand) and delivery (DeWitt 1999)	3200.00	TON	0	0	0	14,894	0	14,894	4.65
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2711.00	CY	239	7,238	3,768	52,881	0	63,888	23.57
AF AA Fill, spread borrow w/dozer	2711.00	CY	33	976	1,762	0	0	2,738	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	2711.00	CY	19	569	488	0	0	1,057	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	110.00	MSF	110	2,781	0	4,896	0	7,677	69.79
33.18.09. Disposal									
HTW AA Transport and Dispose nonhaz waste, bulk	5083.00	TON	0	0	0	0	160,115	160,115	31.50
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99) Assuming all sediment is hazardous.	1694.00	TON	0	0	0	0	198,198	198,198	117.00

33.26. Demobilization	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
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
33.28. Remedial Design									
B HTW AA Remedial Design Workplan	1.00	EA	0	27,600	0	2,568	0	30,168	30168.00
B HTW AA Preliminary Design Report	1.00	EA	0	46,000	0	4,280	0	50,280	50280.00
B HTW AA 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 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 Project Closeout Plan	1.00	EA	0	48,000	0	2,140	0	50,140	50140.00
33.31. Well Installation									
B CIV AB Mob/Demob facility	1.00	EA	0	0	0	0	600	600	600.00
L AFH Decon Pad	1.00	EA	0	0	0	0	150	150	150.00
B HTW Installation of Monitoring well threaded	6.00	EA	0	0	0	0	3,480	3,480	580.00
L HTW Monitor well, drilling, HS auger, 4.25" ID x 8" OD	60.00	LF	0	0	0	0	1,080	1,080	18.00
TOTAL SEAD-4			3,830	461,314	59,538	440,656	914,733	1,876,241	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
TOTAL Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
33.02 Sampling, & Testing									
33.02.06 Sediment	1.00 EA	16,300	330	500	4,280	750	1,770	23,930	23928.02
33.02.08 Soil in Ditches	1.00 EA	38,310	0	1,150	0	1,380	3,270	44,100	44102.62
33.02.10 Confirmatory	1.00 EA	38,290	0	1,150	0	1,380	3,270	44,090	44086.71
TOTAL Sampling, & Testi	1.00 EA	92,900	330	2,800	4,280	3,510	8,300	112,120	112117.35
33.03 Site Work									
33.03.02 Clearing, Grubbin	3.00 ACR	87,010	1,740	2,660	22,850	4,000	9,460	127,730	42576.92
33.03.06 Roadways	1.00 ACR	37,330	750	1,140	9,800	1,720	4,060	54,800	54799.21
33.03.08 Survey Remediatio	1.00 ACR	27,870	560	850	7,320	1,280	3,030	40,910	40910.82
33.03.11 Erosion control	1.00 LF	68,850	1,380	2,110	18,080	3,160	7,490	101,070	101069.51
TOTAL Site Work	1.00 EA	221,060	4,420	6,760	58,060	10,160	24,040	324,510	324510.30
33.07 Building Remediation	1.00 EA	31,200	620	950	8,190	1,430	3,390	45,800	45799.21
33.09 Sediment Remediation									
33.09.04 Sitework	1.00 EA	138,580	2,770	4,240	36,400	6,370	15,070	203,440	203435.23
33.09.09 Disposal	1.00 EA	419,410	8,390	12,830	110,160	19,280	45,610	615,670	615669.87
TOTAL Sediment Remediat	1.00 EA	557,990	11,160	17,070	146,560	25,650	60,670	819,110	819105.10
33.10 Soil Remediation									
33.10. 5 Cover	1.00 EA	359,450	7,190	11,000	94,410	16,520	39,090	527,650	527651.45
TOTAL Soil Remediation	1.00 EA	359,450	7,190	11,000	94,410	16,520	39,090	527,650	527651.45
33.18 Soil in Ditch Remedi									
33.18.04 Sitework	1.00 EA	310,020	0	9,300	0	11,180	26,440	356,930	356934.77
33.18.09 Disposal	1.00 EA	494,970	9,900	15,150	130,000	22,750	53,820	726,590	726585.35
TOTAL Soil in Ditch Rem	1.00 EA	804,980	9,900	24,450	130,000	33,930	80,260	1,083,520	1083520.12

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	240	370	3,200	560	1,330	17,890	17887.61
33.26.06 Demobilization	1.00	EA	4,870	100	150	1,280	220	530	7,160	7155.04
TOTAL Demobilization	1.00	EA	17,060	340	520	4,480	780	1,860	25,040	25042.66
33.28 Remedial Design	1.00	EA	492,120	0	14,760	0	17,740	41,970	566,600	566595.37
33.31 Well Installation	1.00	EA	5,420	0	0	0	0	0	5,420	5416.96
TOTAL Remedial Action	1.00	EA	2,587,470	34,070	78,480	447,380	109,970	260,160	3,517,520	3517520.37

SEAD-4
OFF-SITE DISPOSAL
(SOIL > ecological cleanup values)
(Case 2) REV. 2

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 01/26/02
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 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 2.

Off-Site Disposal: Excavate/Stabilize/Off-site Disposal

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Remove material/debris from abandoned buildings at SEAD-4
- Excavate sediment in the lagoon with chromium, copper, and zinc > NYSDEC sediment values
- Excavate soils with chromium and lead > eco values
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport soil, sediment, and debris failing TCLP criteria to stabilization area (off-site)
- Stabilize soil, sediment, and debris exceeding TCLP criteria (off-site)
- Transport and dispose soil, sediment, and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with common fill & topsoil and hydroseed
- Demobilize
- Long-term monitoring

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
Available 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:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-4 could vary depending on actual condition of building.

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

Owner's cost are calculated as a percentage of running total as
2 % for design contingency
3 % for escalation
25 % for construction contingency
3.5 % for other costs
8 % for construction management

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 Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Sediment									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00	EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00	EA	0	0	0	0	4,600	4,600	230.00
AFH AA For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	20.00	EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00	EA	0	0	0	0	2,400	2,400	120.00
AFH AA Confirmatory: NYSDEC CLP-Pest/PCBs , soil (Severn Trent Lab, 9/99) (Assume 1 sample every 100 lf + 20% QC	84.00	EA	0	0	0	0	14,700	14,700	175.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF + 20% for QC)	84.00	EA	0	0	0	0	13,020	13,020	155.00
33.02.11. Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	52.00	EA	0	0	0	0	6,240	6,240	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	52.00	EA	0	0	0	0	11,960	11,960	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	52.00	EA	0	0	0	0	6,240	6,240	120.00

33.02. Sampling, & Testing	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test every 100 lf + 20% QC)	54.00 EA	0	0	0	0	8,370	8,370	155.00
33.03. Site Work								
33.03.02. Clearing and Grubbing								
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00 LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	20.00 ACR	320	8,653	12,578	0	0	21,231	1061.54
33.03.06. Roadways								
USR AA Grade 20ft wide roadway	3000.00 LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00 LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.08. Survey Remediation Area Survey remediation area								
USR AA Survey remediation area	10.00 DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.11. Erosion control								
B MIL AA Silt Fence: Installation and materials high, polypropylene	5500.00 LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - stalked	5500.00 LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00 LF	37	935	0	5,885	0	6,820	1.24
33.06. Remedial Design								
B HTW AA Remedial Design Workplan	1.00 EA	0	27,600	0	2,568	0	30,168	30168.00
B HTW AA Preliminary Design Report	1.00 EA	0	46,000	0	4,280	0	50,280	50280.00
B HTW AA Pre-final/Final Design Report, Including O&M Plan, S&A Plan, QA Plan, Contingency Plan, Waste	1.00 EA	0	118,000	0	7,490	0	125,490	125490.00
B HTW AA 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 Project Closeout Plan	1.00 EA	0	48,000	0	2,140	0	50,140	50140.00
33.07. Building Remediation								
MIL AA Clean up hazardous material within building: Cleanup, floor area, final	47.00 CSF	8	190	15	13	0	218	4.63
HTW HW packaging, overpacks, 18"dia x 34"H, 16ga stl drum, 55gal, DOT 17C	80.00 EA	0	0	0	6,330	0	6,330	79.13

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA 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 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).)	80.00	DR	0	0	0	0	10,700	10,700	133.75
USR AA Extra fees for overpack use	80.00	EA	0	0	0	0	3,200	3,200	40.00
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99)	20.00	TON	0	0	0	0	2,340	2,340	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Sediment Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	2249.00	CY	0	0	0	0	44,980	44,980	20.00
USR AA Plastic sheeting for ground an d cover: 6mil polyethylene liner	75000	SF	0	0	0	6,420	0	6,420	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2076.00	CY	183	5,543	2,886	40,495	0	48,923	23.57
33.09.09. Disposal									
Transportation of sediment to hazardous waste landfill									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99)	2595.00	TON	0	0	0	0	303,615	303,615	117.00
33.10. Soil Remediation									
33.10.02. Sitework - Surface Soils									
All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	3878.00	CY	0	0	0	0	77,560	77,560	20.00

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Plastic sheeting for ground and cover: 6mil polyethylene liner	129270	SF	0	0	0	11,066	0	11,066	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	1790.00	CY	158	4,779	2,488	34,916	0	42,183	23.57
USR AA Common fill (6") - Material for Backfill, includes cost material (bank sand) and delivery (DeWitt 1999)	2112.00	TON	0	0	0	9,830	0	9,830	4.65
AF AA Fill, spread borrow w/dozer	1790.00	CY	21	644	1,164	0	0	1,808	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	1790.00	CY	13	376	322	0	0	698	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	73.00	MSF	73	1,845	0	3,249	0	5,095	69.79
33.10.04. Sitework - Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	1549.00	CY	0	0	0	0	30,980	30,980	20.00
USR AA Plastic sheeting for ground and cover: 6mil polyethylene liner	50000	SF	0	0	0	4,280	0	4,280	0.09
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	1690.00	TON	0	0	0	7,866	0	7,866	4.65
AF AA Fill, spread borrow w/dozer	1430.00	CY	17	515	930	0	0	1,444	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	1430.00	CY	10	300	257	0	0	558	0.39
33.10.05. Sitework - Ditch Soils All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	572.00	CY	0	0	0	0	11,440	11,440	20.00
USR AA Plastic sheeting for ground and cover: 6mil polyethylene liner	35000	SF	0	0	0	2,996	0	2,996	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	467.00	CY	41	1,247	649	9,109	0	11,005	23.57
USR AA Common fill (6") - Material for Backfill, includes cost material (bank sand) and delivery (DeWitt 1999)	551.00	TON	0	0	0	2,565	0	2,565	4.65
AF AA Fill, spread borrow w/dozer	467.00	CY	6	168	304	0	0	472	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	467.00	CY	3	98	84	0	0	182	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	19.00	MSF	19	480	0	846	0	1,326	69.79

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10.06. Disposal									
Transportation of soil to hazardous waste landfill. Assuming that 25% of soil is hazardous.									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99)	1731.00	TON	0	0	0	0	202,527	202,527	117.00
HTW AA Transport and Dispose nonhaz waste, bulk	5192.00	TON	0	0	0	0	163,548	163,548	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
TOTAL SEAD-4			2,117	363,612	43,256	203,275	924,766	1,534,908	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
TOTAL Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
33.02 Sampling, & Testing									
33.02.06 Sediment	1.00 EA	54,590	1,090	1,670	14,340	2,510	5,940	80,140	80138.57
33.02.11 Soil	1.00 EA	45,320	910	1,390	11,900	2,080	4,930	66,530	66532.05
TOTAL Sampling, & Testi	1.00 EA	99,920	2,000	3,060	26,240	4,590	10,860	146,670	146670.63
33.03 Site Work									
33.03.02 Clearing and Grub	3.00 ACR	31,120	620	950	8,170	1,430	3,380	45,690	15229.26
33.03.06 Roadways	1.00 ACR	37,330	750	1,140	9,800	1,720	4,060	54,800	54799.21
33.03.08 Survey Remediatio	1.00 ACR	27,870	560	850	7,320	1,280	3,030	40,910	40910.82
33.03.11 Erosion control	1.00 LF	72,820	1,460	2,230	19,130	3,350	7,920	106,900	106900.44
TOTAL Site Work	1.00 EA	169,150	3,380	5,180	44,430	7,770	18,390	248,300	248298.25
33.06 Remedial Design	1.00 EA	423,050	0	12,690	0	15,250	36,080	487,070	487073.89
33.07 Building Remediation	1.00 EA	31,200	620	950	8,190	1,430	3,390	45,800	45799.21
33.09 Sediment Remediation									
33.09.04 Sitework	1.00 EA	138,580	2,770	4,240	36,400	6,370	15,070	203,440	203435.23
33.09.09 Disposal	1.00 EA	419,410	8,390	12,830	110,160	19,280	45,610	615,670	615669.87
TOTAL Sediment Remediat	1.00 EA	557,990	11,160	17,070	146,560	25,650	60,670	819,110	819105.10
33.10 Soil Remediation									
33.10.02 Sitework - Surfac	1.00 EA	204,780	4,100	6,270	53,780	9,410	22,270	300,600	300600.67
33.10.04 Sitework - Subsur	1.00 EA	62,340	1,250	1,910	16,370	2,870	6,780	91,510	91510.68
33.10.05 Sitework - Ditch	1.00 EA	41,420	830	1,270	10,880	1,900	4,500	60,810	60805.24
33.10.06 Disposal	1.00 EA	505,690	10,110	15,470	132,820	23,240	54,990	742,330	742326.13
TOTAL Soil Remediation	1.00 EA	814,230	16,280	24,920	213,860	37,420	88,540	1,195,240	1195242.72
33.26 Demobilization									
33.26.04 Decontaminate Equ	1.00 EA	12,190	240	370	3,200	560	1,330	17,890	17887.61
3.26.06 Demobilization	1.00 EA	4,870	100	150	1,280	220	530	7,160	7155.04

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
TOTAL Demobilization	1.00 EA	17,060	340	520	4,480	780	1,860	25,040	25042.66
TOTAL Remedial Action	1.00 EA	2,117,880	33,900	64,550	445,150	93,150	220,370	2,974,990	2974994.29

SEAD-4
OFF-SITE DISPOSAL
(SOIL > metals background) "Pre-disposal conditions" (Case 3)
REV_1

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 06/05/01
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 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 3.

Off-Site Disposal: Excavate/Stabilize/Off-site Disposal

- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Remove material/debris from abandoned buildings at SEAD-4
- Excavate sediment with metals and PCBs > NYSDEC sediment values
- Excavate soils with concentrations > background and TAGMs
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport soil, sediment, and debris failing TCLP criteria to stabilization area (off-site)
- Stabilize soil, sediment, and debris exceeding TCLP criteria (off-site)
- Transport and dispose soil, sediment, and debris in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with common fill & topsoil and hydroseed
- Demobilize
- Long-term monitoring

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:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-4 could vary depending on actual condition of building.

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

Owner's cost are calculated as a percentage of running total as
- 2 % for design contingency
- 3 % for escalation
- 25 % for construction contingency
- 3.5 % for other costs
- 8 % for construction management

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 Mobilization	1.00	EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing									
33.02.06. Sediment									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00	EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00	EA	0	0	0	0	4,600	4,600	230.00
AFH AA For Disposal: TCLP-Pest/PCBs (SW-846 Methods 1311 & 8080),	20.00	EA	0	0	0	0	2,400	2,400	120.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	20.00	EA	0	0	0	0	2,400	2,400	120.00
AFH AA Confirmatory: NYSDEC CLP-Pest/PCBs , soil (Severn Trent Lab, 9/99) (Assume 1 sample every 100 lf + 20% QC	84.00	EA	0	0	0	0	14,700	14,700	175.00
USR AA Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test/100 LF + 20% QC)	84.00	EA	0	0	0	0	13,020	13,020	155.00
33.02.11. Soil									
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	195.00	EA	0	0	0	0	23,400	23,400	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	195.00	EA	0	0	0	0	44,850	44,850	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	195.00	EA	0	0	0	0	23,400	23,400	120.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Confirmatory NYSDEC CLP TAL Inorganics, Soil (Severn Trent Lab, 9/99) Assume 1 test / 100 lf + 20% QC)	84.00	EA	0	0	0	0	13,020	13,020	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
MIL AA Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA Clearing, brush w/dozer & brush rake, light brush	20.00	ACR	320	8,653	12,578	0	0	21,231	1061.54
33.03.06. Roadways									
USR AA Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.08. Survey Remediation Area									
Survey remediation area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.11. Erosion control									
B MIL AA Silt Fence: installation and materials high, polyethylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA Hay bales - staked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24
33.04. Remedial Design									
B HTW AA Remedial Design Workplan	1.00	EA	0	27,600	0	2,568	0	30,168	30168.00
B HTW AA Preliminary Design Report	1.00	EA	0	46,000	0	4,280	0	50,280	50280.00
B HTW AA Pre-final/Final Design Report, Including C&A Plan, S&A Plan, QA Plan, Contingency Plan, Waste	1.00	EA	0	118,000	0	7,490	0	125,490	125490.00
B HTW AA 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 Project Closeout Plan	1.00	EA	0	48,000	0	2,140	0	50,140	50140.00
33.07. Building Remediation									
MIL AA Clean up hazardous material within building: Cleanup, floor area, [illegible]	47.00	CSF	8	190	15	13	0	218	4.63
HTW HW packaging, overpacks, 18"dia x 34"H, [illegible] drum, 55gal, DOT 17C	80.00	EA	0	0	0	6,330	0	6,330	79.13

33.07. Building Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA 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 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).)	80.00	DR	0	0	0	0	10,700	10,700	133.75
USR AA Extra fees for overpack use	80.00	EA	0	0	0	0	3,200	3,200	40.00
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 6/99)	20.00	TON	0	0	0	0	2,340	2,340	117.00
USR AA Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00
33.09. Sediment Remediation									
33.09.04. Sitework									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	2249.00	CY	0	0	0	0	44,980	44,980	20.00
USR AA Plastic sheeting for ground and cover: 6mil polyethylene liner (1000sf / roll : 1 roll = $75) (Assume 1 pile for 150cy occupies 50... ...)	75000	SF	0	0	0	6,420	0	6,420	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2076.00	CY	183	5,543	2,886	40,495	0	48,923	23.57
33.09.09. Disposal									
Transportation of sediment to hazardous waste landfill									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthwatch, 6/99)	2595.00	TON	0	0	0	0	303,615	303,615	117.00

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation									
33.10.02. Sitework - Surface Soils All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category.									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	13799	CY	0	0	0	0	275,980	275,980	20.00
USR AA Plastic sheeting for ground and cover: 6mil polyethylene liner	460000	SF	0	0	0	39,376	0	39,376	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	6369.00	CY	562	17,005	8,853	124,234	0	150,092	23.57
USR AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	7515.00	TON	0	0	0	34,979	0	34,979	4.65
AF AA Fill, spread borrow w/dozer	6369.00	CY	76	2,293	4,140	0	0	6,433	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	6369.00	CY	45	1,337	1,146	0	0	2,484	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	260.00	MSF	260	6,573	0	11,573	0	18,146	69.79
33.10.04. Sitework - Subsurface Soils									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	4637.00	CY	0	0	0	0	92,740	92,740	20.00
USR AA Plastic sheeting for ground and cover: 6mil polyethylene liner	155000	SF	0	0	0	13,268	0	13,268	0.09
B MIL AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	5050.00	TON	0	0	0	23,505	0	23,505	4.65
AF AA Fill, spread borrow w/dozer	4280.00	CY	51	1,541	2,782	0	0	4,323	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	4280.00	CY	30	899	770	0	0	1,669	0.39
33.10.05. Sitework - Ditch Soils All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Surface Soils category..									
L MIL AA Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	5874.00	CY	0	0	0	0	117,480	117,480	20.00
USR AA Plastic sheeting for ground and cover: 6mil polyethylene liner	195000	SF	0	0	0	16,692	0	16,692	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	2711.00	CY	239	7,238	3,768	52,881	0	63,888	23.57

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA Common fill (?") - Material for Backfill, includes cost of material (bank sand) and delivery (Dewitt 1999)	3200.00	TON	0	0	0	14,894	0	14,894	4.65
AF AA Fill, spread borrow w/dozer	2711.00	CY	33	976	1,762	0	0	2,738	1.01
AF AA Compaction, steel wheel tandem roller, 5 ton	2711.00	CY	19	569	488	0	0	1,057	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	110.00	MSF	110	2,781	0	4,896	0	7,677	69.79
33.10.06. Disposal Transportation of soil to hazardous waste landfill Assuming that 25% of soil is haz. waste									
HTW AA Transport and Dispose haz waste , bulk solid, includes 6% disposal taxes & fees (Earthtech, 10/99)	7013.00	TON	0	0	0	0	820,521	820,521	117.00
HTW AA Transport and Dispose nonhaz waste, bulk	21038	TON	0	0	0	0	662,697	662,697	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
TOTAL SEAD-4			3,182	394,370	60,768	452,851	2,479,989	3,387,979	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	110	160	1,390	240	570	7,760	7761.84
TOTAL Mobilization	1.00	EA	5,290	110	160	1,390	240	570	7,760	7761.84
33.02 Sampling, & Testing										
33.02.06 Sediment	1.00	EA	54,590	1,090	1,670	14,340	2,510	5,940	80,140	80138.57
33.02.11 Soil	1.00	EA	144,590	2,890	4,420	37,980	6,650	15,720	212,250	212249.61
TOTAL Sampling, & Testi	1.00	EA	199,180	3,980	6,090	52,310	9,160	21,660	292,390	292388.19
33.03 Site Work										
33.03.02 Clearing and Grub	3.00	ACR	31,120	620	950	8,170	1,430	3,380	45,690	15229.26
33.03.06 Roadways	1.00	ACR	37,330	750	1,140	9,800	1,720	4,060	54,800	54799.21
33.03.08 Survey Remediatio	1.00	ACR	27,870	560	850	7,320	1,280	3,030	40,910	40910.82
33.03.11 Erosion control	1.00	LF	72,820	1,460	2,230	19,130	3,350	7,920	106,900	106900.44
TOTAL Site Work	1.00	EA	169,150	3,380	5,180	44,430	7,770	18,390	248,300	248298.25
33.04 Remedial Design	1.00	EA	423,050	0	12,690	0	15,250	36,080	487,070	487073.89
33.07 Building Remediation	1.00	EA	31,200	620	950	8,190	1,430	3,390	45,800	45799.21
33.09 Sediment Remediation										
33.09.04 Sitework	1.00	EA	138,580	2,770	4,240	36,400	6,370	15,070	203,440	203435.23
33.09.09 Disposal	1.00	EA	419,410	8,390	12,830	110,160	19,280	45,610	615,670	615669.87
TOTAL Sediment Remediat	1.00	EA	557,990	11,160	17,070	146,560	25,650	60,670	819,110	819105.10
33.10 Soil Remediation										
33.10.02 Sitework - Surfac	1.00	EA	728,660	14,570	22,300	191,380	33,490	79,230	1,069,640	1069642.28
33.10.04 Sitework - Subsur	1.00	EA	187,180	3,740	5,730	49,160	8,600	20,350	274,780	274777.22
33.10.05 Sitework - Ditch	1.00	EA	310,020	6,200	9,490	81,430	14,250	33,710	455,090	455091.83
33.10.06 Disposal	1.00	EA	2,048,890	40,980	62,700	538,140	94,170	222,790	3,007,670	3007666.41
TOTAL Soil Remediation	1.00	EA	3,274,750	65,500	100,210	860,110	150,520	356,090	4,807,180	4807177.75
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	240	370	3,200	560	1,330	17,890	17887.61
33.26.06 Demobilization	1.00	EA	4,870	100	150	1,280	220	530	7,160	7155.04

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
TOTAL Demobilization	1.00	EA	17,060	340	520	4,480	780	1,860	25,040	25042.66
TOTAL Remedial Action	1.00	EA	4,677,670	85,090	142,880	1,117,480	210,810	498,710	6,732,650	6732646.88

ANNUAL MONITORING COSTS
FOR SEMI-ANNUAL
GROUNDWATER AND SURFACE WATER
MONITORING
SEAD-4

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 04/03/01
Effective Date of Pricing: 10/03/96

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 scope of work for the contractors is summarized below.

- Sample 6 wells (total of 8 samples including 1 dup and 1 qa sample)for VOCs, SVOCs, and metals analyses.
- Sample 4 surface water locations (total of 6 samples including 1 dup and 1 qa sample) for metals analyses.
- Assumptions: 2-person crew, 3 wells sampled per day, 4 surface water locations sampled per 1/2 day, 1 day for set-up, 1 day for de-mob, no air travel; 2 events per year, and metals, VOCs, and SVOCs laboratory analyses.

The monitoring wells are MW4-8 through MW4-13. Surface water locations are SW4-12 through 14 and SW4-32.

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 the areas where there is the biggest potential for changes in cost due to uncertainties:

· Time necessary to complete sampling may increase depending on the flow of water.
· This estimate does not include the potential for additional wells or the repair of existing wells.

Contractor costs are calculated as a percentage of running total as

0.5 % for field office support
15.0 % for home office support
10.0 % for profit
0.0 % for bond

Owner's cost are calculated as a percentage of running total as
0.0 % for design contingency
3.0 % for escalation
0.0 % for construction contingency
3.0 % for other costs
0.0 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

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

Total, use	3.0%

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.02. Sampling, & Testing									
33.02.01. Health and Safety									
HTW AA Case of 25, disposable coveralls, Tyvek (Pine Environmental Services 9/98)	1.00	EA	0	0	0	115	0	115	114.69
USR AA Poly Tyvek (case of 12) (Pine Environmental Services 9/98)	1.00	EA	0	0	0	74	0	74	73.83
HTW AA First aid kits, 36 ingredients	1.00	EA	0	0	0	88	0	88	88.08
HTW AA Eye prot, safety glasses	2.00	EA	0	0	0	12	0	12	6.18
M HTW AA Latex Gloves (100/box) (Pine Environmental Services 9/98)	4.00	BX	0	0	0	42	0	42	10.43
USR AA North Respirator Cartridges (2 per/pkg) (Pine Environmental Services 9/98)	2.00	PK	0	0	0	9	0	9	4.49
33.02.02. Personnel									
AFH AA Personnel per diem (2 people x 4.5 days x 2 events)	18.00	DAY	0	0	0	1,907	0	1,907	105.93
AFH AA Car or van mileage charge	2000.00	MI	0	0	0	984	0	984	0.49
HTW AA Daily rate, subcontracted	18.00	EA	0	0	0	0	12,240	12,240	680.00
33.02.04. Sample Groundwater Groundwater monitoring costs for one year are included in this estimate. Each monitoring well is sampled semi-annually for TAL metals, VOCs, and SVOCs.									
USR AA Turbidimeter Rental (Pine Environmental Services 9/98)	2.00	WK	0	0	160	0	0	160	80.00
USR AA Hydrolab Rental (Hydrolab Corp. 9/98)	2.00	WK	0	0	690	0	0	690	345.00
USR AA Bladder Pump Rental (Marschalk Corporation 9/98)	2.00	WK	0	0	190	0	0	190	95.00
USR AA Pump Controller Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	300	0	0	300	150.00
USR AA 12-volt Compressor Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	350	0	0	350	175.00
USR AA Misc. Equipment Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	65	0	0	65	32.50
USR AA Thermo Environmental 580B (OVM) Rental (US Environmental, 12/98)	2.00	WK	0	0	400	0	0	400	200.00
USR AA Teflon Tubing (1/4" ID x 3/8") (Pine Environmental Services 9/98)	100.00	FT	0	0	0	268	0	268	2.68
USR AA Isobutylene Calibration Gas (Pine Environmental Services 9/98)	2.00	EA	0	0	0	173	0	173	86.40
USR AA pH4 Buffer Solution (Cole-Parme r Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24

33.02. Sampling, & Testing	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA pH7 Buffer Solution (Cole-Parme r Instrument Co. 9/98)	2.00 EA	0	0	0	22	0	22	11.24
USR AA 700 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00 EA	0	0	0	39	0	39	19.26
USR AA 2060 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00 EA	0	0	0	39	0	39	19.26
HTW AA Custody seals (package of 10)	8.00 EA	0	0	0	126	0	126	15.75
HTW AA 1gal,4/case,safe trans can w/vermiculite	2.00 EA	0	0	0	58	0	58	29.21
AFH AA Packing Tape: Testing, packagin g & shipping, per roll	8.00 EA	0	0	0	13	0	13	1.65
HTW AA Shipping coolers: Testing, packaging & shipping, 51# to 70# pkg, overnight dlvy	14.00 EA	0	0	0	0	1,096	1,096	78.27
AFH AA Testing, packaging & shipping, bag ice	100.00 EA	0	0	0	0	119	119	1.19
HTW AA 48 quart ice chest, cooler & ic e chest	2.00 EA	0	0	0	0	55	55	27.62
USR AA Hydrolab Rental (Hydrolab Corp. 9/98)	2.00 WK	0	0	0	0	0	0	0.00
33.02.05. Sample Surface Water Surface water monitoring costs for one year are included in this estimate. Each location is sampled semi-annually for TAL metals.								
USR AA Decon Chemicals for surface water sampling (cost per event)	2.00 EA	0	0	0	54	0	54	26.75
HTW AA Shipping coolers: Testing, packaging & shipping, 51# to 70# pkg, overnight dlvy	2.00 EA	0	0	0	0	157	157	78.27
AFH AA Testing, packaging & shipping, bag ice	12.00 EA	0	0	0	0	14	14	1.19
33.02.07. Analysis of Groundwater								
HTW AA Purgeable organics (NYSDEC CLP TCL VOCs - unit cost from Severn Trent Lab 9/98)	16.00 EA	0	0	0	0	2,800	2,800	175.00
HTW AA Semi-volatile organics (NYSDEC CLP TCL Semi-VOCs modified - unit cost from Severn Trent Lab 9/98)	16.00 EA	0	0	0	0	5,920	5,920	370.00
AFH AA TAL metals (NYSDEC CLP TAL Inorganics - unit cost from Severn Trent Lab 9/98)	16.00 EA	0	0	0	0	2,480	2,480	155.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.02.09. Analysis of Surface Water									
USR AA NYSDEC CLP TAL Inorganics, (Severn Trent Lab, 9/98)	12.00	EA	0	0	0	0	1,860	1,860	155.00
33.02.12. Disposal of IDW Disposal of Investigation Derived Wastes									
USR AA Disposal of purge water drums (1 drum of purge water for 2 rounds of sampling for 12 wells) (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).)	1.00		0	0	0	0	134	134	133.75
TOTAL ANNUAL MONITORING COSTS			0	0	2,155	4,044	26,875	33,074 ×2 for 2yrs	

** PROJECT OWNER SUMMARY - SUBSYSTM (Rounded to 10's) **

		QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CONTINGN	OTHER	CON MGMT	TOTAL COST	UNIT COST
33	Remedial Action									
33.02	Sampling, & Testing									
33.02.01	Health and Safety	1.00 EA	430	0	10	0	10	0	460	458.16
33.02.02	Personnel	1.00 EA	19,240	0	580	0	590	0	20,410	20408.11
33.02.04	Sample Groundwate	1.00 EA	5,320	0	160	0	160	0	5,640	5644.40
33.02.05	Sample Surface Wa	1.00 EA	290	0	10	0	10	0	300	302.55
33.02.07	Analysis of Groun	1.00 EA	14,240	0	430	0	440	0	15,110	15105.99
33.02.09	Analysis of Surfa	1.00 EA	2,360	0	70	0	70	0	2,510	2508.67
33.02.12	Disposal of IDW	1.00 EA	170	0	10	0	10	0	180	180.40
	TOTAL Sampling, & Testi	1.00 EA	42,050	0	1,260	0	1,300	0	44,610	44608.27
	TOTAL Remedial Action	1.00 EA	42,050 x2	0	1,260	0	1,300	0	44,610	44608.27

for 2 years

R2032: 330204 P0195 46422 32 oz HDPE b Detail item has zero quantity - no costs reported

* * * END OF ERROR REPORT * * *

SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

ANNUAL MONITORING COSTS
FOR SEMI-ANNUAL
GROUNDWATER MONITORING
SEAD-4

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 04/03/01
Effective Date of Pricing: 10/03/96

Sales Tax: 7.0%

M C A C E S for W i n d o w s

Release 1.2

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 scope of work for the contractors is summarized below.

- Sample 6 wells (total of 8 samples including 1 dup and 1 qa sample)for VOCs, SVOCs, and metals analyses.
- Assumptions: 2-person crew, 3 wells sampled per day, 1 day for set-up, 1 day for de-mob, no air travel; 2 events per year, and metals, VOCs, and SVOCs laboratory analyses.

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 the areas where there is the biggest potential for changes in cost due to uncertainties:

· Time necessary to complete sampling may increase depending on the flow of water.
· This estimate does not include the potential for additional wells or the repair of existing wells.

Contractor costs are calculated as a percentage of running total as
0.5 % for field office support
15.0 % for home office support
10.0 % for profit
0.0 % for bond

Owner's cost are calculated as a percentage of running total as
0.0 % for design contingency
3.0 % for escalation
0.0 % for construction contingency
3.0 % for other costs
0.0 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

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

Total, use	3.0%

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.02. Sampling, & Testing									
33.02.01. Health and Safety									
HTW AA Case of 25, disposable coveralls, Tyvek (Pine Environmental Services 9/98)	1.00	EA	0	0	0	115	0	115	114.69
USR AA Poly Tyvek (case of 12) (Pine Environmental Services 9/98)	1.00	EA	0	0	0	74	0	74	73.83
HTW AA First aid kits, 36 ingredients	1.00	EA	0	0	0	88	0	88	88.08
HTW AA Eye prot, safety glasses	2.00	EA	0	0	0	12	0	12	6.18
M HTW AA Latex Gloves (100/box) (Pine Environmental Services 9/98)	4.00	BX	0	0	0	42	0	42	10.43
USR AA North Respirator Cartridges (2 per/pkg) (Pine Environmental Services 9/98)	2.00	PK	0	0	0	9	0	9	4.49
33.02.02. Personnel									
AFH AA Personnel per diem (2 people x 4 days x 2 events)	18.00	DAY	0	0	0	1,907	0	1,907	105.93
AFH AA Car or van mileage charge	2000.00	MI	0	0	0	984	0	984	0.49
HTW AA Daily rate, subcontracted	18.00	EA	0	0	0	0	12,240	12,240	680.00
33.02.04. Sample Groundwater — Groundwater monitoring costs for one year are included in this estimate. Each monitoring well is sampled semi-annually for TAL metals, VOCs, and SVOCs.									
USR AA Turbidimeter Rental (Pine Environmental Services 9/98)	2.00	WK	0	0	160	0	0	160	80.00
USR AA Hydrolab Rental (Hydrolab Corp. 9/98)	2.00	WK	0	0	690	0	0	690	345.00
USR AA Bladder Pump Rental (Marschalk Corporation 9/98)	2.00	WK	0	0	190	0	0	190	95.00
USR AA Pump Controller Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	300	0	0	300	150.00
USR AA 12-volt Compressor Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	350	0	0	350	175.00
USR AA Misc. Equipment Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	65	0	0	65	32.50
USR AA Thermo Environmental 580B (OVM) Rental (US Environmental, 12/98)	2.00	WK	0	0	400	0	0	400	200.00
USR AA Teflon Tubing (1/4" ID x 3/8") (Pine Environmental Services 9/98)	100.00	FT	0	0	0	268	0	268	2.68
USR AA Isobutylene Calibration Gas (Pine Environmental Services 9/98)	2.00	EA	0	0	0	173	0	173	86.40

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA pH4 Buffer Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24
USR AA pH7 Buffer Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24
USR AA 700 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
USR AA 2060 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
HTW AA Custody seals (package of 10)	8.00	EA	0	0	0	126	0	126	15.75
HTW AA 1gal,4/case,safe trans can w/vermiculite	2.00	EA	0	0	0	58	0	58	29.21
AFH AA Packing Tape: Testing, packaging & shipping, per roll	8.00	EA	0	0	0	13	0	13	1.65
HTW AA Shipping coolers: Testing, packaging & shipping, 51# to 70# pkg, overnight dlvy	14.00	EA	0	0	0	0	1,096	1,096	78.27
AFH AA Testing, packaging & shipping, bag ice	100.00	EA	0	0	0	0	119	119	1.19
HTW AA 48 quart ice chest, cooler & ice chest	2.00	EA	0	0	0	0	55	55	27.62
USR AA Hydrolab Rental (Hydrolab Corp. 9/98)	2.00	WK	0	0	0	0	0	0	0.00
33.02.07. Analysis of Groundwater									
HTW AA Purgeable organics (NYSDEC CLP TCL VOCs - unit cost from Severn Trent Lab 9/98)	16.00	EA	0	0	0	0	2,800	2,800	175.00
HTW AA Semi-volatile organics (NYSDEC CLP TCL Semi-VOCs modified - unit cost from Severn Trent Lab 9/98)	16.00	EA	0	0	0	0	5,920	5,920	370.00
AFH AA TAL metals (NYSDEC CLP TAL Inorganics - unit cost from Severn Trent Lab 9/98)	16.00	EA	0	0	0	0	2,480	2,480	155.00
33.02.12. Disposal of IDW Disposal of Investigation Derived Wastes									
USR AA Disposal of purge water drums (1 drum of purge water for 2 rounds of sampling for 12 wells) (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums	1.00		0	0	0	0	134	134	133.75

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)									
TOTAL ANNUAL MONITORING COSTS			0	0	2,155	3,991	24,844	30,989	

** PROJECT OWNER SUMMARY - SUBSYSTM (Rounded to 10's) **

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CONTINGN	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.02 Sampling, & Testing									
33.02.01 Health and Safety	1.00 EA	430	0	10	0	10	0	460	458.16
33.02.02 Personnel	1.00 EA	19,240	0	580	0	590	0	20,410	20408.11
33.02.04 Sample Groundwate	1.00 EA	5,320	0	160	0	160	0	5,640	5644.40
33.02.07 Analysis of Groun	1.00 EA	14,240	0	430	0	440	0	15,110	15105.99
33.02.12 Disposal of IDW	1.00 EA	170	0	10	0	10	0	180	180.40
TOTAL Sampling, & Testi	1.00 EA	39,400	0	1,180	0	1,220	0	41,800	41797.04
TOTAL Remedial Action	1.00 EA	39,400	0	1,180	0	1,220	0	41,800	41797.04

Appendix D

SOIL CLEANUP GOAL SENSITIVITY ANALYSIS

- Sensitivity Analysis
- Table
- Figures
- NYSDEC approval letter of Sensitivity Analysis – January 26, 2005

APPENDIX D
Soil Cleanup Goal Sensitivity Analysis

Purpose

In order to come to a consensus regarding the selection of appropriate soil cleanup goals, NYSDEC proposed and the Army completed a sensitivity analysis for a range of cleanup goals for chromium and lead in soils. The sensitivity (or "knee of the curve") analysis evaluated relative remediation costs versus contaminant mass removed for an offsite disposal remedial alternative. The overall goal of the analysis was to determine the economic effectiveness of various excavation plans based on a comparison of cost to volume of soil removed associated with each cleanup goal scenario. A unit cost per volume of soil excavated, disposed, and backfilled was assumed in order to assign a total cost to each cleanup goal and associated volume. The purpose of the total cost was to serve as a basis of comparison between cleanup goal scenarios; the total cost for each scenario is not intended to be used for project cost estimating purposes. This analysis assessed the mass of contaminant in soils, namely lead (Pb) and chromium (Cr), removed for various metal cleanup goals. Five cleanup goal criteria were assessed, and volumes of excavation and associated masses of contaminant removed were determined for each criterion. This information was plotted on a graph in order to determine which criteria removed the greatest mass of contaminant most economically. Five scenarios were developed:

A: Cr > 60 mg/Kg; Pb > 167 mg/Kg
B: Cr > 30 mg/Kg; Pb > 30 mg/Kg
C: Cr > 60 mg/Kg; Pb > 400 mg/Kg
D: Cr > 324 mg/Kg; Pb > 167 mg/Kg (Case 2 in the FS)
E: Cr > 324 mg/Kg; Pb > 400 mg/Kg

It should be noted that a scenario excavating soils that exceed TAGMs for any individual metal was initially considered; however it was eliminated from further evaluation since it would involve excavating all soils at SEAD-4 and beyond.

Delineation of excavation area

For each cleanup goal scenario, the bounds of excavation of soils (surface soil, subsurface soil, ditch soil, and sediment) were delineated in one of two ways:

1. The limit of excavation extended to the nearest sample meeting the cleanup goal, or
2. If an area was not entirely bounded, the limit of excavation extended 100 feet beyond the location of the last soil sample not meeting the cleanup goal.

For each criteria, a map noting the excavation area correponding to the cleanup goal scenario was created using the GIS mapping program ArcView, and ArcView generated an excavation volume based on the map. These figures depicting the approximate area of excavation for scenarios A, B, C, D, and E are presented as **Figures A, B**, **C**, **D**, and **E**, respectively. The depth of excavation was based on the depth required to meet cleanup goals based on existing results. If a sample at depth was vertically unbounded, the excavation was extended approximately 1 foot downward from the last sample.

Determination of mass of soil and contaminants and cost of removal

Using the excavation volume, the following calculation was performed to determine the mass of soil that would be excavated and the mass of contaminant that would be excavated under each scenario:

> *volume (cy) x 1.5 tons/cy x 2000 lbs/ton x 0.454 kg/lb x Cr concentration (mg/Kg) = Cr mass (mg)*

Average concentrations of a contaminant for each scenario were calculated by including all of the samples within the excavation area for the scenario (including perimeter samples).

The relative cost of soil removal was approximated for comparison purposes by assuming that excavation, disposal, and backfilling costs $100/cy for non-hazardous material, and $200/cy for hazardous material. It was assumed that 25% of the soil excavated under the least conservative scenario, Scenario E, would be hazardous, which accounts for 3239 cy of soil. For all other scenarios, costs were calculated by assuming 3239 cy of soil required hazardous disposal and the remainder was non-hazardous.

In order to assess the effectiveness of each excavation scenario, the cost of soil excavation and disposal was related to the percent of contaminant removed, shown in **Figure D-1** and **Figure D-2** for chromium and lead, respectively. The percent of contaminant removed was calculated by comparing the mass of lead and chromium removed under a cleanup scenario compared to the mass of lead and chromium removed under Scenario B. Accordingly, under Scenario B, 100% of the lead and chromium mass above TAGMs was excavated.

Results

In a sensitivity analysis, the most effective scenario for cost vs. mass removed is determined by a change in the slope from principally horizontal to a vertical slope. The results show that the shape of the curve changes at the data point for Scenario A (Cr > 60 ppm, Pb > 167 ppm), which would remove 94% chromium and 72.5% lead (by mass) at a relative cost of $2.8 million. Scenario B results in the removal of 100% of contaminants; however, the cost increases by 100% (from $2.8 million to $5.6 million). Since the remaining chromium from Scenario A to B is mostly due to levels of chromium and lead close to background, the additional cost of $2.6 million is not warranted. The percent mass of chromium and lead removed and their respective relative costs are presented for each cleanup goal scenario in **Table D-1**.

Based on the results of the sensitivity analysis, the Army recommended cleanup goals from Scenario A (Cr > 60 mg/Kg; Pb > 167 mg/Kg), which would remove 25,050 cy of surface soil, ditch soil, and sediment in the lagoon. The NYSDEC and USEPA have concurred with the Army's conclusions of the sensitivity analysis. The excavation area is delineated by the selected cleanup goals, and no excavation will extend beyond the horizontal limits shown for Scenario A (see **Figure A**), and no horizontal cleanup verification will be performed beyond these limits. However, in areas where the final horizontal limit is not well-defined, the Army will conduct additional sampling to determine where Scenario A cleanup goals are met. Cleanup verification testing will be performed to determine the final vertical limits, and the cleanup goals for Scenario A will be used since these goals are used to determine the horizontal limits.

The cost estimate for Alternative 3 presented in **Section 4** of the FS has been revised based on the volume of soil calculated during this sensitivity analysis for the selected cleanup goals. The updated capital cost for off-site disposal is $5,705,700. The cost backup is provided in **Appendix E**. While this cost exceeds the costs calculated in **Section 4** for the pre-disposal scenario (Case 3), this is due to the updated method for calculating the volume of soil to be excavated. For the selected cleanup goal scenario, the depth of excavation varied from 1 ft. to 8 ft., which included a greater volume of soil at depth than the volume for the pre-disposal condition (Case 3). Were the volumes for the pre-disposal condition revised according to the same guidelines outlined in this appendix, virtually the entire site would be excavated to depths greater than 2 ft., which would raise the cost for Case 3, Alternative 3 to greater than $17 million.

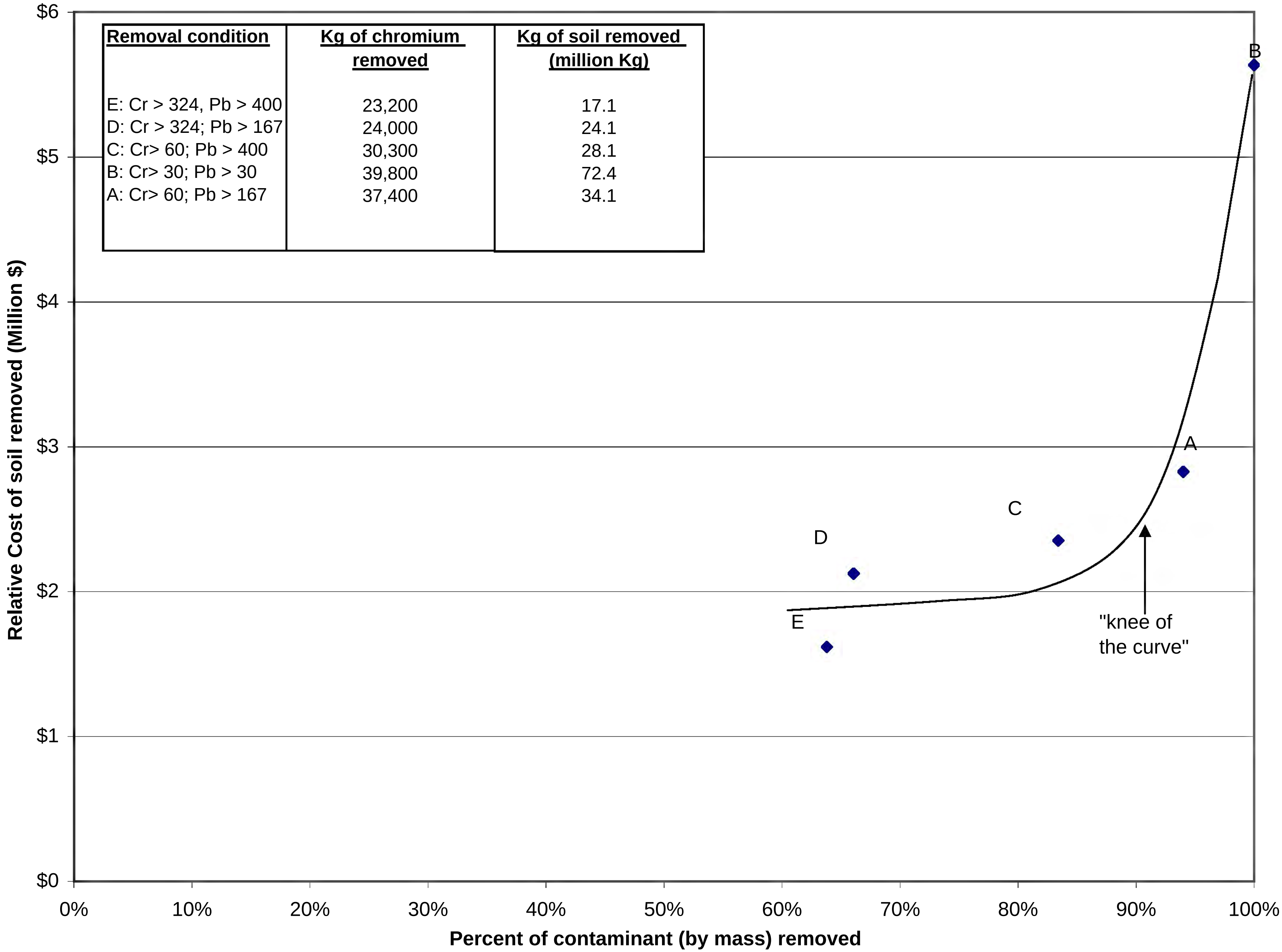
The sensitivity analysis was presented to the public on September 21, 2004, and Parsons issued a modified memorandum on October 15, 2004. NYSDEC's letter of concurrence on the sensitivity analysis approach was received by the Army on January 26, 2005, and is included at the end of this appendix.

Table D-1
Summary of Sensitivity Analysis Results
SEAD-4 Feasibility Study
Seneca Army Depot Activity

	Volume (cy)	Mass of soil (million Kg)	Relative Cost ($mill)	Mass of Cr (Kg)	% Chromium removed	Mass of Pb (Kg)	% Lead removed
Scenario E	12,955	17.1	1.6	23,200	63.8%	3,700	57.7%
Scenario D	18,020	24.5	2.1	24,000	66.0%	4,500	70.3%
Scenario C	20,276	28.1	2.4	30,300	83.4%	4,100	64.3%
Scenario B	53,128	72.4	5.6	39,800	100.0%	6,400	100.0%
Scenario A	25,049	34.1	2.8	37,400	94.0%	5,100	72.5%

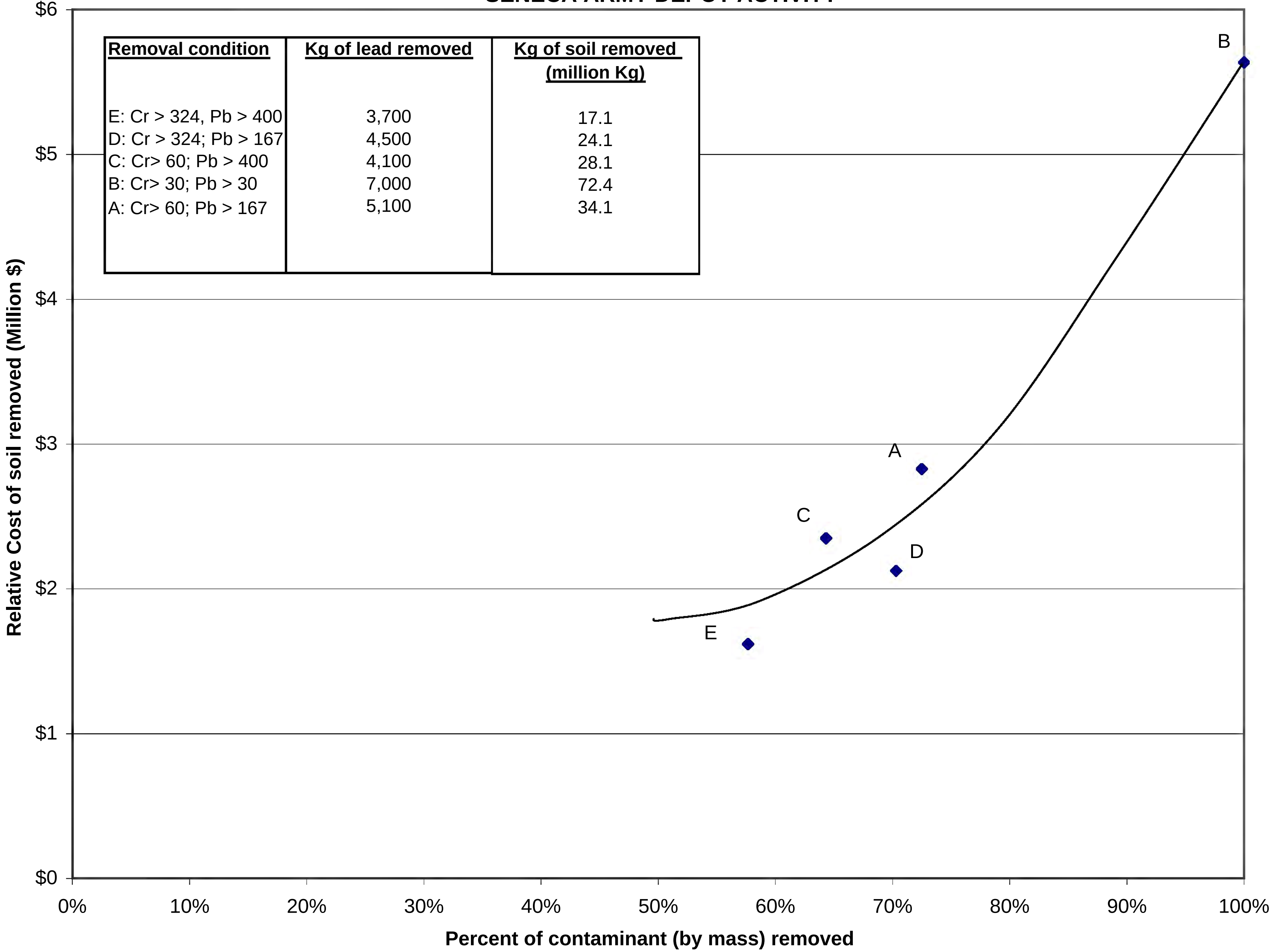
Notes:
A: Cr > 60 Pb > 167
B: Cr> 30; Pb > 30
C: Cr> 60; Pb > 400
D: Cr > 324; Pb > 167
E: Cr > 324, Pb > 400

Figure D-1
Relative Cost for Chromium Mass Removal at SEAD-4
SEAD-4 Feasibility Study
SENECA ARMY DEPOT ACTIVITY



P:\PIT\Projects\SENECA\SEAD4\FS\revised Exc Area_May2004\sensitivity anal Rev 2 Nov04\Knee of Curve Nov04.xls-Fig D-1

Figure D-2
Relative Cost for Lead Mass Removal at SEAD-4
SEAD-4 Feasibility Study
SENECA ARMY DEPOT ACTIVITY



Removal condition	Kg of lead removed	Kg of soil removed (million Kg)
E: Cr > 324, Pb > 400	3,700	17.1
D: Cr > 324; Pb > 167	4,500	24.1
C: Cr> 60; Pb > 400	4,100	28.1
B: Cr> 30; Pb > 30	7,000	72.4
A: Cr> 60; Pb > 167	5,100	34.1

P:\PIT\Projects\SENECA\SEAD4\FS\revised Exc Area_May2004\sensitivity anal Rev 2 Nov04\Knee of Curve Nov04.xls-Fig D-2

LEGEND

Cr and Pb Concentration (ppm)

- Cr < 60 and Pb < 167
- # Cr > 60 or Pb > 167

Section 1	1 ft cut = 4,338 cy
Section 1B	10 ft cut = 946 cy
Section 2	1 ft cut = 3,038 cy
Section 2B	4 ft cut = 1,265 cy
Section 2C	8 ft cut = 809 cy
Section 3	1 ft cut = 2760 cy
Section 3B	7 ft cut = 950 cy
Section 4	4 ft cut = 7046 cy
Section 4B	1 ft cut = 1288 cy
Section 5	1 ft cut = 1206 cy
Section 6	1 ft cut = 148 cy
Section 7	1 ft cut = 942 cy
Section 8	1 ft cut = 312 cy

Total volume to be removed 25,049 cy

N

100 0 100 200 300 Feet

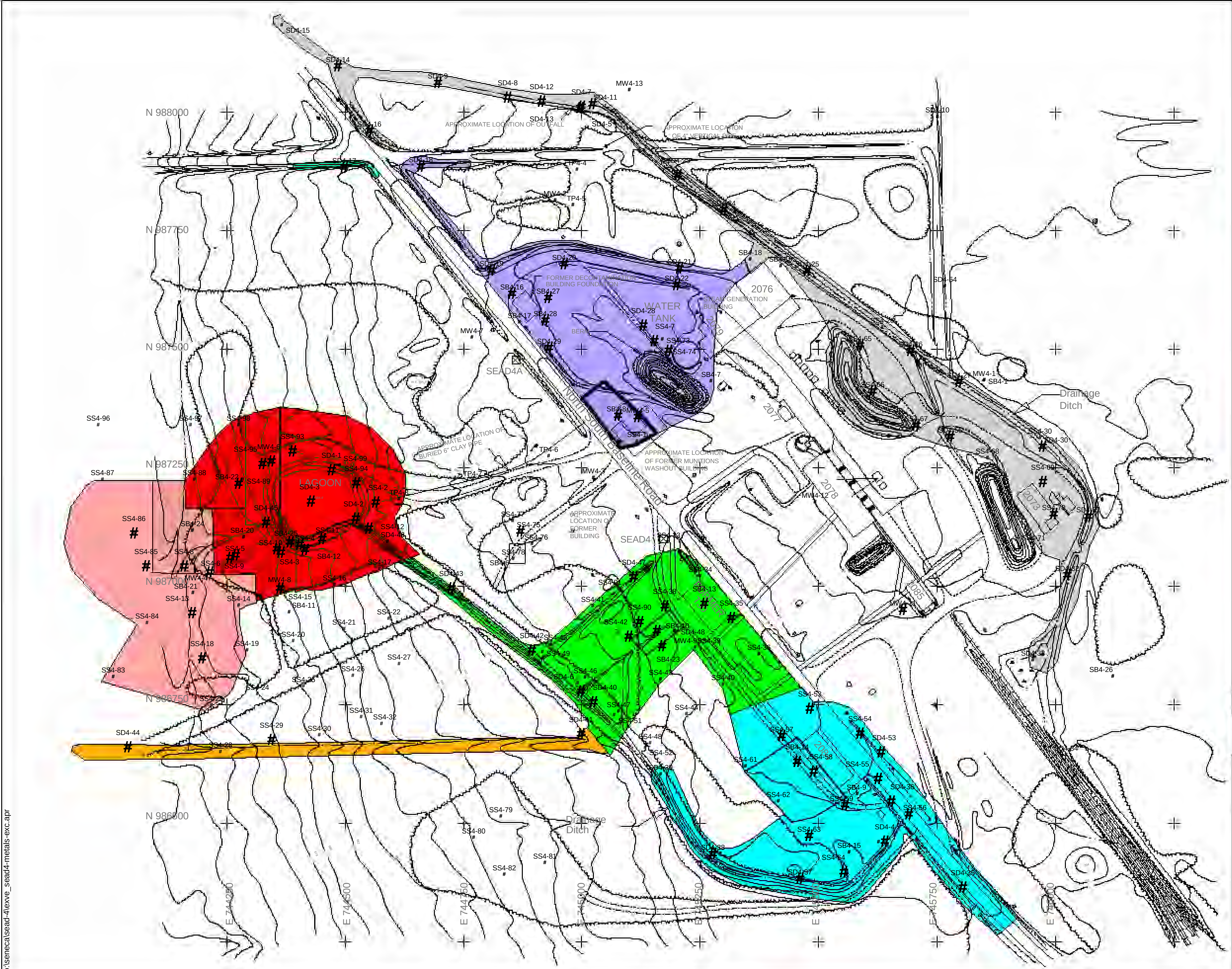
PARSONS

SENECA ARMY DEPOT ACTIVITY

SEAD-4
FEASIBILITY STUDY

Figure A
Approximate Area of Excavation for Criteria - A
Cr > 60, Pb > 167

1" = 200' FEBRUARY 2005



LEGEND

Cr and Pb Concentration (ppm)

- Cr < 30 and Pb < 30
- # Cr > 30 or Pb > 30

Section 1	1 ft cut = 3967 cy
Section 1B	10 ft cut = 7922 cy
Section 2	1 ft cut = 3067 cy
Section 2B	7 ft cut = 468 cy
Section 2C	4 ft cut = 384 cy
Section 2D	9 ft cut = 8208 cy
Section 3	1 ft cut = 4261 cy
Section 3B	7 ft cut = 1218 cy
Section 4	1 ft cut = 5138 cy
Section 4B	4 ft cut = 2960 cy
Section 5	1 ft cut = 1206 cy
Section 6	1 ft cut = 5226 cy
Section 6A	7 ft cut = 2670 cy
Section 7	1 ft cut = 6340 cy
Section 8	1 ft cut = 93 cy

Total volume to be removed 53,129 cy

100 0 100 200 300 Feet

N

PARSONS

SENECA ARMY DEPOT ACTIVITY

SEAD-4
FEASIBILITY STUDY

Figure B
Approximate Area of Excavation
for Criteria - B
Cr > 30, Pb > 30

1" = 200' | FEBRUARY 2005

LEGEND

Cr and Pb Concentration (ppm)

- Cr < 60 and Pb < 400
- # Cr > 60 or Pb > 400

Section 1	1 ft cut = 3793 cy
Section 2	1 ft cut = 3000 cy
Section 2B	4 ft cut = 1041 cy
Section 3	1 ft cut = 2760 cy
Section 3B	7 ft cut = 950 cy
Section 4	4 ft cut = 7046 cy
Section 5	1 ft cut = 1206 cy
Section 6	1 ft cut = 82 cy
Section 7	1 ft cut = 398 cy

Total volume to be removed 20,276 cy

N

100 0 100 200 300 Feet

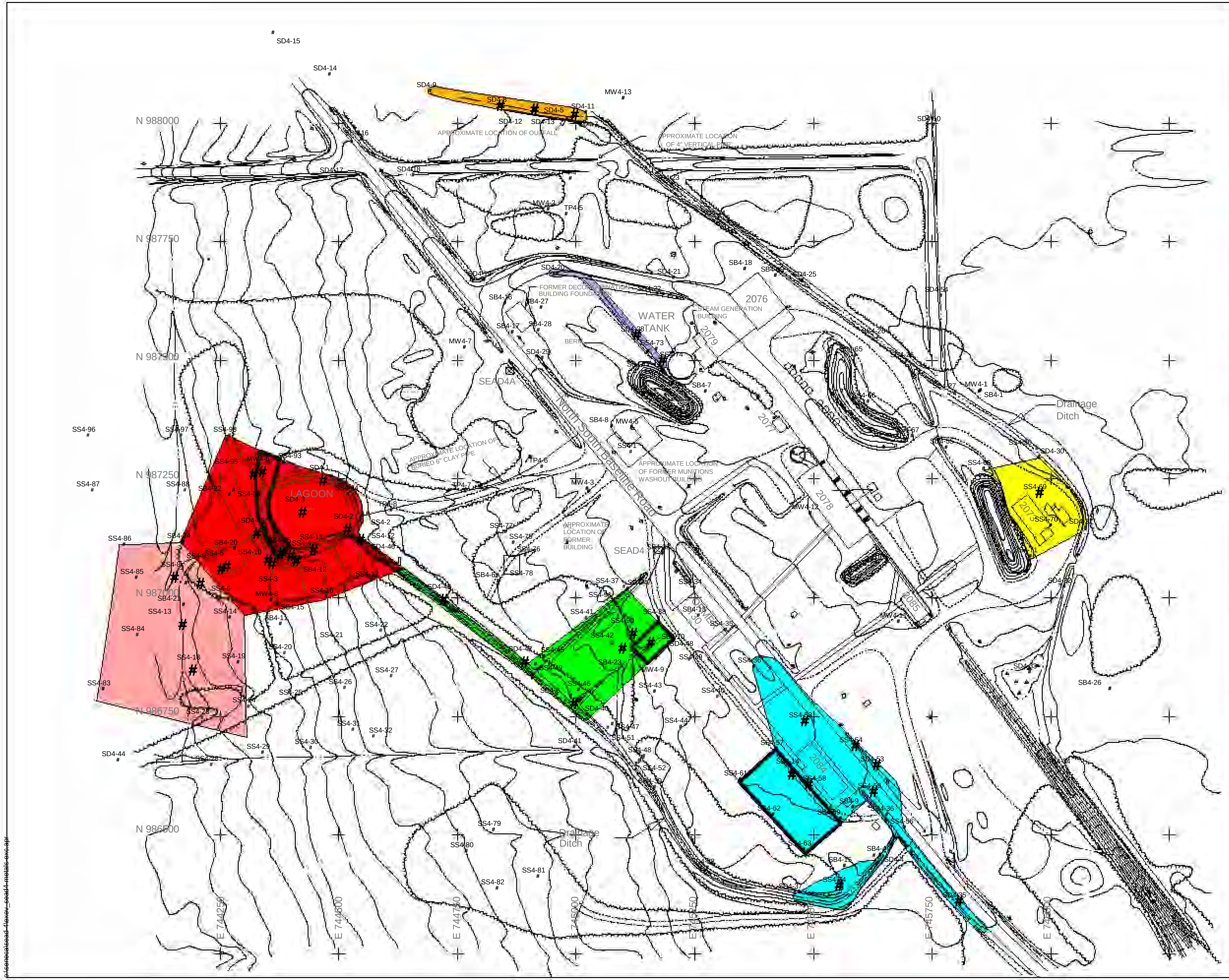
PARSONS

SENECA ARMY DEPOT ACTIVITY

SEAD-4
FEASIBILITY STUDY

Figure C
Approximate Area of Excavation
for Criteria - C
Cr > 60, Pb > 400

1" = 200' | FEBRUARY 2005



LEGEND

Cr and Pb Concentration (ppm)

- Cr < 324 and Pb < 167
- # Cr > 324 or Pb > 167

Section 1	1 ft cut = 3594 cy
Section 2	1 ft cut = 3869 cy
Section 2B	4 ft cut = 1041 cy
Section 3	1 ft cut = 1740 cy
Section 3B	7 ft cut = 950 cy
Section 4	4 ft cut = 3080 cy
Section 4B	1 ft cut = 2344 cy
Section 5	1 ft cut = 312 cy
Section 6	1 ft cut = 148 cy
Section 7	1 ft cut = 942 cy

Total volume to be removed 18,020 cy

N

100 0 100 200 300 Feet

PARSONS

SENECA ARMY DEPOT ACTIVITY

SEAD-4
FEASIBILITY STUDY

Figure D
Approximate Area of Excavation for Criteria - D
Cr > 324, Pb > 167

1" = 200' | FEBRUARY 2005

LEGEND

Cr and Pb Concentration (ppm)

- · Cr < 324 and Pb < 400
- # Cr > 324 or Pb > 400

Section 1	1 ft cut = 3594 cy
Section 2	1 ft cut = 3869 cy
Section 2B	4 ft cut = 1041 cy
Section 3	1 ft cut = 1740 cy
Section 3B	7 ft cut = 950 cy
Section 4	1 ft cut = 1761 cy

Total volume to be removed 12,955 cy

N

100 0 100 200 300 Feet

PARSONS

SENECA ARMY DEPOT ACTIVITY

SEAD-4 FEASIBILITY STUDY

Figure E
Approximate Area of Excavation for Criteria - E
Cr > 324, Pb > 400

1" = 200' | FEBRUARY 2005

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau D, 12th Floor
625 Broadway, Albany, New York 12233-7013
Phone: (518) 402-9814 • **FAX:** (518) 402-9020
Website: www.dec.state.ny.us

Erin M. Crotty
Commissioner

January 26, 2005

Mr. Stephen Absolom
Chief, Engineering and Environmental Division
Seneca Army Depot Activity (SEDA)
5786 State Route 96
Romulus, NY 14541-5001

Re: NYS Inactive Hazardous Waste Disposal Site No. 8-50-006
Sensitivity Analysis SEAD 4

Dear Mr. Absolom:

The "Knee of the Curve" sensitivity analysis for SEAD 4 outlined in Parsons Briefing Presentation of September 21, 2004 and modified by Parsons Memorandum of October 15, 2004 meets the DEC criteria of attaining the practicable cleanup of this site specific area in a cost effective approach to pre release conditions. This concept is approved for inclusion in the Feasibility Study and PRAP for this SEAD.

As part of this concept we have accepted determination of the horizontal extent of contamination by connecting sample points beyond the contaminated area which meet the cleanup criteria of 60 ppm Chromium and 167 ppm Lead. No removal will be necessary beyond this predetermined boundary. The assumed areas use to estimate cost and volume of contamination will be further delineated with sample results prior to the Remedial Action. The vertical attainment of the cleanup criteria will be verified by sampling post excavation and is not to be determined prior to excavation.

If you have questions, please call me at (518)- 402-9812.

Sincerely,

A. Joseph White, P.E.
Environmental Engineer 3

C:\A-Remedial Bureau A\a Site Specific\Region 8\Seneca Army Depot 8-50-006\OU 6- SEAD 4\approval knee of the curve wpd

ecc: Mr. Steve Absolom, Seneca Army Depot
C. Bethoney, NYSDOH
P. Jones, SCIDA
J. Vasquez, USEPA
R. Battaglia, Seneca Army Depot

Appendix E

MCACES Cost Estimate for
Alternative 3 with Cr > 60 mg/Kg and Pb > 167 mg/Kg

SEAD-4
OFF-SITE DISPOSAL
(Soil: Cr>60 mg/Kg; Pb>167 mg/Kg

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 01/20/05
Effective Date of Pricing: 10/03/96
Est Construction Time: 90 Days

Sales Tax: 7.0%

Currency in DOLLARS

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 2.

Off-Site Disposal: Excavate/Stabilize/Off-site Disposal
- Mobilize, site prep, clear/grub, erosion control, access roads, and survey
- Remove material/debris from abandoned buildings at SEAD-4
- Excavate surface soils, subsurface soils, ditch soils, and sediment in the lagoon with chromium and lead exceeding 60 mg/Kg and 167 mg/Kg, respectively.
- Stockpile and perform TCLP testing
- Perform cleanup verification testing
- Transport soil, sediment, and debris failing TCLP criteria to stabilization area (off-site)
- Stabilize soil, sediment, and debris exceeding TCLP criteria (off-site)
- Transport and dispose soil, sediment, and material in an off-site landfill
- Backfill drainage swales with 6-inch topsoil and hydroseed
- Backfill remainder of excavated area with common fill & topsoil and hydroseed
- Demobilize
- Long-term monitoring

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:

1. The volume of excavation and disposal could vary based on the results of the cleanup verification sampling.

2. The volume of material requiring treatment prior to disposal could vary depending on the TCLP test results.

3. The duration and effort to remediate SEAD-4 could vary depending on actual condition of building.

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

Owner's cost are calculated as a percentage of running total as
2 % for design contingency
3 % for escalation
25 % for construction contingency
3.5 % for other costs
8 % for construction management

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										
33.02.11. Soil (surface, subsurface,ditch)										
HTW AA <STL04 >	For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150 cy)	287.00	EA	0	0	0	0	34,440	34,440	120.00
AFH AA <STL05 >	For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	287.00	EA	0	0	0	0	66,010	66,010	230.00
AFH AA <STL06 >	For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	287.00	EA	0	0	0	0	34,440	34,440	120.00
USR AA <STL07 >	Confirmatory: NYSDEC CLP TAL Inorganics, soil (Severn Trent Lab, 9/99) (Assume 1 test every 100 lf + 20% QC)	53.00	EA	0	0	0	0	8,215	8,215	155.00
33.03. Site Work										
33.03.02. Clearing and Grubbing										
MIL AA <P0204 60752>	Remove and dispose existing chain link fence: Site dml, chain link fence, remove & salvage for reuse	1000.00	LF	52	1,300	0	0	0	1,300	1.30
AF AA <02110 0500 >	Clearing, brush w/dozer & brush rake, light brush	20.00	ACR	320	8,653	12,578	0	0	21,231	1061.54
33.03.06. Roadways										
USR AA <PAR02 >	Grade 20ft wide roadway	3000.00	LF	0	1,800	4,260	0	0	6,060	2.02
USR AA <PAR03 >	Roadway stone - 3" deep esl @ 25% of roadway	3000.00	LF	0	1,560	2,070	17,334	0	20,964	6.99
33.03.08. 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

33.03. Site Work		QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03.11. Erosion control										
B MIL AA <PAR08 >	Silt Fence: Installation and materials high, polypropylene	5500.00	LF	1,155	27,500	2,750	8,828	0	39,078	7.11
B HTW AA <PAR01 >	Hay bales - stalked	5500.00	LF	2	935	0	5,885	0	6,820	1.24
B MIL AA <PAR07 >	Maintain silt fence and remove	5500.00	LF	37	935	0	5,885	0	6,820	1.24
33.06. 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	118,000	0	7,490	0	125,490	125490.00
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
33.07. Building Remediation										
MIL AA <P0171 40100>	Clean up hazardous material within building: Cleanup, floor area, final	47.00	CSF	8	190	15	13	0	218	4.63
HTW <02083 5114 >	HW packaging, overpacks, 18"dia x 34"H, 16ga stl drum, 55gal, DOT 17C	80.00	EA	0	0	0	6,330	0	6,330	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).)	80.00	DR	0	0	0	0	10,700	10,700	133.75
USR AA <WM03 >	Extra fees for overpack use	80.00	EA	0	0	0	0	3,200	3,200	40.00
HTW AA <EW01 >	Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99)	20.00	TON	0	0	0	0	2,340	2,340	117.00
USR AA <PAR12 >	Water treatment	1000.00	GAL	0	0	0	0	1,000	1,000	1.00

33.10. Soil Remediation		QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10. Soil Remediation										
33.10.02. Sitework - All Soils All fill, topsoil, and seeding items for soil remediation are included in the Sitework - All Soils category.										
L MIL AA <PAR13 >	Excavate and stockpile (volumes used for estimate are 30% greater than in-situ volumes)	35820	CY	0	0	0	0	716,400	716,400	20.00
USR AA <PAR09 >	Plastic sheeting for ground and cover: 6mil polyethylene liner	1194000	SF	0	0	0	102,206	0	102,206	0.09
MIL AA <02241 0805 >	Loam or topsoil, furnish & place, imported, 6" deep	10851	CY	957	28,972	15,083	211,661	0	255,716	23.57
USR AA <DEW01 >	Common fill (6") - Material for Backfill, includes cost material (bank sand) and delivery (DeWitt 1999)	26212	TON	0	0	0	122,004	0	122,004	4.65
AF AA <02240 0030 >	Fill, spread borrow w/dozer	33065	CY	397	11,903	21,492	0	0	33,396	1.01
AF AA <02220 5800 >	Compaction, steel wheel tandem roller, 5 ton	33065	CY	235	6,944	5,952	0	0	12,895	0.39
RSM AA <02932 0010 >	Seeding, athletic field mix, 8#/MSFpush spreader	444.00	MSF	444	11,224	0	19,763	0	30,988	69.79
33.10.06. Disposal Transportation of soil to hazardous waste landfill. Assuming that 25% of soil is hazardous.										
HTW AA <EW01 >	Transport and Dispose haz waste, bulk solid, includes 6% disposal taxes & fees (Earthwatch, 10/99)	10333	TON	0	0	0	0	1,208,961	1,208,961	117.00
HTW AA <SM01/ SM02 >	Transport and Dispose nonhaz waste, bulk	30998	TON	0	0	0	0	976,437	976,437	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
TOTAL	SEAD-4			3,605	406,659	76,699	525,272	3,062,689	4,071,319	

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	110	160	1,390	240	570	7,760	7761.84
TOTAL Mobilization	1.00	EA	5,290	110	160	1,390	240	570	7,760	7761.84
33.02 Sampling, & Testing										
33.02.11 Soil (surface, subsurface,ditch)	1.00	EA	197,680	3,950	6,050	51,920	9,090	21,500	290,190	290188.02
TOTAL Sampling, & Testing	1.00	EA	197,680	3,950	6,050	51,920	9,090	21,500	290,190	290188.02
33.03 Site Work										
33.03.02 Clearing and Grubbing	3.00	ACR	31,120	620	950	8,170	1,430	3,380	45,690	15229.26
33.03.06 Roadways	1.00	ACR	37,330	750	1,140	9,800	1,720	4,060	54,800	54799.21
33.03.08 Survey Remediation Area	1.00	ACR	27,870	560	850	7,320	1,280	3,030	40,910	40910.82
33.03.11 Erosion control	1.00	LF	72,820	1,460	2,230	19,130	3,350	7,920	106,900	106900.44
TOTAL Site Work	1.00	EA	169,150	3,380	5,180	44,430	7,770	18,390	248,300	248298.25
33.06 Remedial Design	1.00	EA	423,050	0	12,690	0	15,250	36,080	487,070	487073.89
33.07 Building Remediation	1.00	EA	31,200	620	950	8,190	1,430	3,390	45,800	45799.21
33.10 Soil Remediation										
33.10.02 Sitework - All Soils	1.00	EA	1,759,330	35,190	53,840	462,090	80,870	191,300	2,582,610	2582612.70
33.10.06 Disposal	1.00	EA	3,018,870	60,380	92,380	792,900	138,760	328,260	4,431,550	4431545.57
TOTAL Soil Remediation	1.00	EA	4,778,200	95,560	146,210	1,254,990	219,620	519,570	7,014,160	7014158.27
33.26 Demobilization										
33.26.04 Decontaminate Equipment	1.00	EA	12,190	240	370	3,200	560	1,330	17,890	17887.61
33.26.06 Demobilization	1.00	EA	4,870	100	150	1,280	220	530	7,160	7155.04
TOTAL Demobilization	1.00	EA	17,060	340	520	4,480	780	1,860	25,040	25042.66
TOTAL Remedial Action	1.00	EA	5,621,620	103,970	171,770	1,365,400	254,200	601,360	8,118,320	8118322.14

No errors detected...

* * * END OF ERROR REPORT * * *

SUMMARY REPORTS SUMMARY PAGE

DETAILED ESTIMATE DETAIL PAGE

No Backup Reports...

* * * END TABLE OF CONTENTS * * *

Appendix F

Response to Comments

Response to Comments
From
New York State Department of Environmental Conservation (NYSDEC)

Subject: Draft Feasibility Study at the Munitions
Washout Facility, SEAD-4
Seneca Army Depot Activity, Romulus, NY

Comments Dated: October 3, 2001

Date of Comment Response: January 15, 2001

General Comments:

The Division of Fish and Wildlife find the proposed cleanup levels of lead (167 ppm) and chromium (327 ppm) unacceptable in the ability to protect natural resources for a conservation/recreation area. The proposed cleanup levels do not account for possible synergistic effects from the many highly elevated metal concentrations at the site. All natural resource components need to be protected including plants, invertebrates. and heterotrophic processes. Attached is data from Will and Suter that contain screening values for metals which are protective of all the natural resource components.

Eight metals, specifically aluminum, antimony, beryllium, cadmium, iron, magnesium, manganese, and sodium were detected at concentrations in the on-site groundwater above the NY AWQS Class GA or EPA MCL standards. Benzene and ethyl benzene were also detected above the NYS Class GA standards. One of the proposed remedial action objectives in this draft is to monitor the groundwater for metals and VOCs on a semi-annual basis for one year prior to any remedial actions and for one year on semi-annual basis after completion of all remedial actions. The army then proposes to use the groundwater data "to establish potential trends in groundwater quality and if on a statistical basis, the concentrations of metals present in groundwater at SEAD-4 require any further actions." NY Class GA standards are ARARs. At a very minimum, long term monitoring would be required in order to prove that ARARs are no longer exceeded. A statistical analysis based on four sampling events is inadequate.

Nine metals were detected at concentrations in the on-site surface water above NYS Class C surface water standards. This draft proposes as one of its remedial action objectives to monitor the surface water semi-annually for one year before any remedial actions take place. It is then proposed that "the surface water sampling results would be compared to the Class C surface water standards for selected metals to assess if any trends (either increasing or decreasing) in surface water quality are evident and to assess the effects of potential remedial actions performed on soils and sediments." NYS Class C surface water standards are ARARs and at a very minimum, long-term monitoring would be required in order to prove that ARARs are no longer exceeded. Two sampling events are insufficient to indicate any trends in surface water concentrations.

Under the Detailed Analysis of Presumptive Remedies this draft states that "the presumptive remedies along with any other site-specific remedies (e.g., pre-treatment steps, groundwater remedies, institutional controls) be evaluated against the evaluation criteria set forth in 40 CFR 300.430(e)(9)." On the contrary, this draft does not evaluate institutional controls, as proposed under Alternative 2 in Section 3.2.2.2, against any of the evaluation criteria. Institutional controls should be compared to the evaluation criteria just as any other component of a remedial alternative. At least one unrestricted use alternative should be brought forth into the detailed analysis of alternatives to present a full comparison of the advantages and disadvantages of a range of alternatives, from unrestricted use to a restricted use scenario that required institutional controls and long-term monitoring.

There are nine evaluation criteria referenced under 40 CFR 300.430(c)(9)(iii) and this draft only uses six evaluation criteria. Compliance with ARARs and SCGs, state acceptance and community acceptance were omitted.

Also, this draft feasibility study is unclear on how the remediation will be implemented. The draft suggests that the surface soil contaminated areas to be restored are estimated to be of one-foot depth, while the contaminated subsurface soil areas to be remediated are estimated to be two-foot depth, with no verification sampling. Confirmatory sampling will be necessary to achieve site remedial goals.

Response:

Cleanup Goals for lead and chromium

The Army acknowledges the Division of Fish and Wildlife's rejection of the cleanup goals for chromium and lead in soil that are based on ecological risk calculations. NYSDEC proposes the screening values published by the Oak Ridge National Laboratory (i.e., "Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Terrestrial Plants, Will and Suter, 1994 Revision). Based on the toxicological benchmarks published by the Oak Ridge National Laboratory, the toxicity benchmark of 0.4 mg/kg for chromium and 50 mg/kg for lead would be protective of all natural resource components (Table 1). As stated by one of the Oak Ridge Laboratory's publications (Sample, 1996), exceedance of these benchmarks does not indicate any particular level or type of risk. The benchmarks may be used as comparative tools in screening assessments as well as lines of evidence to support or refute the presence of ecological effects in ecological risk assessments (Sample, 1996), but they are not appropriate to be used as clean up goals.

All of the Oak Ridge Laboratory toxicity benchmark values for chromium are lower than the site background concentration of 30 mg/kg. Specifically, the terrestrial plant benchmark value of 1.0 mg/kg for chromium would indicate a potential adverse environment for plant life at SEAD-4. However, it was observed during the site visit for the RI that the majority of SEAD-4 is composed of successional old field vegetation and that many areas of SEAD-4 are rapidly succeeding into shrubland. Successional south hardwood communities were also observed on the site.

The development of the proposed cleanup goals for chromium and lead was based on the assumptions used in the screening-level ecological risk assessment (SLERA) for SEAD-4. As stated in the Uncertainty Section of the SLERA, the assumptions used for the screening-level ecological risk assessment were very conservative in accordance with Ecological Risk Assessment Guidance for Superfund (ERAGS) process (EPA, 1997). For example, ERAGS specifies that 100% be used for the area-use factor for terrestrial animals and that the bioavailability of contaminants at the site be assumed as 100%. The proposed cleanup goal for chromium was limited by mourning doves. According to the United States Department of Agriculture (USDA) Forest Service Database, mourning doves in the northern half of the breeding range are known to migrate in the fall to winter quarters in various southern locations, returning to breeding grounds in the spring. Therefore, a more realistic value for the area-use factor for the mourning dove is 0.5. This change alone would increase the proposed cleanup goal for chromium to 648 mg/kg. For lead, a bioaccumulation factor (BAF) of 2.1 was used to estimate the cleanup goal based on the short-tailed shrew. If a median BAF value of 0.266 was adopted as summarized in the USEPA Ecological Soil Screening Level Guidance (2000) document and used by Efroymson (1997), the cleanup goal for lead would be 278 mg/kg. In comparison, the preliminary remediation goal recommended by Efroymson for the short-tailed shrew is 740 mg/kg for lead, which is higher than the proposed cleanup goal for lead at SEAD-4 and the revised cleanup goal based on a BAF of .0266.

Although the proposed cleanup goals for SEAD-4 are higher than the toxicological benchmarks, the cleanup goals are comparable with other remediation criteria such as MOE, CCME, and the Dutch Intervention Values. The attached Table 1 presents a comparison of the proposed soil cleanup goals with the cleanup goals developed for the OB Grounds at SEDA, the Dutch Intervention Values, the Canadian Soil Quality Guidelines, and the generic soil criteria in Ontario. The basis for each set of criteria is described below:

- "Guideline for Use at Contaminated Sites in Ontario" (MOE, 1999) presents effects-based generic soil quality criteria for different land use scenarios, which replaced "Guideline for the Decommissioning and Clean-up of Sites in Ontario" (MOE, 1989). The effects-based generic soil quality criteria were calculated to protect human health and ecological receptors (including plants).

- The Dutch Intervention Values are based on an integration of the human and ecotoxicological effects. Ecotoxicological effects are quantified in the form of concentration in the soil above which 50% of the potentially present species and processes may experience negative effects.

- Canadian Council of Ministers of the Environment (CCME) presents generic soil quality criteria which define a "no-adverse effect" level for all types of environmental receptors for residential properties.

- The ROD for the OB Grounds located at SEDA states that soil containing lead concentrations above 60 mg/kg will be covered to protect terrestrial ecological receptors and soil with lead concentrations above 500 mg/kg will be remediated to protect human health.

In general, the proposed cleanup goals are comparable to the remediation goals set by MOE, CCME, Netherlands, and Efroymson. Although the proposed cleanup goals exceed the toxicity benchmarks recommended by NYSDEC, they were based on site-specific considerations and would be protective of the environment at the site.

Remediation of soils at SEAD-4 to protect all natural resource components may not be in the best interest of the overall environment. Removal of the contamination may cause more long-term ecological harm due to wide spread destruction of a habitat than leaving it in place.

In addition, a comparison of the affected area at SEAD-4 with the overall conservation/recreation area indicates that the impact to the habitat in the conservation/recreation area is minimal. Under the Reuse Plan and Implementation Strategy for Seneca Army Depot, SEAD-4 has been included in the conservation/recreation area, which encompasses approximately 7,585 acres. The area at SEAD-4, which has concentrations of lead and chromium exceeding the proposed cleanup goals, is approximately 2 acres, or .03% of the total acreage of the conservation/recreation area.

As discussed above, assumptions used in the SLERA were very conservative. Therefore, the resulting HQ values calculated in the SLERA are not considered a measure of risk but a measure of the level of concern. As stated in Step 3 of the SLERA, an HQ greater than one indicates that a compound is a potential contaminant of concern and additional evaluation is required.

The Army believes that the remedial actions proposed for soil at SEAD-4 meet the intent of TAGM #4046 and are protective of the environment. The proposed remedial actions for soil were developed to ensure that the human health risks from potential exposures to constituents in debris and material within the buildings are eliminated. Furthermore, groundwater will be monitored and groundwater use may be restricted at the site if necessary. The proposed remedial actions will decrease future exposure of wildlife from direct ingestion of and/or direct contact to soil with concentrations of chromium and lead above the proposed cleanup goals as well as other co-located metals.

Groundwater

Please note that the eight metals that were detected at concentrations exceeding the NYSDE GA or EPA MCL criteria at SEAD-4 are aluminum, antimony, chromium, iron, manganese, selenium, sodium, and thallium.

The reason for proposing to monitor groundwater for one year prior to and for one year after the remedial actions is that the data collected from two rounds of groundwater sampling during the RI are inconclusive. For several compounds, a concentration was detected above the GA or MCL criteria in one round of sampling and was undetected or below the criteria in the second round of sampling. The VOCs, antimony, and thallium were detected at concentrations above the respective criteria in round 1 of sampling and not detected in round 2. Chromium and selenium were detected at concentrations above the respective criteria in round 1 and below the criteria in round 2.

Additional groundwater sampling is required to determine if there is an exceedance of the NYSDEC GA or EPA MCL criteria and if the detections that exceeded the criteria were a result of high turbidity in the samples. Following the remedial action, the Army will assess remaining concentrations in the groundwater to determine if additional action is required. Long term monitoring may be required if additional data shows exceedances of the NYSDEC GA or EPA MCL criteria. The text has been revised to clarify this and the reference to a statistical analysis has been removed.

Surface Water

The surface water at the site is not classified by NYSDEC because the drainage ditches and man-made lagoon are either intermittent and/or not recognized as established streams or creeks. Because the drainage ditches form the headwater for Indian 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 SEAD-4 data. The Class C standards are not strictly applicable to the surface water at SEAD-4.

The surface water data collected during the RI field investigation was collected in only one round of sampling. The Army proposes sampling the surface water at four locations within the drainage ditches and analyzing for metals and benzo(a)pyrene. Surface water samples would be collected semi-annually for one year prior to and one year after the remedial action at the site resulting in four samples from each location. Following the remedial action, the Army will be better able to assess the effects of the remedial actions performed on soils and sediments and to determine if additional action is required.

Detailed Analysis

The use of institutional controls including access control, land use restrictions, and the possible restriction of groundwater use, has been added to the list of components common to remedial alternatives 2 and 3 (Section 4.3). The report considers clean up for conservation/recreation use and makes reference to the future use of the property being conservation/recreation, which, by definition, will necessitate the imposition of a land use restriction. Institutional controls will be part of the overall remedial strategy to restrict exposure to those activities involving conservation/recreation. Institutional controls are discussed in the evaluation of long-term effectiveness and permanence for the alternatives.

Unrestricted/residential land use has been evaluated. Two levels of soil protection, unrestricted/residential land use (Case 3) and conservation/recreation (Case 2), have been developed for each remedial alternative in terms of cost. For unrestricted/residential land use, TAGM criteria have been used to determine the volume of soil requiring remediation.

The evaluation factor that will be affected by increasing the level of protectiveness is cost. Increasing the level of protectiveness will increase the volume of soil requiring remediation, which will affect the cost for each alternative. Even though the screening and evaluation of the alternatives was performed based on the conservation/recreation future use, costs were developed separately for each level of protection. As stated in the text, this approach has avoided the redundancy of evaluating each alternative for the EPA criteria for each level of protectiveness.

Evaluation Criteria

Evaluation of the remedial alternatives against the criteria, compliance with ARARs and SCGs, has been added to Section 4, Detailed Analysis of Presumptive Remedies. The two criteria, State/agency acceptance and community acceptance, will be assessed following the comment period for the FS report and the proposed plan.

Remediation Implementation

The depth of soil restoration has been estimated based on surface and subsurface soil data collected from the site during the RI program. The collection of confirmatory samples for the excavation areas will be required as stated in the text. The specific number of confirmatory samples that will be collected and the details of the implementation of the remediation will be presented in a cleanup verification work plan.

Specific Comments:

Comment 1: Page 1-3, Section 1.2.1, Site Description: The first sentence states that "SEDA is an active military facility." Please correct.

Response 1: Agreed. The text has been revised.

Comment 2: Page 1-4, Section 1.2.1, Site Description: In the last paragraph, it states that "Building 2073 is the only building at the facility that is currently used." Please specify what the building is currently being used for.

Response 2: Agreed. Building 2073 is no longer being used since SEDA has been closed. The text has been revised.

Comment 3: Page 2-4, Section.2.3.1, Human Health Risk Assessment: In the third paragraph, for the future indoor park worker, please include a discussion on inhalation.

Response 3: Agreed. A discussion on inhalation has been added to the text.

Comment 4: Page 2-8, Section 2.4, ARAR-Based Remedial Action Objectives: The draft states that surface water at this site is found in "two man-made drainage ditches and a man-made lagoon." It continues to state that Class C standards were used as a basis for comparison for the surface water in the ditches. However, the draft does not specify what ARARs are applicable to the lagoon surface water. Please clarify.

Response 4: The surface water at the site is not classified by NYSDEC because the drainage ditches and man-made lagoon are either intermittent and/or not recognized as established streams or creeks. Because the drainage ditches form the headwater for Indian 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 SEAD-4 data. The Class C standards are not strictly applicable to the surface water at SEAD-4. The text has been revised to clarify this.

Comment 5: Page 2-10, Section 2.4.2, Soil In Ditches: The draft states that the soil found in the ditches at SEAD-4 are similar to those found at Seneca Open Burning Grounds. It continues that because the macro invertebrate sampling in the drainage swales were "pre-dominantly non-aquatic" therefore "nature of the soils found in the ditches is expected to be terrestrial instead of aquatic." A simple visual comparison of sediments/soils in one stream to another that is located more than 3 miles away to rule out whether there is aquatic life in the streams is not valid. As with the Open Burning Grounds site, there should be macroinvertebrate sampling to confirm the presence/absence of aquatic life in the streams. Considering that this site is planned for a conservation/recreation re-use, has the Army ever performed a wetlands assessment for this site?

Response 5:, A site visit was conducted at the SEAD-4 area on November 29, 2001 by a Parsons plant physiologist, Sally Newman, Ph.D., for the purpose of determining the aquatic or terrestrial nature of the drainage ditches located on the site. The following information has been added to Section 1 of the FS Report.

Prior to the site visit, information from existing reference sources was gathered about the site and the following information was found.

> The USDA Soil Conservation Service Soil Survey Map for Seneca County shows two soil types are found at SEAD-4: Angola (AnA-0-3% slopes and AnB-3-8% slopes) and Darien (DaA-0-3% slopes). Neither soil type is listed as hydric in the USDA-NRCS Soil Survey Division's list of Hydric Soils of the United States (www.Statlab.iastate.edu/soils/hydric).
>
> The USGS Topographical Survey Map (Ovid Quadrant) showed no streams and only one small pond at SEAD-4. Topography was nearly flat.
>
> The United States Fish and Wildlife Service's National Wetland Inventory Map (Ovid Quadrant) identified only one tiny cluster of Paulustrine Emergent Marsh (PEM) wetlands along the northern perimeter of SEAD-4.

At the site, the following observations were made. Vegetation on the site is dominated by autumn olive (*Elaeagnus umbellate*) and poverty grass (*Aristida dichotomy*). Both autumn olive and poverty prefer dry, disturbed soils. In the majority of ditches at SEAD-4, the vegetation was dominated by upland species of grasses and forbs as rated by Reed, P.B., Jr. (1988)in The National List of Plant Species that Occur in Wetlands: Northeast (Region1). In some places, the ditches had been excavated down into the seasonal high groundwater table and supported wetland communities dominated by cattails and rushes.

The pond identified by the USGS topographical map consisted of an excavated stormwater detention pond. The source of the water in the pond was groundwater due to the depth of the excavation. During rainfall events, the pond can also receive stormwater runoff from a drainage ditch, which enters the pond at its southeast corner. No water was flowing in the drainage ditch at the time of the site visit. The pond was equipped with an elevated stormwater overflow pipe, which exited the pond on its west side. At the time of the site visit, the water level in the pond was approximately 6 to 7 feet below the overflow pipe. This pipe is the pond's only outlet.

The wetland cluster identified by the NWI map was found to be associated with a stormwater management swale on the northern perimeter of SEAD-4. The swale consisted primarily of saturated soils although some pockets of water ranging from 0 to 6 inches were also present. No defined stream channel was present, but, rather, the area consisted of a broad poorly defined wetland. Vegetation ranged from shrubs (within a wooded area) to cattails (along the road).

As the USGS topographical map indicated, SEAD-4 has no source of hydrology other than rainfall (i.e. no streams are present which conduct water onto the site). The site was found to have excellent stormwater management. The rainwater, when present, migrates down nearly level, shallow ditches that essentially act as level spreaders, allowing the water time to filter into the ground. In Angola and Darien soils, seasonal high groundwater can be at 0.5-1.5 feet. In some locations, the stormwater ditches were excavated down into the groundwater, enabling these areas to remain saturated for a long enough duration to sustain limited wetland vegetation (generally cattails or silky dogwood in the wettest swales and rushes mixed in with upland field grasses and forbs in the others). No ditches with perennial flowing water were present.

Information contained in Dates and Byrne (1997) *Living Waters, Using Benthic Macroinvertebrates and Habitat to Assess Your River's Health*, River Network, Montpelier, VT is useful in assessing the habitat value of SEAD-4's stormwater ditches for macroinvertebrates. Benthic macroinvertebrate organisms are generally found in flowing waters. A current velocity of 0.5 to 2.5 feet per second supports the most diverse communities. Their habitat ranges from shallow, fast moving, rocky bottom areas known as riffles; to deeper, slower moving sandy and gravely bottom areas known as runs; to deep, slow moving muddy-bottom areas known as pools. The cobbly condition of riffles supports the widest variety of macroinvertebrates. Runs contain a smaller variety. And, the uniform bottoms of pools, with smaller soil particle sizes like sands and silts, provide very limited living spaces and surfaces for macroinvertebrates to hold onto. Thus, pools support only a very limited variety of macroinvertebrates. Some macroinvertebrates are very sensitive to temperature levels and fluctuations. Temperature also affects the amount of dissolved oxygen that the water can hold, with cold water holding the most. Macroinvertebrates are sensitive to water level fluctuations, since dry areas are no longer available for living, feeding, and breeding areas for aquatic organisms.

None of the ditches or wetland swales at the SEAD-4 represents adequate habitat for aquatic macroinvertebrate organism. The stormwater ditches at SEAD-4 do not contain waters moving at a current velocity of 0.5 to 2.5 feet per second. No riffles or cobble bottoms are present. The ditch bottoms are, generally, well vegetated with a grasses and rushes. The soils in the ditches are composed of small soil particle sizes like loams and clays. When present, the shallow nature of the water in the ditches provides little insulation against temperature fluctuations. And, the intermittent nature of the water supply (rainfall) in the ditches would cause the ditches to be undependable living and breeding grounds for aquatic macroinvertebrates.

The only area of the site with a consistent water supply is the pond. This detention pond does not possess flowing water and the bottom is coated with silt and algae. As indicated by Dates and Byrne, the uniform bottom of pools supports only a very limited variety of macroinvertebrates.

During the site visit, an overview assessment of the SEAD-4 wetlands was also made. Wetlands on the site are limited to the deepest of the stormwater swales. No wetlands exist at SEAD-4 outside of the stormwater ditch system. Stormwater management is a necessary and beneficial activity, which can create wetlands where none existed before. Nationwide Wetlands Permit #41 (Reshaping Existing Drainage Ditches) of the Code of Federal Regulations 33 Part 330 reads: "This nationwide permit does not apply to reshaping drainage ditches constructed in uplands, since these areas are not waters of the United States, and thus no permit from the Corps is required". The ditches at SEAD-4 were carved into upland soils Angola and Darien. In addition all the wetland swales on the site are isolated, none of them border on waters of the United States (streams, ponds, and lakes). Due to a recent Supreme Court ruling, it is no longer clear whether isolated wetlands can be regulated. The Corp's current policy is to examine these isolated areas on a case by case basis. It is probably unlikely that, upon review, the ACOE would take jurisdiction over this ditch system.

The following conclusions were made concerning SEAD-4:

(1) Only the pond at SEAD-4 has permanent water and may support aquatic life; therefore, the NYSDEC's Technical Guidance for Screening Contaminated Sediments (1999) is applicable to the sediment at the pond bottom. Aquatic receptors should be assessed for the area.
(2) All the other drainage swale areas at SEAD-4 are nonwetlands or not regulated as wetlands. There is no evidence that the areas support the living, feeding, and breeding activities of benthic organisms, i.e., aquatic macroinvertebrates, and allow them to complete their life cycles. In addition, the sediment screening levels established by NYSDEC are based on toxic effects for benthic macroinvertebrates. Therefore, the NYSDEC's guidance should not be applied to these areas. In addition, no aquatic receptors or exposure via preying aquatic/benthic biota should be evaluated.

Comment 6. Page 2-14, Section 2.5, Media Specific Remediation Goals: The draft states that "the determination to accept the residential use cleanup scenario value will be considered if the cost comparison show that the additional cost to achieve a lower cleanup level is affordable." The following statement, "this approach is consistent with NYSDEC's September 21, 1998 letter to the Army and the Army's October 1, 1998 to NYSDEC," is incorrect and should be removed from the text. NYSDEC's letter of September 21, 1998 states that it is a "New York State regulatory requirement to restore sites to pre-release conditions to the extent feasible."

Response 6: Acknowledged. The reference to NYSDECs September 21, 1998 has been removed from the text. However, it is the Army's understanding that NYSDEC has not disagreed with the approach of investigating the cost of unrestricted use for comparison purposes.

Comment 7: Page 3-6, Section 3.3.1, Presumptive Remedy Selection Process: In the last sentence of the first paragraph, please correct the typographical error.

Response 7: Agreed. The text has been revised.

Comment 8: Page 3-9, Section 3.3.2.3, Alternative 3 – Off-Site Disposal: This alternative assumes backfilling with common fill and topsoil. Though this may be necessary in some areas for safety it is not likely needed in all areas for a conservation area. It would be simpler to just grade it rather it than have the extra expense of bringing in backfill.

Response 8: Agreed. The text has been revised to include this as an option.

Comment 9: Page 4-8, Section 4.4.1, Definition of Alternative 2: The proposed soil cover for surface soils exhibiting residual contamination may be applicable to NYCRR Part 360, as the contaminated soil may be considered a solid waste.

Response 9: The proposed cover will be a vegetative cover that will prevent exposure to the metals that are contained in the soil beneath. The proposed vegetative cover will be 12-inches thick but will not include all the components of a landfill closure cap such as a gas venting layer nor a low permeability soil barrier. The vegetative cover will not meet the requirements of NYCRR Part 360. A cap required by NYCRR Part 360 is not considered necessary since the metals are not leaching and the risk to terrestrial receptors due to ingestion can be prevented by a vegetative cover.

Comment 10: Page 4-10, Section 4.4.2.1, Short-term Protectiveness: In the second paragraph, please specify how far "away" the site is located from the SEDA boundary.

Response 10: Agreed. The text has been revised to state that the site is located approximately 1750 feet away from the SEDA boundary.

Comment 11: Page 4-28, Section 4.7, Conclusion: A simple cost comparison is not sufficient in order to demonstrate the advantages versus disadvantages for remedial alternatives that allow unrestricted use in comparison to those that require institutional controls and long-term monitoring. See general comments above.

Response 11: Disagree. As stated in the Response to the general comments, the unrestricted/residential land use has been developed as one level protectiveness for each remedial alternative. Each of the alternatives includes two levels of soil protection including unrestricted/residential land use and conservation/recreation land use. The evaluation factor that will be affected by increasing the level of protectiveness is cost. Increasing the level of protectiveness will increase the volume of soil requiring remediation, which will affect the cost for each alternative. As stated in the text, this approach has avoided the redundancy of evaluating each alternative for each EPA criteria for each level of protection.

Comment 12: Figures 2-10 through 2-12: The tables in the legend of each figure are difficult to read. Please make them legible.

Response 12: Agreed. The figures have been revised.

Table 1
Comparison of Proposed Soil Clean-Up Goals for SEAD-4 to Toxicity Benchmark Values and Remediation Criteria

Chemical	Proposed Clean-up Goal (mg/kg)	Toxicity Benchmark Values (mg/kg)			Remediation Criteria (mg/kg)			CUG at OB Grounds [7]
	Parsons [1]	Oak Ridge Earthworm Benchmark [2]	Oak Ridge Microbial Benchmark [2]	Oak Ridge Terrestrial Plant Benchmark [3]	Dutch Intervention Value [4]	CCME [5]	MOE Soil Remediation Criteria [6]	
Chromium (Total)	324	**0.4**	10	1	380	64~87	750~1000	
Chromium (III)								
Lead	167	500	900	**50**	530	70~600	200~1000	60/500

Table 3. Fish + Wildlife

Notes:

1. Parsons. 2001. Draft Feasibility Study at SEAD-4. Table 2-2.

2. Efroymson, R.A., Will, M.E., Suter II, G.W. 1997. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process. Earthworm benchmark based on Cr(VI) toxicity and microbial benchmark based on Cr(III) toxicity.

3. Efroymson, R.A., Will, M.E., Suter II, G.W., Wooten, A.C. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision.

4. Dutch Ministry of Housing, Spatial Planning and the Environment. 2000. Circular on Target Values and Intervention Values for Soil Remediation.

5. Canadian Council of Ministers of the Environment. 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health. http://www.ec.gc.ca/ceqg-rcqe/Soil.pdf. Soil quality guidelines vary depending on different land use.

6. MOE, 1999. Guideline for use at Contaminated Sites in Ontario. Soil remediation criteria vary depending on different land use and soil type.

7. Parsons, 1999. Final Open Burning (OB) Grounds Record of Decision (ROD). Soils containing lead concentrations above 60 ppm was proposed to be covered and soils with lead concentrations greater than 500 mg/kg was proposed to be remediated.

Bold indicates NYSDEC recommended CUGs. NYSDEC in their comments dated October 3, 2001 suggested all natural resource components be protected including plants, invertebrates, and heterotrophic process. The toxicity benchmarks published by the EPA Oak Ridge Risk Assessment

Response to Comments
From
United States Environmental Protection Agency (US EPA)

Subject: Draft Feasibility Study at the Munitions
Washout Facility, SEAD-4
Seneca Army Depot Activity, Romulus, NY

Comments Dated: September 28, 2001

Date of Comment Response: January 15, 2002

General Comments:

1. There is an inconsistent description of unacceptable human health risks from exposure to the interior of the on-site buildings. The third paragraph on Page 1-2, Section 1.1, indicates that unacceptable health risks are present at SEAD-4 from the presence of metals in the debris that are present in the interior of the on-site buildings. This is confirmed on page 2-5, in the last paragraph of Section 2.3.1 where it is stated that lead may pose an unacceptable risk to the indoor worker upon regular exposure to interior building debris.

   However, the second paragraph on Page 2-4, Section 2.3.1 indicates that Aroclor-1254 (a PCB) is the chemical driving the risk to the future worker. The primary exposure routes are the ingestion of and dermal exposure to the PCBs in the indoor dust.

   Section 2.5.1 indicates that the material and debris in the interior of the buildings at SEAD-4 are media of concern because risks exceeded EPA allowable ranges due to the ingestion of and dermal exposure to the PCBs in the indoor dust. No mention is made here or in the development of cleanup standards regarding the presence of lead, which may be causing unacceptable risk levels.

   The Remedial Action Objectives (RAO)-related discussions and tables should be revised to address cleanup goals that are also protective with regard to lead. Any confirmatory sampling done in conjunction with the RAO for Case 1 should include confirmation that unacceptable levels of lead have also been removed.

Response 1: Agreed. Unacceptable human health risks are due to the presence of Aroclor-1254 and lead in the debris that is present in the interior of the buildings. The text in the third paragraph on page 1-2 has been revised.

The text on page 2-4 discusses the results of the human health risk assessment. The second paragraph on page 2-4 states that the quantitative results indicate that risk to the indoor park worker are due to exposure to Aroclor-1254 in the indoor dust. The qualitative analysis of lead is discussed later in the text of the same section. Based on a comparison to the screening level of 400 mg/kg, there is risk from exposure to debris containing lead in the interior of the buildings. Lead has been added as a compound of concern in the debris found in the interior of the buildings.

It will be difficult to conduct confirmatory sampling in the buildings since the remedial action is to remove all material and debris from the buildings. However, some type of confirmatory sampling for Case 1 will be presented in a Remedial Action Workplan.

2. The discussions in the text regarding the results of the ecological risk assessment do not correspond to the ecological risk tables presented in Appendix B. Specific instances are described in detail in the following specific comments. However, due to these discrepancies, the calculation of ecological soil cleanup goals for chromium and lead presented in Table 2-2 are questionable. One of two actions can be taken to solve this problem:

    - More information should be provided in the FS showing how the remediation goals presented in the text correspond to the ecological risk data presented in Appendix B, or

    - The ecological cleanup goals should be reevaluated with respect to the LOAEL mean HQ values that exceed 1.0 as presented in Appendix B.

Response 2: Acknowledged. The screening level ecological risk assessment (SLERA) has been revised since the Final RI Report has been submitted. Revisions to the risk assessment included separation of total chromium data from hexavalent chromium data and the use of the appropriate toxicity values for each compound. The revised SLERA will be submitted with this Draft Final FS Report.

In addition, a more detailed discussion has been added to Section 2.5.2 concerning the development of the cleanup goals for soil at the site.

3. The FS states that the intended future land use of SEAD-4 has been determined by the LRA, in conjunction with the Army, to be "Conservation/Recreation Area." Alternative 2 specifies a one-foot vegetative cap with filter fabric. While a vegetative cap with filter fabric appears to be an appropriate method to isolate the contaminated surface and subsurface soils from potential receptors, the depth of the vegetative cover may be insufficient to achieve this goal. The FS does not state the specific Conservation /Recreation Area reuse intended for SEAD-4.

    The vegetative cover must be thick enough to prevent plant roots from coming in contact with the contaminated soil or penetrating the filter fabric. A vegetative cover depth of 18 inches appears to be more appropriate for grassy areas that would be mowed fairly regularly. However, if trees or woody vegetation are allowed to grow in the capped sections of SEAD-4, the depth of vegetative cover may need to be three feet or greater to accommodate deeper root depths. A drainage layer may be required above the filter fabric if the filter fabric will not adequately drain infiltration.

Response 3: Acknowledged. The vegetative cap is intended to decrease exposure of wildlife from direct contact with soils primarily containing concentrations of chromium above the cleanup goal. The thickness of the cap is proposed to be 12-inches. Most likely the area of the cap will not be mowed and trees and woody vegetation would eventually grow on the cap. Many plants are not harmed by various metal contaminants and tie them up in their root systems. Several plants are known to be tolerant of chromium. During the November 29, 2001 visit by Parsons' plant physiologist, Sally Newman, to investigate the drainage ditches and pond at SEAD-4, she observed that vegetation was present in the area of the proposed cap with high concentrations of chromium in the surface soils. As part of the proposed re-vegetation process, chromium-tolerant plants, including those already growing in the area, could be used to revegetate the cap. The details would be presented in the Remedial Design Work Plan.

At this point, the specific reuse for SEAD-4, other than being designated as part of the Conservation/Recreation Area, has not been identified.

Specific Comments:

Comment 1: Section 2.3.2, Page 2-6: This section discusses the ecological risk assessment results. It is stated in the last paragraph on Page 2-6 that in Step 3 of the ERA process, alternative toxicity values and mean exposures based on mean concentrations were considered when evaluating contaminants of concern (COCs). The last sentence of this paragraph states that the results of the Step 3 evaluation identified chromium and lead as COCs for soil. According to Table B-2 in Appendix B, antimony, copper, and zinc LOAEL mean HQ values greater than one were calculated for the shrew and a zinc LOAEL mean HQ greater than one was calculated for the hawk. It is unclear why these constituents are not considered COCs for soil.

In addition, it is stated in the same sentence of the text that the results of the Step 3 evaluation identified chromium, copper, and zinc as COCs for sediment. According to table B-5, an aluminum LOAEL mean HQ greater than one was calculated for the great blue heron. It is unclear why aluminum is not considered a COC for sediment.

Response 1: Acknowledged. As stated above, the SLERA has been revised and will be submitted with the Draft Final FS Report. Due to the conservative nature of the assumptions in Step 2 of the SLERA, additional evaluation was required to more fully characterize potential ecological risks and to determine if further evaluation is warranted. In accordance with EPA guidance, this additional evaluation was performed as part of the problem formulation in Step 3. Alternative toxicity values and mean exposures based on mean concentrations were considered when evaluating contaminants of concern (COC). In addition, HQs for the hawk were recalculated using a conservative estimate of the site foraging factor of 10% based on a site size of 30 acres and a foraging range of 576 acres. The results of the Step 3 problem formulation of the revised SLERA concluded that chromium and lead are the compounds of concern for soil.

Step 3 of the revised ERA states that aluminum was eliminated as a compound of concern because the foraging range of the great blue heron is approximately 1.6 acres and the size of the man-made lagoon is 0.7 acres. Comparison of the data indicated that the calculated HQs were overestimated by a factor of approximately 2.

Comment 2: Section 2.3.2, Page 2-7: The first paragraph on Page 2-7 discusses results of the ecological risk assessment with regard to surface water receptors. It is stated in this paragraph that cadmium, cobalt and vanadium were not detected in surface water and that the NOAEL HQ values were less than one for aluminum, iron, manganese, and zinc with regard to the largemouth bass. However, in Table B-5 HQ values were calculated for cadmium, cobalt, and vanadium, indicating that these chemicals were detected in surface water samples. In addition, maximum and mean HQ values greater than one were calculated for iron. These discrepancies should be addressed and the text should be revised as appropriate.

Response 2: The referenced paragraph discusses the re-calculation of risk for the largemouth bass in Step 3 of the SLERA using only the surface water samples collected from the man-made lagoon at the site. Cadmium, cobalt, and vanadium were not detected in the two surface water samples collected from the lagoon (SW4-1 and SW4-2). The text has been revised to clarify that re-calculation of the HQs for the largemouth bass in Step 3 used only the surface water samples collected from the man-made lagoon.

Comment 3: Section 2.4.1, Page 2-10: The Army indicates that the found subsurface contamination pose no risk to human health or the environment. However, the RI reports a maximum concentration of Chromium at 3,820 ppm, with 17 samples exceeding the TAGM value of 10 ppm. The impact of the subsurface soil contamination to the groundwater needs to be addressed within the FS.

Response 3: Acknowledged. The subject of the referenced statement from Section 2.4.1 does not refer to all subsurface contamination. The sentence actually states that "The remaining organic and inorganic constituents which were detected in the subsurface soil samples are considered to pose no human health or environmental risk due to their detection at concentrations which were below or only slightly above their respective TAGM values." Antimony, copper, chromium, and zinc were detected at concentrations above the respective NYSDEC TAGM values in the subsurface soils. However, the results of the human health risk assessment indicated that exposure to these compounds in the subsurface soils does not pose a risk to human health. Based on the results of the SLERA, exposure to soils with concentrations of chromium above 324 mg/kg and lead above 167 mg/kg would pose a threat to ecological receptors.

The remedial action objective for soil is to address surface and subsurface soils with concentrations of chromium and lead exceeding the cleanup goals, which are listed above. Remediation of soils to these values is considered adequate to provide protection to potential ecological receptors.

Chromium was detected in several soil samples exceeding the TAGM value of 29.6 ppm. A maximum concentration of 3,820 mg/kg of chromium was detected at a depth of 2-3.5 feet in SB4-25, which is located southwest of the man-made lagoon. The concentrations of chromium detected in the groundwater samples from monitoring well MW4-4, which is located downgradient of SB4-25, were below the NYSDE GA criteria of 50 ug/L. Groundwater from MW4-4 had no exceedances of the NYSDEC GA or EPA MCL criteria.

In Round 1 of the groundwater sampling during the RI program, aluminum, antimony, chromium, iron, manganese, selenium, sodium, and thallium were detected at concentrations exceeding the NYSDEC GA or EPA MCL criteria. In Round 2 of sampling during the RI, only aluminum, iron, manganese, and sodium were found at concentrations exceeding the respective criteria. Therefore, it was concluded that the groundwater data for SEAD-4 is inconclusive and additional groundwater sampling has been proposed as part of the remedial action for the site. Following the remedial action, the Army will assess the groundwater data to determine if additional action is required. Long-term monitoring may be required if additional data shows exceedances of the NYSDEC GA or EPA MCL criteria.

Comment 4: Table 2-1: This table presents the RAGs for each of the six cases at SEAD-4. Case 4 involves the excavation of contaminated sediment to protect ecological receptors. Clean up criteria are presented for Aroclor 1254, antimony, arsenic, chromium, copper, mercury, nickel and zinc. However, it is stated in Section 2.5.6 that ecological concerns in sediment involve only chromium, copper, and zinc. It is therefore unclear why clean up criteria for Aroclor 1254, antimony, arsenic, mercury and nickel are presented in Table 2-1. This discrepancy should be addressed.

Response 4: Agreed. Table 2-1 has been revised to list the cleanup criteria for sediment as chromium, which was determined to be the compound of concern in sediment based on the revised SLERA.

Comment 5: Table 2-1: Case 3 contains the remedial action objective of restoring SEAD-4 to pre-disposal conditions. The cleanup goals for semivolatiles are NYSDEC TAGM values or method detection limits. Table 2-1 states that the cleanup criteria for benzo(a)anthracene, benzo(a)pyrene and dibenzo(a,h)anthracene are all <330ug/kg. NYSDEC TAGM 4046 states that the cleanup criteria for benzo(a)anthracene, benzo(a)pyrene and dibenzo(a,h)anthracene are <224 ug/kg, <61 ug/kg and <14 ug/kg, respectively, or the method detection limit. It appears that the FS incorrectly referenced the CRQL for these contaminants. This discrepancy should be addressed.

Response 5: Agreed. The cleanup goals for the referenced compounds have been revised to the referenced criteria or the MDL.

Comment 6: Section 2.5.1, Page 2-14: The text states that the RAG for building material and debris is to remove debris present in Buildings 2073, 2076, 2078, 2079, 2084 and 2085. The RI states that Building 2077 was used as a condensate return station. This building appears to be the only standing building that has not been sampled. Identify the reasons for not sampling Building 2077.

Response 6: Review of the Project Scoping Plan for SEAD-4 (Parsons, 1996) indicates that sampling in the buildings was determined based on historical use. Building 2077 was used for general storage and as a condensate return station and was an unlikely source of contamination. For this reason, the building was not sampled.

Comment 7: Section 2.5.2, Page 2-17: This section discusses the media-specific remediation goals for soil. It is stated in the fourth paragraph of this section that the results of the SLERA indicated that the terrestrial receptor with the highest HQ values due to exposure to site soils is the short-tailed shrew. It is assumed that this statement is referring to the calculation of the soil cleanup goal for lead. This statement, however, does not correspond to the data presented in Appendix B. Table B-2 shows that the lead LOAEL mean HQ for the shrew is 1.0 while the lead LOAEL mean HQ for the hawk is 10. It is unclear why the hawk was not used to calculate the soil cleanup goal for lead since it has a higher HQ value.

Response 7: As discussed above, the HQs for the hawk were re-calculated in Step 3 of the SLERA. Table B-4 presents the results of the re-calculation of the HQs for the hawk with the site foraging factor of 10%. The resulting HQ values for the hawk with foraging factor of 10% are less than the HQ values for the shrew. The text has been revised to include a discussion of the re-calculation of HQs for the hawk.

Comment 8: Table 2-2: This table presents the calculated ecological soil cleanup goals for chromium and lead. The dove was chosen as the receptor for modeling the chromium cleanup goal. It is unclear why the dove was chosen instead of the hawk since the chromium LOAEL mean HQ for the dove was 2.8 while the chromium LOAEL mean HQ for the hawk was 16. Justification for the selection of the dove should be provided in the text or the chromium soil cleanup goal should be recalculated base on the hawk exposure parameters.

Response 8: Calculation of the HQs for the hawk in Step 2 of the SLERA used the assumption that the site foraging factor was 100% (Table B-2). In Step 3 of the revised SLERA, the HQs for the hawk were recalculated using a conservative estimate of the site foraging factor of 10% based on a site size of 30 acres and a foraging range of 576 acres. The revised HQs for the hawk are presented in Table B-4 of Appendix B in the FS Report. Because of this, the chromium LOAEL mean HQ for the hawk was reduced to 1.6. A footnote has been added to Tables B-2 and B-3 referencing Table B-4 for the re-calculated HQs for the hawk. Text has been added to include a discussion of the re-calculation of the HQs for the hawk.

Comment 9: Section 2.5.4, Page 2-20: This section indicates that RAO for groundwater includes ongoing monitoring. Since PCBs were the risk driver in groundwater, it is recommended that concentrations of PCBs also be monitored during these efforts to confirm that PCBs are not an ongoing constituent of concern in groundwater. In addition, the monitoring would serve to confirm whether the PCBs detected in groundwater are representative of the groundwater plume at this site.

Response 9: Acknowledged. Aroclor-1260 was detected in only one monitoring well in Round 2 of the groundwater sampling event conducted during the RI program and not in Round 1. Furthermore, the concentration of Aroclor-1260 (0.079 ug/L) detected in Round 1 at MW4-7 was below the NYSDEC GA groundwater criteria of 0.09 ug/L. For these reasons, Aroclor-1260 was not included in the list of compounds for groundwater monitoring in the FS. Furthermore, the data does not indicate that a plume is evident at the site.

Aroclor-1260 has been added to the list of compounds for analysis in groundwater and will be sampled at monitoring well MW4-7 only.

Comment 10: Section 2.5.5, Page 2-21: This section indicates that RAO for surface water includes ongoing monitoring. Since PAHs were the risk driver in surface water, it is recommended that concentrations of PAHs also be monitored during these efforts to confirm that PAHs are not an ongoing constituent of concern in surface water. In addition, the monitoring would serve to confirm whether the PAHs detected in surface water are representative of the surface water at this site.

Response 10: Acknowledged. Excess RME cancer risk and hazard indices for the future resident are due primarily to dermal contact with surface water. These results are due to exposures estimated from the detection of benzo(a)pyrene in one surface water sample (SW4-13). These results are considered highly uncertain due to the low number of samples containing this compound and the low concentrations encountered in the sample. Furthermore, the concentration in the surface water sample was below the Class C criteria. For these reasons, benzo(a)pyrene was not included in the list of compounds to be analyzed in surface water. However, benzo(a)pyrene has been added to the list of compounds for analysis in surface water. Samples will be collected from location SW4-13.

Comment 11: Section 3.3.2.2, Page 3-8: The text states that sediments exceeding the cleanup criteria under Case 5 will be excavated and disposed off-site. Table 2-1 states that Case 5 provides the RAO for surface water and Case 4 provides the RAO for sediments. Revise text to state that sediments exceeding the cleanup criteria under Case 4 will be excavated and disposed off-site. Apply comment to entire FS.

Response 11: Agreed. The text has been revised in regard to Case 4 and sediment criteria.

Comment 12: Section 3.3.2.3, Page 3-9: The text states that long-term groundwater monitoring will not be necessary for Alternative 3-Off-Site Disposal. However, Section 4.3 states that both Alternatives 2 and 3 will include semi-annual site groundwater monitoring for VOCs and metals at six monitoring wells in SEAD-4. Both Alternatives 2 and 3 should contain long-term groundwater monitoring. Clarify this discrepancy.

Response 12: Disagree. The semi-annual groundwater monitoring program referenced in Section 4.3 will be conducted as part of the remedial action objective for groundwater. In Round 1 of the groundwater sampling during the RI program, aluminum, antimony, chromium, iron, manganese, selenium, sodium, and thallium were detected at concentrations exceeding the NYSDEC GA or EPA MCL criteria. In Round 2 of sampling during the RI, only aluminum, iron, manganese, and sodium were found at concentrations exceeding the respective criteria. Therefore, it was concluded that the groundwater data for SEAD-4 is inconclusive and additional groundwater sampling has been proposed as part of the remedial action for the site. Following the remedial action, the Army will assess the groundwater data to determine if additional action is required. Long-term monitoring may be required if additional data show exceedances of the NYSDEC GA or EPA MCL criteria.

For Alternative 3, the off-site disposal alternative, soils with concentrations of chromium and lead exceeding the cleanup goals will be removed and disposed of off site. No long term groundwater monitoring would be required for this alternative if the additional groundwater data collected as part of the remedial action objective for groundwater show that there is no impact to groundwater.

Response to the Comments From United States Environmental Protection Agency

Subject: Draft Final FS and Revised Final RI for SEAD-4
Seneca Army Depot Activity
Romulus, New York

Comments Dated: March 14, 2002

Date of Comment Response: February 12, 2003

General Comments:

Your response regarding inconclusive groundwater sampling results (Response to Comment 3 and 12) proposes a supplemental groundwater investigation, not a remedy. Therefore, EPA recommends that this portion of the site (groundwater media) be addressed under a separate operable unit (OU) in order to move forward with the proposed soil remedies.

Response: Disagree. In previous responses, the Army has indicated that long-term groundwater monitoring may be necessary. Upon further review of the groundwater data, the Army believes that groundwater monitoring is not necessary at SEAD-4. Two rounds of groundwater sampling were conducted during the remedial investigation (RI): the first in March/April 1999 and the second round in July 1999. In the second round of sampling, there were no detections of VOCs, and the concentrations of metals were significantly lower. Turbidity data shows that in both rounds of sampling, there is a clear correlation between elevated metal concentrations and high turbidity values. Table 1 presents the concentrations of metals in each round.

Round 1 was not conducted using low-flow sampling methods, which contributed to higher turbidity and, consequently, higher concentrations of metals. Round 2 sampling was conducted using a low-flow method; hence the turbidity values, and the concentrations, were significantly lower. In Round 1, several metals including individual VOCs, antimony, thallium, chromium and selenium were detected at concentrations exceeding NYSDEC's Class GA standards. In Round 2, these parameters were either detected at concentrations below the standards or not detected. Although some metals including aluminum, manganese, and sodium exceeded the GA standards in Round 2 of sampling, the values detected are consistent with background. Based on these results, groundwater exceedances are attributable to suspended solids in the water, and not representative of groundwater concentrations. Accordingly, the Army does not intend to perform long-term monitoring of groundwater at SEAD-4.

I. <u>Remedial Investigation Report</u>

Comment 1: S*ection* 7.2.3 *Ecological COPCs (page* 7-10): Screening out of COPCs based on frequency of detection should not be done as part of a SLERA. During the refinement of COPCs as part of the BERA process, frequency of detection may be considered in consultation with BTAG. Based upon the number of samples collected, location of samples, and overall data adequacy this may or may not be acceptable. Refer to "The Role of Screening-Level Risk Assessment and Refining Contaminants of Concern in Baseline Ecological Risk Assessments," Eco Update (EPA 540/F-01/014) for additional information.

Response 1: Agreed. Based on a conference call between Parsons and the EPA on January 29, 2002 (see attached meeting notes), frequency of detection will not be used to screen out COPCs as part of a SLERA. All the constituents that failed the screening test (either by exceeding the benchmark values or not having a benchmark value) were carried through the HQ calculation. Frequency of detection has been addressed in Section 7.6 (Further Refinement of Contaminants of Concern) to support the decision of the refinement of chemicals of concern. The ecological risk assessment has been revised to reflect these changes.

Comment 2: The correct spelling of the author of the Oak Ridge soil criteria document is "Efroymson" (page 7-12).

Response 2: Agreed. The text has been revised.

Comment 3: It is inappropriate to screen out COPCs based upon their relation to background data (pages 7-14,7-17, etc). Refer to the Eco Update indicated above.

Response 3: Agreed. Based on a conversation between Parsons and the EPA on January 29, 2002 (as attached), COPCs are no longer eliminated based on the background concentrations. Rather, a risk management section (Section 7.7) has been added to present the Army's position that when background is the major contributor to the elevated HQs for the COPCs, these constituents do not warrant further evaluation. Tables presenting background comparisons (i.e., Tables 7-2A, 7-2B, and 7-2C) have been removed and the remaining tables in Section 7.0 have been renumbered. The ecological risk assessment in Appendix H has been revised accordingly.

Comment 4: Table H.7A: Ditch sediments are now considered ditch soils and they are screened against appropriate soil guidelines. It should be indicated whether the depth of collection was from the top 6" or from the top 12".

Response 4: Agreed. The depth of collection was from the top 6". The table has been revised to include this information.

Comment 5: It should be noted that the referenced sediment guidance values in Table H.7B are from NYSDEC, 1999 and not from USEPA, 1999.

Response 5: Acknowledged. It should be noted that the NYSDEC (1999) document was referenced in Table H.7B as versus the USEPA (1999).

Comment 6: Table H.9: Please indicate whether the maximum surface water concentrations were from the pond or drainage ditch.

Response 6: Agreed. The locations of the maximum surface water concentrations for COPCs were SW4-13, SW4-19, and 4Pipe, which were all located in drainage ditches. A note has been included in Table H.9 to indicate that the locations where the maximum surface water concentrations were detected (i.e., SW4-13, SW4-19, and 4Pipe) are in drainage ditches.

Comment 7: Table H.12: An explanation should be provided as to when CFs are used; specifically it is unclear why CFs were not used to calculate a NOAEL from a LOAEL, or for study duration (Tables H.12 & H.13).

Response 7: Agreed. An endpoint conversion factor (CF) was used in the case where a NOAEL was used to estimate the LOAEL or a LOAEL was used to estimate the NOAEL. According to the USEPA Ecological Risk Assessment Guidance for Superfund (USEPA 1997), a standard practice to derive a NOAEL when a LOAEL, but not a NOAEL value, is available, is to multiply the LOAEL by 0.1. Therefore, to derive a NOAEL from a LOAEL, an endpoint CF of 0.1 was applied to the LOAEL. Conversely, a CF of 10 was applied to a NOAEL in order to derive a LOAEL.

In addition, a study duration CF was used to normalize the exposure duration. If the exposure duration was subchronic [less than 90 days for rodents; less than 10 weeks for birds (Sample et al. 1996)], a study duration CF of 0.1 was applied to standardize the value for chronic exposure.

The total CF is the product of the endpoint CF and the study duration CF.

It should be noted that Table H.12 has been replaced by Tables H.12A and H.12B, which present NOAEL values for the meadow vole and the short-tailed shrew, respectively. Similarly, Table H.13 has been replaced by Tables H.13A and H.13B, which present LOAEL values for the meadow vole and the short-tailed shrew, respectively. A note has been included in each of the above tables (i.e., Tables H.12A, H.12B, H.13A, H.13B) to clarify the use of the CFs.

Comment 8: Tables H.35, H.37: Calculated Ditch Soil Exposure -Meadow Vole and Calculated Ditch Soil Exposure-Short Tailed Shrew: Certain variables used in the calculation of exposure dose should be provided; specifically BW, I_p, CF (for organics, inorganics a default of 0.2 is used), I_a, and I_s. These variables should be provided similar to the variables provided for the Red-tailed hawk calculations in Table H.39 and the Mourning Dove calculations in Table H.41.

Response 8: Agreed. Tables H.35 and H.37 have been revised to include the values of the variables (BW, I_p, CF, I_a, and I_s). In addition, variables such as body weight and wildlife intake rate for the ecological receptors are presented in Table H.16.

Comment 9: The discussion that NOAEL max HQs were greater than one but less than five should be removed from the second paragraph on page 7-38 (section 7.6.2 Identification of Soil COCs) and throughout the document. Discussion of "low HQs" should be removed from the discussion on page 7-39.

Response 9: Agreed. The text has been revised to address the comment.

Comment 10: Calculations based on a hawk site foraging factor of 10% are found on Table 7-7, not Table 7-6. This should be corrected in the first paragraph on page 7-39.

Response 10: Agreed. The text has been revised to address the comment. It should be noted that since Tables 7-2A/B/C have been removed from the document, Tables 7-6 and 7-7 have been renumbered as Tables 7-5 and 7-6, respectively.

Comment 11: Antimony, copper and zinc should be retained as COCs for surface soil, based on the summary of HQs for the shrew in Table 7-3 (pages 7-39 and 7-40).

Response 11: Acknowledged. It should be noted that Table 7-3 has been renumbered as Table 7-2. In addition, bioaccumulation factor (BAF) values for inorganics (as presented in Table H.15) have been updated and the USEPA recommended values presented in the Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities (USEPA, 1999) have been adopted for the risk characterization. The updated Table (i.e., Table 7-2) is attached.

As shown in Table 7-2, for the dove the hazard quotients associated with the maximum detected copper concentration were slightly above 1 (i.e., 2.0 and 1.6 for NOAEL and LOAEL scenarios, respectively). The max HQs for the shrew were greater than one (6.5 and 5.0, respectively, for the NOAEL and LOAEL scenarios). As discussed in Section 7 of the RI, it was assumed that the contaminant was 100% bioavailable for the screening level ERA. However, this assumption is very conservative. Copper binds relatively strongly to soils. This adsorption to soils is less affected by pH than other metals, making copper less likely to become bioavailable in the acidic conditions of an animal's digestive tract (ATSDR, 1990). In addition, the average copper concentration at the site poses no significant risk to any wildlife receptors. Therefore, copper is not expected to pose adverse effects at the site and should not be considered a COC.

For zinc, the NOAEL max hazard quotient for the shrew and the dove were slightly above one (1.6 and 1.9 for the shrew and the dove, respectively). Similarly, the 100% bioavailability for zinc is a very conservative assumption, and therefore, zinc is not expected to pose any adverse effects and should not be considered a COC.

For antimony, the maximum detected concentration is associated with elevated HQs for the shrew (i.e., 115 and 12 for the NOAEL and LOAEL scenarios, respectively). The mean HQs for the shrew were 6.4 and 0.6 for the NOAEL and LOAEL scenarios, respectively. All the other HQs are less than one. It should be noted that the toxicity reference value (TRV) identified for antimony (i.e., 0.149 mg/kg-day) is based on a drinking water study where antimony potassium tartrate was used. Antimony potassium tartrate is used as mordant in the textile and leather industry, pesticide, and insecticide. Based on the historical use of the site (ammunition washout), antimony compounds such as antimony alloys and antimony oxides are expected to be the predominant components at the site. A literature review of the toxicity data for antimony trioxide and elemental antimony indicates that the NOAELs published are greater than 50 mg/kg-day. If the alternative TRV (i.e., 50 mg/kg-day) were used, all HQs for antimony would be less than 1. Based on the above discussion, it is concluded that antimony is not expected to pose any adverse effects and should not be considered a COC.

Comment 12: Antimony should be retained as a COC for ditch soil, based on the summary of HQs for the shrew in Table 7-5 (page 7-44). In the discussion of vanadium (first paragraph page 7-46) it should be noted whether the HQ for the mean concentration (excluding the hot spot area) was greater than "1 ". It is unclear why site foraging factors for the dove are discussed for zinc. Zinc should be retained as a COC based on HQs calculated for the shrew (page 7-46).

Response 12: Acknowledged. It should be noted that Table 7-5 has been renumber as Table 7-4. In addition, BAF values for inorganics (as presented in Table H.15) have been updated and the USEPA recommended values presented in the Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities (USEPA, 1999) have been adopted for the risk characterization. The updated Table (i.e., Table 7-5) is attached.

As discussed in the response to Comment 11, the HQs for antimony were based on a very conservative TRV for antimony potassium tartrate. Based on the historical use of the site (ammunition washout), antimony compounds such as antimony alloys and antimony oxides are expected to be the predominant components at the site. A literature review of the toxicity data for antimony trioxide and elemental antimony indicates that the NOAELs published are greater than 50 mg/kg-day. If the alternative TRV (i.e., 50 mg/kg-day) were used, all HQs for antimony would be less than 1. Based on the above discussion, it is concluded that antimony is not expected to pose any adverse effects and should not be considered as a COC.

The text has been revised to indicate that the HQ for the mean vanadium concentration (excluding the hot spot area) is greater than "1” and therefore, vanadium in ditch soil is considered a COC. However, as the mean vanadium concentration (excluding the hot spot area) is lower than two times of the background, the Army's risk management position (as presented in Section 7.7) is that vanadium does not warrant further evaluation for the ditch soil at SEAD-4.

For zinc the NOAEL Max HQ was slightly above one (i.e., 1.1) for the dove. All the other HQs for the other receptors were less than 1 for the dove. As a result, zinc in ditch soil is not considered a COC.

Comment 13: The reevaluation of surface water data based on samples SW4-1 and SW4-2 should be shown in a Table, so it is clearly understood why there are no longer COPCs for surface water (page 7-48).

Response 13: Agreed. Table 7-7, which presents the hazard quotients for surface water in the pond, has been added to the text.

Comment 14: A primary measurement endpoint is not the calculation resulting in a LOAEL max HQ (page 7-50).

Response 14: Agreed. The text has been revised to address the comment.

II. <u>Feasibility Study</u>

Comment 1: All comments noted above regarding selection of COCs and the SLERA are also applicable to the Feasibility Study.

Response 1: Acknowledged. Refer to the above response to comments regarding selection of COCs and the SLERA. In summary, in the revised SLERA, all the constituents that failed the screening test (either by exceeding the benchmark values or by not having a benchmark value) were carried through the HQ calculation. COPCs were no longer eliminated based on the background concentrations or on a low frequency of detection. Rather, frequency of detection has been addressed in Section 7.6 (Further Refinement of Contaminants of Concern) to support the decision of the refinement of chemicals of concern. In addition, a risk management section (Section 7.7) has been added to present the Army's position that when background is the major contributor to the elevated HQs for the COPCs, these constituents do not warrant further evaluation. The ecological risk assessment in Appendix H has been revised accordingly.

Comment 2: NYSDEC TAGM values are not appropriate ecological screening values for soils (page 1-15).

Response 2: Acknowledged. It should be noted that the NYSDEC TAGMs were not used as screening values, as shown in Table H.5 of the RI. The statement has been revised to clarify that the NYSDEC TAGM was considered an ARAR, but not an ecological screening value

Comment 3: Upon completion of Steps 1 and 2 of the ERA a SMDP is reached, rather than at the end of Step 3.

Response 3: Agreed. The SLERA presented in the SEAD-4 RI is comprised of Steps 1 and 2 as described in EPA's supplemental ERAG guidance (June 2001). An additional step was taken to refine the COCs as part of Step 3 in accordance with ERAGs.

The Army has chosen to implement this additional step, providing information to support the elimination or retention of COPCs. It is understood that ERAGs recommends a Scientific Management Decision Point (SMDP) prior to starting the baseline risk assessment process. The Army's inclusion of Step 3 in the RI is not an attempt to circumvent the SMDP, but rather it is a method to provide input up front. The Army would be happy to discuss the adequacy of the data with respect to the findings of the screening risk assessment with the EPA, and the Army proposes to schedule a meeting in the near future.

The text has been revised to reflect that SLERA (including Steps 1 and 2 of ERAGS) and an additional step to refine the COCs (as part of Step 3 of ERAGS) have been presented in the RI report.

Comment 4: The cleanup activities recommended for Case 2 and Case 3 are confusing as it appears that different values are being used to clean up chromium and lead in surface soil depending upon whether (page 2-28).

Response 4: Acknowledged. The different cases represent different cleanup goals; consequently, the cleanup goals for chromium and lead vary among the different cases. Case 2 would be protective of ecological receptors and would remediate the site in accordance with its proposed future use, conservation/recreation. In accordance with 6 NYCRR 375–1.10, Case 3 was presented, which provides cleanup goals that would restore the site to its pre-disposal condition.

Comment 5: The reevaluation of surface water data based on samples SW4-1 and SW4-2 should be shown in a table so that it is clearly understood why there are no longer COPCs for surface water.

Response 5: Agreed. Table 7-7, which presents the hazard quotients for surface water in the pond, has been added to the text.

Comment 6: The cleanup activities recommended for Case 2 and Case 3 are confusing as it appears that different values have been used to cleanup chromium and lead in surface soils. Ecologically protective numbers have been developed and TAGM values are also being used. The latter are considerably lower than the concentration derived to be protective of ecological receptors (page 2-28).

Response 6: Acknowledged. The different cases represent different cleanup goals; consequently, the cleanup goals for chromium and lead vary among the different cases. Case 2 would be protective of ecological receptors and would remediate the site in accordance with its proposed future use, conservation/recreation. In compliance with 6 NYCRR 375–1.10, Case 3 was presented, which provides cleanup goals that would restore the site to its pre-disposal condition. Case 3 is a theoretical scenario that would result in unrestricted use for the site and would enable the site to be used for residential use. While the current land use determination for this site is conservation/recreation, the more conservative residential use cleanup scenario, Case 3, received further theoretical consideration in this process for cost comparison purposes.

III. Response to Comments on the FS

Comment 1: All comments are acceptable with the following exception: As noted for the Feasibility Study, all comments regarding COCs and the revised SLERA are applicable to the Response To Comments.

Response 1: Acknowledged. All comments regarding COCs and the revised SLERA have been addressed. In summary, all the constituents that failed the screening test (either by exceeding the benchmark values or by not having a benchmark value) were carried through the HQ calculation. COPCs are no longer eliminated based on the background concentrations or on a low frequency of detection. Rather, frequency of detection was been addressed in Section 7.6 (Further Refinement of Contaminants of Concern) to support the decision of the refinement of chemicals of concern. In addition, a risk management section (Section 7.7) has been added to present the Army’s position that when background is the major contributor to the elevated HQs for the COPCs, these constituents do not warrant further evaluation. The ecological risk assessment in Appendix H has been revised accordingly.

TABLE 1
Analytical Groundwater Results at SEAD-4
SENECA ARMY DEPOT ACTIVITY

								SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4	
								MW4-1		MW4-1		MW4-1		MW4-10		MW4-10	
								MW4-1		42017		42031		42026		42032	
								5.4		11		12.5		8.4		10	
								9.4		11		12.5		8.4		10	
								1/21/1994		4/1/1999		7/7/1999		3/30/1999		7/7/1999	
								SA		SA		DU		SA		SA	
								ESI		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :	
Parameter	Units	Maximum	Frequency	Action Leve	Exceed	Detect	Analyses	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)
Aluminum	UG/L	3820	90%	50	25	27	30	41.9	U	**2430**	J	**322**		**222**	J	**167**	J
Antimony	UG/L	39.3	23%	3	5	7	30	21.6	U	2.2	U	3.7	U	2.2	U	3.7	U
Arsenic	UG/L	6.5	17%	25	0	5	30	2.2	J	1.8	U	5.2	U	1.8	U	6.5	J
Barium	UG/L	121	100%	1000	0	30	30	19.6	J	30.9	J	22.3	J	27.6	J	33.4	J
Beryllium	UG/L	6.3	10%	4	1	3	30	0.4	U	0.1	U	0.4	U	0.1	U	0.4	U
Cadmium	UG/L	5.6	7%	10	0	2	30	2.1	U	0.3	U	0.9	U	0.3	U	0.9	U
Calcium	UG/L	147000	100%		0	30	30	137000		115000		112000		75800		81800	
Chromium	UG/L	260	60%	50	1	18	30	2.6	U	2.8	J	0.8	U	8.1	J	0.86	J
Cobalt	UG/L	8.2	17%		0	5	30	4.6	J	1.5	U	3.4	U	1.5	U	3.4	U
Copper	UG/L	37.6	30%	200	0	9	30	3.1	U	4.3	J	2.9	U	2.4	U	2.9	U
Cyanide	UG/L	0	0%	100	0	0	28	5	U	5	U	5	U	5	U	5	U
Iron	UG/L	6900	90%	300	15	27	30	**332**		**2310**		**320**		257		204	
Lead	UG/L	2.2	13%	25	0	4	30	0.5	U	0.9	U	0.8	U	0.9	UJ	0.8	U
Magnesium	UG/L	57600	100%		0	30	30	57600		51700		49000		28800		22600	
Manganese	UG/L	855	93%	300	5	28	30	**346**		42.9		17.8		246		145	
Mercury	UG/L	0.04	7%	2	0	2	30	0.04	U	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	UG/L	9.9	40%		0	12	30	4	U	6	J	4	U	1.9	J	4	U
Potassium	UG/L	14400	100%	10	30	30	30	**7380**		**2900**	J	**2200**	J	**2000**	J	**3350**	J
Selenium	UG/L	24	37%	10	3	11	30	2.1	J	5.1		2.9	U	**10.4**		3.9	J
Silver	UG/L	6.7	17%	50	0	5	30	4.2	U	0.9	U	2.5	U	1	J	2.5	U
Sodium	UG/L	82600	100%	20000	7	30	30	11700		6820		7930		7990		10200	
Thallium	UG/L	4.9	10%	2	3	3	30	1.2	U	1.9	U	3	U	**3.3**	J	3	U
Vanadium	UG/L	11.4	30%		0	9	30	3.7	U	4.3	J	2.5	U	1.8	J	2.5	U
Zinc	UG/L	95	87%	300	0	26	30	19.1	J	82.8		7.1	J	27.6		3	U
Turbidity	NTU									28		9.67		8.9		1.56	

SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4	SEAD-4
MW4-11	MW4-11	MW4-12	MW4-12	MW4-13	MW4-13	MW4-2	MW4-2	MW4-3	MW4-3	MW4-3
42027	42035	42028	42034	42029	42041	MW4-2	42018	MW4-3	42019	42033
9	10	8.5	12.9	7.9	9	2.2	5.3	3.9	8.5	10.95
9	10	8.5	12.9	7.9	9	3.2	5.3	7.9	8.5	10.95
3/31/1999	7/8/1999	3/30/1999	7/8/1999	3/31/1999	7/9/1999	2/4/1994	4/1/1999	1/20/1994	3/29/1999	7/7/1999
SA	SA	SA	SA	SA	SA	SA	SA	SA	SA	SA
RI Phase 1 Step :	RI Phase 1 Step :	RI Phase 1 Step :	RI Phase 1 Step :	RI Phase 1 Step :	RI Phase 1 Step :	ESI	RI Phase 1 Step :	ESI	RI Phase 1 Step :	RI Phase 1 :
Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value
947 J	**1390**	**1260** J	**1260**	**320** J	**308**	**435**		**725**	22.8 J	**445**
13.8 J	3.7 U	2.9 J	3.7 U	2.2 U	3.7 U	**39.3** J		21.4 U	2.2 U	3.7
1.8 U	5.2 U	1.8 U	5.2 U	1.8 U	5.9 J	1.4 U		1 J	1.8 U	5.2
35.2 J	55.1 J	53.8 J	57.3 J	30 J	118 J	19.3 J		42.7 J	46.1 J	54
0.1 U	0.4 U	0.1 U	0.4 U	0.1 U	0.4 U	0.4 U		**6.3**	0.1 U	0.4
0.3 U	0.9 U	0.3 U	0.9 U	0.3 U	0.9 U	2.1 U		5.6	0.3 U	0.9
119000	84100	134000	128000	61900	103000	66300		122000	98400	96300
0.7 U	3.2 J	3.2 J	2.6 J	1.7 J	0.82 J	2.6 U		6.9 J	0.7 U	0.8
1.5 U	3.4 U	1.5 J	3.4 U	1.5 U	3.4 U	4.4 U		8.2 J	1.5 U	3.4
2.4 U	3.8 J	2.4 U	2.9 U	2.4 U	10.2 J	3.1 U		6.6 J	2.4 U	2.9
5 U	5 U	5 U	5 U	5 U		5 U		5 U	5 U	5
1280	**1920**	**1990**	**1460**	297	**1150**	**471**		**745**	14.9 U	**415**
0.9 UJ	0.8 U	0.9 UJ	0.8 U	0.9 UJ	0.8 U	1.9 J		0.56 J	0.9 UJ	0.8
40000	19800	30100	28100	5590	15600	10100		32800	25600	25700
288	229	262	137	**378**	**855**	60.5		229	0.4 U	11.4
0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.04 U		0.04 J	0.1 U	0.1
1.4 U	4 U	4 J	4 U	3.1 J	5.8 J	4 U		4.4 J	1.4 U	4
4570 J	**4520** J	**3110** J	**1540** J	**2990** J	**14400**	**1840** J		**5250**	**1480** J	**1480**
1.8 U	2.9 U	**13.4**	2.9 U	1.8 U	2.9 U	0.7 U		1.4 J	1.8 U	2.9
0.9 U	2.5 U	0.9 U	2.5 U	1.2 J	2.5 U	4.2 U		6.7 J	0.9 U	2.5
82600	**63100**	**35200**	**22700**	4650 J	8090	12400		**31100**	**23200**	**22200**
1.9 U	3 U	**4.9** J	3 U	1.9 U	3 U	1.2 U		1.2 U	1.9 U	3
1.6 U	4.7 J	3.3 J	2.5 U	1.6 U	2.5 U	3.7 U		7.7 J	1.6 U	2.5
9 J	10.5 J	7.9 J	5.3 J	9.3 J	16.2 J	15.2 J		17.7 J	3.2 J	4
30	30.8	31	8.4	4.8	8.4		16.4		0.7	3.81

TABLE 1
Analytical Groundwater Results at SEAD-4
SENECA ARMY DEPOT ACTIVITY

	SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4	
	MW4-4		MW4-4		MW4-4		MW4-5		MW4-5		MW4-6		MW4-6		MW4-6		MW4-6		MW4-7	
	MW4-4		42020		42036		MW4-5		42021		42022		42030		42039		42040		42023	
	4.9		10		10		3.1		7		9		9		11		11		6.1	
	8.9		10		10		5.1		7		9		9		11		11		6.1	
	2/1/1994		4/24/1999		7/8/1999		1/20/1994		4/24/1999		4/1/1999		4/1/1999		7/10/1999		7/10/1999		3/29/1999	
	SA		SA		SA		SA		SA		SA		DU		SA		DU		SA	
Step :	ESI		RI Phase 1 Step :		RI Phase 1 Step :		ESI		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :	
(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)
	1240		10.4	U	18.9	U	**108**	J	**249**		**226**	J	**115**	J	**75.3**	J	39.5	J	**170**	J
U	**33.8**	J	2.2	U	3.7	U	21.4	U	2.2	U	2.8	J	2.2	U	5.2	U	3.7	U	2.2	U
U	1.4	U	1.8	U	5.2	U	0.8	U	1.8	U	1.8	U	1.8	U	5.2	U	5.2	U	1.8	U
J	46.7	J	37	J	41.1	J	36.1	J	38.5	J	19.7	J	18.6	J	99.1	J	28.2	J	19.5	J
U	0.4	U	0.22	J	0.4	U	0.4	U	0.26	J	0.1	U	0.1	U	0.4	U	0.4	U	0.1	U
U	2.1	U	0.3	U	0.9	U	2.1	U	0.3	U	0.3	U	0.3	U	0.55	J	0.9	U	0.3	U
	123000		94200		91900		147000		128000		48900		46300		73000		68100		43800	
U	21.3		1.8	J	2.9	J	2.6	U	0.7	U	0.7	U	1	J	0.8	U	0.8	U	0.7	U
U	4.4	U	1.5	U	3.4	U	5.2	J	1.5	U	1.5	U	1.5	U	2.5	U	3.4	U	1.5	U
U	37.6		1	U	2.9	U	3.1	U	1.9	J	2.4	U	2.4	U	4.5	J	2.9	U	2.4	U
U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
	2270		14.9	U	65.9	J	143		296		245	J	153	J	76.7	J	20.8	U	196	
U	2.2	J	0.9	U	0.8	U	0.5	U	0.9	U	0.9	U	0.9	U	0.8	U	0.8	U	0.9	UJ
	19100		13700		13400		31000		18400		5700		5420		8890		8860		5680	
J	263		0.4	U	7.4	J	**477**		8.5	J	30.2		27.4		117		116		42.8	
U	0.04	U	0.1	UJ	0.1	U	0.04	J	0.1	UJ	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
U	6.4	J	1.4	U	4	U	4	U	2.2	J	1.4	U	2	J	2.3	U	4	U	1.5	J
J	**4540**	J	**766**	J	**1110**	J	**7320**		**1050**	J	**366**	J	**260**	J	**1090**	J	**1110**	J	**1560**	J
U	0.7	U	1.8	U	2.9	U	0.9	J	3.2	J	1.8	U	1.8	U	2.9	UJ	2.9	U	2.6	J
U	4.2	U	0.9	U	2.5	U	4.2	U	0.9	U	0.9	U	0.9	U	2.5	J	2.5	U	0.9	U
	11200		9270		10500		14100		11200		2260	J	2030	J	5560		6600		5740	
U	1.2	U	1.9	U	3	U	1.2	U	1.9	U	1.9	U	1.9	U	2.2	U	3	U	**3.7**	J
U	4.9	J	1.6	U	2.5	U	3.7	U	1.6	U	1.6	U	1.6	U	2.9	U	2.5	U	1.6	U
J	95		6.2	J	4.3	J	42.6		10.8	J	2.3	J	48	J	81.1	J	3	UJ	3.5	J
			3.5		4.49				12		18.2		18.2		1.34		1.34		7.3	

TABLE 1
Analytical Groundwater Results at SEAD-4
SENECA ARMY DEPOT ACTIVITY

SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4		SEAD-4	
MW4-7		MW4-8		MW4-8		MW4-9		MW4-9		MW4-9	
42042		42024		42037		42025		42038		042038A	
8.1		8.8		11		6.5		8		8	
8.1		8.8		11		6.5		8		8	
7/10/1999		3/30/1999		7/10/1999		3/30/1999		7/8/1999		7/8/1999	
SA		SA		SA		SA		SA		SA	
RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step :		RI Phase 1 Step 1	
Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)	Value	(Q)
3820		**176**	J	**289**		**2040**	J	**91.8**	J		
3.7	U	**3.2**	J	3.7	U	**3.7**	J	3.7	U		
5.2	U	1.8	U	5.5	J	1.8	U	5.2	U		
121	J	20.3	J	39.2	J	32	J	44.4	J		
0.4	U	0.1	U	0.4	U	0.1	U	0.4	U		
0.9	U	0.3	U	0.9	U	0.3	U	0.9	U		
102000		57300		107000		26400		92400			
9.3	J	2.3	J	1.8	J	**260**		21.8			
3.9	J	1.5	U	3.4	U	1.5	U	3.4	U		
6.6	J	2.4	U	3.2	J	2.4	U	2.9	U		
		5	U	5	U	5	U	5	U		
6900		228		**1090**		**868**		86.7	J		
1	J	0.9	UJ	0.8	U	0.9	UJ	0.8	U		
20200		6150		20200		6500		20800			
187		30.4		**410**		13.5	J	87.6			
0.1	U	0.1	U	0.1	U	0.1	U	0.1	U		
9.9	J	1.4	U	4	U	2.1	J	4	U		
9450		**968**	J	**8580**		**1130**	J	**3580**	J		
2.9	UJ	**24**		3	J	1.8	U	2.9	U		
2.5	U	1.2	J	2.5	U	0.9	U	2.5	U		
9380		3840	J	9930		6760		10500			
3	U	1.9	U	3	U	1.9	U	3	U		
11.4	J	1.9	J	2.5	U	1.6	J	2.5	U		
29.5		8.8	J	3	U	12.2	J	3	U		
100		10		6.4		31		3.71			

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

Subject: Draft-Final Feasibility Study at the Munitions Washout Facility (SEAD-4) January 2002 and Revised Final Remedial Investigation at the Munitions Washout Facility (SEAD-4) January 2002
Seneca Army Depot
Romulus, New York

Comments Dated: April 4, 2002

Date of Comment Response: February 12, 2003

General Comments:

General Comment No. 1: As stated in the Department's October 31 2001 letter, the Division of Fish, Wildlife and Marine Resources find the proposed cleanup goals of 324 ppm for chromium (total) and 167 ppm for lead unacceptable. Those proposed cleanup goals do not protect all components of the Seneca Army Depot environment. They are only indicative of the risk to two species; dove and short-tail shrew. The proposed cleanup goals should provide for protection for all elements that make for a complete and healthy environment including plants, earthworms, etc.

Response No. 1: Disagreed. Recently, the Army has received indications from the Seneca County Industrial Development Agency that a future reuser of SEAD-4 will be interested in using the buildings and grounds at SEAD-4, and conduct light industrial activities. The buildings are structurally sound and could be used by the reuser. Since this area most likely would be used for industrial activities, the Army believes that the ecological cleanup goals that were proposed by the Army in the Feasibility Study are no longer appropriate. The Army will propose land use restrictions to this site to limit activities to industrial requirements. These restrictions will be further described in the proposed plan for this site.

The SEAD-4 area is of little value to the ecological community, and would not serve as a desirable habitat for this community. Most likely, ecological receptors will inhabit unaffected areas adjacent to the impacted areas of SEAD-4, thereby avoiding areas where minimal ecological risk exists. The areas where ecological risk exists represent only 2 acres of the entire 7,585 acres of the conservation/recreation area (0.2 percent).

Based on this, the Army believes that human health should be the driver considered in developing cleanup goals for the site. Since the human health risk from debris within the buildings, remediation of the soils at SEAD-4 is no longer proposed.

The Army does recognize that land use restrictions will be required to limit the site to industrial use (excluding the child in day care scenario).

General Comment No. 2: The Army's evaluation for the unrestricted use scenario is unacceptable in that it does not represent a full analysis using the seven evaluation criteria. The Army should perform a full analysis of an unrestricted use scenario against the seven evaluation criteria, not just a simple cost comparison. This full evaluation should be conducted as outlined in the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA; Interim Final, October 1988.

Response No. 2: Agreed. The unrestricted use scenario will be analyzed using the seven evaluation criteria.

General Comment No. 3: A common component of both Alternatives 2 and 3 is Case 4, which proposes sediment cleanup criteria for the "'man-made lagoon" of less than 26 ppm chromium. Alternatives 2 and 3 were also evaluated under both Case 2 (protection of ecological receptors, prevent ingestion/direct contact with metals in soils, and prevent/minimize migration of metals to groundwater) and Case 3 (pre-disposal conditions) for surface, subsurface soil and “ditch soil” contamination. Case 2 proposes soil cleanup criteria of lead less than 167 ppm and chromium less than 324 ppm. Case 3 proposes site specific background levels as soil cleanup criteria for 11 COCs, two of which are lead and chromium. For Alternative 2, the Army is proposing to cleanup the lagoon sediments to less than 26 ppm chromium while proposing to cleanup the upstream “ditch soils” to 324 ppm chromium. Wouldn’t the contamination upstream in the ditch soils be washed downstream into the lagoon? How does the Army propose to prevent recontaminating the lagoon sediment under the Alternative 2 option? It appears that the corresponding cleanup criteria for the specific media that was chosen for the OB Grounds would be appropriate for this site as well.

Response No. 3: The Army is no longer proposing to perform remediation of the lagoon since no human health risk exists under a industrial use scenario. Additionally, the Army proposes to remove the temporary berm at the end of the storm water control basin and allow this “lagoon” to return to its natural condition. The storm water in this area will be allowed to follow its natural watercourse.

General Comment No. 4: In the USEPA's March 14, 2002 comment letter regarding the Draft-Final FS, the USEPA recommended that the groundwater media be broken into a separate operable unit to move forward with the proposed soil/sediment remedy. Another possibility of moving forward with the soi1/sedimcnt remedy would be to propose long-term groundwater monitoring. However, this subject may be agreed upon at the next BCT meeting therefore we suggest that this topic be added to the next BCT meeting agenda.

Response No. 4: Previously, the Army has indicated that long-term groundwater monitoring may be necessary at SEAD-4. Upon further review of the groundwater data, the Army believes that groundwater monitoring is not necessary at SEAD-4. Two rounds of groundwater sampling were conducted during the remedial investigation (RI): the first in March/April 1999 and the second round in July 1999. In the second round of sampling, there were no detections of VOCs, and the concentrations of metals were significantly lower. Turbidity data shows that in both rounds of sampling, there is a clear correlation between elevated metal concentrations and high turbidity values. Table 1 presents the concentrations of metals in each round.

Round 1 was not conducted using low-flow sampling methods, which contributed to higher turbidity and, consequently, higher concentrations of metals. Round 2 sampling was conducted using a low-flow method; hence the turbidity values, and the concentrations, were significantly lower. In Round 1, several metals including individual VOCs, antimony, thallium, chromium and selenium were detected at concentrations exceeding NYSDEC's Class GA standards. In Round 2, these parameters were either detected at concentrations below the standards or not detected. Although some metals including aluminum, manganese, and sodium exceeded the GA standards in Round 2 of sampling, the values detected are consistent with background. Based on these results, groundwater exceedances are attributable to suspended solids in the water, and not representative of groundwater concentrations. Accordingly, the Army does not intend to perform long-term monitoring of groundwater at SEAD-4.

General Comment No. 5: Please submit a map of SEAD-4 outlining the areas classified as wetlands, identifying state regulated, federal regulated and non-regulated wetlands.

Response No. 5: The Army will provide a plan showing the storm water drainage ditches that are classified as wetlands.

<u>Specific Comments:</u>

Specific Comment 1: Army's Response #6: A statement is made that "it is the Army's understanding that NYSDEC has not disagreed with the approach of investigating the cost of unrestricted use for comparison purposes." If this statement is meant to explain that the state does not disagree with a cost comparison as the sole criteria used to compare a restricted use alternative with an unrestricted use alternative, then the statement is surprising. Clearly cost is a part of the feasibility analysis, but we reiterate that it is only one of the seven evaluation criteria. The NYSDEC has stated in several of their letters (dated January 4, 2001, February 21, 2001, October 3, 2001, and November 13, 2001) that a full analysis of an alternative that would achieve unrestricted use should be performed against the seven evaluation criteria, not just simple cost comparison. A cost comparison is insufficient in presenting a full comparison of the advantages and disadvantages of a range of alternatives, from unrestricted use to a restricted use scenario that requires institutional controls and long-term monitoring.

Response 1: See response to General Comment No. 2.

Specific Comment 2: Replacement page 2-23, Section 2.5.3. Soil in the Ditches: A statement is made that a "hotspot removal will be conducted at the SD4-28 to remove the vanadium." However, besides being depicted in Table 2-1, this is not stated anywhere else in the document, not in the remedial action objectives, cleanup criteria, not outlined in any of the remedial alternatives. Please reconcile.

Response 2: See response to General Comment No. 1

Specific Comment 3: Table 1: The column titled Proposed Clean-up Goal should be renamed to what it actually is i.e. Calculated Soil Concentrations at the LOAEL for Dove and Short-Tailed Shrew. Also, Table 1 should include the Seneca Army Depot background values for chromium and lead. The levels, when listed in Table 1, should then be compared to determine the best overall protection to human health and the environment. In addition, each cleanup goal should also then be evaluated for its ability to restore the site to pre-release conditions.

Response 3: Disagreed: Although NYSDEC disagreed with the proposed cleanup goals, the column heading is correct. The column does present the Army's Proposed Cleanup Goal.

Please see response to General Comment No. 1 for other comments.

Comment 4: Table 2-1: If a hot spot is proposed (see comment #2) as part of Case 2 (ecological soils cleanup values using a HQ of 1), then the cleanup criteria for Case 3 (pre-disposal conditions), should be at least if not more stringent of vanadium than Case 2. This should be indicated as such.

Response 4: Agreed. Since Case 3 addresses remediation of ditch soils, the vanadium hotspot, SD4-28, is included in the area slated for remediation under this scenario. Table 2-1 has been revised to clarify this point.

Response to Comments From
New York State Department of Environmental Conservation (NYSDEC)

Subject: Draft-Final Feasibility Study at the Munitions Washout Facility (SEAD-4) January 2002 and Revised Final Remedial Investigation at the Munitions Washout Facility (SEAD-4) January 2002

Seneca Army Depot Activity, Romulus, NY

Comments Dated: April 25, 2003

Date of Comment Response: September 12, 2003

General Comments:

The New York State Department of Environmental Conservation (NYSDEC) received the Army's February 12, 2003 response to our March 14, 2002 comments on the Draft Final FS and the Revised Final RI for SEAD-4. The Department finds the Army's response of proposing no further action at SEAD-4 unacceptable. It is highly inappropriate for the Army to change their proposed remedy from active remediation to no further action halfway through the finalization of the FS because of a potential change in the future use of the site (from conservation/recreation to light industrial use). The unacceptable ecological risk that was driving the cleanup remains the same, regardless of future use.

The Army's proposal of no further action appears contradictory with their Draft Final FS remedial action objective that calls for "restoration of soil and sediments to levels that are protective of human health and the environment." In addition, it appears in conflict with Part 375 of Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) to leave soils unremediated on-site that exhibit concentrations of lead as high as 11,200 ppm, concentrations of chromium as high as 18,600 ppm, and sediments with chromium concentrations as high as 4,800 ppm.

Also, the Army has rescinded their proposal of remediating the pond/lagoon, but has now proposed to remove the berm that forms the lagoon so that the lagoon can return to its natural watercourse. This could be disposal of hazardous waste since sediments as high as 4,800 ppm chromium could potentially be released off-site.

Response:

Although the Army believes that its position stated in its response to comments, dated February 4, 2002, was appropriate, the Army has reconsidered its position in order to move the project forward. The Army has restated with additional clarity its justification for remediating soils and sediments to the risk-based cleanup goals for lead and chromium. Below is an in depth discussion explaining the basis for the selection of these cleanup goals.

SOIL

The Army proposes remediating the soils at SEAD-4 in accordance with cleanup goals for chromium (167 ppm) and lead (327 ppm). The development of the proposed cleanup goals for chromium and lead was based on the assumptions used in the screening-level ecological risk assessment (SLERA) for SEAD-4. As stated in the Uncertainty Section of the SLERA, the assumptions used for the screening-level ecological risk assessment were very conservative in accordance with Ecological Risk Assessment Guidance for Superfund (ERAGS) process (EPA, 1997). For example, ERAGS specifies that a value of 100% be used for the area-use factor for terrestrial animals and that the bioavailability of contaminants at the site be assumed as 100%. The proposed cleanup goal for chromium was limited by mourning doves. According to the United States Department of Agriculture (USDA) Forest Service Database, mourning doves in the northern half of the breeding range are known to migrate in the fall to winter quarters in various southern locations, returning to breeding grounds in the spring. Therefore, a more realistic value for the area-use factor for the mourning dove is 0.5. This change alone would increase the proposed cleanup goal for chromium to 648 mg/Kg. For lead, a bioaccumulation factor (BAF) of 2.1 was used to estimate the cleanup goal based on the short-tailed shrew. If a median BAF value of 0.266 was adopted as summarized in the USEPA Ecological Soil Screening Level Guidance (2000) document and used by Efroymson (1997), the cleanup goal for lead would be 278 mg/Kg. In comparison, the preliminary remediation goal recommended by Efroymson for the short-tailed shrew is 740 mg/Kg for lead, which is higher than the proposed cleanup goal for lead at SEAD-4 and the revised cleanup goal based on a BAF of 0.266.

The cleanup goals proposed by the Army are comparable to other remediation criteria such as Ontario Ministry of Environment (MOE), Canadian Council of Ministers of the Environment (CCME), and the Dutch Intervention Values. The attached **Table 1** presents a comparison of the proposed soil cleanup goals with the cleanup goals developed for the OB Grounds at SEDA, the Dutch Intervention Values, the Canadian Soil Quality Guidelines, and the generic soil criteria in Ontario. The basis for each set of criteria is described below:

- "Guideline for Use at Contaminated Sites in Ontario" (MOE, 1999) presents effects-based generic soil quality criteria for different land use scenarios, which replaced "Guideline for the Decommissioning and Clean-up of Sites in Ontario" (MOE, 1989). The effects-based generic soil quality criteria were calculated to protect human health and ecological receptors (including plants).

- The Dutch Intervention Values are based on an integration of the human and ecotoxicological effects. Ecotoxicological effects are quantified in the form of concentration in the soil above which 50% of the potentially present species and processes may experience negative effects.

- Canadian Council of Ministers of the Environment (CCME) presents generic soil quality criteria, which defines a "no-adverse effect" level for all types of environmental receptors for residential properties.

- The Record of Decision (ROD) for the OB Grounds located at SEDA (Parsons, 1999) states that soil containing lead concentrations above 60 mg/Kg (based on the MOE criteria) will be covered to protect terrestrial ecological receptors and soil with lead concentrations above 500 mg/Kg will be remediated to protect human health. It should be noted that since the ROD for the OB Grounds was submitted, the MOE criteria has been updated; as shown in **Table 1**, the revised MOE criteria for lead in soil has increased to range from 200 mg/Kg to protect ecological receptors to 1000 mg/Kg to protect human receptors. It should also be noted that the Army's proposed cleanup goal for lead is lower than the revised MOE goal, which was used as the basis for the OB Grounds cleanup goals for lead.

In general, the Army's proposed cleanup goals are comparable to the remediation goals set by MOE, CCME, Netherlands, and Efroymson. Although the proposed cleanup goals exceed the toxicity benchmarks recommended by NYSDEC (letter dated 10/3/01), they were based on site-specific considerations and would be protective of the environment at the site.

Remediation of soils at SEAD-4 to protect all natural resource components may not be in the best interest of the overall environment. Removal of the contamination may cause more long-term ecological harm due to wide spread destruction of a habitat than leaving it in place.

In addition, a comparison of the affected area at SEAD-4 with the overall conservation/recreation area indicates that the impact to the habitat in the conservation/recreation area is minimal. Under the Reuse Plan and Implementation Strategy for Seneca Army Depot, SEAD-4 has been included in the conservation/recreation area, which encompasses approximately 7,585 acres. The area at SEAD-4, which has concentrations of lead and chromium exceeding the proposed cleanup goals, is approximately 2 acres, or 0.03% of the total acreage of the conservation/recreation area.

As discussed above, assumptions used in the SLERA were very conservative. Therefore, the resulting HQ values calculated in the SLERA are not considered a measure of risk but a measure of the level of concern. As stated in Step 3 of the SLERA, an HQ greater than one indicates that a compound is a potential contaminant of concern and additional evaluation is required.

The Army believes that the remedial actions proposed for soil at SEAD-4 meet the intent of TAGM #4046 and are protective of the environment. The proposed remedial actions for soil were developed to ensure that the human health risks from potential exposures to constituents in debris and material within the buildings are eliminated. Furthermore, groundwater will be monitored and groundwater use may be restricted at the site if necessary. The proposed remedial actions will decrease future exposure of wildlife from direct ingestion of and/or direct contact to soil with concentrations of chromium and lead above the proposed cleanup goals as well as other co-located metals.

GROUNDWATER

The Army proposes monitoring groundwater for one year prior to and for one year after the remedial actions, since the data collected from two rounds of groundwater sampling during the RI are inconclusive. For several compounds, a concentration was detected above the GA or MCL criteria in one round of sampling and was undetected or below the criteria in the second round of sampling. The VOCs, antimony, and thallium were detected at concentrations above the respective criteria in round 1 of sampling and not detected in round 2. Chromium and selenium were detected at concentrations above the respective criteria in round 1 and below the criteria in round 2.

Additional groundwater sampling is required to determine if there are exceedances of the NYSDEC GA or EPA MCL criteria and if the detections that exceeded the criteria were a result of high turbidity in the samples. Following the remedial action, the Army will assess remaining concentrations in the groundwater to determine if additional action is required. Long term monitoring may be required if additional data shows exceedances of the NYSDEC GA or EPA MCL criteria.

SURFACE WATER

The surface water at the site is not classified by NYSDEC because the drainage ditches and man-made lagoon are either intermittent and/or not recognized as established streams or creeks. Because the drainage ditches form the headwater for Indian 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 SEAD-4 data. The Class C standards are not strictly applicable to the surface water at SEAD-4.

The surface water data collected during the RI field investigation was collected in only one round of sampling. The Army proposes sampling the surface water at four locations within the drainage ditches and analyzing for metals and benzo(a)pyrene. Surface water samples would be collected semi-annually for one year prior to and one year after the remedial action at the site resulting in four samples from each location. Following the remedial action, the Army will be better able to assess the effects of the remedial actions performed on soils and sediments and to determine if additional action is required.

A site visit was conducted at the SEAD-4 area on November 29, 2001 by a Parsons plant physiologist, Sally Newman, Ph.D., for the purpose of determining the aquatic or terrestrial nature of the drainage ditches located on the site. The following information has been added to Section 1 of the FS Report.

Prior to the site visit, information from existing reference sources was gathered about the site and the following information was found:

The USDA Soil Conservation Service Soil Survey Map for Seneca County shows two soil types are found at SEAD-4: Angola (AnA-0-3% slopes and AnB-3-8% slopes) and Darien (DaA-0-3% slopes). Neither soil type is listed as hydric in the USDA-NRCS Soil Survey Division's list of Hydric Soils of the United States (www.Statlab.iastate.edu/soils/hydric).

The USGS Topographical Survey Map (Ovid Quadrant) showed no streams and only one small pond at SEAD-4. Topography was nearly flat.

The United States Fish and Wildlife Service's National Wetland Inventory Map (Ovid Quadrant) identified only one tiny cluster of Paulustrine Emergent Marsh (PEM) wetlands along the northern perimeter of SEAD-4.

At the site, the following observations were made. Vegetation on the site is dominated by autumn olive (*Elaeagnus umbellate*) and poverty grass (*Aristida dichotomy*). Both autumn olive and poverty prefer dry, disturbed soils. In the majority of ditches at SEAD-4, the vegetation was dominated by upland species of grasses and forbs as rated by Reed, P.B., Jr. (1988) in The National List of Plant Species that Occur in Wetlands: Northeast (Region1). In some places, the ditches had been excavated down into the seasonal high groundwater table and supported wetland communities dominated by cattails and rushes.

The pond identified by the USGS topographical map consisted of an excavated stormwater detention pond. The source of the water in the pond was groundwater due to the depth of the excavation. During rainfall events, the pond can also receive stormwater runoff from a drainage ditch, which enters the pond at its southeast corner. No water was flowing in the drainage ditch at the time of the site visit. The pond was equipped with an elevated stormwater overflow pipe, which exited the pond on its west side. At the time of the site visit, the water level in the pond was approximately 6 to 7 feet below the overflow pipe. This pipe is the pond's only outlet.

The wetland cluster identified by the NWI map was found to be associated with a stormwater management swale on the northern perimeter of SEAD-4. The swale consisted primarily of saturated soils although some pockets of water ranging from 0 to 6 inches were also present. No defined stream channel was present, but, rather, the area consisted of a broad poorly defined wetland. Vegetation ranged from shrubs (within a wooded area) to cattails (along the road).

As the USGS topographical map indicated, SEAD-4 has no source of hydrology other than rainfall (i.e. no streams are present which conduct water onto the site). The site was found to have excellent stormwater management. The rainwater, when present, migrates down nearly level, shallow ditches that essentially act as level spreaders, allowing the water time to filter into the ground. In Angola and Darien soils, seasonal high groundwater can be at 0.5-1.5 feet. In some locations, the stormwater ditches were excavated down into the groundwater, enabling these areas to remain saturated for a long enough duration to sustain limited wetland vegetation (generally cattails or silky dogwood in the wettest swales and rushes mixed in with upland field grasses and forbs in the others). No ditches with perennial flowing water were present.

Information contained in Dates and Byrne (1997) *Living Waters, Using Benthic Macroinvertebrates and Habitat to Assess Your River's Health*, River Network, Montpelier, VT is useful in assessing the habitat value of SEAD-4's stormwater ditches for macroinvertebrates. Benthic macroinvertebrate organisms are generally found in flowing waters. A current velocity of 0.5 to 2.5 feet per second supports the most diverse communities. Their habitat ranges from shallow, fast moving, rocky bottom areas known as riffles; to deeper, slower moving sandy and gravely bottom areas known as runs; to deep, slow moving muddy-bottom areas known as pools. The cobbly condition of riffles supports the widest variety of macroinvertebrates. Runs contain a smaller variety. And, the uniform bottoms of pools, with smaller soil particle sizes like sands and silts, provide very limited living spaces and surfaces for macroinvertebrates to hold onto. Thus, pools support only a very limited variety of macroinvertebrates. Some macroinvertebrates are very sensitive to temperature levels and fluctuations. Temperature also affects the amount of dissolved oxygen that the water can hold, with cold water holding the most. Macroinvertebrates are sensitive to water level fluctuations, since dry areas are no longer available for living, feeding, and breeding areas for aquatic organisms.

None of the ditches or wetland swales at the SEAD-4 represents adequate habitat for aquatic macroinvertebrate organism. The stormwater ditches at SEAD-4 do not contain waters moving at a current velocity of 0.5 to 2.5 feet per second. No riffles or cobble bottoms are present. The ditch bottoms are, generally, well vegetated with a grasses and rushes. The soils in the ditches are composed of small soil particle sizes like loams and clays. When present, the shallow nature of the water in the ditches provides little insulation against temperature fluctuations. And, the intermittent nature of the water supply (rainfall) in the ditches would cause the ditches to be undependable living and breeding grounds for aquatic macroinvertebrates.

The only area of the site with a consistent water supply is the pond. This detention pond does not possess flowing water and the bottom is coated with silt and algae. As indicated by Dates and Byrne, the uniform bottom of pools supports only a very limited variety of macroinvertebrates.

During the site visit, an overview assessment of the SEAD-4 wetlands was also made. Wetlands on the site are limited to the deepest of the stormwater swales. No wetlands exist at SEAD-4 outside of the stormwater ditch system. Stormwater management is a necessary and beneficial activity, which can create wetlands where none existed before. Nationwide Wetlands Permit #41 (Reshaping Existing Drainage Ditches) of the Code of Federal Regulations 33 Part 330 reads: "This nationwide permit does not apply to reshaping drainage ditches constructed in uplands, since these areas are not waters of the United States, and thus no permit from the Corps is required". The ditches at SEAD-4 were carved into upland soils Angola and Darien. In addition all the wetland swales on the site are isolated, none of them border on waters of the United States (streams, ponds, and lakes). Due to a recent Supreme Court ruling, it is no longer clear whether isolated wetlands can be regulated. The

Army's current policy is to examine these isolated areas on a case by case basis. It is probably unlikely that, upon review, the ACOE would take jurisdiction over this ditch system.

The following conclusions were made concerning SEAD-4:

(1) Only the pond at SEAD-4 has permanent water and may support aquatic life; therefore, the NYSDEC's Technical Guidance for Screening Contaminated Sediments (1999) is applicable to the sediment at the pond bottom. Aquatic receptors should be assessed for the area.

(2) All the other drainage swale areas at SEAD-4 are nonwetlands or not regulated as wetlands. There is no evidence that the areas support the living, feeding, and breeding activities of benthic organisms, i.e., aquatic macroinvertebrates, and allow them to complete their life cycles. In addition, the sediment screening levels established by NYSDEC are based on toxic effects for benthic macroinvertebrates. Therefore, the NYSDEC's guidance should not be applied to these areas. In addition, no aquatic receptors or exposure via preying aquatic/benthic biota should be evaluated.