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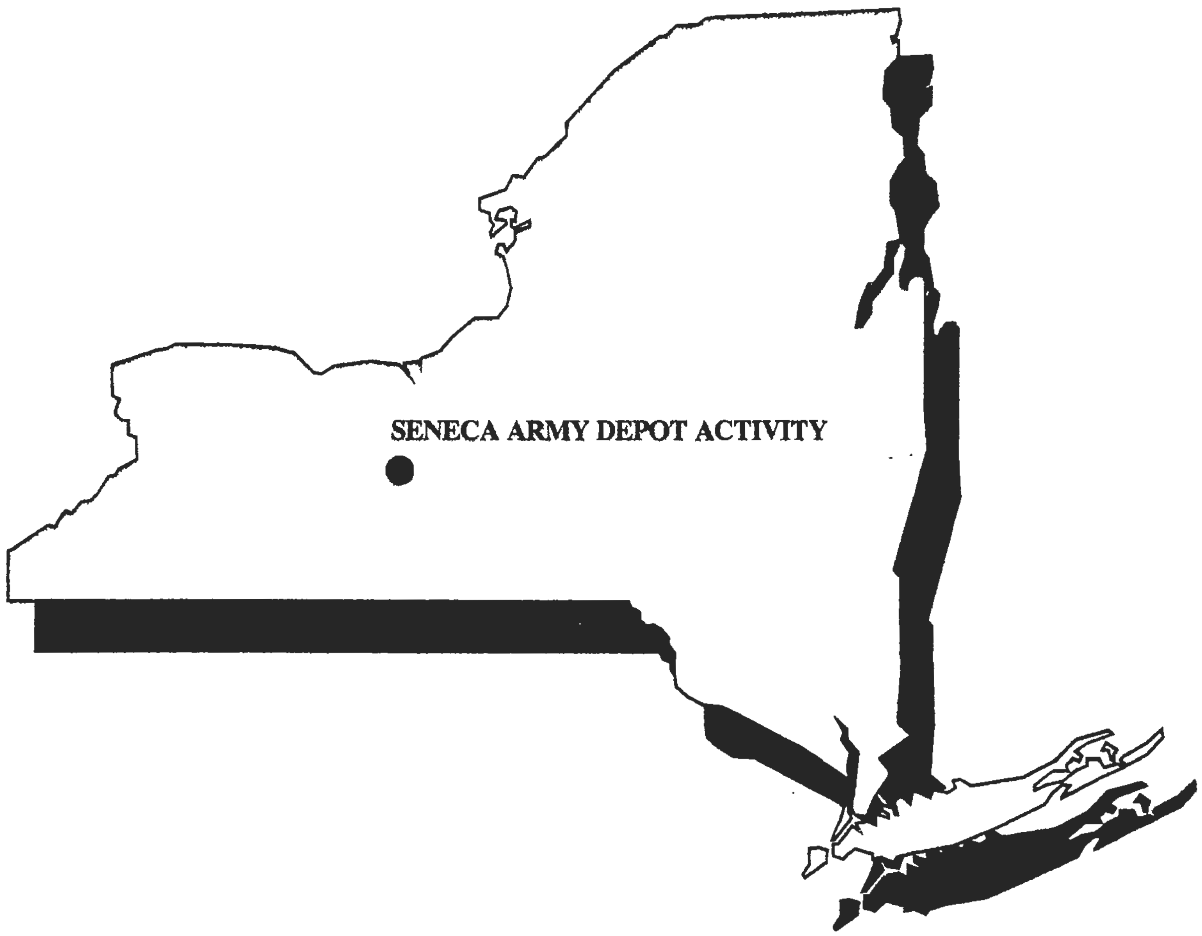

DRAFT FINAL

FEASIBILITY STUDY REPORT
AT THE FIRE TRAINING AND DEMONSTRATION PAD (SEAD-25)
AND THE FIRE TRAINING PIT AND AREA (SEAD-26)

OCTOBER 1998

DRAFT FINAL
FEASIBILITY STUDY REPORT
SEAD-25 AND SEAD-26
SENECA ARMY DEPOT
ROMULUS, NEW YORK

Prepared For:

Seneca Army Depot
Romulus, New York

Prepared By:

Parsons Engineering Science, Inc.
30 Dan Road
Canton, Massachusetts

OCTOBER 1998 **728059-03003**

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1.0 INTRODUCTION

1.1 PURPOSE AND ORGANIZATION OF REPORT

This Feasibility Study (FS) report for the Fire Training and Demonstration Pad (SEAD-25) and Fire Training Pit and Area (SEAD-26) site at the Seneca Army Depot Activity (SEDA) is a continuation 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 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 RI was completed in 1996 and the final draft RI report was submitted to EPA and NYSDEC. The purpose of the RI was to fully characterize the nature and extent of human health and environmental risks posed by the SEAD-25 and -26 site.

SEDA is under the command control of the Tobyhanna Army Depot in Tobyhanna, PA. SEDA is currently an active Army facility, however, the depot has been placed on the closure list for BRAC 95. SEAD-25 (inactive since 1987) and SEAD-26 (inactive since 1994) are part of SEDA. Both sites are in proximity to the SEDA complex. The current site uses include occasional base maintenance activities. The current intended future land use of the SEAD-25 and -26 has not been finalized but will be determined by the Local Redevelopment Authority (LRA) in conjunction with the Army. It was recently proposed that the sites be used for industrial purposes. As required by CERCLA and Army regulations, if control of parcels at SEDA is released or transferred and the site-use changes, the Army must perform any remedial actions necessary to ensure that the site conditions are protective of human health and the environment.

A baseline risk assessment (BRA) was conducted for the RI at the SEAD-25 and -26. The risk assessment included an analysis of three receptor categories. These are: 1) current on-site worker, 2) future on-site residents, and 3) future on-site construction workers,. A hazard index and cancer risk were calculated for each applicable receptor exposure route, and a total receptor risk was also calculated. The risk calculations presented in the RI report and summarized in **Table 1-1** for SEAD-25 and **Table 1-2** for SEAD-26, indicate that under the current and intended future land use scenarios (current on-site worker and future on-site construction worker) the risks are within the acceptable levels defined by EPA, with the exception of risk to the future on-site construction worker at SEAD-25 due to inhalation of VOCs from soil in ambient air. Under the future residential site use scenario the site risks exceed the EPA defined target levels. For SEAD-25, these risks are almost entirely due to the ingestion of and dermal contact to groundwater. For SEAD-26, these risks are almost entirely due to ingestion of on-site soil and sediment, and dermal contact with groundwater.

TABLE 1-1
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

RECEPTOR	EXPOSURE ROUTE	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Volatile Organics in Ambient Air	NA	2E-05	5E-10
	Inhalation of Dust in Ambient Air	NA	NQ	NQ
	Ingestion of Onsite Soils	NA	1E-03	2E-07
	Dermal Contact to Onsite Soils	NA	NQ	NQ
TOTAL RECEPTOR RISK (Nc & CAR)		NA	*1E-03*	*2E-07*
FUTURE RESIDENTIAL (Child and Adult)	Inhalation of Volatile Organics in Ambient Air	2E-03	4E-04	2E-08
	Inhalation of Dust in Ambient Air	NQ	NQ	NQ
	Ingestion of Onsite Soils	2E-01	2E-02	1E-05
	Dermal Contact to Onsite Soils	NQ	NQ	NQ
	Ingestion of Groundwater (Daily)	8E+00	4E+00	2E-04
	Dermal Contact to Groundwater while Showering	9E-01	5E-01	3E-05
	Inhalation of Groundwater while Showering	3E+00	1E+00	3E-05
	Dermal Contact to Surface Water while Wading	8E-03	7E-03	2E-08
	Dermal Contact to Sediment	3E-03	2E-03	8E-08
	Ingestion of Onsite Sediment	9E-01	9E-02	7E-04
TOTAL RECEPTOR RISK (Nc & CAR)		*1E+01*	*5E+00*	*1E-03*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Volatile Organics in Ambient Air	NA	4E+00	3E-06
	Inhalation of Dust in Ambient Air	NA	6E-07	3E-12
	Ingestion of Onsite Soils	NA	2E-02	8E-07
	Dermal Contact to Onsite Soils	NA	3E-03	2E-09
TOTAL RECEPTOR RISK (Nc & CAR)		NA	*4E+00*	*4E-06*

Notes:

NA: Not Applicable

NQ: Not Quantified; toxicity or skin absorption factors not available for compounds with EPCs.

TABLE 1-2
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 26

RECEPTOR	EXPOSURE ROUTE	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Volatile Organics in Ambient Air	NA	2E-06	6E-11
	Inhalation of Dust in Ambient Air	NA	2E-05	2E-08
	Ingestion of Onsite Soils	NA	4E-03	1E-06
	Dermal Contact to Onsite Soils	NA	1E-04	2E-08
TOTAL RECEPTOR RISK (Nc & CAR)		*NA*	*4E-03*	*1E-06*
FUTURE RESIDENTIAL (Child and Adult)	Inhalation of Volatile Organics in Ambient Air	2E-04	4E-05	2E-09
	Inhalation of Dust in Ambient Air	3E-04	1E-04	2E-07
	Ingestion of Onsite Soils	7E-01	7E-02	6E-05
	Dermal Contact to Onsite Soils	4E-03	2E-03	5E-07
	Ingestion of Groundwater (Daily)	6E-02	2E-02	5E-07
	Dermal Contact to Groundwater while Showering	3E-01	1E-01	1E-06
	Inhalation of Groundwater while Showering	8E-03	4E-03	1E-07
	Dermal Contact to Surface Water while Wading	8E-02	7E-02	3E-06
	Ingestion of Onsite Sediment	3E-01	3E-02	6E-06
	Dermal Contact to Sediment	1E-02	9E-03	3E-07
TOTAL RECEPTOR RISK (Nc & CAR)		*1E+00*	*4E-01*	*7E-05*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Volatile Organics in Ambient Air	NA	4E-01	3E-07
	Inhalation of Dust in Ambient Air	NA	2E-04	1E-08
	Ingestion of Onsite Soils	NA	2E-01	2E-06
	Dermal Contact to Onsite Soils	NA	1E-03	9E-09
TOTAL RECEPTOR RISK (Nc & CAR)		*NA*	*6E-01*	*2E-06*

Note:
NA: Not Applicable

This FS will focus on the current and intended future land uses as the basis for remedial action decisions. This report is organized in accordance with "*Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*," EPA/540/G-89/004, October 1988 and the New York State Department of Conservation's "*Revised TAGM—Selection of Remedial Actions at Inactive Hazardous Waste Sites*." **Section 1.0** is divided into five subsections which provide an overview of site conditions, including a brief review of the RI report. **Section 1.2** describes the site background. **Sections 1.2.1** and **1.2.2** describe the site history, including a site description and the local geologic and hydrogeologic setting. **Section 1.3** summarizes the nature and extent of contamination. **Section 1.4** discusses the contaminant fate and transport, and **Section 1.5** presents the conclusions of the Baseline Risk Assessment (BRA).

Section 2.0 identifies and describes the initial screening of the remedial technologies. Remedial action objectives are developed for each media of concern (e.g., groundwater), and general response actions are considered which meet the remedial objectives for each media. The remedial technologies within each response category are screened for technical feasibility and implementation at SEAD-25 and -26. The discussion of remedial technologies are divided into soil/sediment and groundwater treatment technologies. It is possible that the technologies selected will be necessary at both the SEAD-25 and -26 site, though the implementation of each program will be considered independently.

Technologies remaining from the initial screening are combined into remedial alternatives and are presented in **Section 3.0**. Alternatives for each media are evaluated through preliminary screening to determine their relative merit for use in the remedial action. **Section 4.0** describes the treatability testing that may be necessary for alternatives that include innovative technologies prior to their implementation of the remedial actions. In **Section 5.0 and 6.0**, the remedial action alternatives are screened and evaluated in detail for SEAD-25 and SEAD-26, respectively. Also included in **Section 5.0 and 6.0** are detailed descriptions of the technologies and their implementation, as well as cost estimates.

This FS Report also contain eight appendices which include back-up in support of **Sections 1** through **6. Appendix A** contains summary data sheet used in the screening of potential remediation technologies. Supporting calculations are included in **Appendix B**. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) is discussed in **Appendix C**. Back-up information used to develop costs for each remedial option are discussed in **Section D. Appendix E** includes the Ground Water Modeling Report. **Appendix F** contains the Sampling Program Analysis results. Appendix G includes supporting backup tables for risk reduction calculations and Appendix H includes responses to EPA and NYSDEC comments.

1.1.1 Operable Units

In order to facilitate the remedial actions, SEAD-25 and -26 have been separated into two separate operable units.

An operable unit, as defined by EPA (40 CFR 300.5) is:

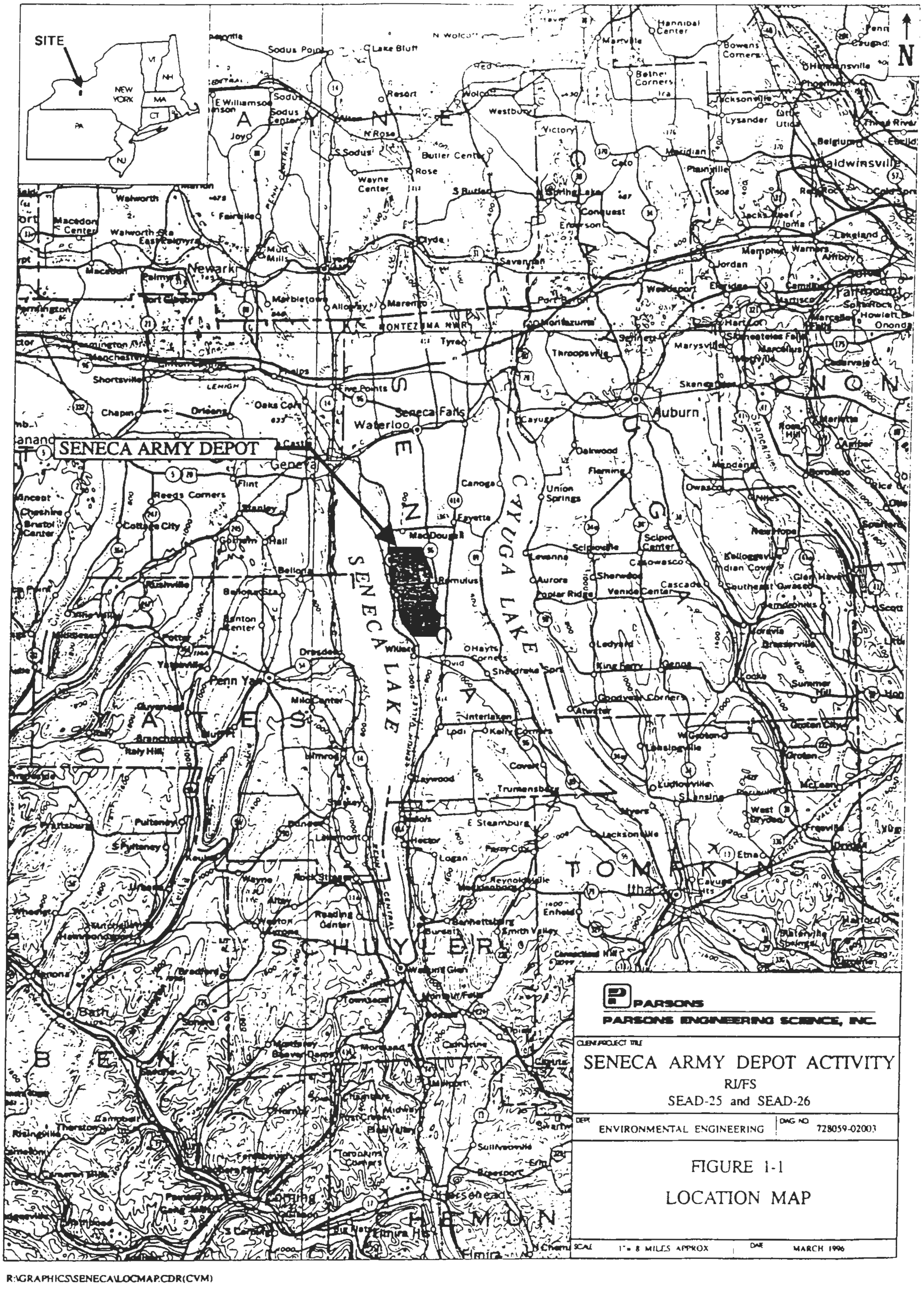
> *"a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site may be divided into a number of operable units, depending on the complexity of the problems associated with the site. Operable units may address geographical portions of a site, specific site problems, or initial phases of an action, or may consist of any set of actions performed over time or any actions that are concurrent but located in different portions of the site."*

1.2 SITE BACKGROUND

1.2.1 Site Description

SEDA is an active military facility constructed in 1941. 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 Highways 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-25 and -26 comprise only a few acres within the 10,587 acres that make up the entire SEDA facility. SEAD-25 and -26 were previously used by the Army to train fire fighters and for fire fighting demonstrations. SEAD-25 is located in the east-central portion of SEDA. It is characterized by a small (50 feet by 50 feet) sparsely vegetated pad, the surface of which is mostly composed of crushed shale (**Figure 1-3**). SEAD-26 is located in the southeastern portion of SEDA. It is characterized by an elevated, 1,500-foot long, rectangular, grass-covered pad that contains a fire training tower, a storage trailer, a circular burning pit, and a former drum storage area (**Figure 1-4**).



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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

RI/FS

SEAD-25 and SEAD-26

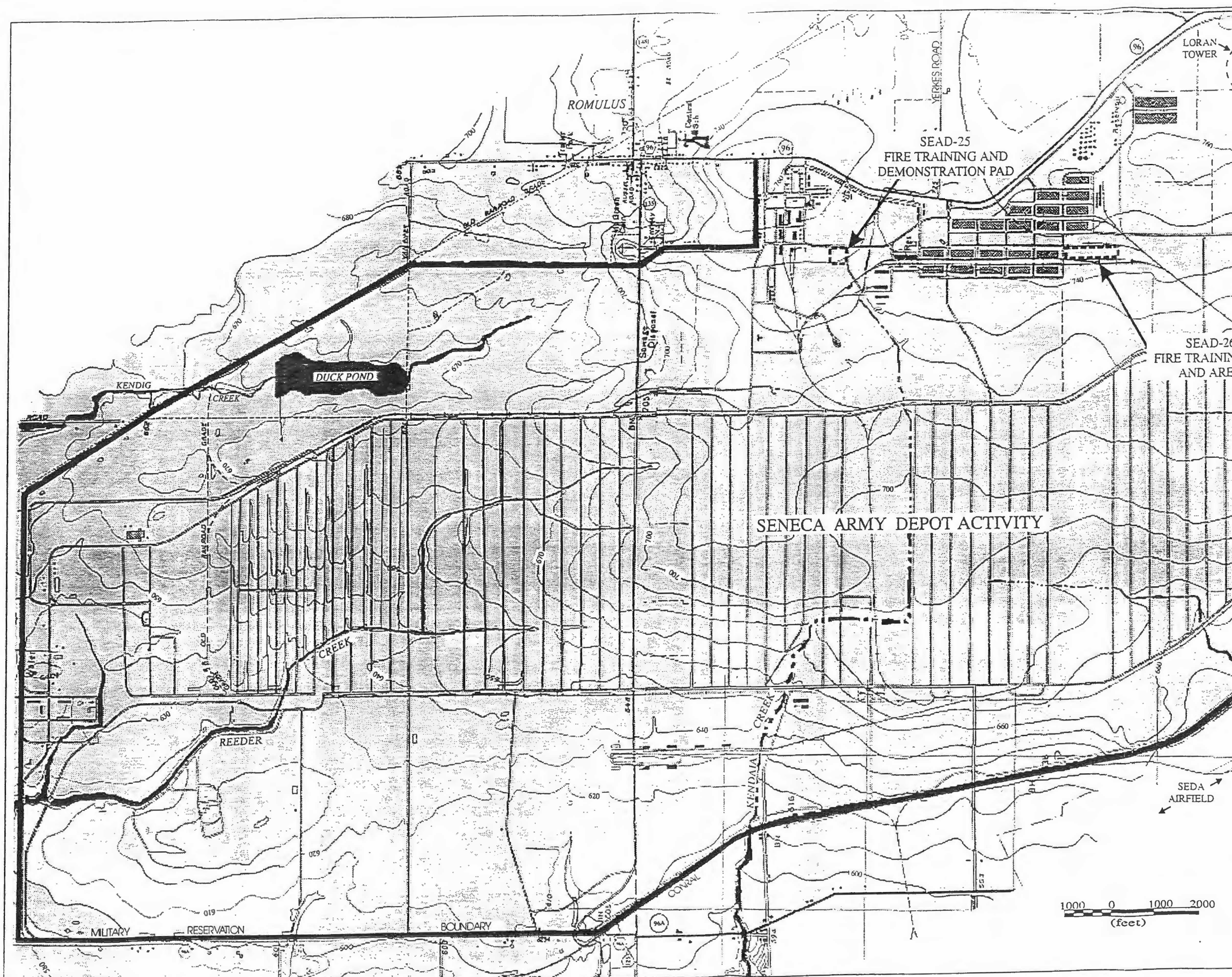
DEPT	DWG NO
ENVIRONMENTAL ENGINEERING	728059-02003

FIGURE 1-1

LOCATION MAP

SCALE	DATE
1" = 8 MILES APPROX	MARCH 1996

R:\GRAPHICS\SENECA\LOCMAP.CDR(CVM)



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SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 and SEAD-26

ENVIRONMENTAL ENGINEERING | 726511-02003

FIGURE 1-2
SENECA ARMY DEPOT MAP

1" = 2000' | MARCH 1996

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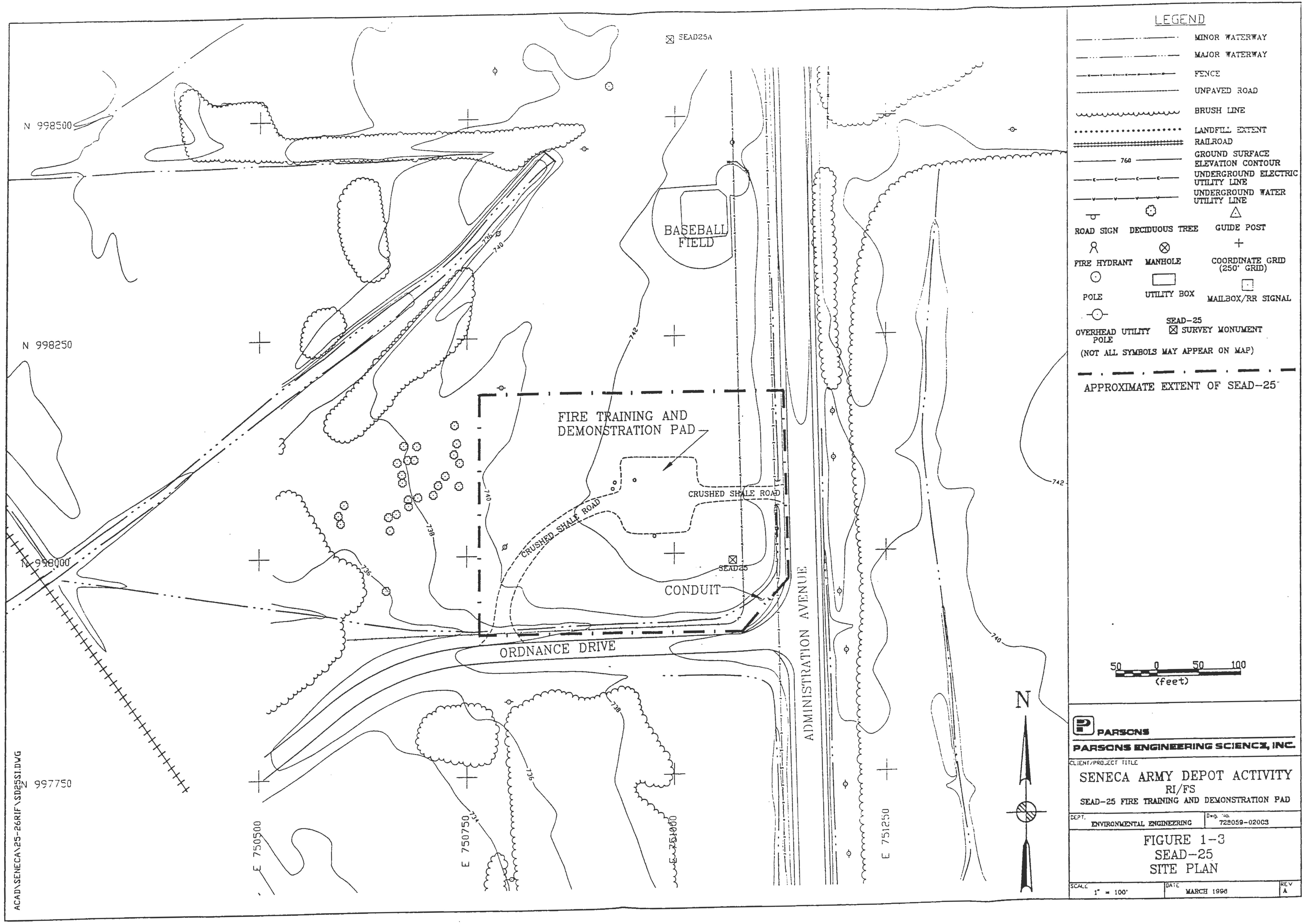
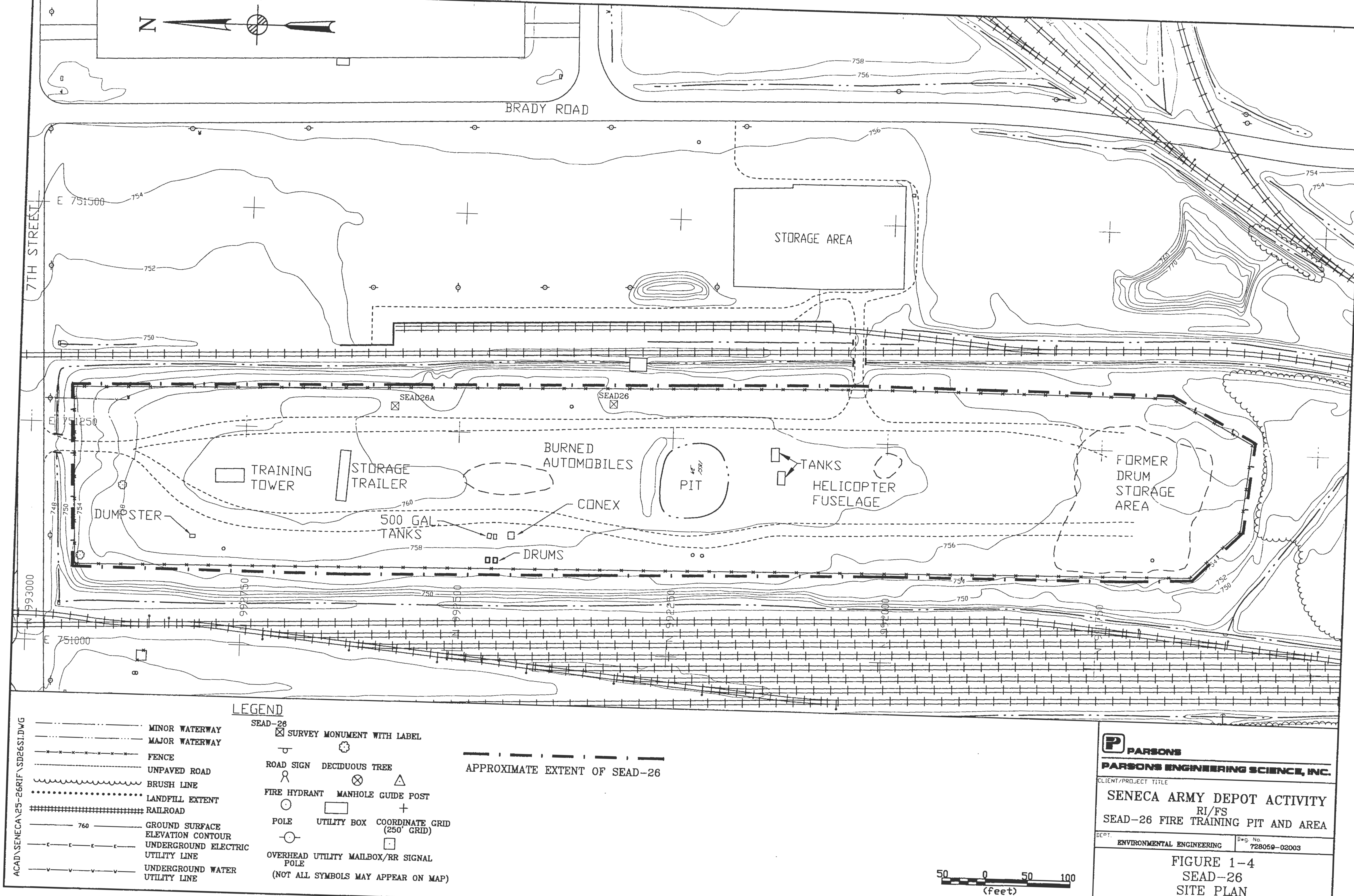


SEAD25A
N 998500
N 998250
N 998000
N 997750
E 750500
E 750750
E 751000
E 751250
BASEBALL FIELD
FIRE TRAINING AND DEMONSTRATION PAD
CRUSHED SHALE ROAD
CRUSHED SHALE ROAD
SEAD25
CONDUIT
ORDNANCE DRIVE
ADMINISTRATION AVENUE
742
740
738
736
734
N
ACAD\SENECA\25-26RIF\SD25S1.DWG
LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENT
RAILROAD
760
GROUND SURFACE ELEVATION CONTOUR
UNDERGROUND ELECTRIC UTILITY LINE
UNDERGROUND WATER UTILITY LINE
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SEAD-25 SURVEY MONUMENT
(NOT ALL SYMBOLS MAY APPEAR ON MAP)
APPROXIMATE EXTENT OF SEAD-25
50 0 50 100
(feet)
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD
DEPT.
ENVIRONMENTAL ENGINEERING
Dwg. No.
729059-02003
FIGURE 1-3
SEAD-25
SITE PLAN
SCALE
1" = 100'
DATE
MARCH 1996
REV
A



PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-26 FIRE TRAINING PIT AND AREA

DEPT. ENVIRONMENTAL ENGINEERING | Dwg. No. 728059-02003

FIGURE 1-4
SEAD-26
SITE PLAN

SCALE 1" = 100' | DATE OCTOBER 1998 | REV. A

1.2.1.1 Geologic and Hydrogeologic Setting

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 a high percentage of silt and clay with the balance comprised of coarser particles. The porosities of 5 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 both SEAD-25 and SEAD-26. 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 and 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 high 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.

1.2.1.2 Site Hydrogeology

The hydrogeologic setting for SEAD-25 and -26 has been described in detail in Sections 3.1.6 and 3.2.6 of the Final RI Report dated May 1998. These Sections address such topics as depth to water, groundwater flow rates and directions, hydraulic conductivities, vertical gradients and the results of vertical connection tests. A brief summary information on the Site Hydrogeology found in the RI Report is presented below for each Operable Unit.

SEAD-25

The depth to water was investigated at SEAD-25 on four different occasions. The results of these Investigations can be found on Table 3-2 of the RI Report. The Table shows that the depth to water varied from between 3.15 feet (MW25-3 on April 4, 1994) to 7.09 feet (MW25-4D on November 4, 1995). The horizontal groundwater flow gradients varied from between 0.01ft/ft to 0.02ft/ft in both the shallow portion of the aquifer located in the till/weathered shale zone and the deep portion of the aquifer located in the competent shale zone.

Results of groundwater contour mapping indicate that groundwater flow is radial below the pad with a strong horizontal gradient to the south and west. The radial groundwater flow that has developed below the pad at SEAD-25 is believed to be a local phenomenon that is present because of the influence of the anthropomorphic bedrock topographic mound located below the pad. The mapping also indicated that the groundwater flow in the deeper portion of the aquifer located in the competent shale zone is to the west and southwest.

Hydraulic conductivities were found range from 1.0 x 10^{-5} cm/sec to 3.4 x10^{-3} cm/sec with an average of 6.1 x 10^{-4} cm/sec in the shallow portion of the aquifer and were found range from 1.8 x 10^{-5} cm/sec to 7.2 x10^{-4} cm/sec with an average of 3.3 x 10^{-4} cm/sec in the deep portion of the aquifer.

Both downward and upward vertical gradients were calculated SEAD-25. The magnitude of the downward gradients (which indicate the potential for downward movement of groundwater) ranged from -0.04 ft/ft to -0.21 ft/ft. The magnitude of the upward gradients (which indicate the potential for upward movement of groundwater) were significantly lower and ranged from 0.01 ft/ft to 0.07 ft/ft.

Vertical Connection Tests results indicate that there is that the shallow portion of the aquifer located in the till weathered shale zone is not significantly connected to the deeper portion of the aquifer located in the competent shale zone.

SEAD-26

The depth to water was investigated at SEAD-26 on four different occasions. The results of these Investigations can be found on Table 3-9 of the RI Report. The Table shows that the depth to water varied from between 5.28 feet (MW26-1 on April 4, 1994) to 16.43 feet (MW26-2 on November 4, 1995). The horizontal groundwater flow gradients was calculated to be 0.01ft/ft between monitoring wells MW26-1 and MW26-3.

Results of groundwater contour mapping indicate that groundwater flow is to the west.

Hydraulic conductivies were found range from 1.5 x 10^{-3} cm/sec to 3.9 x10^{-3} cm/sec with an average of 2.5 x 10^{-3} cm/sec. These values are approximately one order of magnitude higher than those in the till/weathered shale aquifer at SEAD-25, possibly because the fill portion of the overburden is contributing to the overall higher conductivity values at SEAD-26.

Vertical Connection Tests were not required at SEAD-26. The geology and hydrology of SEAD-26 can be assumed to be similar to SEAD-25 and the many other sites at SEAD which have been investigated. These results would indicate that there is that the shallow portion of the aquifer located in the till weathered shale zone is not significantly connected to the deeper portion of the aquifer located in the competent shale zone.

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 Fire Training and Demonstration Pad (SEAD-25) has been in use from the late 1960s to the late 1980s. In the past, the pad was used for fire control training. During the 1980's, the pad was used twice for fire fighting demonstrations, once in 1982 or 1983 and in 1987. The Fire Training Pit and Area (SEAD-26) has been in use from 1977 to 1994. The pit is approximately 75 feet in diameter and approximately 3 feet deep. A bentonite liner was installed in the pit in 1982 or 1983. During a site inspection in 1990, the fire pit was full of water. The pit was used one to four times a year for fire fighting training during which time various flammable materials were floated on water, ignited, and extinguished. Prior to 1977, the fire training area surrounding the pit may have also been used for fire demonstrations.

1.2.2.1 Previous Investigations

SEAD-25 and -26 are described in three previous reports. The first report is the work plan for CERCLA ESI of Ten Solid Waste Management Units written by Parsons Main, Inc. in January 1993. This report detailed the site work and sampling to be performed under the Expanded Site Investigation (ESI) The second report, the SWMU Classification Report (Parsons ES, 1994) was undertaken to describe and evaluate the Solid Waste Management Units at SEDA. The third report is an Expanded Site Inspection Report (Parsons ES, 1995a) which describes a more detailed investigation of SEAD-25 and -26.

All previous investigations of the SEAD-25 and -26 site are summarized in chronological order in the RI.

1.3 NATURE AND EXTENT OF CONSTITUENTS OF CONCERN

The nature and extent of the chemicals of concern at the SEAD-25 and -26 were evaluated through a comprehensive field investigation program. Primary media investigated at the SEAD-25 and -26 included soil (from soil borings and test pits), surface water and sediment (from Kendaia Creek and on-site wetlands and drainage swales), and groundwater (from monitoring wells).

Concentrations above the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) clean-up guidelines were measured in this area at all depths from land surface to the top of the weathered shale. TAGMS are used by NYSDEC for establishing cleanup guidelines. The TAGMS are not promulgated standards and therefore are not ARARs but rather are To Be Considered (TBC) guidelines. As such, remedy selection will be based upon other enforceable standards that are ARARs. However, if appropriate, TAGMs may be used to help determine treatment volumes such as cubic yards of soil.

Surface water at SEAD-25 and -26 have not been classified by NYSDEC. However, because the drainage ditches near SEAD-25 and -26 form the headwaters for Kendaia and Indian Creek, respectively, 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 surface water chemical data. The Class C Standards are not strictly applicable to the surface water found at SEAD-25 and -26.

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).

1.3.1 SEAD-25

On the basis of the analytical results obtained for the 5 media at SEAD-25, the most significant impact to the site is from VOCs. Impacts from SVOCs, metals, pesticides and PCBs were also identified.

In the soil at SEAD-25, BTEX compounds were found to be pervasive in the subsurface soil on and immediately southwest of the Fire Training and Demonstration Pad. Several of BTEX compounds exceeded their respective TAGMS. Chlorinated compounds were also present in the subsurface soils beneath the pad; in some samples at levels above the TAGM values. The southwestern portion of pad is believed to be the source for the BTEX and chlorinated compounds. SVOCs, predominately PAHs, were also found in the surface and subsurface soils on-site. Impacts from metals, pesticides and PCBs, and herbicides in soil are less significant than the impacts from VOCs.

In the shallow groundwater aquifer, BTEX and chlorinated compounds form overlapping plumes. BTEX compounds form a plume that is approximately 200 feet long and originates in the southwestern portion of the Fire Training and Demonstration Pad (see **Figure 1-5**). Based on the concentrations of BTEX compounds in the array of wells at the site, the plume is localized and does not extend beyond Ordnance Drive near the southern perimeter of the site. Several of the BTEX compounds exceeded NYS GA groundwater standards. No BTEX compounds were detected in any of the bedrock wells. Chlorinated compounds form a plume that is approximately 130 feet long, but the total concentrations are significantly less than those detected for the BTEX plume. However, several of the chlorinated compounds did exceed their respective NYS GA standards. Like the BTEX plume, the chlorinated plume is believed to have its source beneath the southwestern portion of the pad (see **Figure 1-6**). Impacts from SVOCs and metals were less significant; no pesticides, PCBs, or herbicides were detected in the groundwater at SEAD-25.

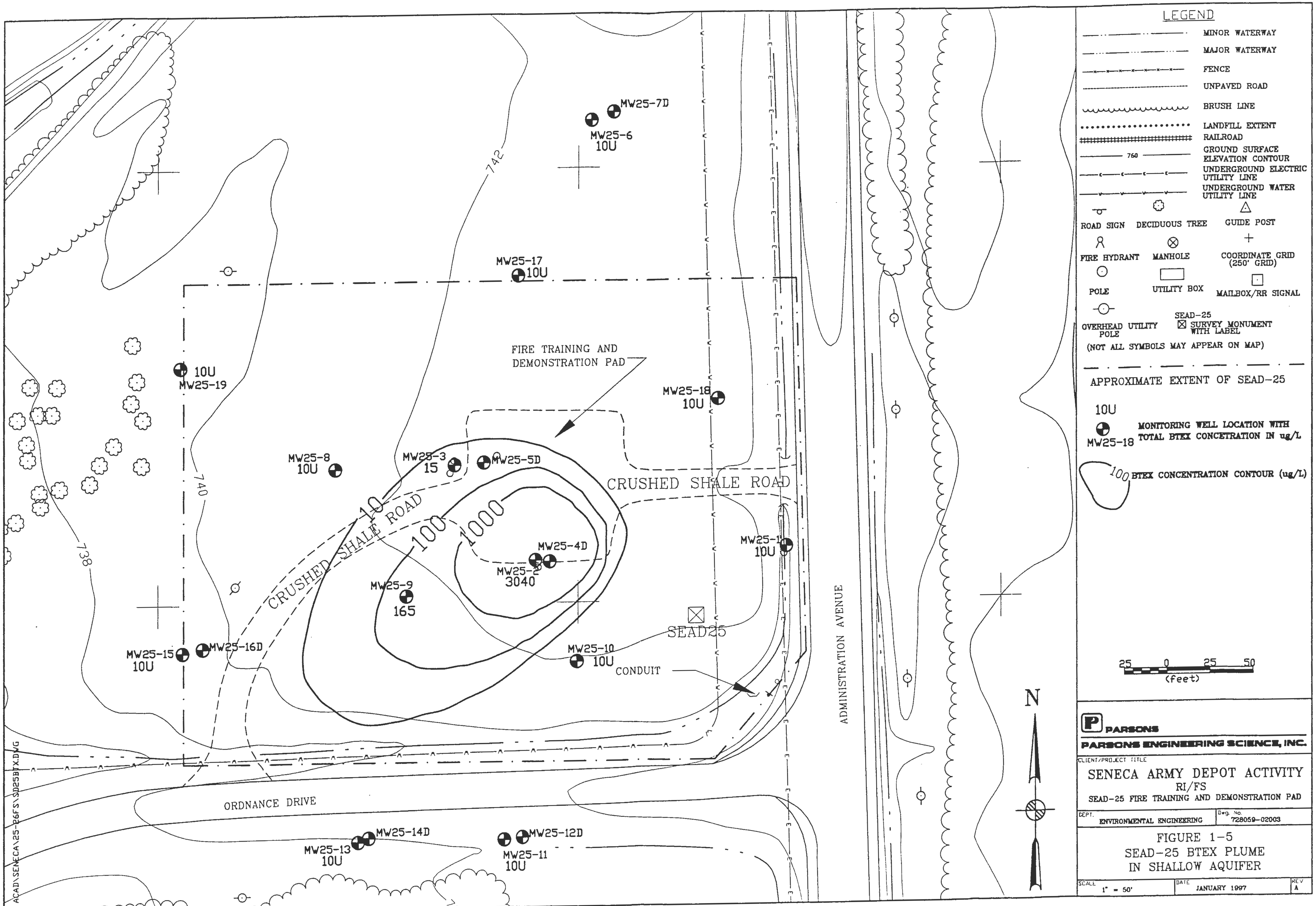
Generally, surface water impacts were not widespread and many of the tested chemical constituents were not present in the samples. SVOC were found in a few surface water samples, but none were above their respective NYS Class C standards. Also, several metals were found at concentrations that exceeded their standards. No VOCs, pesticides, or PCBs were detected in the samples.

Sediment impacts, like those for surface water, were most significant in the drainage ditch located northwest of the Fire Training and Demonstration Pad. In this ditch, SVOCs and pesticides were pervasive. Sediment criteria exceedances for SVOCs, predominantly PAHs, were almost exclusively found in the drainage ditch; elevated TIC concentrations were also found in the ditch. Several pesticide compounds exceeded their respective NYS sediment criteria and by far the most significant exceedences were, again, in the sediment samples collected from the drainage ditch. These impacts are not believed to be caused by past or present activities at SEAD-25. Instead, an alternative source (or sources) for the SVOCs and pesticides in the drainage ditch is likely based upon expected surface water flow patterns. Instead, a 36-inch diameter culvert is located in a headwall (i.e., at the northeast end of the ditch) where a storm sewer transitions to the open drainage ditch, and it empties surface water into this ditch from upgradient locations near SEDA office and maintenance areas adjacent to Administration Avenue and 1st, 2nd and 3rd Avenues. For these reasons, SEAD-25 is not believed to be the source for the elevated SVOCs and pesticides found in the drainage ditch.

1.3.2 SEAD-26

On the basis of the analytical results obtained for the 5 media at SEAD-26, the most significant impacts to the site are from SVOCs. Impacts are from VOCs, metals, pesticides and PCBs were also found.

SVOCs were found in the majority of soil samples at SEAD-26. PAHs were found to be pervasive in the surface and subsurface soils; several at levels that exceeded their respective TAGMs. VOCs were present in the surface and subsurface soil samples, however, none of them exceeded their respective TAGM values. Based on sample locations and concentrations, the burning pit is believed to be the source for the VOCs. Pesticides and PCBs, herbicides, nitroaromatics and metals were not found in levels that exceed applicable TAGM values in the soils.


LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENT
RAILROAD
760
GROUND SURFACE ELEVATION CONTOUR
UNDERGROUND ELECTRIC UTILITY LINE
UNDERGROUND WATER UTILITY LINE
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SEAD-25
SURVEY MONUMENT WITH LABEL
(NOT ALL SYMBOLS MAY APPEAR ON MAP)
APPROXIMATE EXTENT OF SEAD-25
10U
MW25-18
MONITORING WELL LOCATION WITH TOTAL BTEX CONCETRATION IN ug/L
100
BTEX CONCENTRATION CONTOUR (ug/L)
25 0 25 50
(feet)
N
MW25-7D
MW25-6
10U
742
MW25-17
10U
10U
MW25-19
FIRE TRAINING AND DEMONSTRATION PAD
MW25-18
10U
MW25-8
10U
MW25-3
15
MW25-5D
CRUSHED SHALE ROAD
740
10
100
1000
CRUSHED SHALE ROAD
MW25-4D
MW25-2
3040
MW25-1
10U
738
MW25-9
165
SEAD25
MW25-15
10U
MW25-16D
MW25-10
10U
CONDUIT
ADMINISTRATION AVENUE
ORDNANCE DRIVE
MW25-14D
MW25-13
10U
MW25-12D
MW25-11
10U
ACAD\SENECA\25-26FS\SD25BTX.DWG
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD
DEPT.
ENVIRONMENTAL ENGINEERING
Dwg. No.
728059-02003
FIGURE 1-5
SEAD-25 BTEX PLUME
IN SHALLOW AQUIFER
SCALE
1" = 50'
DATE
JANUARY 1997
REV
A

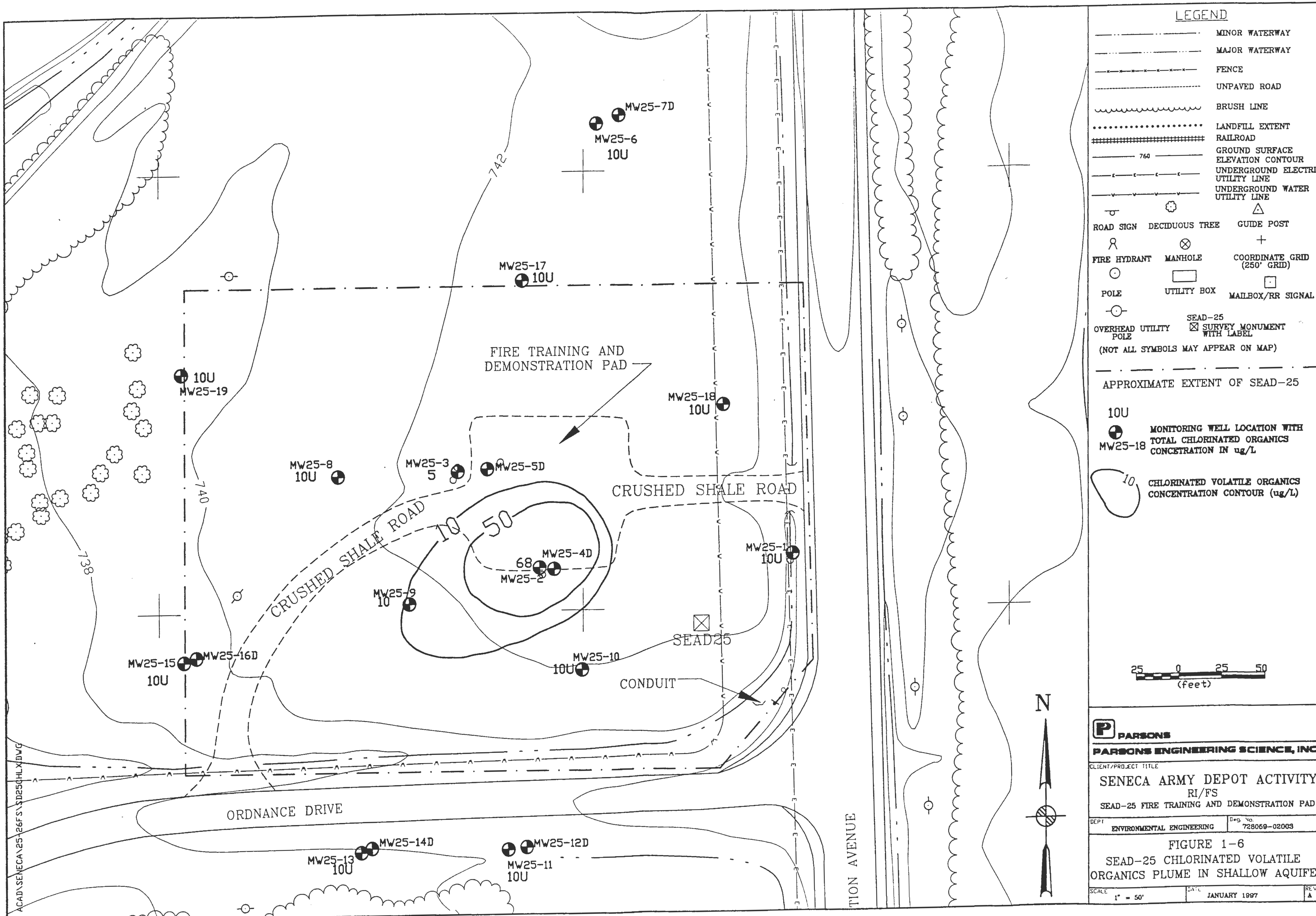


FIGURE 1-6
SEAD-25 CHLORINATED VOLATILE ORGANICS PLUME IN SHALLOW AQUIFER

Generally, the groundwater at SEAD-26 has not been significantly impacted by any of the chemical constituents. Low concentrations of VOCs and SVOCs were detected in the well immediately adjacent to the south side of the pit. Criteria exceedences for BTEX were detected in one well South of the Training Pit. Additionally, no pesticides, PCBs, herbicides, or nitroaromatics were detected in the groundwater.

Surface water impacts were not widespread and many of the tested chemical constituents were not present in the samples. Most of the impacts from SVOCs, pesticides, herbicides, and nitroaromatics occurred in the surface water samples from the burning pit, although a pesticide exceeded its NYS Class C surface water quality standard at another location. Also, several metals were found at concentrations that exceeded their Class C standards. No VOCs or PCBs were detected in the samples.

Sediment impacts were most significant in the burning pit located in the central portion of the site. In the pit, SVOCs (including TICs) were the most pervasive in the sediment, however, VOCs, pesticides, PCBs, nitroaromatics, and an herbicide compound were also detected. At SEAD-26, there were sediment criteria exceedences for 1 SVOC, 3 pesticides, and 1 PCB compound. Metal impacts were more widespread and not restricted to the burning pit; several metals exceeded their respective guidance values.

1.4 FATE AND TRANSPORT

Analysis of the fate and transport mechanisms for the chemicals of concern at the SEAD-25 and -26 considered site specific factors as well as the chemical and physical properties of the target analytes. Soil, sediment, and surface water samples collected off-site, and downstream of the site were used to quantify the extent of impacts to various media.

1.4.1 SEAD-25

VOCs of concern at SEAD-25 (BTEX and chlorinated compounds) are transported primarily by volatilization and groundwater flow. Groundwater and soil gas samples collected during the RI confirm that these materials are present in the subsurface soils and in groundwater. Once these materials have entered the subsurface, they may migrate through the unsaturated vadose zone and/or infiltrate into the groundwater system.

The groundwater system at SEAD-25 has been applied to a mathematical model which is based on physical laws and on the aquifer system characteristics. When applying this system to a model, the chemical and physical properties of the soil and the solute (organic carbon content, solubility, and other characteristics) need to be considered. The vadose zone, which is a much more complex physical system to model than an aquifer, was not modeled because the transport of BTEX and chlorinated compounds was already estimated within the fugacity modeling, and because the groundwater has already been impacted with BTEX and chlorinated compounds at SEAD-25.

The age of the plume, according to site history, is approximately 20 years old. old. For the purposes of modeling the groundwater, a calibration run was made using BIOSCREEN to show that the model could reproduce the concentrations in the existing plume (1995), assuming that the release occurred 20 years ago. BIOSCREEN has the ability to simulate advection, dispersion, adsorption, and aerobic and anaerobic degradation processes. The calibration run concluded that the first-order decay model showed the best fit with the existing conditions supporting the notion that biological degradation of the BTEX plume is occurring. Two predictive simulations were run for 20 years and 100 years. The time required for the plume's benzeneconcentration to decrease to the most conservative NYSDEC Class GA groundwater benzene standard (0.001 mg/L, TOGS 1.1.1, June 1998) was determined in these simulationsFor the 20-year predictive plume, the model predicts that the concentration of benzene will be 0.001 mg/L 270 feet from the source. For the 100- year predictive plume, the model predicts that the concentration of benzenewill be 0.001 mg/L 240 feet from the source. The details of the BIOSCREEN modeling are provided in Appendix E.

1.4.2 SEAD-26

VOCs of concern at SEAD-26 (BTEX) are transported primarily by volatilization and groundwater flow. One groundwater sample (MW26-7) collected during the RI confirms that these materials are present in the subsurface and groundwater. Once these materials have entered the subsurface, they may migrate through the unsaturated vadose zone and/or infiltrate into the groundwater system. The groundwater system at SEAD-26 has been applied to a mathematical model which is based on physical laws and on the aquifer system characteristics. When applying this system to a model, the chemical and physical properties of the soil and the solute (organic carbon content, solubility, and other characteristics) need to be considered. The vadose zone, a much more complex physical system to model than an aquifer, was not modeled because the transport of BTEX and chlorinated compounds was already estimated within the fugacity modeling, and because the groundwater has already been impacted with BTEX at SEAD-26. Using present-day information from MW26-7, the model predicted source decay over the next forty years. According to the results, the total benzene concentration should be below 0.001 mg/L (the lowest NYSDEC Class GA standard of BTEX compounds) 60 feet from the source after 20 years and 100 years. The results of these numerical models are presented in the RI Report (Parsons ES, 1998) which is included in **Appendix E**.

1.5 RISK ASSESSMENT

The objectives of the baseline risk assessment are to: help determine whether additional response actions are necessary at the site; provide a basis for determining residual chemical levels that are adequately protective of human health and the environment; provide a basis for comparing potential health impacts of various remedial alternatives; and to help support selection of the "No Action" remedial alternative, where appropriate. To meet these objectives, the *Risk Assessment Guidance for Superfund* (RAGS) (USEPA, 1989a) was followed wherever possible and applicable. However, as stated in the guidance document, "The Human Health Evaluation Manual (also referred to as RAGS) admittedly cannot address all site circumstances." Technical judgment, consultation with USEPA staff, and recent publications were used in the development of the baseline risk assessment.

The baseline risk assessment is divided into two basic components: the human health evaluation, and the ecological risk assessment evaluation. Separate risk calculations are presented for current and future on-site land-use scenarios.

1.5.1 Baseline Human Health Risk Assessment

The current and future intended land use for SEAD-25 and -26 is industrial. There are no current plans to use these sites for residential purposes. The area is not experiencing a high degree of growth nor is it expected to. There is no pressure to develop land in this area, nor will there likely be the need to develop the area inclusive of SEAD-25 for residential purposes. Section 6.2.2. of RAGS discusses future land uses and states: "If the site is industrial and is located in a very rural area with a low population density and projected low growth, future residential use would probably be unlikely. In this case, a more likely alternate future land use may be recreational. At some sites, it may be most reasonable to assume that the land use will not change in the future."

In July 1995, the Base Realignment and Closure Act (BRAC) Commission voted to recommend closure of SEDA. Congress approved the recommendation, which became public law on October 1, 1995. According to BRAC regulations, future uses of the site will be determined by the Army. This determination has been made by the Seneca Army Depot Local Redevelopment Authority and is documented in the Reuse Plan and Implementation Strategy (October 1997).

Although the intended future use of SEAD-25 and 26 is industrial, the future residential scenario has been considered in this FS for the following reasons:

1. The area directly east of SEAD-25 and north of SEAD-26 is designated as residential.
2. To comply with Army guidance, which states that alternatives consistent with property use without restriction should be considered to compare life-cycle institutional control costs with more conservative clean-up alternatives (DAIM-BO, "Army Guidance for Using Institutional Controls in the CERCLA Process").

Consistent with the current land use and future land use discussed above, human health risk assessments were calculated for the following three exposure scenarios:

1) current on-site worker;
2) future on-site residents; and
3) future on-site construction worker.

SEAD-25

Potential future residents of the site are the only receptors exhibiting risk of cancer above the USEPA target risk range and potential future residents of the site and future on-site construction workers exhibit a potential for adverse noncarcinogenic health threats. As shown on **Table 1-1**, the RME excess cancer risk is $1x10^{-3}$,the RME child hazard index is 10, and the RME adult hazard index is 5 for the future resident scenario. These risks are due primarily to exposure of future residential receptors to groundwater as their sole drinking and shower water source. Although risks are exhibited by potential future residents using groundwater for drinking and showering, there is, at best, a very minimal likelihood of residential development and groundwater use on the site. If the pathway is not completed, there are no risks. The RME adult hazard index for the future on-site construction worker is 4 and is primarily due to inhalation of benzene in the ambient air which originates in the soil.

SEAD-26

Potential future residents of the site are the only receptors exhibiting risk of cancer above the USEPA target risk range and a potential for adverse noncarcinogenic health threats. As shown on **Table 1-2**, the RME excess cancer risk of 7×10^{-5} and the RME hazard index of 1, are due primarily to ingestion of on-site soil and sediment, and dermal contact to groundwater for future residents. Although risks are exhibited by potential future residents using groundwater for showering, there is, at best, a very minimal likelihood of residential development and groundwater use on the site, as well as ingestion of soil and sediment. If the pathway is not completed, there are no risks.

1.5.2 Baseline Ecological Risk Assessment

The ecological risk assessment 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 Framework for Ecological Risk Assessment*" (EPA, 1992f), and the "*Procedural Guidelines for Ecological Risk Assessment at U.S. Army Sites-Vol. 1*" (Wentsel et al., 1994). The results of the Baseline Ecological Risk Assessment (ERA) indicate that the

COPCs identified at SEAD-25 and -26 are considered to pose a negligible risk to the ecosystem surrounding the site.

The SEAD-25 and -26 ERA has included both a qualitative and quantitative assessment of the ecological status of the Operable Units. Phase I field evaluations included the characterization and description of the local wildlife habitat and ecological conditions within the study area. The conclusions determined from these field efforts indicated a diverse and healthy aquatic and terrestrial environment. No overt acute toxic impacts were evidenced during the field evaluation.

Quantitative sediment and surface water analytical data were compared to USEPA and NYSDEC guidelines for the protection of aquatic and macroinvertebrate life in sediments and surface water. Additionally, as a supplement to specific guidelines, criteria, which are protective of terrestrial wildlife and vegetation in soils, were also considered.

The quantitative ecological risk evaluation, which involved comparisons of the ecological assessment endpoint exposures with the toxicity reference values, initially suggested that a slight possibility exists for the COPCs to present a small potential for environmental effects. In addition, four inorganic elements at SEAD-25 and one phthalate compound, one herbicide and three inorganic elements at SEAD-26 presented a potential for greater exposure to result in environmental effects. However the effects from all of these analytes have not been observed during fieldwork, i.e. the ecological community appears diverse and normal. Furthermore, upon considering the weight of evidence presented in the Ecological Risk Summary section (Sections 6.6.12.4 and 7.6.12.4 of the RI, Parsons ES, 1996) and the very conservative assumptions used in the ERA, the COPCs identified at SEAD-25 and -26 are considered to pose a negligible risk to the ecosystem of the SEAD-25 and -26 study area.

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.1 INTRODUCTION

The purpose of this section of the feasibility study is to present and screen an appropriate range of remedial action technologies that will eventually be combined as remedial alternatives and undergo further screening in **Section 3.0**. Technologies were developed following the standard EPA method of identifying and screening technologies/processes. This method consists of the following six steps:

- Develop remedial action objectives that are risk-based, with consideration given to Applicable or Relevant and Appropriate Requirements (ARARs). The remedial action objectives are based on media of interest, chemical constituents of concern and the results of the BRA presented in Section 6.0 and 7.0 of the SEAD-25 and -26 RI Report.

- Develop general response actions for each medium of interest that will satisfy each remedial action objective for the site.

- Estimate quantities of media to which general response actions may be applied to meet remedial action objectives.

- Identify remediation technologies/processes associated with each general response action. Screen and eliminate technologies/processes based on technical implementability.

- Evaluate technologies/processes and retain processes that are representative of each technology that is retained from the technology screening.

- The retained technologies/processes are then assembled into a range of alternatives as appropriate and screened further. The remaining alternatives are then analyzed in detail.

This six-step approach to technology screening and alternatives development is described in the following subsections.

2.2 REMEDIAL ACTION OBJECTIVES

2.2.1 General Remedial Action Objectives

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process is a risk based process when considering remedial action objectives (RAOs). It requires that the overall objective of any remedial response is to reduce the environmental and human health risks of the chemicals present in the various environmental media to within established EPA target ranges. Additionally, the National Contingency Plan (NCP) requires that CERCLA remedial action objectives must comply with all ARARs. Finally, CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, requires that a CERCLA remedial action must be cost effective and must use permanent solutions to the maximum extent possible. Remedial action objectives have been developed that consist of media-specific objectives for the protection of human health and the environment. These objectives are risk based and comply with ARARs to the maximum extent possible.

The remedial action objectives for SEAD-25 and -26 are based on exposure levels and associated risks posed by on-site contamination and contamination that has or may migrate off-site. These objectives consider the site characteristics that define the fate and transport of contaminants, pathways of exposure, receptors, and short and long-term health effects. The remedial action objectives for the SEAD-25 and -26 operable unit are as follows:

- Prevent public or other persons from direct contact with adversely impacted soils, sediments, solid waste and surface water that may present a health risk.
- Eliminate or minimize the migration of hazardous constituents from soil to groundwater.
- Prevent ingestion of groundwater containing constituents in excess of federal and state drinking water standards or criteria, or which pose a threat to public health.
- Prevent off-site migration of constituents above levels protective of public health and the environment.
- Restore groundwater, soil, surface water, and sediments to levels that are protective of public health and the environment.

The following sections describe how these general remedial action objectives were determined and the development of remedial actions to attain these objectives. As previously mentioned, remedial action objectives for this site will be based upon the current and intended land use (i.e. industrial) scenarios. Residential land use is only considered to compare the cost of remediating the site for this land use versus the cost to implement restricted use on the site, in accordance with Army guidance (DAIM-BO Memorandum, "Army Guidance on Using Institutional Controls in the CERCLA Process").

Remedial action objectives are dependent on the media of interest, which is dependent on the human and ecological health risk assessment and ARAR compliance. Remedial action objectives will be developed by:

- determining the risk based media of interest
- determining the ARAR based media of interest
- establishing media-specific remediation goals
- estimate quantities of each media to be remediated

Based on the results, technologies capable of accomplishing the remedial action objectives will undergo applicability screening. Applicable technologies will then be assembled into remedial alternatives in **Section 3.0**.

2.2.2 Risk-Based Remedial Action Objectives

The first step in developing remedial action objectives is to review the results of the Baseline Risk Assessment (BRA) presented in the RI report (Parsons ES, May 1998). In general, EPA considers that a site exhibits unacceptable risk levels if the Hazard Index (HI) for the site is greater than 1, or if the cancer risk is greater than the target range of 1×10^{-4} to 1×10^{-6}. As shown in **Table 1-1** and **1-2**, both the total hazard index (0.001 and 0.004 for SEAD-25 and -26, respectively) and current total cancer risk (2×10^{-7} and 1×10^{-6} for SEAD-25 and -26, respectively) are within the EPA target risk range for the current land use scenario. For the intended future land use scenario, the hazard index at SEAD-25 is greater than 1.0 (HI = 4). Therefore, remedial action must be undertaken to reduce human health risk at SEAD-25. The total cancer risk at SEAD-25 is 3×10^{-6} which is within the EPA target risk range for this scenario. The hazard index (0.6) and current total cancer risk (2×10^{-6}) are within EPA target risk range for the intended future land use scenario at SEAD-26.

For the future residential scenario which is considered for cost comparison purposes, both the child and adult hazard indices exceeded EPA criteria (HI = 10 and 5, respectively) at SEAD-25. The cancer risk also exceed the target range (1×10^{-3}) at SEAD-25. At SEAD-26, the adult hazard index and cancer risk values are within EPA criteria and target ranges (0.4 and 7 x 10-5, respectively). The child hazard index only slightly exceeds the hazard index of 1. For evaluation of the residential scenario, remedial action must be undertaken to reduce human health risk at SEAD-25. Remedial action at SEAD-26 is not necessary based on human health risk.

The results of the ecological risk assessment (ERA) presented in the RI report (Parsons ES, May 1998) concluded that there is negligible risk to the ecosystem of the SEAD-25 and -26 study areas. The ERA included both a qualitative and quantitative assessment of the ecological status of the Unit. During field evaluation, no overt acute toxic impacts were evidenced during the field evaluation. The quantitative ecological risk evaluation, which involved comparisons of the ecological assessment endpoint exposures with the toxicity reference values, initially suggested that a slight possibility exists for the contaminants of potential concern (COPCs) to present a small potential for environmental effects due to sediment at SEAD-25 and due to sediment, soil and surface water at SEAD-26. In addition, four inorganic elements present in the sediment presented a potential for greater exposure to result in environmental effects at SEAD-25 and one phthalate, one herbicide and three inorganics present in the sediment presented a potential for greater exposure to result in environmental effects at SEAD-26. However, the effects from all of these analytes have not been observed during fieldwork, i.e. the ecological community appears diverse and normal. Furthermore, upon considering the weight of evidence presented in the Ecological Risk Summary section of the RI (Sections 6.6.12.4 and 7.6.12.4 of the RI), and the very conservative assumptions used in the ERA, the COPCs identified at SEAD-25 and SEAD-26 are considered to pose negligible risk to the ecosystem of the SEAD-25 and -26 study areas.

In addition to those reasons discussed in the RI, the following reasons for excluding sediment as a media of interest based on ecological risk are:

1. The presence of PAHs at SEAD-25 may be due to sources other than past activities at SEADs-25. This is apparent by the increasing PAH concentrations upstream of SEAD-25. PAH concentrations downstream of SEAD-25 decrease.
2. A significant portion of the ecological risk calculated in the RI for SEADs-25 and 26, was to aquatic receptors. As discussed in the RI, the ecological quotients calculated for aquatic receptors are very conservative since the sediment criteria that were used in their calculations are based upon a continuous exposure of aquatic organisms to these contaminants. Aquatic organisms are unlikely to occur in the drainage ditches of the unit as the conditions in the ditches are not aquatic in nature. Surface water in the ditches at SEADs-25 and -26 is ephemeral and is only present after heavy rains. Stormwater discharge from the base has been tested and does not predict ecological risk. This discharge runs through the drainage ditches at SEADs-25 and -26. Therefore, no ecological risk impacts are predicted at the point where sediment from these areas may eventually come in contact with aquatic receptors (i.e. at Kendaia Creek).

Both sites are described in more detail below.

2.2.2.1 SEAD-25 Human Health Risk-Based Remedial Action Objectives

Based upon the results of the baseline human health risk assessment, risk levels are within the acceptable risk levels for the current land use scenario, but outside of EPA target ranges for soil under theintended future land use scenario. Inhalation of volatile organic compounds (secondary to soil-borne vaporization) for the future on-site construction worker exhibits a hazard index greater than 1 (HI=4). In addition, soils contribute the most to the total carcinogenic and non-carcinogenic risks for both the current and future intended land use scenarios. Carcinogenic and non-carcinogenic risks from groundwater exposure pathways apply only to future residents using the groundwater as their water source for drinking and showering. In addition, sediment contributes to carcinogenic and non-carcinogenic risks for future residents, although by itself, non-carcinogenic risk levels for this media are within the acceptable EPA risk levels. As there are no intentions of using this land for residential purposes, human health risk under the current and future land use scenarios exist for soil only. However, risk from groundwater and sediment exposure pathways will be considered in the residential scenario which is developed and considered for cost comparison purposes.

Human health risk to a future on-site construction worker is present primarily due to the non-carcinogenic effects of benzene (HI=4). Other contributing volatiles are 1,1,1-trichloroethane (HI=0.02), 2-butanone (HI=0.002), chloroform (HI=0.002), ethylbenzene (HI=0.05), methylene chloride (HI=0.005), and toluene (HI=0.08). These compounds all have hazard indices less than one.

Groundwater and sediment at SEAD-25 contribute to the human health risk under a future residential scenario which is considered for cost comparison purposes. For groundwater, daily ingestion and inhalation of groundwater while showering contributed most significantly to non-carcinogenic human health risk. Ingestion of onsite sediment and groundwater contributed most significantly to carcinogenic human health risks. Carcinogenic and non-carcinogenic risks from ingestion of groundwater and inhalation of groundwater while showering are mainly due to the presence of benzene. Carcinogenic risks from sediment are mostly due to the presence of PAHs (benzo(a)pyrene and benzo(b)fluoranthene). Although non-carcinogenic risk from sediment by itself does not exceed EPA criteria (i.e. HI<1), 4,4-DDD, cadmium, and magnesium contribute most significantly to non-carcinogenic risk from ingestion of sediment.

Clean-up goals for soil at SEAD-25 will be established such that risk to future on-site construction workers will be reduced to within EPA criteria values.. Clean-up goals for groundwater and sediment will be established for the residential scenario such that risk to future residents will be within EPA criteria and target ranges.

2.2.2.2 SEAD-25 Ecological Risk-Based Remedial Action Objectives

Constituents in the sediment at SEAD-25 displayed ecological quotients greater than 1. However, this media was dismissed as a ecological risk-based media of interest for the following reasons. The results of the ecological risk assessment (ERA) presented in the RI report (Parsons ES, May 1998) concluded that there is negligible risk to the ecosystem of the SEAD-25 study area. Although some COPCs exhibited a potential for risk to ecological receptors, the effects from these COPCs have not been observed during fieldwork, i.e. the ecological community appears diverse and normal. Furthermore, upon considering the weight of evidence presented in the Ecological Risk Summary section of the RI (Section 6.6.12.4 and 7.6.12.4), and the very conservative assumptions used in the ERA, the COPCs identified at SEAD-25 are considered to pose negligible risk to the ecosystem of the SEAD-25 study area.

2.2.2.3 SEAD-26 Human Health Risk-Based Remedial Action Objectives

Based upon the results of the baseline risk assessment there are no unacceptable risk levels and there is no need to perform a remedial action. Soils contribute the most to the total carcinogenic and non-carcinogenic risks for both the current and future intended land use scenarios. Carcinogenic and non-carcinogenic risks from groundwater exposure pathways apply only to future residents using the groundwater as their water source for drinking and showering. Sediment is also a contributor to risk at the site for future residents. As there are no intentions of using this land for residential purposes, the risks for SEAD-26 are all below EPA risk criteria. Even under the unlikely future residential land use scenario, the cancer risk is within the EPA target range (1×10^{-4}—1×10^{-6}) and slightly higher than the non-carcinogenic risk level of 1.0. Therefore, no additional media will be considered in developing clean-up goals for a future residential scenario since the baseline risk assessment indicates there is negligible risk.

2.2.2.4 SEAD-26 Ecological Risk-Based Remedial Action Objectives

Constituents in the soil, sediment, and surface water displayed ecological quotients greater than 1. However, these media were dismissed as ecological risk-based media of interest for reasons explained below.

Soil

The ecological risk assessment suggested that a potential for greater exposure to result in environmental effects from soil exposure due to elevated ecological quotients for bis(2-ethyl hexyl)phthalate, and zinc (EQ=86.3, and 24.3, respectively). As stated in Section 7.6.12.4 of the Remedial Investigation, these two compounds are not likely to cause a decrease in the overall receptor population in the local area based on uncertainties in the risk assessment, the low frequency of detection of bis (2-ethyl hexyl)phthalate, and the uncertainty in the bioavailability of zinc. In addition, due to the elevated background soil concentrations of zinc at SEAD-26, zinc was dismissed as a constituent of concern. Thus, soil at SEAD-26 is not a risk-based media of interest.

Sediment

The ecological risk assessment suggested that sediment in the drainage ditch presented a potential for greater exposure to result in environmental effects. However, the effects from all of the COPCs have not been observed during fieldwork, i.e. the ecological community appears diverse and normal. Furthermore, upon considering the weight of evidence presented in the Ecological Risk Summary section of the RI (Section 7.6.12.4), and the very conservative assumptions used in the ERA, the COPCs identified at SEAD-26 are considered to pose negligible risk to the ecosystem of the SEAD-26 study area.

Surface Water

Concentrations of aluminum, iron, zinc, and one herbicide (heptachlor) in surface water presented a potential for greater exposure to result in environmental effects due to elevated ecological quotients (21.5, 28.1, 15.4 and 28.0, respectively). Because of elevated iron and aluminum concentrations in all media at SEAD-26, these constituents are not considered to pose any additional ecological risk due to their presence in surface water and can be dismissed. Examination of the sample results, indicate that heptachlor was present in only one sample at a concentration of (0.03 ppb). The low concentration and low detection frequency allow for the dismissal of heptachlor as an ecological risk-based media of interest. In addition, because the surface water is ephemeral and only found in the drainage ditch, adverse effects to aquatic-amphibian life is unlikely. Thus, surface water is not considered an ecological risk-based media of interest.

2.2.2.5 Risk-Based Remedial Action Objectives Summary

In conclusion, for SEAD-25 and -26, the risk-based remedial objectives are to reduce any non-carcinogenic and carcinogenic risks to acceptable levels based upon EPA criteria established under CERCLA and SARA. The human risk assessment indicated that soils at SEAD-25 present a risk to future on-site construction workers via inhalation of volatile organic compounds. This risk is present primarily due to the non-carcinogenic effects of benzene (HI=4). In addition, in considering a residential scenario, ingestion and inhalation of groundwater and ingestion of sediment contribute to human health risk. The ecological risk assessment indicated that the COPCs identified in sediment at SEAD-25 and in sediment, soil, and surface water at SEAD-26 are considered to pose negligible risk to the ecosystem of these study areas. Clean-up goals for soil at SEAD-25 will be established such that risk to future on-site construction workers will be reduced to within EPA criteria values for all scenarios. Clean-up goals for groundwater and sediment at SEAD-25 will be established for the residential scenario such that risk to future residents will be within EPA criteria. Clean-up goals for SEAD-26 will not be risk based since no risk is exhibited.

Additional considerations such as ARARs and removal actions under the NCP must be considered prior to developing an overall remedial action plan for SEAD-25 and -26. The following sections discuss these criteria in order to evaluate necessary remedial actions.

2.2.3 ARAR-Based Remedial Action Objectives

The investigation and clean-up of SEAD-25 and -26 falls under the jurisdiction of both the State of New York regulations (administered by NYSDEC) and Federal regulations (administered by USEPA Region II). 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.

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 items. CERCLA indicates that the TBC category could 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 such as ARARs. To date, ARARs have only been propagated for groundwater and surface water.

Potentially applicable state and federal requirements are reviewed in **Appendix C**. The following is a discussion of the comparison of SEAD-25 and -26 data to ARAR and TBC criteria by media.

SEAD-25 Groundwater

NYSDEC AWQS for Class GA waters are compared to the results of the groundwater analyses in **Table 2-1a**. ARAR exceedances were found for the following compounds: 1,1,1-Trichloroethane, 1,1-Dichloroethane, 1,2-Dichloroethene, Benzene, Chloroform, Ethylbenzene, Toluene, Trichloroethene, Xylene, 2,4-Dimethylphenol, 2-Methylphenol, 3,3'-Dichlorobenzidine, 4-Methylphenol, and Phenol. As the NYSDEC AWQS for Class GA waters are ARARs, groundwater is a media of interest at SEAD-25. The extent of contamination (i.e., plume dimensions) will be discussed in **Section 2.4.3**.

SEAD-25 Surface Soil

Results of the surface soil analysis are shown in **Table 2-1b**. Levels of Benzo(a)pyrene, Dibenz(a,h)anthracene, Lead, and Thallium exceed the NYSDEC TAGM values for soils. The NYSDEC Groundwater Protection Standards are dependent on the organic content of the surface soils at SEAD-25 which is 0.97%. The NYSDEC TAGMs presented are not ARARs but rather To Be Considered (TBCs) because they are not promulgated standards. These values are not used to determine the necessity of remediation but may be used as guidelines in setting remedial goals. Because none of the compounds with TAGM exceedances for surface soil are present in the groundwater, protection of groundwater for ARAR exceedances is not a concern. Thus, surface soil is not an ARAR based media of interest. Further, the contaminants present are not expected to leach to the groundwater due to their partition coefficients.

SEAD-25 Surface and Subsurface Soil

Results of the surface and subsurface soil analysis are displayed in **Table 2-1c**. Concentrations of Acetone, Benzene, Ethylbenzene, Methylene Chloride, Toluene, Xylene, 2-Chlorophenol, 4-Chloro-3-methylphenol, 4-Nitrophenol, Benzo(a)pyrene, Dibenz(a,h)anthracene, Pentachlorophenol, Phenol, Lead, Selenium, and Thallium exceed the NYSDEC TAGM values or background concentrations, as determined in Section 6.2.3 of the RI for soils. The NYSDEC Groundwater Protection Standards are dependent on the organic content of the soils at SEAD-25 which is 0.78% (organic content of subsurface soils). The NYSDEC TAGMs are not ARARs but rather To Be Considered (TBCs) because they are not promulgated standards. These values are not used to determine the necessity of remediation but may be used as guidelines in setting remedial goals. Because the contaminants responsible for groundwater ARAR exceedances are present in values exceeding TAGMs, but are not present in the surface soil, subsurface soil should be considered a media of interest from an ARAR standpoint. Individual sample points are evaluated in **Table F-1c** (**Appendix F**) to determine the extent of contamination.

SEAD-25 Surface Water

Surface water analysis results are displayed in **Table 2-1d**. Aluminum, Iron, Copper, Lead, Silver, and Zinc concentrations exceed the NYSDEC AWQS for Class C surface water. Although the AWQS are promulgated standards, Aluminum, Iron, Copper, Silver, and Zinc are not considered ARAR-based constituents of concern for the following reasons:

- Aluminum and Iron can be dismissed as constituents of concern due to the site background concentrations of these metals in all the media at SEAD-25.
- Silver exceeded the ARAR at one sample point (the concentration was 0.82 ppb, the AWQS is 0.1 ppb).
- Zinc exceeded the ARAR at one sample point, (the concentration was 70.3 ppb, the AWQS is 56.8 ppb).
- Copper exceeded the ARAR at two sample points, (the concentrations were 13.2 and 9.1, the AWQS is 8.1 ppb).

Thus, only lead is considered to be an ARAR-based constituent of concern in surface water. Lead exceeded the ARAR at four sample points at slightly elevated levels (the maximum exceedance was 7 ppb, the AWQS is 1.8 ppb). It is suspected that lead in the sediment of the drainage ditches and turbidity in the sample is responsible for surface water contamination. However, due to the fact that the water in the ditches is ephemeral and that this water is not a classified surface water body, this ARAR exceedance is not of concern at this site. Surface water analysis by sample point is displayed in **Table F-1d (Appendix F)**.

SEAD-25 Sediment

Sediment analysis results are displayed in **Table 2-1e**. Sediment criteria for Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Ideno(1,2,3-cd)pyrene, Phenanthrene, 4,4'-DDD, 4,4'-DDE, 4,4-DDT, Aldrin, Heptachlor, Heptachlor epoxide, Antimony, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Manganese, Mercury, Nickel, Silver, and Zinc were exceeded in the drainage ditches surrounding SEAD-25. Both the NYS BALCT and NYSDEC HHB are dependent on the organic content of the sediment, which is 3.5% for SEAD-25. Sediment criteria are not ARARs but rather To Be Considered (TBCs) because they are not promulgated standards. These values are not used to determine the necessity of remediation but may be used as guidelines in setting remedial goals. Although lead in the sediment is the probable cause of the surface water ARAR exceedance, the surface water is ephemeral and is not a classified surface water body. Therefore, sediment is not considered a media of interest from an ARAR standpoint. The extent of sediment contamination by sample point is addressed in **Table F-1e**.

TABLE 2-1a
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results

Parameter	NYSDEC AWQS*	Units	Source	Mean	Max. Hit	No. of Hits>AWQS	Total No. of Samples**	% of AWQS exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc. (units)(1)
Volatile Organics										
1,1,1-Trichloroethane	5	UG/L	NYSDEC AWQS-GA	5.4	37.0	3	34.0	9%	18.6	18.6
1,1-Dichloroethane	5	UG/L	NYSDEC AWQS-GA	2.2	8.0	1	34.0	3%	7.5	7.5
1,1-Dichloroethene	5	UG/L	NYSDEC AWQS-GA	0.6	1.0	0	34.0	0%	0.8	0.8
1,2-Dichloroethene (total)	5	UG/L	NYSDEC AWQS-GA	8.9	40.0	4	21.0	19%	12.8	12.8
2-Butanone (2)	50	UG/L	NYSDEC Guidance	9.7	130.0	1	34.0	3%	9.9	9.9
Benzene	1	UG/L	NYSDEC AWQS-GA	79.2	1000.0	7	34.0	21%	370.7	370.7
Bromoform (2)	50	UG/L	NYSDEC Guidance	1.8	6.0	0	34.0	0%	5.7	5.7
Chlorodibromomethane (2)	50	UG/L	NYSDEC Guidance	1.3	3.0	0	34.0	0%	2.9	2.9
Chloroform	7	UG/L	NYSDEC AWQS-GA	4.5	17.0	2	34.0	6%	16.1	16.1
Ethyl benzene	5	UG/L	NYSDEC AWQS-GA	25.8	520.0	5	34.0	15%	75.8	75.8
Tetrachloroethene	5	UG/L	NYSDEC AWQS-GA	0.6	1.0	0	34.0	0%	0.8	0.8
Toluene	5	UG/L	NYSDEC AWQS-GA	71.9	1400.0	6	34.0	18%	201.2	201.2
Total Xylenes (3)	5	UG/L	NYSDEC AWQS-GA	231.0	3300.0	7	34.0	21%	1277.3	1277.3
Trichloroethene	5	UG/L	NYSDEC AWQS-GA	2.5	10.0	2	34.0	6%	9.6	9.6
Semivolatile Organics										
2,4-Dimethylphenol (4)	1	UG/L	NYSDEC AWQS-GA	8.5	86.0	3	34.0	9%	8.8	8.8
2-Methylnaphthalene (5)		UG/L		9.2	69.0	0	34.0	0%	9.8	9.8
2-Methylphenol (4)	1	UG/L	NYSDEC AWQS-GA	15.5	23.0	2	34.0	6%	12.3	12.3
3,3'-Dichlorobenzidine (6)	5	UG/L	NYSDEC AWQS-GA	8.9	10.0	1	34.0	3%	8.6	8.6
4-Methylphenol (4)	1	UG/L	NYSDEC AWQS-GA	37.5	42.0	2	34.0	6%	8.5	8.5
Fluorene (2)	50	UG/L	NYSDEC Guidance	5.0	1.0	0	34.0	0%	5.6	5.6
Naphthalene (2)	10	UG/L	NYSDEC Guidance	14.9	160.0	3	34.0	9%	15.1	15.1
Phenanthrene (2)	50	UG/L	NYSDEC Guidance	5.0	1.0	0	34.0	0%	5.6	5.6
Phenol (4)	1	UG/L	NYSDEC AWQS-GA	10.0	56.0	1	34.0	3%	9.8	9.8
Metals ***										
Arsenic	25	UG/L	NYSDEC AWQS-GA	2.0	8.9	0	34.0	0%	2.4	2.4
Cadmium	5	UG/L	NYSDEC AWQS-GA	0.2	0.4	0	34.0	0%	0.2	0.2
Selenium	10	UG/L	NYSDEC AWQS-GA	1.8	4.8	0	34.0	0%	2.1	2.1
Thallium (2)	0.5	UG/L	NYSDEC Guidance	1.9	4.7	2	34.0	6%	2.1	2.1

*NYSDEC AWQS for Class GA waters. From 6 NYCRR Parts 703.5, March 12, 1998.
** As explained in Section 6. of the RI, all sample results were not necessarily used in determining the 95% UCL.
***According to the statistical analysis conducted in Section 6.2.3 of the RI report, arsenic, cadmium, selenium, and thallium were found to be at concentrations in portions of SEAD-25 which exceed concentrations in portions of background areas.
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 6 of the RI, page 6-43. This value may be greater than the maximum hit as noted to RAGS: Calculating the Concentration Term" (EPA/9285.7-081/May 1992)
(2) NYS Guidance Value. "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations", TOGS 1.1.1, June 1998.
(3) A standard of 5 ug/L has been assigned to each of the following xylene isomers (1,2-xylene, 1,3-xylene, and 1,4-xylene)
(4) A standard of 1 ug/L applies to the sum of total phenolic compounds.
(5) No standard or guidance value for groundwater is available for these substances as of June 1998.
(6) Principal Organic Contaminant Standard applies (TOGS, June 1998).

TABLE 2-1b
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-25 Surface Soil Analysis Results

Parameter	NYSDEC TAGM*	Units	Source	Mean	Max Hit	No of Hits>TAGM	Total No of Samples***	% of TAGM exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc (units)(1)
Volatile Organics										
Acetone	106 7	UG/KG	NYSDEC GW Prot	5 6	5 0	0	9	0%	6 7	6.7
Semivolatile Organics										
Benzo[a]anthracene	224 OR MDL**	UG/KG	USEPA Health Based	176.2	78 0	0	9	0%	275 4	275.4
Benzo[a]pyrene	61 OR MDL**	UG/KG	USEPA Health Based	161.1	87 0	2	9	22%	286.9	286 9
Benzo[b]fluoranthene	1067	UG/KG	NYSDEC GW Prot	162 4	86 0	0	9	0%	271 0	271.0
Benzo[ghi]perylene	50000	UG/KG	NYSDEC Rec	159 9	82 0	0	9	0%	285.2	285.2
Benzo[k]fluoranthene	1067	UG/KG	NYSDEC GW Prot	180 0	96 0	0	9	0%	249 9	249.9
Chrysene	388	UG/KG	NYSDEC GW Prot	129 9	110 0	0	9	0%	257 1	257 1
Dibenz[a,h]anthracene	14 or MDL**	UG/KG	USEPA Health Based	168 0	42 0	2	9	22%	515 4	515.4
Fluoranthene	50000	UG/KG	NYSDEC Rec	92 3	200 0	0	9	0%	140.0	140.0
Indeno[1,2,3-cd]pyrene	3104	UG/KG	NYSDEC GW Prot	172 9	55 0	0	9	0%	310 4	310 4
Phenanthrene	50000	UG/KG	NYSDEC Rec	153 9	130 0	0	9	0%	253 5	253.5
Pyrene	50000	UG/KG	NYSDEC Rec	82 7	170 0	0	9	0%	118 0	118.0
Pesticides/PCBs										
Endosulfan I	873	UG/KG	NYSDEC Rec	1 3	2 1	0	9	0%	1 5	1.5
Endrin aldehyde		UG/KG		2 9	8 4	0	9	0%	4 2	4.2
Metals****										
Lead	21 86	MG/KG	Site Background	33 0	44 4	8	9	89%	37.6	37 6
Selenium	2	MG/KG	NYSDEC Rec	1 0	1 3	0	9	0%	1 2	1 2
Thallium	0 28	MG/KG	Site Background	0 9	1 8	7	9	78%	1 1	1.1

*NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046
January 24, 1994 The TAGMs are TBCs and are for comparison purposes only
NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-25 which is 0 97%
** For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg
*** As explained in Section 6 of the RI, all sample results were not necessarily used in determining the 95% UCL
****According to the statistical analysis conducted in Section 6 2 3 of the RI report, lead, selenium, and thallium are the only elements that tend to be greater than the inorganic element concentrations that were detected in the same background media
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 6 of the RI, page 6-43 This value may be greater than the maximum hit as noted in "Supplemental Gu to RAGS Calculating the Concentration Term" (EPA 9285 7-081/May 1992)

TABLE 2-1c
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-25 Surface and Subsurface Soil Analysis Results

Parameter	NYSDEC TAGM*	Units	Source	Mean	Max Hit	No of Hits>TAGM	Total No of Samples***	% of TAGM exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc (units)(1)
Volatile Organics										
1,1,1-Trichloroethane	592 8	UG/KG	NYSDEC GW Prot	136 5	170 0	0	42.0	0%	80 9	80.9
1,2-Dichloroethene (total)		UG/KG		125 0	310 0	0	42 0	0%	59 9	59.9
2-Butanone	234	UG/KG	NYSDEC GW Prot	6 4	10 0	0	42 0	0%	6 8	6 8
Acetone	85 8	UG/KG	NYSDEC GW Prot	217.6	2800 0	3	42 0	7%	156 5	156.5
Benzene	46 8	UG/KG	NYSDEC GW Prot	134.8	100 0	1	42 0	2%	76 0	76 0
Carbon disulfide	2106	UG/KG	NYSDEC GW Prot	5.6	2.0	0	42.0	0%	5 9	5 9
Chloroform	234	UG/KG	NYSDEC GW Prot	6 3	9 0	0	42 0	0%	6 9	6 9
Ethyl benzene	4290	UG/KG	NYSDEC GW Prot	488.0	17000 0	1	42 0	2%	177 6	177.6
Methylene chloride	78	UG/KG	NYSDEC GW Prot	116 4	390 0	2	42 0	5%	50 8	50.8
Toluene	1170	UG/KG	NYSDEC GW Prot	183.3	4500 0	1	42.0	2%	122 0	122.0
Total Xylenes	936	UG/KG	NYSDEC GW Prot	3828 9	130000 0	5	42 0	12%	3677 6	3677 6
Trichloroethene	546	UG/KG	NYSDEC GW Prot	124 6	280.0	0	42 0	0%	60 6	60 6
Semivolatile Organics										
1,2,4-Trichlorobenzene	2652	UG/KG	NYSDEC GW Prot	796 0	1600 0	0	42 0	0%	896 9	896 9
1,4-Dichlorobenzene	6630	UG/KG	NYSDEC GW Prot	798 4	1700 0	0	42 0	0%	901 5	901 5
2,4-Dinitrotoluene		UG/KG		796 0	1600 0	0	42 0	0%	896 9	896.9
2-Chlorophenol	624	UG/KG	NYSDEC GW Prot	819 8	2600 0	1	42 0	2%	937 7	937 7
2-Methylnaphthalene	28392	UG/KG	NYSDEC GW Prot	925 3	8900 0	0	42 0	0%	1072 9	1072 9
4-Chloro-3-methylphenol	187 2	UG/KG	NYSDEC GW Prot	819 8	2600 0	1	42 0	2%	937 7	937 7
4-Nitrophenol	78	UG/KG	NYSDEC GW Prot	1578 2	1700 0	1	42 0	2%	1667 1	1667 1
Acenaphthene	50000	UG/KG	NYSDEC Rec	732 2	2000.0	0	42 0	0%	746 3	746 3
Benzo[a]anthracene	224 or MDL*	UG/KG	USEPA Health Based	182 9	78 0	0	42 0	0%	217 9	217 9
Benzo[a]pyrene	61 or MDL**	UG/KG	USEPA Health Based	183 9	87 0	2	42 0	5%	208 4	208 4
Benzo[b]fluoranthene	858	UG/KG	NYSDEC GW Prot	184 2	86 0	0	42 0	0%	206 3	206 3
Benzo[ghi]perylene	50000	UG/KG	NYSDEC Rec	176 3	120 0	0	42 0	0%	209 4	209 4
Benzo[k]fluoranthene	858	UG/KG	NYSDEC GW Prot	303 5	360 0	0	42 0	0%	336 5	336 5
Bis(2-Ethylhexyl)phthalate	50000	UG/KG	NYSDEC Rec	557 2	750 0	0	42 0	0%	631 7	631 7
Chrysene	312	UG/KG	NYSDEC GW Prot	165 3	110 0	0	42 0	0%	221 3	221.3
Dibenz[a,h]anthracene	14 or MDL**	UG/KG	USEPA Health Based	260 1	360.0	3	42 0	7%	318 9	318 9
Fluoranthene	50000	UG/KG	NYSDEC Rec	155 6	200 0	0	42 0	0%	198 5	198 5
Fluorene	50000	UG/KG	NYSDEC Rec	456 6	1900 0	0	42 0	0%	478 4	478.4
Indeno[1,2,3-cd]pyrene	2496	UG/KG	NYSDEC GW Prot	187 1	55 0	0	42 0	0%	211 0	211.0
N-Nitrosodiphenylamine		UG/KG		673 6	1500 0	0	42 0	0%	676 7	676 7
N-Nitrosodipropylamine		UG/KG		803 2	1900 0	0	42 0	0%	910 3	910.3
Naphthalene	10140	UG/KG	NYSDEC GW Prot	387 7	4300.0	0	42 0	0%	405 3	405.3
Pentachlorophenol	780	UG/KG	NYSDEC GW Prot	1900 1	2300 0	1	42 0	2%	2097 5	2097 5
Phenanthrene	50000	UG/KG	NYSDEC Rec	471 3	4600 0	0	42 0	0%	571 1	571.1
Phenol	23 4	UG/KG	NYSDEC GW Prot	815 1	2400 0	1	42 0	2%	930 3	930 3
Pyrene	50000	UG/KG	NYSDEC Rec	591 2	2000 0	0	42 0	0%	742 4	742 4
Pesticides/PCBs										
4,4 -DDE	2100	UG/KG		2 0	4 8	0	42 0	0%	2 1	2 1
4,4 -DDT	1950	UG/KG	NYSDEC GW Prot	1 9	3 4	0	42 0	0%	2 0	2.0
Alpha-Chlordane		UG/KG		1 0	2 5	0	42 0	0%	1 1	1 1
Aroclor-1254	1560	UG/KG	NYSDEC GW Prot	21 9	130 0	0	42 0	0%	23 0	23 0
Endosulfan I	702	UG/KG	NYSDEC GW Prot	1 1	2 5	0	42 0	0%	1 1	1 1
Endrin	78	UG/KG	NYSDEC GW Prot	1 9	3 4	0	42 0	0%	2 0	2.0
Endrin aldehyde		UG/KG		2 1	8 4	0	42 0	0%	2 3	2 3
Heptachlorepoxide	15 6	UG/KG	NYSDEC GW Prot	1 1	2 9	0	42 0	0%	1 1	1 1
Metals****										
Lead	21 86	MG/KG	NYSDEC TAGM	31 7	291 0	14	42 0	33%	38 3	38 3
Selenium	2	MG/KG	NYSDEC TAGM	0 7	2 3	1	42 0	2%	1 1	1 1
Thallium	0 28	MG/KG	NYSDEC TAGM	0 6	1 8	20	42 0	48%	0 8	0 8
Herbicides										
Dicamba		UG/KG		3 0	6 4	0	15 0	0%	3 4	3 4
MCPP		UG/KG		2875 0	4075 0	0	15.0	0%	3020 4	3020 4

*NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046
January 24, 1994 The TAGMs are TBCs and are for comparison purposes only
NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-25 which is 0 78%
** For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg
*** As explained in Section 6 of the RI, all sample results were not necessarily used in determining the 95% UCL
****According to the statistical analysis conducted in Section 6 2 3 of the RI report, lead, selenium, and thallium are the only elements that tend to be
greater than the inorganic element concentrations that were detected in the same background media
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 6 of the RI, page 6-43 This value may be greater than the maximum hit as noted in "Supple
to RAGS Calculating the Concentration Term" (EPA/9285 7-081/May 1992)

TABLE 2-1d
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-25 Surface Water Analysis Results

Parameter	NYS Class C SWQS	Units	Source	Mean	Max. Hit	No. of Hits>SWQS	Total No. of Samples	% of SWQS exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc. (units)(1)
Volatile Organics										
Acetone		UG/L		6.9	24.0	0	10	0%	9.5	9.5
Semivolatile Organics										
Di-n-butylphthalate		UG/L		4.2	1.0	0	10	0%	10.8	10.8
Dibenzofuran		UG/L		4.7	1.0	0	10	0%	7.3	7.3
Diethyl phthalate		UG/L		4.7	0.5	0	10	0%	10.0	10.0
Pyrene		UG/L		4.7	1.0	0	10	0%	7.2	7.2
Metals										
Aluminum	100	UG/L	NYSDEC SWQS-C	635.9	1500.0	6	10	60%	22285.0	22285.0
Arsenic	190	UG/L	NYSDEC SWQS-C	1.3	3.5	0	10	0%	1.7	1.7
Barium		UG/L		45.0	75.1	0	10	0%	57.5	57.5
Calcium		UG/L		64050.0	105000.0	0	10	0%	81764.4	81764.4
Chromium	144.2	UG/L	NYSDEC SWQS-C	1.5	3.3	0	10	0%	2.2	2.2
Cobalt	5	UG/L	NYSDEC SWQS-C	0.7	1.6	0	10	0%	0.9	0.9
Copper	8.1	UG/L	NYSDEC SWQS-C	4.3	13.2	2	10	20%	7.9	7.9
Iron	300	UG/L	NYSDEC SWQS-C	649.3	1500.0	5	10	50%	17852.5	17852.5
Lead	1.8	UG/L	NYSDEC SWQS-C	2.3	7.0	4	10	40%	6.0	6.0
Magnesium		UG/L		7888.0	13300.0	0	10	0%	10280.1	10280.1
Manganese		UG/L		20.1	42.5	0	10	0%	27.2	27.2
Mercury		UG/L		0.0	0.1	0	10	0%	0.0	0.0
Nickel	68.3	UG/L	NYSDEC SWQS-C	2.0	4.0	0	10	0%	2.8	2.8
Potassium		UG/L		4998.0	12900.0	0	10	0%	7623.5	7623.5
Silver	0.1	UG/L	NYSDEC SWQS-C	0.4	0.8	1	10	10%	0.5	0.5
Sodium		UG/L		119420.0	213000.0	0	10	0%	158067.5	158067.5
Vanadium	14	UG/L	NYSDEC SWQS-C	2.1	4.7	0	10	0%	3.0	3.0
Zinc	56.8	UG/L	NYSDEC SWQS-C	14.5	70.3	1	10	10%	44.9	44.9

*NYSDEC AWQC for Class C surface waters From 6 NYCRR Subparts 701-705.
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 6 of the RI, page 6-43 This value may be greater than the maximum hit as noted in "S to RAGS: Calculating the Concentration Term" (EPA/9285.7-081/May 1992)

TABLE 2-1e
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-25 Sediment Analysis Results

Parameter	Sediment Criteria	Units	Source	Mean	Max Hit	No of Hits>Guideline	Total No of Samples	% of Guideline Exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc (units)(1)
Volatile Organics										
2-Butanone		UG/KG		8.9	17.0	0	10	0%	11.4	11.4
Acetone		UG/KG		6.8	8.0	0	10	0%	7.6	7.6
Carbon disulfide		UG/KG		6.5	3.0	0	10	0%	8.4	8.4
Toluene		UG/KG		6.5	3.0	0	10	0%	8.4	8.4
Semivolatile Organics										
2-Methylnaphthalene		UG/KG		230.7	230.0	0	10	0%	248.6	248.6
Acenaphthene	4900	UG/KG	NYS B.A.L.C.T.*	381.5	1100.0	0	10	0%	626.2	626.2
Acenaphthylene		UG/KG		1013.5	3500.0	0	10	0%	4724.2	4724.2
Anthracene		UG/KG		1367.6	3700.0	0	10	0%	16311.0	16311.0
Benzo[a]anthracene	45.5	UG/KG	NYSDEC HHB (1)	3106.0	9000.0	7	10	70%	48863.8	48863.8
Benzo[a]pyrene	45.5	UG/KG	NYSDEC HHB (1)	4070.0	13000.0	7	10	70%	84179.8	84179.8
Benzo[b]fluoranthene	45.5	UG/KG	NYSDEC HHB (1)	7318.8	25000.0	7	10	70%	3827397.2	3827397.2
Benzo[ghi]perylene		UG/KG		4249.5	19000.0	0	10	0%	84343.6	84343.6
Benzo[k]fluoranthene	45.5	UG/KG	NYSDEC HHB (1)	1346.4	6300.0	3	10	30%	14794.8	14794.8
Carbazole		UG/KG		585.0	1400.0	0	10	0%	1389.8	1389.8
Chrysene	45.5	UG/KG	NYSDEC HHB (1)	3888.5	11000.0	7	10	70%	233385.2	233385.2
Di-n-butylphthalate		UG/KG		611.9	2000.0	0	10	0%	1676.2	1676.2
Dibenz[a,h]anthracene		UG/KG		1995.4	7100.0	0	10	0%	19171.8	19171.8
Dibenzofuran		UG/KG		294.4	540.0	0	10	0%	402.5	402.5
Fluoranthene	35700	UG/KG	NYS B.A.L.C.T.*	6152.6	21000.0	0	10	0%	1180176.4	1180176.4
Fluorene		UG/KG		504.7	1300.0	0	10	0%	1341.6	1341.6
Indeno[1,2,3-cd]pyrene	45.5	UG/KG	NYSDEC HHB (1)	3613.5	14000.0	7	10	70%	63468.3	63468.3
Naphthalene		UG/KG		269.4	440.0	0	10	0%	327.8	327.8
Phenanthrene	4200	UG/KG	NYS B.A.L.C.T.*	2814.0	8300.0	3	10	30%	4497.5	4497.5
Pyrene		UG/KG		6091.9	18000.0	0	10	0%	9843.1	9843.1
Pesticides/PCBs										
4,4'-DDD	0.35	UG/KG	NYSDEC HHB (1)	138.7	550.0	5	10	50%	46185.4	46185.4
4,4'-DDE	0.35	UG/KG	NYSDEC HHB (1)	12.4	45.0	5	10	50%	74.1	74.1
4,4'-DDT	0.35	UG/KG	NYSDEC HHB (1)	21.4	93.0	5	10	50%	288.1	288.1
Aldrin	3.5	UG/KG	NYSDEC HHB (1)	2.4	6.0	3	10	30%	5.0	5.0
Alpha-Chlordane		UG/KG		18.0	64.0	0	10	0%	378.0	378.0
Beta-BHC		UG/KG		1.3	1.7	0	10	0%	1.4	1.4
Endosulfan sulfate		UG/KG		2.5	3.6	0	10	0%	2.9	2.9
Endrin aldehyde		UG/KG		3.2	8.1	0	10	0%	5.1	5.1
Endrin ketone		UG/KG		11.6	52.0	0	10	0%	64.6	64.6
Gamma-Chlordane		UG/KG		19.6	69.0	0	10	0%	540.1	540.1
Heptachlor	0.028	UG/KG	NYSDEC HHB (1)	6.8	46.0	1	10	10%	35.0	35.0
Heptachlorepoxide	0.028	UG/KG	NYSDEC HHB (1)	1.5	2.3	2	10	20%	1.8	1.8
Metals										
Aluminum		MG/KG		10567.5	21900.0	0	10	0%	13764.2	13764.2
Antimony	2	MG/KG	Lowest Effect Level	0.8	3.4	1	10	10%	1.6	1.6
Arsenic	6	MG/KG	Lowest Effect Level	5.6	12.2	4	10	40%	7.2	7.2
Barium		MG/KG		68.2	133.0	0	10	0%	85.4	85.4
Beryllium		MG/KG		0.6	1.1	0	10	0%	0.7	0.7
Cadmium	0.6	MG/KG	Lowest Effect Level	0.7	2.7	3	10	30%	112.5	112.5
Calcium		MG/KG		57561.0	154000.0	0	10	0%	84266.1	84266.1
Chromium	26	MG/KG	Lowest Effect Level	15.9	40.2	1	10	10%	24.7	24.7
Cobalt		MG/KG		9.7	26.7	0	10	0%	16.2	16.2
Copper	16	MG/KG	Lowest Effect Level	41.3	116.0	10	10	100%	75.8	75.8
Iron	20000	MG/KG	Lowest Effect Level	21406.0	54700.0	4	10	40%	34491.5	34491.5
Lead	31	MG/KG	Lowest Effect Level	121.4	378.0	7	10	70%	191.0	191.0
Magnesium		MG/KG		9118.0	14400.0	0	10	0%	11424.6	11424.6
Manganese	460	MG/KG	Lowest Effect Level	407.4	835.0	2	10	20%	515.5	515.5
Mercury	0.15	MG/KG	Lowest Effect Level	0.1	0.4	2	10	20%	0.4	0.4
Nickel	16	MG/KG	Lowest Effect Level	28.8	72.6	8	10	80%	48.0	48.0
Potassium		MG/KG		1750.2	3270.0	0	10	0%	2212.9	2212.9
Selenium		MG/KG		0.8	1.3	0	10	0%	1.0	1.0
Silver	1	MG/KG	Lowest Effect Level	2.5	10.2	3	10	30%	38.3	38.3
Sodium		MG/KG		385.6	832.0	0	10	0%	523.0	523.0
Thallium		MG/KG		0.7	1.1	0	10	0%	0.9	0.9
Vanadium		MG/KG		28.6	84.6	0	10	0%	49.1	49.1
Zinc	120	MG/KG	Lowest Effect Level	150.9	541.0	3	10	30%	264.7	264.7

(1) NYSDEC Human Health Bioaccumulation sediment criteria, December, 1989
*NYS Benthic Aquatic Life Chronic Toxicity
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 6 of the RI, page 6-43. This value may be greater than the maximum hit as noted i
to RAGS "Calculating the Concentration Term" (EPA/9285.7-081/May 1992)

SEAD-26 Groundwater

NYSDEC AWQS for Class GA waters are compared to the results of the groundwater analyses in **Table 2-2a**. Groundwater ARARs for 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, Benzene, Ethylbenzene, Xylene, n-Propylbenzene, and p-Isopropyltoluene were exceeded. As the NYSDEC AWQS for Class GA waters are ARARs, groundwater is a media of interest at SEAD-26. The extent of contamination (i.e., plume dimensions) will be conducted in **Section 2.4.3**.

SEAD-26 Surface Soil

Results of the surface soil analysis are shown in **Table 2-2b**. Concentrations of 2,4,5 Trichlorophenol, 2,4-Dinitrophenol, 2-Nitroaniline, 2-Nitrophenol, 3-Nitroaniline, 4-Chloro-3-methylphenol, 4-Chloroaniline, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, Nitrobenzene, Arsenic, Lead, Thallium, and Zinc exceed the NYSDEC TAGM values for soil cleanup for on-site soils. The NYSDEC Groundwater Protection Standards are dependent on the organic content of the surface soils at SEAD-26 which is 0.97%. The values for soil cleanup presented as NYSDEC TAGMs are not ARARs but rather To Be Considered (TBCs) because they are not promulgated standards. These values are not used to determine the necessity of remediation but may be used as guidelines in setting remedial goals. Because none of the compounds with TAGM exceedances for surface soil are present in the groundwater, protection of groundwater for ARAR exceedances is not a concern. Thus, surface soil is not an ARAR based media of interest. Further, the contaminants present are not expected to leach to the groundwater due to their partition coefficients.

SEAD-26 Surface and Subsurface Soil

Results of the surface and subsurface soil analysis are displayed in **Table 2-2c**. Concentrations of Acetone, Methylene Chloride, 2,4,5-Trichlorophenol, 2,4-Dintrophenol, 2-Nitroaniline, 2-Nitrophenol, 3-Niroaniline, 4-Chloro-3-methylpehnol, 4-Chloroaniline, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, Ideno(1,2,3-cd)pyrene, Nitrobenzene, Arsenic, Lead, Selenium, Thallium, and Zinc exceed the NYSDEC TAGM values for soil cleanup for on-site soils. The NYSDEC Groundwater Protection Standards are dependent on the organic content of the soils at SEAD-26 which is 0.31% (organic content of subsurface soils). The values for soil cleanup presented as NYSDEC TAGMs, are not ARARs but rather To Be Considered (TBCs) because they are not promulgated standards. These values are not used to determine the necessity of remediation but may be used as guidelines in setting remedial goals. Because none of the compounds with TAGM exceedances for surface and subsurface soil are present in the groundwater, protection of groundwater for ARAR exceedances is not a concern. Thus, surface and subsurface soil is not an ARAR based media of interest.

SEAD-26 Surface Water

Surface water analysis results are displayed in **Table 2-2d**. NYS Class C AWQS are exceeded for Aluminum, Iron, Cyanide, Lead, Nickel, Zinc, and Heptachlor. Although the AWQS are promulgated standards, surface water was dismissed as an ARAR based media of interest for the following reasons:

- Aluminum and Iron are not considered constituents of concern due to elevated background levels at the site (as explained previously).
- Cyanide exceeded the ARAR at one sample point (the concentration was 8.5 ppb, the AWQS is 5.2 ppb).
- Lead exceeded the ARAR at one sample point (the concentration was 6.4 ppb, the AWQS is 3.2 ppb).
- Nickel exceeded the ARAR at one sample points, (the concentrations was 209, the AWQS is 94.5 ppb).
- Zinc was present at four sample points in excess of the ARAR (the maximum exceedance was 219 ppb, the ARAR is 81.9 ppb). Zinc has elevated site background concentrations.
- Heptachlor was exceed the ARAR at one sample point (the concentration was 0.03 ppb, the AWQS is 0.001 ppb).

Due to the elimination of Aluminum, Iron, Cyanide, Lead, Nickel, and Zinc as ARAR-based constituents of concern, the surface water at SEAD-26 can be dismissed as an ARAR-based media of interest.

SEAD-26 Sediment

Sediment analysis results are displayed in **Table 2-2e**. Sediment criteria for Acenaphthene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Chrysene, Ideno(1,2,3-cd)pyrene, Phenanthrene, Phenol, 4,4'-DDD, 4,4'-DDE, 4,4-DDT, Aroclor-1260, Endosulfan I, Endosulfan II, Heptachlor epoxide, Arsenic, Copper, Iron, Lead, Manganese, Mercury, Nickel, and Zinc were exceeded in the drainage ditches surrounding SEAD-26. Both the NYS BALCT and NYSDEC HHB are dependent on the organic content of the sediment, which is 3.93% for SEAD-26. The sediment criteria values are not ARARs but rather To Be Considered (TBCs) because they are not promulgated standards. These values are not used to determine the necessity of remediation but may be used as guidelines in setting remedial goals. Because there are no ARAR-based constituents of concern in the surface water of SEAD-26 and there are no ARARs for sediment, sediment is not an ARAR-based media of interest.

TABLE 2-2a
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Groundwater Analysis Results

Parameter	NYSDEC AWQS*	Units	Source	Mean	Max. Hit	No. of Hits>AWQS	Total No. of Samples**	% of AWQS exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc.(units)(1)
Volatile Organics										
1,2,4-Trimethylbenzene	5	UG/L	NYSDEC AWQS-GA	1.6	17.0	2	18	11%	2.2	2.2
1,3,5-Trimethylbenzene	5	UG/L	NYSDEC AWQS-GA	0.8	7.0	1	18	6%	0.9	0.9
Acetone(2)	50	UG/L	NYSDEC Guidance	2.8	3.8	0	20	0%	3.1	3.1
Benzene	1	UG/L	NYSDEC AWQS-GA	0.8	1.5	1	20	5%	1.2	1.2
Ethyl benzene	5	UG/L	NYSDEC AWQS-GA	1.4	8.0	2	20	10%	2.8	2.8
Isopropylbenzene	5	UG/L	NYSDEC AWQS-GA	0.7	5.0	1	18	6%	0.9	0.9
Methyl chloride	5	UG/L	NYSDEC AWQS-GA	0.5	0.7	0	20	0%	0.6	0.6
Naphthalene (2)	10	UG/L	NYSDEC Guidance	1.5	15.0	2	18	11%	2.0	2.0
Toluene	5	UG/L	NYSDEC AWQS-GA	0.3	0.3	0	20	0%	0.3	0.3
Total Xylenes (3)	5	UG/L	NYSDEC AWQS-GA	1.1	5.0	1	20	5%	1.8	1.8
n-Butylbenzene	5	UG/L	NYSDEC AWQS-GA	0.4	3.0	0	18	0%	0.5	0.5
n-Propylbenzene	5	UG/L	NYSDEC AWQS-GA	0.7	6.0	1	18	6%	0.9	0.9
p-Isopropyltoluene	5	UG/L	NYSDEC AWQS-GA	0.7	6.0	1	18	6%	0.9	0.9
sec-Butylbenzene	5	UG/L	NYSDEC AWQS-GA	0.6	4.0	0	18	0%	0.7	0.7
tert-Butylbenzene	5	UG/L	NYSDEC AWQS-GA	0.3	0.6	0	18	0%	0.3	0.3
Semivolatile Organics										
2-Methylnaphthalene(5)		UG/L		5.4	8.5	0	20	0%	5.7	5.7
Acenaphthene(2)	20	UG/L	NYSDEC Guidance	5.1	3.5	0	20	0%	5.4	5.4
Dibenzofuran (5)		UG/L		5.0	3.0	0	20	0%	5.6	5.6
Diethyl phthalate (2)	50	UG/L	NYSDEC Guidance	5.0	0.5	0	20	0%	7.0	7.0
Fluorene (2)	50	UG/L	NYSDEC Guidance	5.2	5.0	0	20	0%	5.4	5.4
Naphthalene (2)	10	UG/L	NYSDEC Guidance	5.8	12.5	1	20	5%	6.4	6.4
Phenanthrene(2)	50	UG/L	NYSDEC Guidance	5.0	3.0	0	20	0%	5.5	5.5
Metals ***										
Potassium (5)		UG/L		29452.0	108000.0	0	20	0%	76878.4	76878.4

* NYSDEC AWQS for Class GA waters from 6 NYCRR Parts 703.5 March 12, 1998.
** As explained in Section 7 of the RI, all sample results were not necessarily used in determining the 95% UCL.
****According to the statistical analysis conducted in Section 7.2.3 of the RI report, only potassium was found to be at concentrations in portions of SEAD-26 which exceed concentrations in portions of background areas.
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 7 of the RI, page 7-43. This value may be greater than the maximum hit as noted to RAGS: Calculating the Concentration Term" (EPA/9285.7-081/May 1992)
(2) NYS Guidance Value, "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations", TOGS 1.1.1, June 1998.
(3) A standard of 5 ug/L has been assigned to each of the following xylene isomers (1,2-xylene, 1,3-xylene, and 1,4-xylene)
(4) A standard of 1 ug/L applies to the sum of total phenolic compounds.
(5) No standard or guidance value for groundwater is available for these substances as of June 1998.

TABLE 2-2b
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results

Parameter	NYSDEC TAGM*	Units	Source	Mean	Max. Hit	No. of Hits>TAGM	Total No. of Samples***	% of TAGM exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc.(units)(1)
Volatile Organics										
1,1-Dichloroethene	388	UG/KG	NYSDEC GW Prot.	5.6	2.0	0	57	0%	5.8	2.0
Acetone	106.7	UG/KG	NYSDEC GW Prot.	7.0	31.0	0	57	0%	7.8	7.8
Benzene	28.2	UG/KG	NYSDEC GW Prot.	5.6	3.0	0	57	0%	5.7	3.0
Carbon disulfide	2619	UG/KG	NYSDEC GW Prot.	5.6	2.0	0	57	0%	5.8	2.0
Chlorobenzene	1649	UG/KG	NYSDEC GW Prot.	5.6	4.0	0	57	0%	5.7	4.0
Chloroform	291	UG/KG	NYSDEC GW Prot.	5.6	5.8	0	57	0%	5.8	5.8
Methylene chloride	97	UG/KG	NYSDEC GW Prot.	5.8	11.0	0	57	0%	6.0	6.0
Toluene	1455	UG/KG	NYSDEC GW Prot.	5.5	4.0	0	57	0%	5.8	4.0
Total Xylenes	1164	UG/KG	NYSDEC GW Prot.	5.6	7.0	0	57	0%	5.8	5.8
Trichloroethene	679	UG/KG	NYSDEC GW Prot.	5.6	4.0	0	57	0%	5.7	4.0
Semivolatile Organics										
1,2,4-Trichlorobenzene	3298	UG/KG	NYSDEC GW Prot.	375.9	430.0	0	57	0%	404.0	404.0
2,4,5-Trichlorophenol	97	UG/KG	NYSDEC GW Prot.	747.6	850.0	1	57	2%	807.2	807.2
2,4-Dinitrophenol	194	UG/KG	NYSDEC GW Prot.	816.4	960.0	9	57	16%	902.1	902.1
2-Methylnaphthalene	35308	UG/KG	NYSDEC GW Prot.	775.6	590.0	0	57	0%	540.3	540.3
2-Nitroaniline	417.1	UG/KG	NYSDEC GW Prot	1853.9	4400.0	16	57	28%	1706.2	1706.2
2-Nitrophenol	320.1	UG/KG	NYSDEC GW Prot.	357.1	430.0	15	57	26%	398.5	398.5
3,3'-Dichlorobenzidine		UG/KG		932.6	1800.0	0	57	0%	753.1	753.1
3-Nitroaniline	485	UG/KG	NYSDEC GW Prot.	1756.4	5900.0	2	57	4%	1521.1	1521.1
4,6-Dinitro-2-methylphenol		UG/KG		747.5	840.0	0	57	0%	807.0	807.0
4-Chloro-3-methylphenol	232.8	UG/KG	NYSDEC GW Prot.	369.6	400.0	4	57	7%	395.5	395.5
4-Chloroaniline	213.4	UG/KG	NYSDEC GW Prot.	322.1	390.0	5	57	9%	352.3	352.3
4-Nitroaniline		UG/KG		1712.2	1800.0	0	57	0%	1472.8	1472.8
Acenaphthene	50000	UG/KG	NYSDEC Rec.	844.6	990.0	0	57	0%	621.3	621.3
Anthracene	50000	UG/KG	NYSDEC Rec.	879.5	1600.0	0	57	0%	789.9	789.9
Benzo[a]anthracene	224 or MDL**	UG/KG	USEPA Health Based	1157.0	4700.0	18	57	32%	1890.2	1890.2
Benzo[a]pyrene	61 or MDL**	UG/KG	USEPA Health Based	1114.6	4400.0	30	57	53%	1637.8	1637.8
Benzo[b]fluoranthene	1067	UG/KG	NYSDEC GW Prot.	1233.2	5000.0	8	57	14%	2057.1	2057.1
Benzo[ghi]perylene	50000	UG/KG	NYSDEC Rec	958.1	2800.0	0	57	0%	1325.4	1325.4
Benzo[k]fluoranthene	1067	UG/KG	NYSDEC GW Prot.	1066.2	4200.0	5	57	9%	1418.0	1418.0
Bis(2-Ethylhexyl)phthalate	50000	UG/KG	NYSDEC Rec.	304.2	400.0	0	57	0%	351.8	351.8
Butylbenzylphthalate	50000	UG/KG	NYSDEC Rec.	877.3	730.0	0	57	0%	648.5	648.5
Carbazole		UG/KG		880.0	1400.0	0	57	0%	717.4	717.4
Chrysene	388	UG/KG	NYSDEC GW Prot.	1213.3	4900.0	15	57	26%	1994.5	1994.5
Di-n-butylphthalate	7857	UG/KG	NYSDEC GW Prot.	604.7	6200.0	0	57	0%	618.7	618.7
Dibenz[a,h]anthracene	14 or MDL**	UG/KG	USEPA Health Based	835.2	750.0	16	57	28%	627.9	627.9
Dibenzofuran	6014	UG/KG	NYSDEC GW Prot.	462.1	480.0	0	57	0%	417.0	417.0
Fluoranthene	50000	UG/KG	NYSDEC Rec.	1893.8	11000.0	0	57	0%	3875.9	3875.9
Fluorene	50000	UG/KG	NYSDEC Rec.	833.8	960.0	0	57	0%	608.0	608.0
Hexachlorobutadiene		UG/KG		375.8	430.0	0	57	0%	403.8	403.8
Hexachlorocyclopentadiene		UG/KG		379.2	430.0	0	57	0%	408.6	408.6
Indeno[1,2,3-cd]pyrene	3104	UG/KG	NYSDEC Rec	959.1	2800.0	0	57	0%	1161.5	1161.5
Isophorone	4268	UG/KG	NYSDEC Rec.	357.1	430.0	0	57	0%	398.5	398.5
Naphthalene	1261	UG/KG	NYSDEC GW Prot.	185.0	36.0	0	57	0%	213.3	36.0
Nitrobenzene	194	UG/KG	NYSDEC GW Prot.	332.8	400.0	8	57	14%	366.9	366.9
Pentachlorophenol	970	UG/KG	NYSDEC GW Prot.	871.4	960.0	0	57	0%	921.6	921.6
Phenanthrene	50000	UG/KG	NYSDEC Rec.	1395.3	8900.0	0	57	0%	2236.8	2236.8
Pyrene	50000	UG/KG	NYSDEC Rec.	1116.0	8500.0	0	57	0%	2240.8	2240.8
Pesticides/PCBs										
4,4'-DDD	2900	UG/KG	USEPA Health Based	2.9	22.0	0	57	0%	3.1	3.1
4,4'-DDE	2100	UG/KG	USEPA Health Based	7.3	140.0	0	57	0%	7.2	7.2
4,4'-DDT	2100	UG/KG	USEPA Health Based	5.3	66.0	0	57	0%	5.6	5.6
Alpha-Chlordane		UG/KG		1.2	1.6	0	57	0%	1.2	1.2
Beta-BHC	194	UG/KG	NYSDEC GW Prot.	1.2	1.4	0	57	0%	1.2	1.2

TABLE 2-2b
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results

Parameter	NYSDEC TAGM*	Units	Source	Mean	Max. Hit	No. of Hits>TAGM	Total No. of Samples***	% of TAGM exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc.(units)(1)
Pesticides/PCBs (cont)										
Delta-BHC	291	UG/KG	NYSDEC GW Prot.	1.1	1.2	0	57	0%	1.1	1.1
Dieldrin	44	UG/KG	USEPA Health Based	2.3	4.4	0	57	0%	2.4	2.4
Endosulfan I	873	UG/KG	NYSDEC GW Prot.	1.3	5.6	0	57	0%	1.5	1.5
Endosulfan II	873	UG/KG	NYSDEC GW Prot.	4.9	60.0	0	57	0%	4.9	4.9
Endosulfan sulfate	970	UG/KG	NYSDEC GW Prot.	3.7	23.0	0	57	0%	4.1	4.1
Endrin	97	UG/KG	NYSDEC GW Prot.	2.4	8.0	0	57	0%	2.5	2.5
Endrin aldehyde		UG/KG		3.7	23.0	0	57	0%	4.1	4.1
Endrin ketone		UG/KG		2.6	13.0	0	57	0%	2.7	2.7
Gamma-Chlordane	540	UG/KG	USEPA Health Based	1.3	7.8	0	57	0%	1.3	1.3
Heptachlor	97	UG/KG	NYSDEC GW Prot.	1.3	2 9	0	57	0%	1.3	1.3
Heptachlorepoxide	19.4	UG/KG	NYSDEC GW Prot.	1.3	2.8	0	57	0%	1.3	1.3
Methoxychlor		UG/KG		11.3	21.0	0	57	0%	11.9	11.9
Nitroaromatics										
2,4-Dinitrotoluene		UG/KG		148.5	410.0	0	10	0%	305.0	305.0
4-amino-2,6-Dinitrotoluene		UG/KG		68.3	97.5	0	10	0%	73.8	73.8
HMX		UG/KG		76.2	120.0	0	10	0%	88.0	88.0
Metals ****										
Arsenic	7.5	MG/KG	NYSDEC Rec.	6.3	12.2	14	57	25%	6.8	6.8
Lead	21.86	MG/KG	Site Background	28.6	522.0	15	57	26%	46.1	46.1
Selenium	2	MG/KG	NYSDEC Rec	0.4	0 9	0	57	0%	0.4	0.4
Thallium	0.28	MG/KG	Site Background	0.6	1.3	31	57	54%	0.7	0.7
Zinc	82.5	MG/KG	Site Background	99.9	503 0	34	57	60%	121.9	121.9
Herbicides										
2,4,5-T	1843	UG/KG	NYSDEC GW Prot	26.1	220 0	0	10	0%	101.3	101.3
2,4-D	485	UG/KG	NYSDEC GW Prot.	50 7	260.0	0	10	0%	81.2	81.2

* NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046
January 24, 1994 The TAGMs are TBCs and are for comparison purposes only.
NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-26 which is 0.97%.
** For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg.
*** As explained in Section 7 of the RI, all sample results were not necessarily used in determining the 95% UCL.
****According to the statistical analysis conducted in Section 7.2.3 of the RI report, arsenic, lead, selenium, thallium, and zinc are the only elements that tend to be greater than the inorganic element concentrations that were detected in the same background media.
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 7 of the RI, page 7-43. This value may be greater than the maximum hit as noted to RAGS: Calculating the Concentration Term" (EPA/9285.7-081/May 1992)

TABLE 2-2c
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Surface and Subsurface Soil Analysis Results

Parameter	NYSDEC TAGM*	Units	Source	Mean	Max. Hit	No. of Hits>TAGM	Total No. of Samples ***	% of TAGM exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc. (units)(1)
Volatile Organics										
1,1-Dichloroethene	124	UG/KG	NYSDEC GW Prot.	5.7	2.0	0	96	0%	5.8	2.0
2-Butanone	93	UG/KG	NYSDEC GW Prot.	28.1	19.0	0	96	0%	11.8	11.8
Acetone	34.1	UG/KG	NYSDEC GW Prot.	33.2	120.0	2	96	2%	16.8	16.8
Benzene	18.6	UG/KG	NYSDEC GW Prot.	5.7	3.0	0	96	0%	5.8	3.0
Carbon disulfide	837	UG/KG	NYSDEC GW Prot.	5.6	2.0	0	96	0%	5.9	2.0
Chlorobenzene	527	UG/KG	NYSDEC GW Prot.	5.7	4.0	0	96	0%	5.8	4.0
Chloroform	93	UG/KG	NYSDEC GW Prot.	5.7	5.8	0	96	0%	5.8	5.8
Ethyl benzene	1705	UG/KG	NYSDEC GW Prot.	24.4	360.0	0	96	0%	10.8	10.8
Methylene chloride	31	UG/KG	NYSDEC GW Prot.	31.8	365.0	1	96	1%	13.5	13.5
Toluene	465	UG/KG	NYSDEC GW Prot.	5.6	4.3	0	96	0%	5.8	4.3
Total Xylenes	372	UG/KG	NYSDEC GW Prot.	23.8	310.0	0	96	0%	10.7	10.7
Trichloroethene	700	UG/KG	NYSDEC GW Prot.	5.7	4.0	0	96	0%	5.8	4.0
Semivolatile Organics										
1,2,4-Trichlorobenzene	1054	UG/KG	NYSDEC GW Prot.	452.8	430.0	0	96	0%	418.6	418.6
2,4,5-Trichlorophenol	31	UG/KG	NYSDEC GW Prot.	849.8	930.0	3	96	3%	874.0	874.0
2,4-Dinitrophenol	62	UG/KG	NYSDEC GW Prot.	879.8	960.0	9	96	9%	915.7	915.7
2-Methylnaphthalene	11284	UG/KG	NYSDEC GW Prot.	688.0	5300.0	0	96	0%	507.0	507.0
2-Nitroaniline	133.3	UG/KG	NYSDEC GW Prot	1471.3	4400.0	22	96	23%	1315.1	1315.1
2-Nitrophenol	102.3	UG/KG	NYSDEC GW Prot.	378.8	430.0	17	96	18%	399.0	399.0
3,3'-Dichlorobenzidine		UG/KG		702.4	1800.0	0	96	0%	554.3	554.3
3-Nitroaniline	155	UG/KG	NYSDEC GW Prot.	1367.0	5900.0	2	96	2%	1145.2	1145.2
4,6-Dinitro-2-methylphenol		UG/KG		850.2	950.0	0	96	0%	874.9	874.9
4-Chloro-3-methylphenol	74.4	UG/KG	NYSDEC GW Prot	352.9	400.0	4	96	4%	364.0	364.0
4-Chloroaniline	68.2	UG/KG	NYSDEC GW Prot.	354.7	390.0	5	96	5%	366.3	366.3
4-Nitroaniline	309.69	UG/KG	NYSDEC GW Prot.	1340.8	1800.0	1	96	1%	1124.0	1124.0
Acenaphthene	27900	UG/KG	NYSDEC GW Prot.	614.3	990.0	0	96	0%	437.9	437.9
Anthracene	50000	UG/KG	NYSDEC Rec.	650.0	1600.0	0	96	0%	543.0	543.0
Benzo[a]anthracene	224 or MDL*	UG/KG	USEPA Health Based	832.5	4700.0	20	96	21%	913.6	913.6
Benzo[a]pyrene	61 or MDL **	UG/KG	USEPA Health Based	799.2	4400.0	37	96	39%	851.8	851.8
Benzo[b]fluoranthene	341	UG/KG	NYSDEC GW Prot	880.0	5000.0	18	96	19%	985.2	985.2
Benzo[ghi]perylene	50000	UG/KG	NYSDEC Rec.	708.4	2800.0	0	96	0%	749.3	749.3
Benzo[k]fluoranthene	341	UG/KG	NYSDEC GW Prot.	769.2	4200.0	17	96	18%	771.4	771.4
Bis(2-Ethylhexyl)phthalate	50000	UG/KG	NYSDEC Rec.	683.7	1300.0	0	96	0%	557.0	557.0
Butylbenzylphthalate	37820	UG/KG	NYSDEC GW Prot	658.5	730.0	0	96	0%	487.1	487.1
Carbazole		UG/KG		650.2	1400.0	0	96	0%	511.6	511.6
Chrysene	124	UG/KG	NYSDEC GW Prot.	873.0	4900.0	35	96	36%	995.8	995.8
Di-n-butylphthalate	2511	UG/KG	NYSDEC GW Prot.	492.8	6200.0	1	96	1%	463.0	463.0
Dibenz[a,h]anthracene	14 or MDL **	UG/KG	USEPA Health Based	625.7	1100.0	20	96	21%	469.8	469.8
Dibenzofuran	1922	UG/KG	NYSDEC GW Prot.	604.0	520.0	0	96	0%	423.5	423.5
Fluoranthene	50000	UG/KG	NYSDEC Rec.	1354.8	13000.0	0	96	0%	1688.1	1688.1
Fluorene	50000	UG/KG	NYSDEC Rec.	616.3	1200.0	0	96	0%	458.6	458.6
Hexachlorobutadiene		UG/KG		456.8	430.0	0	96	0%	424.4	424.4
Hexachlorocyclopentadiene		UG/KG		366.4	430.0	0	96	0%	382.2	382.2
Indeno[1,2,3-cd]pyrene	992	UG/KG	NYSDEC GW Prot	720.9	2800.0	6	96	6%	702.4	702.4
Isophorone	1364	UG/KG	NYSDEC GW Prot.	378.8	430.0	0	96	0%	399.0	399.0
Naphthalene	4030	UG/KG	NYSDEC GW Prot.	641.8	850.0	0	96	0%	479.4	479.4
Nitrobenzene	62	UG/KG	NYSDEC GW Prot.	360.8	400.0	8	96	8%	374.8	374.8
Pentachlorophenol	310	UG/KG	NYSDEC GW Prot.	840.9	960.0	1	96	1%	862.1	862.1
Phenanthrene	50000	UG/KG	NYSDEC Rec.	1032.4	8900.0	0	96	0%	1134.3	1134.3
Pyrene	50000	UG/KG	NYSDEC Rec.	834.3	8500.0	0	96	0%	1019.3	1019.3
Pesticides/PCBs										
4,4'-DDD	2900	UG/KG	USEPA Health Based	2.5	22.0	0	96	0%	2.6	2.6
4,4'-DDE	1364	UG/KG	NYSDEC GW Prot	5.2	140.0	0	96	0%	4.5	4.5
4,4'-DDT	775	UG/KG	NYSDEC GW Prot.	3.9	66.0	0	96	0%	3.7	3.7

TABLE 2-2c
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Surface and Subsurface Soil Analysis Results

Parameter	NYSDEC TAGM*	Units	Source	Mean	Max. Hit	No. of Hits>TAGM	Total No. of Samples ***	% of TAGM exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc. (units)(1)
Pesticides/PCBs (cont)										
Alpha-Chlordane		UG/KG		1.1	1.6	0	96	0%	1.1	1.1
Beta-BHC	62	UG/KG	NYSDEC GW Prot	1.1	1.4	0	96	0%	1.1	1.1
Delta-BHC	93	UG/KG	NYSDEC GW Prot.	1.1	1.2	0	96	0%	1.1	1.1
Dieldrin	44	UG/KG	USEPA Health Based	2.1	4.4	0	96	0%	2.2	2.2
Endosulfan I	279	UG/KG	NYSDEC GW Prot.	1.2	5.6	0	96	0%	1.3	1.3
Endosulfan II	279	UG/KG	NYSDEC GW Prot.	3.7	60.0	0	96	0%	3.3	3.3
Endosulfan sulfate	310	UG/KG	NYSDEC GW Prot.	3.0	23.0	0	96	0%	3.0	3.0
Endrin	31	UG/KG	NYSDEC GW Prot.	2.2	8.0	0	96	0%	2.2	2.2
Endrin aldehyde		UG/KG		3.1	23.0	0	96	0%	3.2	3.2
Endrin ketone		UG/KG		2.3	13.0	0	96	0%	2.4	2.4
Gamma-Chlordane	540	UG/KG	USEPA Health Based	1.2	7.8	0	96	0%	1.2	1.2
Heptachlor	31	UG/KG	NYSDEC GW Prot.	1.1	2.9	0	96	0%	1.2	1.2
Heptachlor epoxide	6.2	UG/KG	NYSDEC GW Prot	1.1	2.8	0	96	0%	1.2	1.2
Methoxychlor		UG/KG		10.7	21.0	0	96	0%	11.0	11.0
Nitroaromatics										
2,4-Dinitrotoluene		UG/KG		124.6	410.0	0	14	0%	188.9	188.9
4-amino-2,6-Dinitrotoluene		UG/KG		67.3	97.5	0	14	0%	71.0	71.0
HMX		UG/KG		73.0	120.0	0	14	0%	80.6	80.6
Metals										
Arsenic	7.5	MG/KG	NYSDEC Rec.	6.7	13.0	30	96	31%	7.0	7.0
Lead	21.86	MG/KG	Site Background	31.1	522.0	20	96	21%	35.0	35.0
Selenium	2	MG/KG	NYSDEC Rec.	0.4	1.1	0	96	0%	0.5	0.5
Thallium	0.28	MG/KG	Site Background	0.5	1.4	44	96	46%	0.6	0.6
Zinc	82.5	MG/KG	Site Background	96.9	503.0	52	96	54%	108.6	108.6
Herbicides										
2,4,5-T	589	UG/KG	NYSEC GW Prot	9.9	220.0	0	33	0%	6.7	6.7
2,4-D	155	UG/KG	NYSDEC GW Prot	35.7	260.0	1	33	3%	37.5	37.5
Dicamba		UG/KG		3.3	9.1	0	33	0%	3.6	3.6
MCPA		UG/KG		4172.0	29000.0	0	33	0%	4556.0	4556.0
MCPP		UG/KG		3487.1	13000.0	0	33	0%	3820.8	3820.8

*NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046
January 24, 1994 The TAGMs are TBCs and are for comparison purposes only.
NYSDEC Groundwater Protection Standards are dependent on the organic content of surface soils at SEAD-26 which is 0.31%
** For semivolatile organic compounds the Minimum Detection Limit (MDL) is 330 ug/Kg.
*** As explained in Section 7 of the RI, all sample results were not necessarily used in determining the 95% UCL.
****According to the statistical analysis conducted in Section 7.2.3 of the RI report, arsenic, lead, selenium, thallium, and zinc are the only elements that tend to be greater than the inorganic element concentrations that were detected in the same background media.
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 7 of the RI, page 7-43. This value may be greater than the maximum hit as note to RAGS: Calculating the Concentration Term" (EPA/9285.7-081/May 1992)

TABLE 2-2d
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Surface Water Analysis Results

Parameter	NYS Class C SWQS	Units	Source	Mean	Max. Hit	No. of Hits>SWQS	Total No. of Samples	% of SWQS exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc. (units)(1)
Volatile Organics										
Acetone		UG/L		5.3	8.5	0	11	0%	5.8	5.8
Semivolatile Organics										
Carbazole		UG/L		8.7	10.0	0	11	0%	10.2	10.0
Di-n-butylphthalate		UG/L		5.2	1.0	0	11	0%	8.6	1.0
Diethyl phthalate		UG/L		5.4	3.0	0	11	0%	6.4	3.0
Pesticides/PCB										
Beta-BHC		UG/L		0.03	0.06	0	11	0%	0.03	0.03
Endrin aldehyde		UG/L		0.05	0.07	0	11	0%	0.06	0.06
Gamma-Chlordane		UG/L		0.03	0.04	0	11	0%	0.03	0.03
Heptachlor	0.001	UG/L	NYSDEC SWQS-C	0.03	0.03	1	11	9%	0.03	0.03
Metals										
Aluminum	100	UG/L	NYSDEC SWQS-C	426.9	2140.0	9	11	82%	2148.5	2140.0
Arsenic	190	UG/L	NYSDEC SWQS-C	2.8	7.0	0	11	0%	5.1	5.1
Barium		UG/L		33.9	84.4	0	11	0%	44.6	44.6
Calcium		UG/L		53963.6	92400.0	0	11	0%	64842.0	64842.0
Chromium	205.3	UG/L	NYSDEC SWQS-C	0.3	0.5	0	11	0%	0.4	0.4
Cobalt	5	UG/L	NYSDEC SWQS-C	0.9	3.5	0	11	0%	1.6	1.6
Copper	11	UG/L	NYSDEC SWQS-C	1.9	4.0	0	11	0%	2.5	2.5
Cyanide	5.2	UG/L	NYSDEC SWQS-C	3.0	8.5	1	11	9%	3.8	3.8
Iron	300	UG/L	NYSDEC SWQS-C	1290.2	6910.0	8	11	73%	8439.7	6910.0
Lead	3.2	UG/L	NYSDEC SWQS-C	1.6	6.4	1	11	9%	2.7	2.7
Magnesium		UG/L		7181.4	20900.0	0	11	0%	10679.1	10679.1
Manganese		UG/L		32.0	128.0	0	11	0%	73.0	73.0
Mercury		UG/L		0.02	0.06	0	11	0%	0.03	0.03
Nickel	94.5	UG/L	NYSDEC SWQS-C	24.4	209.0	1	11	9%	132.2	132.2
Potassium		UG/L		3607.3	5650.0	0	11	0%	4205.8	4205.8
Sodium		UG/L		2222.5	4670.0	0	11	0%	2799.3	2799.3
Vanadium	14	UG/L	NYSDEC SWQS-C	1.7	8.2	0	11	0%	3.3	3.3
Zinc	81.9	UG/L	NYSDEC SWQS-C	75.0	219.0	4	11	36%	1258.3	219.0

* NYSDEC AWQC for Class C surface water from 6 NYCRR Subparts 701-705.
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 7 of the RI, page 7-43. This value may be greater than the maximu
to RAGS: Calculating the Concentration Term" (EPA/9285.7-081/May 1992)

TABLE 2-2e
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Sediment Analysis Results

Parameter	Sediment Criteria	Units	Source	Mean	Max. Hit	No. of Hits > Guideline	Total No. of Samples	% of Guideline Exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc. (units)(1)
Volatile Organics										
2-Butanone		UG/KG		105.9	1075.0	0	11	0%	285.6	285.6
Acetone		UG/KG		8.9	26.0	0	11	0%	13.3	13.3
Ethyl benzene		UG/KG		45.3	425.0	0	11	0%	87.8	87.8
Total Xylenes		UG/KG		279.4	3000.0	0	11	0%	1032.4	1032.4
Semivolatile Organics										
2,4-Dinitrotoluene		UG/KG		302.2	520.0	0	11	0%	381.5	381.5
2-Methylnaphthalene		UG/KG		2605.5	26000.0	0	11	0%	5818.2	5818.2
2-Nitroaniline		UG/KG		672.2	1100.0	0	11	0%	792.8	792.8
2-Nitrophenol		UG/KG		273.3	440.0	0	11	0%	320.3	320.3
3,3'-Dichlorobenzidine		UG/KG		273.3	440.0	0	11	0%	320.3	320.3
3-Nitroaniline		UG/KG		677.8	1200.0	0	11	0%	818.0	818.0
4-Nitroaniline		UG/KG		672.2	1100.0	0	11	0%	792.8	792.8
Acenaphthene	5502	UG/KG	NYS B.A.L.C.T*	1539.1	11000.0	1	11	9%	6016.8	6016.8
Acenaphthylene		UG/KG		208.1	89.0	0	11	0%	258.3	89.0
Anthracene		UG/KG		181.0	260.0	0	11	0%	347.3	260.0
Benzo[a]anthracene	51.09	UG/KG	NYSDEC HHB (1)	281.0	560.0	6	11	55%	381.7	381.7
Benzo[a]pyrene	51.09	UG/KG	NYSDEC HHB (1)	267.0	610.0	7	11	64%	378.0	378.0
Benzo[b]fluoranthene	51.09	UG/KG	NYSDEC HHB (1)	386.7	1200.0	8	11	73%	1016.2	1016.2
Benzo[ghi]perylene		UG/KG		286.7	750.0	0	11	0%	419.7	419.7
Benzo[k]fluoranthene	51.09	UG/KG	NYSDEC HHB (1)	348.8	800.0	7	11	64%	513.2	513.2
Bis(2-Ethylhexyl)phthalate	7860	UG/KG	NYS B.A.L.C.T*	226.1	55.0	0	11	0%	362.8	55.0
Butylbenzylphthalate		UG/KG		353.9	520.0	0	11	0%	427.0	427.0
Carbazole		UG/KG		213.0	400.0	0	11	0%	273.3	273.3
Chrysene	51.09	UG/KG	NYSDEC HHB (1)	396.7	1000.0	8	11	73%	1616.2	1000.0
Dibenz[a,h]anthracene		UG/KG		206.1	220.0	0	11	0%	246.8	220.0
Fluoranthene	40086	UG/KG	NYS B.A.L.C.T*	997.5	2800.0	0	11	0%	13208.4	2800.0
Fluorene		UG/KG		1762.4	13500.0	0	11	0%	8116.5	8116.5
Hexachlorobutadiene		UG/KG		273.3	440.0	0	11	0%	320.3	320.3
Hexachlorocyclopentadiene		UG/KG		302.2	520.0	0	11	0%	381.5	381.5
Indeno[1,2,3-cd]pyrene	51.09	UG/KG	NYSDEC HHB (1)	240.0	500.0	6	11	55%	320.6	320.6
Isophorone		UG/KG		311.1	680.0	0	11	0%	414.3	414.3
Naphthalene		UG/KG		328.9	520.0	0	11	0%	428.8	428.8
Phenanthrene	4716	UG/KG	NYS B.A.L.C.T*	2562.7	25000.0	1	11	9%	10039.9	10039.9
Phenol	19.65	UG/KG	NYS B.A.L.C.T*	353.9	520.0	4	11	36%	427.0	427.0
Pyrene		UG/KG		569.8	2000.0	0	11	0%	3497.8	2000.0
Pesticides/PCBs										
4,4'-DDD	0.39	UG/KG	NYSDEC HHB (1)	4.4	7.3	1	11	9%	7.1	7.1
4,4'-DDE	0.39	UG/KG	NYSDEC HHB (1)	9.3	48.0	6	11	55%	22.2	22.2
4,4'-DDT	0.39	UG/KG	NYSDEC HHB (1)	5.0	8.9	3	11	27%	8.3	8.3
Alpha-BHC		UG/KG		2.1	10.5	0	11	0%	3.1	3.1
Aroclor-1260	0.03	UG/KG	NYSDEC HHB (1)	81.3	650.0	0	11	0%	140.0	140.0
Beta-BHC		UG/KG		1.3	1.9	0	11	0%	1.5	1.5
Dieldrin	3.93	UG/KG	NYSDEC HHB (1)	2.6	3.8	0	11	0%	2.9	2.9
Endosulfan I	1.18	UG/KG	NYS B.A.L.C.T*	1.5	3.1	1	11	9%	1.8	1.8
Endosulfan II	1.18	UG/KG	NYS B.A.L.C.T*	5.7	32.8	3	11	27%	9.7	9.7
Endosulfan sulfate		UG/KG		8.2	66.0	0	11	0%	14.2	14.2
Endrin	31.44	UG/KG	NYS W.B.C.(2)	2.9	6.5	0	11	0%	3.6	3.6
Endrin aldehyde		UG/KG		10.4	90.0	0	11	0%	18.8	18.8
Endrin ketone		UG/KG		6.6	26.0	0	11	0%	13.7	13.7
Gamma-BHC/Lindane		UG/KG		2.4	13.5	0	11	0%	3.6	3.6
Gamma-Chlordane		UG/KG		1.3	1.3	0	11	0%	1.4	1.3
Heptachlor epoxide	0.03	UG/KG	NYSDEC HHB (1)	3.3	18.0	2	11	18%	6.3	6.3

TABLE 2-2e
SENECA ARMY DEPOT
SEAD-25 AND 26 FEASIBILITY STUDY

SEAD-26 Sediment Analysis Results

Parameter	Sediment Criteria	Units	Source	Mean	Max. Hit	No. of Hits > Guideline	Total No. of Samples	% of Guideline Exceedances	95% UCL of Mean	Reasonable Maximum Exposure EP Conc. (units)(1)
Metals										
Aluminum		MG/KG		9499.6	15300 0	0	11	0%	12073.6	12073.6
Antimony	2	MG/KG	Lowest Effect Level	0.3	0.5	0	11	0%	0.4	0.4
Arsenic	6	MG/KG	Lowest Effect Level	8.2	24.8	5	11	45%	13.3	13.3
Barium		MG/KG		54.7	118.0	0	11	0%	68.6	68.6
Beryllium		MG/KG		0.5	0.8	0	11	0%	0.6	0.6
Cadmium	0.6	MG/KG	Lowest Effect Level	0.1	0.3	0	11	0%	0.2	0.2
Calcium		MG/KG		71121.8	313000.0	0	11	0%	293380.2	293380.2
Chromium	26	MG/KG	Lowest Effect Level	13.9	25.1	0	11	0%	19.6	19.6
Cobalt		MG/KG		8.5	13.4	0	11	0%	10.6	10.6
Copper	16	MG/KG	Lowest Effect Level	16.5	23 9	7	11	64%	19.0	19.0
Cyanide		MG/KG		0 4	0.5	0	11	0%	0.4	0.4
Iron	20000	MG/KG	Lowest Effect Level	17850.5	29400.0	6	11	55%	22779.8	22779.8
Lead	31	MG/KG	Lowest Effect Level	16.0	31.6	1	11	9%	20.3	20.3
Magnesium		MG/KG		5241.4	7270.0	0	11	0%	5956.0	5956.0
Manganese	460	MG/KG	Lowest Effect Level	353.3	906.0	2	11	18%	537.1	537.1
Mercury	0.15	MG/KG	Lowest Effect Level	0.0	0.2	1	11	9%	0.1	0.1
Nickel	16	MG/KG	Lowest Effect Level	36.5	108 0	9	11	82%	63.8	63.8
Potassium		MG/KG		1468.1	2190.0	0	11	0%	1744.7	1744.7
Selenium		MG/KG		0.5	0.9	0	11	0%	0.6	0.6
Silver	1	MG/KG	Lowest Effect Level	0.1	0.2	0	11	0%	0.1	0.1
Sodium		MG/KG		58.1	231.0	0	11	0%	119.9	119.9
Thallium		MG/KG		0.5	0 8	0	11	0%	0 7	0.7
Vanadium		MG/KG		16.8	26.5	0	11	0%	20.2	20.2
Zinc	120	MG/KG	Lowest Effect Level	205.8	505.0	6	11	55%	295.6	295.6

(1) NYSDEC Human Health Bioaccumulation sediment criteria, December, 1989.
(2) NYS Wildlife Bioaccumulation Criteria
*NYS Benthic Aquatic Life Chronic Toxicity
(1) Reasonable Maximum Exposure EP Concentration is the 95% UCL as calculated in Section 7 of the RI, page 7-43. This value may be greater than the maximum hit as noted in "Supplem to RAGS. Calculating the Concentration Term" (EPA/9285.7-081/May 1992)

2.2.4 Media of Interest

The selection of the media of interest is based upon the two general remedial action objectives: those media that contribute the greatest risk and cause an exceedance of an EPA target risk level, and those media that do not comply with ARARs. The remedial investigation has examined all media at SEAD-25 and -26. Discrete samples of the on-site and off-site surface water, sediment, soil and groundwater have been sampled and analyzed using EPA and NYSDEC established analytical techniques. This process has yielded high quality data meeting all established Data Quality Objective (DQO) and has been used for determining both the need to remediate, if necessary, and the extent of any required remediation program.

Based on the results of the Baseline Risk Assessment and the ARAR Assessment, the following media will require remedial action objectives. For SEAD-25, groundwater and soil will require remedial action objectives for all scenarios and additionally, surface water and sediment will also require remedial action objectives under the residential scenario. By establishing remedial action objectives for sediment, remedial action objectives will also be established for the ephemeral surface water since the sediment appears to be the source of ARAR exceedances in the surface water. For SEAD-26, groundwater requires remedial action objectives for all scenarios.

2.2.5 Summary of the Result of the RAO Determination and Site-Specific Clean-up Goals

For each media of interest described in the previous section, the clean-up goals for SEAD-25 and -26 are presented for each constituent of concern in **Tables 2-3** and **2-4**, respectively. Individual sample point concentrations compared to clean-up goal concentrations are presented for each media of interest in **Tables 2-5** through **2-8** for SEAD-25 and **Table 2-10** for SEAD-26. The clean-up goals are based on ARARs or TBCs. For soils and sediments at SEAD-25, the constituents of concern are human risk based. Compounds contributing most significantly to human risk were identified as contaminants of concern and assigned clean up goals based on TBCs. For groundwater and surface water, ARARs were assigned as clean-up goals for constituents whose ARARs were exceeded.

The following is a general discussion of the RAOs for each site by media of interest.

2.2.5.1 SEAD-25 Clean-up Goals

SEAD-25 Groundwater

Groundwater is a media of interest based on ARARs for all exposure scenarios and on human health risk for the future residential scenario. The following compounds exceed NYSDEC AWQS for Class GA waters: 1,1,1-Trichloroethane, 1,1-Dichloroethane, 1,2-Dichloroethene, Benzene, Chloroform, Ethylbenzene, Toluene, Trichloroethene, Xylene, 2,4-Dimethylphenol, 2-Methylphenol, 3,3'Dichlorobenzidine, 4-Methylphenol, and Phenol. Although the compounds

TABLE 2-3
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Site Specific Clean-up Goals for Media of Interest

Groundwater

Constituent of Concern	Clean-up Goal (ug/L)	ARAR
Volatile Organics		
1,1,1-Trichloroethane	5	NYSDEC AWQS-GA
1,1-Dichloroethane	5	NYSDEC AWQS-GA
1,2-Dichloroethene (total)	5	NYSDEC AWQS-GA
Benzene	1	NYSDEC AWQS-GA
Chloroform	7	NYSDEC AWQS-GA
Ethylbenzene	5	NYSDEC AWQS-GA
Toluene	5	NYSDEC AWQS-GA
Trichloroethene	5	NYSDEC AWQS-GA
Xylene (total)	5	NYSDEC AWQS-GA
Semivolatile Organics		
2,4-Dimethylphenol (1)	1	NYSDEC AWQS-GA
3',3 Dichlorobenzidine	5	NYSDEC AWQS-GA
2-Methylphenol (1)	1	NYSDEC AWQS-GA
4-Methylphenol (1)	1	NYSDEC AWQS-GA
Phenol (1)	1	NYSDEC AWQS-GA

* NYSDEC AWQS for Class GA waters. From 6 NYCRR Parts 701-705. TOGS 1.1.1 June 1998.
(1) A standard of 1 ug/L applies to the sum of total phenolic compounds.

Soil

Constituent of Concern	Clean-up Goal (ug/Kg)	Source
Volatile Organics		
1,1,1-Trichloroethane	592.8	NYSDEC GW Prot.
1,2-Dichloroethene (total)		
Benzene	46.8	NYSDEC GW Prot.
Chloroform	234	NYSDEC GW Prot.
Ethylbenzene	4290	NYSDEC GW Prot.
Toluene	1170	NYSDEC GW Prot.
Trichloroethene	546	NYSDEC GW Prot.
Xylene (total)	936	NYSDEC GW Prot.
Semivolatile Organics		
2-Methylnaphthalene	28392	NYSDEC GW Prot.
Naphthalene	10140	NYSDEC GW Prot.
Phenol	23.4	NYSDEC GW Prot.

* NYSDEC TAGM values are based on Technical and Administrative Guidance Memorandum HWR-94-4046, January 24, 1994. The TAGMs are TBCs and are for comparison purposes only. NYSDEC Groundwater Protection Standards are dependent on the organic content of the subsurface soils which is 0.78%.

Surface Water

Constituent of Concern	Clean-up Goal (ug/L)	Source
Metals		
Lead	1.8	NYSDEC SWQS-C

* NYSDEC AWQS for Class C surface waters From 6 NYCRR Subparts 701-705.

Sediment

Constituent of Concern	Clean-up Goal (ug/Kg)	Source
Semivolatile Organics		
Benzo(a)anthracene	45.5	NYS H H B (1)
Benzo[a]pyrene	45.5	NYS H H B (1)
Benzo(b)fluoranthene	45.5	NYS H H B (1)
Pesticides		
4,4'-DDD	0.35	NYS H H B (1)
	(mg/Kg)	
Metals		
Cadmium	0.6	L.E.L. (2)
Lead	31	L.E.L. (2)
Manganese	460	L.E.L. (2)

(1) NYS Human Health Bioaccumulation, NYS Technical Guidance for Screening Contaminated Sediment. November, 1993.
(2) NYS Lowest Effect Level, NYS Technical Guidance for Screening Contaminated Sediment. November, 1993.

TABLE 2-4
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Site Specific Cleaun-up Goals for Media of Interest

Constituent of Concern	Groundwater Clean-up Goal (ug/L)	Groundwater Source**
Volatile Organics		
Benzene	1	NYSDEC AWQS-GA
Ethylbenzene	5	NYSDEC AWQS-GA
Xylene (total)	5	NYSDEC AWQS-GA
1,2,4-Trimethylbenzene	5	NYSDEC AWQS-GA**
1,3,5-Trimethylbenzene	5	NYSDEC AWQS-GA**
n-Propylbenzene	5	NYSDEC AWQS-GA**
p-Isopropyltoluene	5	NYSDEC AWQS-GA**

* NYSDEC AWQS for Class GA waters. From 6 NYCRR Parts 701-705.
** Principal organic contaminant standard applies (TOGS 1.1.1, June 1998)

which exceed ARARs do not pose a threat to human health for the current or intended future land use, groundwater does present unacceptable risk for the future residential use scenario which is being considered for cost analysis purposes. Since NYSDEC GA standards are exceeded, groundwater is a media of interest for all exposure scenarios and clean up goals will be based on meeting these standards. The clean up goals for groundwater are presented in Table 2-3. Individual sample point concentrations compared to clean-up goals are presented as **Table 2-5.**

SEAD-25 Subsurface Soil Clean-up Goals

Soil is a media of interest based on human health risk for the intended land use (industrial) and being the source of groundwater contamination. The remedial action objective for subsurface soil at SEAD-25 is twofold: (1) to reduce levels of benzene such that risk to future construction workers is acceptable; and (2) to remediate soils to NYS Groundwater Protection TAGM values for the organics that have leached to the groundwater in order to prevent additional groundwater contamination. The values for soil clean up presented in Table 2-3 are from NYSDEC TAGM No. GWR94-4046 for Groundwater Protection. Individual soil sample point concentrations compared to clean-up goals are presented as **Table 2-6**. These values are to be considered (TBCs) and are not used to determine the necessity of remediation, but are used as guidelines in setting the remedial goals. Because metals and pesticides have not leached to the groundwater, are not expected to do so, and do not pose elevated human health risks, they are not included as part of the subsurface soil remedial action goals.

Lead was not considered as part of the risk assessment because the EPA has withdrawn the allowable Reference Dose (RfD) value for lead. A site-specific clean-up goal for soil and on-site sediment was established at 500 mg/kg for lead as part of the Feasibility Study for the OB Grounds. This clean-up goal has been adopted for the SEAD-25 and there are no soil samples that do not meet this criteria.

SEAD-25 Surface Water Goals

Surface water is a media of interest for the future residential scenario only. Surface water concentrations of Lead at SEAD-25 were found to exceed ARARs. However, because the surface water is ephemeral and present only in the drainage swales after heavy rains, concentrations of lead in the drainage ditch sediment and/or turbidity in the sample is most likely responsible for the ARAR exceedance. Since sediment is a media of interest under the future residential scenario, surface water clean-up goals will be achieved as a result of achieving sediment clean-up goals. Surface water clean-up goals are presented in **Table 2-3**. Individual surface water sample point concentrations compared to clean-up goals are presented as **Table 2-7**.

SEAD-25 Sediment Goals

Sediment is a media of interest for the future residential scenario only. The carcinogenic risk for ingestion of sediment is 7×10^{-4} which is greater than the EPA criteria. The sediment clean-up goals are to reduce concentrations of 4,4'-DDD, Lead, Cadmium, Manganese, benzo(a)pyrene and benzo(b)fluorene. These compounds constitute the greatest contributors to carcinogenic and non-carcinogenic human health risk. By remediating the sediment, surface water goals should be met as well, since the sediment is most likely the cause for surface water ARAR exceedance. Lead, which exceeds the surface water ARAR is present at levels exceeding sediment criteria. Sediment clean-up goals for the future residential scenario are presented in **Table 2-3**. Individual sediment sample point concentrations compared to clean-up goals are presented as **Table 2-8**.

2.2.5.2 SEAD-26 Clean-up Goals

SEAD-26 Groundwater

Groundwater is a media of interest based on ARARs for all exposure scenarios. The groundwater clean-up goals for the SEAD-26 are to reduce concentrations of Benzene, Ethylbenzene, Xylene, 1,2,4-Trimethylbenzene, 1,3,5-Trimethylbenzene, n-Propylbenzene, and p-Isopropyltoluene to meet NYSDEC AWQS for Class GA waters.

Volatile organics in groundwater do not pose a threat to human health because ingestion of on-site groundwater is not an exposure pathway under the current or intended future land use. Although these compounds pose additional risk for the future residential scenario, this risk is still within acceptable levels. The risks posed by other constituents (e.g., metals) fall within or below the EPA target ranges. The plume of volatile organics and semi-volatiles does not extend off-site—volatiles were only detected in one well (MW26-7). Groundwater clean-up goals are presented in **Table 2-4**. Individual groundwater sample point concentrations compared to clean-up goals are presented as **Table 2-9**.

SEAD-26 Soil Clean-up Goals

Soil is not a media of interest at SEAD-26. Because the contaminants that exceed groundwater ARARs are no longer present in the soil of SEAD-26, there is no need for a remedial action addressing soil contamination for the purposes of protecting groundwater. All soil TAGMs are to be considered (TBCs) and are not used to determine the necessity of remediation, but are used as guidelines in setting the remedial goals. Because there is no evidence of TAGM exceeding pollutants leaching to the groundwater, soil is not included as part of the remedial action goals. As discussed in Section 2.2.2.3 and 2.2.2.4, , soil poses little risk to ecological receptors and the site hazard index and total cancer risk for human health are within the acceptable EPA risk range (**Table 1-2**).

Lead was not considered as part of the risk assessment because the EPA has withdrawn the allowable Reference Dose (RfD) value for lead. A site-specific clean-up goal for soil and on-site sediment was established at 500 mg/kg for lead as part of the Feasibility Study for the OB Grounds. This clean-up goal has been adopted for the SEAD-26. One surface soil sample and one subsurface sample were found to be in excess of this criteria and therefore, lead in soil was considered to be of negligible concern at SEAD-26.

Table 2-5
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater RAO Analysis Results by Sample Point

			LOC ID:	MW25-1	MW25-1	MW25-1	MW25-1	MW25-10	MW25-10	MW25-11	MW25-11
			SAMP ID:	MW25-4-1	MW25-1-1	MW25-1	25001	MW25-10	25012	MW25-11	25010
			QC CODE:	DU	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	ESI	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	06-Feb-94	06-Feb-94	22-Nov-95	10-Apr-96	21-Nov-95	31-Mar-96	17-Nov-95	12-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics											
1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U	10 U	10 U		10 UJ		10 U	
Benzene	1	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
Chloroform	7	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
Ethylbenzene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
Toluene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
Trichloroethene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
Xylene (total)	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
Semivolatile Organics											
2,4-Dimethylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
2-Methylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 UJ	10 U
4-Methylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
Phenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U

Table 2-5
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater RAO Analysis Results by Sample Point

			LOC ID:	MW25-12D	MW25-12D	MW25-13	MW25-13	MW25-14D	MW25-14D	MW25-15	MW25-15
			SAMP ID:	MW25-12D	25014	MW25-13	25015	MW25-14D	25016	MW25-15	25011
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP DATE:	18-Nov-95	02-Apr-96	17-Nov-95	29-Mar-96	18-Nov-95	29-Mar-96	20-Nov-95	13-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics											
1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U		10 U		10 UJ		10 U	
Benzene	1	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
Chloroform	7	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
Toluene	5	NYS Class GA	UG/L	10 U	0.6 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
Trichloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.6
Semivolatile Organics											
2,4-Dimethylphenol	1	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
2-Methylphenol	1	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
3,3'-Dichlorobenzidine	5	NYS Class GA	UG/L	11 UJ	10 U	11 UJ	10 U	10 UJ	10 U	10 J	12 U
4-Methylphenol	1	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
Phenol	1	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U

Table 2-5
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater RAO Analysis Results by Sample Point

			LOC ID:	MW25-16D	MW25-16D	MW25-17	MW25-17	MW25-18	MW25-18	MW25-19	MW25-19
			SAMP ID:	MW25-16D	25018	MW25-17	25019	MW25-18	25020	MW25-19	25021
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP DATE:	20-Nov-95	30-Mar-96	20-Nov-95	30-Mar-96	28-Nov-95	28-Mar-96	21-Nov-95	10-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics											
1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U		10 U		10 U		10 UJ	
Benzene	1	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
Chloroform	7	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
Toluene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.6 UJ	10 UJ	0.5 UJ
Trichloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
Semivolatile Organics											
2,4-Dimethylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
2-Methylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
3,3'-Dichlorobenzidine	5	NYS Class GA	UG/L	10 UJ	10 U	10 UJ	10 U	10 U	10 U	10 UJ	10 U
4-Methylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
Phenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U

Table 2-5
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater RAO Analysis Results by Sample Point

			LOC ID	MW25-2	MW25-2	MW25-2	MW25-3	MW25-3	MW25-3	MW25-4D	MW25-4D
			SAMP ID:	MW25-2-1	MW25-2	25002	MW25-3-1	MW25-3	25003	MW25-4D	25200
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	DU
			STUDY ID:	ESI	RI ROUND1	RI ROUND2	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP DATE:	05-Feb-94	29-Nov-95	12-Apr-96	15-Nov-93	19-Nov-95	10-Apr-96	15-Nov-95	01-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics											
1,1,1-Trichloroethane	5	NYS Class GA	UG/L	**36**	**25 J**	**37 J**	10 U	10 U	10 U	10 U	0.5 U
1,1-Dichloroethane	5	NYS Class GA	UG/L	**8 J**	59 U	100 U	3 J	10 U	10 U	10 U	0.5 U
1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	**25**	**37 J**	**40 J**	2 J	10 U	10 U	10 U	
Benzene	1	NYS Class GA	UG/L	**780**	**730**	**1000**	**30**	**5 J**	10 U	10 U	0.5 U
Chloroform	7	NYS Class GA	UG/L	**17**	59 U	**12 J**	10 U	10 U	10 U	10 U	0.5 U
Ethylbenzene	5	NYS Class GA	UG/L	**110**	**140**	**520**	**18**	3 J	10 U	10 U	0.5 U
Toluene	5	NYS Class GA	UG/L	**560**	**370**	**1400**	**8 J**	10 U	10 U	10 U	0.7 U
Trichloroethene	5	NYS Class GA	UG/L	**10**	**6 J**	100 U	10 U	10 U	10 U	10 U	0.5 U
Xylene (total)	5	NYS Class GA	UG/L	**2500**	**1800**	**3300**	**82**	**7 J**	10 U	10 U	0.5 U
Semivolatile Organics											
2,4-Dimethylphenol	1	NYS Class GA	UG/L	**86**	**29**	**15 J**	11 U	11 U	10 U	10 U	10 U
2-Methylphenol	1	NYS Class GA	UG/L	**23 J**	**8 J**	230 U	11 U	11 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	NYS Class GA	UG/L	25 U	21 U	230 U	11 U	11 UJ	10 U	10 UJ	10 U
4-Methylphenol	1	NYS Class GA	UG/L	**42**	21 U	**33 J**	11 U	11 U	10 U	10 U	10 U
Phenol	1	NYS Class GA	UG/L	**56**	21 U	230 U	11 U	11 U	10 U	10 U	10 U

Table 2-5
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater RAO Analysis Results by Sample Point

			LOC ID:	MW25-4D	MW25-5D	MW25-5D	MW25-5D	MW25-6	MW25-6	MW25-7D	MW25-7D
			SAMP ID	25006	MW25-50	MW25-5D	25004	MW25-6	25008	MW25-7D	25009
			QC CODE:	SA	DU	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND2	RI ROUND1	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE	01-Apr-96	19-Nov-95	19-Nov-95	11-Apr-96	21-Nov-95	31-Mar-96	22-Nov-95	31-Mar-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics											
1,1,1-Trichloroethane	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
1,1-Dichloroethane	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
1,2-Dichloroethene (total)	5	NYS Class GA	UG/L		10 U	10 U		10 UJ		10 U	
Benzene	1	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
Chloroform	7	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
Ethylbenzene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
Toluene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
Trichloroethene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
Xylene (total)	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
Semivolatile Organics											
2,4-Dimethylphenol	1	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
2-Methylphenol	1	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
3,3'-Dichlorobenzidine	5	NYS Class GA	UG/L	10 U	11 U	10 UJ	10 U	11 UJ	10 U	10 U	10 U
4-Methylphenol	1	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
Phenol	1	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U

Table 2-5
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

5 Groundwater RAO Analysis Results by Sample Point

			LOC ID:	MW25-8	MW25-8	MW25-9	MW25-9
			SAMP ID:	MW25-8	25005	MW25-9	25007
			QC CODE:	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	28-Nov-95	11-Apr-96	19-Nov-95	13-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics							
1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	0.5 U	2 J	1 J
1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	0.5 U	2 J	10 UJ
1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U		**6 J**	1 J
Benzene	1	NYS Class GA	UG/L	10 U	0.5 U	**60**	**14 J**
Chloroform	7	NYS Class GA	UG/L	10 U	0.5 U	10 U	10 UJ
Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 U	**10**	3 J
Toluene	5	NYS Class GA	UG/L	10 U	0.5 U	**22**	**5 J**
Trichloroethene	5	NYS Class GA	UG/L	10 U	0.5 U	10 U	10 UJ
Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 U	**73**	**18 J**
Semivolatile Organics							
2,4-Dimethylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
2-Methylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
3,3'-Dichlorobenzidine	5	NYS Class GA	UG/L	10 U	10 U	10 UJ	11 U
4-Methylphenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
Phenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	11 U

Table 2-6
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil RAO Analysis by Sample Point

				LOC_ID:	SB25-1		SB25-1		SB25-1		SB25-10		SB25-10		SB25-11	
				SAMP ID	SB25-1-01		SB25-1-03		SB25-1-04		SB25-10-01		SB25-10-02		SB25-11-02	
				QC CODE:	SA		SA		SA		SA		SA		SA	
				STUDY ID	ESI		ESI		ESI		RI ROUND1		RI ROUND1		RI ROUND1	
				TOP	0		4		6		0.17		2		2	
				BOTTOM	2		6		8		2		4		4	
				MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
				SAMPLE DATE:	12/03/93		12/03/93		12/03/93		09/27/95		09/27/95		10/17/95	
PARAMETER	LEVEL	SOURCE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
1,2-Dichloroethene (total)				UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Benzene	46.8	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Chloroform	234	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Ethylbenzene	4290	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Toluene	1170	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Trichloroethene	546	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Xylene (total)	936	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	2	J	11	U	12	U
SEMIVOLATILE ORGANICS																
2-Methylnaphthalene	28392	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	55	J	360	U	500	U	370	U	360	U	380	U
Naphthalene	10140	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Phenol	23.4	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U

Table 2-6
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil RAO Analysis by Sample Point

			SB25-11		SB25-12		SB25-12		SB25-13		SB25-13		SB25-14	
			SB25-11-03		SB25-12-02		SB25-12-03		SB25-13-02		SB25-13-04		SB25-14-01	
			SA		SA		SA		SA		SA		SA	
			RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			4		2		4		0.17		6		0.17	
			6		4		6		3		7.3		2	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			10/17/95		10/16/95		10/16/95		10/08/95		10/07/95		10/10/95	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS														
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
1,2-Dichloroethene (total)			11	U	11	U	11	U	11	U	11	U	12	U
Benzene	46.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Chloroform	234	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Ethylbenzene	4290	NYSDEC Prot. GW	11	UJ	11	U	11	U	11	U	11	U	12	U
Toluene	1170	NYSDEC Prot. GW	11	UJ	11	U	11	U	11	U	11	U	12	U
Trichloroethene	546	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Xylene (total)	936	NYSDEC Prot. GW	69	J	11	U	11	U	11	U	11	U	12	U
SEMIVOLATILE ORGANICS														
2-Methylnaphthalene	28392	NYSDEC Prot. GW	360	U	370	U	360	U	360	U	360	U	400	U
Naphthalene	10140	NYSDEC Prot. GW	360	U	370	U	360	U	360	UJ	360	UJ	400	U
Phenol	23.4	NYSDEC Prot. GW	360	U	370	U	**2400**		360	U	360	U	400	U

Table 2-6
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil RAO Analysis by Sample Point

PARAMETER	LEVEL	SOURCE	SB25-14 SB25-14-02 SA RI ROUND1 2 4 SOIL 10/10/95 VALUE	Q	SB25-15 SB25-15-01 SA RI ROUND1 0.17 2 SOIL 10/17/95 VALUE	Q	SB25-15 SB25-15-02 SA RI ROUND1 2 4 SOIL 10/17/95 VALUE	Q	SB25-16 SB25-16-01 SA RI ROUND1 0.17 2 SOIL 10/23/95 VALUE	Q	SB25-16 SB25-16-02 SA RI ROUND1 2 4 SOIL 10/23/95 VALUE	Q	SB25-2 SB25-2-01 SA ESI 0 2 SOIL 12/03/93 VALUE	Q
VOLATILE ORGANICS														
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
1,2-Dichloroethene (total)			11	U	11	U	11	U	12	U	11	U	11	U
Benzene	46.8	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Chloroform	234	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Ethylbenzene	4290	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	2	J
Toluene	1170	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Trichloroethene	546	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Xylene (total)	936	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
SEMIVOLATILE ORGANICS														
2-Methylnaphthalene	28392	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	40	J
Naphthalene	10140	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
Phenol	23.4	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U

Table 2-6
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil RAO Analysis by Sample Point

			SB25-2		SB25-2		SB25-2		SB25-3		SB25-3		SB25-3	
			SB25-2-02		SB25-2-03		SB25-20-01		SB25-3-01		SB25-3-02		SB25-3-03	
			SA		SA		DU		SA		SA		SA	
			ESI		ESI		ESI		ESI		ESI		ESI	
			2		4		0		0		2		4	
			4		6		2		2		4		5	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS														
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	19	U	11	U	11	U	170		12	U	11	U
1,2-Dichloroethene (total)			19	U	11	U	11	U	52	U	12	U	11	U
Benzene	46.8	NYSDEC Prot. GW	19	U	11	U	11	U	**100**		12	U	4	J
Chloroform	234	NYSDEC Prot. GW	19	U	11	U	11	U	52	U	12	U	11	U
Ethylbenzene	4290	NYSDEC Prot. GW	19	U	6	J	11	U	370		12	U	28	
Toluene	1170	NYSDEC Prot. GW	19	U	11	U	11	U	840		4	J	30	
Trichloroethene	546	NYSDEC Prot. GW	19	U	11	U	11	U	38	J	12	U	11	U
Xylene (total)	936	NYSDEC Prot. GW	19	U	37		11	U	**4100**	**J**	49		320	
SEMIVOLATILE ORGANICS														
2-Methylnaphthalene	28392	NYSDEC Prot. GW	5100		2800	J	51	J	4700	J	400	U	410	
Naphthalene	10140	NYSDEC Prot. GW	390	J	250	J	500	U	1100	J	400	U	130	J
Phenol	23.4	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U

Table 2-6
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil RAO Analysis by Sample Point

			SB25-4		SB25-4		SB25-4		SB25-5		SB25-5		SB25-5		SB25-6	
			SB25-4-01		SB25-4-02		SB25-4-03		SB25-5-01		SB25-5-02		SB25-5-03		SB25-6-01	
			SA		SA		SA		SA		SA		SA		SA	
			ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			0		2		4		0		2		4		0	
			2		4		6		2		4		6		2	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	1400	U	11	U	11	U	1300	U	6800	U	1200	U	11	U
1,2-Dichloroethene (total)			1400	U	11	U	11	U	310	J	6800	U	1200	U	11	U
Benzene	46.8	NYSDEC Prot GW	1400	U	11	U	11	U	1300	U	6800	U	1200	U	11	U
Chloroform	234	NYSDEC Prot GW	1400	U	9	J	11	U	1300	U	6800	U	1200	U	11	U
Ethylbenzene	4290	NYSDEC Prot GW	1400	U	11	U	11	U	990	J	**17000**		1200		11	U
Toluene	1170	NYSDEC Prot GW	1400	U	11	U	11	U	820	J	**4500**	**J**	1200	U	11	U
Trichloroethene	546	NYSDEC Prot GW	1400	U	11	U	11	U	280	J	6800	U	1200	U	11	U
Xylene (total)	936	NYSDEC Prot GW	**2900**		50		110		**14000**		**130000**		**9000**		11	U
SEMIVOLATILE ORGANICS																
2-Methylnaphthalene	28392	NYSDEC Prot GW	2600	J	1500	U	68	J	8900	J	550		7100	J	360	U
Naphthalene	10140	NYSDEC Prot GW	770	J	1500	U	810	U	1500	J	330	J	4300	J	360	U
Phenol	23.4	NYSDEC Prot GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U

Table 2-6
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil RAO Analysis by Sample Point

PARAMETER	LEVEL	SOURCE	SB25-6 SB25-6-02 SA ESI 2 4 SOIL 12/03/93 VALUE	Q	SB25-7 SB25-7-03 SA RI ROUND1 4 6 SOIL 09/25/95 VALUE	Q	SB25-7 SB25-7-04 SA RI ROUND1 6 8 SOIL 09/25/95 VALUE	Q	SB25-8 SB25-8-01 SA RI ROUND1 0.17 2 SOIL 09/26/95 VALUE	Q	SB25-8 SB25-8-02 SA RI ROUND1 2 4 SOIL 09/26/95 VALUE	Q	SB25-9 SB25-9-01 SA RI ROUND1 0.17 2 SOIL 09/26/95 VALUE	Q	SB25-9 SB25-9-02 SA RI ROUND1 2 4 SOIL 09/26/95 VALUE	Q
VOLATILE ORGANICS																
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
1,2-Dichloroethene (total)			11	U	11	U	11	U	11	U	11	U	11	U	11	U
Benzene	46.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Chloroform	234	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Ethylbenzene	4290	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Toluene	1170	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Trichloroethene	546	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Xylene (total)	936	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
SEMIVOLATILE ORGANICS																
2-Methylnaphthalene	28392	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Naphthalene	10140	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Phenol	23.4	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U

Table 2-7
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Surface Water RAO Analysis by Sample Point

			LOC ID:	SW25-1		SW25-10		SW25-2		SW25-3		SW25-4		SW25-5	
			SAMP ID:	SW25-1		SW25-10		SW25-2		SW25-3		SW25-4		SW25-5	
			QC CODE:	SA		SA		SA		SA		SA		SA	
			STUDY ID:	PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1	
			MATRIX:	SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
			SAMP. DATE:	06-Oct-95		06-Oct-95		06-Oct-95		22-Oct-95		06-Oct-95		06-Oct-95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Metals															
Lead	1.8	NYS Class C SWQS	UG/L	**7**		1.5	U	**5.5**		**2.8**		**3.3**		1.5	U

Table 2-7
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

D-25 Surface Water RAOAnalysis Sample Point

			LOC ID:	SW25-6		SW25-6		SW25-7		SW25-8		SW25-9	
			SAMP ID:	SW25-15		SW25-6		SW25-7		SW25-8		SW25-9	
			QC CODE:	DU		SA		SA		SA		SA	
			STUDY ID:	PHASE I		PHASE I		PHASE I		PHASE I		PHASE I	
			MATRIX:	SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
			SAMP. DATE:	09-Oct-95		09-Oct-95		08-Oct-95		08-Oct-95		08-Oct-95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Metals													
Lead	1.8	NYS Class C SWQS	UG/L	1.5	U	1.5	U	1.5	U	1.5	U	1.5	U

Table 2-8
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

EAD-25 Sediment RAO Analysis Results by Sample Point

			LOC ID	SD25-1		SD25-10		SD25-2		SD25-3		SD25-3		SD25-4	
			SAMP ID	SD25-1		SD25-10		SD25-2		SD25-30		SD25-3		SD25-4	
			QC CODE:	SA		SA		SA		DU		SA		SA	
			STUDY ID	PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1	
			SAMP. DEPTH TOP	0		0		0		0		0		0	
			SAMP. DEPTH BOT:	0.25		0.17		0.17		0.17		0.17		0.25	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
			SAMP. DATE:	06-Oct-95		06-Oct-95		06-Oct-95		22-Oct-95		22-Oct-95		06-Oct-95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Semivolatile Organics															
Benzo(a)anthracene	45.5	NYS H.H.B.	UG/KG	**3500**		450	U	**600**		**220**	**J**	**210**	**J**	500	U
Benzo(a)pyrene	45.5	NYS H.H.B.	UG/KG	**3600**		450	U	**770**		**300**	**J**	**270**	**J**	500	U
Benzo(b)fluoranthene	45.5	NYS H.H.B.	UG/KG	1700	U	450	U	**1200**		**240**	**J**	**220**	**J**	500	U
Pesticides															
4,4'-DDD	0.35	NYS H.H.B.	UG/KG	**16**	**J**	4.5	U	4.6	U	4.4	U	4.4	U	5	U
Metals															
Cadmium	0.6	Lowest Effect Level	MG/KG	0.06	U	0.07	U	0.04	U	0.08	U	0.05	U	0.05	U
Lead	31	Lowest Effect Level	MG/KG	**94.8**		11.2		**47.7**		20.4		24.5		**34.1**	
Manganese	460	Lowest Effect Level	MG/KG	389		452		394		411		**711**		370	

Table 2-8
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Sediment RAO Analysis Results by Sample Point

			LOC ID	SD25-5		SD25-6		SD25-6		SD25-7		SD25-8		SD25-9	
			SAMP ID	SD25-5		SD25-15		SD25-6		SD25-7		SD25-8		SD25-9	
			QC CODE	SA		DU		SA		SA		SA		SA	
			STUDY ID	PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1	
			SAMP. DEPTH TOP	0		0		0		0		0		0	
			SAMP. DEPTH BOT	0 25		0.17		0.17		0.25		0 25		0.25	
			MATRIX	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
			SAMP. DATE	06-Oct-95		09-Oct-95		09-Oct-95		08-Oct-95		08-Oct-95		08-Oct-95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Semivolatile Organics															
Benzo(a)anthracene	45.5	NYS H.H.B	UG/KG	540	U	**2200**	**J**	**5800**		**8500**	**J**	**9000**		**4500**	
Benzo(a)pyrene	45 5	NYS H.H.B.	UG/KG	540	U	**2300**	**J**	**5100**		**12000**		**13000**		**6600**	
Benzo(b)fluoranthene	45.5	NYS H.H.B	UG/KG	**64**	**J**	**1800**	**J**	**8000**		**25000**		**21000**		**13000**	
Pesticides															
4,4'-DDD	0 35	NYS H.H.B	UG/KG	5.4	U	**32**	**J**	**27**	**J**	**550**	**J**	**480**	**J**	**300**	**J**
Metals															
Cadmium	0 6	Lowest Effect Level	MG/KG	0.1	U	0.16		0.18		**1.2**	**J**	**2.5**	**J**	**2.7**	**J**
Lead	31	Lowest Effect Level	MG/KG	19		**92.2**		**327**		**175**	**J**	**222**	**J**	**378**	**J**
Manganese	460	Lowest Effect Level	MG/KG	364		227		277		129	J	328	J	**835**	**J**

Table 2-9
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Groundwater RAO Analysis by Sample Point

			LOC ID:	MW26-1	MW26-1	MW26-1	MW26-10	MW26-10	MW26-11	MW26-11
			SAMP ID:	MW26-1-1	MW26-1	26001	MW26-10	26012	MW26-11	26013
			QC CODE:	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	21-Jan-94	13-Nov-95	11-Apr-96	16-Nov-95	27-Mar-96	16-Nov-95	12-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
1,2,4-Trimethylbenzene	5	NYS Class GA	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
1,3,5-Trimethylbenzene	5	NYS Class GA	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
Benzene	1	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
n-Propylbenzene	5	NYS Class GA	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
p-Isopropyltoluene	5	NYS Class GA	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U

Table 2-9
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Groundwater RAO Analysis by Sample Point

			LOC ID:	MW26-3	MW26-3	MW26-3	MW26-4	MW26-4	MW26-4	MW26-4
			SAMP ID:	MW26-3-1	MW26-3	26003	MW26-4-1	MW26-4	26004	26006
			QC CODE:	SA	SA	SA	SA	SA	DU	SA
			STUDY ID:	ESI	RI ROUND1	RI ROUND2	ESI	RI ROUND1	RI ROUND2	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	22-Jan-94	05-Nov-95	09-Apr-96	22-Jan-94	08-Nov-95	09-Apr-96	09-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
1,2,4-Trimethylbenzene	5	NYS Class GA	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
1,3,5-Trimethylbenzene	5	NYS Class GA	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
Benzene	1	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.5 UJ	0.5 UJ
Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.5 UJ	0.5 UJ
Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.5 UJ	0.5 UJ
n-Propylbenzene	5	NYS Class GA	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
p-Isopropyltoluene	5	NYS Class GA	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ

Table 2-9
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Groundwater RAO Analysis by Sample Point

			LOC ID:	MW26-5	MW26-5	MW26-6	MW26-6	MW26-7	MW26-7	MW26-7
			SAMP ID:	MW26-5	26007	MW26-6	26008	MW26-70	MW26-7	26009
			QC CODE:	SA	SA	SA	SA	DU	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	05-Nov-95	27-Mar-96	05-Nov-95	26-Mar-96	14-Nov-95	14-Nov-95	28-Mar-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
1,2,4-Trimethylbenzene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	**6**	**11**	**17**
1,3,5-Trimethylbenzene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	2	3	7
Benzene	1	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	**1**	**2**	**1**
Ethylbenzene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	**6**	**7**	**8**
Xylene (total)	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	2	2	**5**
n-Propylbenzene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	3	3	**6**
p-Isopropyltoluene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	2	3	**6**

Table 2-9
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Groundwater RAO Analysis by Sample Point

			LOC ID:	MW26-8		MW26-8		MW26-9		MW26-9	
			SAMP ID:	MW26-8		26010		MW26-9		26011	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND2		RI ROUND1		RI ROUND2	
			MATRIX:	GROUND WATER		GROUND WATER		GROUND WATER		GROUND WATER	
			SAMP. DATE:	06-Nov-95		28-Mar-96		13-Nov-95		27-Mar-96	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
1,2,4-Trimethylbenzene	5	NYS Class GA	UG/L	0.5	UJ	0.5	U	0.5	U	0.5	UJ
1,3,5-Trimethylbenzene	5	NYS Class GA	UG/L	0.5	UJ	0.5	U	0.5	U	0.5	UJ
Benzene	1	NYS Class GA	UG/L	0.5	UJ	0.5	U	0.5	U	0.5	UJ
Ethylbenzene	5	NYS Class GA	UG/L	0.5	UJ	0.5	U	0.5	U	0.5	UJ
Xylene (total)	5	NYS Class GA	UG/L	0.5	UJ	0.5	U	0.5	U	0.5	UJ
n-Propylbenzene	5	NYS Class GA	UG/L	0.5	UJ	0.5	U	0.5	U	0.5	UJ
p-Isopropyltoluene	5	NYS Class GA	UG/L	0.5	UJ	0.5	U	0.5	U	0.5	UJ

SEAD-26 Sediment Goals

Sediment is not a media of interest at SEAD-26. Human health risk based on sediment is within acceptable levels and there is negligible ecological risk based on the conclusions of the RI.

2.3 GENERAL RESPONSE ACTIONS

As discussed in previous sections, remedial action objectives and site-specific cleanup goals were developed for the media of concern.

General response actions for SEAD-25 and -26 can be divided into the following groups:

- no-action
- institutional controls/natural attenuation
- containment
- diversion (groundwater)
- in situ treatment
- collection and removal
- on site (ex situ) treatment
- disposal

2.4 ESTIMATE OF QUANTITIES TO BE REMEDIATED

2.4.1 Introduction

Remedial Action Objectives for SEAD-25 and -26 are based upon two criteria. First, the need to achieve acceptable risk for the intended land use and the second is to achieve compliance with all ARARs. As previously discussed, the BRA for SEAD-25 has concluded that for the intended use of this land, which is as an industrial site, the risks to human health are acceptable for all media except soil under the future on-site construction worker scenario. This risk is mainly attributed to inhalation of benzene. Groundwater and sediment also contribute to human risk for the residential scenario. Since sediment will be addressed under this scenario and sediment is the source of the surface water ARAR exceedance, surface water will also be addressed as well. Groundwater is also a media of concern based on exceedance of ARARs. For SEAD-26, groundwater is a media of concern based on ARAR exceedances.

2.4.2 Soil and Sediment

For SEAD-25, volume estimates for soil and sediment removal and treatment are summarized in **Table 2-10** Soil and sediment are not media of interest at SEAD-26. The data applies the

TABLE 2 - 10
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILTY STUDY

SEAD-25 Areas for Soil Remediation

CASE	LOGIC	DESCRIPTION OF AREA TO BE REMEDIATED	TOTAL AREA (ft^2)	AVERAGE DEPTH (ft)	TOTAL VOLUME (yd^3)	SAMPLING LOCATIONS
1	High VOC, SVOCs Reduce risk to future on-site construction workers.	Soil on West side of Fire Training and Demonstration Pad	6,000	6.0	1,333	SB25-3, 4, 5
				Cumulative Total	1,333	
2	High Pesticide (4,4'-DDD), and PAHs, Cadmium, and Lead. Protection of future on-site residents.	Sediment in drainage ditch.	5,010	2.0	371	SD25-1,2,3,4,5,6,7,8,9
				Cumulative Total	371	

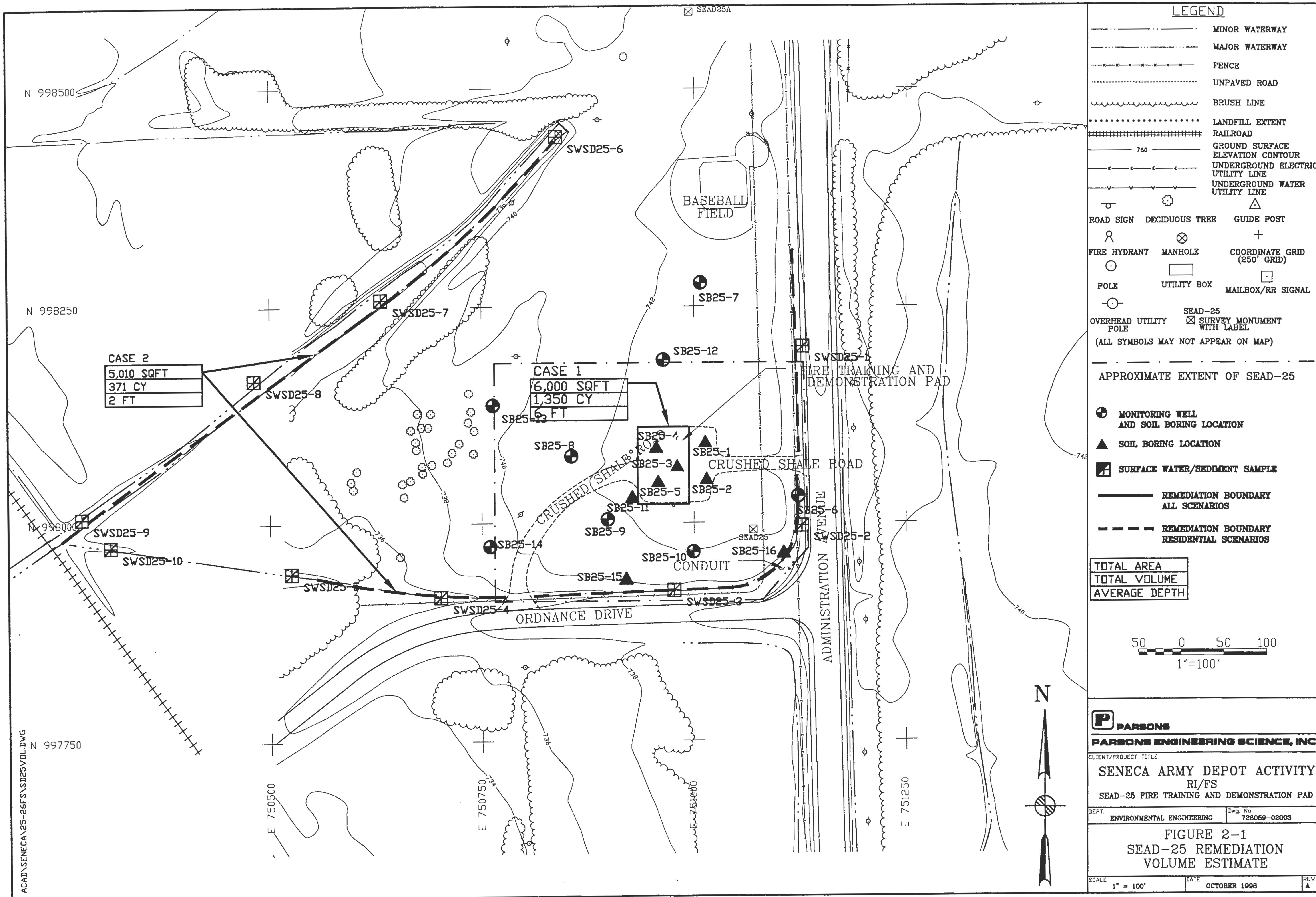
Remedial Action Goals to the data presented in the Remedial Investigation Report (Parsons ES, May 1998) for each media of interest. Each area was assigned a case number.

SEAD-25

Soil contamination in SEAD-25 is limited to a relatively concentrated 60' x 100' area surrounding the former Fire Demonstration and Training Pad (Case I). Elevated concentrations of VOCs, and SVOCs of concern were present in concentrations above TAGMS at depths up to 6 feet below the surface at the following sample points: SB25-3,4,5. Groundwater sampling indicates that Case I appears to be the source of a plume contaminated with VOCs (primarily BTEX) and SVOCs. The purpose of this remedial action is to 1) reduce human health risk and 2) prevent any further contamination of the groundwater. Case I equates to approximately 1,350 cubic yards of soil that will require remediation. Although Phenol was found at SB25-12 at a concentration above the clean-up goal, there is no evidence of groundwater contamination at the corresponding sampling well (MW25-17). In addition, phenol is not a significant contributor to human health risk. Thus, the elevated Phenol level at this isolated location is not targeted as part of a remedial action.

PAHs, one pesticide and elevated metal concentrations were found in the sediment of the drainage ditches along the Northwest border of SEAD-25 causing unacceptable human health risk under a residential scenario. Lead concentrations in the surface water samples collected from the Eastern and Southern drainage ditches were in excess of the ARAR. Approximately 1670 linear feet of the drainage ditch, (roughly 3 feet wide and 2 feet deep) is proposed for remediation (Case II). This equates to approximately 371 cubic yards of soil. Both cases are displayed in **Figure 2-1**. **Table 2-10** provides the dimensions of soil/sediment involved in both remedial cases.

Table 2-11 shows the reduction in risk associated with implementation of soil remediation for the current and future intended use scenarios. In addition, risk reduction is shown for a future residential scenario which will be developed for cost comparison purposes. **Table 2-12** shows the reduction in risk after implementation of soil remediation for future residential scenarios. After implementation of remedial action, risk is reduced to below or within EPA criteria. Supporting risk tables and calculations are provided in Appendix G.


LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENT
RAILROAD
GROUND SURFACE ELEVATION CONTOUR
UNDERGROUND ELECTRIC UTILITY LINE
UNDERGROUND WATER UTILITY LINE
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SEAD-25 SURVEY MONUMENT WITH LABEL
(ALL SYMBOLS MAY NOT APPEAR ON MAP)
APPROXIMATE EXTENT OF SEAD-25
MONITORING WELL AND SOIL BORING LOCATION
SOIL BORING LOCATION
SURFACE WATER/SEDIMENT SAMPLE
REMEDIATION BOUNDARY ALL SCENARIOS
REMEDIATION BOUNDARY RESIDENTIAL SCENARIOS
TOTAL AREA
TOTAL VOLUME
AVERAGE DEPTH
50 0 50 100
1"=100'
CASE 2
5,010 SQFT
371 CY
2 FT
CASE 1
6,000 SQFT
1,350 CY
6 FT
N 998500
N 998250
N 998000
N 997750
E 750500
E 750750
E 751000
E 751250
SEAD25A
SEAD25
BASEBALL FIELD
FIRE TRAINING AND DEMONSTRATION PAD
CRUSHED SHALE ROAD
ORDNANCE DRIVE
ADMINISTRATION AVENUE
CONDUIT
SWSD25-1
SWSD25-2
SWSD25-3
SWSD25-4
SWSD25-5
SWSD25-6
SWSD25-7
SWSD25-8
SWSD25-9
SWSD25-10
SB25-1
SB25-2
SB25-3
SB25-4
SB25-5
SB25-6
SB25-7
SB25-8
SB25-9
SB25-10
SB25-11
SB25-12
SB25-13
SB25-14
SB25-15
SB25-16
734
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ACAD\SENECA\25-26FS\SD25VOL.DWG
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD
DEPT. ENVIRONMENTAL ENGINEERING
Dwg. No. 726059-02003
FIGURE 2-1
SEAD-25 REMEDIATION VOLUME ESTIMATE
SCALE 1" = 100'
DATE OCTOBER 1998
REV A

TABLE 2-11
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE FOR SOIL EXPOSURE ROUTES
COMPARISON OF BASELINE RISK AND RISK AFTER REMEDIATION(1)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

RECEPTOR	EXPOSURE ROUTE(2)	Baseline Risk Assessment			Case 1		
		CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Volatile Organics in Ambient Air	NA	2E-05	5E-10	NA	2E-06	5E-11
	Inhalation of Dust in Ambient Air	NA	NQ	NQ	NA	NQ	NQ
	Ingestion of Onsite Soils(3)	NA	1E-03	2E-07	NA	1E-03	2E-07
	Dermal Contact to Onsite Soils	NA	NQ	NQ	NA	NQ	NQ
TOTAL RECEPTOR RISK (Nc & CAR)		NA	*1E-03*	*2E-07*	NA	*1E-03*	*2E-07*
FUTURE RESIDENTIAL (Child and Adult)	Inhalation of Volatile Organics in Ambient Air	2E-03	4E-04	2E-08	1E-04	3E-05	1E-09
	Inhalation of Dust in Ambient Air	NQ	NQ	NQ	NQ	NQ	NQ
	Ingestion of Onsite Soils(3)	2E-01	2E-02	1E-05	2E-01	2E-02	1E-05
	Dermal Contact to Onsite Soils	NQ	NQ	NQ	NQ	NQ	NQ
TOTAL RECEPTOR RISK (Nc & CAR)		*2E-01*	*2E-02*	*1E-05*	*2E-01*	*2E-02*	*1E-05*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Volatile Organics in Ambient Air	NA	4E+00	3E-06	NA	3E-01	3E-07
	Inhalation of Dust in Ambient Air	NA	6E-07	3E-12	NA	1E-07	2E-12
	Ingestion of Onsite Soils	NA	2E-02	8E-07	NA	2E-02	5E-07
	Dermal Contact to Onsite Soils	NA	3E-03	2E-09	NA	3E-03	2E-09
TOTAL RECEPTOR RISK (Nc & CAR)		NA	*4E+00*	*4E-06*	NA	*3E-01*	*8E-07*

Notes:
NA: Not Applicable
NQ: Not Quantified; toxicity or skin absorption factors not available for compounds with EPCs.
(1)Baseline Risk Assessment was performed as part of the Remedial Investigation for SEADs-25 and 26. BRA values taken from Table 6-79 of the RI, May 1998.
Projected risk after remediation calculated using new exposure point concentrations (EPCs) provided in Appendix G.
(2)Exposure Assessment and Risk Characterization Tables are found in Appendix G for each exposure route.
(3) Only surface soils were considered for ingestion of onsite soils for these receptors.

TABLE 2-12
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE FOR SEDIMENT EXPOSURE ROUTES
COMPARISON OF BASELINE RISK AND RISK AFTER REMEDIATION(1)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

RECEPTOR	EXPOSURE ROUTE (2)	Baseline Risk Assessment			Case II		
		CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK
FUTURE RESIDENTIAL (Child and Adult)	Dermal Contact to Sediment	3E-03	2E-03	8E-08	4E-07	4E-07	8E-11
	Ingestion of Onsite Sediment	9E-01	9E-02	7E-04	6E-04	7E-05	2E-06
TOTAL RECEPTOR RISK (Nc & CAR)		*9E-01*	*9E-02*	*7E-04*	*6E-04*	*7E-05*	*2E-06*

Notes:
NA: Not Applicable
NQ: Not Quantified; toxicity or skin absorption factors not available for compounds with EPCs.
(1)Baseline Risk Assessment was performed as part of the Remedial Investigation for SEADs-25 and 26. BRA values taken from Table 6-79 of the RI, May 1998.
Projected risk after remediation calculated using new exposure point concentrations (EPCs) provided in Appendix G.
(2)Exposure Assessment and Risk Characterization Tables are found in Appendix G for each exposure route.

SEAD-26

While elevated concentrations of contaminants are distributed throughout the 1,350 x 225 foot area that comprises SEAD-26, there is no remedial action case that deals with soil contamination at the site. This is due to the fact that human and ecological risks (for all scenarios (intended as well as residential use) are within EPA guidelines, there are no ARARs associated with soil contamination, and there is no evidence that the remaining contaminants in the soils have leached to the groundwater. While groundwater at one sampling well (MW26-7, just south of the fire training pit) indicated slight BTEX concentrations, the surrounding soil sampling points indicated that there was no BTEX contamination.

2.4.3 Groundwater

ARAR-based limits and human health risk under the residential scenario at SEAD-25 are the principal cleanup criteria for groundwater. New York has promulgated Class GA ambient water quality standards which apply to the groundwater at SEAD-25 and 26. These limits are shown on **Tables 2-1** and **2-2**.

SEAD-25

The volume of contaminated groundwater was estimated to be 0.282 million gallons. This is the quantity of water present at the site within the estimated boundaries of the BTEX plume. The actual volume treated over the course of the remedial action would likely be much greater under a pump-and-treat scenario. However, given the small volume of water involved and the lack of extensive contamination, preliminary estimates (**Appendix B**) indicate that enough water could be treated in less than a year to reduce the groundwater concentration in the plume to the NYSDEC Class GA standards. Assuming the maximum sustainable treatment flow would be 30 gpm, the total volume of groundwater that would be treated in a year is estimated to be 13 million gallons. However, it is unlikely that this flow would be sustainable throughout the year since field data indicate large groundwater fluctuation occurring at the site. At dry portions of the year the flow will likely be one-tenth of the indicated flow.

The mass of the contaminants of concern in the groundwater was also estimated. Over time, the concentration of each contaminant of concern would decrease, and the volume of water treated to obtain a unit mass decrease of each contaminant of concern would increase. An accurate estimate of the mass of each compound will help provide an estimate of the time required for treatment. The two primary constituents of concern in the groundwater at the SEAD-25 are BTEX and to a lesser extent chlorinated volatile compounds.

In the shallow groundwater aquifer, BTEX and chlorinated compounds form overlapping plumes. BTEX compounds form a plume that is approximately 200 feet long and originates in the southwestern portion of the Fire Training and Demonstration Pad. Based on concentrations of BTEX compounds in the array of wells at the site, the plume is not believed to extend beyond

Ordnance Drive near the southern perimeter of the site. Several of the BTEX compounds exceed NYS GA groundwater standards. Chlorinated compounds form a plume that is approximately 130 feet long, but the total concentrations are significantly less that those detected for the BTEX plume. However, several of the chlorinated compounds did exceed their respective GA standards. Like the BTEX plume, the chlorinated plume is sourced beneath the southwestern portion of the pad. No BTEX compounds were detected in any of the bedrock wells. Impacts from SVOCs and metals were less significant; no pesticides, PCBs or herbicides were detected in the groundwater at SEAD-25.

Table 2-13 shows the reduction in human health risk under the future residential scenario at SEAD-25 once groundwater is remediated to meet ARARs. **Table 2-14** shows the reduction in human health risk for surface water, once sediment is remediated under the residential scenario and surface water is thereby reduced to below ARARs. After implementation of remedial action, risk was reduced to below or within EPA criteria. Supporting risk tables and calculations are provided in Appendix G.

SEAD-26

To date, only one monitoring well detected concentrations of contaminants above the NYSDEC Glass GA standards. Concentrations of Benzene (1-2 ppb), Ethylbenzene (6-8 ppb), and Xylene (2-5 ppb) were only slightly above the NYSDEC Class GA standards of 0.7, 5, and 5 for Benzene, Ethylbenzene, and Xylene, respectively. There is no evidence of a contaminated plume. No human health risk was exhibited due to groundwater contamination at SEAD-26 under any scenario (intended or residential use).

2.5 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.5.1 Identification of Technologies

Remedial action technologies and processes have been identified for consideration as possible remedial options at the SEAD-25 and -26. The list of technologies and processes presented was developed from several sources:

- Standard engineering handbooks
- Vendors information
- "Washing Contaminated Fine Soil Particles" (Rossetti, 1993, Carnegie Mellon University MS Thesis)
- Best engineering estimates
- EPA references: "Handbook on In Situ Treatment of Hazardous Waste - Contaminated Soils" (EPA 1990)
  -"Handbook on Remediation of Contaminated Sediments" (EPA 1991)
  -"The Superfund Innovative Technology Evaluation Program" (EPA 1992)
  -"Vendor Information System for Innovative Treatment Technologies" (EPA 1993)

TABLE 2-13
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE FOR GROUNDWATER EXPOSURE ROUTES
COMPARISON OF BASELINE RISK AND RISK AFTER REMEDIATION(1)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

RECEPTOR	EXPOSURE ROUTE (2)	Baseline Risk Assessment			Resulting Risk After Clean-up Goals Met		
		CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK
FUTURE RESIDENTIAL (Child and Adult)	Ingestion of Groundwater (Daily)	8E+00	4E+00	2E-04	2E-01	9E-02	5E-05
	Dermal Contact to Groundwater while Showering	9E-01	5E-01	3E-05	4E-02	2E-02	6E-06
	Inhalation of Groundwater while Showering	3E+00	1E+00	3E-05	8E-03	4E-03	2E-06
TOTAL RECEPTOR RISK (Nc & CAR)		*1E+01*	*6E+00*	*3E-04*	*3E-01*	*1E-01*	*6E-05*

Notes:
NA: Not Applicable
NQ: Not Quantified; toxicity or skin absorption factors not available for compounds with EPCs.
(1)Baseline Risk Assessment was performed as part of the Remedial Investigation for SEADs-25 and 26. BRA values taken from Table 6-79 of the RI, May 1998.
Projected risk after remediation calculated using new exposure point concentrations (EPCs) provided in Appendix G.
(2)Exposure Assessment and Risk Characterization Tables are found in Appendix G for each exposure route.

TABLE 2-14
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS
REASONABLE MAXIMUM EXPOSURE FOR SURFACE WATER EXPOSURE ROUTES
COMPARISON OF BASELINE RISK AND RISK AFTER REMEDIATION(1)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

RECEPTOR	EXPOSURE ROUTE	Baseline Risk Assessment			Resulting Risk After Clean-up Goals Met		
		CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK
FUTURE RESIDENTIAL (Child and Adult)	Dermal Contact to Surface Water while Wading	2E-02	1E-02	2E-08	8E-03	7E-03	2E-08
TOTAL RECEPTOR RISK (Nc & CAR)		*2E-02*	*1E-02*	*2E-08*	*8E-03*	*7E-03*	*2E-08*

Notes:

NA: Not Applicable

NQ: Not Quantified; toxicity or skin absorption factors not available for compounds with EPCs.

(1)Baseline Risk Assessment was performed as part of the Remedial Investigation for SEADs-25 and 26. BRA values taken from Table 6-79 of the RI, May 1998.
Projected risk after remediation calculated using new exposure point concentrations (EPCs) provided in Appendix G.

- "The Application of In Situ Air Sparging As An Innovative Soils and Groundwater Technology. (Marley, Hazebrouk, and Walsh, 1992 Spring, "Groundwater Monitoring Review)

Table 2-15 shows the remedial action processes arranged according to categories for general response actions for remediation of soil/sediment at SEAD-25 and -26 and provides the basis for screening out the various technologies/processes. **Table 2-16** displays similar information for remediation of groundwater and both sites. These tables also indicate which technologies/processes were retained for further evaluation in **Section 3.0**.

2.5.2 Screening of Technologies

Screening results of Remedial action technologies and processes are displayed in **Tables 2-15** and **2-16** for SEAD-25 and -26. The screening criteria used were: the technical feasibility of a process, its effectiveness for remediating soils/sediment, and its ability to meet the remedial action objectives and its suitability considering site conditions. Processes that are shaded in **Tables 2-15** and **2-16** have been screened out for the reasons listed under "screening comments." For SEAD-25 the following remedial technologies and processes were retained for further evaluation as source control alternatives:

- No Action;
- Intrinsic Remediation (Access control);
- Bioventing;
- Natural Attenuation;
- Air Sparging
- Air Stripping
- Excavation: earthmoving/excavation;
- Solids handling: RCRA Subtitle D landfill.

For SEAD-26 the following remedial technologies and processes were retained for further evaluation as source control alternatives:

- No Action;
- Intrinsic Remediation (Access control);
- Natural Attenuation;
- Air Stripping
- Air Sparging
- Excavation: earthmoving/excavation;
- Solids handling: RCRA Subtitle D landfill.

TABLE 2-15
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 and 26 TECHNOLOGY SCREENING FOR SOIL/SEDIMENT REMEDIATION

SOIL/ SEDIMENT GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
No Action	None	Natural Degradation	No Action.	Applicable. Required as baseline response for comparison to other technologies.
Institutional controls	Access Control	Fencing	Access to SEAD-25 and 26 restricted by fencing at access points.	Applicable. Effective in reducing and eliminating human exposure.
		Wall and posting	Access to SEAD-25 and 26 is restricted by construction of a permanent, low-maintenance wall. Warning signs posted.	Applicable. Effective in reducing human exposure. Permanence dependent on design and materials of construction.
		Deed restrictions	Deed for property modified to restrict future sales and land use, or U.S. Government holds deed into perpetuity.	Applicable. May not restrict future resident exposure.
	Monitoring	Soil Monitoring	Periodic sampling soils. Monitors changes in extent of soil/sediment affected by constituents.	Not Applicable. Not necessary because the condition of the SEAD-25 and 26 source area is not expected to change significantly in the near future.
	Alternative Water Supply	City water line or bottle water	Extend city supply line to area or provide trucked in water.	Not Applicable. No current drinking water supply is affected.
Containment	Horizontal barriers	Soil cap	Consolidate all wastes into the Non-Combustible Fill Landfill as required to meet existing grade. Place two to five feet of clean fill on entire landfill, grade and seed.	Not Applicable. Water table at SEAD-25 and 26 too high to be effective—will not prevent groundwater exposure to contaminated soils.
		Clay cap	Add one to two foot clay layer beneath soil cap.	Not Applicable. Water table at SEAD-25 and 26 too high to be effective—will not prevent groundwater exposure to contaminated soils.

= screened

= retained

TABLE 2-15
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 and 26 TECHNOLOGY SCREENING FOR SOIL/SEDIMENT REMEDIATION (Cont.)

SOIL/ SEDIMENT GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Containment (cont.)	Horizontal Barriers (cont.)	Asphalt cap	Highway-grade base and asphalt pavement over entire SEAD-25 and 26.	Not applicable. Not as reliable as a clay or soil cap, high maintenance.
	Vertical barriers	Sheet pile	Steel barrier wall driven into soil in sections using a drop-hammer or vibrating hammer.	Not Applicable. Impractical, area of concern too small to justify sheet pile.
		Slurry wall	Trench around affected area and fill trench with cement/bentonite or soil/bentonite slurry.	Not Applicable. Impractical, area of concern too small to justify a slurry wall..
		Grout Curtain	Pressure injection of grout in a regular pattern of drill holes.	Not applicable. Not as effective in low-permeability soils as slurry wall. Typically used if other treatment alternatives cannot be used.
		Vibrating beam	Drive steel beam into ground and inject slurry as beam is withdrawn.	Not applicable. Not as effective as slurry wall. Typically used if other treatment alternatives cannot be used.
In-Situ Treatment	Solidification	Pozzolan-portland cement	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Usually implemented for soils with inorganics contam. VOCs may cause high emissions.
		Pozzolan-lime/flyash	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Usually implemented for soils with inorganics contam. VOCs may cause high emissions.
		Microencapsulation	High density polyethylene is mixed with soil/sediment to form plastic frit	Not Applicable. Not practical for small volume of soil at SEAD-25 and 26.
		Vitrification	Additives mixed into soil, electrodes placed in-ground and energy applied to electrodes. Soil/sediment and additives form molten glass that cools to a stable non-crystalline solid.	Not Applicable. Innovative technology with some successful applications but not used widely.

= screened

= retained

TABLE 2-15
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 and 26 TECHNOLOGY SCREENING FOR SOIL/SEDIMENT REMEDIATION
(Cont.)

SOIL/ SEDIMENT GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
In-Situ (cont.)	Extraction	Soil flushing	Constituents are extracted using surfactants, solvent (polar or non-polar) or hot water.	Not Applicable. Not effective in meeting remedial objectives for metals and semi-volatiles. Low soil permeability will restrict effectiveness. Requires wastewater treatment plant and/or solvent recovery process.
	Biological	Bioventing	Soil is aerated to stimulate in situ biological activity and promote bidegradation of organic contaminants by enhancing/accelerating the natural biodegradation process.	Applicable for SEAD-25 only (not necessary for SEAD-26). Effective in removing VOCs. SVOCs may require longer treatment period. Ineffective for metals.
		Vegetative uptake	Area is planted with coniferous and deciduous trees that uptake constituents through root system and incorporate them into wood mass.	Not Applicable. Effectiveness depends on solubility of constituents. Unproven and not a permanent solution.
	Soil Vapor Extraction	Vacuum extraction	Apply negative pressure to vadose zone well system and treat soil vapor off-gas (via carbon filter, biofilter, catalytic incinerator, chemical oxidation or plasma reactor	Not Applicable. Groundwater table too high to be effective at SEAD-25 and 26.
		Radiowave volatilization	Apply radio frequency to soil, extract soil vapor and treat.	Not applicable. Not a proven technology.
Removal	Excavation	Earthmoving/Excavation	Wheeled, bulk scraper, removes surficial or subsurficial soil into storage compartment.	Applicable. Effective. Used for relatively large quantities of soil.
Ex-Situ Treatment	Biological	Aerobic	Microbes cultivated to degrade constituents under aerobic conditions. Includes composting, land farming and slurry reactors.	Not Applicable. Not effective for metals, chlorinated organics or high molecular weight Polynuclear Aromatic Hydrocarbons (PAHs).
		Anaerobic	Microbes cultivated to degrade constituents under anaerobic conditions, typically an in-vessel process.	Not Applicable. Not practical for small volume of soil at SEAD-25.

= screened

= retained

SEAD-25 and 26 TECHNOLOGY SCREENING FOR SOIL/SEDIMENT REMEDIATION (Cont.)

SOIL/ SEDIMENT GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Ex Situ Treatment (cont.)	Physical- Solidification	Pozzolan-portland cement	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Volatile organics more likely to be volatilzed to atmosphere during stabilization than to be solidified.
		Pozzolan-lime/flyash	Pozzolan mixed with soil/sediment using auger type mechanism.	Not Applicable. Volatile organics more likely to be volatilzed to atmosphere during stabilization than to be solidified.
		Asphalt Batching	Asphalt mixed with soil/sediment using an auger type mechanism.	Not Applicable. Effective in stabilizing soils with high oil content. But not practical given volume of soil at SEAD-25.
		Micro-encapsulation	High density polyethylene is mixed with soil/sediment to form plastic frit.	Not Applicable. Volatile organics more likely to be volatilzed to atmosphere during stabilization than to be solidified.
	Physical-Separation	Washing (wet separation)	Mix soil/sediment with water and wet-classify soil particles by size and density. Includes dry screening (grizzly, vibratory, trammel), attrition scrub, hydrocyclones, flotation, water treatment/recycle.	Not Applicable. Not practical for volume of soils at SEAD-25. Volume reductions achieved. Innovative technology: treatability study required. Effective when used in conjunction with another technology such as solidification or off-site landfilling.
		Magnetic classification	Soils subjected to magnetic field to remove ferrous metals.	Not Applicable. Not practical for volume of soil at SEAD-25. No appreciable quantities of ferrous metals.
	Oxidation-thermal	High temperature processes	Includes: electric reactor, fluid bed incinerator, molten salt, multi-hearth incinerator, rotary kiln incinerator, plasma arc incinerator and catalytic incinerator.	Not Applicable. Effective for most organic constituents, however, not enough soil to justify construction of an on-site incinerator.
		Low temperature processes	Soils subjected to <800^{o} heat to drive off volatile organic compounds.	Not Applicable. Not effective for semi-volatile organic constituents.

[ ]	=	screened
[ ]	=	retained

TABLE 2-15
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 and 26 TECHNOLOGY SCREENING FOR SOIL/SEDIMENT REMEDIATION
(Cont.)

SOIL/ SEDIMENT GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
	Oxidation-other	Supercritical air/water oxidation	Soil mixed with water and excess air under supercritical pressure and temperature.	Not Applicable. Not a proven technology. Heavy metals are not removed.
Ex Situ Treatment (cont)	Oxidation (cont.)	Chemical	Oxidizing agent such as hydrogen peroxide or potassium permanganate solution mixed into soil.	Not Applicable. Not a proven technology.
		Microwave plasma	Microwave frequency electromagnetic radiation applied to soil.	Not Applicable. Not a proven technology.
	Chemical-extraction	Supercritical extraction	Constituents extracted in countercurrent process using carbon dioxide, propane or other highly volatile solvent under supercritical temperature and pressure conditions. Solvent is separated from extracted constituents (flashed or distilled) and recycled.	Not Applicable. Not practical for volume of soil at SEAD-25. Site Demonstration report indicates PAH removals of 80 to 99% can be achieved. Sizing of materials is required. All materials must be less than 1/8 inch. High pressure (up to 300 psi) vessels are required. Costly for small volumes ($300 to $600/ton).
		Aqueous solvent	Constituents extracted using aqueous solvent such as acid, base, salt or surfactant solutions. Extracted soil is rinsed. Solvent and rinsewater treated and recycled.	Not Applicable. Not practical for volume of soil at SEAD-25. Volume reduction achieved. Acid extraction less effective for SVOCs. Surfactant solution more appropriate. Technology is used in mining operations: treatability study required.
		Amine Extraction	Constituents extracted using secondary or tertiary amines, usually triethyl amine (TEA). TEA is completely soluble in water below 20°C. Separation of TEA from solids are achieved by gravity and centrifuging. TEA is separated from water by heating causing the TEA to be insoluble. TEA is recycled by distillation, leaving the extracted organics, usually an oily sludge. The sludge is then incinerated.	Not Applicable. Not practical for volume of soil at SEAD-25. Volume reduction achieved, final extracted organic material requires additional final treatment. Material sizing to less than 1/4 inch as required prior to processing.
Disposal	Solids Handling	Backfill on-site	Reuse of treated soil as backfill in excavated areas.	Not Applicable. No ex-situ treatment technologies retained.

= screened

= retained

TABLE 2-15
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 and 26 TECHNOLOGY SCREENING FOR SOIL/SEDIMENT REMEDIATION
(Cont.)

SOIL/ SEDIMENT GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Disposal (cont.)	Solids Handling	Subtitle D landfill	Disposal of soil that has been treated to remove toxicity hazard. Local or regional landfill, that accepts industrial solid waste (off-site or constructed on-site)	Applicable. Must comply with EPA Subtitle D and 6 NYCRR Part 360 requirements. Groundwater monitoring required.
		RCRA Landfill	Disposal of soil, treated to remove toxicity hazard, in a RCRA hazardous waste landfill (off-site).	Not Applicable. Required for RCRA listed and characteristic hazardous waste. RCRA groundwater monitoring required.

=	screened
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TABLE 2-16
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY
SEAD-25 and 26 TECHNOLOGY SCREENING FOR GROUNDWATER REMEDIATION

GROUNDWATER GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
No-Action	None	Natural Degradation	No Action.	Applicable. Required as baseline response for comparison to other technologies. Does not meet all remedial action objectives.
Institutional controls	Access Control	Fencing, Security	Access to SEAD-25 and 26 restricted by security force at access points. Perimeter patrolled daily.	Applicable. Effective in reducing and eliminating human exposure. Dependent on the U.S. Government's continued ownership: does not meet all remedial action objectives.
		Wall and posting	Access to SEAD-25 and 26 is restricted by construction of a permanent, low-maintenance wall. Warning signs posted.	Applicable. Permanence dependent on design and materials of construction. Does not meet all remedial action objectives.
		Deed restrictions	Deed for property modified to restrict future sales and land use, or U.S. Government holds deed into perpetuity.	Applicable. May not restrict future resident exposure.
	Monitoring	Groundwater monitoring	Periodic sampling of groundwater to monitor changes in the extent of migration of potentially hazardous constituents.	Applicable. Does not meet all remedial action objectives.
	Alternative Water Supply	City water line or bottle water	Extend city supply line to area or provide trucked in water.	Not Applicable. No current drinking water supply is affected.
Containment	Horizontal barriers	Soil cap	Place two to five feet of clean fill on affected areas of SEAD-25 and 26 site, grade and seed.	Not Applicable. Does not eliminate infiltration.
		Clay cap	Add one to two foot clay layer beneath soil cap.	Not Applicable. Not completely effective in reducing infiltration and recharge. Does not eliminate infiltration.
		Asphalt cap	Highway-grade base and asphalt pavement over affected areas of SEAD-25 and 26.	Not Applicable. Not permanent, high maintenance. Does not eliminate infiltration.

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TABLE 2-16
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY
SEAD-25 and 26 TECHNOLOGY SCREENING FOR GROUNDWATER REMEDIATION
(Cont.)

GROUNDWATER GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Containment (cont.)	Vertical barriers	Sheet pile	Steel barrier wall driven into soil in sections using a drop-hammer or vibrating hammer.	Not Applicable. Not as cost-effective as slurry walls at shallow depths. Would not prevent horizontal infiltration.
		Slurry wall	Trench around affected area and fill trench with cement/bentonite or soil/bentonite slurry.	Not Applicable. Not cost-effective given limited extent of contamination. Would not prevent horizontal infiltration.
		Grout curtain	Pressure injection of grout in a regular pattern of drill holes.	Not Applicable. Not as effective as slurry walls. Would not prevent horizontal infiltration.
		Vibrating beam	Drive steel beam into ground and inject slurry as beam is withdrawn.	Not Applicable. Not as effective as slurry walls. Would not prevent horizontal infiltration.
Diversion	Vertical Barriers	Slurry wall	Trench around affected area and fill trench with cement/bentonite or soil/bentonite slurry.	Not Applicable. Slurry wall diversion not as effective as containment. Would not prevent horizontal infiltration.
		Grout curtain	Pressure injection of grout in a regular pattern of drill holes.	Not Applicable. Grout curtain diversion not as effective as containment. Would not prevent horizontal infiltration.
		Vibrating beam	Drive steel beam into ground and inject slurry as beam is withdrawn.	Not Applicable. Vibrating beam diversion not as effective as containment. Would not prevent horizontal infiltration.
		Interceptor trench	A trench is dug downgradient of the groundwater plume to divert the groundwater.	Not Applicable. Interceptor trench diversion not as effective as collection. Would not prevent horizontal infiltration.

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TABLE 2-16
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY
SEAD-25 and 26 TECHNOLOGY SCREENING FOR GROUNDWATER REMEDIATION
(Cont.)

GROUNDWATER GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
Collection	Collectors Vertical	Interceptor trench	A trench is dug downgradient of the groundwater plume to collect the groundwater.	Applicable. Very effective at shallow depths.
		Collector wells	Several wells are set up to capture the groundwater.	Not Applicable. Numerous wells required due to tight soils and small radius of influence. Not cost-effective.
In Situ Treatment	Biological	Aerobic (Natural Attenuation)	Cultivate microbes in aquifer to degrade constituents by controlling pH, and supplying oxygen and nutrients.	Applicable. Groundwater modeling results indicate this is already occurring at the site.
		Anaerobic (Natural Attenuation)	Cultivate microbes in aquifer to degrade constituents by controlling pH, and supplying nutrients.	Applicable. Depleted nitrate concentrations indicate that denitrification is occurring as a result of anaerobic hydrocarbon biodegradation.
		Air sparging	Treatment combines in situ air stripping with aerobic biodegradation	Applicable. Technology that works well for volatile organics, however, tight soils may limit its effectiveness.
On Site Treatment	Biological	Aerobic biodegradation (Activated sludge)	Cultivate aerobic microbes to degrade constituents by controlling oxygen, pH, nutrients and temperature.	Not Applicable. Not effective for contaminants of concern and concentrations present. (low F/M ratio)
		Anaerobic biodegradation	Cultivate methanogenic microbes to degrade constituents by controlling oxygen, pH, nutrients and temperature.	Not Applicable. Not effective for contaminants of concern and concentrations present (low F/M ratio).
		Landfarming/spray irrigation	Promotes aerobic biodegradation by mixing the groundwater with soil, and controlling moisture, nutrients, and pH.	Not Applicable. Does not provide adequate controls for air emissions of volatile organic compounds. Not effective for contaminants of concern and concentrations present.

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TABLE 2-16
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY
SEAD-25 and 26 TECHNOLOGY SCREENING FOR GROUNDWATER REMEDIATION
(Cont.)

GROUNDWATER GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
On Site Treatment (cont)	Biological (cont.)	Two-stage anaerobic/ aerobic reactor	Two step anaerobic biological dechlorination followed by aerobic oxidation using either fluidized bed or solid-phase fixed-film reactor.	Not Applicable. Not cost-effective for small volumes of contaminated groundwater on sites.
	Physical/chemical	Reverse osmosis	Membrane separation is used to remove organic and inorganic contaminants.	Not Applicable. Not a proven technology for chlorinated solvents in groundwater.
		Ultraviolet Oxidation	Organics are treated with a combination of UV light and an oxidizing agent (ozone or peroxide)	Not Applicable. Not cost-effective for limited volumes of contaminated groundwater at sites.
		Reduction	Heavy metals are treated by inducing electrochemical reactions	Not Applicable for BTEX and chlorinated organics.
		Precipitation	Metal hydroxide formed form dissolved species and settled-out of solution.	Not Applicable for BTEX and chlorinated organics.
		Hydrolysis	Water and caustic are used to destroy organic contaminants.	Not Applicable. Effectiveness for chlorinated solvents not demonstrated.
		Wet air oxidation	Heat and pressure are used to degrade waste.	Not Applicable. Effectiveness for chlorinated solvents not demonstrated.
		Supercritical water oxidation	Organics are oxidized in a reactor using supercritical water as the oxidizing medium.	Not Applicable. Impractical, not cost-effective.

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TABLE 2-16
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY
SEAD-25 and 26 TECHNOLOGY SCREENING FOR GROUNDWATER REMEDIATION
(Cont.)

GROUNDWATER GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
On Site Treatment (cont.)	Physical/chemical	Ion exchange	Aqueous solvent or rinsewater exposed to cationic and/or anionic resin bed where constituents are exchanged (captured on resin surface) with other species. Resin is regenerated.	No Applicable. Not effective for chlorinated organics.
		Air stripping	Organics are removed by transfer to the air phase.	Applicable. Effective for highly volatile compounds. Not effective for metals removal. Iron and Calcium can cause column fouling due to accumulation of oxide precipitation and growth of an iron consuming bacterial slime.
		Steam stripping	Organics are removed by transfer to steam phase.	Not Applicable. Not cost-effective given volume of contaminated groundwater
		Distillation	Groundwater is heated, and the organics are driven off and collected.	Not Applicable. Not cost-effective given volume of contaminated groundwater
		Precipitation/coagulation/ flocculation	Various reagents are used to induce settling of particulates in the groundwater.	Applicable. This technology works well for separation of particulates and groundwater.
		Sedimentation/clarification/ gravity thickening	Separates water from metal hydroxide solids.	Not Applicable.
		Hardness Removal	Removes calcium and other minerals from groundwater.	Applicable. May be used to reduce hardness of water for organic treatment processes.

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TABLE 2-16
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY
SEAD-25 and 26 TECHNOLOGY SCREENING FOR GROUNDWATER REMEDIATION
(Cont.)

GROUNDWATER GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
		Filtration	Particulates are removed from the groundwater.	Applicable. Filtration will be used to remove silt and precipitate metals prior to the organic treatment.
On Site Treatment (cont.)	Physical/chemical	Carbon adsorption - liquid phase	Solution exposed to activated carbon bed for removal of dissolved organic constituents. Carbon thermally regenerated with off-gas treatment.	Not Applicable. Not cost-effective given volumes of groundwater involved.
		Carbon adsorption - vapor phase	Off-gas from air stripping unit is passed through carbon to remove organics from the air stream.	Applicable. Used in conjunction with other migration control technologies. Its purpose is to treat the off-gas to minimize air emissions.
		Mechanical aeration	Aerators are used to transfer oxygen to the groundwater. Aeration also promotes the removal of volatile organics.	Not Applicable. Requires air emission controls and is not as effective as air stripping.
Treated water disposal	SPDES Permit	Surface water	Discharge treated wastewater to drainage ditch, with eventual flow to Kendaia Creek.	Applicable. Must meet substantive requirements of SPDES permit.

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TABLE 2-16
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY
SEAD-25 and 26 TECHNOLOGY SCREENING FOR GROUNDWATER REMEDIATION
(Cont.)

GROUNDWATER GENERAL RESPONSE ACTION	REMEDIAL TECHNOLOGY	PROCESS	DESCRIPTION	SCREENING COMMENTS
		Groundwater	Reinject treated groundwater at site.	Applicable. However, may cause plugging of soils. Tight soils minimize infiltration potential.
		SEDA POTW	Collect treated wastewater in tank truck, transport to on-site wastewater treatment plant and discharge.	Requires excessive trucking of treated water, or installation of extensive piping. No sewer is located near SEAD-25.
	Reinjection	Groundwater	Treated water is reinjected via a leach field.	Applicable. This is likely to be more effective than straight reinjection, but, again, the tight soils minimize the infiltration potential.

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No Action

The No Action response may be appropriate for source areas where natural environmental mechanisms will result in degradation or immobilization of the constituents or concern where the risks are acceptable. Although this remedial action will not meet the RAOs for source control, this response provides the baseline against which other responses can be compared.

Institutional Control Technologies

Institutional control technologies are only applicable to the receptor and do not involve reductions in the volume, toxicity or control of wastes at the site. Institutional control technologies that have been retained for consideration include: Access Controls (such as fencing, wall and posting, administrative controls), and Groundwater Monitoring.

- **Access Controls**—Physical barriers that restrict access to the site are feasible and effective in preventing humans from becoming exposed to on-site impacts. There are a number of access controls that are currently in place at the SEAD-25 and -26, and that may be part of any long-term solution. Access to the site is limited by a fence that surrounds the entire depot and this area is currently patrolled 24 hours by security guards—although security patrolling would be discontinued under proposed BRAC Process. Although not currently in place, access to the site could be further restricted by constructing a permanent wall with warning signs posted. Administrative controls may be implemented as well to restrict future use of the site, if necessary.

- **Groundwater Monitoring**—Groundwater monitoring is another institutional control. Quarterly monitoring is already in place for over 30 wells at the site. The monitoring program can be modified to account for the results of the remedial activities.

In-Situ Treatment Technologies

The following in-situ treatment technologies were retained as potential remedial alternatives: Bioventing, Natural Attenuation, and Air Sparging.

- **Bioventing**—Bioventing involves aeration of soils to stimulate in situ biological activity and promote biodegradation of organic contaminants. Naturally-occurring microorganisms degrade the organic contaminants in soil by using them as a carbon source for cell production. Bioventing speeds up the natural degradation process due to the fact that biodegradation rates are generally much faster under aerobic conditions. This option would not be practical for sediment treatment.

- **Natural Attenuation** - Natural attenuation involves several processes which collectively destroy or alter contaminants in the groundwater or soil. These processes include adsorption to soil particles, biodegradation of contaminants, and dilution and dispersion in groundwater.

Groundwater modeling performed as part of the Remedial Investigation for SEADs 25 and 26 provides support that natural attenuation processes are occurring at SEAD-25 (Parsons ES, May 1998).

- **Air Sparging**—Air sparging is a technique that uses interceptor trenches or a large number of wells to inject air and nutrients into the groundwater plume. The treatment uses a combination of air stripping and in-situ biological treatment. The system may be operated aerobically or anaerobically, depending on the nature of the contaminants. In an aerobic system, air or oxygen is injected. In an anaerobic system, methane is typically injected.

Ex Situ Treatment Technologies

Air stripping of the contaminated groundwater and excavation of contaminated soils were retained as possible ex situ treatment techniques.

- **Air Stripping**—Air stripping is another common groundwater treatment process which is very effective in treating volatile organics. The groundwater is passed through the stripping tower, where it is contacted by a countercurrent air stream. Trays or column packing is used to increase the surface area of the air/water contact. The organic constituents are transferred from the water to the air. Next, depending on the air emissions requirements, the air phase may be treated, or directly discharged. Vapor-phase activated carbon may be used to treat the air stream. The air passes through the carbon which, as described above, adsorbs the organic constituents. The spent carbon is then sent off site for regeneration or disposal.

Interceptor trenches would be very effective for the collection of contaminated groundwater at SEAD-25 and -26 sites due to the shallowness of each site's aquifer. An interceptor trench is a 2- to 3-foot wide trench dug to the top of the impermeable competent shale bedrock. The trench is lined with a geotextile that helps minimize the collection of fine soil particles that could clog the drainage system. A perforated PVC pipe is placed in the trench, and sloped to a low point collection sump. A number of sumps may be used depending on the natural slope and the length of the trench. The trench is then filled with gravel or some other highly permeable material. The top 1 to 2 feet of the trench can be backfilled with the removed soil in order to minimize inflow of rainwater. Interceptor trenches can be used to cut off the forward migration of a plume, or can be used in the middle of a plume as a collection device.

Collector wells are not a cost-effective technology and have been screened out. Because of the glacial till overburden, numerous wells would be required to be effective.

Pretreatment

Prior to ex situ treatment, groundwater must often go through a pretreatment. The following technologies were retained for further consideration.

- **Hardness Removal/Precipitation**—In general, all of the organic treatment processes considered for the groundwater at the SEAD-25 and -26 are subject to scaling, fouling, or plugging if the groundwater is high in hardness, alkalinity, iron, or other minerals. The groundwater at the SEAD-25 and -26 is fairly high in hardness and alkalinity, and some pretreatment of the water would be necessary to optimize the performance of an organic treatment unit.

- **Filtration**—Filtration is another important unit operation. Filtration will remove silt and precipitated metals prior to the organic treatment unit. This will help the efficiency of the organic treatment unit and provide for a better discharge. A variety of filters have been used in groundwater remediations, including in-line pressure filters, sand-bed filters, and multi-media bed filters. The specific filter used will depend upon the specifications of the organic treatment unit, and cost and maintenance considerations.

- **Excavation**—Since the soil and sediment at SEAD-25 and -26 can be easily removed using standard mechanical excavation techniques, this technology was retained for further consideration. Excavation would remove designated volumes of contaminated soil and sediment for deposition in an off-site landfill. Specialized excavation equipment or a bulldozer may be used to loosen the shale fill. One or two 5 cubic yard bucket front end loaders would be used to load the excavated soil into waiting dumper trucks or treatment storage containers. The production rate is estimated to be 150 cy/hr/loader (225 ton/hr/loader). On-site hauling is estimated to be done at a rate of 100 cy/hr/dumper truck. Off-site hauling to a RCRA Subtitle D landfill is estimated to be done at a rate of 40 cy/day/truck (60 ton/day/truck).

<u>**Disposal**</u>

If an ex situ remedial action is selected, the treated or excavated contaminated soil will require disposal. After excavation of contaminated soil, the soil can be deposited in a RCRA Subtitle D landfill off-site. The RCRA Subtitle D landfill refers to an existing solid waste municipal landfill 10 to 40 miles from SEDA. Such a landfill would meet NYSDEC and EPA RCRA Subtitle D landfill construction specifications. The on-site landfill would be constructed near SEAD-25 and -26. The option of constructing a landfill on site was not considered because the low volumes of contaminated soil and sediment would make this prospect impractical.

3.0 DEVELOPMENT AND SCREENING OF ALTERNATIVES

3.1 INTRODUCTION

This section summarizes the remedial alternatives that were developed using the remedial technologies described in Section 2.0 for the intended future use (industrial) of these sites. Alternatives considered under a future residential scenario a derived from the alternatives developed here and are presented in Sections 5 and 6 for cost comparison purposes. Prior to the development of alternatives, an evaluation and screening of general response actions and technologies was conducted for inclusion into proposed remedial alternatives for SEAD-25 and -26. General response actions are broad response categories based on the findings of field work conducted for the Remedial Investigation (Parsons ES, June 1996). Soil and groundwater treatment technologies remaining after preliminary screening (**Tables 2-13** and **2-14**, respectively) were combined into remedial action alternatives. The alternatives assembled consider the waste-limiting (waste characteristics that limit the effectiveness or feasibility of a technology) and site-limiting (site characteristics such as a high water table that preclude the use of a technology) factors unique to the site, and the level of technical development for each technology. The rationale for how and why the selected technologies were assembled into remedial action alternatives is presented in **Section 3.2**.

The remedial alternatives address the remedial action objectives specific to each site. For SEAD-25, remedial action alternatives deal with both the source of groundwater contamination, and contaminated groundwater. For SEAD-26, the remedial action alternatives address the small volume of contaminated groundwater exceeding ARAR limits for volatiles. The samples taken during the RI show that the volatiles present in the groundwater at SEAD-26 are no longer present in the soil.

Per NYSDEC TAGM—"Selection of Remedial Actions at Inactive Hazardous Waste Sites," proposed remedial alternatives were screened using the remedial alternatives evaluation ranking criteria provided. A preliminary screening of alternatives was conducted based on short-term/long-term effectiveness and implementability in **Tables A-1** and **A-2** (based on Tables 4-1 and 4-2 of the NYSDEC TAGM), for SEAD-25 and -26, respectively (see **Appendix A**). Remedial Actions that did not meet the NYSDEC preliminary evaluation criteria were dropped

3.2 ASSEMBLY OF ALTERNATIVES

This section presents the rationale for assembling the screened technologies and processes into remedial action alternatives.

SEAD-25

For SEAD-25, the following general response actions were retained:

- No-action;
- Institutional Controls & Natural Attenuation;
- In situ treatment;
- Ex situ treatment (groundwater);
- Collection and removal; and
- Disposal.

Technologies and processes associated with these actions are assembled into alternatives and presented in **Table 3-1**. The alternatives are described briefly below.

Alternative RA25-1 (the No-Action alternative) is the alternative that provides the baseline against which other responses can be compared. The no-action response will result in leaving on-site soil source areas intact. The no-action response may be appropriate for source areas where natural environmental mechanisms will result in degradation or immobilization of constituents or where the risk is within acceptable target ranges. The BRAC process has designated the future use of this site for industrial purposes. Under the future on-site construction worker scenario, non-carcinogenic risk exceeds EPA target values at SEAD-25. In addition, the no-action response could allow for the off-site migration of contaminated groundwater to go undetected. The no-action alternative) is considered as a baseline comparison to all other alternatives.

Alternative RA25-2 (Institutional Controls and Natural Attenuation) would rely upon natural mechanisms to biodegrade organic contaminants in the soil and groundwater. RA25-2 is similar to the no-action alternative, in that it would result in leaving areas with contaminated soils intact. Institutional Controls, such as fencing at site access points to prevent human exposure to contaminated surface soils, are also part of this alternative. Residential use of the land would be prevented through the BRAC designation for the site. Quarterly groundwater monitoring would continue to determine if natural degradation of the plume is taking place and would provide a detection mechanism for off-site migration of contaminants indicating that action must be taken.

Alternatives RA25-3 through RA25-6 are remedial alternatives that may be used for treatment of volatiles and semi-volatiles on the site. A description of the alternatives and the rationale for choosing these alternatives is given below.

Table 3-1

SEAD-25 Assembled Remedial Alternatives

Alternative	Technologies and Processes
RA25-1	No-action
RA25-2	Institutional Controls, and Natural Attenuation of Plume.
RA25-3	Bioventing of Soil and Air Sparging of Plume
RA25-3A	Bioventing of Soil and Natural Attenuation of Plume.
RA25-4	Source Removal,Off-site Disposal, & Natural Attenuation of Plume
RA25-5	Source Removal, Off-site Disposal, & Air Stripping of Plume
RA25-6	Source Removal, Off-site Disposal, & Air Sparging of Plume

RA25-3 is the in-situ remedial alternative. It would involve bioventing the western portion of the Fire demonstration pad and air sparging the plume. The rationale for selecting this option is that bioventing is an in situ, innovative technology. Bioventing would be effective in treating the contaminated soil and the groundwater concurrently. The introduction of air to the soil through bioventing would not only promote natural degradation of the organic contaminants in the soil, but the surrounding groundwater as well. Air sparging using interceptor trenches would be conducted southwest of the pad and farther downgradient to treat the contaminated plume.

Combining interceptor trenches and air sparging of the plume provides an effective in situ remedial alternative for groundwater treatment. The trenches allow for the collection of a significant volume of water through which air could be injected, thus assuring efficient sparging of the groundwater. Trenches also provide a physical mechanism to ensure that all the groundwater will be treated. Because of the low permeability of the soils, standard sparging of groundwater through air injection wells would not be as effective as trenches. Even if artificial fracturing of the soils was performed to promote air injection, the true effectiveness and extent of the fracturing, and thus the sparging, would not be assured.

RA25-3A is a modification of RA25-3. This alternative replaces the air sparging option with natural attenuation of the groundwater plume while retaining the soil bioventing component of the alternative.

RA25-4, RA25-5, and RA25-6 all involve excavating the contaminated western portion of the Fire Training Pad for off-site disposal (source removal). Off-site disposal at a RCRA approved landfill or treatment by Clean Berkshires would eliminate any threat that these constituents may pose at the SEAD-25 site. Excavation, hauling, and disposal are readily available and proven technologies. The groundwater removed from excavated soil and pumped out of the excavated area would be treated using an air stripper. Due to the volume of groundwater that would require ex situ treatment, an air stripper is the most viable treatment technology in terms of practicality and cost. Together these technologies provided alternatives that will provide no uncertainty of source control.

RA25-4, RA25-5, and RA25-6 differ in how they would address the contaminated groundwater plume of SEAD-25. Alternative RA25-4 would use natural attenuation to reduce concentrations of groundwater contaminants to target cleanup levels.. Alternative RA25-5 uses , air stripping, to treat extracted groundwater. Air stripping was chosen as the ex situ process for reasons identified above. Alternative RA25-6 would rely on the in situ process, air sparging, to treat the groundwater. Air sparging was chosen over other in situ groundwater treatment technologies for reasons of effectiveness, practicality, and cost.

All the alternatives (except the No-action alternative) involve testing the groundwater to verify the alternative's efficacy.

SEAD-26

Based on the remedial action objectives for SEAD-26 , the following general response actions were retained:

- No-action;
- Institutional Controls & Natural Attenuation;
- In situ treatment (groundwater);
- Ex situ treatment (groundwater);
- Collection and removal; and
- Disposal.

Technologies and processes associated with these actions are assembled into alternatives and presented in **Table 3-2**.

Alternative RA26-1 is the no-action alternative. The no-action alternative is the alternative that provides the baseline against which other responses are compared to. The no-action response may be appropriate for areas where natural environmental mechanisms will result in degradation or immobilization of constituents or where the risk is within acceptable target ranges. The BRAC process has designated the future use of this site for industrial purposes. The site is not intended for future residents and therefore is well within human risk criteria. Even under a future residential scenario, human risk meets the carcinogenic target range and only slightly exceeds the non-carcinogenic target value of one. However, the no-action response could allow for the off-site migration of contaminated groundwater to go undetected. EPA guidance for conducting feasibility studies requires that the no-action alternative be evaluated as one of the remedial action alternatives.

Alternative RA26-2 (Institutional Controls, Natural Attenuation,) would rely upon natural mechanisms to biodegrade organic contaminants in the groundwater. RA26-2 is similar to the no-action alternative, in that it would result in leaving areas with contaminated soils intact. Residential use of the land would be prevented through the BRAC designation for the site. Quarterly groundwater monitoring would continue to determine if natural degradation of the

Table 3-2

SEAD- 26 Assembled Remedial Alternatives

Alternative	Technologies and Processes
RA26-1	No-action
RA26-2	Institutional Controls, and Natural Attenuation,
RA26-3	Air Sparging of Plume
RA26-4	Air Stripping of Plume

plume is taking place and would provide a detection mechanism for off-site migration of contaminants indicating that action must be taken.

Alternatives RA26-3 and RA26-4 are remedial alternatives that may be used for treatment of the small amount of groundwater on-site that exceeds ARARs. A description of the alternative and the rationale for choosing these alternatives is given below.

RA26-3 would involve air sparging the groundwater through the existing well containing elevated levels of volatile organics. The introduction of air to the groundwater would facilitate volatilization of the organic contaminants of concern and promote natural degradation.

RA26-4 involves pumping the groundwater from the existing well where volatile organic contamination was present and treating the groundwater in an ex situ, air stripping batch reactor.

3.3 DESCRIPTION OF REMEDIAL ALTERNATIVES

3.3.1 General

To better screen alternatives, the technologies involved are described in greater detail. In addition to better defining technologies and processes, the quantity of material to be remediated is also considered. It is important to note that the final decision regarding specific remedial technologies and processes to be used may be dependent on the results of treatability studies proposed in **Section 4**. Detailed screening of alternatives, including cost estimates is performed in **Sections 5.0 and 6.0**.

3.3.2 RA25-1 No-Action

The No-Action Alternative involves doing no further action to address the contamination found at the site and during the RI. The contribution of risks, both carcinogenic and non-carcinogenic, resulting from the presence of site soils were evaluated during the baseline risk assessment of the RI. Consequently, the No-Action Alternative has been evaluated based upon the results of this analysis of risk. The decision to implement the No-Action Alternative, i.e., do no further action, is a function of the exposure scenarios considered during the analysis of risk which is closely tied to the current and intended future land use of this site.

This parcel is currently under control of the U.S. Army, which regulates the current and future land uses. The U.S. Army has no intention to use this land for any purpose other than its proposed BRAC designation, which is as an industrial area. Therefore, under this land use scenario the most reasonable exposure scenario would include a current or future construction worker.

If the future intended use of this parcel changes, then in accordance with Army Regulation AR-200.1, the unacceptable risks that result from this future use will need to be addressed. At that time, full disclosure of the intended land use and the consequences occurring from these uses will be made to the appropriate regulatory authorities. Under these exposure scenarios, the total current site risks totaled 2×10^{-7} for carcinogenic risks, and the Hazard Index (HI) was 0.001. The future site risks totaled 4×10^{-6} for carcinogenic risks, and the Hazard Index (HI) was 4 (due to soil). The EPA target range for carcinogenic risks are 1×10^{-4} to 1×10^{-6} and the EPA target for non-carcinogenic risk is to have an HI less than one. Since the intended use site risks are not below the required non-carcinogenic level, the risks from the site soils are not acceptable. The no action alternative would not address soil contamination and therefore not result in acceptable risk levels.

The groundwater plume, containing BTEX and chlorinated volatiles, has concentrations exceeding ARAR compliance. Under this alternative, contaminants in the groundwater plume would be addressed through natural degradation processes. The plume's constituents of concern (BTEX and chlorinated organics) are biodegradable. Modeling results from the RI indicate that through natural attenuation of contaminated plume, the groundwater would comply with the most conservative ARAR (NYSDEC Class GA groundwater standard for Benzene- 1 ug/L) in excess of 120 to 140 years (depending on a 40 or 20 year old plume, respectively. However, given the migration of the plume to date and degradation rates computed by the model, groundwater with benzene concentrations above the ARAR will migrate 270 feet. Discrepancies are most likely due to the conservative assumptions of the model, which do not take into account the fact that the shallow aquifer does not exist for several months during the course of the year. All of the aforementioned distances are within the boundaries of the Seneca Army Depot Activity. The No Action Alternative, however, would not incorporate any monitoring of the effectiveness of natural attenuation of groundwater.

3.3.3 RA25-2 Institutional Controls and Natural Attenuation of Plume

This remedial action alternative employs institutional controls, and natural attenuation of the groundwater plume.

Similar to the no-action alternative, this alternative involves doing no further action to address the contamination in soils investigated during the RI. The contribution of risks, both carcinogenic and non-carcinogenic, resulting from the presence of on-site soils were evaluated during the baseline risk assessment of the RI. Consequently, RA25-2 has been evaluated based upon the results of this analysis of risk. The decision to implement the Institutional Controls Alternative, i.e., constructing fences at access points and/or posting warning signs, is a function of the exposure scenarios considered during the analysis of risk which is closely tied to the current and intended future land use of this site. Current security measures preclude the need for institutional controls at SEAD-25. They are included as part of this alternative should the ownership of the base change.

This parcel is currently under control of the U.S. Army, which regulates the current and future land uses. The U.S. Army has no intention to use this land for any purpose other than its proposed BRAC designation, which is as an industrial area. Therefore, under this land use scenario the most reasonable exposure scenario would include a current or future construction worker.

If the future intended use of this parcel changes, then in accordance with Army Regulation AR-200.1, the unacceptable risks that result from this future use will need to be addressed. At that time, full disclosure of the intended land use and the consequences occurring from these uses will be made to the appropriate regulatory authorities. Under these exposure scenarios, the total current site risks, listed previously, are within the EPA target range for carcinogenic risks but above the required non-carcinogenic level for the future on-site construction worker. Therefore, the risks from the site soils are acceptable. The Institutional Controls Alternative takes extra precautions by preventing human exposure to the contaminated area, if the base is permanently closed.

As discussed in Section 3.3.2, No Action Alternative, natural attenuation of groundwater would occur. Alternative RA25-2 also incorporates natural attenuation of groundwater. A main difference between the two alternatives is that in Alternative RA25-3, groundwater would be monitored as part of the institutional controls to assure that natural biodegradation is taking place and that contaminated groundwater is not migrating off-site.

3.3.4 RA25-3 Bioventing of Soil, Air Sparging of Plume.

Remedial Action RA25-3 addresses the area surrounding the Fire Demonstration Pad that is contaminated with volatiles and semi-volatiles using the in situ, innovative technology, bioventing. The contaminated plume would be treated using air sparging.

Bioventing involves aeration of soils to stimulate in situ biologic activity and promote biodegradation of organic contaminants. Bioventing would be effective in treating the contaminated soil by promoting natural degradation of the organic contaminants at the source of groundwater contamination.

The final end-products of aerobic biodegradation are carbon dioxide and water. Aeration of soil causes some of the more volatile organic constituents to volatilize. However, the low air flow employed in bioventing provides only enough oxygen to sustain microbial activity. Thus volatilization of organics is minimized. In addition, whereas aeration of soil may be less effective in low permeability soils which exist at SEAD-25, bioventing has been shown to be effective in low permeability soils (Downey et.al., 1992). Bioventing is also effective in soils contaminated with heavier, less volatile organics present at the site.

There are four primary physical characteristics that affect the success of bioventing:

- Soil gas permeability
- Oxygen diffusion in soil
- Contaminant distribution
- Radius of oxygen influence

Soil gas permeability is perhaps the most important soil characteristic for successful implementation of bioventing. Soils should be permeable enough to allow adequate oxygen to be distributed for biodegradation (approximately 0.25 to 0.5 pore volumes per day). Soil gas permeability is a function of both soil structure and particle size, as well as moisture content.

Oxygen Diffusion in soil is affected by the permeability of the soil. If the soil permeability is below 0.01 darcy, soil gas flow is primarily through either secondary porosity (e.g., fractures) or any more permeable strata that may be present.

It is important to know how contaminants are distributed in the area of concern. Organic contaminants may be present in any or all of four phases in the geologic media: sorbed phase on soil grains; vapor phase in vadose zone; free-phase (floating on water table or as droplets in the vadose zone); and in the aqueous phase.

It is also important to know the radius of influence a venting well has to ensure that the entire site receives a supply of oxygen-rich air to sustain in situ biodegradation. The radius of oxygen influence is defined as the radius to which oxygen can be supplied This definition is different from what is typically used for Soil Vapor Extraction, where radius of influence is defined as the maximum distance from air extraction or injection well vacuum pressure.

Other factors affecting the biodegradation process are:

- Soil moisture content. Excess moisture, as at SEAD-25 directly affects the soil permeability and may contribute to poor distribution of oxygen and nutrients.
- Soil pH. Soils with a pH between 5 and 9 are most desirable.
- Soil temperature. Colder soils may require heat addition to improve the bioventing process.
- Nutrient Supply. The soil must have certain nutrients to support microbial growth.
- Contaminant concentration. Excess contamination can be toxic to microbial life.
- Bioavailability. The contaminant of concern must be accessible to the microorganisms (high aqueous solubility/low affinity for soil is desirable).

Treatability testing would be necessary to determine the extent these factors have on the effectiveness of bioventing at SEAD-25. In particular, the low permeability soils at the site should be assessed to ensure that there is adequate soil gas permeability. However, since this technology has been shown to be effective in low permeability soils, this technology is considered in this alternative.

The groundwater plume would be treated using air sparging. Air sparging is a technique that typically uses a large number of wells or an interceptor trench to inject air and nutrients into the groundwater plume. The treatment uses the concept of air stripping to remove volatile organic compounds in-situ. Under the in-situ sparging alternative, air or oxygen is injected into the subsurface forcing contaminants to transfer from subsurface soil and groundwater into sparged air bubbles. The air streams are then transported to the soil pore spaces in the unsaturated zone, where they can be removed by soil vapor extraction. If contaminant vapors are degraded as they pass through the unsaturated zone, soil vapor extraction is not always used (Johnson, et.al, 1993).

Since the hydraulic conductivity of the soil is low, the use of interceptor trenches is preferred over the wells. Two trenches, one located just down gradient of source areas and the other located at the toe of the existing plume, would be installed to the top of the competent shale. A perforated pipe would be placed in the trench to inject air into the groundwater collected in the trenches. The trenches would be backfilled with gravel or some other highly permeable material. If required, a second perforated pipe could be installed at the top of the trench and a vacuum would be applied to collect the air exiting the groundwater. This air could then be directed to a treatment systems such as vapor phase activated carbon.

Treatability testing would be necessary to determine the extent these factors have on the effectiveness of air sparging at SEAD-25. In particular, the low permeability soils at the site should be assessed to ensure that there is adequate soil gas permeability. However, with the use of an interceptor trench to aid in the collection of groundwater, this technology should be effective in low permeability soils and therefore is considered for this site.

3.3.5 RA25-3A Bioventing of Soil and Natural Attenuation of Plume

This alternative relies on natural attenuation as the treatment mechanism for the BTEX and volatile organics compounds in groundwater as described in Section 3.3.2. Soils would be treated using bioventing and removal as discussed in the previous section.

To simulate this scenario, the model source soluble mass was set to zero, which reflects the removal of the source of dissolved organics being flushed into the plume. With the source removed, the BIOSCREEN model simulated the movement of a slug of dissolved organics in the aquifer. It is likely that multiple flushing of ground water through the system will be required before the dissolved organics are completely desorbed from the soil and the plume is completely degraded. In order to better simulate the multiple flushings using the BIOSCREEN model, the distribution coefficient was increased (i.e., Koc was multiplied by a factor of 5), which resulted in an increase in the retardation factor. This resulted in a decrease of the effective velocity of the plume of dissolved organics. Based on the results of the modeling, the groundwater would comply with the most conservative ARAR (NYSDEC Class GA groundwater standard for Benzene) within 20 years.

3.3.6 RA25-4 Source Removal, Off-site Disposal, and Natural Attenuation of Plume

This alternative involves excavation of the most contaminated soil at SEAD-25. This alternative is considered feasible for control of all contaminants of concern. Based upon groundwater data, the soils at SEAD-25 may exceed the Toxicity Characteristics Leaching Procedure (TCLP) limits. Thus, they may be considered a characteristic hazardous waste if they are excavated. TCLP testing would have to be conducted on the soils to determine if VOCs exceed the TCLP limit. RCRA Subtitle D landfills are not regulated hazardous waste landfills, therefore, excavated soils that exhibit the characteristic of a hazardous waste could not be disposed of in this manner. In accordance with the RCRA Land Disposal Restrictions (LDRs), soils considered to be hazardous waste cannot be land disposed of until the "characteristic" that causes these soils to be considered hazardous is eliminated. Therefore, according to RCRA based treatment standards for contaminated soils, the soils at SEAD-25 would be deposited in a RCRA approved landfill.

The results of the RI indicate that soil contamination is in well defined localized areas. The source soil contamination at SEAD-25 (delineated as Case 1) is shallow (6 feet deep) and could be removed with standard construction equipment. The removal and management of the contaminated soil in an off-site, licensed, hazardous waste landfill provides a technically acceptable, cost-effective alternative.

The groundwater plume would be remediated using natural biodegradation. The rationale behind selecting natural attenuation of the groundwater plume is explained in RA25-2. The time anticipated for attenuation of the groundwater is as described under RA25-3A.

3.3.7 RA25-5 Source Removal, Off-site Disposal, and Air Stripping of Plume

This remedial action would handle the soils, and groundwater from the excavated area exactly the same way as the previous remedial action, RA25-4. However, the groundwater plume would be treated by air stripping rather than through natural attenuation.

Groundwater will be collected by using interceptor trenches in the same manner as described for alternative RA25-3. These trenches are ideal for conditions at this site since the groundwater movement is somewhat slow (i.e., between 62 and 84 feet per year south west of the pad), and the aquifer thickness is small (i.e. between 0 to 6 feet depending upon the time of year).

Hydraulically, interceptor trenches are analogous to an infinite line of extraction wells. These trenches will be placed perpendicular to the flow of groundwater, would extend across the width of the plume (approximately 200 feet), and would collect groundwater continuously. Additionally, collection pipes placed at the bottom of each trench and sloped properly will allow the trenches to deliver the intercepted groundwater by gravity, thus simplifying the process and eliminating the need for multiple pumping stations. Only one pumping station would be required at the sump location for each trench used. Water would be pumped to a treatment facility.

The collection trenches would discharge to a collection sump and be pumped to an on-site treatment facility. At the treatment facility, the collected water would accumulate in a tank that functions as a flow equalizer. Flow fluctuation are expected over the year due to varying aquifer thickness. This tank will be used as a buffer to allow the subsequent treatment unit operations to operate continuously and uniformly.

Clogging and coating of unit processes reduces treatment effectiveness and therefore sediment or precipitated metal oxides should be controlled with filtration prior to air stripping. It is common for dissolved metals, especially iron, to precipitate as insoluble oxides as the dissolved oxygen content of the collected groundwater increases due to exposure with ambient air.

Air stripping is a common groundwater treatment process which is effective in treating BTEX and other volatiles. Groundwater is passed through a stripping tower, where it is contacted by a countercurrent air stream. Trays or column packing is used to increase the surface area of the air and water contact area to improve the efficiencies of mass transfer operations. The organic constituents are transferred from the water to the air. Depending on the air emissions requirements, the air phase may be treated or directly discharged to the atmosphere. Air emission control technologies include: vapor-phase activated carbon, thermal oxidation and catalytic oxidation. Vapor-phase carbon can be used to treat the off-gas in order to minimize air emissions. Vapor-phase carbon is efficient in capturing TCE and heavier organics but is less efficient at capturing DCE, and lighter organics.

Thermal oxidation is another off-gas control technology which can be used to minimize air emissions. A thermal oxidizer works by combusting the off-gas. Thermal oxidizers are effective in treating all of the chlorinated compounds present in SEAD-25 groundwater.

Catalytic oxidization is another off-gas treatment technology that could be considered for off-gas control. Catalytic oxidation is similar to thermal oxidation in that the organic compounds are thermally destroyed. An advantage of catalytic oxidizers over thermal oxidizers is that catalytic oxidizers operate at lower temperatures and therefore have lower operating costs. Catalytic oxidizers are effective in treating all the organics present in the site groundwater. Occasionally, especially in long-term operations and with high concentrations of chlorinated compounds, the catalyst becomes fouled and must be replaced. New catalysts have been developed recently that decrease this occurrence, however, because of this, catalytic oxidizers may have higher O&M costs than thermal oxidizers, though the day to day operational costs are lower.

Following treatment, the effluent would be discharged to the nearby drainage ditches that exist along the sides of the patrol roads. Eventually the water drains to Kendaia Creek. In this case, the effluent would need to meet the requirements for a Class C surface water which is the classification of Kendaia Creek.

3.3.8 RA25-6 Source Removal, Off-site Disposal, and Air Sparging of Plume

This remedial action would handle the soils from the excavated areas exactly the same way as alternative RA25-4. However, the groundwater plume would be treated using the air sparging technique discussed in RA25-3.

3.3.9 RA26-1 No-Action

As the name implies, the No-Action Alternative involves doing no further action to address the contamination fully investigated during the RI. The contribution of risks, both carcinogenic and non-carcinogenic, resulting from the presence of site soils were evaluated during the baseline risk assessment of the RI. Consequently, the No-Action Alternative has been evaluated based upon the results of this analysis of risk. The decision to implement the No-Action Alternative, i.e., do no further action, is a function of the exposure scenarios considered during the analysis of risk which is closely tied to the current and intended future land use of this site.

This parcel is currently under control of the U.S. Army, which regulates the current and future land uses. The U.S. Army has no intention to use this land for any purpose other than its proposed BRAC designation, which is as an industrial area. Therefore, under this land use scenario the most reasonable exposure scenario would include a current or future construction worker.

If the future intended use of this parcel changes, then in accordance with Army Regulation AR-200.1, the unacceptable risks that result from this future use will need to be addressed. At that time, full disclosure of the intended land use and the consequences occurring from these uses will be made to the appropriate regulatory authorities. Under these exposure scenarios, the total current site risks totaled 1x 10^{-6} for carcinogenic risks, and the Hazard Index (HI) was 0.004.

The future site risks totaled 2 x 10^{-6} for carcinogenic risks, and the Hazard Index (HI) was 0.6. The EPA target range for carcinogenic risks are 1 x 10^{-4} to 1 x 10^{-6} and the EPA target for non-carcinogenic risk is to have an HI less than one. Since the current and intended use site risks are within the EPA target range for carcinogenic risks and below the required non-carcinogenic level, the risks are acceptable. Even under a future residential scenario, site risks are within EPA target ranges, except for the hazard index for child exposure which only slightly exceeds the hazard index target value of one. From the standpoint of risk, there is no requirement to do any remedial action. Since neither the EPA nor NYSDEC have promulgated soil quality standards, the current site conditions do not violate any ARAR. These two criteria, risk and ARAR compliance, are the only two criteria used to determine if a remedial action is required, therefore, no-action is required for source soils. However, groundwater at one well was found to contain BTEX compounds at concentrations slightly exceeding ARAR compliance. Under this scenario, natural attenuation processes would occur for the groundwater and soil. However, this alternative does not incorporate any monitoring of these processes.

3.3.10 RA26-2 Institutional Controls and Natural Attenuation of Plume

This remedial action alternative employs institutional controls and natural attenuation of the groundwater plume..

Similar to the No-Action Alternative, this alternative involves doing no further action to address the soils investigated during the RI. The contribution of risks, both carcinogenic and non-carcinogenic, resulting from the presence of on-site soils were evaluated during the baseline risk assessment of the RI. Consequently, RA26-2 has been evaluated based upon the results of this analysis of risk. The decision to implement the Institutional Controls Alternative, i.e., constructing fences at access points and/or posting warning signs, is a function of the exposure scenarios considered during the analysis of risk which is closely tied to the current and intended future land use of this site.

The Institutional Controls Alternative takes extra precautions by preventing human exposure to the contaminated area. Under this remedial action, contaminants in the groundwater would be dealt with through natural degradation processes. The one well's constituents of concern (BTEX compounds) are biodegradable. Modeling results from the RI indicate that through natural attenuation of contaminated plume, the groundwater would comply with the most conservative ARAR (NYSDEC Class GA groundwater standard for Benzene) in 36 years. Thus, in 36 years the plume could migrate 500 meters prior to degradation to ARAR limits, which is within the boundaries of the Seneca Army Depot Activity.

As part of the institutional controls, groundwater would be monitored annually to assure that natural biodegradation is taking place and that contaminated groundwater is not migrating off-site.

3.3.11 RA26-3 Air Sparging of Plume

Remedial Action RA26-3 employs air sparging to treat the localized groundwater contamination. For SEAD-26, the air sparging technique would use test well MW26-7 to inject air and nutrients into the groundwater. The treatment uses the concept of air stripping to remove volatile organic compounds in-situ. Under the in-situ sparging alternative, air or oxygen is injected into the subsurface forcing contaminants to transfer from subsurface soil and groundwater into sparged air bubbles. The air streams are then transported to the soil pore spaces in the unsaturated zone, where they can be removed by soil vapor extraction.

If required, a vacuum would be applied into the well (above the water table) to collect the air exiting the groundwater. This air could then be directed to a treatment systems such as vapor phase activated carbon described previously.

3.3.12 RA26-4 Air Stripping of Plume

This remedial action would propose pumping the groundwater out of well MW26-7 (where elevated BTEX concentrations were detected) and treating them using a batch air stripping system. The air stripping system would operate in a similar fashion to the air stripping systems described previously. Groundwater would be pumped from the well until flows reached a minimum flow rate. Collected groundwater would then be treated in the air stripping unit and discharged. Vapor-phase activated carbon, thermal oxidation, or catalytic oxidation, would be used to treat air emissions from the unit. Once groundwater returned to normal levels in the well, groundwater would be tested to determine the success of this remedial action. Pumping and batch air stripping of the groundwater would be repeated as necessary.

3.5 SCREENING CRITERIA

3.5.1 General

The alternatives assembled above for both source and migration control were screened as described in NYSDEC and EPA guidance. As part of the Preliminary Screening process outlined in NYSDEC's TAGM, these alternatives, listed on **Tables 3-1** and **3-2** have been evaluated against short-term and long-term aspects of effectiveness and implementability. Because the purpose of screening is to reduce the number of alternatives that will undergo detailed analysis, the screening conducted in this section is of a general nature and follows the screening criteria in Tables 4-1 and 4-2 of the NYSDEC TAGM and are included as **Tables A-1** and **A-2** in **Appendix A**. Although this is necessarily a qualitative screening, care has been taken to ensure that screening criteria are applied consistently to each alternative and that comparisons have been made on an equal basis, at approximately the same level of detail.

According to the NYSDEC TAGM, once alternatives have been developed, individual remedial technologies should be screened primarily on their ability to meet medium-specific remedial action objectives, their implementability, and their short-term and long-term effectiveness. At this time, cost is not used to screen alternatives. Cost is used as an evaluation criteria for the detailed analysis conducted in **Sections 5.0 and 6.0**.

3.5.2 <u>Effectiveness</u>

A key aspect of the screening evaluation is the effectiveness of each alternative in protecting human health and the environment. Each alternative should be evaluated as to the extent to which it will eliminate significant threats to public health and the environment through reductions in toxicity, mobility, and volume of the hazardous wastes at the site. Both short-term and long-term effectiveness should be evaluated; short-term referring to the construction and implementation period, and long-term referring to the period after the remedial action is in place and effective.

The expected lifetime or duration of effectiveness should be identified for each alternative. The control and isolation technologies may fail if any of the following is expected to take place:

1. significant loss of the surface cover such as clay cap with a potential for exposure of waste material underneath the cap;
2. contamination of the groundwater by the leachate from the waste material;
3. contamination of the adjoining surface water by the leachate from the waste material or by the contaminated groundwater;
4. structural failure of the control or isolation technology.

Table A-1 (Appendix A) is used in evaluating the effectiveness of each alternative in protecting human health and the environment. If an alternative is scored less than 10 out of a maximum score of 25, that remedial alternative may be a candidate for rejection from further consideration.

3.5.3 Implementability

Implementability is a measure of both the technical and administrative feasibility of constructing and operating a remedial action alternative.

- Technical feasibility - Rating of the ability to construct, reliably operate, and meet technical specifications or criteria, and the availability of specific equipment and technical specialists to operate necessary process units. It also includes operation maintenance, replacement, and monitoring of technical components of an alternative, if required, into the future after the remedial action is complete.

- Administrative feasibility - Rating of the ability to comply with applicable rules, regulations and statutes and the ability to obtain approvals from other offices and agencies, the availability of treatment, storage and disposal services and capacity.

3.6 Preliminary Screening Results

The remedial alternatives for SEAD-25 and 26 were ranked using Tables 4-1 and 4-2 of the NYSDEC TAGM. Preliminary Screening worksheets are presented in **Appendix A** as **Tables A-1** and **A-2**. The results are summarized in **Tables 3-3** and **3-4** below.

Based on the results of the preliminary screening of alternatives for SEAD-25, all of the proposed remedial alternatives were retained for a detailed analysis. The minimum score required for retaining is 10 for effectiveness and 8 for implementability. Section 5.0 describes the detailed analysis of alternatives.

Based on the results of the preliminary screening of alternatives for SEAD-26, none of the proposed remedial alternatives may be screened out. The minimum requirement for retainment was score of 10 for effectiveness and a score of 8 for implementability. Thus, all alternatives will go through detailed analysis in **Section 6.0**.

Table 3-3

SEAD-25 Preliminary Screening Results

Alternative	Technologies and Processes	Effectiveness Rating (25 Max.)	Implementability Rating (15 Max.)
RA25-1	No-action	17	12
RA25-2	Institutional Controls, Natural Attenuation of Plume	14	12
RA25-3	Bioventing of Soil, Air Sparging of Plume,	20	10
RA25-3A	Bioventing of Soil, Natural Attenuation of Plume.	20	10
RA25-4	Source Removal, Off-site Disposal, & Natural Attenuation of Plume	18	14
RA25-5	Source Removal, Off-site Disposal, & Air Stripping of Plume	19	10
RA25-6	Source Removal, Off-site Disposal, & Air Sparging of Plume	19	10

Table 3-4

SEAD- 26 Preliminary Screening Results

Alternative	Technologies and Processes	Effectiveness Rating (25 Max.)	Implementability Rating (15 Max.)
RA26-1	No-action	17	12
RA26-2	Institutional Controls, Natural Attenuation of Plume.	19	12
RA26-3	Air Sparging of Plume.	21	10
RA26-4	Air Stripping of Plume.	21	10

4.0 TREATABILITY STUDIES

4.1 INTRODUCTION

An important aspect of many remedial actions is the treatability study. In general, there are two primary objectives for treatability studies:

- Gather sufficient data to allow treatment alternatives to be fully developed and evaluated and to support the remedial design of a selected alternative;
- Reduce cost and performance uncertainties for treatment alternatives.

There are three stages in the CERCLA process in which treatability studies may be used: remedy screening, remedy selection, and remedy design. In the remedy screening phase, treatability studies are designed to establish whether or not a technology can effectively treat a given waste. These studies generally provide little cost or design data. In the next stage, remedy selection, treatability studies are used to evaluate the site-specific performance of each technology in order to support selection of an alternative. Treatability studies in the remedy selection stage will yield information on 7 of the 9 technology evaluation criteria (EPA, 1991b), including:

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

This mid-stage of the CERCLA process is generally implemented prior to the Record of Decision (ROD) and would be referred to as a pre-ROD treatability study.

The last stage of the CERCLA process is the remedy design stage. This stage is implemented after the ROD has been signed, and these treatability studies are often referred to as post-ROD treatability studies. Post-ROD treatability studies provide quantitative performance, cost, and design information (EPA, 1991). This information is then used to design the remedial treatment process, refine the remedial action cost estimate, and make accurate predictions of the time required for remediation.

There are two technologies proposed for this remedial action which require treatability testing: bioventing and air sparging. In addition, trench tests are recommended to evaluate groundwater flow. Treatability tests are not performed for proven remediation techniques, such as air stripping. **Section 4.2** provides a brief overview of the pre-ROD treatability study process. **Sections 4.3** describes the detailed treatability procedures for each technology.

4.2 GENERAL TREATABILITY STUDIES

This section will focus on those treatability studies conducted prior to the ROD. The primary goals of a pre-ROD treatability study are:

- Facilitate the alternative selection process
- To select among multiple vendors and/or processes within a given technology
- To support the detailed design and the development of specifications
- To provide information supporting a detailed cost estimate.

These studies can be conducted either in the laboratory or the field, at bench or pilot scale. For these remedial actions, the treatability studies will likely be conducted in the laboratory, by the Army or the various vendors interested in performing the remedial activities. Bench-scale testing is usually conducted in the laboratory, and is best used to establish treatment parameters.. Pilot-scale testing can be done either at the site or in the laboratory. In pilot-scale testing, smaller versions of the actual treatment equipment, or the actual treatment equipment may be used.

The first step in any treatability study is establishing the Data Quality Objectives (DQOs) and preparing the study workplans. DQOs are qualitative and quantitative statements that specify the requirements for the data collected during the study. The final DQOs will be incorporated into the treatability study design, workplan, sampling and analysis plan, and chemical data acquisition plan will ensure that the data collected are of sufficient quality to support the objectives of the treatability study. For pre-ROD treatability studies, fairly rigorous Quality Assurance/Quality Control (QA/QC) will be required. Since the QA/QC required will be similar to that required for the remedial investigation, the chemical data acquisition plan developed in support of the RI/FS (MAIN, 1991) will be modified for use in the treatability testing.

An important part of the DQO and workplan process is identifying the treatment goals. These goals include, but are not limited to the attainment of ARARs and TBCs. The treatability study workplan will clearly delineate all treatment criteria for this remedial action.

The subsections generally included in a treatability study workplan are:

- Project description
- Remedial technology description
- Test objectives
- Experimental design and procedures
- Equipment and materials
- Sampling and analysis
- Data management
- Data analysis and interpretation
- Health and safety
- Residuals management
- Community relations
- Reports
- Schedule
- Management and staffing
- Budget

Not every one of these items will be described in detail in each workplan, but it is important to at least consider each item. Most of the section titles are self-explanatory, and will not be described in detail, but there are several points which should be highlighted. First, Health and Safety merits its own section in the workplan. Health and Safety is very important because the soil and groundwater to be treated contains potentially hazardous constituents. Not only will the party implementing the work plan be required to follow the Health and Safety plan, but they must be in full compliance with all Occupational Safety and Health Administration (OSHA) and EPA regulations regarding working with hazardous materials.

Once the workplan has been completed, the next step in the process is to identify the party who will implement the study. It is likely that the treatability studies will be carried out by the vendors, if proprietary materials are necessary. It will be important to clearly specify the goals of the study so that the results of the different vendors can be accurately compared and evaluated.

Once the work plans have been finalized and the vendors have been selected, the next step will be to collect a representative sample. A sufficient volume of sample for all the studies to be conducted will be collected. A set volume of soil could be collected from each area designated for remediation in proportion to the volume of soil in the given unit. All the soil collected would be composited and apportioned to each vendor. Groundwater can be collected from the trench used for the trench test or from a representative group of wells. This assures that each vendor will be testing similar material.

Once each vendor has completed their studies, the data must be reviewed and assessed prior to contractor selection and the completion of the detailed designs and specifications. The results will be reviewed to ensure that each technology meets the specified treatment criteria. All technologies that meet the treatment criteria will then be reviewed for other items, such as cost-effectiveness and ease of implementation. Once a vendor is selected, detailed design and specifications will be developed.

4.3 TREATABILITY STUDIES DESCRIPTION

A bioventing treatability study will be conducted prior to implementation of this alternative at SEAD-25. This technology is not considered at SEAD-26 since soil is not a media of interest. The treatability study will consist of a field pilot test. This is necessary since the geology of the site must be evaluated with respect to the effectiveness of this alternative. The testing procedures are described in further detail below.

4.3.1 Bioventing

The first step of the bioventing treatability study involves preparing the DQOs and work plans to describe the goals of the study. A summary of the proposed test procedure is described below and is based on the method developed by Hinchee and Ong (1992) and is described in more detail in "Test Plan and Technical Protocol for Bioventing" (Hinchee et al., 1992) and summarized in "Principles and Practices of Bioventing", (Leeson and Hinchee, 1996). The field treatability study will consist initially of an in situ respiration (ISR) test and a soil gas permeability test. The portion of SEAD-25 requiring bioventing is shown in Figure 2-1 and the treatability study would be conducted in this location. The information from these tests will be used to assess the potential application of bioremediation at SEAD-25 and estimate the required time for remediation. ISR and soil permeability testing is described in more detail below.

During ISR Testing, a mixture of air and an inert tracer gas (typically helium at 2% to 4% concentration) is injected into selected Monitoring Points (MP) for approximately 20 hours with small, portable air pumps (approximately 1 scfm flowrate) in order to fully oxygenate the surrounding, oxygen-deficient soils in the contamination zone. The selected MP are those where bacterial degradation is indicated by initially depleted oxygen levels and elevated carbon dioxide levels in soil gas. Locations are usually chosen where soil samples and soil-gas samples are also taken so that comparative data are generated.

Following the air/tracer injection, the pumps are shut off and the oxygen and carbon dioxide levels in soil gas are monitored using field instruments for approximately 48 to 72 hours (or until oxygen is at or below 5%). Observed decreases in oxygen are largely attributable to usage by indigenous microorganisms for respiration during degradation of the fuel residuals. Typically, a rapid linear decrease in oxygen is observed, followed by a lag period after the oxygen concentration reaches about 5%. Oxygen-utilization rates are determined from the IRS test data by a zero-order relationship between oxygen versus time using only the linear portion of the curve.

Quality control checks in the field are performed to verify that measured decreases in oxygen are due to microbial utilization and not other mechanisms. The helium data collected at a site is used to determine if observed oxygen-utilization rates are due to microbial utilization or to other effects such as leakage or diffusion. The molecular weight of helium is 1/8 that of oxygen and helium diffuses about 2.8 times faster than oxygen. Therefore, helium is more prone to diffusion and escape due to faulty well construction. Use of tracer gas is important for low permeability soils to verify that sufficient aeration of the soil volume has been achieved and that oxygen-depletion in soil-gas samples taken during the test are not due to the influx of oxygen-depleted soil gas from outside the zone of aeration.

An ISR test is also performed in clean soils to observe any oxygen uptake by soils due to sources other than microorganisms (i.e., humic materials, ferrous iron, etc.). Any oxygen uptake in clean soils is used to adjust oxygen-utilization rates observed in the contamination zone to more accurately estimate biodegradation rates.

Soil gas permeability is an important site characteristic for a successful bioventing application. The general approach involves the injection or extraction of air at a constant flow rate into a single vent well while measuring the pressure/vacuum changes at MPs spaced at various distances from the vent well. The main objective of soil gas permeability testing for full-scale bioventing design is to determine the extent of the subsurface which can be oxygenated from a single vent well. If the soil vacuum or pressure response is relatively slow (on the order of hours), a dynamic solution is used to estimate permeability. If the soil vacuum or pressure response is relatively fast (on the order of minutes), a steady-state solution is used to estimate permeability. If possible, both methods are used in order to compare calculated soil gas permeability values.

The bioventing treatability system will be performed through air injection. Air injection has been demonstrated to be more efficient in the biodegradation of hydrocarbons than air extraction. In addition, air injection minimizes discharge of volatile organics to the atmosphere and is less expensive to operate. According to Leeson and Hinchee (1996), air injection is the preferred method for bioventing unless the radius of influence of a vent well overlaps basements, utility corridors, or occupied surface structures. Since these conditions do not exist at SEAD-25, it is unlikely that there is a need for air extraction incorporation into the bioventing system. In addition, due to the seasonally high water table, air injection will avoid the potential for drawing water up into the bioventing blower system.

If the results of the ISR testing and soil permeability testing are positive, additional testing consisting of additional in situ respiration tests and operation of the system for several months will be performed. By conducting further analysis over several months, the effect of the fluctuating groundwater table on the bioventing system may be evaluated. The results of the additional testing will then be used to prepare the final design and specifications (i.e, blower size and treatment time).

If the results of the ISR testing and soil permeability testing are not positive, implementation of hydraulic or pneumatic fracturing may be considered to enhance the performance of the bioventing system.

4.3.2 Air Sparging

Air sparging is considered both at SEAD-25 and SEAD-26. The BTEX groundwater plume at SEAD-25 is approximately 200 feet long originating at the southwestern portion of the Fire Training and Demonstration Pad. The chlorinated compound plume is approximately 130 feet originating at the same source. As described in Section 2, no contaminated plume has been defined at SEAD-26. Concentrations of BTEX were detected in only one well at this site. Air sparging treatability study testing would be conducted in the field (pilot study) within the existing groundwater plume or contaminated areas.

The mechanics of the air sparging treatability study are very similar to those of the bioventing treatability study. Again, a DQOs and a work plan will be developed to describe the goals of the study. The testing will vary slightly for the air sparging treatability study due to the difference in the target media. Pilot-scale treatability testing would be performed to fully evaluate this technology with respect to the particular geology at the sites.

The main purpose of treatability testing for air sparging is to determine the radius of injection point influence. This would only be applicable to SEAD-26, as interceptor trenches would be used at SEAD-25. Air sparging would be evaluated with the use of interceptor trenches at SEAD-25 during the pilot-scale study. The radius of influence is evaluated based on observed increases in soil-gas VOC concentrations in vadose zone monitoring points above the sparging point location, recorded increases in dissolved oxygen levels in saturated zone monitoring points, and localized water-table mounding observed above gas injection points (Marley, Hazebrouck, and Walsh, 1992). Injection of air into the saturated zone may cause mounding of the groundwater table. In past pilot studies, air sparging wells were operated intermittently at air injection flow rates from 3 to 10 scfm and pressures of 15 to 60 psi. The radius of influence and air sparging effectiveness can be determined by measuring the criteria mentioned previously (soil-gas VOC concentration, DO levels in groundwater, and water table mounding effects) as well as, post treatment organic concentrations in the groundwater.

Air sparging injection points should be beneath the zone of contamination in the saturated zone. Due to groundwater fluctuations at the site and the extent of the zone of contamination to bedrock, it is proposed that air sparging injection wells or interceptor trenches would be placed as deep as possible on top of the bedrock during the treatability study. By placing the well screen as deep as possible within the aquifer and minimizing the screen length, the goal would be to maintain air injection below the saturated zone throughout the seasonal groundwater fluctuations experienced at the sites. Since air exits through the top of the screened interval, where the pressure head is at a minimum, the use of long screened intervals does not significantly add to the effectiveness of the process (Marley, et. al., 1992).

The necessity of vapor extraction wells is not anticipated, but will be evaluated during the treatability study. According to Johnson, et. al., 1993, vapor extraction wells are not used where the injected air flow rate is so low that contaminant vapors are degraded as they pass through the unsaturated zone. It is expected that air flow rates will be low at these sites. In addition, VOC concentrations are low. By evaluating oxygen uptake rates, the extent of biodegradation of contaminants may be evaluated. Monitoring would be implemented to detect if contaminants are volatilizing at the ground surface and if soil vapor extraction should be implemented with the air sparging injection wells.

The treatability test is also performed in clean groundwater to observe any oxygen uptake by groundwater due to sources other than microorganisms (i.e., humic materials, ferrous iron, etc.). Any oxygen uptake in clean groundwater is used to adjust oxygen-utilization rates observed in the contamination zone more accurately estimate biodegradation rates.

The results of the treatability study will then be used to prepare the final design and specifications (i.e, blower size and treatment time).

Trench tests would be used to estimate groundwater collection rates and potential treatment throughputs. This information would be essential to estimating treatment times.

5.0 DETAILED ANALYSIS OF SEAD-25 ALTERNATIVES

5.1 GENERAL

For SEAD-25, RA25-1 through RA25-6 have been retained for analysis for the intended use of SEAD-25 in this section. Further definition of each alternative is presented and the results of the detailed analysis are presented. Proposed remedial alternatives were screened using the detailed alternative ranking tables provided in the NYSDEC TAGM—"Selection of Remedial Actions at Inactive Hazardous Waste Sites." The results of the screening are presented in **Table 5-1**. Cost estimate summaries for each alternative are provided in **Table 5-2**. More detailed cost information is in **Appendix D**.

Following the detailed analysis, the top two ranking alternatives were modified to incorporate sediment removal, thereby formulating residential alternatives. By incorporating sediment removal, human risk is reduced under these alternatives such that EPA target ranges for human health under a future residential scenario are satisfied. The cost of these modified alternatives were calculated and the risk reduction was compared to the increase in cost to achieve the reduction in risk.

5.2 ANALYSIS OF RA25-1 NO-ACTION

5.2.1 Definition of Alternative RA25-1

The No-action alternative means that no remedial activities will be undertaken at the site. No monitoring or security measures will be undertaken other than those currently implemented at the site. Any attenuation of the threats posed by the site to human health and the environment would be the result of natural processes. Groundwater monitoring activities have previously included quarterly monitoring of approximately 19 wells-in place at the site, but monitoring will not continue under this alternative. Current security measures include the SEDA-wide security activities which effectively eliminates public access to the area. This is required because SEAD-25 is located within the area of the facility which includes the storage of munitions. Access to this site will be limited as long as SEDA is active. If SEDA is deactivated, munitions will no longer be stored. Security activities will still continue while this parcel is under Army control, but existing security activities are not associated with this alternative.

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

5.2.2 Protectiveness

The protectiveness of this and all alternatives are assessed with regards to short- and long-term protectiveness to both human health and the environment. The Baseline Risk Assessment (BRA) performed as part of the Remedial Investigation (RI) indicates that, in the short-term, the No-action alternative is protective of human health, since the calculated carcinogenic risk for current site workers is 2 x 10^{-8}, which is at the well below the EPA target risk range (1.0 x 10^{-4}—1.0 x 10^{-6}). The non-carcinogenic risk HI of 0.001 is less than the 1.0 criterion and is protective of human health. Since the current SEDA security measures prevent public access to the site, there is little or no risk to the public because there is no exposure. Based on the conclusions of the RI,, all ecosystems studied appeared to be normal. In addition, the RI concluded that there is negligible risk to the ecosystem at SEAD-25.

The No-action alternative does not provide for long-term protectiveness of human health. As described in the BRA portion of the RI report, the intended future long term land use of the site is as an industrial land parcel. Under the intended future land use scenario, the BRA indicated that the on-site concentrations exceed the non-carcinogenic risks for the future on-site construction worker. The hazard index for this worker is 4 which is an excess of the EPA target value of 1.

5.2.3 Reductions

Current site conditions indicate that reductions in the concentrations of the impacted soil, sediment, surface water, and groundwater at the site can be expected. Natural attenuation and degradation, through biological, photochemical and physical interactions between the organic constituents of concern and the soil/groundwater system have decreased the concentrations of pollutants in the soil. For chlorinated and heavier organic solvents these decreases take longer. However, there is potential for further groundwater contamination due to organics leaching from the soil. Natural attenuation would not have an impact on heavy metal contamination in sediments.

5.2.4 Permanence

Natural attenuation processes are expected to gradually and permanently reduce the concentrations and toxicity of the BTEX and chlorinated compounds in both groundwater and soils. However, since the source of groundwater contamination remains at the site and continues to leach into the groundwater, there is a risk that groundwater remediation may be required at a later date. Therefore, this alternative is not considered permanent.

5.2.5 Compliance with ARARs

There are no promulgated soil standards to use as ARARs for comparison with on-site soil and sediment concentrations. However, the no-action alternative would not comply with NYS AWQS for groundwater, which are promulgated ARARs. Therefore, this alternative does not comply with the chemical-and location-specific ARARs listed in **Appendix C**. Over time, natural attenuation would reduce concentrations of organic contaminants to levels that comply with ARARs. However, the lead contamination in surface water and sediment would not be reduced to the extent of the organics.

5.2.6 Implementability

The criterion of implementability is not applicable to the No-action alternative since there are no activities occurring. There would still be monitoring and security activities, as described above, as well as some administrative requirements, but these activities are performed as part of the existing security program because this is an active military installation. These peripheral activities are already occurring and will continue until the intended use of the site changes.

5.2.7 Cost

There are no costs associated with the No-action alternative. The costs associated with the monitoring and security are covered through other mechanisms, and are not directly attributable to this remedial action.

5.3 ANALYSIS OF RA25-2 INSTITUTIONAL CONTROLS AND NATURAL ATTENUATION OF GROUNDWATER PLUME

5.3.1 Definition of Alternative RA25-2

The institutional controls and natural attenuation of groundwater plume alternative means that no remedial activities will be undertaken at the site other than institutional controls. Natural attenuation of the groundwater plume will be the only treatment. Current groundwater monitoring activities include quarterly monitoring of a number of wells in place at the site which will continue under this alternative. Current security measures include the SEDA-wide security activities which effectively control public access to the area.

5.3.2 Protectiveness

The RI indicated that, in the short-term, the No-action alternative is currently protective of human health. Although there has been some migration of the groundwater plume according to modeling results, off-site migration is not a concern. No off-site drinking water wells have been impacted. There is no current use of the shallow groundwater at SEAD-25, and there are no plans to use this groundwater for drinking water in the near future.

The natural attenuation alternative will provide long-term protectiveness of human health. The Army intends to maintain a groundwater monitoring program and ensure that public health and the environment are protected, using institutional controls, if necessary. As described in the baseline risk assessment (BRA) portion of the RI report, the future long term land use of the site included a site construction worker assuming some construction activities could occur at this inactive site. Due to the concentrations of benzene in the soil, unacceptable risk would remain under this alternative for the future on-site construction worker. The RI concluded that there is negligible risk to the ecosystem at SEAD-25. However, the natural attenuation alternative may not be protective of the environment, as further groundwater contamination due to organic leaching from the soil is a possibility.

5.3.3 Reductions

Natural attenuation would be expected, through dispersal of the hazardous constituents in the groundwater, and through natural biodegradation. Should no further leaching occur, the volume of impacted groundwater (i.e., size of the plume) is expected to decrease over time, through dispersion and natural biodegradation, as shown by the groundwater model (**Appendix E**).

5.3.4 Permanence

Natural attenuation processes are expected to gradually and permanently reduce the concentrations and toxicity of the BTEX and chlorinated compounds in both groundwater and soils. However, since the source of groundwater contamination remains at the site and continues to leach into the groundwater, there is a risk that groundwater remediation may be required at a later date. Therefore, this alternative is not considered permanent.

5.3.5 Compliance with ARARs

The natural attenuation alternative complies with chemical-specific ARARs., The concentrations of VOCs in groundwater maybe reduced to below the NY State GA standards, assuming no additional leaching from soils occurs. The list of ARARs for this alternative are shown in **Appendix C**.

5.3.6 Implementability

Alternative RA25-2 is considered to be a highly implementable alternative. It ranks high from a technical implementability perspective, because no technologies are employed in this alternative. This alternative does not rank as highly for administrative implementability. Administrative implementability of this alternative involves coordination of all regulatory agencies (EPA, NYSDEC) and obtaining the necessary approvals to implement, as well as ensuring compliance with all ARARs.

5.3.7 Cost

The costs associated with the natural attenuation alternative include monitoring groundwater, site security activities. Since security is provided for the entire base, this cost is not be directly attributable to this remedial action. Costs are included for fencing and maintaining restrictions for residential development. The total present worth O&M costs for 150 years of annual groundwater monitoring is estimated to be $ 484,700. The total estimated present worth direct costs for site work and professional labor are $40,125.

5.4 ANALYSIS OF RA25-3 BIOVENTING OF SOIL AND AIR SPARGING OF PLUME.

5.4.1 Definition of Alternative RA25-3

Alternative RA25-3 involves the installation of a bioventing system and two air sparging trenches.. A vapor extraction trench to collect sparged volatiles is not necessary due to the low concentrations of VOCs in the groundwater (see **Appendix B**). An aboveground bioventing system would feed air through 3 injection points to the western portion of the fire training and demonstration pad. The bioventing system consists of one compressed air pump to feed oxygen into the soil to promote the natural degradation of organic contaminants in the source area.

According to "Test Plan and Testing Protocol for Bioventing", air injection is the recommended mode of operation. Air injection does not result in a direct discharge of volatile organics to the atmosphere and is less expensive to operate and maintain. Such systems do not produce condensate, liquid wastes, nor a contaminated air stream. Aeration of the VOC source area is expected to cause the volatilization of organic contaminants in the groundwater near the source. However, the low air flow employed in bioventing provides only enough oxygen to sustain microbial activity. The downgradient air sparging trenches would run northwest of Ordnance Drive. One would be located just off the southwest corner of the pad, and the other farther downgradient. Each trench would be approximately 200 feet long (see **Figure 5-1**).

The air sparging system consists of air sparging trenches installed in the saturated soil with horizontal piping for air injection. Due to the low permeability of the native soils, trenches were selected instead of vertical well points.. The injected air promotes volatilization of the organic constituents in the groundwater, and aerobic biodegradation. Due to the low concentration of volatiles, a vapor recovery system is not required. Periodic groundwater monitoring will be used to assess the progress of the treatment.

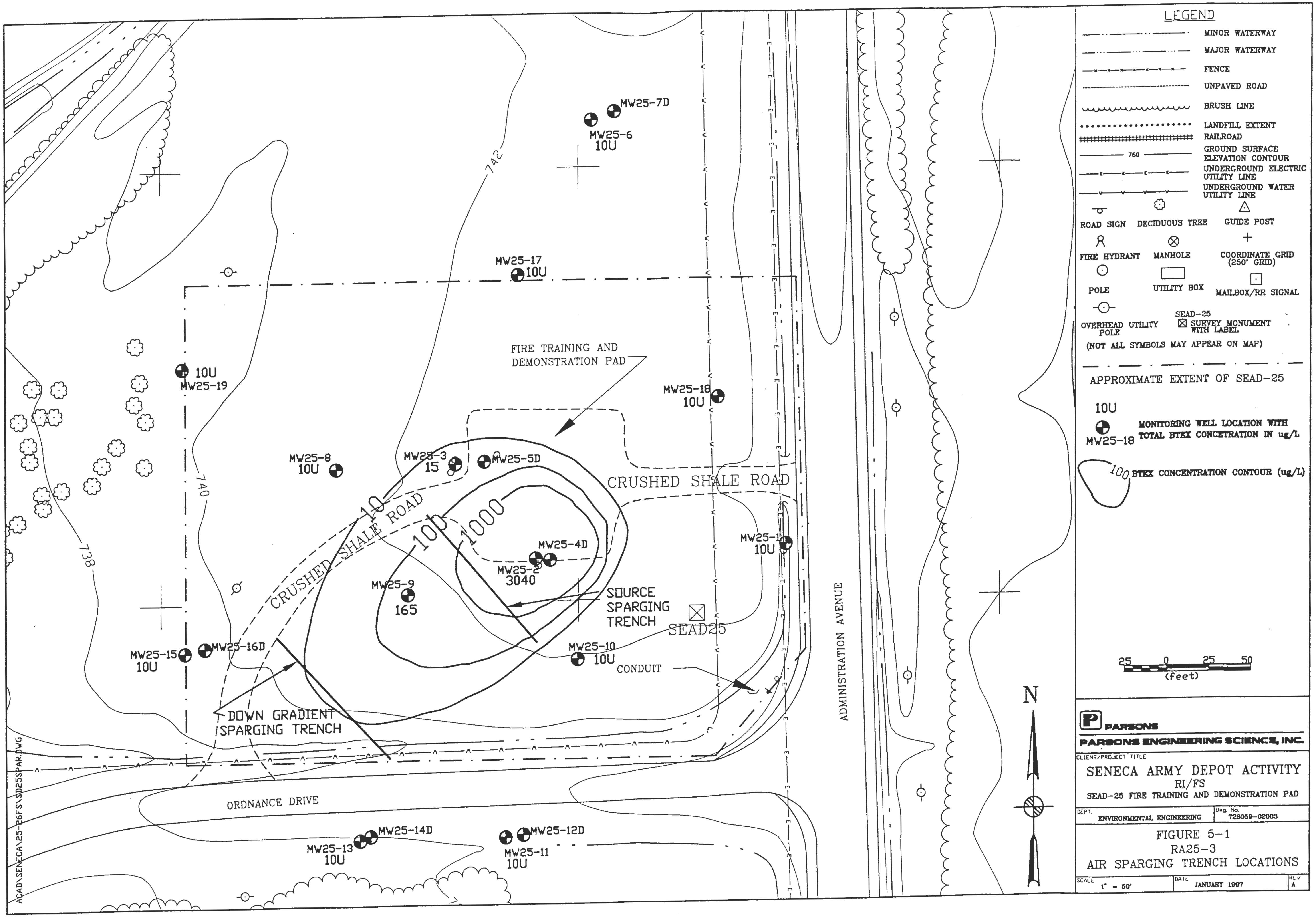
5.4.2 Protectiveness

Short-term Protectiveness

The RA25-3 alternative, is protective of the community. All remedial activities associated with this alternative will be conducted on-site. The remediation will be designed and implemented so that air emissions generated by the air sparging system will not exceed EPA and NYSDEC air quality standards.

There will be little or no threat from releases during the excavation for the air sparging trench. The excavation for the downgradient trench is near Ordnance Drive, where the concentrations of hazardous constituents in the groundwater are very low, and where there are little or no hazardous constituents detected in soils. The upgradient trench would be located southwest of the pad, outside the area of the soils with the highest concentrations of VOCs..

The short-term protectiveness to site workers must also be considered. The major routes of exposure during excavation are direct contact with the affected soil and inhalation of vapors or particulates. As described above, the concentrations of the potentially hazardous constituents exhibit unacceptable risk to future on-site construction workers due to the presence of benzene.



LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENT
RAILROAD
760
GROUND SURFACE ELEVATION CONTOUR
UNDERGROUND ELECTRIC UTILITY LINE
UNDERGROUND WATER UTILITY LINE
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SEAD-25
SURVEY MONUMENT WITH LABEL
(NOT ALL SYMBOLS MAY APPEAR ON MAP)
APPROXIMATE EXTENT OF SEAD-25
10U
MW25-18
MONITORING WELL LOCATION WITH TOTAL BTEX CONCETRATION IN ug/L
100
BTEX CONCENTRATION CONTOUR (ug/L)
25 0 25 50
(feet)
MW25-7D
MW25-6
10U
742
MW25-17
10U
FIRE TRAINING AND DEMONSTRATION PAD
10U
MW25-19
MW25-18
10U
MW25-8
10U
MW25-3
15
MW25-5D
740
CRUSHED SHALE ROAD
CRUSHED SHALE ROAD
10
100
1000
MW25-4D
MW25-2
3040
MW25-1
10U
MW25-9
165
738
SOURCE SPARGING TRENCH
SEAD25
MW25-15
10U
MW25-16D
MW25-10
10U
CONDUIT
ADMINISTRATION AVENUE
DOWN GRADIENT SPARGING TRENCH
ORDNANCE DRIVE
MW25-14D
MW25-13
10U
MW25-12D
MW25-11
10U
N
ACAD\SENECA\25-26FS\SD25SPAR.DWG
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD
DEPT.
ENVIRONMENTAL ENGINEERING
Dwg. No.
728059-02003
FIGURE 5-1
RA25-3
AIR SPARGING TRENCH LOCATIONS
SCALE
1" = 50'
DATE
JANUARY 1997
REV
A

However, the highest concentrations of benzene were detected upgradient of the proposed locations for the air sparging trenches. Protection from exposure can be minimized through site access controls and the use of proper protective equipment for site workers, such as respirators, dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of vapors or particulates. Dust generation at the excavation can be minimized by using water or other dust control chemicals. It should also be noted that all the site workers will be required to meet all the OSHA training and medical monitoring requirements prior to working on-site.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. There will be few environmental impacts. As described above, there is little potential for release of hazardous constituents during the construction of the bioventing and air sparging system. There are no sensitive environments which will be disturbed by the construction activities. The threat of dust release during the on-site excavation will be eliminated through the use of dust suppression techniques. A monitoring program will be established around the perimeter of the area to assure protection of the community. The closest area to be excavated from the SEDA boundary is approximately 1500 feet, so the likelihood of any dust migrating off-site is negligible.

The last item to be considered is the time until treatment is accomplished. It is very difficult to assess the length of time required to treat the soil and groundwater to the required concentration. It may be necessary to run the air sparging systems for 10 years. The bioventing system is estimated to take up to 5 years to meet clean-up goals. Construction and start-up of the bioventing/air sparging system should take 2 to 3 months.

The RI concluded that there is negligible risk to the ecosystem at SEAD-25. The environment would not be impacted by implementation of this remedy.

Long-term Protectiveness

The assessment of the long-term protectiveness of Alternative RA25-3 can be divided into two major 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.

The bioventing system will be run until the NYSDEC soil criteria for groundwater protection from organic contaminants are met. The air sparging treatment system will be run until the concentrations of organics in the groundwater are below the NYSDEC criteria for Class GA groundwaters. There will be little or no treatment residuals. Any soils removed for the downgradient trench installation will come from areas in which previous soil sampling has indicated little or no soil contamination. The soil from the upgradient trench will be disposed off-site in a RCRA approved landfill.

5.4.3 Reductions

Alternative RA25-3 would be effective in reducing the mobility, and volume of the hazardous constituents present at the site, and somewhat effective in reducing the toxicity. Bioventing will reduce the volume of contaminated soil and eliminate the source groundwater contamination. The air sparging will reduce the volume of contaminated groundwater through in situ treatment. The toxicity of the constituents present in the groundwater will be diminished through aerobic biodegradation and volatilization in the aquifer.

5.4.4 Permanence

The permanence of the alternative must also be assessed. Once the groundwater and soil at the site meet the treatment criteria, the remedial action would be considered permanent. There will be minimal treatment residues, and these residues can be treated and/or disposed of off-site.

5.4.5 Compliance with ARARs

Alternative RA25-3 will comply with all ARARs. ARARs for this site are listed in **Appendix C**.

5.4.6 Implementability

A discussion of implementability can be divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, 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 off-site disposal capacity.

Technical Feasibility

The technical feasibility of Alternative RA25-3 is average due to the uncertainties associated with innovative in situ technologies and the ability of naturally occurring bacteria to breakdown these contaminants. Bioventing is a proven technology for reducing organic contamination in soils. Several factors (e.g., soil gas permeability, oxygen diffusion in soil, contaminant distribution, and radius of oxygen influence) effect the success of bioventing. Treatability tests, as described in **Section 4.3**, should be conducted prior to implementing this approach. The basis of the air sparging approach is the volatility and biodegradability of the chlorinated and BTEX organics that are dissolved in the groundwater. As the groundwater migrates into the interceptor trench, air is bubbled into the collector pipe located at the bottom of the trench that causes the dissolved volatile solvents to undergo a phase transfer from the liquid phase to the gaseous phase. Air sparging systems are easy to implement, but the low hydraulic conductivity of soils at the site will limit the flow of water into the trench and therefore treatment time is expected to be long. Hydraulically, there is the potential to cause the groundwater to mound in the area of the trench due to the increase in pressure from the sparging system. This may cause the groundwater plume to spread around the trench area.

Another aspect of technical feasibility is the ease with which additional work may be conducted. None of these technologies will interfere with other remedial activities.

Administrative Feasibility

The administrative feasibility of this alternative is good. All work will be conducted on-site, and there will be few air emissions due to the low concentrations of contaminants in the groundwater. Construction permits necessary for the activities are readily attainable. There will be some transport of contaminated trench soil, but all the contractors used for excavation and hauling will be experienced in excavation work materials and backfilling.

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

Availability of Services and Materials

The materials and services necessary to accomplish this alternative are readily available. All of the equipment necessary for this technology is standard. The air filtration and trench installation equipment is readily available from a number of contractors.

5.4.7 Cost

The construction capital costs are estimated to be \$ 393,352. This includes \$ 62,200 to complete treatability studies. Costs are also included for fencing and maintaining restrictions for residential development. Annual O&M costs for the system are estimated to be \$ 75,3176. The present worth costs for Alternative RA25-3 are estimated to be \$ 906,238 million. The present worth cost for this system were estimated with a 5 % escalation rate and assumes 5 years of bioventing, 10 years of air sparging, and 10 years of groundwater monitoring. A 20% contingency cost has been added to the cost estimate for each alternative. However, the cost estimate for this alternative probably has a higher degree of uncertainty than others due to the need to perform treatability testing prior to implementation for both bioventing and air sparging.

5.5 ANALYSIS OF RA25-3A BIOVENTING OF SOIL AND NATURAL ATTENUATION OF GROUNDWATER PLUME

5.5.1 Definition of Alternative RA25-3A

Alternative RA25-3A involves the installation of a bioventing system and long-term groundwater monitoring for natural attenuation. An aboveground bioventing system would feed air through 3 injection points (vertical wells) to the western portion of the fire training and demonstration pad. The bioventing system consists of one compressed air pump to feed oxygen into the soil to enhance the natural degradation of organic contaminants in the source area. Aeration of the VOC source area is expected to enhance the volatilization of organic contaminants in the groundwater near the source. However, the low air flow employed in bioventing provides only enough oxygen to sustain microbial activity. Natural attenuation would be relied upon to enhance the degradation of BTEX and VOCs in groundwater. This alternative would use regular groundwater monitoring to assess the effectiveness of this approach over time.

5.5.2 Protectiveness

Short-term Protectiveness

Several items are included in an assessment of the short-term protectiveness of RA25-3A. The first issue is protection of the community during the remedial action. This alternative, is protective of the community. All remedial activities associated with this alternative will be conducted on-site.

The short-term protectiveness to site workers must also be considered. The major routes of exposure during excavation are direct contact with the affected soil and inhalation of vapors or particulates. As described above, the concentrations of the potentially hazardous constituents exhibit unacceptable risk to future on-site construction workers due to the presence of benzene. However, bioventing would only entail the installation of wells which would limit site worker exposure. Protection from exposure can be minimized through site access controls and the use of proper protective equipment for site workers, such as respirators, dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of vapors or particulates. Site workers will be required to meet all the OSHA training and medical monitoring requirements prior to working on-site.

Short-term protectiveness must also consider environmental impacts during the remedial action. As described above, there is little potential for release of hazardous constituents during the construction of the bioventing system. There are no sensitive environments which will be disturbed by the construction activities. A monitoring program will be established around the perimeter of the area to assure protection of the community. The closest area to be excavated from the SEDA boundary is approximately 1500 feet and the likelihood of any dust migrating off-site is negligible.

The last item to be considered is the time until treatment is accomplished. It is very difficult to assess the length of time required to treat the soil and groundwater to the required cleanup levels. Modeling of the aquifer as described in Section 3.3.5 suggests that it may take up to 20 years for natural attenuation to reduce the concentrations of groundwater contaminants to meet clean-up goals. The bioventing system is estimated to take up to 5 years to meet clean-up goals. Construction and start-up of the bioventing system would take 2 to 3 months.

The RI concluded that there is negligible risk to the ecosystem at SEAD-25. The environment would not be impacted by implementation of this remedy.

Long-term Protectiveness

The assessment of the long-term protectiveness of Alternative RA25-3A can be divided into two major 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.

The bioventing system will be run until the NYSDEC soil criteria for groundwater protection from organic contaminants are met. Groundwater monitoring of natural attenuation will be performed until the concentrations of organics in the groundwater are below the NYSDEC criteria for Class GA groundwaters. There will be little or no treatment residuals.

5.5.3 Reductions

Alternative RA25-3A would be effective in reducing the mobility, and volume of the hazardous constituents present at the site, and somewhat effective in reducing the toxicity. Bioventing will reduce the volume of contaminated soil and eliminate the source groundwater contamination. The toxicity of the constituents present in the groundwater will be diminished through aerobic biodegradation and volatilization in the aquifer.

5.5.4 Permanence

The permanence of the alternative must also be assessed. Once the groundwater and soil at the site meet the treatment criteria, the remedial action would be considered permanent. Since this alternative addresses the source of contamination, natural attenuation of groundwater is considered to offer greater permanence than those alternatives where the source is not addressed. There will be minimal treatment residues, and these residues can be treated and/or disposed of off-site.

5.5.5 Compliance with ARARs

Alternative RA25-3A will comply with all ARARs. ARARs for this site are listed in **Appendix C**.

5.5.6 Implementability

A discussion of implementability should consider the technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility involves construction and operation, technology reliability, 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 off-site disposal capacity.

Technical Feasibility

The technical feasibility of Alternative RA25-3A is considered to be average due to the uncertainties associated with innovative in situ technologies and the ability of naturally occurring bacteria to break down these contaminants. Bioventing is a proven technology for reducing organic contamination in soils. Several factors (e.g., soil gas permeability, oxygen diffusion in soil, contaminant distribution, and radius of oxygen influence) affect the success of bioventing. Treatability tests, as described in **Section 4.3**, should be conducted prior to implementing this remedial action.

Another aspect of technical feasibility is the ease at which additional work may be conducted. None of these technologies will interfere with other remedial activities.

Administrative Feasibility

The administrative feasibility of this alternative is good. All work will be conducted on-site, and there will be few air emissions due to the low concentrations of contaminants in the groundwater. Construction permits necessary for the activities are readily attainable.

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

Availability of Services and Materials

The materials and services necessary to accomplish this alternative are readily available. All of the equipment necessary for this technology is standard. The air filtration and well installation equipment is readily available from a number of contractors.

5.5.7 Cost

The construction capital costs are estimated to be $ 248,909. This estimate includes $ 48,000 to complete treatability studies. Costs are also included for fencing and maintaining restrictions for residential development. Annual O&M costs for the system are estimated to be $ 72,900. The total present worth cost for Alternative RA25-3A is estimated to be $ 992,714. The present worth cost for this alternative was estimated with a 5 % escalation rate and assumes 5 years of bioventing, and 20 years of groundwater monitoring. A 20% contingency cost has been added to the cost estimate for each alternative. However, the cost estimate for this alternative probably has a higher degree of uncertainty than others due to the need to perform treatability testing prior to implementation for bioventing.

5.6 ANALYSIS OF RA25-4 SOURCE REMOVAL, OFF-SITE DISPOSAL, AND NATURAL ATTENUATION OF GROUNDWATER PLUME

5.6.1 Definition of RA25-4

This option consists of excavation of the soils that make up the western 3/4 of the fire demonstration pad (i.e. Case 1 in Figure 2-1). This remedial action would remove the contaminated soils that are the source of the groundwater plume at SEAD-25. The soils would be removed using traditional construction equipment and placed in a RCRA approved landfill. The plume would be remediated using natural attenuation. Modeling of the aquifer as described in Section 3.3.5 suggests that it may take up to 20 years for natural attenuation to reduce the concentrations of groundwater contaminants to meet clean-up goals. Groundwater recovered during excavation activities will be treated using an air stripper. Each of these processes will be described briefly in this section. A detailed analysis of how this option meets the selection criteria, as well as a budgetary cost estimate, is provided below.

Process Flow and Site Layout

An excavation plan will be developed using previous RI data to delineate the extent of removal. The data indicates that the soils to be removed are limited to the areas described above, although excavation depths will vary. Two cases were considered for excavation described in **Tables 2-10** and displayed in **Figure 2-1**. The maximum volume to be excavated is approximately 1,666 cubic yards. The excavation will be accomplished with standard construction equipment, such as a front-end-loader or bulldozer. The excavated soils will be immediately transported to an off-site landfill or treatment facility. Groundwater exposed during the remedial action will be collected using pumps or soil dewatering equipment and treated using an air stripping unit. Air stripping is described in more detail in **Section 5.7**.

This process provides a very simple approach. First, the soil is excavated, placed in trucks and transported to the off-site receptor. The site is accessible by trucks, and each truck will be loaded directly from the excavation area. A small staging and equipment decontamination area will be set up as necessary, and will likely be located near one of the site roads. To assure that health and safety requirements are met air monitoring will be installed to monitor VOC and particulate emissions during excavation and loading activities.

5.6.2 Protectiveness

Short-term Protectiveness

Several items are included in an assessment of the short-term protectiveness of alternative RA25-4. The first issue is protection of the community during the remedial action. Excavation and air stripping will be performed on-site, however, there will be the need to transport excavated materials. The increase in truck traffic will increase the potential for off-site accidents and will be considered during the planning of the remedial action. This is not considered to be a significant issue since the area surrounding SEDA is primarily agricultural and sparsely populated. Care will be taken to assure that the trucks are not overloaded. The soils will be covered with a tarp during transport to ensure that no dust is released from the trucks.

The threat from dust released during the on-site excavation will be eliminated through the use of dust suppression techniques. A monitoring program will be established around the perimeter of the excavation area in order to assure protection of the community. The closest area to be excavated from the SEDA boundary is approximately 1500 feet, so the likelihood of any dust migrating off-site is negligible. As discussed in Section 6.0 & 7.0 of the RI report, fugitive dust migration is not considered to be a major migration pathway. VOC emissions from the air stripper are not a concern due to the low level of groundwater contamination. The total mass of contaminants in the groundwater that could potentially be excavated is roughly equivalent to 0.4 lbs.

The short-term protectiveness to site workers must also be considered. Based on the conclusions of the RI, there is unacceptable risk from the inhalation of benzene from soils to the future on-site construction worker. Protection from exposure can be minimized through site access controls, the use of proper protective equipment for site workers, and stopping work while volatiles dissipate. Air monitoring may be used to determine if there is a significant threat from VOCs as well as the inhalation of particulates. Dust generation at the excavation can be minimized by using water or other dust control chemicals. It should also be noted that all the site workers will be required to meet all the OSHA training and medical monitoring requirements prior to working on-site.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. For this alternative, there will be little or no environmental impacts. This alternative calls for construction type activities in an area of the Depot where trucks and trains routinely load and unload munitions. These activities will not be substantially different from what is currently occurring. In addition, since the hazardous material is primarily in the soil, there is little or no risk of a spill or release of hazardous liquid materials during the remedial action.

Natural attenuation of the groundwater plume is protective of human health, as there are currently no unacceptable carcinogenic or non-carcinogenic risks to intended users of the site.

The last item to be considered is the time until treatment is accomplished. The construction portion of Alternative RA25-4 should not take long to complete. The estimate for performing the excavation portion task is approximately one to two months, depending on the weather. There is little mobilization required since only a loader, and maybe a scraper are necessary to accomplish the excavation. It should only take a week to set up the staging area and construct an equipment decontamination pad. Based on the potential amount of groundwater recovered during the excavation (70,000 gallons) and a 30gpm air stripper throughput, the air stripper would have to operated for less than a week. Setting up the air stripper would take 1-2 months. Once the soil are removed and the excavated groundwater is treated, the plume would be treated through natural attenuation.

The RI concluded that there is negligible risk to the ecosystem at SEAD-25. The environment would not be impacted by implementation of this remedy.

Long-term Protectiveness

The long-term protectiveness of this alternative for on-site exposures is favorable , since soil will be permanently removed from the site. Half of the groundwater plume would be treated during the excavation. Long-term protectiveness of off-site receptors is not as favorable due to the landfilling of contaminated soils.

No long-term maintenance is required at the site to assure continued protectiveness from soil contamination. Any areas where soil is removed below grade will be backfilled with clean soil. A cover of native vegetation will be established as an additional erosion control measure. Groundwater will require monitoring for several years to determine the progress of natural attenuation. Costs were based on a 20 year monitoring program.

5.5.3 Reductions

This alternative would be very effective in reducing the mobility, toxicity and volume of the constituents present in the soils at the site. Clean backfill would be used to replace the excavated soil, preventing future contamination of the groundwater and dermal contact to human and environmental receptors. Groundwater contamination would also be reduced by this remedial action. Nearly half the total mass of contaminants in the groundwater plume could be removed under this alternative. Over time, the remaining groundwater contamination would be expected to decrease to concentrations capable of meeting stringent Class GA groundwater. This alternative does not result in a permanent reduction in the toxicity of all or most of the hazardous wastes due to the landfilling of soils off-site.

5.5.4 Permanence

The permanence of the alternative has also been assessed. Since the soil at the site will not be treated, remedial action for soil does not constitute a permanent solution. However, air stripping the excavated groundwater will provide a permanent solution to the most contaminated portion of the plume. Natural attenuation of groundwater does provide a permanent solution over time, despite the fact that no constructed groundwater treatment will occur.

5.5.5 Compliance with ARARs

Alternative RA25-4 will comply with chemical specific ARARs. Over time the concentration of VOCs and SVOCs in the groundwater are expected to decrease by natural degradation processes to concentrations below the NY State GA Standards. The list of ARARs for RA25-4 is shown in **Appendix C**.

5.5.6 Implementability

Implementability should consider technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility involves construction and operation, technology reliability, 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 off-site disposal capacity.

Technical Feasibility

The technical feasibility of RA25-4 is considered favorable. Excavation and air stripping are well established, reliable technologies that are readily available. The site does not pose any unusual problems or difficulties for implementing these technologies and there would not be any expected delays due to technical problems. The work would be scheduled to avoid potential problems from inclement weather that could interfere with the excavation process. These technologies are also considered to be very reliable in meeting the cleanup goals established for soils and groundwater.

Administrative Feasibility

The administrative feasibility of this alternative is also very good. Construction permits necessary for the activities are readily attainable. There will be some transport of contaminated soils and clean fill, but all the contractors used for excavation and hauling will be experienced in excavating waste materials and backfilling.

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

Availability of Services and Materials

The excavation and hauling equipment is readily available. The equipment to be used is fairly standard, and is available from a number of vendors. Monitoring wells are already in place. Air stripping manufactures/vendors are also readily available.

5.5.7 Cost

The three major costs for this alternative are, excavation and disposal, excavated groundwater treatment, and groundwater monitoring. The total capital construction cost is estimated to be $ 846,417. A 20% contingency cost has been added to the capital cost estimate for each alternative. Costs are included for fencing and maintaining restrictions for residential development since this alternative restricts residential use. The present worth O & M costs associated with RA25-4 are approximately $ 367,156. As with the no-action alternative (RA25-1), the costs for SEDA security are included in other programs, and are not part of this remedial action. Groundwater monitoring for this alternative was estimated to be required for 20 years. Air stripping was estimated to be required for 1 year. The total present worth costs for Alternative RA25-4 are estimated to be $ 1,213,572.

5.7 ANALYSIS OF RA25-5 SOURCE REMOVAL, OFF-SITE DISPOSAL, AND AIR STRIPPING OF PLUME

5.7.1 Definition of Alternative RA25-5

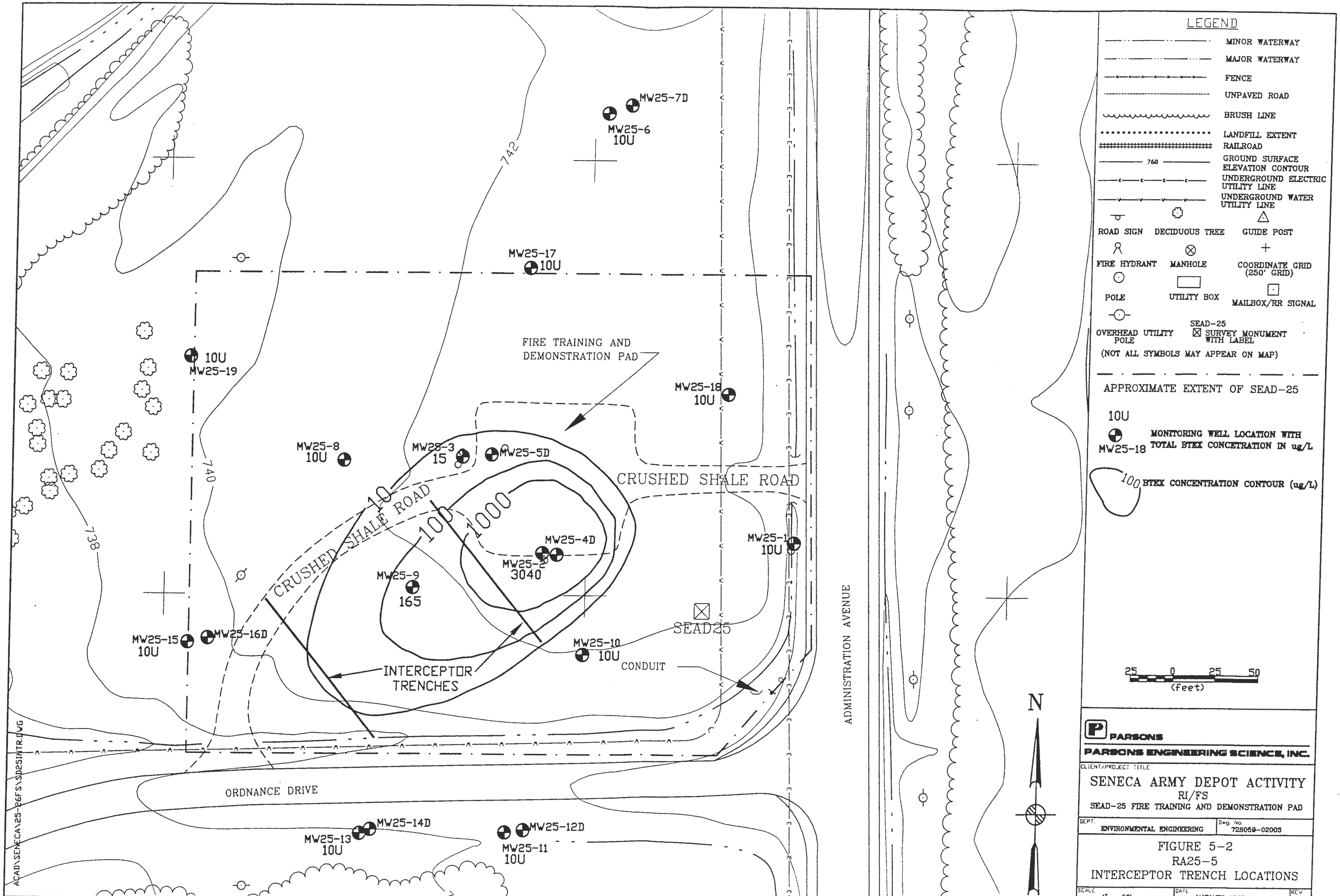
Alternative RA25-5 uses the source and removal approach described in RA25-4. If excavation is conducted when the groundwater table is high, the groundwater will be recovered and delivered to the air stripper system described below.

For the treatment of groundwater, this alternative consists of the installation of two interceptor trenches, from which the collected groundwater is pumped to a treatment unit. .As shown in **Figure 5-2**, the downgradient interceptor trench would run northwest of Ordnance Drive. The upgradient trench would be located southwest of the Demonstration Pad. The downgradient trench will prevent off-site migration of the plume. The upgradient trench collects the groundwater near the source. The design uses the natural contours of the site to help drain the groundwater. Each trench will be approximately 200 feet long by 3 feet wide by 8 feet deep. The trench will extend from the ground surface to the competent shale bedrock. The trenches will be excavated with a bucket loader and the outside walls will be lined with a geotextile filter. Perforated PVC pipe will be placed in the bottom of the trench to facilitate drainage to the collection sumps. The trench will then be filled in with gravel to a depth of 2 to 3 feet below grade. Geotextile will be placed over the gravel, and the trench will be backfilled to grade with the dirt previously removed. **Figure 5-3** shows a cross-section of the interceptor trench.

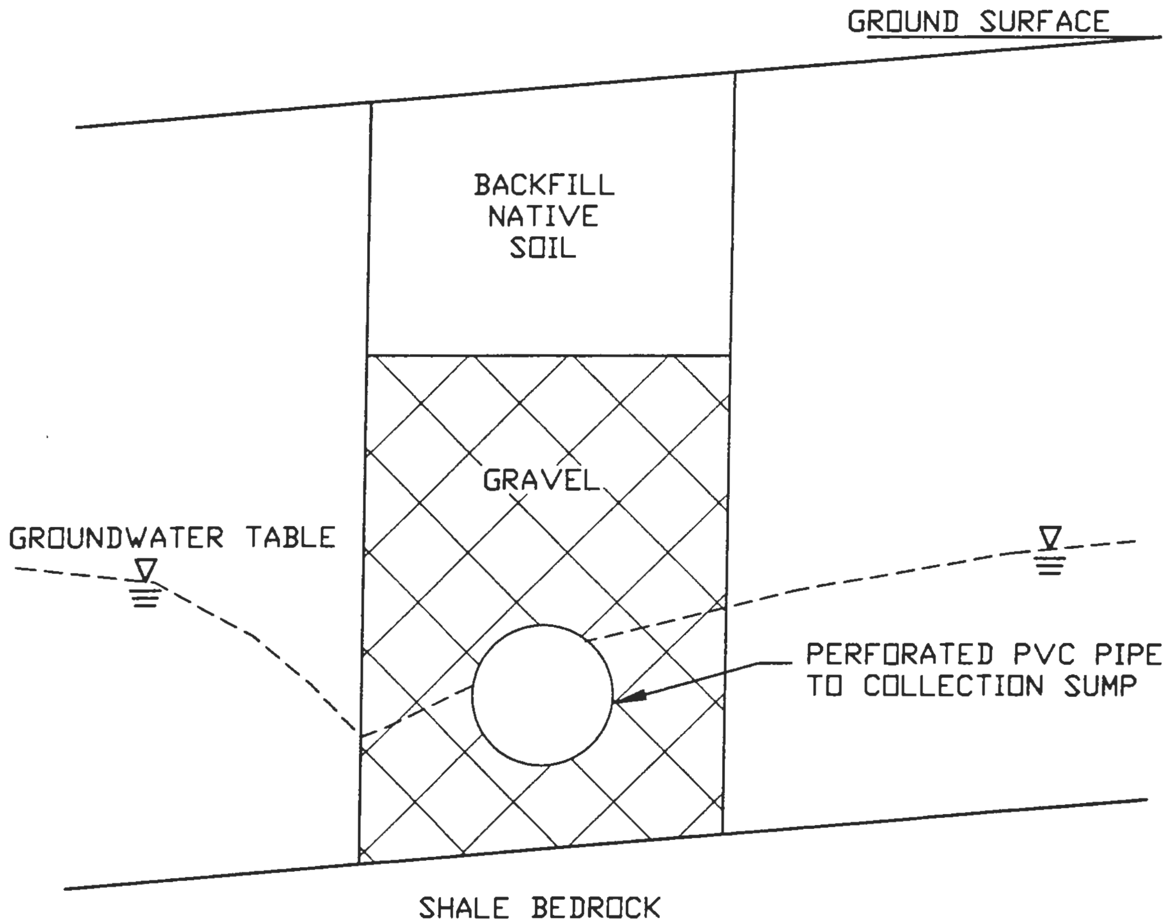
The water will be pumped from the trenches to the treatment system. The treatment process is shown in **Figure 5-4**. The first step in the treatment train is an equalization/settling tank. An equalization tank is used to minimize the flow fluctuations going to the treatment unit which are due to seasonal variations in precipitation. It is estimated that a 10,000 gallon tank will be appropriate. The tank will also provide settling capacity. It is anticipated that iron and other metals will begin to precipitate once the groundwater is exposed to oxygen. An overflow weir in the tank will allow the precipitated metals to be removed from the process train. The next step in the treatment process is an inline filter for suspended solids removal. The filter will be followed with a hardness removal unit. An industrial water softener will remove calcium and other minerals from the groundwater. This is an important step because the minerals in groundwater tend to foul the various treatment units.

The groundwater would then flow to an air stripper for organics removal. An air stripper uses a countercurrent air stream to extract volatile organics from water. The stripper usually consists of a tower which is filled with trays, plates, or packing material. This devices increase the surface area of contact between the water and the air. The size of the tower is based on the nature of the contaminants and the discharge requirements. The treated water is then discharged.

The treated water may be passed through a liquid phase carbon unit and discharged to the drainage ditches adjacent to the patrol roads, eventually being discharged to Kendaia Creek. The carbon unit is not necessary to meet the treatment objectives, but may be used for polishing and protection during process upsets.



LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENT
RAILROAD
760
GROUND SURFACE ELEVATION CONTOUR
UNDERGROUND ELECTRIC UTILITY LINE
UNDERGROUND WATER UTILITY LINE
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SEAD-25
SURVEY MONUMENT WITH LABEL
(NOT ALL SYMBOLS MAY APPEAR ON MAP)
APPROXIMATE EXTENT OF SEAD-25
10U
MW25-18
MONITORING WELL LOCATION WITH TOTAL BTEX CONCETRATION IN ug/L
100
BTEX CONCENTRATION CONTOUR (ug/L)
25 0 25 50
(feet)
MW25-7D
MW25-6
10U
742
MW25-17
10U
FIRE TRAINING AND DEMONSTRATION PAD
10U
MW25-19
MW25-18
10U
MW25-8
10U
MW25-3
15
MW25-5D
740
CRUSHED SHALE ROAD
CRUSHED SHALE ROAD
10
100
1000
MW25-4D
MW25-2
3040
MW25-1
10U
MW25-9
165
738
SEAD25
MW25-15
10U
MW25-16D
MW25-10
10U
CONDUIT
INTERCEPTOR TRENCHES
ADMINISTRATION AVENUE
N
ORDNANCE DRIVE
MW25-14D
MW25-13
10U
MW25-12D
MW25-11
10U
ACAD\SENECA\25-26FS\SD25INTR.DWG
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD
DEPT.
ENVIRONMENTAL ENGINEERING
Dwg. No.
728059-02003
FIGURE 5-2
RA25-5
INTERCEPTOR TRENCH LOCATIONS
SCALE
1" = 50'
DATE
JANUARY 1997
REV



The proposed trench will extend to the top of competent bedrock

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

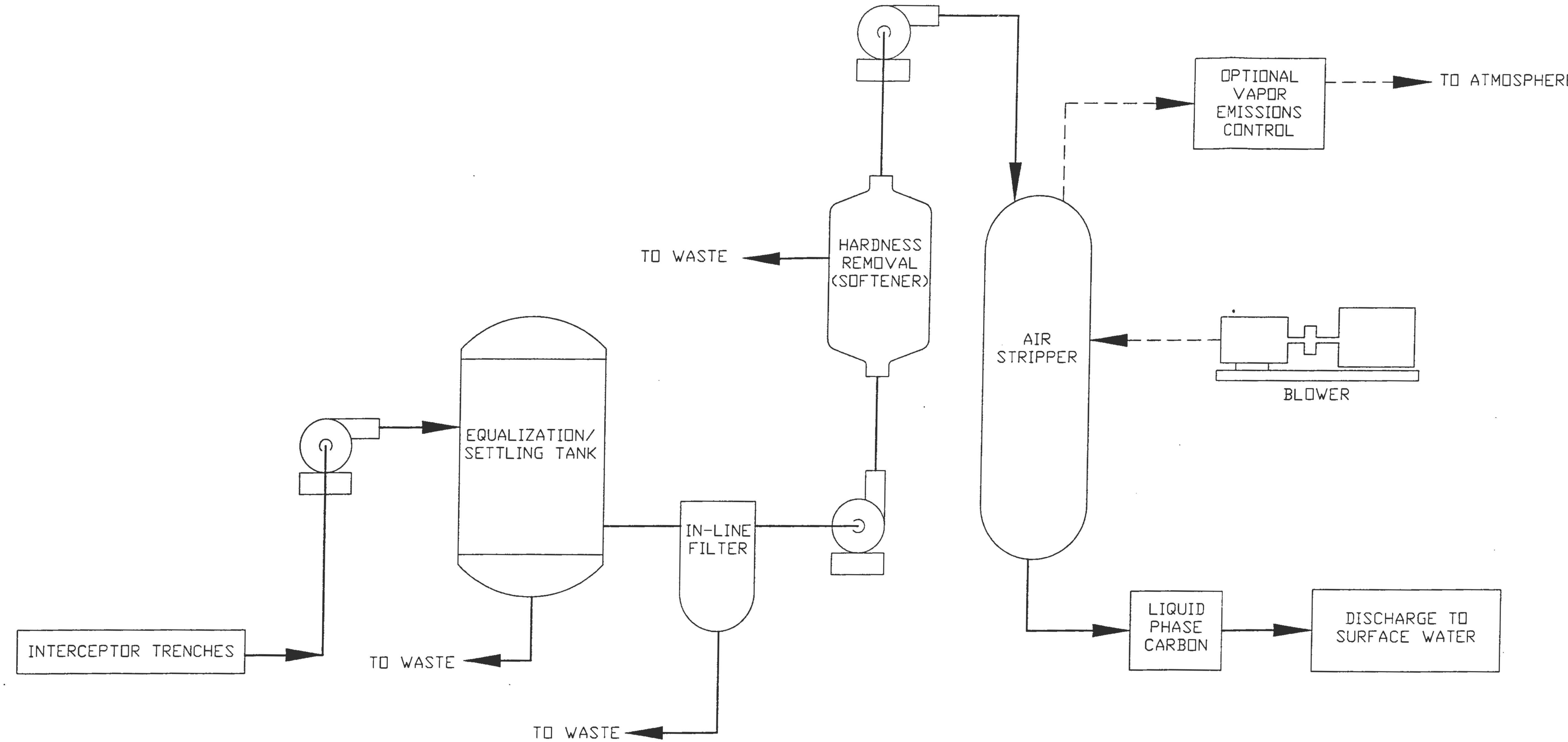
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 AND SEAD-26

DEPT.	Dwg. No.
ENVIRONMENTAL ENGINEERING	726059-02003

FIGURE 5-3
CROSS SECTION
INTERCEPTOR TRENCH

SCALE	DATE	REV
NA	JANUARY 1997	A

ACAD\SENECA\25-26FS\SD2526CT.DWG



ACAD\SENECA\25-26FS\SD2526PF.DWG

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 AND SEAD-26

DEPT.	Dwg. No.
ENVIRONMENTAL ENGINEERING	728059-02003

FIGURE 5-4
AIR STRIPPING
PROCESS FLOW SCHEMATIC

SCALE	DATE	REV
NA	JANUARY 1997	A

5.7.2 Protectiveness

An evaluation of the criterion of protectiveness addresses several issues. The short- and long-term protectiveness to both human health and the environment has been considered. The following discussion will illustrate how this alternative meets these criteria.

Short-term Protectiveness

The first issue in short-term protectiveness is protection of the community during the remedial action. This alternative is protective of the community. Threat from releases during the excavation will be minimized using techniques described in Alternative RA25-4. The excavations of the interceptor trenches will be in areas where the concentrations of hazardous constituents in the groundwater are low. Because of the low contaminant concentrations in the groundwater, the emissions from the air stripper will meet all NYSDEC and EPA air standards, and will therefore be protective of human health.

The short-term protectiveness to site workers has also been considered. The major routes of exposure during excavation, as described above, are direct contact with the affected soil and inhalation of vapors or particulates. Inhalation of benzene has been shown to result in unacceptable risk to future on-site construction workers. Personal protective equipment and appropriate air monitoring will be necessary to minimize worker exposure.

Protection from exposure can be minimized through site access controls and the use of proper protective equipment for site workers, such as respirators, dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of vapors or particulates. Dust generation at the excavation can be minimized by using water or other dust control chemicals. It should also be noted that all the site workers will be required to meet all the OSHA training and medical monitoring requirements prior to working on-site.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. There will be few environmental impacts. As described above, there is little potential for release of hazardous constituents during the excavations. There are no sensitive environments which will be disturbed by the construction activities.

The last item to be considered is the time until treatment is accomplished. Excavation of soil and should take 2-3 months depending on weather. It is difficult to assess the length of time required to treat the groundwater. However, an initial estimate indicates that it may be necessary to run the air stripper for less than one year. Construction and start-up of the system should take 2 to 4 months.

The RI concluded that there is negligible risk to the ecosystem at SEAD-25. The environment would not be impacted by implementation of this remedy.

Long-term Protectiveness

The assessment of the long-term protectiveness of Alternative RA25-5 can be divided into two major 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. The source of groundwater and surface water contamination will be permanently removed upon excavation of the soil and sediment.

The treatment system will be run until the concentrations of organics in the groundwater are below the NYSDEC criteria for Class GA groundwaters. The most contaminated soil will be removed. There will be little or no treatment residuals. Any soils removed for the trenches will be from areas in which previous soil sampling has indicated little or no soil contamination. This soil can be used as fill. Other soils could be treated on-site or sent off-site to an appropriate treatment, storage, and disposal facility. The only potential treatment residual is spent activated carbon: if carbon is used to polish the liquid stream. This carbon would be sent off-site for regeneration or disposal.

5.7.3 Reductions

Alternative RA25-5 would remove the source of groundwater and surface water contamination from the site. The air stripping action would effectively reduce the mobility, toxicity, and volume of the hazardous constituents present at the site. The interceptor trenches will effectively eliminate the mobility of the plume, and ensure that no off-site migration occurs. The volume of contaminated groundwater will decrease over time as the organics are removed. A large volume of contaminated groundwater will be removed during the removal action if the excavation is performed when the groundwater is high.

5.7.4 Permanence

The permanence of the alternative has also been assessed. Once the groundwater at the site meets the treatment criteria, the remedial action would be considered permanent. The most contaminated soil and will be disposed of off-site.

5.7.5 Compliance with ARARs

Alternative RA25-5 will comply with all ARARs. A list of the ARARs for this site is in **Appendix C**.

5.7.6 Implementability

The discussion of implementability is divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, 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 off-site disposal capacity.

Technical Feasibility

The technical feasibility of Alternative RA25-5 is high. The soil removal is technically feasible, as described previously. Interceptor trenches will collect more water than individual recovery wells, which are limited by a small radius of influence. Air stripping is a proven technology for volatile organic compounds, and the compounds that exceed ARARs are volatile. Activated carbon could be used as a final effluent polishing step and has been proven to be effective in capturing the contaminants of concern.

Another aspect of technical feasibility is the ease with which additional work may be conducted. The groundwater treatment technology will not interfere with the source removal activities, since all work can be conducted in a different portion of the site.

Administrative Feasibility

The administrative feasibility of this alternative is very good. All work will be conducted on-site, and based on groundwater concentrations, VOC emissions are not expected to require control equipment. Nonetheless air stripper vendors have extensive experience in complying with air emission regulations. Construction permits necessary for the activities are readily attainable.

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

Availability of Services and Materials

Materials and services necessary to accomplish this alternative are readily available. All of the equipment necessary for this technology is standard. The excavation and treatment equipment is readily available from a number of contractors.

5.7.7 Cost

Capital costs for Alternative RA25-5 are estimated to be \$ 926,787. A 20% contingency cost has been added to the capital cost estimate for each alternative. Annual O&M costs, including quarterly groundwater monitoring, are estimated to be \$ 194,483. This includes energy, equipment maintenance, and replacement of spent carbon and filter beds for the air stripping system. Costs are also included for fencing and maintaining restrictions for residential development since this alternative restricts future residential use of the site. The total present worth cost for Alternative RA25-5 (the sum of the O&M present worth cost and the capital costs) are estimated to be \$ 1,121,270.

5.8 ANALYSIS OF RA25-6 SOURCE REMOVAL, OFF-SITE DISPOSAL, AND AIR SPARGING OF GROUNDWATER

5.8.1 Definition of Alternative RA25-6

Alternative RA25-6 involves the excavation and removal of soil as described in alternative RA25-4 and the installation of air sparging trenches as described in RA25-3Groundwater recovered during the excavation will be treated in an air stripping system, similar to that described under alternative RA25-4.

5.8.2 Protectiveness

An evaluation of the criterion of Protectiveness must address several issues. The short- and long-term protectiveness to both human health and the environment must be considered. The following discussion will show how this alternative meets these criteria.

Short-term Protectiveness

As described for RA25-3 and 4, this alternative is protective of the community. Precautions would be taken to protect construction workers. Construction and start-up of the air sparging system should take 2 to 3 months. Excavation should take 2-3 months depending on the weather.

The RI concluded that there is negligible risk to the ecosystem at SEAD-25. The environment would not be impacted by implementation of this remedy.

Long-term Protectiveness

The assessment of the long-term protectiveness of Alternative RA25-6 can be divided into two major 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. As mentioned previously, there will be little to no treatment residuals.

The treatment system will be run until the concentrations in the groundwater are below the NYSDEC criteria for Class GA groundwaters. Excavated soils will be disposed of off-site.

5.8.3 Reductions

Alternative RA25-6 would be effective in reducing the mobility, and volume of the hazardous constituents present at the site, and effective in reducing the toxicity. The air sparging system will reduce the volume of contaminated groundwater through in situ treatment. The toxicity of the constituents present in the groundwater will be diminished through aerobic biodegradation and volatilization. Mobility, volume, and toxicity for soil, willwill be greatly reduced.

5.8.4 Permanence

The permanence of the alternative must also be assessed. Once the groundwater at the site meets the treatment criteria, the remedial action would be considered permanent.

5.8.5 Compliance with ARARs

Alternative RA25-6 will comply with all ARARs. A list of the ARARs for this site is in **Appendix C**.

5.8.6 Implementability

A discussion of implementability can be divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, 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 off-site disposal capacity.

As mentioned previously for the technologies/approaches cited in RA25-3 and 4, there are no foreseeable problems with implementing this approach.

Availability of Services and Materials
Materials and services necessary to accomplish this alternative are readily available. All of the equipment necessary for this technology is standard. The excavation and trench installation equipment is readily available from a number of contractors.

5.8.7 Cost

The capital costs are estimated to be \$ 869,836, including \$ 57,000 for the design and treatability studies. Costs are also included for fencing and maintaining restrictions for residential development since the site is restricted from future residential use. Annual O&M costs for the system are estimated to be \$ 541,751. The total present worth costs for Alternative RA25-6 are estimated to be \$ 1,4118,587. The present worth costs for this alternative were estimated with a 5% escalation rate and assumes a 10 year treatment time for air sparging and 20 years of groundwater monitoring. A 20% contingency cost has been added to the capital cost estimate for each alternative. However, the cost estimate for this alternative probably has a higher degree of uncertainty than others due to the need to perform treatability testing prior to implementation for both air sparging.

5.9 COMPARATIVE ANALYSIS OF ALTERNATIVES

5.9.1 Introduction

This section compares each of the alternatives with respect to the each of the evaluation criteria. The following discussion will rate each of the alternatives with regard to the evaluation criteria and identify the relative advantages and disadvantages of each. This comparison will provide the information necessary to choose the most appropriate alternative for this site.

The discussion is divided into two groups. The first group, the threshold criteria, includes the overall protection of human health and the environment and compliance with ARARs. The next group considers 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. **Table 5-1** presents a summary of the scores assigned to each alternative for all of the ranking criteria.. **Table 5-1A** shows the reduction in human health risk which is achieved upon implementation of each alternative. **Table 5-2** summarizes the costs associated with each alternative. **Tables 5-1A** and **5-2** include human health risk calculations and costs for residential scenarios which are presented and discussed below in **Section 5.10**. **Table 5-3** lists each of the alternatives in relative order of ranking from highest to lowest for costs, effectiveness, and implementability.

5.9.2 Threshold Criteria

The first two criteria are overall protection of human health and the environment and compliance with ARARs. Each alternative must meet these threshold criteria to be carried through the ranking process. With the exception of the RA25-1 (No-action), which was retained for comparative purposes, all the alternatives rated highly for ARAR compliance and protectiveness of human health and the environment. While the more aggressive alternatives will achieve ARAR compliance sooner than approaches employing natural mechanisms, all are expected to comply with ARARs and clean-up goals.

Table 5-1A presents human risk predicted at the site after implementation of each of the above alternatives compared to the risk calculated in the baseline risk assessment. Risk was calculated not only for the intended use of the site (industrial), but also for the future residential scenario.

TABLE 5-1
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

DETAILED ANALYSIS OF SEAD-25 REMEDIAL ALTERNATIVES

ALT.	TECHNOLOGY AND PROCESSES	EFFECTIVENESS							IMPLEMENTABILITY			COST	TOTAL SCORE
		ARAR/SCGs Compliance	PROTECTIVENESS of Human Health and Environment	EFFECTIVENESS		REDUCTIONS			Technical Feasibility	Admin. Feasibility	Availability	Present Worth	
				Short-term	Long-term	Vol./Tox.	Mob.	Perm.					
RA25-1	No action	0	8	9	6	2	0	0	9	0	3	15	52
RA25-2	Institutional Controls/Natural Attenuation of groundwater	6	12	9	10	4	0	3	8	1	3	14	70
RA25-3	Bioventing of Soil/Air Sparging of Groundwater	10	18	8	16	9	5	5	7	1	3	12	94
RA25-3a	Bioventing of Soils/Natural Attenuation of groundwater	10	18	8	15	9	5	5	9	1	3	11	94
RA25-4	SourceRemoval/Off-site Disposal/Natural Attenuation of Groundwater	10	18	8	9	4	3	3	9	1	3	8	76
RA25-5	Source Removal/Off-site Disposal/Air Stripping of groundwater	10	18	7	9	4	3	3	7	1	3	8	73
RA25-6	Source Removal/Off-site Disposal/Air Sparging of groundwater	10	18	7	9	4	3	3	7	1	3	7	72

TABLE 5-1A
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SUMMARY OF TOTAL RECEPTOR RISK FOR SEAD-25 REMEDIAL ALTERNATIVES

ALT.	TECHNOLOGY AND PROCESSES	Current Site Worker			Future Residential (Child & Adult)			Future On-Site Construction Workers		
		CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK	CHILD HAZARD INDEX	ADULT HAZARD INDEX	CANCER RISK
Baseline Risk Assessment		NA	1E-03	2E-07	1E+01	5E+00	1E-03	NA	4E+00	4E-06
Industrial Alternatives										
RA25-1	No action	NA	1E-03	2E-07	1E+00	2E-01	8E-04	NA	4E+00	4E-06
RA25-2	Institutional Controls/Natural Attenuation (1)	NA	1E-03	2E-07	1E+00	2E-01	8E-04	NA	4E+00	4E-06
RA25-3	Bioventing Soil/Air Sparging Plume	NA	1E-03	2E-07	1E+00	2E-01	8E-04	NA	3E-01	8E-07
RA25-3A	Bioventing Soil/Natural Attenuation of Plume	NA	1E-03	2E-07	1E+00	2E-01	8E-04	NA	3E-01	8E-07
RA25-4	Source Removal/Off-site Disposal/Natural Attenuation	NA	1E-03	2E-07	1E+00	2E-01	8E-04	NA	3E-01	8E-07
RA25-5	Source Removal/Off-site Disposal/Air Stripping Plume	NA	1E-03	2E-07	1E+00	2E-01	8E-04	NA	3E-01	8E-07
RA25-6	Source Removal/Off-site Disposal/Air Sparging of Plume	NA	1E-03	2E-07	1E+00	2E-01	8E-04	NA	3E-01	8E-07
Residential Alternatives										
RA25-3R	Bioventing Soil/Air Sparging of Plume/Sediment Removal	NA	1E-03	2E-07	5E-01	1E-01	7E-05	NA	3E-01	8E-07
RA25-3AR	Bioventing Soil/Natural Attenuation of Plume/Sediment Removal	NA	1E-03	2E-07	5E-01	1E-01	7E-05	NA	3E-01	8E-07

(1) Risk values are shown for comparison purposes if institutional controls were not in place. The risk in this under this scenario would actually not exist since there would be no human receptor under this alterative.

Table 5-2

Cost Summary for SEAD-25 Remedial Alternatives

Industrial Alternatives:

Alternative	Capital Costs	Present Worth O&M Costs	Total Present Worth Costs
RA25-1	$0	$0	$0
RA25-2	$40,125	$484,678	$524,803
RA25-3	$393,352	$512,886	$906,238
RA25-3A	$248,909	$693,787	$942,695
RA25-4	$846,417	$367,156	$1,213,572
RA25-5	$926,7876	$194,483	$1,121,270
RA25-6	$869,836	$541,751	$1,411,587

Residential Alternatives:

RA25-3R	$480,120	$494,521	$974,641
RA25-3AR	$336,281	$714,166	$1,050,447

Table 5-3

Remedial Alternatives Ranking

Cost		Effectiveness		Implementability	
Alternative	Score	Alternative	Score	Alternative	Score
RA25-1	15	RA25-3	71	RA25-3a	13
RA25-2	14	RA25-3a	70	RA25-4	13
RA25-3	12	RA25-4	55	RA25-1	12
RA25-3a	11	RA25-5	54	RA25-2	12
RA25-4	8	RA25-6	54	RA25-3	11
RA25-5	8	RA25-2	44	RA25-5	11
RA25-6	7	RA25-1	25	RA25-6	11

By recalculating human health risks as performed in the Remedial Investigation after attaining the clean-up goals set forth in Section 2.0, human health risk will be acceptable for both the current site worker and future on-site construction worker under Alternatives RA25-3, RA25-3A, RA25-4, RA25-5, and RA25-6. Human health risk would remain unacceptable for the future on-site construction worker under Alternative RA25-1 and 2 since the remediation of site soils would not be addressed. Supporting human health risk assessment calculations are included in Appendix G.

5.9.3 Other Considerations

5.9.3.1 Short-term Effectiveness

Alternative RA25-1 (No-action) and RA25-2 (Institutional Controls, and Natural Attenuation of Plume) were ranked highest for short-term protection of human health and the environment. Neither of these alternatives require any construction of remedial systems and therefore pose the least risk to the community and on-site workers, and do not create any adverse environmental impacts. These alternatives would however, take longer to achieve the remedial response action objectives than other alternatives evaluated. .
Alternatives RA25-3 (Bioventing of Soil, and Air Sparging of Groundwater), RA25-3A (Bioventing of soil and natural attenuation of groundwater), and RA25-4 (Source Removal, , Off-site Disposal, & Natural Attenuation of groundwater) were rated equally and ranked slightly below alternative RA25-2 (Institutional Controls, and Natural Attenuation of Groundwater Plume,). Alternatives RA25-5 (Source Removal, Off-site Disposal, & Air Stripping of Plume) and RA25-6 (Source Removal, , Off-site Disposal, & Air Sparging of Plume) ranked just below RA25-3 and RA25-4 because they involve excavation of the source soils, which would lower short-term protection to workers, and involve treatment technologies that result in the volatilization of organic contaminants. In general, all the alternatives scored relatively high for short-term protection.

5.9.3.2 Long Term Effectiveness

The criterion of long-term effectiveness addresses the long-term protectiveness to human health and the environment, permanence of the remedial alternative, magnitude of remaining risk and adequacy and reliability of controls. . Alternative RA25-3 (Bioventing of Soil and Air Sparging of Plume) ranked highest for long-term effectiveness because it ranks as a permanent solution, and is considered an on-site treatment. Alternative RA25-3A (Bioventing of soils and natural attenuation of groundwater) ranked just below RA25-3 because of the longer term groundwater monitoring required. Alternatives RA25-2 (Institutional Controls, and Natural Attenuation of Plume),RA25-4 (Source Removal, Off-site Disposal, & Natural Attenuation of Plume), RA25-5 (Source Removal, Off-site Disposal, & Air Stripping of Plume) and RA25-6 (Source Removal, Off-site Disposal, & Air Sparging of Plume) scored lower because they are not considered as on-site treatment, and do not qualify as permanent

5.9.3.3 Reductions

SEAD-25 alternatives were ranked relative to the decreases in the volume/toxicity, mobility, and permanence of the hazardous constituents present at the site.

The No-action alternative (RA-25-1) and RA-25-2 (institutional controls and natural attenuation) ranked the lowest in this category because these alternatives do not effectively reduce the volume, toxicity, or mobility of the hazardous constituents at the site. RA25-3 (Bioventing of soils and air sparging of groundwater) and RA25-3A (Bioventing of soils and natural attenuation) ranked the highest in this category because they both effectively reduce the volume/toxicity and mobility of the hazardous constituents in both soil and groundwater using on-site treatment technologies. RA25-4 (Source removal, off-site disposal and air stripping of groundwater), RA25-5 (Source removal, off-site disposal, and air stripping of groundwater), and RA25-6 (Source removal, off-site disposal, and sparging of groundwater) ranked lower because they rely on a non-destructive technology (excavation) as the remedial action for on-site soils. .

RA25-3 (Bioventing of soil and air sparging of groundwater) and RA25-3A (Bioventing of soil and natural attenuation of groundwater) ranked the highest for reduction in mobility of wastes because they treat both the soils and groundwater and therefore reduce the overall volume of wastes at the site by 90-100%. RA25-4, RA25-5 and RA25-6 do not reduce the mobility of hazardous constituents by at least 60% because of the off-site landfilling of source soils and therefore rank slightly lower in this category. RA25-1 and RA25-2 rank the lowest in this category because they essentially do not effectively treat either soils or groundwater.

All of the alternatives that involve active treatment are considered permanent once the remedial action objectives are met . Alternative RA25-3 (Bioventing of Soil, and Air Sparging of Groundwater Plume)) and RA25-3A (Bioventing of soil and natural attenuation) received the highest ranking because they permanently destroy all the contaminants of concern. The No-action alternative received the lowest score because most of the contaminants are not treated or removed. The remaining alternatives (RA25-2, RA25-4, RA25 5, and RA25-6) received equal ranking because they involve excavation and off-site disposal of soils.

5.9.3.4 Implementability

The alternatives carried to the detailed analysis score well on implementability. For technical implementability , alternatives RA25-1 (No action), RA25-3A (bioventing and natural attenuation) and RA25-4 (excavation and natural attenuation) scored slightly higher than the other alternatives due to the ease of construction (either no construction at all, or no construction to address groundwater contamination). Alternative RA25-2 (Institutional Controls, and Natural Attenuation of Plume) ranked slightly lower since this future remedial action may be necessary. Alternatives RA25-3, 5, and 6 ranked lowest due to the uncertainties associated with air sparging (i.e. mounding, effects of fluctuating groundwater table) and implementing groundwater collection in a collection trench.

The No-action alternative scored lowest for administrative implementability , due to the extensive coordination with EPA and NYSDEC for justification and approval of this remedial alternative. All of the other alternatives were ranked equally as requiring "normal coordination" with agencies and for obtaining necessary permits and approvals.

All the alternatives scored equally for availability of services and materials.

5.9.4 Cost

Capital costs and operating and maintenance costs were estimated for the six remedial action alternatives. Capital costs include those costs for professional labor, treatability study costs, construction and equipment costs, site work, monitoring and testing, and treatment and disposal costs. Operating costs include administrative and professional labor costs, monitoring, and utilities. Administrative costs include the costs for restricting future land use to non-residential. All costs discussed are present worth estimates using a common discount rate of 5%. Table 5-2 summarizes the capital and operating costs for alternatives RA25-1 through RA25-6.

Alternative RA25-1 (No-action) is not considered to have any associated capital or operating costs. This alternative is used as a basis of comparison for all other alternatives. RA25-2 (Institutional Controls, and Natural Attenuation of Plume) ranked highest for costs of the remaining five alternatives other than the no-action alternative. This alternative has no capital construction costs other than fencing and professional labor. Operating costs are for annual groundwater monitoring with a planned life of 150 years. This is based upon groundwater modeling that suggests that concentrations of volatile organics would meet the GA groundwater standards in this time frame by natural attenuation. The total present worth cost for RA25-2 is $524,803. RA25-3 was the next highest ranking alternative for costs after RA25-2 with a total present worth cost of $906,238. Capital costs for this alternative are estimated to be $393,352 and include equipment costs for a soil bioventing system and groundwater air sparging system, treatability studies, site work, professional labor, and engineering design and construction costs. The operating costs include costs for operation of the bioventing system for 5 years and operation of the air sparging system for 10 years. RA25-3A was ranked slightly lower than RA25-3 because the total present worth cost of this remedial action alternative was estimated to be slightly higher at $992,714. The capital costs for this alternative were estimated to be $248,909 which is lower than the capital costs for RA25-3. However, the operating costs were estimated using a planned life of 20 years for monitoring the natural attenuation Off-site soil disposal costs increased the cost of the remaining alternatives above alternatives which incorporated on-site treatment.

5.9.5 Conclusions and Recommendations for Industrial Scenario

The baseline human health risk assessment indicates that under the current and future use of the site, noncarcinogenic human health risk values are not within the EPA target ranges. Therefore, remedial action must be taken. Based on the conclusions in the RI, there is negligible ecological risk at SEAD-25.

All of the alternatives, with the exception of the RA25-1 (No-action) and RA25-2 (institutional controls and natural attenuation), which does not address soils at SEAD-25, will meet the site specific remedial objectives. Table 5-1A shows the reduction in human health risk upon implementation of the remedial alternatives. For the future on-site construction worker, non-carcinogenic risk is reduced from 4 to 0.3 under alternatives RA25-3, -3A, -4, -5, or -6. Alternative RA25-1 and RA25-2 are ruled out since they will not result in acceptable risk to the future on-site construction worker.

Alternative RA25-3 (Bioventing of Soil and Air Sparging of Plume) and RA25-3A (Bioventing of Soil and Natural Attenuation of Plume) rank highest. They ranked highest in terms of ARAR compliance, protectiveness, effectiveness and reductions. RA25-3 ranked higher in effectiveness due to its ability to achieve groundwater ARARs more quickly without long-term monitoring. RA25-3A ranked higher in implementability since air sparging, which may be subject to some technical implementation obstacles is not a part of this alternative. Of the alternatives which result in acceptable human health risk, alternatives RA25-3 and RA25-3A are the least expensive alternatives (RA25-3 is less expensive than RA25-3A).

5.10 RESIDENTIAL ALTERNATIVES

5.10.1 Introduction

According to the Seneca Army Depot Local Redevelopment Authority, and as documented in the Reuse Plan and Implementation Strategy (October, 1997), the intended future use of SEAD-25 is industrial. However, the future residential scenario has been considered in this FS for the following reasons:

1. The area directly east of SEAD-25 is designated as residential.
2. To comply with Army guidance, which states that alternatives consistent with property use without restriction should be considered to compare life-cycle institutional control costs with more conservative clean-up alternatives (DAIM-BO, "Army Guidance for Using Institutional Controls in the CERCLA Process").

As discussed in Section 2.0, to achieve acceptable human health risk under the residential scenario, sediment must be incorporated as a media of concern, in addition to soil and groundwater which were considered under the industrial scenarios. In order to evaluate residential scenarios, the removal of sediment has been incorporated into the two highest ranking alternatives under the industrial scenario. These residential scenarios are presented in this section and compared with their respective industrial alternatives with regards to human health risk and cost only.

5.10.2 Alternative RA25-3R: Bioventing of Soil/Air Sparging of Groundwater/Sediment Removal

Alternative RA25-3R would be implemented exactly as alternative RA25-3 except that sediment from the ditches surrounding SEAD-25 would be excavated and disposed off-site. The quantity of sediment to be removed is defined in Section 2.0 as Case II in Table 2-10. Approximately 370 cubic yards of sediment would be removed from these ditches.

5.10.2.1 Human Health Risk Reduction

As shown in Table 5-1A, human health risk for the future resident would be reduced by removing sediment from the site. Since sediment would be removed from the site, risks from surface water at the site would also be reduced. Non-carcinogenic risk to a child receptor would be reduced from 1 under Alternative RA25-3 to 0.3 under Alternative RA25-3R. Carcinogenic risk would be reduced from 8 x 10^{-4} to within the acceptable EPA target range (5 x 10^{-5}). Supporting risk calculations are provided in Appendix G.

5.10.2.2 Cost

The incremental present worth cost to remove sediment from the site to achieve acceptable human health risk under the residential scenario is $68,403. Capital costs under the residential scenario increase from $393,352 to $480,120 due to excavation and disposal costs. The present worth of annual O&M costs are reduced from $512,886 to $494,521 (reduction of $2,400 per year) due to the elimination of costs associated with restricted use of the site.

5.10.3 Alternative RA25-3AR: Bioventing of Soil/Natural Attenuation of Groundwater/Sediment Removal

Alternative RA25-3AR would be implemented exactly as alternative RA25-3A except that sediment from the ditches surrounding SEAD-25 would be excavated and disposed off-site. The quantity of sediment to be removed is defined in Section 2.0 as Case II in Table 2-10. Approximately 370 cubic yards of sediment would be removed from these ditches.

5.10.3.1 Human Health Risk Reduction

As shown in Table 5-1A, human health risk for the future resident would be reduced by removing sediment from the site. Since sediment would be removed from the site, risks from surface water at the site would also be reduced. Non-carcinogenic risk to a child receptor would be reduced from 1 under Alternative RA25-3A to 0.3 under Alternative RA25-3AR. Carcinogenic risk would be reduced from 8 x 10^{-4} to within the acceptable EPA target range (5 x 10^{-5}). Supporting risk calculations are provided in Appendix G.

5.10.3.2 Cost

The incremental present worth cost to remove sediment from the site to achieve acceptable human health risk under the residential scenario is $57,733. Capital costs under the residential scenario increase from $248,909 under the industrial scenario to $336,281 due to excavation and disposal costs. The present worth of annual O&M costs are reduced from $743,805 to $714,166 (reduction of $2,400 per year) due to the elimination of costs associated with restricted use of the site.

6.0 DETAILED ANALYSIS OF SEAD-26 ALTERNATIVES

6.1 GENERAL

For SEAD-26, RA26-1 through RA26-4 have been retained for detailed analysis. Further definition of each alternative is presented and the same criteria used in **Section 3.0** is applied to evaluate these alternatives. The results of detailed screening are presented in **Table 6-1**. Proposed remedial alternatives were screened using the detailed alternative ranking tables provided in the NYSDEC TAGM—"Selection of Remedial Actions at Inactive Hazardous Waste Sites." Cost estimate summaries are provided for each alternative in **Table 6-2**. More detailed cost information is in **Appendix D**.

Since based on the conclusions of the baseline risk assessment for SEAD-26, human health risk is presently within EPA target ranges for both the intended future use of the site (industrial), as well as the future residential scenario. Therefore, the alternatives analyzed in this section are considered to be applicable for both the industrial and residential scenario.

6.2 ANALYSIS OF RA26-1 NO-ACTION

6.2.1 Definition of Alternative RA26-1

The No-action alternative means that no remedial activities will be undertaken at the site. No monitoring or security measures will be undertaken other than those currently implemented at the site. Any attenuation of the threats posed by the site to human health and the environment would be the result of natural processes. Groundwater monitoring activities have previously included quarterly monitoring of approximately 11 wells in place at the site but will not continue under this alternative. Current security measures include the SEDA-wide security activities which effectively eliminates public access to the area. This is required because the site is located within the area of the facility which includes the storage of munitions. Access to the this site will be limited as long as SEDA is active. If SEDA is deactivated, munitions will no longer be stored. Security activities are part of normal base activities and will continue while this parcel is under Army control. However, the costs associated with security activities and groundwater monitoring are not included as part of this alternative.

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

6.2.2 Protectiveness

The protectiveness of this and all alternatives are assessed with regards to short- and long-term protectiveness to both human health and the environment. The Baseline Risk Assessment (BRA) performed as part of the Remedial Investigation (RI) indicates that, in the short-term, the No-action alternative is protective of human health, since the calculated carcinogenic risk for current site workers is 1.1×10^{-6}, which is at the lower end of the EPA target risk range (1.0×10^{-4}—1.0×10^{-6}). The non-carcinogenic risk HI of 0.004 is less than the 1.0 criterion and is protective of human health. Since the current SEDA security measures prevent public access to the site, there is little or no risk to the public because there is no exposure. According to the baseline risk assessment, ecological risk at this site is negligible.

The No-action alternative provides long-term protectiveness of human health. As described in the BRA portion of the RI report, the intended future long term land use of the site is as an industrial land parcel. Under the current and intended future land use scenario, the BRA indicated that, the on-site concentrations are protective of human health in the future.

6.2.3 Reductions

Current site conditions indicate that reductions in the concentrations of the impacted soil, and groundwater at the site can be expected. Natural attenuation and degradation, through biological, photochemical and physical interactions between the constituents of concern and the soil/groundwater system have decreased the concentrations of pollutants in the soil. For chlorinated and heavier organic solvents, which show no sign of migrating to the groundwater, these decreases take longer.

6.2.4 Permanence

Natural attenuation processes are expected to gradually and permanently reduce the concentrations and toxicity of the BTEX compounds in the groundwater. However, this reduction would not be monitored under this alternative.

6.2.5 Compliance with ARARs

This alternative complies with the chemical- and location-specific ARARs specified in **Appendix C**. Under the no-action alternative, reductions in BTEX concentrations in groundwater to ARAR levels can be expected in the future. There are no promulgated soil standards to use as ARARs for comparison with on-site soil and sediment concentrations.

6.2.6 Implementability

The criterion of implementability is not applicable to the no-action alternative since there are no activities occurring. There would still be security activities, as described above, as well as some administrative requirements but these activities are performed as part of the existing security program because this is an active military installation. These peripheral activities are already occurring and will continue until the intended use of the site changes.

6.2.7 Cost

There are no costs associated with the no-action alternative. The costs associated with the monitoring and security described above are covered through other mechanisms, and are not directly attributable to this remedial action.

6.3 ANALYSIS OF RA26-2 INSTITUTIONAL CONTROLS AND NATURAL ATTENUATION OF PLUME

6.3.1 Definition of Alternative RA26-2

The institutional control and natural attenuation of plume alternative involves groundwater monitoring of natural attenuation of the groundwater plume. The groundwater plume will be treated through natural attenuation. This option includes groundwater monitoring similar to the program currently implemented at the site. Current monitoring activities include quarterly monitoring of a number of wells in place at the site. Current security measures include the SEDA-wide security activities which effectively eliminate public access to the area. Cost estimates were prepared for 40 years of groundwater monitoring. Costs associated with security activities are not included as part of this alternative for reasons similar to RA25-1.

6.3.2 Protectiveness

The protectiveness of this and all alternatives will be assessed with regard to short- and long-term protectiveness to both human health and the environment. The RI indicated that, in the short-term, the no-action alternative is currently protective of human health. No migration of the contaminated groundwater has been observed. Only one well was found to be impacted by

VOCs. There is no current use of the shallow groundwater at SEAD-26, and there are no plans to use this groundwater for drinking water in the near future.

Another item to consider is time to completion. Modeling of the site (**Appendix E**) predicted that BTEX concentrations would meet ARARs in 20 years. The model parameters were highly conservative and natural attenuation of the groundwater should take less than the model's estimate.

The natural attenuation alternative will provide long-term protectiveness of human health and the environment, however, there is some uncertainty associated with long term protectiveness since off-site land use cannot be controlled. To date, the groundwater contamination is limited to one well and is not expected to migrate off-site. The Army intends to maintain a groundwater monitoring program and ensure that public health and the environment are protected, using institutional controls if necessary. As described in Section 7.0 of the baseline risk assessment (BRA) conducted for the RI report, the future long term land use of the site included a site construction worker assuming some construction activities could occur at this inactive site.

6.3.3 Reductions

Overtime, there will be a reduction in the VOC concentrations in groundwater to levels below the NY State GA standards, and thus, there would be a reduction in toxicity of the impacted groundwater at the site. Natural attenuation can be expected, through dispersal of the hazardous constituents in the groundwater and natural biodegradation. Additionally, the volume of impacted groundwater is expected to decrease over time.

6.3.4 Permanence

The natural attenuation alternative does provide a permanent solution to groundwater contamination over the course of time..

6.3.5 Compliance with ARARs

The natural attenuation alternative does comply with chemical-specific ARARs. Over time, the concentrations of VOCs in groundwater will be reduced to below the NY State GA standards. A list of the ARARs for this alternative are in **Appendix C**.

6.3.6 Implementability

Security activities, that would prevent on-site exposure. The concentrations of pollutants in several monitoring wells will be monitored in a manner similar to the current groundwater monitoring program. The land use will be restricted and residential development will be prohibited. These institutional controls will eliminate exposure and, therefore, maintain acceptable risk.

6.3.7 Cost

The costs associated with the natural attenuation alternative include monitoring costs. Since security is provided for the entire base this cost is not be directly attributable to this remedial action. The present worth cost of 40 years of quarterly monitoring is estimated to be $436,200. Capital costs for fencing and controls is $205,224. The total present worth cost of this alternative is $641,387. A contingency of 20% on the capital costs has been incorporated into this cost estimate.

6.4 ANALYSIS OF RA26-3 AIR SPARGING OF PLUME

6.4.1 Definition of Alternative RA26-3

Alternative RA26-3 involves injecting air into the well that exceeded ARARs for VOCs (well MW26-7). Vertical piping into the existing well will be used to deliver air to the groundwater. The air promotes volatilization of the organic constituents in the groundwater, and also promotes aerobic biodegradation. Due to the low concentration of organics in the groundwater there is not a need for vapor recovery wells, or off gas treatment. Periodic groundwater monitoring will be used to assess the progress of the treatment.

6.4.2 Protectiveness

The short- and long-term protectiveness to both human health and the environment must be considered. The following discussion will show how this alternative meets these criteria.

Short-term Protectiveness

Several items are included in an assessment of the short-term protectiveness of Alternative RA26-3. The first issue is protection of the community during the remedial action. This alternative, like all the other alternatives, is protective of the community. The remediation will be designed and implemented such that any air emissions generated by the air sparging system will be below all EPA and NYSDEC air quality standards.

Protection from exposure can be minimized through site access controls and the use of proper protective equipment for site workers, such as respirators, dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of vapors or particulates. Dust generation at the excavation can be minimized by using water or other dust control chemicals. It should also be noted that all the site workers will be required to meet all the OSHA training and medical monitoring requirements prior to working on-site.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. There will be few environmental impacts. As described above, there is little potential for release of hazardous constituents during the construction of the air sparging system. There are no sensitive environments which will be disturbed by the construction activities.

The last item to be considered is the time until treatment is accomplished. It is very difficult to assess the length of time required to treat the groundwater to the required concentration. It may be necessary to run the air sparging system for 10 years. Given the VOC concentration in the groundwater, this is a highly conservative estimate. Construction and start-up of the air sparging system should take 1 to 2 months.

Long-term Protectiveness

The assessment of the long-term protectiveness of Alternative RA26-3 can be divided into two major 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.

The treatment system will be run until the concentrations of BTEX in the groundwater are below the NYSDEC criteria for Class GA groundwaters. There will be little or no treatment residuals. Any soils removed from the drainage ditch will be disposed of off-site. Thus, this alternative ranked highly for long-term protectiveness.

6.4.3 Reductions

Alternative RA26-3 would be effective in reducing the mobility, volume, and toxicity of the hazardous constituents present at the site. Air sparging will reduce the volume of contaminated groundwater through in situ treatment. The toxicity of the constituents present in the groundwater will be diminished through aerobic biodegradation and volatilization form in the aquifer.

6.4.4 Permanence

The permanence of the alternative must also be assessed. Once the groundwater at the site meets the treatment criteria, the remedial action would be considered permanent.

6.4.5 Compliance with ARARs

Alternative RA26-3 will comply with all ARARs. A list of the ARARs for this site is in **Appendix C**.

6.4.6 Implementability

A discussion of implementability can be divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, 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.

Technical Feasibility

The technical feasibility of Alternative RA26-3 is average due to the uncertainties associated with an innovative in situ technology. The basis of this technology is the volatility of BTEX dissolved in the groundwater. Air is bubbled into the bottom of well MW26-7 which will cause the dissolved volatile solvents to undergo a phase transfer from the liquid phase to the gaseous phase. Given the low concentrations of BTEX, a vacuum collection system is not required. Air sparging systems are easy to implement, especially one as fundamental as what is required at SEAD-26. Hydraulically, there is the potential to cause the groundwater to mound in the area surrounding the well due to the increase in pressure from the sparging system. This may cause the groundwater plume to spread around the well.

Another aspect of technical feasibility is the ease with which additional work may be conducted. This technology will not interfere with other remedial activities.

Administrative Feasibility

The administrative feasibility of this alternative is good. There will be few air emissions from the sparging system due to the low VOC concentrations present. Construction permits necessary for the activities are readily attainable.

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

Availability of Services and Materials

The materials and services necessary to accomplish this alternative are readily available. All of the equipment necessary for this technology is standard.

6.4.7 Cost

The capital costs are estimated to be $315,723. A 20% contingency cost has been added to the capital cost estimate. However, the cost estimate for this alternative probably has a higher degree of uncertainty than others due to the need to perform treatability testing prior to implementation of air sparging. The capital cost includes $ 52,000 to conduct the required treatability studies. Annual O&M costs for the system are estimated to be $51,200. The present worth cost of 10 years of air sparging and groundwater monitoring is $395,200. The total present worth costs for Alternative RA26-3 are estimated to be $710,918. The present worth cost for this system were estimated with a 5% escalation rate and assumes a 10 year groundwater treatment and testing time.

6.5 ANALYSIS OF RA26-4 AIR STRIPPING OF PLUME

6.5.1 Definition of Alternative RA26-4

Alternative RA26-4 is the only "pump-and-treat" alternative. This alternative consists of the installation of a pump which will be used to extract the groundwater around the BTEX impacted well (MW26-7) and deliver it to a treatment unit.

The treatment process is shown in **Figure 5-4**. The first step in the treatment train is an equalization/settling tank. An equalization tank is used to minimize the flow fluctuations going to the treatment unit which are due to seasonal variations in precipitation. It is estimated that a 5,000 gallon tank will be appropriate. The tank will also provide settling capacity. It is anticipated that iron and other metals will begin to precipitate once the groundwater is exposed to oxygen. An overflow weir in the tank will allow the precipitated metals to be removed from the process train. The next step in the treatment process is an inline filter for suspended solids removal. The filter will be followed with a hardness removal unit. An industrial water softener will remove calcium and other minerals from the groundwater. This is an important step because the minerals in groundwater tend to foul the various treatment units.

The next step in the process is the treatment unit. This alternative relies on an air stripper for removing organics from groundwater. An air stripper uses a countercurrent air stream to extract volatile organics from water. The stripper usually consists of a tower which is filled with trays, plates, or packing material. This devices increase the surface area of contact between the water and the air. The size of the tower is based on the nature of the contaminants and the discharge requirements. The treated water is then discharged. Given the low concentrations of VOCs, air treatment will not be necessary to meet NYSDEC air standards.

The treated water may be passed through a liquid phase carbon unit and discharged to the drainage ditches adjacent to the patrol roads, eventually being discharged to Kendaia Creek. The carbon unit is not necessary to meet the treatment objectives, but may be used for polishing and protection during process upsets.

6.5.2 Protectiveness

An evaluation of the criterion of protectiveness addresses several issues. The short- and long-term protectiveness to both human health and the environment has been considered. The following discussion will illustrate how this alternative meets these criteria.

Short-term Protectiveness

The first issue in short-term protectiveness is protection of the community during the remedial action. This alternative is protective of the community.

The short-term protectiveness to site workers has also been considered. It is likely that some level of personal protective equipment will be necessary to minimize worker exposure.

Protection from exposure can be minimized through site access controls and the use of proper protective equipment for site workers, such as respirators, dust masks and Tyvek protective clothing. Air monitoring may be used to determine if there is a significant threat from the inhalation of vapors or particulates. Dust generation at the excavation can be minimized by using water or other dust control chemicals. It should also be noted that all the site workers will be required to meet all the OSHA training and medical monitoring requirements prior to working on-site.

Another part of the short-term protectiveness criterion is assessing the environmental impacts during the remedial action. As described above, there is little potential for release of hazardous constituents during the excavations. There are no sensitive environments which will be disturbed by the construction activities. Thus, there will be few environmental impacts.

The last item to be considered is the time until treatment is accomplished. It is difficult to assess the length of time required to treat the groundwater to the required concentration. However, an initial estimate indicates that it may be necessary to run the air stripper for 10 years which is a highly conservative estimate.

Long-term Protectiveness

The assessment of the long-term protectiveness of Alternative RA26-4 can be divided into two major 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.

The treatment system will be run until the concentrations of BTEX in the groundwater are below the NYSDEC criteria for Class GA groundwaters. There will be little or no treatment residuals. The only potential treatment residual is spent activated carbon; if carbon is used to polish the liquid stream. This carbon would be sent off-site for regeneration or disposal.

6.5.3 Reductions

Alternative RA26-4 would effectively reduce the mobility, toxicity, and volume of the hazardous constituents present at the site. The volume of contaminated groundwater will decrease over time as the organics are removed.

The extent of groundwater contamination to date indicates that migration of contaminated groundwater off-site is highly unlikely.

6.5.4 Permanence

The permanence of the alternative has also been assessed. Once the groundwater at the site meets the treatment criteria, the remedial action would be considered permanent. There will be minimal treatment residues, and these residues can be treated and/or disposed of off-site.

6.5.5 Compliance with ARARs

Alternative RA26-4 will comply with all ARARs. A list of the ARARs for this site is in **Appendix C**.

6.5.6 Implementability

The discussion of implementability is divided into three sections, technical feasibility, administrative feasibility, and availability of services and materials. Technical feasibility describes items such as construction and operation, technology reliability, 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 off-site disposal capacity.

Technical Feasibility

The technical feasibility of Alternative RA26-4 is high. Air stripping is a proven technology for volatile organic compounds, and BTEX compounds are volatile.

Another aspect of technical feasibility is the ease with which additional work may be conducted. This technology will not interfere with any future remedial activities, since it is a very unobtrusive approach.

Administrative Feasibility

The administrative feasibility of this alternative is very good. Construction permits necessary for the activities are readily attainable.

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

Availability of Services and Materials

Materials and services necessary to accomplish this alternative are readily available. All of the equipment necessary for this technology is standard. The excavation and treatment equipment is readily available from a number of contractors.

6.5.7 Cost

Capital costs for Alternative RA26-4 are estimated to be $358,211. A 20% contingency cost has been added to the cost estimate for each alternative. It should be noted that depending on whether RA25-4, 5, or 6 is chosen at SEAD-25, the air stripping unit could be used to treat the groundwater extracted from SEAD-26, saving most of the capital costs associated with this alternative.

Annual O&M costs, including quarterly groundwater monitoring, are estimated to be $57,400. Assuming a 5% escalation rate, the 10 year present worth O&M costs are $443,400. This includes energy, equipment maintenance, and replacement of spent carbon and filter beds. The total present worth costs for Alternative RA26-4 is the sum of the O&M present worth cost and the capital costs, which has been estimated to be $801,613.

6.6 COMPARATIVE ANALYSIS OF ALTERNATIVES

6.6.1 Introduction

The purpose of this section is to compare each of the alternatives to each other with respect to the specific evaluation criteria. The following discussion will rate each of the alternatives with regard to the evaluation criteria and identify the relative advantages and disadvantages of each. This comparison will provide the information necessary to choose the most appropriate 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 and includes compliance with ARARs. The next group considers 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. **Table 6-1** presents a summary of the analysis of each alternative in terms of the criteria. **Table 6-2** summarizes the costs associated with each alternative. **Table 6-3** lists the alternatives in order of decreasing conformance to requirements for each of the following categories: cost, effectiveness and implementability.

6.6.2 Threshold Criteria

The first two criteria are overall protection of human health and the environment and compliance with ARARs. These are called threshold criteria because each alternative must meet these in order to be carried through the process. With the exception of the No-Action alternative, which was retained for comparative purposes, all the alternatives were rated highly for ARAR compliance and protectiveness of human health and the environment. While the more aggressive alternatives will achieve ARAR compliance sooner than approaches employing natural mechanisms, all are expected to comply with ARARs and clean-up goals. The No-action alternative scored poorly for protection of the environment due to the lack of monitoring incorporated into this alternative.

6.6.3 Other Considerations

6.6.3.1 Short Term Effectiveness

Alternative RA26-1 (No-action) ranked highest in terms of short-term protection of human health and the environment. This is due to the low risk to human health and the environment that the site currently poses. Administrative and land use controls currently in place also contribute to the short-term effectiveness. Alternatives RA26-2 through RA26-4 were rated equally in terms of short term effectiveness. They were ranked slightly lower due to the time required to implement the remedy. RA26-2 (Institutional Controls, Natural Attenuation of Plume) is expected to take 36 years to meet ARAR levels for BTEX in groundwater. Alternative RA26-3 (Air Sparging of Plume) and RA26-4 (Air Stripping of Plume) were also ranked slightly lower than the No-action alternative due to the potential treatment time.

6.6.3.2 Long Term Effectiveness

The criterion of long-term effectiveness addresses the long-term protectiveness to human health and the environment. Most of the evaluated alternatives are highly effective in eliminating the long-term threats. The results of the BRA indicate that for current and intended future use of this site, the risks are within the EPA target range for carcinogenic risks and below the acceptable target value for non-carcinogenic risks. There is no requirement to perform a risk-based remedial action since current site conditions are protective of human health. The environmental risk assessment concluded there was negligible risk at SEAD-26 to the environment. Because BTEX compounds exceed ARARs in the groundwater, the no-action alternative is not protective of the environment and ranked lowest. Alternative RA26-2 through RA26-4 were rated equally for long term effectiveness. All are expected to achieve clean-up goals and provide permanent solutions.

6.6.3.3 Reductions

Alternatives have been compared relative to the decreases in the volume/toxicity, mobility, and permanence of the hazardous constituents present at the site.

With the exception of RA26-1 (No-action), all the alternatives received the same score for volume/toxicity reduction. The No-action alternative was ranked lowest because there no-action taken to monitor ARAR exceedances. All of the other alternatives effectively reduce the volume and/or toxicity of contaminants at the site. However, the No-action alternative will not monitor contaminants on-site, whereas the other alternatives will be shown to meet clean-up goals prior to their completion. The primary difference between the alternatives is the time to achieve the reductions. According to groundwater modeling results (**Appendix E**), Alternative RA26-2 (Institutional Controls, Natural Attenuation of Plume) will reduce BTEX levels in groundwater to clean-up goal levels in 20 years. Alternative RA26-3 (Air Sparging of Plume) and RA26-4 (Air Stripping of Plume) are expected meet the clean-up goals sooner (conservatively estimated at 10 years).

The No-action alternative scored lowest for reduction in mobility because when the alternative is complete, there will still be contaminants in the groundwater capable of migrating off-site. However, even with No-action, off-site migration is unlikely. The remaining alternatives scored equally because they all prevent the migration of contaminants off-site.

In terms of permanence, the no-action alternative was rated lowest due to the lack of destruction of contaminants upon completion. The remaining alternatives effectively provide permanent destruction of the contaminants of concern once the remedial action objectives have been obtained.

6.6.3.4 Implementability

The alternatives carried to the detailed analysis score well on implementability. For technical feasibility, alternative RA26-1 (No-action) scored highest due the lack of technical concerns. Alternative RA26-2 (Institutional Controls, Natural Attenuation of Plume) rated slightly lower than the No-action alternative due to the uncertainties associated with natural biodegradation of contaminants in groundwater. Alternative RA26-3 (Air Sparging of Plume) and RA26-4 (Air Stripping of Plume) were rated lower due to the difficulties associated with setting up the groundwater treatment system.

The No-action alternative scored lowest for administrative feasibility, due to the difficulties expected in receiving administrative acceptance of a "no-action" solution at this site. ARAR exceedances would be difficult for administrative authorities to overlook. All of the other alternatives were rated as "required coordination is normal" because each option can be expected to require coordination with other offices and agencies (e.g., obtaining permits for off-site activities or rights-of-way for construction).

All the alternatives scored equally high on the issue of availability of services and materials. None of the alternatives pose a challenge from this standpoint.

TABLE 6-1
SENECA ARMY DEPOT
SEAD-25 and 26 FEASIBILITY STUDY

SCREENING OF SEAD-26 REMEDIAL ALTERNATIVES

ALT.	TECHNOLOGY AND PROCESSES	EFFECTIVENESS							IMPLEMENTABILITY			COST	TOTAL SCORE
		ARAR Compliance	ROTECTIVENESS of Human Health and Environment	EFFECTIVENESS		REDUCTIONS							
				Short-term	Long-term	Vol./ Tox.	Mob.	Perm.	Technical Feasibility	Admin. Feasibility	Availability	Present Worth	
RA26-1	No action	3	12	10	3	2	0	0	10	0	3	15	58
RA26-2	Institutional Controls/Natural Attenuation	10	20	9	12	9	2	3	9	1	3	14	92
RA26-3	Air Sparging Plume	10	20	9	12	9	2	3	8	1	3	12	89
RA26-4	Air Stripping Plume	10	20	9	12	9	2	3	8	1	3	11	88

Table 6-2

Cost Summary for SEAD-26 Remedial Alternatives

Alternative	Capital Costs	Present Worth O&M Costs	Total Present Worth Cost
RA26-1	$0	$0	$0
RA26-2	$205,200	$436,200	$641,400
RA26-3	$315,700	$395,200	$710,900
RA26-4	$358,200	$443,400	$801,600

Table 6-3

Remedial Alternatives Ranking

Cost		Effectiveness		Implementability	
Alternative	Score	Alternative	Score	Alternative	Score
RA26-1	15	RA26-2	65	RA26-1	13
RA26-2	14	RA26-3	65	RA26-2	13
RA26-3	12	RA26-4	65	RA26-3	12
RA26-4	11	RA26-1	30	RA26-4	12

6.6.4 Cost

The last criterion to compare is cost. This comparison evaluated the present worth costs of the alternatives. The capital, present worth annual, and total present worth costs are presented in **Table 6-2**.

The least expensive alternative is RA26 (No-action) which has no costs associated with it. RA26-2 (Institutional Controls, Natural Attenuation of Plume) rated second in terms of cost because it only involves natural attenuation. These tasks can be performed by local vendors with local materials. The most expensive alternative is the RA26-4 (air stripping of plume) due to the present worth costs of constructing an air stripping system. However, if an alternative employing air stripping is selected for SEAD-25, the possibility of transporting the small volume of contaminated groundwater from SEAD-26 to the SEAD-25 treatment unit should be considered. Due to the limited level of groundwater contamination present at the site, the O&M costs for the air sparging alternative is relatively low.

6.6.5 Conclusions and Recommendations

As described above, all of the alternatives described in the detailed analysis would be effective for the use of SEAD-26 as an industrial site.

Because the contaminants of concern are organic, all of the alternatives are capable of meeting clean-up objectives over time. In a comparison of Remediation Alternatives, the RA26-1 and RA26-2 rate the lowest in addressing ecological risk and ARARs. While the No-action alternative scored highest for technical implementability, none of the alternatives pose a challenge from a technical standpoint. Alternatives RA26-2, 3, and 4 scored fairly equally in every category except for cost, where alternative RA26-4 (Air Stripping of Plume) was rated lowest. As mentioned previously, if an air stripping unit is set up at SEAD-25, the possibility of transporting the small volume of SEAD-26 contaminated groundwater to SEAD-25 should be addressed. This would greatly increase the attractiveness of RA26-4.

Alternatives RA26-2, 3, and 4 take steps to comply with ARARs and are protective of the environment. The three alternatives rank equally for long-term protectiveness of human health and the environment. That is, the alternatives are effective in reducing the concentration of constituents of concern to below the NYSDEC GA or Federal standards and protecting off-site receptors. RA26-2, 3, and 4 rank equally in reducing toxicity, mobility, and volume of hazardous constituents. The difference between the alternatives is the time-to-compliance.

Based on the results of the detailed analysis, none of the remedial actions can be ruled out. Alternative RA26-2 (Institutional Controls, Natural Attenuation of Plume) was rated highest overall.

Appendix A
Screening Data Sheets

Appendix A

SEAD-25 Preliminary Screening Data Sheets

Table A-1

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-1 (No-action)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**	1	1
		>2 yr.		0
Subtotal (maximum = 2)		**2**		
4. On-site or off-site treatment or land disposal	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (maximum = 3)		**0**		

*treatment is defined as destruction or separation/
treatment or solidification/chemical fixation of inorganic wastes.

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
5. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 7.	**Yes**		3
		No	0	0
		0		

Table A-1 (cont'd)

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-1 (No-action)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%		2
		25-50%		1
		> or = 50%	0	0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**	0	0
		No		2
	iii) Is the treated residual toxic?	**Yes**	0	0
		No		1
	iv) Is the treated residual mobile?	**Yes**	0	0
		No		1
Subtotal (maximum = 5)		**0**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**	1	1
		>5 yr.		0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**	2	2
		Moderate		1
		Extensive		0
Subtotal (maximum = 4)		**4**		
Total (maximum = 25)			**17**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-1

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-2 (Institutional controls, natural attenuation)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**	1	1
		>2 yr.		0
Subtotal (maximum = 2)		**2**		
4. On-site or off-site treatment or land disposal	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (maximum = 3)		**0**		

*treatment is defined as treatment or solidification/

chemical fixation of inorganic wastes

Table A-1 (cont'd)

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-2 (Institutional controls, natural attenuation)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%		2
		25-50%		1
		> or = 50%	0	0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**	0	0
		No		2
	iii) Is the treated residual toxic?	**Yes**	0	0
		No		1
	iv) Is the treated residual mobile?	**Yes**	0	0
		No		1
Subtotal (maximum = 5)		**0**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**		1
		>5 yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate		1
		Extensive	0	0
Subtotal (maximum = 4)		**1**		
Total (maximum = 25)			**14**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-1

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-3 (Bioventing of soils, air sparging of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**		1
		>2 yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**0**		
4. On-site or off-site treatment or land disposal	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (maximum = 3)		**3**		

*treatment is defined as treatment or solidification/

chemical fixation of inorganic wastes

Table A-1 (cont'd)

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-3 (Bioventing of soils, air sparging of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%	2	2
		25-50%		1
		> or = 50%		0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**		0
		No	2	2
	iii) Is the treated residual toxic?	**Yes**		0
		No		1
	iv) Is the treated residual mobile?	**Yes**		0
		No		1
Subtotal (maximum = 5)		**4**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**		1
		>5 yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate	1	1
		Extensive		0
Subtotal (maximum = 4)		**2**		
Total (maximum = 25)			**20**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-1

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-3a (Bioventing of soils, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**		1
		>2 yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**0**		
4. On-site or off-site treatment or land disposal	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (maximum = 3)		**3**		

*treatment is defined as treatment or solidification/

chemical fixation of inorganic wastes

Table A-1 (cont'd)

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-3a (Bioventing of soils, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%	2	2
		25-50%		1
		> or = 50%		0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**		0
		No	2	2
	iii) Is the treated residual toxic?	**Yes**		0
		No		1
	iv) Is the treated residual mobile?	**Yes**		0
		No		1
Subtotal (maximum = 5)		**4**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**		1
		>5 yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate	1	1
		Extensive		0
Subtotal (maximum = 4)		**2**		
Total (maximum = 25)			**20**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-1

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-4 (Source removal, off-site disposal, natural attenuation)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**1**		
4. On-site or off-site treatment or land disposal	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (maximum = 3)		**0**		

*treatment is defined as treatment or solidification/ chemical fixation of inorganic wastes

Table A-1 (cont'd)

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-4 (Source removal, off-site disposal, natural attenuation)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%	2	2
		25-50%		1
		> or = 50%		0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**		0
		No	2	2
	iii) Is the treated residual toxic?	**Yes**		0
		No		1
	iv) Is the treated residual mobile?	**Yes**		0
		No		1
Subtotal (maximum = 5)		**4**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**		1
		>5 yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate	1	1
		Extensive		0
Subtotal (maximum = 4)		**2**		
Total (maximum = 25)			**18**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-1

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-5 (Source removal, off-site disposal, air stripping of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**1**		
4. On-site or off-site treatment or land disposal	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (maximum = 3)		**0**		

*treatment is defined as treatment or solidification/

chemical fixation of inorganic wastes

Table A-1 (cont'd)

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-5 (Source removal, off-site disposal, air stripping of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**	3	3
		< or = 25%		2
		25-50%		1
		> or = 50%		0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**		0
		No	2	2
	iii) Is the treated residual toxic?	**Yes**		0
		No		1
	iv) Is the treated residual mobile?	**Yes**		0
		No		1
Subtotal (maximum = 5)		**5**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**		1
		>5 yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate	1	1
		Extensive		0
Subtotal (maximum = 4)		**2**		
Total (maximum = 25)			**19**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-1

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-6 (Source removal, off-site disposal, air sparging of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**1**		
4. On-site or off-site treatment or land disposal	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (maximum = 3)		**0**		

*treatment is defined as treatment or solidification/

chemical fixation of inorganic wastes

Table A-1 (cont'd)

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-25
RA25-6 (Source removal, off-site disposal, air sparging of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**	3	3
		< or = 25%		2
		25-50%		1
		> or = 50%		0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**		0
		No	2	2
	iii) Is the treated residual toxic?	**Yes**		0
		No		1
	iv) Is the treated residual mobile?	**Yes**		0
		No		1
Subtotal (maximum = 5)		**5**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**		1
		>5 yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate	1	1
		Extensive		0
Subtotal (maximum = 4)		**2**		
Total (maximum = 25)			**19**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-2

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-1 (No action)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**9**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.			1
	iii) Extensive coordination is required.		0	0
Subtotal (maximum = 2)		**0**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-2 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-1 (No action)

Analysis Factor	Basis for Evaluation During Preliminary Screening		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** 1 **No**	1 0

Subtotal (maximum = 3) **3**

TOTAL (maximum = 15) **12**

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-2

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-2 (Institutional controls, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**9**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.			1
	iii) Extensive coordination is required.		0	0
Subtotal (maximum = 2)		**0**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-2 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-2 (Institutional controls, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** 1 **No**	1 0
Subtotal (maximum = 3)		**3**	
TOTAL (maximum = 15)		**12**	

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-2

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-3 (Bioventing of soil, air sparging of plume)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**6**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)		**1**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-2 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-3 (Bioventing of soil, air sparging of plume)

Analysis Factor	Basis for Evaluation During Preliminary Screening		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** 1 **No**	1 0
Subtotal (maximum = 3)		**3**	
TOTAL (maximum = 15)		**10**	

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-2

IMPLEMENTABILITY
(Maximum Score = 1[illegible])

SEAD-25
RA25-3a (Bioventing of soil, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**6**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)		**1**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-2 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-3a (Bioventing of soil, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** 1 **No**	1 0
Subtotal (maximum = 3)		**3**	
TOTAL (maximum = 15)		**10**	

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-2

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-4 (Source removal, off-site disposal, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)		**10**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)		**1**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-2 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-4 (Source removal, off-site disposal, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** 1 **No**	1 0
Subtotal (maximum = 3)		**3**	
TOTAL (maximum = 15)		**14**	

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-2

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-5 (Source removal, off-site disposal, air stripping of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**7**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)		**1**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-2 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-5 (Source removal, off-site disposal, air stripping of groundwater)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes**		1
		No	0	0

Subtotal (maximum = 3) **2**

TOTAL (maximum = 15) **10**

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-2

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-6 (Source removal, off-site disposal, air sparging of plume)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**7**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)		**1**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-25
RA25-6 (Source removal, off-site disposal, air sparging of plume)

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** **No**	 0	1 0
Subtotal (maximum = 3)		**2**		
TOTAL (maximum = 15)			**10**	

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-1

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**	1	1
		>2 yr.		0
Subtotal (maximum = 2)		**2**		
4. On-site or off-site treatment or land disposal	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (maximum = 3)		**0**		

*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes

5. Permanence of the remedial alternative.	Will the remedy by classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 7.)	**Yes**		3
		No	0	0
Subtotal (maximum = 3)		**0**		

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-1

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%		2
		25-50%		1
		> or = 50%	0	0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**	0	0
		No		2
	iii) Is the treated residual toxic?	**Yes**	0	0
		No		1
	iv) Is the treated residual mobile?	**Yes**	0	0
		No		1
Subtotal (maximum = 5)		**0**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**	1	1
		>5 yr.		0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**	2	2
		Moderate		1
		Extensive		0
Subtotal (maximum = 4)		**4**		
Total (maximum = 25)			**17**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-2

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**1**		
4. On-site or off-site treatment or land disposal	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (maximum = 3)		**3**		
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes				
5. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 7.)	**Yes**	3	3
		No		0
Subtotal (maximum = 3)		**3**		

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-2

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%		2
		25-50%		1
		> or = 50%	0	0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**	0	0
		No		2
	iii) Is the treated residual toxic?	**Yes**	0	0
		No		1
	iv) Is the treated residual mobile?	**Yes**	0	0
		No		1
Subtotal (maximum = 5)		**0**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**		1
		>5 yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate		1
		Extensive	0	0
Subtotal (maximum = 4)		**1**		
Total (maximum = 25)			**19**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-3

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**1**		
4. On-site or off-site treatment or land disposal	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (maximum = 3)		**3**		
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes				
5. Permanence of the remedial alternative.	Will the remedy by classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 7.)	**Yes**	3	3
		No		0
Subtotal (maximum = 3)		**3**		

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-3

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%		2
		25-50%		1
		> or = 50%	0	0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**	0	0
		No		2
	iii) Is the treated residual toxic?	**Yes**	0	0
		No		1
	iv) Is the treated residual mobile?	**Yes**		0
		No	1	1
Subtotal (maximum = 5)		**1**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**	1	1
		>5 yr.		0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate		1
		Extensive	0	0
Subtotal (maximum = 4)		**2**		
Total (maximum = 25)			**21**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-3

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If the answer is no, go to Factor 2.)	**Yes**		0
		No	4	4
	Can the short-term risk be easily controlled?	**Yes**		1
		No		0
	Does the mitigative effort to control short-term risk impact the community life-style?	**Yes**		0
		No		2
Subtotal (maximum = 4)		**4**		
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (if answer is no, go to Factor 3.)	**Yes**		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	**Yes**		3
		No		0
Subtotal (maximum = 4)		**4**		
3. Time to implement the remedy.	What is the required time to implement the remedy?	**< or = 2 yr.**	1	1
		>2 yr.		0
	Required duration of the mitigative effort to control short-term risk.	**< or = 2 yr.**		1
		>2 yr.	0	0
Subtotal (maximum = 2)		**1**		
4. On-site or off-site treatment or land disposal	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (maximum = 3)		**3**		

*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
5. Permanence of the remedial alternative.	Will the remedy by classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 7.)	**Yes**	3	3
		No		0
Subtotal (maximum = 3)		**3**		

Table A-3

SHORT-TERM/LONG-TERM EFFECTIVENESS
(Maximum Score = 25)

SEAD-26 RA26-3

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
6. Lifetime of remedial actions.	Expected lifetime or duration of effectiveness of the remedy.	**25-30yr.**	3	3
		20-25 yr.		2
		15-20 yr.		1
		<15 yr.		0
Subtotal (maximum = 3)		**3**		
7. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	**None**		3
		< or = 25%		2
		25-50%		1
		> or = 50%	0	0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 8.)	**Yes**	0	0
		No		2
	iii) Is the treated residual toxic?	**Yes**	0	0
		No		1
	iv) Is the treated residual mobile?	**Yes**		0
		No	1	1
Subtotal (maximum = 5)		**1**		
8. Adequacy and reliability of controls.	i) Operation and maintenance required for a period of:	**<5 yr.**	1	1
		>5 yr.		0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv".)	**Yes**	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	**Moderate to very confident**	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives.)	**Minimum**		2
		Moderate		1
		Extensive	0	0
Subtotal (maximum = 4)		**2**		
Total (maximum = 25)			**21**	

IF THE TOTAL IS LESS THAN 10, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-4

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-1 No Action

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**9**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.			1
	iii) Extensive coordination is required.		0	0
Subtotal (maximum = 2)		**0**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-4 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-1 No Action

Analysis Factor	Basis for Evaluation During Preliminary Screening		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** 1 **No**	1 0

Subtotal (maximum = 3) **3**

TOTAL (maximum = 15) **12**

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-4

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-2 Instituional Controls/Natural Attenuation

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**9**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.			1
	iii) Extensive coordination is required.		0	0
Subtotal (maximum = 2)		**0**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-4 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-2 Instituional Controls/Natural Attenuation

Analysis Factor	Basis for Evaluation During Preliminary Screening		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes** 1 **No**	1 0
Subtotal (maximum = 3)		**3**	
TOTAL (maximum = 15)		**12**	

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-4

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-3 Air Stripping Plume

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**7**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)		**1**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-4 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-3 Air Stripping Plume

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes**		1
		No	0	0

Subtotal (maximum = 3) **2**

TOTAL (maximum = 15) **10**

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Table A-4

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-4 Air Sparging Plume

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)		**7**		
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)		**1**		
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	**Yes**	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	**Yes**	1	1
		No		0

Table A-4 (cont'd)

IMPLEMENTABILITY
(Maximum Score = 15)

SEAD-26 RA26-4 Air Sparging Plume

Analysis Factor	Basis for Evaluation During Preliminary Screening			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	**Yes**		1
		No	0	0

Subtotal (maximum = 3) **2**

TOTAL (maximum = 15) **10**

IF THE TOTAL IS LESS THAN 8, PROJECT MANAGER MAY REJECT THE REMEDIAL ALTERNATIVE FROM FURTHER CONSIDERATION.

Appendix A

SEAD-25 Detailed Screening Data Sheets

Table A-5

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Maximum Score = 10)

Analysis Factor	RA25-1 Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes		4
		No	0	0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes		3
		No	0	0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes		3
		No	0	0
TOTAL (maximum = 10)			0	

Table A-5

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Maximum Score = 10)

Analysis Factor	RA25-2 Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes		4
		No	0	0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes	3	3
		No		0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes	3	3
		No		0
TOTAL (maximum = 10)			6	

Table A-5

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Maximum Score = 10)

Analysis Factor	RA25-3 Basis for Evaluation During Detailed Analysis		Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes 4 No	4 0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes 3 No	3 0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes 3 No	3 0
TOTAL (maximum = 10)		10	

Table A-5

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Maximum Score = 10)

Analysis Factor	RA25-3a Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes	4	4
		No		0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes	3	3
		No		0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes	3	3
		No		0
TOTAL (maximum = 10)			10	

Table A-5

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Maximum Score = 10)

Analysis Factor	RA25-4 Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes	4	4
		No		0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes	3	3
		No		0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes	3	3
		No		0
TOTAL (maximum = 10)			10	

Table A-5

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Maximum Score = 10)

Analysis Factor	RA25-5 Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes No	4	4 0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes No	3	3 0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes No	3	3 0
TOTAL (maximum = 10)			10	

Table A-5

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Maximum Score = 10)

Analysis Factor	RA25-6 Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes	4	4
		No		0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes	3	3
		No		0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes	3	3
		No		0
TOTAL (maximum = 10)			10	

Table A-6

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA25-1

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes		20
		No	0	0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes		4
		No	0	0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes		3
		No	0	0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,000		5
	ii) Health risk	< = 1 in 100,000	2	2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable		3	3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)				
Total (Maximum = 20)			8	

Table A-6

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA25-2

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes		20
		No	0	0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes	4	4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes		3
		No	0	0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,000		5
	ii) Health risk	< = 1 in 100,000	2	2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable		3	3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)			12	
Total (Maximum = 20)				

Table A-6

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA25-3

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes		20
		No	0	0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes	4	4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes	3	3
		No		0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,00	5	5
	ii) Health risk	< = 1 in 100,000		2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable		3	3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)				
Total (Maximum = 20)			18	

Table A-6

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA25-3a

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes		20
		No	0	0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes	4	4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes	3	3
		No		0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,00	5	5
	ii) Health risk	< = 1 in 100,000		2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable		3	3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)				
Total (Maximum = 20)			18	

Table A-6

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA25-4

Analysis Factor	Basis for Evaluation During Detailed Analysis		
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes	
		No	0
Total (Maximum = 20)			
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3
		No	
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes	4
		No	
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes	3
		No	
Subtotal (Maximum = 10)			
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,00	5
	ii) Health risk	< = 1 in 100,000	
Subtotal (Maximum = 5)			
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable		
	ii) Slightly greater than acceptable		3
	iii) Significant risk still exists		
Subtotal (Maximum = 5)			18
Total (Maximum = 20)			

Table A-6

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA25-5

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes		20
		No	0	0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes	4	4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes	3	3
		No		0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,00	5	5
	ii) Health risk	< = 1 in 100,000		2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable		3	3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)				
Total (Maximum = 20)			18	

Table A-6

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA25-6

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes		20
		No	0	0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes	4	4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes	3	3
		No		0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,00	5	5
	ii) Health risk	< = 1 in 100,000		2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable		3	3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)				
Total (Maximum = 20)			18	

Table A-7

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA25-1

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.	1	1
		>=2yr.		0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.		1
		>=2yr.		0
			9	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-7

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA25-2

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.	1	1
		>=2yr.		0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.		1
		>=2yr.		0
			9	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-7

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA25-3

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.		1
		>=2yr.		0
			8	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-7

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA25-3a

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.		1
		>=2yr.	0	0
			8	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-7

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA25-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes	0	0
		No		4
	Can the risk be easily controlled?	Yes	1	1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No	2	2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.	1	1
		>=2yr.		0
			8	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-7

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA25-5

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes	0	0
		No		4
	Can the risk be easily controlled?	Yes	1	1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No	2	2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.		1
		>=2yr.	0	0
			7	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-7

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA25-6

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes	0	0
		No		4
	Can the risk be easily controlled?	Yes	1	1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No	2	2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.		1
		>=2yr.	0	0
			7	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-1
(No-action)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes		3
		No	0	0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.		3
		20-25yr.		2
		15-20yr.		1
		<15yr.	0	0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None		3
		<=25%		2
		25-50%		1
		>=50%	0	0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 5.)	Yes		0
		No	2	2
	iii) Is the treated residual toxic?	Yes	0	0
		No		1
	iv) Is the treated residual mobile?	Yes	0	0
		No		1
Subtotal (Maximum = 5)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-1
(No-action)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.	1	1
		> 5yr.		0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum	2	2
		Moderate		1
		Extensive		0
Subtotal (Maximum = 4)			6	
Total (Maximum = 15)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-2
(Institutional Controls and Natural Attenuation of Plume)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes		3
		No	0	0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.	3	3
		20-25yr.		2
		15-20yr.		1
		<15yr.		0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None		3
		<=25%	2	2
		25-50%		1
		>=50%		0
	ii) Is there treated residual left at the site? (If answer is no, to to Factor 5.)	Yes	0	0
		No		2
	iii) Is the treated residual toxic?	Yes	0	0
		No		1
	iv) Is the treated residual mobile?	Yes	0	0
		No		1
Subtotal (Maximum = 5)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-2
(Institutional Controls and Natural Attenuation of Plume)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.		1
		> 5yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum		2
		Moderate	1	1
		Extensive		0
Subtotal (Maximum = 4)				
Total (Maximum = 15)			10	

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-3
(Bioventing of Soil, Air Sparging of Groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes	3	3
		No		0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.	3	3
		20-25yr.		2
		15-20yr.		1
		<15yr.		0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None		3
		<=25%	2	2
		25-50%		1
		>=50%		0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 5.)	Yes		0
		No	2	2
	iii) Is the treated residual toxic?	Yes		0
		No		1
	iv) Is the treated residual mobile?	Yes	0	0
		No		1
Subtotal (Maximum = 5)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-3
(Bioventing of Soil, Air Sparging of Groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.		1
		> 5yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum	2	2
		Moderate		1
		Extensive		0
Subtotal (Maximum = 4)				
Total (Maximum = 15)			16	

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-3a
(Bioventing of Soils, Natural Attenuation of Groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*		3	3
	Off-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes	3	3
		No		0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.	3	3
		20-25yr.		2
		15-20yr.		1
		<15yr.		0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None		3
		<=25%	2	2
		25-50%		1
		>=50%		0
	ii) Is there treated residual left at the site? (If answer is no, to to Factor 5.)	Yes		0
		No	2	2
	iii) Is the treated residual toxic?	Yes		0
		No		1
	iv) Is the treated residual mobile?	Yes		0
		No		1
Subtotal (Maximum = 5)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-3a
(Bioventing of Soils, Natural Attenuation of Groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.		1
		> 5yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes	0	0
		No		1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident	1	1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum		2
		Moderate	1	1
		Extensive		0
Subtotal (Maximum = 4)				
Total (Maximum = 15)			15	

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-4
(Source removal, off-site disposal, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes		3
		No	0	0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.	3	3
		20-25yr.		2
		15-20yr.		1
		<15yr.		0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None		3
		<=25%	2	2
		25-50%		1
		>=50%		0
	ii) Is there treated residual left at the site? (If answer is no, to to Factor 5.)	Yes		0
		No	2	2
	iii) Is the treated residual toxic?	Yes		0
		No		1
	iv) Is the treated residual mobile?	Yes		0
		No		1
Subtotal (Maximum = 5)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-4
(Source removal, off-site disposal, natural attenuation of groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.		1
		> 5yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum		2
		Moderate	1	1
		Extensive		0
Subtotal (Maximum = 4)			9	
Total (Maximum = 15)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-5
(Source removal, off-site disposal, air stripping of plume)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes		3
		No	0	0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.	3	3
		20-25yr.		2
		15-20yr.		1
		<15yr.		0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None		3
		<=25%	2	2
		25-50%		1
		>=50%		0
	ii) Is there treated residual left at the site? (If answer is no, go to Factor 5.)	Yes		0
		No	2	2
	iii) Is the treated residual toxic?	Yes		0
		No		1
	iv) Is the treated residual mobile?	Yes		0
		No		1
Subtotal (Maximum = 5)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-5
(Source removal, off-site disposal, air stripping of plume)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.		1
		> 5yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum		2
		Moderate	1	1
		Extensive		0
Subtotal (Maximum = 4)				
Total (Maximum = 15)			9	

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-6
(Source removal, off-site disposal, air sparging of groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*			3
	Off-site treatment*			1
	On-site or off-site land disposal		0	0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes		3
		No	0	0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.	3	3
		20-25yr.		2
		15-20yr.		1
		<15yr.		0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous 'waste left at the site.	None		3
		<=25%	2	2
		25-50%		1
		>=50%		0
	ii) Is there treated residual left at the site? (If answer is no, to to Factor 5.)	Yes		0
		No	2	2
	iii) Is the treated residual toxic?	Yes		0
		No		1
	iv) Is the treated residual mobile?	Yes		0
		No		1
Subtotal (Maximum = 5)				

Table A-8

LONG-TERM EFFECTIVENESS AND PERMANENCE
(Relative Weight = 15)
RA25-6
(Source removal, off-site disposal, air sparging of groundwater)

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.		1
		> 5yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum		2
		Moderate	1	1
		Extensive		0
Subtotal (Maximum = 4)				
Total (Maximum = 15)			9	

Table A-9

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA25-1 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%		7
		80-90%		6
		60-80%		4
		40-60%		2
		20-40%		1
		< 20%	0	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%		2
		60-90%		1
		< 60%		0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization			
	- Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.			3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.			3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.		0	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			2	

Table A-9

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA25-2 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%		7
		80-90%		6
		60-80%		4
		40-60%	2	2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%		2
		60-90%		1
		< 60%		0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.			3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.		3	3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.			0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			7	

Table A-9

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA25-3 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%	7	7
		80-90%		6
		60-80%		4
		40-60%		2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%	2	2
		60-90%		1
		< 60%		0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.		3	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.		5	5
	Irreversible for most of the hazardous waste constituents.			3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.			0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			19	

Table A-9

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA25-3a Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%	7	7
		80-90%		6
		60-80%		4
		40-60%		2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10)				
If subtotal = 10, go to Factor 3.	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%	2	2
		60-90%		1
		< 60%		0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.		3	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.		5	5
	Irreversible for most of the hazardous waste constituents.			3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.			0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			19	

Table A-9

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA25-4 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%		7
		80-90%		6
		60-80%		4
		40-60%	2	2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%		2
		60-90%		1
		< 60%	0	0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.		3	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.		3	3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.			0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			10	

Table A-9

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA25-5 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%		7
		80-90%		6
		60-80%		4
		40-60%	2	2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%		2
		60-90%		1
		< 60%	0	0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.		3	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.		3	3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.			0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			10	

Table A-9

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA25-6 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%		7
		80-90%		6
		60-80%		4
		40-60%	2	2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%		2
		60-90%		1
		< 60%	0	0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization			
	- Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.		3	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.		3	3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.		0	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			10	

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-1

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.			1
	iii) Extensive coordination is required.		0	0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-1

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes ___1___ No ______	1 0

Subtotal (maximum = 3)

TOTAL (maximum = 15) 12

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-2

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.		1	1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-2

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes 1 No	1 0
Subtotal (maximum = 3)			
TOTAL (maximum = 15)		12	

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-3

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes No	1	1 0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes No	1	1 0

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-3

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes ___1__ No ______	1 0

Subtotal (maximum = 3)

TOTAL (maximum = 15) 11

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-3a

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-3a

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes 1	1
		No	0

Subtotal (maximum = 3)

TOTAL (maximum = 15) 13

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes No	1	1 0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes No	1	1 0

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes	1	1
		No		0
Subtotal (maximum = 3)				
TOTAL (maximum = 15)			13	

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-5

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.			2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-5

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes ___1___ No ______	1 0

Subtotal (maximum = 3)

TOTAL (maximum = 15) 11

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-6

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely			2
	ii) Somewhat likely		1	1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes No	1	1 0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes No	1	1 0

Table A-10

IMPLEMENTABILITY
(Maximum Score = 15)
RA25-6

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes	1	1
		No		0
Subtotal (maximum = 3)				
TOTAL (maximum = 15)			11	

Appendix A

SEAD-26 Detailed Screening Data Sheets

Table A-11

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Maximum Score = 10)

Analysis Factor	RA26-1 Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes		4
		No	0	0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes		3
		No	0	0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes	3	3
		No		0
TOTAL (maximum = 10)			3	

Table A-11

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)
(Maximum Score = 10)

Analysis Factor	RA26-2 Basis for Evaluation During Detailed Analysis			Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes	4	4
		No		0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes	3	3
		No		0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes	3	3
		No		0
TOTAL (maximum = 10)			10	

Table A-11

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Maximum Score = 10)

Analysis Factor	RA26-3 Basis for Evaluation During Detailed Analysis		Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes 4 No	4 0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes 3 No	3 0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes 3 No	3 0
TOTAL (maximum = 10)		10	

Table A-11

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE NEW YORK STATE STANDARDS CRITERIA AND GUIDELINES (SCGs)

(Maximum Score = 10)

Analysis Factor	RA26-4 Basis for Evaluation During Detailed Analysis		Score
1. Compliance with chemical-specific SCGs.	Meets chemical specific SCGs such as groundwater standards.	Yes 4 No	4 0
2. Compliance with action-specific SCGs.	Meets SCGs such as technology standards for incineration or landfill.	Yes 3 No	3 0
3. Compliance with location-specific SCGs.	Meets location-specific SCGs such as Freshwater Wetlands Act.	Yes 3 No	3 0
TOTAL (maximum = 10)		10	

Table A-12

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA26-1

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes		20
		No	0	0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes	3	3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes	4	4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes		3
		No	0	0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,000		5
	ii) Health risk	< = 1 in 100,000	2	2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable		3	3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)			12	
Total (Maximum = 20)				

Table A-12

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA26-2

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes	20	20
		No		0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes		3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes		4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes		3
		No		0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,000		5
	ii) Health risk	< = 1 in 100,000		2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable			3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)				
Total (Maximum = 20)			20	

Table A-12

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA26-3

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes	20	20
		No		0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes		3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes		4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes		3
		No		0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,000		5
	ii) Health risk	< = 1 in 100,000		2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable			3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)			20	
Total (Maximum = 20)				

Table A-12

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT
(Relative Weight = 20)
RA26-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Use of the site after remediation.	Unrestricted use of the land and water. (If answer is yes, go to the end of the Table.)	Yes	20	20
		No		0
Total (Maximum = 20)				
2. Human health and the environment exposure after the remediation.	i) Is the exposure to contaminants via air route acceptable?	Yes		3
		No		0
	ii) Is the exposure to contaminants via groundwater/surface water acceptable?	Yes		4
		No		0
	iii) Is the exposure to contaminants via sediments/soils acceptable?	Yes		3
		No		0
Subtotal (Maximum = 10)				
3. Magnitude of residual public health risks after the remediation.	i) Health risk	< = 1 in 1,000,000		5
	ii) Health risk	< = 1 in 100,000		2
Subtotal (Maximum = 5)				
4. Magnitude of residual environmental risks after the remediation.	i) Less than acceptable			5
	ii) Slightly greater than acceptable			3
	iii) Significant risk still exists			0
Subtotal (Maximum = 5)				
Total (Maximum = 20)			20	

Table A-13

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA26-1

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.	1	1
		>=2yr.		0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.	1	1
		>=2yr.		0
			10	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-13

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA26-2

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.	1	1
		>=2yr.		0
			9	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-13

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA26-3

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.	1	1
		>=2yr.		0
			9	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-13

SHORT-TERM EFFECTIVENESS
(Relative Weight = 10)
RA26-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Protection of community during remedial actions.	Are there significant short-term risks to the community that must be addressed? (If answer is no, go to Factor 2.)	Yes		0
		No	4	4
	Can the risk be easily controlled?	Yes		1
		No		0
	Does the mitigative effort to control risk impact the community life-style?	Yes		0
		No		2
Subtotal (Maximum = 4)				
2. Environmental Impacts	Are there significant short-term risks to the environment that must be addressed? (If answer is no, go to Factor 3.)	Yes		0
		No	4	4
	Are the available mitigative measures reliable to minimize potential impacts?	Yes		3
		No		0
Subtotal (Maximum = 4)				
3. Time to implement the remedy.	What is the required time to implement the remedy?	<=2yr.		1
		>=2yr.	0	0
	Required duration of the mitigative effort to control short-term risk.	<=2yr.	1	1
		>=2yr.		0
			9	
Subtotal (Maximum = 2)				
Total (Maximum = 10)				

Table A-14

LONG-TERM EFFECTIVENESS AND PERFORMANCE
(Relative Weight = 15)
RA26-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. On-site or off-site treatment or land disposal.	On-site treatment*		3	3
	On-site treatment*			1
	On-site or off-site land disposal			0
Subtotal (Maximum = 3)				
*treatment is defined as destruction or separation/ treatment or solidification/ chemical fixation of inorganic wastes.				
2. Permanence of the remedial alternative.	Will the remedy be classified as permanent in accordance with Section 2.1(a), (b), or (c). (If answer is yes, go to Factor 4.)	Yes	3	3
		No		0
Subtotal (Maximum = 3)				
3. Lifetime of remedial alternative.	Expected lifetime or duration of effectiveness of the remedy.	25-30 yr.		3
		20-25yr.		2
		15-20yr.		1
		<15yr.		0
Subtotal (Maximum = 3)				
4. Quantity and nature of waste or residual left at the site after remediation.	i) Quantity of untreated hazardous waste left at the site.	None		3
		<=25%	2	2
		25-50%		1
		>=50%		0
	ii) Is there treated residual left at the site? (If answer is no, to to Factor 5.)	Yes		0
		No	2	2
	iii) Is the treated residual toxic?	Yes		0
		No		1
	iv) Is the treated residual mobile?	Yes		0
		No		1
Subtotal (Maximum = 5)				

Table A-14

LONG-TERM EFFECTIVENESS AND PERFORMANCE
(Relative Weight = 15)
RA26-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
5. Adequacy and reliability of controls.	i) Operation and Maintenance required for a period of:	< 5yr.		1
		> 5yr.	0	0
	ii) Are environmental controls required as a part of the remedy to handle potential problems? (If answer is no, go to "iv").	Yes		0
		No	1	1
	iii) Degree of confidence that controls can adequately handle potential problems.	Moderate to very confident		1
		Somewhat to not confident		0
	iv) Relative degree of long-term monitoring required (compare with other remedial alternatives)	Minimum		2
		Moderate	1	1
		Extensive		0
Subtotal (Maximum = 4)				
Total (Maximum = 15)			12	

Table A-15

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA26-1 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%		7
		80-90%		6
		60-80%		4
		40-60%		2
		20-40%		1
		< 20%	0	0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%		2
		60-90%		1
		< 60%	0	0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization			
	- Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.			3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.			3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.		0	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			2	

Table A-15

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

(Maximum Score = 15)

Analysis Factor	RA26-2 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%	7	7
		80-90%		6
		60-80%		4
		40-60%		2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%	2	2
		60-90%		1
		< 60%		0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.			3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.		3	3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.			0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			14	

Table A-15

REDUCTION OF TOXICITY, MOBILITY OR VOLUME
(Maximum Score = 15)

Analysis Factor	RA26-3 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%	7	7
		80-90%		6
		60-80%		4
		40-60%		2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%	2	2
		60-90%		1
		< 60%		0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.		3	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.		3	3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.			0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			17	

Table A-15

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

(Maximum Score = 15)

Analysis Factor	RA26-4 Basis for Evaluation During Detailed Analysis			Score
1. Volume of hazardous waste reduced (reduction in volume or toxicity). If Factor 1 is not applicable, go to Factor 2.	i) Quantity of hazardous waste destroyed or treated. Immobilization technologies do not score under Factor 1.	99-100%		8
		90-99%	7	7
		80-90%		6
		60-80%		4
		40-60%		2
		20-40%		1
		< 20%		0
	ii) Are there untreated or concentrated hazardous waste produced as a result of (i) ? If answer is no, go to Factor 2.	Yes		0
		No	2	2
Subtotal (maximum = 10) **If subtotal = 10, go to Factor 3.**				
	iii) After remediation, how is the untreated, residual hazardous waste material disposed?	Off-site land disposal		0
		On-site land disposal		1
		Off-site destruction or treatment		2
2. Reduction in mobility of hazardous waste.	i) Quality of Available Wastes Immobilized After Destruction/Treatment.	90-100%	2	2
		60-90%		1
		< 60%		0
If Factor 2 is not applicable, go to Factor 3.	ii) Method of Immobilization - Reduced mobility by containment			0
	- Reduced mobility by alternative treatment technologies.		3	3
Subtotal (maximum = 5)				
3. Irreversibility of the destruction or treatment or immobilization of hazardous waste.	Completely irreversible.			5
	Irreversible for most of the hazardous waste constituents.		3	3
	Irreversible for only some of hazardous waste constituents.			2
	Reversible for most ot the hazardous waste constituents.		0	0
Subtotal (maximum = 5)				
TOTAL (maximum = 15)			17	

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-1

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.		3	3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.			2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.			1
	iii) Extensive coordination is required.		0	0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-1

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes 1 No	1 0

Subtotal (maximum = 3)

TOTAL (maximum = 15) 13

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-2

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.		3	3
	ii) Somewhat difficult to construct. No uncertainties in construction.			2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-2

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes ___1___ No _______	1 0
Subtotal (maximum = 3)			
TOTAL (maximum = 15)		13	

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-3

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-3

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes ___1___ No ______	1 0

Subtotal (maximum = 3)

TOTAL (maximum = 15) 12

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-4

Analysis Factor	Basis for Evaluation During Detailed Analysis			Score
1. Technical Feasibility				
a. Ability to construct technology.	i) Not difficult to construct. No uncertainties in construction.			3
	ii) Somewhat difficult to construct. No uncertainties in construction.		2	2
	iii) Very difficult to construct and/or significant uncertainties in construction.			1
b. Reliability of technology.	i) Very reliable in meeting the specified process efficiencies or performance goals.			3
	ii) Somewhat reliable in meeting the specified process efficiencies or performance goals.		2	2
c. Schedule of delays due to technical problems.	i) Unlikely		2	2
	ii) Somewhat likely			1
d. Need of undertaking additional remedial action, if necessary.	i) No future remedial actions may be anticipated.		2	2
	ii) Some future remedial actions may be necessary.			1
Subtotal (maximum = 10)				
2. Administrative Feasibility				
a. Coordination with other agencies.	i) Minimal coordination is required.			2
	ii) Required coordination is normal.		1	1
	iii) Extensive coordination is required.			0
Subtotal (maximum = 2)				
3. Availability of Services and Materials				
a. Availability of prospective technologies.	i) Are technologies under consideration generally commercially available for the site-specific application?	Yes	1	1
		No		0
	ii) Will more than one vendor be available to provide a competitive bid?	Yes	1	1
		No		0

Table A-16

IMPLEMENTABILITY
(Maximum Score = 15)
RA26-4

Analysis Factor	Basis for Evaluation During Detailed Analysis		Score
b. Availability of necessary equipment and specialists.	i) Additional equipment and specialists may be available without significant delay.	Yes ___1___ No ______	1 0
Subtotal (maximum = 3)			
TOTAL (maximum = 15)		12	

Appendix B
Calculations

Appendix B
Hand Calculation

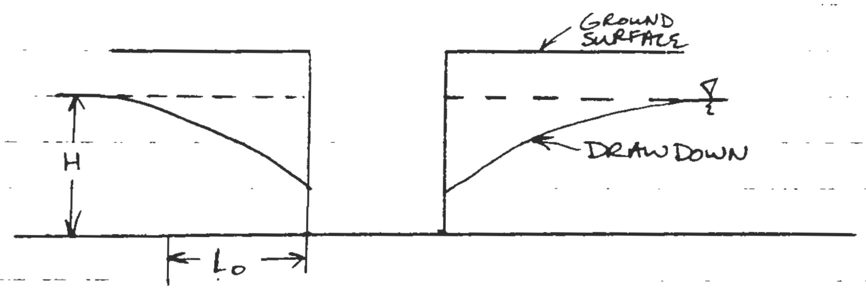
PARSONS ENGINEERING SCIENCE, INC. PARSONS

CLIENT Seneca Army Depot Activity JOB. NO. 728059-0032 SHEET 1 OF
SUBJECT Estimate Flow into Dewatering Trench - SEAD 25 BY PKR DATE 12/13
CKD. REVISION

TOT. LENGTH OF TRENCHES = 400 FT

$K_{SOIL} = 0.53$ m/day $= 6.13 \times 10^{-4}$ cm/sec - From RI Report

Average Depth to Bedrock = 5.72' - FROM RI REPORT



TRENCH CROSS SECTION

- CALCULATE INFLOW PER UNIT LENGTH OF TRENCH

Two Phases to DEWATERING:
1) INITIAL DEWATERING DURING EXCAVATION
2) STEADY STATE FLOW

AREA TO DEWATER ≅ 27,950 ft²
MAX WATER LEVEL = 5.72'
EFFECTIVE POROSITY = 17.5% From RI REPORT

WATER TO REMOVE = 29,950 × 5.72 × .175 = 29,980 ft³
× 7.48 gal/ft³ = 2.24 × 10⁵ gal

ESTIMATING AQUIFER PROPERTIES (after Driscoll, 1986)

$T \cong KH = 6.13 \times 10^{-4}$ cm/sec × 5.72 ft × 30.48 cm/ft = .107 cm²/sec
$= 1.15 \times 10^{-4}$ ft²/sec

FOR H = 3.645 (Avg AQ depth) × 3.645 $= 7.33 \times 10^{-5}$ ft²/s

PARSONS ENGINEERING SCIENCE, INC.

PARSONS

CLIENT: SENECA ARMY DEPOT — JOB. NO. 72 8059-0032 — SHEET 3 OF

SUBJECT: TRENCH SEAD 25 — BY PKR — DATE 12/13

CKD. — REVISION

ESTIMATE L_o

$$R_o = 2L_o = r_s\sqrt{\frac{Tt}{C_4 S}}$$ (POWERS, 1992 EQ C.13)

r_s = radius of one well   assume r_s = trench width ~ 3'

$C_4 = 4790$ (TABLE 4 2 POWERS)

$T = 1.15 \times 10^{-4}\ ft^2/sec \times 86400\ \frac{sec}{day} \times 7.48\ gal/ft^3 = 74.3\ gpd/ft$

t = time (min)

$S = .2$

$$R_o = 3\ ft + \sqrt{\frac{(74.3)\cdot t\ (min)}{4790 \times .2}}$$

$$R_o = 3 + .278\sqrt{t}$$

Appendix B
Calculation Tables

Table B-1
SEAD-25
Estimation of Flow into Dewatering Trench (one sided flow)

Parameters (units)	
t = time (days)	Q=Flow (gpm)
Ro=Radius of Influence (feet)	Qd=flow (gpd)
Lo=Length of Influence = Ro/2 (feet)	Cum. Flow (gallons)

Calculations for 5.72 foot water table:

t (day)	Ro (ft)	Lo (ft)	Q (gpm)	Qd (gpd)	Cum Flow (gal)	Cum. Flow per 400 ft
0.10	3.09	1.54	9.59E-02	138.04	13.80	5,521
0.20	3.12	1.56	9.47E-02	136.43	27.29	10,914
0.50	3.20	1.60	9.26E-02	133.34	66.67	26,669
1.00	3.28	1.64	9.03E-02	130.03	130.03	52,012
2.00	3.39	1.70	8.72E-02	125.62	251.24	100,494
5.00	3.62	1.81	8.17E-02	117.69	588.46	235,386
10	3.88	1.94	7.63E-02	109.88	1,098.81	439,523
20	4.24	2.12	6.98E-02	100.45	2,009.02	803,610
50	4.97	2.48	5.96E-02	85.84	4,291.79	1,716,717
100	5.78	2.89	5.12E-02	73.74	7,374.39	2,949,758
200	6.93	3.47	4.27E-02	61.49	12,298.61	4,919,445
300	7.82	3.91	3.79E-02	54.54	16,362.17	6,544,867
400	8.56	4.28	3.46E-02	49.79	19,917.76	7,967,103
500	9.22	4.61	3.21E-02	46.25	23,124.33	9,249,730

Calculations for 3.645 foot water table:

t (day)	Ro (ft)	Lo (ft)	Q (gpm)	Qd (gpd)	Cum Flow (gal)	Cum. Flow per 400 ft
0.10	3.09	1.54	3.59E-02	51.76	5.18	2,071
0.20	3.12	1.56	3.55E-02	51.16	10.23	4,093
0.50	3.20	1.60	3.47E-02	50.00	25.00	10,001
1.00	3.28	1.64	3.39E-02	48.76	48.76	19,505
2.00	3.39	1.70	3.27E-02	47.11	94.21	37,685
5.00	3.62	1.81	3.06E-02	44.13	220.67	88,270
10	3.88	1.94	2.86E-02	41.21	412.05	164,821
20	4.24	2.12	2.62E-02	37.67	753.38	301,354
50	4.97	2.48	2.24E-02	32.19	1,609.42	643,769
100	5.78	2.89	1.92E-02	27.65	2,765.40	1,106,159
200	6.93	3.47	1.60E-02	23.06	4,611.98	1,844,792
300	7.82	3.91	1.42E-02	20.45	6,135.81	2,454,325
400	8.56	4.28	1.30E-02	18.67	7,469.16	2,987,664
500	9.22	4.61	1.20E-02	17.34	8,671.62	3,468,649

Table B-2
SEAD-25

Estimation of Flow into Dewatering Trench (two sided flow)

Parameters (units)

t = time (days)	Q=Flow (gpm)
Ro=Radius of Influence (feet)	Qd=flow (gpd)
Lo=Length of Influence = Ro/2 (feet)	Cum. Flow (gallons)

Calculations for 5.72 foot water table:

t (day)	Ro (ft)	Lo (ft)	Q (gpm)	Qd (gpd)	Cum Flow (gal)	Cum. Flow per 400 ft
0.10	3.09	1.54	1.92E-01	276.07	27.61	11,043
0.20	3.12	1.56	1.89E-01	272.85	54.57	21,828
0.50	3.20	1.60	1.85E-01	266.69	133.34	53,337
1.00	3.28	1.64	1.81E-01	260.06	260.06	104,024
2.00	3.39	1.70	1.74E-01	251.24	502.47	200,988
5.00	3.62	1.81	1.63E-01	235.39	1,176.93	470,772
10	3.88	1.94	1.53E-01	219.76	2,197.62	879,046
20	4.24	2.12	1.40E-01	200.90	4,018.05	1,607,219
50	4.97	2.48	1.19E-01	171.67	8,583.59	3,433,434
100	5.78	2.89	1.02E-01	147.49	14,748.79	5,899,516
200	6.93	3.47	8.54E-02	122.99	24,597.22	9,838,890
300	7.82	3.91	7.58E-02	109.08	32,724.34	13,089,734
400	8.56	4.28	6.92E-02	99.59	39,835.51	15,934,206
500	9.22	4.61	6.42E-02	92.50	46,248.65	18,499,460

Calculations for 3.645 foot water table:

t (day)	Ro (ft)	Lo (ft)	Q (gpm)	Qd (gpd)	Cum Flow (gal)	Cum. Flow per 400 ft
0.10	3.09	1.54	7.19E-02	103.53	10.35	4,141
0.20	3.12	1.56	7.11E-02	102.32	20.46	8,186
0.50	3.20	1.60	6.94E-02	100.01	50.00	20,001
1.00	3.28	1.64	6.77E-02	97.52	97.52	39,009
2.00	3.39	1.70	6.54E-02	94.21	188.43	75,371
5.00	3.62	1.81	6.13E-02	88.27	441.35	176,539
10	3.88	1.94	5.72E-02	82.41	824.11	329,642
20	4.24	2.12	5.23E-02	75.34	1,506.77	602,707
50	4.97	2.48	4.47E-02	64.38	3,218.84	1,287,538
100	5.78	2.89	3.84E-02	55.31	5,530.80	2,212,318
200	6.93	3.47	3.20E-02	46.12	9,223.96	3,689,584
300	7.82	3.91	2.84E-02	40.91	12,271.63	4,908,650
400	8.56	4.28	2.59E-02	37.35	14,938.32	5,975,327
500	9.22	4.61	2.41E-02	34.69	17,343.24	6,937,298

Table B-3
SEAD-25

Treatment Time Required:

Total Volume of groundwater in plume: 731,438 L

Without Removal Action:

Contaminant	Goal (1) (ug/L)	Trench 1 Conc. (2) (ug/L)	Trench 2 Conc. (3) (ug/L)	Avg. Influent Conc.(4) (ug/L)	Tot. Removal Required (5) (g)	Liters treated Per year (6)	Removal Rate per year (7) (g/yr)	Treatment Time Required (8) (yrs)
1,1,1-Trichloroethane	5	8.17	1.50	4.83	NA	49,058,784	237	0
1,1-Dichloroethane	5	0.92	1.00	0.96	NA	49,058,784	47	0
1,2-Dichloroethene (total)	5	11.56	3.50	7.53	1.85	49,058,784	369	5.01E-03
Benzene	0.7	212.08	37.00	124.54	90.58	49,058,784	6,110	1.48E-02
Chloroform	7	2.42	0.00	1.21	NA	49,058,784	59	0
Ethylbenzene	5	65.92	6.50	36.21	22.83	49,058,784	1,776	1.29E-02
Toluene	5	194.83	13.50	104.17	72.53	49,058,784	5,110	1.42E-02
Trichloroethene	5	1.33	0.00	0.67	NA	49,058,784	33	0
Xylene (total)	5	640.75	45.50	343.13	247.32	49,058,784	16,833	1.47E-02
2,4-Dimethylphenol	5	10.83	0.00	5.42	0.30	49,058,784	266	1.15E-03
2-Methylnaphthalene	50	12.67	0.00	6.33	NA	49,058,784	311	0
2-Methylphenol	5	2.58	0.00	1.29	NA	49,058,784	63	0
4-Methylphenol	5	6.25	0.00	3.13	NA	49,058,784	153	0
Naphthalene	50	29.67	1.50	15.58	NA	49,058,784	764	0
Phenol	1	4.67	0.00	2.33	0.98	49,058,784	114	8.52E-03

Notes:
(1) New York State Class GA water standards
(2) Concentration @ Trench 1 (avg. conc. for wells upstream of Trench 1, wells MW25-2,3,4d,and 5)
(3) Concentration @ Trench 2 (avg. conc. for well upstream of Trench 2, well MW25-9)
(4) Conentration of water treated: (avg of trench 1 & 2 concentration)
(5) (Average influent concentration - goal)*total volume of plume
(6) Based on 30 gpm, 300 days per year of operation
(7) Average influent conc. (ug/L) x Liters treated per year (L/yr)
(8) Treatment time required = total removal required (ug) / removal rate per year (ug/yr)

Note: Removal action would reduce the groundwater influent concentrations. However, the groundwater excavated during the removal action would require treatment.

Table B-4
SEAD-25

Calculation of Maximum Air emissions from Stripper

Representative wells:
MW25-2, MW25-3, MW25-4D, MW25-5D, MW25-9

Compound	95% UCL (ug/L)	Air Emis. (lb/hr)	Air Emis. (TPY)
Ethyl benzene	2,060.05	2.16E-03	9.46E-03
Chloroform	46.07	4.83E-05	2.12E-04
1,1-Dichloroethane	67.08	7.03E-05	3.08E-04
1,2-Dichloroethene	38.17	4.00E-05	1.75E-04
Benzene	47,624.44	4.99E-02	2.19E-01
1,1,1-Trichloroethane	81.05	8.50E-05	3.72E-04
2-Methylphenol	29.06	3.05E-05	1.33E-04
2-Methylnaphthalene	25.86	2.71E-05	1.19E-04
Trichloroethene	43.35	4.54E-05	1.99E-04
Xylene	1,183,486.53	1.24E+00	5.43E+00
2,4-Dimethylphenol	37.01	3.88E-05	1.70E-04
Toluene	19,998.86	2.10E-02	9.18E-02
Phenol	48.96	5.13E-05	2.25E-04
2,4-Dimethylphenol	37.01	3.88E-05	1.70E-04
4-Methylphenol	14.63	1.53E-05	6.72E-05
Total:		**1.31**	**5.76**

Based on 30 g.p.m. max treatment rate
Assuming 100% Volatilization from Stripper

APPENDIX C ARAR COMPLIANCE

C.1 ARAR-BASED REMEDIAL OBJECTIVES

The investigation and clean-up of SEAD-25 and -26 falls under the jurisdiction of both the State of New York regulations (administered by NYSDEC) and Federal regulations (administered by USEPA Region II). Three categories of potentially applicable state and federal requirements are reviewed separately in the subsequent subsections. The three categories of ARARs are chemical specific, location specific and action specific. A brief regulatory discussion of ARARs is given below.

In 40 CFR 300.5, EPA defines applicable requirements as those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental, or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. Relevant and appropriate requirements are defined as those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Any standard, requirement, criterion, or limitation under any federal 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.

As mentioned earlier in this section, three categories of ARARs were analyzed. The are as follows: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs address certain contaminants or a class of contaminants and relate to the level of contamination allowed for a specific pollutant in various environmental media (water, soil, air). Chemical-specific ARARs are discussed below, in the media-specific sections. Location-specific ARARs are based on the specific setting and nature of the site. Action-specific ARARs relate to specific actions proposed for implementation at a site. Both location-specific and action-specific ARARs are independent of the media. In addition to ARARs, advisories, criteria or guidance may be evaluated as "To Be Considered" (TBC) regulatory items. CERCLA indicates that the TBC category could 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 such as ARARs.

C.2 CHEMICAL SPECIFIC ARARs AND TBCs

Chemical-specific ARARs are usually health or risk-based standards limiting the concentration of a chemical found in, or discharged to, the environment. They govern the extent of site remediation by providing actual cleanup levels, or the basis for calculating such levels for specific media. A number of federal and state regulations are potential ARARs for this site. For each of the ARARs listed below 4 categories of information are provided.

C.2.1 Water Quality

- 40 CFR Part 141 (applicable): National Primary Drinking Water Regulations. This part establishes primary drinking water regulators pursuant to Section 1412 of the Public Health Service Act as amended by the Safe Drinking Water Act. Consideration: MCLs and NY state groundwater standards (GA) were used as a frame of reference for the applicable constituents; the lower, more conservative of the two standards were used to set clean-up levels in groundwater at the SEAD-25 and -26 sites.

- 40 CFR Part 141.11 (applicable): Maximum Inorganic Chemical Contaminant Levels. This section establishes maximum contaminant levels (MCLs) for inorganic chemicals in drinking water including the following:

Maximum Contaminant Level

Metal	(mg/L)	(µg/L)
Arsenic	0.05	50
Barium	2.0	2000
Cadmium	0.005	5
Chromium	0.1	100
Lead	0.015*	15*
Mercury	0.002	2
Selenium	0.05	50

*—Action Level

Consideration: MCLs and NY State groundwater standards (GA) were used as a frame reference for the applicable constituents; the lower of the two standards were used to set clean-up levels in groundwater at the SEAD-25 and -26 sites.

- 40 CFR Part 141.12 (applicable): Maximum Organic Chemical Contaminant Levels. This section establishes MCLs for organic chemicals in drinking water including the following:

Maximum Contaminant Level

Metal	(mg/L)	(µg/L)
TCE	0.005	5
Benzene	0.005	5
Total trihalomethanes	0.10	100

Consideration: MCLs and NY State groundwater standards (GA) were used as a frame of reference for the applicable constituents; the lower of the two standards were used to set clean-up levels in groundwater at the SEAD-25 and -26 sites.

- 40 CFR Part 264 Subpart F (applicable): Releases from Solid Waste Management Units. Standards for protection of groundwater are established under this citation. This ARAR is applicab.. .. long-term monitoring of the site.

- 6 NYCRR subparts 701 and 702 (applicable): These subparts provide classification definitions for surface water and groundwaters and describe procedures that may be used to obtain guidelines or standards that will be protective of human health and aquatic life. Consideration: Definitions of local surface water and groundwater classifications at the site were obtained from these subparts.

- 6 NYCRR subpart 703 (applicable): This subpart establishes groundwater standards specified to protect groundwater for drinking water purposes. Consideration: The groundwater at SEAD-25 and -26 has been classified as GA which means the best usage is as a source of potable water. Given the current and future intended uses of the site, these standards are the most appropriate for comparison to on-site concentrations. Also, groundwater effluent standards apply to a discharge from a point source or outlet (that may be associated with a remedial measure) that will or may enter the unsaturated or saturated zones.

- 6 NYCRR subpart 373-2.6 and 373-2.11 (applicable): This regulation requires groundwater monitoring for releases from solid waste management units.

- 6 NYCRR subpart 373-2 (relevant and appropriate): This regulation establishes post closure care and groundwater monitoring requirements. Consideration: This regulation applies after the SEAD-25 and -26 sites has been closed under CERCLA requirements.

- 6 NYCRR Part 5 (relevant and appropriate): This regulation establishes criteria for drinking water supplies. Specifically, NYSDOH has established MCLs for water. Consideration: These criteria are relevant and appropriate to drinking water sources in NY State.

- NYSDEC TOGS 1.1.1 (relevant and appropriate): This document compiles water quality standards and guidance values for use in NYSDEC programs. Consideration: This document was used as a reference for the NYSDEC water quality standards and guidance values.

C.2.3 Soil Quality

NYSDEC Technical and Administrative Guidance Manuals (TAGMs) (TBCs): The New York State rules for inactive hazardous waste disposal sites are provided in these documents. Cleanup levels for hazardous constituents in soil have been proposed by the State of New York through Technical and Administrative Guidance Manuals (TAGMs) specifically, #HWR-92-4045. Consideration: The NYSDEC TAGM manual for cleanup levels for soils is #HWR-92-4046 and has been used as guidance for this remedial action. These levels are shown in Table 2-1 and 2-2 for constituents detected at SEAD-25 and -26. The TAGMs are TBC guidelines and are not ARARs. The primary chemicals of concern at SEAD-25 are Semivolatile Organics, Volatile Organics (primarily BTEX), and to a lesser extent, metals. The primary chemicals of concern at SEAD-26 are Semivolatile Organics and, to a lesser extent, metals. A review of the data presented in Tables 2.1 and 2-2 indicates that concentrations of these compounds found at the site exceed the established TAGM values. Site Cleanup Goals (SCG) for metals have been determined as either the site background concentration or the NYSDEC TAGM value, whichever is higher. The background metal concentration value has been determined as the 95th Upper Confidence Limit (UCL) of the mean for the background soil samples collected from the entire SEAD facility. TAGMs are being considered as remedial goals for volatile organics for the remedial measure.

C.2.4 PCBs

- 40 CFR Part 761 (TBC): Polychlorinated Biphenyls (PCBs) Manufacturing, processing, distribution in commerce and use prohibition. This part establish and the requirements for the storage and disposal of PCBs. Consideration: No action is required in regard to this regulation.

- 40 CFR Part 761 subpart G (TBC): PCB Spill Clean Up Policy, This regulation establishes criteria EPA will use to determine the adequacy of the clean up of spills resulting from the release of materials containing PCBs. Consideration: No action is required in regard to this regulation since maximum concentrations of PCBs in soil at SEAD-25 and -26 are less than the action limit of 50 ppm.

- EPA OSWER 8/90 (TBC): A Guide to Remedial Actions at Superfund sites with PCB contamination. Consideration: No action is required in regard to this document because PCB concentrations in soil at SEAD-25 and -26 are less than the action limit of 50 ppm.

C.3 LOCATION-SPECIFIC ARARS

Location-specific ARARs govern natural site features such as wetlands, flood plains, and sensitive ecosystems, and manmade features such as 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. Federal and State regulations that may apply are listed below.

C.3.1 <u>Endangered Species</u>

- 40 CFR Part 257.3-2 (relevant and appropriate): Facilities or practices shall not cause or contribute to the taking of any endangered or threatened species. Consideration: A site survey for endangered species was performed during the SEAD-25 and -26 field program. No endangered species were observed. A letter from the U.S. Fish and Wildlife Service (USFWS) indicated no known endangered species existed at the site.

C.3.2 <u>Location Standards</u>

- 40 CFR Part 264.18 (relevant and appropriate): Location Standards for Hazardous Waste Facilities. The general requirements for locating a hazardous treatment, storage, or disposal facility are found in this section. They include provisions for seismic considerations and flood plains. Consideration: These standards are relevant and appropriate to remedial measures instituted at SEAD-25 and -26.

- 40 CFR Part 241.202 (applicable): Site selection shall be consistent with public health and welfare. It shall also be consistent with land-use plans and air and water quality standards. Consideration: These standards apply to remedial measures instituted at the SEAD-25 and -26 sites.

- 40 CFR Part 230-Section 404(b)(1) (applicable): Guidelines for Specifications of Disposal sites for dredged or filled material. The purpose of these guidelines is to restore and maintain the chemical, physical, and biological integrity of waters (including wetlands) of the United States through control of dredged or fill material. Considerations: No permit is required under Section 404, however, wetland restoration is required for remedial activities selected for SEAD-25 and -26.

- Wetlands Executive Order (EO1199) (applicable): Under this regulation federal agencies are required to minimize the destruction, loss, or degradation of wetlands and preserve and enhance natural and beneficial values of wetlands. Consideration: Remedial alternatives that involve construction must include all practical means of minimizing harm to wetlands.

C.3.3 Antiquities

- USC Part 469a-1 (applicable): The Archaeological and Historic Preservation Act requires that action be taken to recover and preserve artifacts. Consideration: An archeological survey is currently underway and will be completed shortly. A preliminary survey conducted in 1986 titled "An Archeological Overview and Management Plan for Seneca Army Depot," did not suggest any known archeological or historical site existed within the site boundaries.

- 36 CFR Part 800 (relevant and appropriate): Action must be taken to preserve historic properties. Actions must be planned to minimize harm to national historic landmarks. Consideration: As previously mentioned, a site archeological survey is currently underway. A preliminary archeological survey did not indicate that any historic properties exist on the site.

C.4 ACTION-SPECIFIC ARARS

Action-specific ARARs are usually technology- or activity-based limitations that control actions at hazardous waste sites. 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 removal alternatives. Action specific ARARs are applicable to this site. The action-specific ARARs to be used will be determined by the Army based upon the technology chosen. Federal and State regulations which may apply include the following:

C.4.1 Air Quality

- 40 CFR Part 50.8 (relevant and appropriate): Ambient Air Quality Standard for Carbon Monoxide. Carbon monoxide concentrations in the ambient air shall not exceed the following hourly average, 35 parts per million (ppm); 8-hour average, 9 ppm.

Consideration: This standard for carbon monoxide may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 50.12 (relevant and appropriate): Ambient Air Quality Standard for Lead. Lead concentrations in the ambient air shall not exceed 1.5 micrograms lead per cubic meter of air, 90-day average. Consideration: This standard for lead may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 50.9 (relevant and appropriate): Ambient Air Quality Standard for Ozone. Ozone concentrations in the ambient air shall not exceed 0.10 ppm hourly average. Consideration: This standard for ozone may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 50.6 (relevant and appropriate): Ambient Air Quality Standard for PM-10. PM-10 concentrations in the ambient air shall not exceed the following: 24 hour average, 150 micrograms per cubic meter of air; annual average, 50 micrograms per cubic meter of air. Consideration: This standard for PM-10 may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 61 (applicable and relevant and appropriate): National Emission Standards for Hazardous Air Pollutants. This regulation requires the minimization of emissions, specifies emissions tests and monitoring requirements, and sets limits on several hazardous air pollutants. Consideration: These standards may apply to air emissions for a removal action or other remedial activities.

- 40 CFR Part 58 (applicable): Ambient Air Quality Surveillance. This part defines quality assurance requirements, monitoring methods, instrument siting, and operating schedule for ambient air quality surveillance. Consideration: These ambient air quality standards may apply to removal actions or other remedial activities.

- 40 CFR Part 52 (applicable): Approval and Promulgation of Implementation Plans. This part defines general provisions for the contents of State Implementation Plans (SIPs). Consideration: These provisions may apply to removal actions or other remedial activities at SEAD-25 and -26.

- 40 CFR Part 264 Subpart AA, BB, and CC (applicable): Organic Air Emission Standards). Applicable to any air discharges due to treatment of the groundwater on site.

- 6 NYCRR Part 256 (applicable): Air Quality Classification System. This regulation defines four general levels of social and economic development for geographical areas in New York. These levels range from Level I, which would be used for timber, dairy farming or recreation and would be sparsely populated, to Level IV, which would be densely populated with large commercial metropolitan office buildings or areas of heavy industry. Consideration: SEAD is classified as Level II, which is an area of predominantly single and two family residences, small farms and limited commercial services and industrial development.

- 6 NYCRR subpart 257-1 (applicable): Air Quality Standards General. This section of the air regulations defines what an air standard is, how the standard will be applied and what compliance with these standards will entail. Consideration: These standards may apply to a removal action or other remedial activities at SEAD-25 and -26.

- 6 NYCRR subpart 257-3 (applicable): Air Quality Standards-Particulates. Suspended particulates shall not exceed 250 mg/m^3 more than once a year. Annual standard—55 $\mu g/m^3$, 30-day standard—100 $\mu g/m^3$, 60-day standard—85 $\mu g/m^3$, 90-day standard—80 $\mu g/m^3$, standard for settleable solids—50 percent of the values of the 30 day average concentrations shall not exceed 0.30 $mg/cm^2/mo$;—84 percent shall not except 0.45 $mg/cm^2/mo$. Consideration: These standards may apply to a removal action or other remedial activities at SEAD-25 and -26.

- 6 NYCRR subpart 257-4 (applicable): Air Quality Standards for Carbon Monoxide. Eight hour standard— 9 ppm, 1 hour standard 35 ppm. Consideration: The carbon monoxide standard may apply to a removal action or other remedial activity at the SEAD-25 and -26 sites.

- 6 NYCRR subpart 257-6 (applicable): Air Quality Standards—Hydrocarbons (non methane). Three hour standard measured from 6 to 9 am—0.24 ppm. Consideration: The hydrocarbon standard may apply to a removal action or other remedial activity at the SEAD-25 and -26 sites.

C.4.2 Water Quality

- 40 CFR Part 131 (applicable): Water Quality Standards. This part implements Section 101 of the Clean Water Act (CWA), which specifies the national goals of eliminating the discharge of pollutants, prohibiting the discharge of toxic pollutants in toxic amounts, and implementing programs for control of nonpoint sources.

- 40 CFR Part 131.12 (applicable): Antidegradation Policy. Establishes standards to prevent a body of water which has an existing high standard from degrading to a lower standard.
- 40 CFR Part 403 (applicable): Pretreatment Standards for the Discharge of Treated Site Water to a Publicly Owned Treatment Works (POTW). This part establishes pretreatment standards for the discharge of wastewater to POTWs. Consideration: These standards apply to any removal action or other remedial measure that might involve the discharge of treated site water to a POTW. If such a discharge system is installed at the SEAD-25 and 26 and the discharge is sent to a POTW, then a permit would be obtained from the POTW prior to the discharge.

- 6 NYCRR Chapter X (relevant and appropriate): This chapter establishes the requirements of the State Pollutant Discharge Elimination System. Consideration: These standards are relevant and appropriate discharges from remedial activities that occur at the site.

C.4.3 Solid Waste Management

- 40 CFR Part 241.100 (relevant and appropriate): Guidelines for the Land Disposal of Solid Wastes. These regulations are geared specifically toward sanitary landfills; however, they are applicable to all forms of land disposal and land-based treatment. Consideration: These regulations are relevant and appropriate to land disposal or land-based treatment that may be established as part of remedial measures at SEAD-25 and -26.

- 40 CFR Part 241.204 (applicable): Water Quality. The location, design, construction, and operation of land disposal facilities shall protect water quality. Consideration: These regulations apply to land disposal facilities that may be established as part of remedial measures at the SEAD-25 and -26 sites.

- 40 CFR Part 241.205 (applicable): The design, construction, and operation of land disposal facilities shall conform to air quality and source control standards. Considerations: These standards are applicable to land disposal facilities that may be established as part of remedial measures on the SEAD-25 and -26 sites.

- 40 CFR Part 257.1 (relevant and appropriate): This part establishes the scope and purpose of criteria for use in assessing the possibility of adverse effects on health or the environment from solid waste disposal operations. Consideration: This part is relevant and appropriate to solid waste disposal operations that may be established during remedial activities at the SEAD-25 and -26 sites.

- 40 CFR Part 257.3 (relevant and appropriate): This part establishes criteria to assess the impact of disposal operations, including such considerations as flood plains, endangered species, air, surface water, groundwater, and land used for food-chain crops. Consideration: This part is relevant and appropriate to disposal operations performed during remedial activities at the SEAD-25 and -26 sites.

- 40 CFR Part 243.202 (relevant and appropriate): This part specifies the requirements for transporting solid waste, including provisions to prevent spillage. Consideration: This part is relevant and appropriate to remedial measures that involve transporting of solid waste.

- 6 NYCRR Part 360: Subtitle D Solid Waste Landfills (applicable). Consideration: Applies to remedial alternatives using capping options.

C.4.4 <u>Hazardous Waste Management</u>

- 40 CFR 262.11 (applicable): Standards Applicable to Generators of Hazardous Waste. This regulation requires a person who generates a solid waste to determine if that waste is a hazardous waste. Consideration: This part is applicable if solid waste is disposed of as part of remedial measures.

- 40 CFR Part 263.30 and 263.31 (applicable): These regulations set forth the standards and requirements for action in the event of a release during transport. Consideration:

These regulations are relevant and appropriate if the transport hazardous wastes is part of a remedial measure at the SEAD-25 and 26 sites.

- 40 CFR Part 264 (applicable): This part establishes hazardous waste management facility standards and requirements, including long-term monitoring requirements. The on-site disposal areas used for stockpiling, mixing, and extended bioremediation of wastes must meet the substantive requirements of 40 CFR subparts B (general facility standards), E (manifest system, record keeping, and reporting), F (releases from solid waste management units), G (closure and post closure), L (waste piles), M (land treatment), and N (landfills). These regulations are applicable for hazardous wastes and are also relevant and appropriate for certain wastes which are not hazardous wastes. Consideration: These hazardous waste management facility standards and requirements are relevant and appropriate to on-site disposal areas established for remedial measures at the SEAD-25 and 26 sites. Any facilities will be constricted, fenced, posted, and operated in accordance with this requirement. All workers will be properly trained. These standards would be applicable to any treatment or disposal facility operated on the site. In addition, Subpart J (Tank Systems) would be applicable to any treatment of groundwater on site and Subparts AA, BB, and CC (Organic Air Emission Standards) would be applicable to any air discharged due to treatment of groundwater on the site.

- 40 CFR subpart S parts 264.552 and 264.533 (relevant and applicable): Corrective Action for Solid Waste Management Units. Allows for the consolidation of wastes, or the replacement of remediated wastes in land based units without invoking the RCRA land-disposal requirement of 40 CFR 268. Consideration: These parts are relevant and appropriate during a removal action or other remedial measures at the SEAD-25 and 26 sites.

- 40 CFR Part 268 (applicable): Land Disposal Restrictions (LDR). Restricts the disposal of listed and characteristic hazardous waste which contain hazardous constituents exceeding designated levels. Only applies when the waste is "placed" on the land. Consideration: For this site, only the restrictions on land disposal of Toxicity Characteristic (TC) hazardous wastes are ARARs, since there are no F or K listed wastes on-site. Specifically, it has been assumed that the characteristic would exceed TCLP limits, based upon existing groundwater quality. Accordingly, if soil is excavated the LDR are considered an ARAR.

- 40 CFR Part 270 subpart C (relevant and appropriate): This regulation establishes permit conditions, including record keeping requirements, operation and maintenance requirements, sampling, and monitoring requirements. Consideration: Although no permit is required for activities conducted entirely on site, the substantive requirements of these provisions are relevant and appropriate to the SEAD-25 and -26 sites.

- 40 CFR Part 270 subpart B (relevant and appropriate): This part defines the required contents of a hazardous waste management permit application. Consideration: The substantive requirements of these provisions are relevant and appropriate to the SEAD-25 and -26 sites.

- 6 NYCRR Part 375 (applicable): Inactive Hazardous Waste Disposal Sites. These regulations apply to State Superfund sites. Consideration: As a CERCLA site in the State of New York, these regulations apply.

Occupational Health and Safety Administration

- 29 CFR Part 1910.50 (applicable): Occupational Noise. No worker shall be exposed to noise levels in excess of the levels specified in this regulation. Consideration: Adherence to occupational noise regulations has been a part of all previous on-site activities and all future work will also comply with these regulations.

- 29 CFR Part 1910.1000 (applicable): Occupational Air Contaminants. The purpose of this rule is to establish maximum threshold limit values for air contaminants to which it is believed nearly all workers may be repeatedly exposed day after day without adverse health effects. No worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in the regulation. Consideration: Adherence to air contaminant regulations for on-site workers has been a part of all previous field programs at SEAD-25 and -26 and all future work will also comply with these regulations.

- 29 CFR Part 1910.1200 (applicable): This part requires that each employer compile and maintain a workplace chemical list which contains the chemical name of each hazardous chemical in the workplace, cross-referenced to generally used common names. This list must indicate the work area in which each such hazardous chemical is stored or used. Employees must be provided with information and training regarding the hazardous chemicals. Consideration: The requirements of this part have been complied with during the performance of all previous work at the SEAD-25 and -26 sites. All future work will also require compliance with this part.

- 29 CFR Part 120 (applicable): This part applies to employers and employees engaged in sites that have been designated for cleanup, and other work related to RCRA and CERCLA. The regulation establishes proceedings for site characterization and control, and requirements for employee training and medical monitoring. Consideration: The requirements of this part have been complied with during the performance of all previous work at the SEAD-25 and -26 sites. All future work will also require compliance with this part.

Transportation of Hazardous Waste

- 40 CFR Part 171 (applicable): General information, regulations, and definitions. This regulation prescribes the requirements of the DOT governing the transportation of hazardous material. Consideration: This part may apply to remedial measures that require the transport of hazardous materials. Contaminated materials will be packaged, manifested, and transported to a licensed off-site disposal facility in accordance with these regulations.

- 40 CFR Part 172 (applicable): Hazardous materials table, special provisions, Hazardous Materials Communications, Emergency Response Information, and Training requirements. This regulation lists and classifies those materials which the DOT has designated to be hazardous materials for the purpose of transportation and prescribes the requirements for shipping papers, package marking, labeling and transport vehicle placarding applicable to the shipment and transportation of those hazardous materials. Consideration: This part may be applicable to remedial measures that require the shipment and transportation of hazardous materials.

- 40 CFR Part 177 (applicable): Carriage by Public Highway. This regulation prescribes requirements that are applicable to the acceptance and transportation of hazardous materials by private, common, or contract carriers by motor vehicle. Consideration: This part may be applicable to remedial measures that require this shipment and transportation of hazardous materials.

- 6 NYCRR Chapter 364 (applicable): New York Waste Transport Permit Regulation. This regulation governs the collection, transport, and delivery of regulated waste originating on terminating within the state of New York. Consideration: This regulation may be applicable to remedial measures that involve regulated waste.

- EPA/DOT Guidance Manual on hazardous waste transportation (TBC): Consideration: This information contained in this manual will be considered for remedial measures that involve hazardous waste transportation.

Table C-1
ARARs Summary for Remedial Action Alternatives
Seneca Army Depot Activity - SEAD-25

ARARs	Alternative RA25-1	Alternative RA25-2	Alternative RA25-3	Alternative RA25-3a	Alternative RA25-4	Alternative RA25-5	Alternative RA25-6	Alternative RA25-3R	Alternative RA25-3AR
Chemical-Specific ARARs									
Water Quality									
40 CFR Part 141 National Primary Drinking Water Regulations.	Will Not Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 141.11 Maximum Inorganic Chemical Contaminant Levels.	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 264 Subpart F. Releases from Solid Waste Management Units.	Will Not Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subparts 701 and 702: Water quality standards	Will Not Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 703. Groundwater standards	Will Not Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 373-2.6 and 373-2.11: Groundwater monitoring for releases from SWMUs	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 373-2. Postclosure care and groundwater monitoring	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
10 NYCRR Part 5 Drinking water supplies.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
NYSDEC TOGS 1 1 1 Water quality standards and guidance	Will Not Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
LOCATION-SPECIFIC ARARS									
40 CFR Part 257.3-2: Endangered species	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 264.18. Location Standards for Hazardous Waste Facilities.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 241.202. Site selection	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
16 USC Part 469a-1 The Archaeological and Historic Preservation Act	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
36 CFR Part 800 Historic properties	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
ACTION-SPECIFIC ARARS									
Air Quality									
40 CFR Part 50.8: Ambient Air Quality Standard for Carbon Monoxide	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 50 12 Ambient Air Quality Standard for Lead.	Not applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 50.9: Ambient Air Quality Standard for Ozone.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 50.6: Ambient Air Quality Standard for PM-10.	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 61: NESHAPS	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 58: Ambient Air Quality Surveillance	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply

Table C-1
ARARs Summary for Remedial Action Alternatives
Seneca Army Depot Activity - SEAD-25

ARARs	Alternative RA25-1	Alternative RA25-2	Alternative RA25-3	Alternative RA25-3a	Alternative RA25-4	Alternative RA25-5	Alternative RA25-6	Alternative RA25-3R	Alternative RA25-3AR
6 NYCRR subpart 257-1 Air Quality Standards General.	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 257-3 Air Quality Standards-Particulates	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 257-4. Air Quality Standards for Carbon Monoxide.	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 257-6 Air Quality Standards - Hydrocarbons (non methane)	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
NYSDEC Air Guide - 1 AGCs and SGC for barium, copper, zinc, TCE, DCE, vinyl chloride	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
Water Quality									
40 CFR Part 131 Water Quality Standards	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 131.12 Antidegradation Policy	Will Not Comply	Will Not Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 230; Section 404(b)(I)L. Guidelines for Specification for Disposal Sites for Dredged or Fill material	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 403 Pretreatment Standards	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Not Applicable	Not Applicable
6 NYCRR Chapter X. SPDES	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Solid Waste Management									
40 part CFR 241.100 Land Disposal of Solid Wastes	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 241.204 Water Quality.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 241.205 Air quality	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 243.202 Transport	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR Part 360. Subtitle D solid waste landfills	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hazardous Waste Management									
40 CFR 262.11 Generators	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 263.30 and 263.31: Release during trans-port.	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 264 Hazardous waste management facility standards	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Subpart S parts 264.552 and 264.533 Corrective Action	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 264, Subparts AA, BB, and CC Organic Air Emission Standards	Not Applicable	Not Applicable	Will Comply	Not Applicable	Not Applicable	Will Comply	Will Comply	Will Comply	Not Applicable
40 CFR Part 268: Land Disposal Restrictions	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Will Comply
40 CFR Part 270 subpart C: Permit conditions	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply

Table C-1
ARARs Summary for Remedial Action Alternatives
Seneca Army Depot Activity - SEAD-25

ARARs	Alternative RA25-1	Alternative RA25-2	Alternative RA25-3	Alternative RA25-3a	Alternative RA25-4	Alternative RA25-5	Alternative RA25-6	Alternative RA25-3R	Alternative RA25-3AR
40 CFR Part 270 subpart B. Permit applications	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 375: Inactive hazardous waste disposal sites.	Will Not Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
Occupational Health and Safety Administration									
29 CFR Part 1910.50: Occupational Noise	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
29 CFR Part 1910 1000 Occupational Air Contaminants	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
29 CFR Part 1910 1200 Hazard communication	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
29 CFR Part 120: Employee training and medical monitoring.	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
Transportation of Hazardous Waste									
49 CFR Part 171. Transport of hazardous material	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 172: Hazardous materials table, special provisions, Hazardous Materials Communications, Emergency Response Information, and Training requirements	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
49 CFR Part 177: Carriage by Public Highway	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR Chapter 364 New York Waste Transport Permit Regulation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply
EPA/DOT Guidance Manual on hazardous waste transportation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Will Comply	Will Comply	Will Comply	Will Comply	Will Comply

Note: Final Compliance with 16 USC Part 469a-1 and 36CFR Part 800 depends on the results of the archeological survey.

Table C-2
ARARs Summary for Remedial Action Alternatives
Seneca Army Depot Activity - SEAD-26

ARARs	Alternative RA26-1	Alternative RA26-2	Alternative RA26-3	Alternative RA26-4
Chemical-Specific ARARs				
Water Quality				
40 CFR Part 141: National Primary Drinking Water Regulations.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 141.11: Maximum Inorganic Chemical Contaminant Levels.	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 264 Subpart F. Releases from Solid Waste Management Units.	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subparts 701 and 702: Water quality standards	Will Not Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 703: Groundwater standards	Will Not Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 373-2.6 and 373-2.11: Groundwater monitoring for releases from SWMUs	Will Comply	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 373-2: Postclosure care and groundwater monitoring	Not Applicable	Will Comply	Will Comply	Will Comply
10 NYCRR Part 5: Drinking water supplies.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
NYSDEC TOGS 1.1.1: Water quality standards and guidance	Will Not Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 268: Land Disposal Restrictions.	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR subpart S parts 264.552 and 264.533: Corrective Action	Not Applicable	Not Applicable	Not Applicable	Not Applicable
LOCATION-SPECIFIC ARARS				
40 CFR Part 257.3-2: Endangered species	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 264.18: Location Standards for Haz-ardous Waste Facilities.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 241.202: Site selection	Not Applicable	Not Applicable	Not Applicable	Not Applicable
16 USC Part 469a-1: The Archaeological and Historic Preservation Act	Will Comply	Will Comply	Will Comply	Will Comply
36 CFR Part 800: Historic properties	Will Comply	Will Comply	Will Comply	Will Comply

Table C-2
ARARs Summary for Remedial Action Alternatives
Seneca Army Depot Activity - SEAD-26

ARARs	Alternative RA26-1	Alternative RA26-2	Alternative RA26-3	Alternative RA26-4
ACTION-SPECIFIC ARARS				
Air Quality				
40 CFR Part 50.8: Ambient Air Quality Standard for Carbon Monoxide.	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 50.12: Ambient Air Quality Standard for Lead.	Not applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 50.9: Ambient Air Quality Standard for Ozone.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 50.6: Ambient Air Quality Standard for PM-10.	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 61: NESHAPS	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 58: Ambient Air Quality Surveillance.	Not Applicable	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 257-1: Air Quality Standards General.	Not Applicable	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 257-3: Air Quality Standards-Particulates.	Not Applicable	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 257-4: Air Quality Standards for Carbon Monoxide.	Not Applicable	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 257-6: Air Quality Standards - Hydrocarbons (non methane).	Not Applicable	Will Comply	Will Comply	Will Comply
NYSDEC Air Guide - 1: AGCs and SGCs for barium, copper, zinc, TCE, DCE, vinyl chloride	Not Applicable	Will Comply	Will Comply	Will Comply
Water Quality				
40 CFR Part 131: Water Quality Standards.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 131.12: Antidegradation Policy.	Will Comply	Will Comply	Will Comply	Will Comply
40 CFR Part 230; Section 404(b)(I)L: Guidelines for Specification for Disposal Sites for Dredged or FIll material	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 403: Pretreatment Standards	Not Applicable	Not Applicable	Not Applicable	Will Comply
6 NYCRR Chapter X: SPDES	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Solid Waste Management				
40 part CFR 241.100: Land Disposal of Solid Wastes.	Not Applicable	Will Comply	Will Comply	Will Comply

Table C-2
ARARs Summary for Remedial Action Alternatives
Seneca Army Depot Activity - SEAD-26

ARARs	Alternative RA26-1	Alternative RA26-2	Alternative RA26-3	Alternative RA26-4
40 CFR Part 241.204: Water Quality.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 241.205: Air quality	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 243.202: Transport	Not Applicable	Will Comply	Will Comply	Will Comply
6 NYCRR Part 360: Subtitle D solid waste landfills	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Hazardous Waste Management				
40 CFR 262.11: Generators	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 263.30 and 263.31: Release during transport.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 264: Hazardous waste management facility standards	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 264 Subpart AA, BB, and CC: Organic Air Emission Standards	Not Applicable	Not Applicable	Will Comply	Will Comply
40 CFR Part 268: Land Disposal Restrictions.	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR subpart S parts 264.552 and 264.533: Corrective Action	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 270 subpart C: Permit conditions	Not Applicable	Will Comply	Will Comply	Will Comply
40 CFR Part 270 subpart B: Permit applications	Not Applicable	Will Comply	Will Comply	Will Comply
6 NYCRR subpart 375: Inactive hazardous waste disposal sites.	Not Applicable	Will Comply	Will Comply	Will Comply
Occupational Health and Safety Administration				
29 CFR Part 1910.50: Occupational Noise	Not Applicable	Will Comply	Will Comply	Will Comply
29 CFR Part 1910.1000: Occupational Air Contaminants	Not Applicable	Will Comply	Will Comply	Will Comply
29 CFR Part 1910.1200: Hazard communication	Not Applicable	Will Comply	Will Comply	Will Comply
29 CFR Part 120: Employee training and medical monitoring.	Not Applicable	Will Comply	Will Comply	Will Comply

Table C-2
ARARs Summary for Remedial Action Alternatives
Seneca Army Depot Activity - SEAD-26

ARARs	Alternative RA26-1	Alternative RA26-2	Alternative RA26-3	Alternative RA26-4
Transportation of Hazardous Waste				
49 CFR Part 171 Transport of hazardous material.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
40 CFR Part 172 Hazardous materials table, special provisions, Hazardous Materials Communications, Emergency Response Information, and Training requirements.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
49 CFR Part 177: Carriage by Public Highway.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
6 NYCRR Chapter 364: New York Waste Transport Permit Regulation.	Not Applicable	Not Applicable	Not Applicable	Not Applicable
EPA/DOT Guidance Manual on hazardous waste transportation	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Note Final Compliance with 16 USC Part 469a-1 and 36CFR Part 800 depends on the results of the archeological survey

Appendix D
Cost Backup

Appendix D
SEAD-25 Cost Backup

The cost estimate was prepared using ECHOS© (Environmental Cost Handling Options and Solutions) and Softbooks© (a computer data base/program based upon ECHOS©). A brief overview of ECHOS is attached.

Preface

The Book

The ECHOS *Environmental Restoration: Unit Cost Book* is "the cost source book" for environmental restoration activities beginning with initial site investigation and continuing through studies, design, remediation, and long-term monitoring and operation. Containing over 4,000 assembly cost items, this publication is updated and expanded biannually to reflect the latest cost and technology information in the rapidly changing environmental field.

The ECHOS *Environmental Restoration: Unit Cost Book* provides you with the detailed line items, component costs, forms, instructions, and guidelines needed to prepare or verify cost estimates for almost any type of environmental restoration project, ranging from simple underground storage tank removals to complex multimedia/multicontaminant hazardous waste sites listed on the US EPA's National Priority List.

The assembly numbering follows the recently introduced US Government Interagency Code of Accounts, an evolving standard for organizing environmental restoration costs. Cost information is provided for labor, equipment, and materials with guidelines for adjusting costs to reflect work performed at various OSHA-dictated safety levels. Location factors are supplied by zip code, allowing you to adjust your estimate to local conditions.

The Data

The ECHOS research staff is constantly gathering, monitoring, and developing construction and environmental restoration cost information throughout the US. In so doing, the ECHOS database reflects the most current trends in both procedures and unit costs for environmental restoration activities. This book is the result of over seven years of research in environmental restoration costs, and the cost information used in this book has been successfully used on over 1,500 environmental restoration projects in every state in the US.

This data is received by us from sources we believe to be reliable, but no warranty, guaranty or representation is made by ECHOS as to the correctness or sufficiency of any information, prices or representation contained in the ECHOS *Environmental Restoration: Unit Cost Book* and ECHOS assumes no responsibility or liability in connection therewith.

Material costs are determined through contact with product manufacturers, dealers, supply houses, distributors, and contractors. Labor costs are based on crews and productivity factors determined by ECHOS environmental engineering and construction experts. Equipment costs are based on either rental rates or purchase and annual cost of ownership.

Regulatory Environment

There are numerous state and federal laws and regulations that govern the practice of environmental restoration activities. The two primary laws that set the standards for this book are the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and its amendments (commonly referred to as the SUPERFUND Law), and the Resource Conservation and Recovery Act (RCRA). The environmental restoration technologies and processes used in this book are primarily designed to be used on projects that are regulated by these laws but the data can be used for other unregulated projects.

About ECHOS

ECHOS is a joint venture between Delta Technologies Group, Inc., experts in environmental restoration cost estimating and technology application and R.S. Means Co. Inc., the leading publisher of construction cost information in North America. Through this collaboration of seasoned technical experts and exhaustive cost research, all of the practical tools necessary to assemble or analyze restoration costs have been established.

Appendix D

Table D-1 Cost Estimate Assumptions Summary

Table D-1
Cost Estimate Assumptions Summary
SEAD-25 and SEAD-26

Alternative	Description	GW Monitoring, Years	Air Sparging, Years	Air Stripping, Years	Bioventing Years	Soils Removal Y/N	Sediment Removal Y/N
25-2	Institutional Controls, Natural Attenuation of Plume.	150					N
25-3	Bioventing of Soil, Air Sparging of Plume.	10	10		5		N
25-3a	Bioventing of Soil, Natural Attenuation of Plume	20			5		N
25-4	Source Removal, Off-site Disposal, and Natural Attenuation of Plume	20		1		Y	N
25-5	Source Removal, Off-site Disposal, and Air Stripping of Plume	5		2		Y	N
25-6	Source Removal Off-site Disposal, and Air Sparging of Plume	20	10	1		Y	N
25-3R	Bioventing of Soil, Air Sparging of Plume. Sediment Removal	10	10		5		Y
25-3aR	Bioventing of Soil, Natural Attenuation of Plume Sediment Removal	20			5		Y
26-2	Institutional Controls, Natural Attenuation of Plume	40				N	N
26-3	Air Sparging of Plume	10	10			N	N
26-4	Air Stripping of Plume	10		10		N	N

Appendix D

Tables D-2 Through D-6 SEAD-25 Cost Estimate Summaries

Table D-2

SENECA ARMY DEPOT SEAD -25 &- 26 FS
COST ESTIMATE SUMMARY
RA 25-2 (Institutional Controls, Natural Attenuation of Plume)

WBS number	Description	Cost
32xxx	**Design** (see 25-2 Capital Cost, Professional Labor")	8,258.80
331xx01	**Mobilization and preparatory work** (See 25-2 Capital Cost, Decontamination Facilities and Fencing)	21,050.12
331xx02	**Monitoring, sampling,testing,and analysis** (See 25-2 Capital Cost , Analyses ;Soil Sludge, ...)	0
331xx03	**Site work** (See 25-2 Capital cost , Cleanup and Landscaping)	0
331xx08	**Solids collection and Containment** (See 25-2 Capital Cost, Excavation)	0
331xx19	**Disposal, Commercial** (See 25- 2 Capital cost, Landfill Disposal, Load and haul)	0
331xx22	**General requirements** (See 25- 2 Capital cost, Contractor Costs/ General conditions)	0
332xx	**Engineering During Construction** (See 25- 2 Capital Cost, Professional Labor)	2038.58
333xx	**Construction management** (See 25-2 Capital Cost, Professional Labor)	0
	SUBTOTAL ESTIMATED CONSTRUCTION COST	**31,347.50**
	Location Multiplier, 0.85	26645.38
	Escalation at 10 % of estimated construction cost	3134.75
	Overhead and Profit, 13 % of estimated construction cost	4075.18
	Contingency, 20 % of estimated construction cost	6269.50
	TOTAL ESTIMATED CONSTRUCTION COST	**$ 40,124.80**
342XXX	**Operation and Maintenance (post construction)** (See 25 -2) Annual cost	**24233.90**
	Present worth O & M cost at 150 years and 5 % per year	**$ 484,678**
	Total Evaluated cost for Alternative 25-2	**$ 524,803**

Table D-3

SENECA ARMY DEPOT SEAD-25 & -26 FS
COST ESTIMATE SUMMARY
RA 25-3, (Bioventing of Soil, Air Sparging of Plume)

WBS number	Description		Cost,$
32xxx	**Design and treatability study** (See 25-3 Capital Cost, Professional Labor")		62,217.73
331xx01	**Mobilization and preparatory work** (See 25-3 Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		57,975.67
331xx02	**Monitoring, sampling,testing,and analysis** (See 25-3 Capital Cost , Analyses ;Soil ..., Analyses ; Water..., Groundwater monitoring wells)		10745.81
331xx03	**Site work** (See 25-3 Capital cost,Clear & Grub, Cleanup and Landscaping)		4,445.12
331xx08	**Solids collection and Containment** (See 25-3 Capital Cost, Excavation)		0
331xx11	**Bioventing** (See 25-3 Capital Cost,In-situ biodegradation (Bioventing))		26,785.64
331xx11	**Air Sparging** (See 25-3 Capital Cost, Air Sparging)		47,619.49
331xx19	**Disposal, Commercial** (See 25-3 Capital cost , Landfill Disposal, Load and haul)		0
331xx22	**General requirements** (See 25-3 Capital cost , Contractor Costs/ General conditions)		17,942.38
332xx	**Engineering During Construction** (See 25-3 Capital Cost, Professional Labor)		29,459.39
333xx	**Construction management** (See 25-3 Capital Cost, Professional Labor)		50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**307,306.26**
	Location Multiplier, 0.85		261,210.32
	Escalation at 10 % of estimated construction cost		30,730.63
	Overhead and Profit, 13 % of estimated construction cost		39,949.81
	Contingency, 20 % of estimated construction cost		61,461.25
	TOTAL ESTIMATED CONSTRUCTION COST		**$ 393,352.01**
342XXX	**Operation and Maintenance (post construction)**		
	(See 25 -3 , Bioventing)	Annual cost	20,249.74
	(See 25 -3 , Balance of O & M costs)	Annual cost	55,067.50
			75,317.24
	Present worth Bioventing cost at 5 years and 5 % per year		**$ 87,671.2**
	Present worth balance of O & M cost at 10 years and 5 % per year		**$ 425,214.7**
	Total Evaluated cost for Alternative 25-3		**$ 906,238.0**

Table D-3a

SENECA ARMY DEPOT SEAD-25 & -26 FS
COST ESTIMATE SUMMARY
RA 25-3a (Bioventing and Natural Attenuation of Plume)

WBS number	Description		Cost, $
32xxx	**Design and treatability study** (See 25-4 Capital Cost, Professional Labor)		48,440.91
331xx01	**Mobilization and preparatory work** (See 25-3a Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		54,036.82
331xx02	**Monitoring, sampling,testing,and analysis** (See 25-3a Capital Cost, Analyses ;Soil ., Analyses; Water., Analyses:air ..., Groundwater monitoring wells)		10,745.81
331xx03	**Site work** (See 25-3a Capital cost,Clear & Grub, Cleanup and Landscaping)		4,445.12
331xx08	**Solids collection and Containment** (See 25-3a Capital Cost, Excavation)		0
331xx11	**Bioventing** (See 25-3a Capital Cost, Bioventing)		26,740.81
331xx19	**Disposal, Commercial** (See 25-3a Capital cost, Landfill Disposal, Load and Haul)		0
331xx22	**General requirements** (See 25- 3a Capital cost, Contractor Costs/ General conditions)		10,446.89
332xx	**Engineering During Construction** (See 25-3a Capital Cost, Professional Labor)		7,326.16
333xx	**Construction management** (See 25-3a Capital Cost, Professional Labor)		32,277.47
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**194,459.99**
	Location Multiplier, 0.85		165,290.99
	Escalation at 10 % of estimated construction cost		19,446.00
	Overhead and Profit, 13 % of estimated construction cost		25,279.80
	Contingency, 20 % of estimated construction cost		38,892.00
	TOTAL ESTIMATED CONSTRUCTION COST		$ 248,908.79
342XXX	**Operation and Maintenance (post construction)**		
	(See 25 -3a, Bioventing)	Annual cost	20,249.74
	(See 25 -3a, Balance of O & M costs.)	Annual cost	52,649.95
			72,899.69
	Present worth Bioventing cost at 5 years and 5 %/yr.		$ 87,671.2
	Present worth, balance of O & M cost at 20 years and 5 %/yr.		$ 656,134.2
			$ 992,714.2

Table D-4

SENECA ARMY DEPOT SEAD-25 & -26 FS
COST ESTIMATE SUMMARY
RA 25-4 (Source Removal, Off-site Disposal, and Natural Attenuation of Plume)

WBS number	Description	Cost,$
32xxx	**Design and treatability study** (See 25-4 Capital Cost, Professional Labor)	40,789.45
331xx01	**Mobilization and preparatory work** (See 25-4 Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)	57,480.96
331xx02	**Monitoring, sampling,testing,and analysis** (See 25-4 Capital Cost, Analyses ;Soil ., Analyses; Water., Analyses:air ..., Groundwater monitoring wells)	35,045.31
331xx03	**Site work** (See 25-4 Capital cost,Clear & Grub, Cleanup and Landscaping)	4,419.35
331xx08	**Solids collection and Containment** (See 25-4 Capital Cost, Excavation)	37607.95
331xx11	**Air stripping** (See 25-4 Capital Cost, Air stripping)	50,958.74
331xx19	**Disposal, Commercial** (See 25-4 Capital cost, Landfill Disposal)	337,103.75
331xx22	**General requirements** (See 25- 4 Capital cost, Contractor Costs/ General conditions)	17,942.38
332xx	**Engineering During Construction** (See 25-4 Capital Cost, Professional Labor)	29,800.00
333xx	**Construction management** (See 25-4 Capital Cost, Professional Labor)	50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST	**661,262.92**
	Location Multiplier, 0.85	562,073.48
	Escalation at 10 % of estimated construction cost	66,126.29
	Overhead and Profit, 13 % of estimated construction co	85,964.18
	Contingency, 20 % of estimated construction cost	132,252.58
	TOTAL ESTIMATED CONSTRUCTION COST	**$ 846,416.54**
342XXX	**Operation and Maintenance (post construction)**	
	(See 25 -4, Air stripping) Annual cost	10,359.99
	(See 25 -4, Balance of O & M costs.) Annual cost	28,630.25
		38,990.24
	Present worth Air Stripping cost at 1 years and 5 %/yr.	**$ 10,360.0**
	Present worth, balance of O & M cost at 20 years and 5 %/yr.	**$ 356,795.9**
		$1,213,572.4

Table D-5

SENECA ARMY DEPOT SEAD-25 & -26 FS
COST ESTIMATE SUMMARY
RA 25-5, (Source Removal, Off-site Disposal & Air Stripping of Plume

WBS number	Description		Cost,$
32xxx	**Design** (See 25-5 Capital Cost, Professional Labor")		38,416.56
331xx01	**Mobilization and Preparatory Work** (See 25-5 Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		57,635.13
331xx02	**Monitoring, sampling,testing,and analysis** (See 25-5 Capital Cost , Analyses ;Soil ..., Analyses ; W water, Analyses air..., Groundwater monitoring wells)		34,232.04
331xx03	**Site work** (See 25-5 Capital cost,Clear & Grub, Cleanup and Landscaping)		4,419.35
331xx06	**Groundwater Colllection and Control** (See 25-5 Capital cost, Discharge to POTW)		12,958.77
331xx08	**Solids Collection and Containment** (See 25-5 Capital Cost, Excavation)		37,607.95
331xx11	**Air Stripping** (See 25-5 Capital Cost, Air stripping)		87,787.97
331xx19	**Disposal, Commercial** (See 25-5 Capital cost, Landfill Disposal)		353,137.39
331xx22	**General requirements** (See 25- 5 Capital cost, Contractor Costs/ General conditions)		17,942.38
332xx	**Engineering During Construction** (See 25-5 Capital Cost, Professional Labor)		29,800.00
333xx	**Construction management** (See 25-5 Capital Cost, Professional Labor)		50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**724,052.57**
	Location Multiplier, 0.85		615,444.68
	Escalation at 10 % of estimated construction cost		72,405.26
	Overhead and Profit, 13 % of estimated construction c		94,126.83
	Contingency, 20 % of estimated construction cost		144,810.51
	TOTAL ESTIMATED CONSTRUCTION COST		**$ 926,787.29**
342XXX	**Operation and Maintenance (post construction)**		
	(See 25 -5 , Air stripping)	Annual cost	10,359.99
	(See 25 -5 , All, except Air stripping)	Annual cost	40,471.03
			50,831.02
	Present worth, Air Stripping cost at 2 years and 5 %/yr.		**$ 19,263.37**
	Present worth, balance of O & M cost at 5 years and 5 %/yr.		**$ 175,219.32**
			$ 194,482.69
			$ 1,121,269.98

Table D-6

SENECA ARMY DEPOT SEAD-25 & -26 FS
COST ESTIMATE SUMMARY
RA 25-6 (Source Removal, Off-site Disposal, and Air Sparging of Plume)

WBS number	Description		Cost,$
32xxx	**Design and treatability study** (See 25-6 Capital Cost, Professional Labor")		57,949.48
331xx01	**Mobilization and preparatory work** (See 25-6 Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		57,635.13
331xx02	**Monitoring, sampling,testing,and analysis** (See 25-6 Capital Cost , Analyses ;Soil ..., Analyses ; Wat water, Analyses air..., Groundwater monitoring wells)		36,586.41
331xx03	**Site work** (See 25-6 Capital cost, Clear & Grub, Cleaning and landscaping)		4,445.12
331xx08	**Solids Collection and Containment** (See 25-6 Capital Cost, Excavation)		37,607.95
331xx11	**Air Sparging** (See 25-6 Capital Cost, Air sparging)		50,374.11
331xx19	**Disposal, Commercial** (See 25-6 Capital cost, Landfill Disposal)		337,103.75
331xx22	**General requirements** (See 25- 6 Capital cost, Contractor Costs/ General conditions)		17,942.38
332xx	**Engineering During Construction** (See 25-6 , Capital Cost, Professional Labor)		29,800.00
333xx	**Construction management** (See 25-6 , Capital Cost, Professional Labor)		50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**679,559.36**
	Location Multiplier, 0.85		577,625.46
	Escalation at 10 % of estimated construction cost		67,955.94
	Overhead and Profit, 13 % of estimated construction c		88,342.72
	Contingency, 20 % of estimated construction cost		135,911.87
	TOTAL ESTIMATED CONSTRUCTION COST		**$ 869,835.98**
342XXX	**Operation and Maintenance (post construction)**		
	(See 25 -6 , Air sparging)	Annual cost	26,462.11
	(See 25 -6 , Balance of O & M costs)	Annual cost	27,075.35
			53,537.46
	Present worth, Air Sparging cost at 10 years and 5 %/yr.		**$ 204,332.47**
	Present worth, balance of O & M cost at 20 years and 5 %/yr.		**$ 337,418.43**
			$ 541,750.9
			$ 1,411,586.88

Table D-7

SENECA ARMY DEPOT SEAD-25 & -26 FS
COST ESTIMATE SUMMARY
RA 25-3r, (Bioventing of Soil, Air Sparging of Plume)

WBS number	Description		Cost,$
32xxx	**Design and treatability study**		
	(See 25-3R Capital Cost, Professional Labor")		62,217.73
331xx01	**Mobilization and preparatory work**		
	(See 25-3R Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		57,975.67
331xx02	**Monitoring, sampling,testing,and analysis**		
	(See 25-3R Capital Cost , Analyses ;Soil ..., Analyses ; Water..., Groundwater monitoring wells)		17,678.67
331xx03	**Site work**		
	(See 25-3R Capital cost,Clear & Grub, Cleanup and Landscaping)		4,445.12
331xx08	**Solids collection and Containment**		
	(See 25-3R Capital Cost, Excavation)		27,967.94
331xx11	**Bioventing**		
	(See 25-3R Capital Cost,In-situ biodegradation (Bioventing))		26,785.64
331xx11	**Air Sparging**		
	(See 25-3R Capital Cost, Air Sparging)		47,619.49
331xx19	**Disposal, Commercial**		
	(See 25-3R Capital cost , Landfill Disposal, Load and haul)		32,886.54
331xx22	**General requirements**		
	(See 25-3R Capital cost , Contractor Costs/ General conditions)		17,942.38
332xx	**Engineering During Construction**		
	(See 25-3R Capital Cost, Professional Labor)		29,459.39
333xx	**Construction management**		
	(See 25-3R Capital Cost, Professional Labor)		50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**375,093.60**
	Location Multiplier, 0.85		318,829.56
	Escalation at 10 % of estimated construction cost		37,509.36
	Overhead and Profit, 13 % of estimated construction cost		48,762.17
	Contingency, 20 % of estimated construction cost		75,018.72
	TOTAL ESTIMATED CONSTRUCTION COST		**$ 480,119.81**
342XXX	**Operation and Maintenance (post construction)**		
	(See 25 -3 , Bioventing)	Annual cost	20,249.74
	(See 25 -3 , Balance of O & M costs minus	Annual cost	52,689.16
	$2378.34 for attorney fee under industrial land use)		72,938.90
	Present worth Bioventing cost at 5 years and 5 % per year		**$ 87,671.25**
	Present worth balance of O & M cost at 10 years and 5 % per year		**$ 406,849.89**
	Total Evaluated cost for Alternative 25-3R		**$ 974,640.94**

Table D-8

SENECA ARMY DEPOT SEAD-25 & -26 FS
COST ESTIMATE SUMMARY

RA 25-3ar (Bioventing and Natural Attenuation of Plume)

WBS number	Description		Cost, $
32xxx	**Design and treatability study** (See 25-3ar Capital Cost, Professional Labor)		48,440.91
331xx01	**Mobilization and preparatory work** (See 25-3ar Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		54,036.82
331xx02	**Monitoring, sampling,testing,and analysis** (See 25-3ar Capital Cost, Analyses ;Soil ., Analyses; Water., Analyses:air ..., Groundwater monitoring wells)		17,728.67
331xx03	**Site work** (See 25-3ar Capital cost,Clear & Grub, Cleanup and Landscaping)		4,445.12
331xx08	**Solids collection and Containment** (See 25-3ar Capital Cost, Excavation)		27,967.94
331xx11	**Bioventing** (See 25-3ar Capital Cost, Bioventing)		26,740.81
331xx19	**Disposal, Commercial** IN (See 25-3ar Capital cost, Landfill Disposal, Load and Haul)		33,308.78
331xx22	**General requirements** (See 25- 3ar Capital cost, Contractor Costs/ General conditions)		10,446.89
332xx	**Engineering During Construction** (See 25-3ar Capital Cost, Professional Labor)		7,326.16
333xx	**Construction management** (See 25-3ar Capital Cost, Professional Labor)		32,277.47
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**262,719.57**
	Location Multiplier, 0.85		223,311.63
	Escalation at 10 % of estimated construction cost		26,271.96
	Overhead and Profit, 13 % of estimated construction cost		34,153.54
	Contingency, 20 % of estimated construction cost		52,543.91
	TOTAL ESTIMATED CONSTRUCTION COST		**$ 336,281.05**
342XXX	**Operation and Maintenance (post construction)**		
	(See 25 -3a, Bioventing)	Annual cost	20,249.74
	(See 25 -3a, Balance of O & M costs minus	Annual cost	50,271.61
	$2378.34 for attorney fee under industrial land use)		70,521.35
	Present worth Bioventing cost at 5 years and 5 %/yr.		**$ 87,671.25**
	Present worth, balance of O & M cost at 20 years and 5 %/yr.		**$ 626,494.86**
	Total Evaluated cost for Alternative 25-3AR		**$ 1,050,447.16**

Appendix D

SoftBooks SEAD-25 Site Summary

Parsons Engineering Science, Inc.
30 Dan Road
Canton, MA
(781) 401-3200

RA25-2	
Analyses: Water and Liquids	$1,850.00
Monitoring	$11,621.86
Professional Labor	$13,140.39
Site Total	**$26,612.25**
RA25-2 Capital Costs	
Fencing	$21,050.12
Professional Labor	$10,297.38
Site Total	**$31,347.50**
RA25-3	
Air Sparging	$22,839.06
Analyses: Soil, Sludge, and Sediment	$5,327.48
Analyses: Water and Liquids	$2,140.51
In Situ Biodegradation (Bioventing)	$20,249.74
Monitoring	$9,966.36
Professional Labor	$14,437.34
Sampling: Air	$356.75
Site Total	**$75,317.24**

RA25-3 Capital Costs

Air Sparging	$47,619.49
Cleanup and Landscaping	$4,338.11
Clear and Grub	$107.01
Contractor Costs / General Conditions	$17,942.38
Decontamination Facilities	$12,012.04
Fencing	$21,018.93
Groundwater Monitoring Wells	$10,745.81
In Situ Biodegradation (Bioventing)	$26,785.64
Overhead Electrical Distribution	$24,944.70
Professional Labor	$141,792.15
Site Total	**$307,306.27**

RA25-3a

Analyses: Soil, Sludge, and Sediment	$5,327.48
Analyses: Water and Liquids	$2,140.51
In Situ Biodegradation (Bioventing)	$20,249.74
Monitoring	$30,387.87
Professional Labor	$14,437.34
Sampling: Air	$356.75
Site Total	**$72,899.69**

RA25-3a Capital Costs

Cleanup and Landscaping	$4,338.11
Clear and Grub	$107.01
Contractor Costs / General Conditions	$10,446.89
Decontamination Facilities	$8,042.00
Fencing	$21,050.12
Groundwater Monitoring Wells	$10,745.81
In Situ Biodegradation (Bioventing)	$26,740.81
Overhead Electrical Distribution	$24,944.70
Professional Labor	$88,044.54
Site Total	**$194,459.99**

RA25-4

Air Stripping	$10,359.99
Analyses: Water and Liquids	$2,140.51
Monitoring	$12,885.60
Professional Labor	$13,604.14
Site Total	**$38,990.24**

RA25-4 Capital Costs

Air Stripping	$50,958.74
Analyses: Air and Gas	$2,478.23
Analyses: Soil, Sludge, and Sediment	$20,751.02
Analyses: Water and Liquids	$1,070.25
Cleanup and Landscaping	$4,312.34
Clear and Grub	$107.01
Contractor Costs / General Conditions	$17,942.38
Decontamination Facilities	$12,012.04
Excavation, Trench/Channel	$37,607.95
Fencing	$20,524.22
Groundwater Monitoring Wells	$10,745.81
Landfill Disposal	$337,103.75
Overhead Electrical Distribution	$24,944.70
Professional Labor	$120,704.48
Site Total	**$661,262.93**

RA25-5

Air Stripping	$10,359.99
Analyses: Water and Liquids	$2,140.51
Discharge to POTW	$14,073.45
Monitoring	$11,113.88
Professional Labor	$13,143.20
Site Total	**$50,831.02**

RA25-5 Capital Costs

Air Stripping	$87,787.97
Analyses: Air and Gas	$2,478.23
Analyses: Soil, Sludge, and Sediment	$20,751.02
Analyses: Water and Liquids	$1,070.25
Cleanup and Landscaping	$4,312.34
Clear and Grub	$107.01
Contractor Costs / General Conditions	$17,942.38
Decontamination Facilities	$12,012.04
Discharge to POTW	$12,958.77
Excavation, Trench/Channel	$37,607.95
Fencing	$20,524.22
Groundwater Monitoring Wells	$9,932.54
Landfill Disposal	$353,137.39
Overhead Electrical Distribution	$25,098.87
Professional Labor	$118,331.59
Site Total	**$724,052.59**

RA25-6

Air Sparging	$26,462.11
Analyses: Water and Liquids	$2,140.51
Monitoring	$12,371.28
Professional Labor	$12,563.57
Site Total	**$53,537.46**

RA25-6 Capital Costs

Air Sparging	$50,374.11
Analyses: Air and Gas	$2,478.23
Analyses: Soil, Sludge, and Sediment	$20,751.02
Analyses: Water and Liquids	$1,070.25
Cleanup and Landscaping	$4,338.11
Clear and Grub	$107.01
Contractor Costs / General Conditions	$17,942.38
Decontamination Facilities	$12,012.04
Excavation, Trench/Channel	$37,607.95
Fencing	$20,524.22
Groundwater Monitoring Wells	$12,286.91
Landfill Disposal	$337,103.75
Overhead Electrical Distribution	$25,098.87
Professional Labor	$137,864.51
Site Total	**$679,559.35**

Appendix D

SoftBooks SEAD-25 Full Detail

SEDA / FS/ SEAD 25

Parsons ES / DYonika / M. Duchesneau

10/7/97

Preliminary cost estimates for the following remediation alternatives : RA25-1 (site 1), No Action ; RA25-2 (site 2), Institutional Controls/monitoringl ; RA25-3 (site3), Source Removal / Bioventing / Air Sparging Groundwater ; RA25-3a (Site 3) Bioventing of Soil/ Natural Attenuation of Plume; RA25-4 (site4), Source Removal and Natural Attenuation of groundwater plume; RA25-5 (site5) , Source Removal /Air Stripping Plume ; RA25-6 (site6), Source Removal /Air Sparging Plume

Parsons Engineering Science, Inc.

30 Dan Road

Canton, MA

(781) 401-3200

RA25-2

SEAD 25 Fire Training and Demonstration Area

Soil and Groundwater impacted from petroleum hydrocarbons, BTEX, SVOC's and Pesticides.

Institutional Controls with monitoring of groundwater for natural attenuation.

Analyses: Water and Liquids

Analyze Groundwater on an annual bassis

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (NYSDEC CLP)	10.00 EACH		*$0.0000*	*$0.0000*	*$185.0000*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,850.00**	**$1,850.00**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$1,850.00**	**$1,850.00**

Monitoring

Annual mobilization , and collection of groundwater samples.All labor rates include overhead and profit.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**
Per Diem	4.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$384.00**	**$384.00**
Mobilize Crew, 100 Miles, per Person	8.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,902.67**	**$1,902.67**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Day	5.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$594.59**	**$594.59**
DO Meter, Portable, Probe, 10' Cable, Quick Readings	1.00 EACH		*$0.0000*	*$0.0000*	*$976.8200*	
33020540		D	70.00%	100.00%		
			$0.00	**$0.00**	**$976.82**	**$976.82**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
40ml, 16 Oz, Clear Wide Mouth Jar, Case of 12	1.00 EACH		*$0.0000*	*$0.0000*	*$37.9821*	
33022021		D	70.00%	100.00%		
			$0.00	**$0.00**	**$37.98**	**$37.98**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
Project Engineer - field	44.00 HOUR		*$52.0260*	*$0.0000*	*$0.0000*	
33220105		D	70.00%	100.00%		
			$3,270.21	**$0.00**	**$0.00**	**$3,270.21**
Project Hydrogeologist - field	44.00 HOUR		*$52.0260*	*$0.0000*	*$0.0000*	
33220106		D	70.00%	100.00%		
			$3,270.21	**$0.00**	**$0.00**	**$3,270.21**
Health & Safety Officer	2.00 HOUR		*$31.2158*	*$0.0000*	*$0.0000*	
33220113		D	70.00%	100.00%		
			$89.19	**$0.00**	**$0.00**	**$89.19**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	4.00 EACH		*$0.0000*	*$0.0000*	*$7.0399*	
33232407		D	70.00%	100.00%		
			$0.00	**$0.00**	**$28.16**	**$28.16**
Suspension Cable, Teflon Coated	15.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		D	70.00%	100.00%		
			$0.00	**$0.00**	**$15.34**	**$15.34**
	Monitoring Total		**$6,629.60**	**$0.00**	**$4,992.26**	**$11,621.86**

Professional Labor

Review of annual results and reporting and associated legal fees for any deed restrictions .All labor rates are marked up to reflect a total of 2.5 times direct salary rate provided by Means.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	8.00 HOUR		*$83.2419*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$951.34	**$0.00**	**$0.00**	**$951.34**
Senior Contract Administrator	8.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$594.63	**$0.00**	**$0.00**	**$594.63**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8367*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.19	**$0.00**	**$0.00**	**$8,324.19**
Senior Health & Safety Officer	4.00 HOUR		*$39.5400*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.94	**$0.00**	**$0.00**	**$225.94**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Word Processing/Clerical	16.00 HOUR		*$29.1350*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$665.94	**$0.00**	**$0.00**	**$665.94**
	Professional Labor Total		**$13,140.39**	**$0.00**	**$0.00**	**$13,140.39**
Site Total			**$19,769.99**	**$0.00**	**$6,842.26**	**$26,612.25**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

RA25-2 Capital Costs

Fire Training and Demonstration Pad (SEAD-25) Capital Costs for Remedial Alternative RA25-2
Soil and Groundwater impacted with Petroleum Hydrocarbons, BTEX, SVOCs & pesticides
Source Controls using Institutional Controls, Natural Attenuation for groundwater plume.

Fencing

Fence the 600 by 100 foot area

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
Swing Gates, Complete	3.00 EACH		*$73.3583*	*$61.3664*	*$291.0877*	
18040115		D	70.00%	100.00%		
			$314.39	**$184.10**	**$873.26**	**$1,371.76**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
	Fencing Total		**$2,096.24**	**$200.43**	**$18,753.45**	**$21,050.12**

Professional Labor

Professional enginnering support and coordination with contractor,SEDA, agencies.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Word Processing/Clerical	20.00 HOUR		*$20.8100*	*$0.0000*	*$0.0000*	
33220119		D	70.00%	100.00%		
			$594.57	**$0.00**	**$0.00**	**$594.57**
Senior Project Manager	8.00 HOUR		*$83.2800*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$951.77	**$0.00**	**$0.00**	**$951.77**
Senior Contract Administrator	20.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$1,486.57	**$0.00**	**$0.00**	**$1,486.57**
Senior Staff Hydrogeologist	80.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220140		D	70.00%	100.00%		
			$5,000.00	**$0.00**	**$0.00**	**$5,000.00**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Senior Field Technician	80.00 HOUR		*$17.8376*	*$0.0000*	*$0.0000*	
33220159		D	70.00%	100.00%		
			$2,038.58	**$0.00**	**$0.00**	**$2,038.58**
	Professional Labor Total		**$10,297.38**	**$0.00**	**$0.00**	**$10,297.38**

Site Total

	Labor	Equipment	Materials	Total
Site Total	**$12,393.62**	**$200.43**	**$18,753.45**	**$31,347.50**

RA25-3

SEAD 25 Fire Training and Demonstration Area
Soil and Groundwater impacted from petroleum hydrocarbons, BTEX, SVOC's and Pesticides
Bioventing of Source Soils, Air Sparging of groundwater.

Air Sparging

Operate air sparging system for 10 years

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Operational Labor Cost	20.00 DAY		*$500.0000*	*$24.3571*	*$0.0000*	
33132311		D	70.00%	100.00%		
			$14,285.71	**$487.14**	**$0.00**	**$14,772.86**
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
Miscellaneous Electrical Site Usage	12.00 MONTH		*$0.0000*	*$0.0000*	*$237.8340*	
33420106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,854.01**	**$2,854.01**
	Air Sparging Total		**$14,285.71**	**$487.14**	**$8,066.21**	**$22,839.06**

Analyses: Soil, Sludge, and Sediment

Soil analyses will be used to monitor the clean-up

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
TCLP (RCRA) (EPA 1311)	2.00 EACH		*$0.0000*	*$0.0000*	*$1,861.0511*	
33021702		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,722.10**	**$3,722.10**
Volatile Organic Analysis (SW 5030/SW 8240)	6.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021720		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Soil, Sludge, and Sediment Total			**$0.00**	**$0.00**	**$5,327.48**	**$5,327.48**

Analyses: Water and Liquids

annual monitoring of groundwater plume.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$2,140.51**	**$2,140.51**

In Situ Biodegradation (Bioventing)

Operate bioventing system for 5 years.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Continuous Monitoring and Recording of Air Flow	1.00 EACH		*$0.0000*	*$0.0000*	*$4,000.0000*	
33021507		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,000.00**	**$4,000.00**
Operational Labor Cost	12.00 DAY		*$626.8065*	*$24.3571*	*$0.0000*	
33132311		D	70.00%	100.00%		
			$10,745.25	**$292.29**	**$0.00**	**$11,037.54**
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
In Situ Biodegradation (Bioventing) Total			**$10,745.25**	**$292.29**	**$9,212.20**	**$20,249.74**

Monitoring

Annual monitoring of Groundwater. All direct labor rates are marked up by a total of 2.5 to reflect overhead and profit.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**
Per Diem	4.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$384.00**	**$384.00**
Mobilize Crew, 100 Miles, per Person	4.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$951.34**	**$951.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Day	5.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$594.59**	**$594.59**
DO Meter, Portable, Probe, 10' Cable, Quick Readings	1.00 EACH		*$0.0000*	*$0.0000*	*$976.8200*	
33020540		D	70.00%	100.00%		
			$0.00	**$0.00**	**$976.82**	**$976.82**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
500 ml, 16 Oz, Boston Round Bottle, Case of 12	1.00 EACH		*$0.0000*	*$0.0000*	*$30.0266*	
33022025		D	70.00%	100.00%		
			$0.00	**$0.00**	**$30.03**	**$30.03**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
Project Engineer	44.00 HOUR		*$52.0200*	*$0.0000*	*$0.0000*	
33220105		D	70.00%	100.00%		
			$3,269.83	**$0.00**	**$0.00**	**$3,269.83**
Staff Hydrogeologist	44.00 HOUR		*$39.5370*	*$0.0000*	*$0.0000*	
33220108		D	70.00%	100.00%		
			$2,485.18	**$0.00**	**$0.00**	**$2,485.18**
Health & Safety Officer	4.00 HOUR		*$31.2160*	*$0.0000*	*$0.0000*	
33220113		D	70.00%	100.00%		
			$178.38	**$0.00**	**$0.00**	**$178.38**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	4.00 EACH		*$0.0000*	*$0.0000*	*$7.0399*	
33232407		D	70.00%	100.00%		
			$0.00	**$0.00**	**$28.16**	**$28.16**
Suspension Cable, Teflon Coated	15.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		D	70.00%	100.00%		
			$0.00	**$0.00**	**$15.34**	**$15.34**
Monitoring Total			**$5,933.39**	**$0.00**	**$4,032.97**	**$9,966.36**

Professional Labor

Annual review of system performance and report to agencies and Army. Professional labor is included for field support (senior field technician) and construction management and maintenance of any property restrictions such as a deed restriction.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	8.00 HOUR		*$83.2420*	*$0.0000*	*$150.0000*	
33220123		D	70.00%	100.00%		
			$951.34	**$0.00**	**$1,200.00**	**$2,151.34**
Senior Contract Administrator	4.00 HOUR		*$52.0200*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$297.26	**$0.00**	**$0.00**	**$297.26**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8370*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.23	**$0.00**	**$0.00**	**$8,324.23**
Senior Health & Safety Officer	8.00 HOUR		*$39.5400*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$451.89	**$0.00**	**$0.00**	**$451.89**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Word Processing/Clerical	20.00 HOUR		*$29.2000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$834.29	**$0.00**	**$0.00**	**$834.29**
Professional Labor Total			**$13,237.34**	**$0.00**	**$1,200.00**	**$14,437.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Sampling: Air						
Sampling air during bioventing. (first year only.						
Organic Vapor Analyzer Rental, per Day	3.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
	Sampling: Air Total		**$0.00**	**$0.00**	**$356.75**	**$356.75**
Site Total			**$44,201.69**	**$779.43**	**$30,336.12**	**$75,317.24**

RA25-3 Capital Costs

(Sead 25) Fire Demonstration Pad

Soils and Groundwater impacted from petroleum hydrocarbons, BTEX, SVOC's and pesticides.

Bioventing of Soils /Air Sparging of Groundwater Plume .

Air Sparging

Air sparging equipment installation is required for groundwater plume

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Crawler-mounted, 2 CY, 235 Hydraulic Excavator	80.00 HOUR		*$25.2100*	*$92.9693*	*$0.0000*	
17030232		D	70.00%	100.00%		
			$2,881.14	**$7,437.54**	**$0.00**	**$10,318.69**
950, 3 CY, Backfill with Excavated Material	80.00 CY		*$0.2736*	*$0.6184*	*$0.0000*	
17030401		D	70.00%	100.00%		
			$31.27	**$49.47**	**$0.00**	**$80.74**
Gravel, 6" Lifts	80.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$183.28	**$126.86**	**$899.01**	**$1,209.14**
580K, 1CY, Backhoe with Front-end Loader	60.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$1,776.63	**$834.09**	**$0.00**	**$2,610.72**
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Day	60.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$7,135.07**	**$7,135.07**
Geogrid, Nylon Geomatrix/PVC-coated Polyester	4,000.00 SF		*$0.0215*	*$0.0035*	*$1.4390*	
33080525		D	70.00%	100.00%		
			$122.86	**$14.00**	**$5,756.00**	**$5,892.86**
Installation Using Chain Trencher, Depth <= 4'	300.00 CY		*$0.5315*	*$0.3485*	*$0.0000*	
33132320		D	70.00%	100.00%		
			$227.79	**$104.55**	**$0.00**	**$332.34**
Blower 170 SCFM, 10.3 HP, 10 PSI	1.00 EACH		*$881.0901*	*$17.5189*	*$3,460.4847*	
33139002		D	70.00%	100.00%		
			$1,258.70	**$17.52**	**$3,460.48**	**$4,736.70**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$48.0000*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$48.00**	**$49.06**
5' Guard Posts, Cast Iron, Concrete Fill	2.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$57.62	**$0.88**	**$58.51**	**$117.02**
2" PVC, Schedule 40, Manifold Piping	600.00 LF		*$1.6827*	*$0.0346*	*$0.8946*	
33260417		D	70.00%	100.00%		
			$1,442.31	**$20.76**	**$536.76**	**$1,999.83**
2" PVC, Schedule 40, Tee	6.00 EACH		*$20.5473*	*$0.9467*	*$1.0766*	
33270102		D	70.00%	100.00%		
			$176.12	**$5.68**	**$6.46**	**$188.26**
2" PVC, 90 Degree, Elbow	5.00 EACH		*$12.1425*	*$0.2498*	*$0.8795*	
33270112		D	70.00%	100.00%		
			$86.73	**$1.25**	**$4.40**	**$92.38**
Pressure Gauge	2.00 EACH		*$31.2708*	*$0.4644*	*$98.1353*	
33310209		D	70.00%	100.00%		
			$89.35	**$0.93**	**$196.27**	**$286.54**
	Air Sparging Total		**$16,151.55**	**$10,179.53**	**$21,288.40**	**$47,619.49**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Cleanup and Landscaping						
Cleanup and landscaping is required after completion of remediation activities.						
General Area Cleanup	2.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$288.29	**$190.73**	**$0.00**	**$479.02**
Load & Haul Debris, 5 Miles, Dumptruck	10.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$12.46	**$25.81**	**$0.00**	**$38.27**
Seeding, Vegetative Cover	2.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$102.73	**$114.49**	**$3,309.46**	**$3,526.68**
Fertilize, 800 Lbs/Acre, Push Rotary	2.00 ACRE		*$15.0311*	*$30.0266*	*$31.0731*	
18050409		D	70.00%	100.00%		
			$42.95	**$60.05**	**$62.15**	**$165.15**
Watering with 3,000-Gallon Tank Truck, Per Pass	2.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$39.96	**$44.55**	**$4.76**	**$89.27**
Mowing	2.00 ACRE		*$11.2562*	*$3.7814*	*$0.0000*	
18050415		D	70.00%	100.00%		
			$32.16	**$7.56**	**$0.00**	**$39.72**
	Cleanup and Landscaping Total		**$518.55**	**$443.19**	**$3,376.36**	**$4,338.11**
Clear and Grub						
Require initial clearing for remediation activities						
Light Brush without Grub, Clearing	2.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$65.91	**$41.10**	**$0.00**	**$107.01**
	Clear and Grub Total		**$65.91**	**$41.10**	**$0.00**	**$107.01**
Contractor Costs / General Conditions						
Support during remediation and construction.						
Van or Pickup Rental	90.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	90.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8,640.00**	**$8,640.00**
Disposable Boot Covers (Tyvek)	100.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$137.35**	**$137.35**
Disposable Gloves (Latex)	100.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$22.76**	**$22.76**
Disposable Coveralls (Tyvek)	100.00 EACH		*$0.0000*	*$0.0000*	*$3.5675*	
33010425		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Temporary Office 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$673.65**	**$673.65**
Temporary Storage Trailer 28' x 10'	3.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$366.63**	**$366.63**
Portable Toilets - Chemical	3.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	4.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,698.81	**$780.10**	**$0.00**	**$2,478.91**
Contractor Costs / General Conditions Total			**$2,208.46**	**$780.10**	**$14,953.83**	**$17,942.38**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Decontamination Facilities						
Support during remediation/ construction.						
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	3.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$9,999.02**	**$9,999.02**
8' x 36' Decontamination Trailer with 2 Showers, Fans	3.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
DOT Steel Drum, 55 Gallon	8.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$407.65**	**$407.65**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$12,012.04**	**$12,012.04**
Fencing						
Area will be fenced off during remediation.						
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
7' Swing Gate, 12' Double	3.00 EACH		*$73.3583*	*$61.3664*	*$280.6917*	
18040118		D	70.00%	100.00%		
			$314.39	**$184.10**	**$842.08**	**$1,340.57**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$2,096.24**	**$200.43**	**$18,722.26**	**$21,018.93**
Groundwater Monitoring Wells						
Install four additiuonal groundwater monitoring wells for long term monitoring.						
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, Schedule 40, Well Screen	10.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$37.77	**$56.12**	**$119.33**	**$213.22**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
4" Well, Portland Cement Grout	12.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$19.26**	**$19.26**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**
5' Guard Posts, Cast Iron, Concrete Fill	4.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$115.25	**$1.76**	**$117.03**	**$234.03**
Groundwater Monitoring Wells Total			**$3,201.50**	**$4,587.93**	**$2,956.39**	**$10,745.81**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
In Situ Biodegradation (Bioventing)						
Bioventing will be used to treat contaminated soils and groundwater.						
2 1/2", Cast-iron Body, Gate Valve	2.00 EACH		*$18.8127*	*$0.6303*	*$167.9108*	
18050706		D	70.00%	100.00%		
			$53.75	**$1.26**	**$335.82**	**$390.83**
2 1/2", Class 200, PVC Piping	250.00 LF		*$2.2133*	*$0.4611*	*$0.7730*	
19010205		D	70.00%	100.00%		
			$790.46	**$115.28**	**$193.25**	**$1,098.99**
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
Continuous Monitoring and Recording of Air Flow	1.00 EACH		*$0.0000*	*$0.0000*	*$11,416.0320*	
33021507		D	70.00%	100.00%		
			$0.00	**$0.00**	**$11,416.03**	**$11,416.03**
Purchase, 10 HP, 190 SCFM Vapor Extraction Blower	1.00 EACH		*$267.3968*	*$3.1038*	*$6,744.9722*	
33132340		D	70.00%	100.00%		
			$382.00	**$3.10**	**$6,744.97**	**$7,130.07**
4" PVC, Schedule 40, Well Casing	30.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$84.55	**$125.63**	**$87.90**	**$298.09**
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	60.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$751.55	**$1,116.79**	**$0.00**	**$1,868.34**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
4" Screen, Filter Pack	30.00 LF		*$1.9728*	*$4.1878*	*$12.3067*	
33231402		D	70.00%	100.00%		
			$84.55	**$125.63**	**$369.20**	**$579.38**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Surface Pad, Concrete, 4' x 4' x 4"	4.00 EACH		*$2.8481*	*$0.1893*	*$12.6844*	
33231502		D	70.00%	100.00%		
			$16.27	**$0.76**	**$50.74**	**$67.77**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$48.0000*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$48.00**	**$49.06**
4" Well, Portland Cement Grout	20.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$32.11**	**$32.11**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
4" PVC, Schedule 40, Tee	5.00 EACH		*$37.4394*	*$0.7703*	*$8.4915*	
33270104		D	70.00%	100.00%		
			$267.42	**$3.85**	**$42.46**	**$313.73**
4" PVC, 90 Degree, Elbow	6.00 EACH		*$28.0795*	*$0.5776*	*$5.7318*	
33270114		D	70.00%	100.00%		
			$240.68	**$3.47**	**$34.39**	**$278.54**
In Situ Biodegradation (Bioventing) Total			**$3,412.58**	**$2,595.97**	**$20,777.10**	**$26,785.64**

Overhead Electrical Distribution

Electrical power will be required to operate the air sparging and bioventing equipment.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	600.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$3,246.43	**$556.56**	**$856.20**	**$4,659.19**
40' Class 3 Treated Power Pole	8.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$2,702.07	**$463.21**	**$1,988.29**	**$5,153.56**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
15 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$308.5710*	*$1.4689*	*$78.5062*	
20020546		D	70.00%	100.00%		
			$881.63	**$2.94**	**$157.01**	**$1,041.58**
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**
1" Rigid Steel Conduit	100.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$298.99	**$1.20**	**$112.98**	**$413.17**
Overhead Electrical Distribution Total			**$9,961.26**	**$1,073.59**	**$13,909.84**	**$24,944.70**

Professional Labor

Treatability tests will be required to confirm the bioventing system design and air sparging as well as provide final performance specifcations, prepare and evaluate bids and interface with contractor , agencies and SEDA for the remediation activities. labor includes support during construction and construction management.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem - senior field technician	50.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,459.39**	**$4,459.39**
Treatability test	1.00 ls		*$8,000.0000*	*$4,500.0000*	*$5,500.0000*	
33220101		D	70.00%	100.00%		
			$11,428.57	**$4,500.00**	**$5,500.00**	**$21,428.57**
Senior Field Technician	400.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220117		D	70.00%	100.00%		
			$25,000.00	**$0.00**	**$0.00**	**$25,000.00**
Senior Project Manager	90.00 HOUR		*$83.2420*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$10,702.54	**$0.00**	**$0.00**	**$10,702.54**
Senior Contract Administrator	40.00 HOUR		*$52.0400*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$2,973.71	**$0.00**	**$0.00**	**$2,973.71**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Hydrogeologist	200.00 HOUR		*$72.8370*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$20,810.57	**$0.00**	**$0.00**	**$20,810.57**
Senior Health & Safety Officer	40.00 HOUR		*$39.5400*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$2,259.43	**$0.00**	**$0.00**	**$2,259.43**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Word Processing/Clerical	40.00 HOUR		*$29.1300*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$1,664.57	**$0.00**	**$0.00**	**$1,664.57**
Field Engineer - Average Cost	13.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$22,084.59	**$0.00**	**$0.00**	**$22,084.59**
Site Project Manager - Average Cost	15.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$28,030.44	**$0.00**	**$0.00**	**$28,030.44**
	Professional Labor Total		**$127,332.76**	**$4,500.00**	**$9,959.39**	**$141,792.15**
Site Total			**$164,948.82**	**$24,401.84**	**$117,955.61**	**$307,306.27**

RA25-3a

SEAD-25, Fire Demonstration Pad Area.

BTEX, Petroleum Hydrocarbons

Natural Attenuation for Groundwater and Bioventing for source soils.

Analyses: Soil, Sludge, and Sediment

Soil analyses will be used to monitor the cleanup.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
TCLP (RCRA) (EPA 1311)	2.00 EACH		*$0.0000*	*$0.0000*	*$1,861.0511*	
33021702		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,722.10**	**$3,722.10**
Volatile Organic Analysis (SW 5030/SW 8240)	6.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021720		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Soil, Sludge, and Sediment Total			**$0.00**	**$0.00**	**$5,327.48**	**$5,327.48**

Analyses: Water and Liquids

Annual monitoring of groundwater plume.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$2,140.51**	**$2,140.51**

In Situ Biodegradation (Bioventing)

In-situ Treatment of On-site soils. Operate system for a period of 5 years.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Continuous Monitoring and Recording of Air Flow	1.00 EACH		*$0.0000*	*$0.0000*	*$4,000.0000*	
33021507		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,000.00**	**$4,000.00**
Operational Labor Cost	12.00 DAY		*$626.8065*	*$24.3571*	*$0.0000*	
33132311		D	70.00%	100.00%		
			$10,745.25	**$292.29**	**$0.00**	**$11,037.54**
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
In Situ Biodegradation (Bioventing) Total			**$10,745.25**	**$292.29**	**$9,212.20**	**$20,249.74**

Monitoring

Long Term Groundwater Monitoring in Support of Natural Attenuation

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**
Per Diem	4.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Mobilize Crew, 100 Miles, per Person	4.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010203		D	70.00%	100.00%		
			$0.00	**$0.00**	**$951.34**	**$951.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Day	5.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$594.59**	**$594.59**
Monitoring Well Slug Testing Equipment Rental	3.00 WEEK		*$0.0000*	*$0.0000*	*$856.2024*	
33020405		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,568.61**	**$2,568.61**
Water Level Indicator, 100' Tape, Electric, Light & Horn	12.00 EACH		*$0.0000*	*$0.0000*	*$529.2402*	
33020533		D	70.00%	100.00%		
			$0.00	**$0.00**	**$6,350.88**	**$6,350.88**
DO Meter, Portable, Probe, 10' Cable, Quick Readings	1.00 EACH		*$0.0000*	*$0.0000*	*$976.8200*	
33020540		D	70.00%	100.00%		
			$0.00	**$0.00**	**$976.82**	**$976.82**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
Volatile Organic Analysis (EPA 624)	12.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**
500 ml, 16 Oz, Boston Round Bottle, Case of 12	1.00 EACH		*$0.0000*	*$0.0000*	*$30.0266*	
33022025		D	70.00%	100.00%		
			$0.00	**$0.00**	**$30.03**	**$30.03**
40 ml, Clear Vial, Case of 72	1.00 EACH		*$0.0000*	*$0.0000*	*$104.7659*	
33022026		D	70.00%	100.00%		
			$0.00	**$0.00**	**$104.77**	**$104.77**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Overnight Delivery, 11 - 20 Lb Package	12.00 LB		*$0.0000*	*$0.0000*	*$2.4973*	
33022041		D	70.00%	100.00%		
			$0.00	**$0.00**	**$29.97**	**$29.97**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
60 Quart Ice Chest	12.00 EACH		*$0.0000*	*$0.0000*	*$53.0965*	
33022046		D	70.00%	100.00%		
			$0.00	**$0.00**	**$637.16**	**$637.16**
Project Engineer	44.00 HOUR		*$52.0200*	*$0.0000*	*$0.0000*	
33220105		D	70.00%	100.00%		
			$3,269.83	**$0.00**	**$0.00**	**$3,269.83**
Staff Hydrogeologist	44.00 HOUR		*$39.5370*	*$0.0000*	*$0.0000*	
33220106		D	70.00%	100.00%		
			$2,485.18	**$0.00**	**$0.00**	**$2,485.18**
Health & Safety Officer	4.00 HOUR		*$31.2160*	*$0.0000*	*$0.0000*	
33220113		D	70.00%	100.00%		
			$178.38	**$0.00**	**$0.00**	**$178.38**
Well Development Equipment Rental	12.00 WEEK		*$27.4970*	*$0.4357*	*$452.5599*	
33231111		D	70.00%	100.00%		
			$471.38	**$5.23**	**$5,430.72**	**$5,907.32**
Furnish 55 Gallon Drum for Development/Purge Water	12.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231127		D	70.00%	100.00%		
			$0.00	**$0.00**	**$611.47**	**$611.47**
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	150.00 EACH		*$0.0000*	*$0.0000*	*$7.0399*	
33232407		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,055.99**	**$1,055.99**
Suspension Cable, Teflon Coated	15.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		D	70.00%	100.00%		
			$0.00	**$0.00**	**$15.34**	**$15.34**
	Monitoring Total		**$6,404.77**	**$5.23**	**$23,977.88**	**$30,387.87**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

Professional Labor

Annual review of system performance and report to agencies and Army. Professional labor is included for field support (senior field technician) and construction management and maintenance of any property restrictions such as a deed restriction.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	8.00 HOUR		*$83.2420*	*$0.0000*	*$150.0000*	
33220123		D	70.00%	100.00%		
			$951.34	**$0.00**	**$1,200.00**	**$2,151.34**
Senior Contract Administrator	4.00 HOUR		*$52.0200*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$297.26	**$0.00**	**$0.00**	**$297.26**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8370*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.23	**$0.00**	**$0.00**	**$8,324.23**
Senior Health & Safety Officer	8.00 HOUR		*$39.5400*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$451.89	**$0.00**	**$0.00**	**$451.89**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Word Processing/Clerical	20.00 HOUR		*$29.2000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$834.29	**$0.00**	**$0.00**	**$834.29**
	Professional Labor Total		**$13,237.34**	**$0.00**	**$1,200.00**	**$14,437.34**

Sampling: Air

Sampling air during bioventing, first year only.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Day	3.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
	Sampling: Air Total		**$0.00**	**$0.00**	**$356.75**	**$356.75**

	Labor	Equipment	Materials	Total
Site Total	**$30,387.36**	**$297.51**	**$42,214.82**	**$72,899.69**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

RA25-3a Capital Costs

SEAD-25 Fire Demonstration Pad.

BTEX and Petroleum Hydrocarbons.

Natural Attenuation for the groundwater and Bioventing for the On-site soils.

Cleanup and Landscaping

Cleanup and landscaping is required after completion of remediation activities

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
General Area Cleanup	2.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$288.29	**$190.73**	**$0.00**	**$479.02**
Load & Haul Debris, 5 Miles, Dumptruck	10.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$12.46	**$25.81**	**$0.00**	**$38.27**
Seeding, Vegetative Cover	2.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$102.73	**$114.49**	**$3,309.46**	**$3,526.68**
Fertilize, 800 Lbs/Acre, Push Rotary	2.00 ACRE		*$15.0311*	*$30.0266*	*$31.0731*	
18050409		D	70.00%	100.00%		
			$42.95	**$60.05**	**$62.15**	**$165.15**
Watering with 3,000-Gallon Tank Truck, Per Pass	2.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$39.96	**$44.55**	**$4.76**	**$89.27**
Mowing	2.00 ACRE		*$11.2562*	*$3.7814*	*$0.0000*	
18050415		D	70.00%	100.00%		
			$32.16	**$7.56**	**$0.00**	**$39.72**
Cleanup and Landscaping Total			**$518.55**	**$443.19**	**$3,376.36**	**$4,338.11**

Clear and Grub

Require intial clearing for remediation activities

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Light Brush without Grub, Clearing	2.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$65.91	**$41.10**	**$0.00**	**$107.01**
Clear and Grub Total			**$65.91**	**$41.10**	**$0.00**	**$107.01**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Contractor Costs / General Conditions						
Support during remediation and construction						
Van or Pickup Rental	45.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	45.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,013.45**	**$4,013.45**
Disposable Boot Covers (Tyvek)	50.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$68.68**	**$68.68**
Disposable Gloves (Latex)	50.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$11.38**	**$11.38**
Disposable Coveralls (Tyvek/Polycoated)	50.00 EACH		*$0.0000*	*$0.0000*	*$5.1730*	
33010424		D	70.00%	100.00%		
			$0.00	**$0.00**	**$258.65**	**$258.65**
Temporary Office 20' x 8'	2.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$449.10**	**$449.10**
Temporary Storage Trailer 28' x 10'	2.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$244.42**	**$244.42**
Portable Toilets - Chemical	2.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$237.83**	**$237.83**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Surveying - 2-man Crew	3.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,274.11	**$585.07**	**$0.00**	**$1,859.18**
Contractor Costs / General Conditions Total			**$1,783.76**	**$585.07**	**$8,078.06**	**$10,446.89**
Decontamination Facilities						
Support during remediation/construction						
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	2.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$6,666.01**	**$6,666.01**
8' x 36' Decontamination Trailer with 2 Showers, Fans	2.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
DOT Steel Drum, 55 Gallon	6.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$305.74**	**$305.74**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$8,042.00**	**$8,042.00**
Fencing						
Area will be fenced off during remediation.						
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
Swing Gates, Complete	3.00 EACH		*$73.3583*	*$61.3664*	*$291.0877*	
18040115		D	70.00%	100.00%		
			$314.39	**$184.10**	**$873.26**	**$1,371.76**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$2,096.24**	**$200.43**	**$18,753.45**	**$21,050.12**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Groundwater Monitoring Wells						
Grondwater Monitoring wells will be used to monitor the groundwater for Natrual Attenuation.						
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	10.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$37.77	**$56.12**	**$119.33**	**$213.22**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
4" Well, Portland Cement Grout	12.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$19.26**	**$19.26**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**
5' Guard Posts, Cast Iron, Concrete Fill	4.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$115.25	**$1.76**	**$117.03**	**$234.03**
Groundwater Monitoring Wells Total			**$3,201.50**	**$4,587.93**	**$2,956.39**	**$10,745.81**

In Situ Biodegradation (Bioventing)

Bioventing will be used to treat the on-site source soils.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
2 1/2", Cast-iron Body, Gate Valve	2.00 EACH		*$18.8127*	*$0.6303*	*$167.9108*	
18050706		D	70.00%	100.00%		
			$53.75	**$1.26**	**$335.82**	**$390.83**
2 1/2", Class 200, PVC Piping	250.00 LF		*$2.2133*	*$0.4611*	*$0.7730*	
19010205		D	70.00%	100.00%		
			$790.46	**$115.28**	**$193.25**	**$1,098.99**
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
Continuous Monitoring and Recording of Air Flow	1.00 EACH		*$0.0000*	*$0.0000*	*$11,416.0320*	
33021507		D	70.00%	100.00%		
			$0.00	**$0.00**	**$11,416.03**	**$11,416.03**
Purchase, 10 HP, 190 SCFM Vapor Extraction Blower	1.00 EACH		*$267.3968*	*$3.1038*	*$6,744.9722*	
33132340		D	70.00%	100.00%		
			$382.00	**$3.10**	**$6,744.97**	**$7,130.07**
4" PVC, Schedule 40, Well Casing	30.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$84.55	**$125.63**	**$87.90**	**$298.09**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	60.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$751.55	**$1,116.79**	**$0.00**	**$1,868.34**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
4" Screen, Filter Pack	30.00 LF		*$1.9728*	*$4.1878*	*$12.3067*	
33231402		D	70.00%	100.00%		
			$84.55	**$125.63**	**$369.20**	**$579.38**
Surface Pad, Concrete, 4' x 4' x 4"	4.00 EACH		*$2.8481*	*$0.1893*	*$12.6844*	
33231502		D	70.00%	100.00%		
			$16.27	**$0.76**	**$50.74**	**$67.77**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$3.1709*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$3.17**	**$4.24**
4" Well, Portland Cement Grout	20.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$32.11**	**$32.11**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
4" PVC, Schedule 40, Tee	5.00 EACH		*$37.4394*	*$0.7703*	*$8.4915*	
33270104		D	70.00%	100.00%		
			$267.42	**$3.85**	**$42.46**	**$313.73**
4" PVC, 90 Degree, Elbow	6.00 EACH		*$28.0795*	*$0.5776*	*$5.7318*	
33270114		D	70.00%	100.00%		
			$240.68	**$3.47**	**$34.39**	**$278.54**
In Situ Biodegradation (Bioventing) Total			**$3,412.58**	**$2,595.97**	**$20,732.27**	**$26,740.81**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Overhead Electrical Distribution						
Electrical power will be required to operate the bioventing system.						
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	600.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$3,246.43	**$556.56**	**$856.20**	**$4,659.19**
40' Class 3 Treated Power Pole	8.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$2,702.07	**$463.21**	**$1,988.29**	**$5,153.56**
15 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$308.5710*	*$1.4689*	*$78.5062*	
20020546		D	70.00%	100.00%		
			$881.63	**$2.94**	**$157.01**	**$1,041.58**
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**
1" Rigid Steel Conduit	100.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$298.99	**$1.20**	**$112.98**	**$413.17**
Overhead Electrical Distribution Total			**$9,961.26**	**$1,073.59**	**$13,909.84**	**$24,944.70**
Professional Labor						
Treatability tests will be required to confirm the bioventing system design as well as provide final performance specifications, prepare and evalutate bids and interface with contractors, agencies and SEDA for the remediation avtivites. Labor includes support during construction and construction management.						
Per Diem-Senior field techncician	25.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,229.70**	**$2,229.70**
Senior Project Manager	45.00 HOUR		*$83.2420*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$5,351.27	**$0.00**	**$0.00**	**$5,351.27**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Contract Administrator	20.00 HOUR		*$52.0400*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$1,486.86	**$0.00**	**$0.00**	**$1,486.86**
Treatability tests.	1.00 LS		*$8,000.0000*	*$4,500.0000*	*$5,500.0000*	
33220129		D	70.00%	100.00%		
			$11,428.57	**$4,500.00**	**$5,500.00**	**$21,428.57**
Senior Project Hydrogeologist	150.00 HOUR		*$72.8370*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$15,607.93	**$0.00**	**$0.00**	**$15,607.93**
Senior Health & Safety Officer	24.00 HOUR		*$39.5400*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$1,355.66	**$0.00**	**$0.00**	**$1,355.66**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Field Technician	200.00 HOUR		*$17.8376*	*$0.0000*	*$0.0000*	
33220159		D	70.00%	100.00%		
			$5,096.46	**$0.00**	**$0.00**	**$5,096.46**
Senior Word Processing/Clerical	20.00 HOUR		*$29.1300*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$832.29	**$0.00**	**$0.00**	**$832.29**
Field Engineer - Average Cost	8.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$13,590.51	**$0.00**	**$0.00**	**$13,590.51**
Site Project Manager - Average Cost	10.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$18,686.96	**$0.00**	**$0.00**	**$18,686.96**
	Professional Labor Total		**$75,814.84**	**$4,500.00**	**$7,729.70**	**$88,044.54**
Site Total			**$96,854.64**	**$14,027.28**	**$83,578.07**	**$194,459.99**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

RA25-4

SEAD 25 Fire Training and Demonstration Area

Soil and Groundwater impacted from petoloeum hydrocarbons, BTEX, SVOC's and Pesticides.

Source Removal and disposal at off-site landfill, with Natural Attenuation of the Groundwater Plume.Monitor Groundwater for 30 years.

Air Stripping

Air stripping is required during source soils excavation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Packing Reconditioning	2.00 EACH		*$749.3216*	*$1,113.5693*	*$0.0000*	
33130701		D	70.00%	100.00%		
			$2,140.92	**$2,227.14**	**$0.00**	**$4,368.06**
Blower and Motor Maintenance and Repair	2.00 EACH		*$216.1483*	*$81.0852*	*$0.0000*	
33410201		D	70.00%	100.00%		
			$617.57	**$162.17**	**$0.00**	**$779.74**
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
	Air Stripping Total		**$2,758.49**	**$2,389.31**	**$5,212.20**	**$10,359.99**

Analyses: Water and Liquids

Analysis on an annual basis

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
	Analyses: Water and Liquids Total		**$0.00**	**$0.00**	**$2,140.51**	**$2,140.51**

Monitoring

Annual mobilization and collection of groundwater samples. Monitoring and reporting of results .

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**
Per Diem	8.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$713.50**	**$713.50**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilize Crew, 100 Miles, per Person	8.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,902.67**	**$1,902.67**
Organic Vapor Analyzer Rental, per Day	5.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$594.59**	**$594.59**
DO Meter, Portable, Probe, 10' Cable, Quick Readings	1.00 EACH		*$0.0000*	*$0.0000*	*$976.8200*	
33020540		D	70.00%	100.00%		
			$0.00	**$0.00**	**$976.82**	**$976.82**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
40 ml, 4 Oz, Clear Wide Mouth Jar, Case of 24	1.00 EACH		*$0.0000*	*$0.0000*	*$56.5213*	
33022023		D	70.00%	100.00%		
			$0.00	**$0.00**	**$56.52**	**$56.52**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
Project Manager	44.00 HOUR		*$60.3500*	*$0.0000*	*$0.0000*	
33220101		D	70.00%	100.00%		
			$3,793.43	**$0.00**	**$0.00**	**$3,793.43**
Project Hydrogeologist	44.00 HOUR		*$52.0400*	*$0.0000*	*$0.0000*	
33220106		D	70.00%	100.00%		
			$3,271.09	**$0.00**	**$0.00**	**$3,271.09**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Word Processing/Clerical	20.00 HOUR		*$16.6484*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$475.67	**$0.00**	**$0.00**	**$475.67**
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	4.00 EACH		*$0.0000*	*$0.0000*	*$7.0399*	
33232407		D	70.00%	100.00%		
			$0.00	**$0.00**	**$28.16**	**$28.16**
Suspension Cable, Teflon Coated	20.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		D	70.00%	100.00%		
			$0.00	**$0.00**	**$20.45**	**$20.45**
	Monitoring Total		**$7,540.18**	**$0.00**	**$5,345.42**	**$12,885.60**

Professional Labor

Professional labor is required to evaluate, specify, and coordinate activities with agencies, army and contractor, and maintain any property restrictions such as a deed restriction etc.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	8.00 HOUR		*$83.2420*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$951.34	**$0.00**	**$0.00**	**$951.34**
Senior Contract Administrator	20.00 HOUR		*$34.7500*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$992.86	**$0.00**	**$0.00**	**$992.86**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8370*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.23	**$0.00**	**$0.00**	**$8,324.23**
Senior Health & Safety Officer	4.00 HOUR		*$39.5400*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.94	**$0.00**	**$0.00**	**$225.94**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Word Processing/Clerical	16.00 HOUR		*$32.0000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$731.43	**$0.00**	**$0.00**	**$731.43**
	Professional Labor Total		**$13,604.14**	**$0.00**	**$0.00**	**$13,604.14**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Site Total			$23,902.81	$2,389.31	$12,698.12	$38,990.24

RA25-4 Capital Costs

(Sead 25) Fire Training and Demonstration Pad.

Soils impacted with Petroleum hydrocarbons, BTEX, SVOC's and pesticides

Source removal and disposal at offsite landfill / Natural Attenuation of groundwater Plume

Air Stripping

Air stripping of groundwater during excavation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" Structural Slab on Grade	100.00 SF		*$1.3888*	*$0.1677*	*$1.8464*	
18020320		D	70.00%	100.00%		
			$198.40	**$16.77**	**$184.64**	**$399.81**
4", Class 50, Bell & Spigot Sanitary Sewer, Cast-iron Pipe	200.00 LF		*$1.3319*	*$0.0238*	*$3.8173*	
19020101		D	70.00%	100.00%		
			$380.54	**$4.76**	**$763.46**	**$1,148.76**
2,000 Gallon Steel Sump, Aboveground with Supports & Fittings	1.00 EACH		*$661.9042*	*$76.6674*	*$1,289.1202*	
19040605		D	70.00%	100.00%		
			$945.58	**$76.67**	**$1,289.12**	**$2,311.37**
2", 60 PSI, Polyethylene Pipe	200.00 LF		*$1.3398*	*$0.1942*	*$1.4627*	
19070122		D	70.00%	100.00%		
			$382.80	**$38.84**	**$292.54**	**$714.18**
4' Diameter Electric Automatic Pressure Filter Unit	1.00 EACH		*$1,606.9203*	*$550.2171*	*$6,729.3132*	
33130102		D	70.00%	100.00%		
			$2,295.60	**$550.22**	**$6,729.31**	**$9,575.13**
Iron removal system	1.00 EACH		*$1,606.9203*	*$550.2171*	*$10,341.8797*	
33130103		D	70.00%	100.00%		
			$2,295.60	**$550.22**	**$10,341.88**	**$13,187.70**
Install Air Stripper Tower, 1' - 3' Diameter, 13' - 20' High	1.00 EACH		*$2,620.6572*	*$303.5475*	*$0.0000*	
33130705		D	70.00%	100.00%		
			$3,743.80	**$303.55**	**$0.00**	**$4,047.34**
Internal Parts for Air Stripper, < 20' High	30.00 SF		*$0.0000*	*$0.0000*	*$59.4585*	
33130736		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,783.76**	**$1,783.76**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1" - 3.5" Packing for Air Stripper Tower	30.00 CF		*$0.0000*	*$0.0000*	*$8.9188*	
33130738		D	70.00%	100.00%		
			$0.00	**$0.00**	**$267.56**	**$267.56**
Electrical Controls for Air Stripper	1.00 EACH		*$1,050.7264*	*$65.3464*	*$5,279.9148*	
33130741		D	70.00%	100.00%		
			$1,501.04	**$65.35**	**$5,279.91**	**$6,846.30**
2.0' Diameter Tower, Skid Mount	1.00 EACH		*$0.0000*	*$0.0000*	*$1,260.5202*	
33130753		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,260.52**	**$1,260.52**
High Sump Level Switch for Avoiding Overflow	2.00 EACH		*$0.0000*	*$0.0000*	*$630.2601*	
33231306		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,260.52**	**$1,260.52**
2" Carbon Steel Piping	250.00 LF		*$2.3645*	*$0.0500*	*$2.5330*	
33260102		D	70.00%	100.00%		
			$844.46	**$12.50**	**$633.25**	**$1,490.21**
2" Ball Valve, Carbon Steel Trim	4.00 EACH		*$24.9488*	*$0.4281*	*$53.8100*	
33270422		D	70.00%	100.00%		
			$142.56	**$1.71**	**$215.24**	**$359.52**
50 GPM, 100' Head, 3 HP, Centrifugal Pump	1.00 EACH		*$272.5247*	*$4.3182*	*$1,831.9634*	
33290103		D	70.00%	100.00%		
			$389.32	**$4.32**	**$1,831.96**	**$2,225.60**
75 GPM, 2" Discharge, Cast-iron Sump Pump	1.00 EACH		*$329.8982*	*$5.2274*	*$2,433.5246*	
33290402		D	70.00%	100.00%		
			$471.28	**$5.23**	**$2,433.52**	**$2,910.04**
250 CFM, 6" Pressure, 3/4 HP, Blower	1.00 EACH		*$120.3084*	*$2.2119*	*$606.4767*	
33310149		D	70.00%	100.00%		
			$171.87	**$2.21**	**$606.48**	**$780.56**
Blower and Motor Maintenance and Repair	1.00 EACH		*$216.1483*	*$81.0852*	*$0.0000*	
33410201		D	70.00%	100.00%		
			$308.78	**$81.09**	**$0.00**	**$389.87**
	Air Stripping Total		**$14,071.64**	**$1,713.42**	**$35,173.68**	**$50,958.74**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Air and Gas						
Analyze air during remediation activities						
Organic Vapor Analyzer Rental, per Month	2.00 MONTH		*$0.0000*	*$0.0000*	*$1,239.1151*	
33020302		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,478.23**	**$2,478.23**
Analyses: Air and Gas Total			**$0.00**	**$0.00**	**$2,478.23**	**$2,478.23**
Analyses: Soil, Sludge, and Sediment						
Analyze source soils prior to and after removal.						
TCLP (RCRA) (EPA 1311)	10.00 EACH		*$0.0000*	*$0.0000*	*$1,861.0511*	
33021702		D	70.00%	100.00%		
			$0.00	**$0.00**	**$18,610.51**	**$18,610.51**
Volatile Organic Analysis (SW 5030/SW 8240)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021720		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
Analyses: Soil, Sludge, and Sediment Total			**$0.00**	**$0.00**	**$20,751.02**	**$20,751.02**
Analyses: Water and Liquids						
Analyze surface water in trench and annual analysis of groundwater						
Volatile Organic Analysis (EPA 624)	4.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$1,070.25**	**$1,070.25**
Cleanup and Landscaping						
Cleanup after remediation activity						
General Area Cleanup	2.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$288.29	**$190.73**	**$0.00**	**$479.02**
Load & Haul Debris, 5 Miles, Dumptruck	30.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$37.39	**$77.42**	**$0.00**	**$114.81**
Area Preparation, 67% Level & 33% Slope	2.00 ACRE		*$14.5041*	*$30.5622*	*$0.0000*	
18050101		D	70.00%	100.00%		
			$41.44	**$61.12**	**$0.00**	**$102.56**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Seeding, Vegetative Cover	2.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$102.73	**$114.49**	**$3,309.46**	**$3,526.68**
Watering with 3,000-Gallon Tank Truck, Per Pass	2.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$39.96	**$44.55**	**$4.76**	**$89.27**
Cleanup and Landscaping Total			**$509.81**	**$488.32**	**$3,314.22**	**$4,312.34**

Clear and Grub

Clearing prior to remediation

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Light Brush without Grub, Clearing	2.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$65.91	**$41.10**	**$0.00**	**$107.01**
Clear and Grub Total			**$65.91**	**$41.10**	**$0.00**	**$107.01**

Contractor Costs / General Conditions

Support during remediation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	90.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	90.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8,640.00**	**$8,640.00**
Disposable Boot Covers (Tyvek)	100.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$137.35**	**$137.35**
Disposable Gloves (Latex)	100.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$22.76**	**$22.76**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Disposable Coveralls (Tyvek)	100.00 EACH		*$0.0000*	*$0.0000*	*$3.5675*	
33010425		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Temporary Office 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$673.65**	**$673.65**
Temporary Storage Trailer 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$366.63**	**$366.63**
Portable Toilets - Chemical	3.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	4.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,698.81	**$780.10**	**$0.00**	**$2,478.91**
Contractor Costs / General Conditions Total			**$2,208.46**	**$780.10**	**$14,953.83**	**$17,942.38**

Decontamination Facilities

Support during remediation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	3.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$9,999.02**	**$9,999.02**
8' x 36' Decontamination Trailer with 2 Showers, Fans	3.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
DOT Steel Drum, 55 Gallon	8.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$407.65**	**$407.65**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$12,012.04**	**$12,012.04**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Excavation, Trench/Channel						
Excavate source soils for disposal offsite in landfill						
Gravel, 6" Lifts	1,333.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$3,053.90	**$2,113.74**	**$14,979.72**	**$20,147.36**
580K, 1CY, Backhoe with Front-end Loader	100.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$2,961.04	**$1,390.15**	**$0.00**	**$4,351.19**
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
2" Diameter Contractor's Trash Pump, 75 GPM	40.00 DAY		*$5.4995*	*$0.0871*	*$40.5669*	
17031002		D	70.00%	100.00%		
			$314.26	**$3.48**	**$1,622.68**	**$1,940.42**
Excavation, Trench/Channel Total			**$13,582.35**	**$4,235.77**	**$19,789.84**	**$37,607.95**
Fencing						
require fencing during remediation activities.						
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
6' Swing Gate, 12' Double	2.00 EACH		*$60.2645*	*$25.3900*	*$311.4430*	
18040117		D	70.00%	100.00%		
			$172.18	**$50.78**	**$622.89**	**$845.85**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$1,954.03**	**$67.11**	**$18,503.07**	**$20,524.22**
Groundwater Monitoring Wells						
install four groundwater monitoring wells.						
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	10 00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$37.77	**$56.12**	**$119.33**	**$213.22**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
4" Well, Portland Cement Grout	12.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$19.26**	**$19.26**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
5' Guard Posts, Cast Iron, Concrete Fill	4.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$115.25	**$1.76**	**$117.03**	**$234.03**
Groundwater Monitoring Wells Total			**$3,201.50**	**$4,587.93**	**$2,956.39**	**$10,745.81**

Landfill Disposal

landfill disposal of source soils

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Bulk Solid Hazardous Waste Loading Into Truck	1,666.00 CY		*$0.3727*	*$1.0436*	*$0.0000*	
33190102		D	70.00%	100.00%		
			$887.03	**$1,738.64**	**$0.00**	**$2,625.66**
Transport Bulk Solid Hazardous Waste, Maximum 18 Ton (per Mile)	10,000.00 MILE		*$0.0000*	*$0.0000*	*$3.3297*	
33190206		D	70.00%	100.00%		
			$0.00	**$0.00**	**$33,297.00**	**$33,297.00**
Landfill Hazardous Solid Bulk Waste by CY	1,333.00 CY		*$0.0000*	*$0.0000*	*$225.9423*	
33197264		D	70.00%	100.00%		
			$0.00	**$0.00**	**$301,181.09**	**$301,181.09**
Landfill Disposal Total			**$887.03**	**$1,738.64**	**$334,478.09**	**$337,103.75**

Overhead Electrical Distribution

Electrical power is required to operate equipment.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	600.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$3,246.43	**$556.56**	**$856.20**	**$4,659.19**
40' Class 3 Treated Power Pole	8.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$2,702.07	**$463.21**	**$1,988.29**	**$5,153.56**
15 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$308.5710*	*$1.4689*	*$78.5062*	
20020546		D	70.00%	100.00%		
			$881.63	**$2.94**	**$157.01**	**$1,041.58**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**
1" Rigid Steel Conduit	100.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$298.99	**$1.20**	**$112.98**	**$413.17**
Overhead Electrical Distribution Total			**$9,961.26**	**$1,073.59**	**$13,909.84**	**$24,944.70**

Professional Labor

provide specifications, and oversite of site activities.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem - Senior field technician	50.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,800.00**	**$4,800.00**
Senior Field Technician	400.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220117		D	70.00%	100.00%		
			$25,000.00	**$0.00**	**$0.00**	**$25,000.00**
Senior Project Manager	90.00 HOUR		*$83.2420*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$10,702.54	**$0.00**	**$0.00**	**$10,702.54**
Senior Contract Administrator	40.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$2,973.14	**$0.00**	**$0.00**	**$2,973.14**
Senior Project Hydrogeologist	200.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$20,811.43	**$0.00**	**$0.00**	**$20,811.43**
Senior Health & Safety Officer	40.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$2,258.86	**$0.00**	**$0.00**	**$2,258.86**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Word Processing/Clerical	40.00 HOUR		*$29.1400*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$1,665.14	**$0.00**	**$0.00**	**$1,665.14**
Field Engineer - Average Cost	13.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$22,084.59	**$0.00**	**$0.00**	**$22,084.59**
Site Project Manager - Average Cost	15.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$28,030.44	**$0.00**	**$0.00**	**$28,030.44**
	Professional Labor Total		**$115,904.48**	**$0.00**	**$4,800.00**	**$120,704.48**

Site Total

	Labor	Equipment	Materials	Total
Site Total	**$162,346.46**	**$14,725.97**	**$484,190.49**	**$661,262.93**

RA25-5

SEAD 25 Fire Training and Demonstration Pad

Soil and Groundwater impacted from petroleum hydrocarbons, BTEX, SVOCs and Pesticides.

Source Removal and disposal in off-site landfill / Groundwater Extraction and treatment by Air Stripping

Air Stripping

Annual operating costs for air stripping

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Packing Reconditioning	2.00 EACH		*$749.3216*	*$1,113.5693*	*$0.0000*	
33130701		D	70.00%	100.00%		
			$2,140.92	**$2,227.14**	**$0.00**	**$4,368.06**
Blower and Motor Maintenance and Repair	2.00 EACH		*$216.1483*	*$81.0852*	*$0.0000*	
33410201		D	70.00%	100.00%		
			$617.57	**$162.17**	**$0.00**	**$779.74**
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
	Air Stripping Total		**$2,758.49**	**$2,389.31**	**$5,212.20**	**$10,359.99**

Analyses: Water and Liquids

Annual monitoring of ground water plume.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$2,140.51**	**$2,140.51**

Discharge to POTW

annual costs for upkeep and discharge to POTW

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
35 gpm, 660 lb fill, carbon absorption	2.00 EACH		*$159.2317*	*$39.0669*	*$5,470.1820*	
33132012		D	70.00%	100.00%		
			$454.95	**$78.13**	**$10,940.36**	**$11,473.45**
Wastewater Disposal Fee	1,300.00 KGAL		*$0.0000*	*$0.0000*	*$2.0000*	
33197102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,600.00**	**$2,600.00**
Discharge to POTW Total			**$454.95**	**$78.13**	**$13,540.36**	**$14,073.45**

Monitoring

Annual monitoring of groundwater.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	2.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$71.35**	**$71.35**
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**
Per Diem	8.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$768.00**	**$768.00**
Mobilize Crew, 100 Miles, per Person	8.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,902.67**	**$1,902.67**
Organic Vapor Analyzer Rental, per Day	10.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.18**	**$1,189.18**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
40 ml, Clear Vial, Case of 72	1.00 EACH		*$0.0000*	*$0.0000*	*$104.7659*	
33022026		**D**	70.00%	100.00%		
			$0.00	**$0.00**	**$104.77**	**$104.77**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		**D**	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		**D**	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		**D**	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
Project Engineer	44.00 HOUR		*$52.0400*	*$0.0000*	*$0.0000*	
33220105		**D**	70.00%	100.00%		
			$3,271.09	**$0.00**	**$0.00**	**$3,271.09**
Staff Hydrogeologist	44.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220108		**D**	70.00%	100.00%		
			$2,484.74	**$0.00**	**$0.00**	**$2,484.74**
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		**D**	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	4.00 EACH		*$0.0000*	*$0.0000*	*$7.0399*	
33232407		**D**	70.00%	100.00%		
			$0.00	**$0.00**	**$28.16**	**$28.16**
Suspension Cable, Teflon Coated	15.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		**D**	70.00%	100.00%		
			$0.00	**$0.00**	**$15.34**	**$15.34**
	Monitoring Total		**$5,981.71**	**$0.00**	**$5,132.16**	**$11,113.88**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Professional Labor						
Professional labor is required to review annual performance and to coordinate activities, and maintain any property restrictions such as deed restrictions, etc.						
Senior Project Manager	8.00 HOUR		*$83.2900*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$951.89	**$0.00**	**$0.00**	**$951.89**
Senior Contract Administrator	8.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$594.63	**$0.00**	**$0.00**	**$594.63**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8360*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.11	**$0.00**	**$0.00**	**$8,324.11**
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Word Processing/Clerical	16.00 HOUR		*$29.2400*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$668.34	**$0.00**	**$0.00**	**$668.34**
	Professional Labor Total		**$13,143.20**	**$0.00**	**$0.00**	**$13,143.20**
Site Total			$22,338.35	$2,467.44	$26,025.23	$50,831.02

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

RA25-5 Capital Costs

(SEAD 25) Fire Training and Demonstration Pad.

Soils impacted with petroleum hydrocarbons,BTEX, SVOC's and pesticides

Source Removal and disposal in off-site landfill / Groundwater Extraction and treatment by Air Stripping

Air Stripping

air stripping of groundwater

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Ditch Excavation, Normal Soil, Haul Spoil 1 Mile for gw treatment	355.00 CY		*$2.0057*	*$3.1864*	*$0.0000*	
17030202		D	70.00%	100.00%		
			$1,017.18	**$1,131.17**	**$0.00**	**$2,148.35**
Crawler-mounted, 1 CY, 215 Hydraulic Excavator	60.00 HOUR		*$25.2100*	*$42.1680*	*$0.0000*	
17030230		D	70.00%	100.00%		
			$2,160.86	**$2,530.08**	**$0.00**	**$4,690.94**
4" Structural Slab on Grade	225.00 SF		*$1.3888*	*$0.1677*	*$1.8464*	
18020320		D	70.00%	100.00%		
			$446.40	**$37.73**	**$415.44**	**$899.57**
10,000 Gallon Horizontal Plastic Sump with 6" NPT Connection	1.00 EACH		*$661.9042*	*$76.6674*	*$8,822.4522*	
19040627		D	70.00%	100.00%		
			$945.58	**$76.67**	**$8,822.45**	**$9,844.70**
2", 60 PSI, Polyethylene Pipe	200.00 LF		*$1.3398*	*$0.1942*	*$1.4627*	
19070122		D	70.00%	100.00%		
			$382.80	**$38.84**	**$292.54**	**$714.18**
Geogrid, Nylon Geomatrix/PVC-coated Polyester	10,000.00 SF		*$0.0215*	*$0.0035*	*$1.4390*	
33080525		D	70.00%	100.00%		
			$307.14	**$35.00**	**$14,390.00**	**$14,732.14**
4' Diameter Electric Automatic Pressure Filter Unit	1.00 EACH		*$1,606.9203*	*$550.2171*	*$6,729.3132*	
33130102		D	70.00%	100.00%		
			$2,295.60	**$550.22**	**$6,729.31**	**$9,575.13**
Iron removal system	1.00 EACH		*$1,606.9203*	*$550.2171*	*$10,341.8797*	
33130103		D	70.00%	100.00%		
			$2,295.60	**$550.22**	**$10,341.88**	**$13,187.70**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Install Air Stripper Tower, 1' - 3' Diameter, 13' - 20' High	1.00 EACH		*$2,620.6572*	*$303.5475*	*$0.0000*	
33130705		D	70.00%	100.00%		
			$3,743.80	**$303.55**	**$0.00**	**$4,047.34**
Internal Parts for Air Stripper, < 20' High	1.00 SF		*$0.0000*	*$0.0000*	*$59.4585*	
33130736		D	70.00%	100.00%		
			$0.00	**$0.00**	**$59.46**	**$59.46**
1" - 3.5" Packing for Air Stripper Tower	1.00 CF		*$0.0000*	*$0.0000*	*$8.9188*	
33130738		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8.92**	**$8.92**
Electrical Controls for Air Stripper	1.00 EACH		*$1,050.7264*	*$65.3464*	*$5,279.9148*	
33130741		D	70.00%	100.00%		
			$1,501.04	**$65.35**	**$5,279.91**	**$6,846.30**
2.0' Diameter Tower, Skid Mount	1.00 EACH		*$0.0000*	*$0.0000*	*$1,260.5202*	
33130753		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,260.52**	**$1,260.52**
Water Level Sensor, Float Switch, with 50' Cable	1.00 EACH		*$0.0000*	*$0.0000*	*$511.3431*	
33231305		D	70.00%	100.00%		
			$0.00	**$0.00**	**$511.34**	**$511.34**
High Sump Level Switch for Avoiding Overflow	2.00 EACH		*$0.0000*	*$0.0000*	*$630.2601*	
33231306		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,260.52**	**$1,260.52**
2" Carbon Steel Piping	250.00 LF		*$2.3645*	*$0.0486*	*$2.5330*	
33260102		D	70.00%	100.00%		
			$844.46	**$12.15**	**$633.25**	**$1,489.86**
4" PVC Piping Including Fittings & Hangers	600.00 LF		*$7.2584*	*$0.2374*	*$3.5241*	
33260404		D	70.00%	100.00%		
			$6,221.49	**$142.44**	**$2,114.46**	**$8,478.39**
2" Ball Valve, Carbon Steel Trim	4.00 EACH		*$24.9488*	*$0.4281*	*$53.8100*	
33270422		D	70.00%	100.00%		
			$142.56	**$1.71**	**$215.24**	**$359.52**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
2" Steel Tee	3.00 EACH		*$17.9684*	*$0.3687*	*$8.6215*	
33270502		D	70.00%	100.00%		
			$77.01	**$1.11**	**$25.86**	**$103.98**
2" Steel 90-degree Elbow	4.00 EACH		*$12.1415*	*$0.2498*	*$5.7675*	
33270512		D	70.00%	100.00%		
			$69.38	**$1.00**	**$23.07**	**$93.45**
50 GPM, 100' Head, 3 HP, Centrifugal Pump	1.00 EACH		*$272.5247*	*$4.3182*	*$1,831.9634*	
33290103		D	70.00%	100.00%		
			$389.32	**$4.32**	**$1,831.96**	**$2,225.60**
75 GPM, 2" Discharge, Cast-iron Sump Pump	1.00 EACH		*$329.8982*	*$5.2274*	*$2,433.5246*	
33290402		D	70.00%	100.00%		
			$471.28	**$5.23**	**$2,433.52**	**$2,910.04**
250 CFM, 6" Pressure, 3/4 HP, Blower	1.00 EACH		*$120.3084*	*$2.2119*	*$606.4767*	
33310149		D	70.00%	100.00%		
			$171.87	**$2.21**	**$606.48**	**$780.56**
Pump & Motor Maintenance/Repair	3.00 EACH		*$216.1483*	*$81.0852*	*$0.0000*	
33410101		D	70.00%	100.00%		
			$926.35	**$243.26**	**$0.00**	**$1,169.61**
Blower and Motor Maintenance and Repair	1.00 EACH		*$216.1483*	*$81.0852*	*$0.0000*	
33410201		D	70.00%	100.00%		
			$308.78	**$81.09**	**$0.00**	**$389.87**
	Air Stripping Total		**$24,718.50**	**$5,813.33**	**$57,256.15**	**$87,787.97**

Analyses: Air and Gas

analyze initially and on an annual basis

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Month	2.00 MONTH		*$0.0000*	*$0.0000*	*$1,239.1151*	
33020302		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,478.23**	**$2,478.23**
	Analyses: Air and Gas Total		**$0.00**	**$0.00**	**$2,478.23**	**$2,478.23**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Soil, Sludge, and Sediment						
analyze source soils prior to and after disposal .						
TCLP (RCRA) (EPA 1311)	10.00 EACH		*$0.0000*	*$0.0000*	*$1,861.0511*	
33021702		D	70.00%	100.00%		
			$0.00	**$0.00**	**$18,610.51**	**$18,610.51**
Volatile Organic Analysis (SW 5030/SW 8240)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021720		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
Analyses: Soil, Sludge, and Sediment Total			**$0.00**	**$0.00**	**$20,751.02**	**$20,751.02**
Analyses: Water and Liquids						
Analyze surface water during removal of soils and groundwater on an annual basis.						
Volatile Organic Analysis (EPA 624)	4.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$1,070.25**	**$1,070.25**
Cleanup and Landscaping						
Cleanup and landscaping required after completion of remediation activities.						
General Area Cleanup	2.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$288.29	**$190.73**	**$0.00**	**$479.02**
Load & Haul Debris, 5 Miles, Dumptruck	30.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$37.39	**$77.42**	**$0.00**	**$114.81**
Area Preparation, 67% Level & 33% Slope	2.00 ACRE		*$14.5041*	*$30.5622*	*$0.0000*	
18050101		D	70.00%	100.00%		
			$41.44	**$61.12**	**$0.00**	**$102.56**
Seeding, Vegetative Cover	2.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$102.73	**$114.49**	**$3,309.46**	**$3,526.68**
Watering with 3,000-Gallon Tank Truck, Per Pass	2.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$39.96	**$44.55**	**$4.76**	**$89.27**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Cleanup and Landscaping Total			**$509.81**	**$488.32**	**$3,314.22**	**$4,312.34**

Clear and Grub

Required prior to initiating remediation activities.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Light Brush without Grub, Clearing	2.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$65.91	**$41.10**	**$0.00**	**$107.01**
Clear and Grub Total			**$65.91**	**$41.10**	**$0.00**	**$107.01**

Contractor Costs / General Conditions

Support during construction and remediation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	90.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	90.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8,640.00**	**$8,640.00**
Disposable Boot Covers (Tyvek)	100.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$137.35**	**$137.35**
Disposable Gloves (Latex)	100.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$22.76**	**$22.76**
Disposable Coveralls (Tyvek)	100.00 EACH		*$0.0000*	*$0.0000*	*$3.5675*	
33010425		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Temporary Office 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$673.65**	**$673.65**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Temporary Storage Trailer 28' x 10'	3.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$366.63**	**$366.63**
Portable Toilets - Chemical	3.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	4.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,698.81	**$780.10**	**$0.00**	**$2,478.91**
Contractor Costs / General Conditions Total			**$2,208.46**	**$780.10**	**$14,953.83**	**$17,942.38**

Decontamination Facilities

Decon. facilities to support remediation and construction activities.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	3.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$9,999.02**	**$9,999.02**
8' x 36' Decontamination Trailer with 2 Showers, Fans	3.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
DOT Steel Drum, 55 Gallon	8.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$407.65**	**$407.65**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$12,012.04**	**$12,012.04**

Discharge to POTW

Discharge of air stripper discharge to site sanitary treatment system.stimate.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Medium Brush, Medium Trees, Clear, Grub, Haul	0.25 ACRE		*$1,882.0673*	*$1,937.3439*	*$0.0000*	
17010107		D	70.00%	100.00%		
			$672.17	**$484.34**	**$0.00**	**$1,156.50**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Demolish Bituminous Pavement with Air Equipment	20.00 CY		*$14.7695*	*$5.1372*	*$0.0000*	
17020203		D	70.00%	100.00%		
			$421.99	**$102.74**	**$0.00**	**$524.73**
Trenching to 48" Deep, Including Backfill & Compaction	177.00 CY		*$2.1669*	*$1.0047*	*$0.0000*	
17030255		D	70.00%	100.00%		
			$547.92	**$177.83**	**$0.00**	**$725.75**
Soil, 5 Miles, Dump Truck, Load/Haul Spoil From Trench	133.00 CY		*$0.7849*	*$1.6768*	*$0.0000*	
17030282		D	70.00%	100.00%		
			$149.13	**$223.01**	**$0.00**	**$372.15**
Compact Soil with Vibrating Plate	133.00 CY		*$1.8449*	*$0.1234*	*$0.0000*	
17030511		D	70.00%	100.00%		
			$350.53	**$16.41**	**$0.00**	**$366.94**
4", Class 50, Bell & Spigot Sanitary Sewer, Cast-iron Pipe	600.00 LF		*$1.3319*	*$0.0238*	*$3.8173*	
19020101		D	70.00%	100.00%		
			$1,141.63	**$14.28**	**$2,290.38**	**$3,446.29**
Precast, CIP Base, 4' Diameter, 6' Deep, Manhole	1.00 EACH		*$172.7463*	*$51.5322*	*$331.3798*	
19020201		D	70.00%	100.00%		
			$246.78	**$51.53**	**$331.38**	**$629.69**
35 GPM, 660 Lb Fill, H-d Polyethylene-lined Steel, Permanent activated carbon	1.00 EACH		*$159.2317*	*$39.0669*	*$5,470.1820*	
33132012		D	70.00%	100.00%		
			$227.47	**$39.07**	**$5,470.18**	**$5,736.72**
	Discharge to POTW Total		**$3,757.61**	**$1,109.22**	**$8,091.94**	**$12,958.77**

Excavation, Trench/Channel

Excavate source soils for offsite disposal

Gravel, 6" Lifts	1,333.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$3,053.90	**$2,113.74**	**$14,979.72**	**$20,147.36**
580K, 1CY, Backhoe with Front-end Loader	100.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$2,961.04	**$1,390.15**	**$0.00**	**$4,351.19**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
2" Diameter Contractor's Trash Pump, 75 GPM	40.00 DAY		*$5.4995*	*$0.0871*	*$40.5669*	
17031002		D	70.00%	100.00%		
			$314.26	**$3.48**	**$1,622.68**	**$1,940.42**
Excavation, Trench/Channel Total			**$13,582.35**	**$4,235.77**	**$19,789.84**	**$37,607.95**

Fencing

Provide fencing during remediation activities.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
6' Swing Gate, 12' Double	2.00 EACH		*$60.2645*	*$25.3900*	*$311.4430*	
18040117		D	70.00%	100.00%		
			$172.18	**$50.78**	**$622.89**	**$845.85**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$1,954.03**	**$67.11**	**$18,503.07**	**$20,524.22**

Groundwater Monitoring Wells

Install four groundwater monitoring wells for monitoring groundwater.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
4" PVC, Schedule 40, Well Casing	60.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$169.10	**$251.27**	**$175.81**	**$596.17**
4" PVC, Schedule 40, Well Screen	10.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$37.77	**$56.12**	**$119.33**	**$213.22**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
Surface Pad, Concrete, 2' x 2' x 4"	4.00 EACH		*$0.7119*	*$0.0473*	*$3.1709*	
33231504		D	70.00%	100.00%		
			$4.07	**$0.19**	**$12.68**	**$16.94**
4" Well, Portland Cement Grout	12.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$19.26**	**$19.26**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**
Groundwater Monitoring Wells Total			**$2,921.22**	**$4,335.09**	**$2,676.23**	**$9,932.54**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Landfill Disposal						
Disposal of source soils at a landfill.						
Bulk Solid Hazardous Waste Loading Into Truck	1,900.00 CY		*$0.3727*	*$1.0436*	*$0.0000*	
33190102		D	70.00%	100.00%		
			$1,011.61	**$1,982.84**	**$0.00**	**$2,994.45**
Transport Bulk Solid Hazardous Waste, Maximum 18 Ton (per Mile)	10,500.00 MILE		*$0.0000*	*$0.0000*	*$3.3297*	
33190206		D	70.00%	100.00%		
			$0.00	**$0.00**	**$34,961.85**	**$34,961.85**
Landfill Hazardous Solid Bulk Waste by CY	1,333.00 CY		*$0.0000*	*$0.0000*	*$225.9423*	
33197264		D	70.00%	100.00%		
			$0.00	**$0.00**	**$301,181.09**	**$301,181.09**
Landfill Nonhaz Solid Bulk Waste from POTW trench)	200.00 CY		*$0.0000*	*$0.0000*	*$70.0000*	
33197270		D	70.00%	100.00%		
			$0.00	**$0.00**	**$14,000.00**	**$14,000.00**
	Landfill Disposal Total		**$1,011.61**	**$1,982.84**	**$350,142.94**	**$353,137.39**
Overhead Electrical Distribution						
Provide electricsl power to air stripping equipment.						
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	600.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$3,246.43	**$556.56**	**$856.20**	**$4,659.19**
40' Class 3 Treated Power Pole	8.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$2,702.07	**$463.21**	**$1,988.29**	**$5,153.56**
5 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$158.6935*	*$0.7554*	*$370.4154*	
20020545		D	70.00%	100.00%		
			$453.41	**$1.51**	**$740.83**	**$1,195.75**
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1" Rigid Steel Conduit	100.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$298.99	**$1.20**	**$112.98**	**$413.17**
Overhead Electrical Distribution Total			**$9,533.04**	**$1,072.17**	**$14,493.66**	**$25,098.87**

Professional Labor

Provide engineering and design support during specification preparation ,evaluation of bids and coordinating site work and interfacing with regulatory agncies and Army.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem	50.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,800.00**	**$4,800.00**
Senior Field Technician	400.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220117		D	70.00%	100.00%		
			$25,000.00	**$0.00**	**$0.00**	**$25,000.00**
Senior Project Manager	90.00 HOUR		*$83.2400*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$10,702.29	**$0.00**	**$0.00**	**$10,702.29**
Senior Contract Administrator	40.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$2,973.14	**$0.00**	**$0.00**	**$2,973.14**
Senior Project Hydrogeologist	200.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$20,811.43	**$0.00**	**$0.00**	**$20,811.43**
Senior Health & Safety Officer	40.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$2,258.86	**$0.00**	**$0.00**	**$2,258.86**
Senior Word Processing/Clerical	40.00 HOUR		*$29.2400*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$1,670.86	**$0.00**	**$0.00**	**$1,670.86**
Field Engineer - Average Cost	13.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$22,084.59	**$0.00**	**$0.00**	**$22,084.59**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Site Project Manager - Average Cost	15.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$28,030.44	**$0.00**	**$0.00**	**$28,030.44**
	Professional Labor Total		**$113,531.59**	**$0.00**	**$4,800.00**	**$118,331.59**
Site Total			**$173,794.14**	**$19,925.03**	**$530,333.42**	**$724,052.59**

RA25-6

Sead 25 Fire Training and Demonstration Pad

Soil and Groundwater impacted from petroleum hydrocarbons, BTEX , SVOC's and Pesicides.

Source Removal and disposal in off-site landfill / in-situ air sparging of Groundwater plume

Air Sparging

Air sparging annual costs, including electrical

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Operational Labor Cost	20.00 DAY		*$626.8065*	*$24.3571*	*$0.0000*	
33132311		D	70.00%	100.00%		
			$17,908.76	**$487.14**	**$0.00**	**$18,395.90**
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
Miscellaneous Electrical Site Usage	12.00 MONTH		*$0.0000*	*$0.0000*	*$237.8340*	
33420106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,854.01**	**$2,854.01**
	Air Sparging Total		**$17,908.76**	**$487.14**	**$8,066.21**	**$26,462.11**

Analyses: Water and Liquids

Annual groundwater monitoring weel analysis.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
	Analyses: Water and Liquids Total		**$0.00**	**$0.00**	**$2,140.51**	**$2,140.51**

Monitoring

Annual cost to perform monitoring.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem	8.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$768.00**	**$768.00**
Mobilize Crew, 100 Miles, per Person	8.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,902.67**	**$1,902.67**
Organic Vapor Analyzer Rental, per Day	5.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$594.59**	**$594.59**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
40 ml, Clear Vial, Case of 72	1.00 EACH		*$0.0000*	*$0.0000*	*$104.7659*	
33022026		D	70.00%	100.00%		
			$0.00	**$0.00**	**$104.77**	**$104.77**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
Project Manager	44.00 HOUR		*$60.3600*	*$0.0000*	*$0.0000*	
33220101		D	70.00%	100.00%		
			$3,794.06	**$0.00**	**$0.00**	**$3,794.06**
Project Hydrogeologist	44.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220106		D	70.00%	100.00%		
			$3,270.46	**$0.00**	**$0.00**	**$3,270.46**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Word Processing/Clerical	20.00 HOUR		*$29.2400*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$835.43	**$0.00**	**$0.00**	**$835.43**
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	4.00 EACH		*$0 0000*	*$0.0000*	*$7.0399*	
33232407		D	70.00%	100.00%		
			$0.00	**$0.00**	**$28.16**	**$28.16**
Suspension Cable, Teflon Coated	20.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		D	70.00%	100.00%		
			$0.00	**$0.00**	**$20.45**	**$20.45**
	Monitoring Total		**$7,899.94**	**$0.00**	**$4,471.34**	**$12,371.28**

Professional Labor

professional Labor is required to evaluate performance and coordinate activities.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	8.00 HOUR		*$84.2420*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$962.77	**$0.00**	**$0.00**	**$962.77**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.57	**$0.00**	**$0.00**	**$8,324.57**
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Word Processing/Clerical	16.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$672.00	**$0.00**	**$0.00**	**$672.00**
	Professional Labor Total		**$12,563.57**	**$0.00**	**$0.00**	**$12,563.57**
Site Total			**$38,372.27**	**$487.14**	**$14,678.05**	**$53,537.46**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

RA25-6 Capital Costs

(SEAD 25) Fire Training and Demonstration Pad.

Soils impacted with petroleum hydrocarbons, BTEX, SVOC's and pesticides..

Source removal and disposal at off-site landfill / in situ air sparging of ground water. Air sparging will operate for approximately 10 years and groundwater monitoring will continue for 30 years.

Air Sparging

Air sparging plume.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Crawler-mounted, 2 CY, 235 Hydraulic Excavator	80.00 HOUR		*$25.2100*	*$92.9693*	*$0.0000*	
17030232		D	70.00%	100.00%		
			$2,881.14	**$7,437.54**	**$0.00**	**$10,318.69**
Backfill, Large Spread Footing Excavated Material, 950, 3 CY	80.00 CY		*$0.5946*	*$1.3794*	*$0.0000*	
17030416		D	70.00%	100.00%		
			$67.95	**$110.35**	**$0.00**	**$178.31**
Gravel, 6" Lifts	80.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$183.28	**$126.86**	**$899.01**	**$1,209.14**
580K, 1CY, Backhoe with Front-end Loader	60.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$1,776.63	**$834.09**	**$0.00**	**$2,610.72**
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
Organic Vapor Analyzer Rental, per Day	60.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$7,135.07**	**$7,135.07**
Geogrid, Nylon Geomatrix/PVC-coated Polyester	4,000.00 SF		*$0.0215*	*$0.0035*	*$1.4390*	
33080525		D	70.00%	100.00%		
			$122.86	**$14.00**	**$5,756.00**	**$5,892.86**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Blower 170 SCFM, 10.3 HP, 10 PSI	1.00 EACH		*$881.0901*	*$17.5189*	*$3,460.4847*	
33139002		D	70.00%	100.00%		
			$1,258.70	**$17.52**	**$3,460.48**	**$4,736.70**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$3.1709*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$3.17**	**$4.24**
5' Guard Posts, Cast Iron, Concrete Fill	2.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$57.62	**$0.88**	**$58.51**	**$117.02**
4" PVC, Schedule 40, Manifold Piping	600.00 LF		*$3.6232*	*$0.0745*	*$2.5930*	
33260408		D	70.00%	100.00%		
			$3,105.60	**$44.70**	**$1,555.80**	**$4,706.10**
4" PVC, Schedule 40, Tee	6.00 EACH		*$37.4394*	*$0.7703*	*$8.4915*	
33270104		D	70.00%	100.00%		
			$320.91	**$4.62**	**$50.95**	**$376.48**
4" PVC, 90 Degree, Elbow	5.00 EACH		*$28.0795*	*$0.5776*	*$5.7318*	
33270114		D	70.00%	100.00%		
			$200.57	**$2.89**	**$28.66**	**$232.11**
Pressure Gauge	2.00 EACH		*$31.2708*	*$0.4644*	*$98.1353*	
33310209		D	70.00%	100.00%		
			$89.35	**$0.93**	**$196.27**	**$286.54**
	Air Sparging Total		**$17,882.36**	**$10,160.38**	**$22,331.37**	**$50,374.11**

Analyses: Air and Gas

Analyze air during remediation process.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Month	2.00 MONTH		*$0.0000*	*$0.0000*	*$1,239.1151*	
33020302		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,478.23**	**$2,478.23**
	Analyses: Air and Gas Total		**$0.00**	**$0.00**	**$2,478.23**	**$2,478.23**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Soil, Sludge, and Sediment						
Analyze source soils.						
TCLP (RCRA) (EPA 1311)	10.00 EACH		*$0.0000*	*$0.0000*	*$1,861.0511*	
33021702		D	70.00%	100.00%		
			$0.00	**$0.00**	**$18,610.51**	**$18,610.51**
Volatile Organic Analysis (SW 5030/SW 8240)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021720		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
Analyses: Soil, Sludge, and Sediment Total			**$0.00**	**$0.00**	**$20,751.02**	**$20,751.02**
Analyses: Water and Liquids						
Analyze surface and groundwater during remediation..						
Volatile Organic Analysis (EPA 624)	4.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$1,070.25**	**$1,070.25**
Cleanup and Landscaping						
Cleanup and landscaping at completion of remediation activities.						
General Area Cleanup	2.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$288.29	**$190.73**	**$0.00**	**$479.02**
Load & Haul Debris, 5 Miles, Dumptruck	10.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$12.46	**$25.81**	**$0.00**	**$38.27**
Seeding, Vegetative Cover	2.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$102.73	**$114.49**	**$3,309.46**	**$3,526.68**
Fertilize, 800 Lbs/Acre, Push Rotary	2.00 ACRE		*$15.0311*	*$30.0266*	*$31.0731*	
18050409		D	70.00%	100.00%		
			$42.95	**$60.05**	**$62.15**	**$165.15**
Watering with 3,000-Gallon Tank Truck, Per Pass	2.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$39.96	**$44.55**	**$4.76**	**$89.27**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mowing	2.00 ACRE		*$11.2562*	*$3.7814*	*$0.0000*	
18050415		D	70.00%	100.00%		
			$32.16	**$7.56**	**$0.00**	**$39.72**
Cleanup and Landscaping Total			**$518.55**	**$443.19**	**$3,376.36**	**$4,338.11**

Clear and Grub

Clear work area prior to initiating remediation activities.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Light Brush without Grub, Clearing	2.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$65.91	**$41.10**	**$0.00**	**$107.01**
Clear and Grub Total			**$65.91**	**$41.10**	**$0.00**	**$107.01**

Contractor Costs / General Conditions

Support during construction and remediation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	90.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	90.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8,640.00**	**$8,640.00**
Disposable Boot Covers (Tyvek)	100.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$137.35**	**$137.35**
Disposable Gloves (Latex)	100.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$22.76**	**$22.76**
Disposable Coveralls (Tyvek)	100.00 EACH		*$0.0000*	*$0.0000*	*$3.5675*	
33010425		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Temporary Office 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$673.65**	**$673.65**
Temporary Storage Trailer 28' x 10'	3.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$366.63**	**$366.63**
Portable Toilets - Chemical	3.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	4.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,698.81	**$780.10**	**$0.00**	**$2,478.91**
Contractor Costs / General Conditions Total			**$2,208.46**	**$780.10**	**$14,953.83**	**$17,942.38**

Decontamination Facilities

Suppoprt during construction and remediation.

1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	3.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$9,999.02**	**$9,999.02**
8' x 36' Decontamination Trailer with 2 Showers, Fans	3.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
DOT Steel Drum, 55 Gallon	8.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$407.65**	**$407.65**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$12,012.04**	**$12,012.04**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Excavation, Trench/Channel						
Excavation of source soils.						
Gravel, 6" Lifts	1,333.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$3,053.90	**$2,113.74**	**$14,979.72**	**$20,147.36**
580K, 1CY, Backhoe with Front-end Loader	100.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$2,961.04	**$1,390.15**	**$0.00**	**$4,351.19**
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
2" Diameter Contractor's Trash Pump, 75 GPM	40.00 DAY		*$5.4995*	*$0.0871*	*$40.5669*	
17031002		D	70.00%	100.00%		
			$314.26	**$3.48**	**$1,622.68**	**$1,940.42**
Excavation, Trench/Channel Total			**$13,582.35**	**$4,235.77**	**$19,789.84**	**$37,607.95**
Fencing						
Fence required during remediation activities.						
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
6' Swing Gate, 12' Double	2.00 EACH		*$60.2645*	*$25.3900*	*$311.4430*	
18040117		D	70.00%	100.00%		
			$172.18	**$50.78**	**$622.89**	**$845.85**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$1,954.03**	**$67.11**	**$18,503.07**	**$20,524.22**
Groundwater Monitoring Wells						
Install four groundwater monitoring wells.						
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	60.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$226.59	**$336.71**	**$715.99**	**$1,279.29**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	90.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,127.33	**$1,675.18**	**$0.00**	**$2,802.51**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
4" Well, Grout (Annular Seal)	30.00 LF		*$11.2451*	*$23.8712*	*$7.6795*	
33231802		D	70.00%	100.00%		
			$481.93	**$716.14**	**$230.39**	**$1,428.45**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
5' Guard Posts, Cast Iron, Concrete Fill	4.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$115.25	**$1.76**	**$117.03**	**$234.03**
Groundwater Monitoring Wells Total			**$3,496.48**	**$5,026.26**	**$3,764.17**	**$12,286.91**

Landfill Disposal

Landfill disposal of source soils.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Bulk Solid Hazardous Waste Loading Into Truck	1,666.00 CY		*$0.3727*	*$1.0436*	*$0.0000*	
33190102		D	70.00%	100.00%		
			$887.03	**$1,738.64**	**$0.00**	**$2,625.66**
Transport Bulk Solid Hazardous Waste, Maximum 18 Ton (per Mile)	10,000.00 MILE		*$0.0000*	*$0.0000*	*$3.3297*	
33190206		D	70.00%	100.00%		
			$0.00	**$0.00**	**$33,297.00**	**$33,297.00**
Landfill Hazardous Solid Bulk Waste by CY	1,333.00 CY		*$0.0000*	*$0.0000*	*$225.9423*	
33197264		D	70.00%	100.00%		
			$0.00	**$0.00**	**$301,181.09**	**$301,181.09**
Landfill Disposal Total			**$887.03**	**$1,738.64**	**$334,478.09**	**$337,103.75**

Overhead Electrical Distribution

install electrical power for air sparging equipment.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	600.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$3,246.43	**$556.56**	**$856.20**	**$4,659.19**
40' Class 3 Treated Power Pole	8.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$2,702.07	**$463.21**	**$1,988.29**	**$5,153.56**
5 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$158.6935*	*$0.7554*	*$370.4154*	
20020545		D	70.00%	100.00%		
			$453.41	**$1.51**	**$740.83**	**$1,195.75**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**
1" Rigid Steel Conduit	100.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$298.99	**$1.20**	**$112.98**	**$413.17**
Overhead Electrical Distribution Total			**$9,533.04**	**$1,072.17**	**$14,493.66**	**$25,098.87**

Professional Labor

Provide support for specifications, evaluate bids, interface with contractors, regulatory agencies and Army during remediation activities.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem - -Senior field technician	50.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,800.00**	**$4,800.00**
Senior Project Manager	90.00 HOUR		*$83.2600*	*$0.0000*	*$0.0000*	
33220101		D	70.00%	100.00%		
			$10,704.86	**$0.00**	**$0.00**	**$10,704.86**
Treatability Studies	1.00 LS		*$5,000.0000*	*$4,500.0000*	*$5,500.0000*	
33220123		D	70.00%	100.00%		
			$7,142.86	**$4,500.00**	**$5,500.00**	**$17,142.86**
Senior Contract Administrator	40.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$2,973.14	**$0.00**	**$0.00**	**$2,973.14**
Senior Project Hydrogeologist	200.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$20,811.43	**$0.00**	**$0.00**	**$20,811.43**
Senior Health & Safety Officer	40.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$2,258.86	**$0.00**	**$0.00**	**$2,258.86**
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Field Technician	400.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220159		D	70.00%	100.00%		
			$25,000.00	**$0.00**	**$0.00**	**$25,000.00**
Senior Word Processing/Clerical	40.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$1,680.00	**$0.00**	**$0.00**	**$1,680.00**
Field Engineer - Average Cost	13.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$22,084.59	**$0.00**	**$0.00**	**$22,084.59**
Site Project Manager - Average Cost	15.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$28,030.44	**$0.00**	**$0.00**	**$28,030.44**
Professional Labor Total			**$123,064.51**	**$4,500.00**	**$10,300.00**	**$137,864.51**
Site Total			$173,192.72	$28,064.71	$478,301.92	$679,559.35

Site Total

RA25-3R Capital Costs

(Sead 25) Fire Demonstration Pad

Soils and Groundwater impacted from petroleum hydrocarbons, BTEX, SVOC's and pesticides.

Bioventing of Soils /Air Sparging of Groundwater Plume and Sediment Removal.

Costs are for meeting Residential Standards

Air Sparging

Air sparging equipment installation is required for groundwater plume

Crawler-mounted, 2 CY, 235 Hydraulic Excavator	80.00 HOUR		*$25.2100*	*$92.9693*	*$0.0000*	
17030232		D	70.00%	100.00%		
			$2,881.14	**$7,437.54**	**$0.00**	**$10,318.69**
950, 3 CY, Backfill with Excavated Material	80.00 CY		*$0.2736*	*$0.6184*	*$0.0000*	
17030401		D	70.00%	100.00%		
			$31.27	**$49.47**	**$0.00**	**$80.74**
Gravel, 6" Lifts	80.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$183.28	**$126.86**	**$899.01**	**$1,209.14**
580K, 1CY, Backhoe with Front-end Loader	60.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$1,776.63	**$834.09**	**$0.00**	**$2,610.72**
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Day	60.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$7,135.07**	**$7,135.07**
Geogrid, Nylon Geomatrix/PVC-coated Polyester	4,000.00 SF		*$0.0215*	*$0.0035*	*$1.4390*	
33080525		D	70.00%	100.00%		
			$122.86	**$14.00**	**$5,756.00**	**$5,892.86**
Installation Using Chain Trencher, Depth <= 4'	300.00 CY		*$0.5315*	*$0.3485*	*$0.0000*	
33132320		D	70.00%	100.00%		
			$227.79	**$104.55**	**$0.00**	**$332.34**
Blower 170 SCFM, 10.3 HP, 10 PSI	1.00 EACH		*$881.0901*	*$17.5189*	*$3,460.4847*	
33139002		D	70.00%	100.00%		
			$1,258.70	**$17.52**	**$3,460.48**	**$4,736.70**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$48.0000*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$48.00**	**$49.06**
5' Guard Posts, Cast Iron, Concrete Fill	2.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$57.62	**$0.88**	**$58.51**	**$117.02**
2" PVC, Schedule 40, Manifold Piping	600.00 LF		*$1.6827*	*$0.0346*	*$0.8946*	
33260417		D	70.00%	100.00%		
			$1,442.31	**$20.76**	**$536.76**	**$1,999.83**
2" PVC, Schedule 40, Tee	6.00 EACH		*$20.5473*	*$0.9467*	*$1.0766*	
33270102		D	70.00%	100.00%		
			$176.12	**$5.68**	**$6.46**	**$188.26**
2" PVC, 90 Degree, Elbow	5.00 EACH		*$12.1425*	*$0.2498*	*$0.8795*	
33270112		D	70.00%	100.00%		
			$86.73	**$1.25**	**$4.40**	**$92.38**
Pressure Gauge	2.00 EACH		*$31.2708*	*$0.4644*	*$98.1353*	
33310209		D	70.00%	100.00%		
			$89.35	**$0.93**	**$196.27**	**$286.54**
	Air Sparging Total		**$16,151.55**	**$10,179.53**	**$21,288.40**	**$47,619.49**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Soil, Sludge, and Sediment						
Analyze sediment prior to removal						
TCLP (RCRA) (EPA 1311)	2.00 EACH		*$0.0000*	*$0.0000*	*$1,861.0511*	
33021702		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,722.10**	**$3,722.10**
Analyses: Soil, Sludge, and Sediment Total			**$0.00**	**$0.00**	**$3,722.10**	**$3,722.10**
Analyses: Water and Liquids						
Analyze water in trench						
Volatile Organic Analysis (EPA 624)	10.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,675.63**	**$2,675.63**
BTEX/MTBE (Mod EPA 602)	6.00 EACH		*$0.0000*	*$0.0000*	*$89.1878*	
33022139		D	70.00%	100.00%		
			$0.00	**$0.00**	**$535.13**	**$535.13**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$3,210.76**	**$3,210.76**
Cleanup and Landscaping						
Cleanup and landscaping is required after completion of remediation activities.						
General Area Cleanup	2.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$288.29	**$190.73**	**$0.00**	**$479.02**
Load & Haul Debris, 5 Miles, Dumptruck	10.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$12.46	**$25.81**	**$0.00**	**$38.27**
Seeding, Vegetative Cover	2.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$102.73	**$114.49**	**$3,309.46**	**$3,526.68**
Fertilize, 800 Lbs/Acre, Push Rotary	2.00 ACRE		*$15.0311*	*$30.0266*	*$31.0731*	
18050409		D	70.00%	100.00%		
			$42.95	**$60.05**	**$62.15**	**$165.15**
Watering with 3,000-Gallon Tank Truck, Per Pass	2.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$39.96	**$44.55**	**$4.76**	**$89.27**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mowing	2.00 ACRE		*$11.2562*	*$3.7814*	*$0.0000*	
18050415		D	70.00%	100.00%		
			$32.16	**$7.56**	**$0.00**	**$39.72**
Cleanup and Landscaping Total			**$518.55**	**$443.19**	**$3,376.36**	**$4,338.11**

Clear and Grub

Require initial clearing for remediation activities

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Light Brush without Grub, Clearing	2.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$65.91	**$41.10**	**$0.00**	**$107.01**
Clear and Grub Total			**$65.91**	**$41.10**	**$0.00**	**$107.01**

Contractor Costs / General Conditions

Support during remediation and construction.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	90.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	90.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8,640.00**	**$8,640.00**
Disposable Boot Covers (Tyvek)	100.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$137.35**	**$137.35**
Disposable Gloves (Latex)	100.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$22.76**	**$22.76**
Disposable Coveralls (Tyvek)	100.00 EACH		*$0.0000*	*$0.0000*	*$3.5675*	
33010425		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Temporary Office 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$673.65**	**$673.65**
Temporary Storage Trailer 28' x 10'	3.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$366.63**	**$366.63**
Portable Toilets - Chemical	3.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	4.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,698.81	**$780.10**	**$0.00**	**$2,478.91**
Contractor Costs / General Conditions Total			**$2,208.46**	**$780.10**	**$14,953.83**	**$17,942.38**

Decontamination Facilities

Support during remediation/ construction.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	3.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$9,999.02**	**$9,999.02**
8' x 36' Decontamination Trailer with 2 Showers, Fans	3.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
DOT Steel Drum, 55 Gallon	8.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$407.65**	**$407.65**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$12,012.04**	**$12,012.04**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Excavation, Trench/Channel						
Sediment in trenches to be removed for offsite disposal.						
Crawler-mounted, 2 CY, 235 Hydraulic Excavator	100.00 HOUR		*$25.2100*	*$92.9693*	*$0.0000*	
17030232		D	70.00%	100.00%		
			$3,601.43	**$9,296.93**	**$0.00**	**$12,898.36**
950, 3 CY, Backfill with Excavated Material	80.00 CY		*$0.2736*	*$0.6184*	*$0.0000*	
17030401		D	70.00%	100.00%		
			$31.27	**$49.47**	**$0.00**	**$80.74**
Gravel, 6" Lifts	80.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$183.28	**$126.86**	**$899.01**	**$1,209.14**
580K, 1CY, Backhoe with Front-end Loader	60.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$1,776.63	**$834.09**	**$0.00**	**$2,610.72**
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
Excavation, Trench/Channel Total			**$12,845.75**	**$11,035.75**	**$4,086.45**	**$27,967.94**
Fencing						
Area will be fenced off during remediation.						
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
7' Swing Gate, 12' Double	3.00 EACH		*$73.3583*	*$61.3664*	*$280.6917*	
18040118		D	70.00%	100.00%		
			$314.39	**$184.10**	**$842.08**	**$1,340.57**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$2,096.24**	**$200.43**	**$18,722.26**	**$21,018.93**

Groundwater Monitoring Wells

Install four additiuonal groundwater monitoring wells for long term monitoring.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	10.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$37.77	**$56.12**	**$119.33**	**$213.22**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
4" Well, Portland Cement Grout	12.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$19.26**	**$19.26**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**
5' Guard Posts, Cast Iron, Concrete Fill	4.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$115.25	**$1.76**	**$117.03**	**$234.03**
Groundwater Monitoring Wells Total			**$3,201.50**	**$4,587.93**	**$2,956.39**	**$10,745.81**

In Situ Biodegradation (Bioventing)

Bioventing will be used to treat contaminated soils and groundwater.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
2 1/2", Cast-iron Body, Gate Valve	2.00 EACH		*$18.8127*	*$0.6303*	*$167.9108*	
18050706		D	70.00%	100.00%		
			$53.75	**$1.26**	**$335.82**	**$390.83**
2 1/2", Class 200, PVC Piping	250.00 LF		*$2.2133*	*$0.4611*	*$0.7730*	
19010205		D	70.00%	100.00%		
			$790.46	**$115.28**	**$193.25**	**$1,098.99**
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
Continuous Monitoring and Recording of Air Flow	1.00 EACH		*$0.0000*	*$0.0000*	*$11,416.0320*	
33021507		D	70.00%	100.00%		
			$0.00	**$0.00**	**$11,416.03**	**$11,416.03**
Purchase, 10 HP, 190 SCFM Vapor Extraction Blower	1.00 EACH		*$267.3968*	*$3.1038*	*$6,744.9722*	
33132340		D	70.00%	100.00%		
			$382.00	**$3.10**	**$6,744.97**	**$7,130.07**
4" PVC, Schedule 40, Well Casing	30.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$84.55	**$125.63**	**$87.90**	**$298.09**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	60.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$751.55	**$1,116.79**	**$0.00**	**$1,868.34**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
4" Screen, Filter Pack	30.00 LF		*$1.9728*	*$4.1878*	*$12.3067*	
33231402		D	70.00%	100.00%		
			$84.55	**$125.63**	**$369.20**	**$579.38**
Surface Pad, Concrete, 4' x 4' x 4"	4.00 EACH		*$2.8481*	*$0.1893*	*$12.6844*	
33231502		D	70.00%	100.00%		
			$16.27	**$0.76**	**$50.74**	**$67.77**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$48.0000*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$48.00**	**$49.06**
4" Well, Portland Cement Grout	20.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$32.11**	**$32.11**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
4" PVC, Schedule 40, Tee	5.00 EACH		*$37.4394*	*$0.7703*	*$8.4915*	
33270104		D	70.00%	100.00%		
			$267.42	**$3.85**	**$42.46**	**$313.73**
4" PVC, 90 Degree, Elbow	6.00 EACH		*$28.0795*	*$0.5776*	*$5.7318*	
33270114		D	70.00%	100.00%		
			$240.68	**$3.47**	**$34.39**	**$278.54**
In Situ Biodegradation (Bioventing) Total			**$3,412.58**	**$2,595.97**	**$20,777.10**	**$26,785.64**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Landfill Disposal						
Sediments from trench will be disposed at on off-site landfill.						
Bulk Solid Non-Hazardous Waste Loading Into Truck	371.00 CY		*$0.3727*	*$1.0436*	*$0.0000*	
33190102		D	70.00%	100.00%		
			$197.53	**$387.18**	**$0.00**	**$584.71**
Transport Bulk Solid Hazardous Waste, Maximum 22 Ton (per trip)	371.00 Ton		*$0.0000*	*$0.0000*	*$14.0000*	
33190206		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,194.00**	**$5,194.00**
Landfill Nonhazardous Solid Bulk Waste by Ton	371.00 Ton		*$0.0000*	*$0.0000*	*$70.0000*	
33197270		D	70.00%	100.00%		
			$0.00	**$0.00**	**$25,970.00**	**$25,970.00**
	Landfill Disposal Total		**$197.53**	**$387.18**	**$31,164.00**	**$31,748.71**
Load and Haul						
Sediments will be loaded and hauled to an off-site landfill.						
910, 1.25 CY, Wheel Loader	24.00 HOUR		*$20.2397*	*$15.9824*	*$0.0000*	
17030220		D	70.00%	100.00%		
			$693.93	**$383.58**	**$0.00**	**$1,077.51**
8 CY, Dump Truck	1.00 HOUR		*$13.7468*	*$40.6816*	*$0.0000*	
17030284		D	70.00%	100.00%		
			$19.64	**$40.68**	**$0.00**	**$60.32**
	Load and Haul Total		**$713.57**	**$424.26**	**$0.00**	**$1,137.83**
Overhead Electrical Distribution						
Electrical power will be required to operate the air sparging and bioventing equipment.						
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	600.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$3,246.43	**$556.56**	**$856.20**	**$4,659.19**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
40' Class 3 Treated Power Pole	8.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$2,702.07	**$463.21**	**$1,988.29**	**$5,153.56**
15 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$308.5710*	*$1.4689*	*$78.5062*	
20020546		D	70.00%	100.00%		
			$881.63	**$2.94**	**$157.01**	**$1,041.58**
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**
1" Rigid Steel Conduit	100.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$298.99	**$1.20**	**$112.98**	**$413.17**
Overhead Electrical Distribution Total			**$9,961.26**	**$1,073.59**	**$13,909.84**	**$24,944.70**

Professional Labor

Treatability tests will be required to confirm the bioventing system design and air sparging as well as provide final performance specifcations, prepare and evaluate bids and interface with contractor , agencies and SEDA for the remediation activities. labor includes support during construction and construction management.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem - senior field technician	50.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,459.39**	**$4,459.39**
Treatability test	1.00 ls		*$8,000.0000*	*$4,500.0000*	*$5,500.0000*	
33220101		D	70.00%	100.00%		
			$11,428.57	**$4,500.00**	**$5,500.00**	**$21,428.57**
Senior Field Technician	400.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220117		D	70.00%	100.00%		
			$25,000.00	**$0.00**	**$0.00**	**$25,000.00**
Senior Project Manager	90.00 HOUR		*$83.2420*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$10,702.54	**$0.00**	**$0.00**	**$10,702.54**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Sampling: Air Total			**$0.00**	**$0.00**	**$356.75**	**$356.75**
Site Total			$30,387.36	$297.51	$42,214.82	$72,899.69

RA25-3AR Capital Costs

SEAD-25 Fire Demonstration Pad.

BTEX and Petroleum Hydrocarbons.

Natural Attenuation for the groundwater, Bioventing for the On-site soils and sediment excavation and disposal.

Costs to meet Residential Standards.

Analyses: Soil, Sludge, and Sediment

Analyze sediment prior to removal and off-site disposal.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
TCLP (RCRA) (EPA 1311)	2.00 EACH		*$0.0000*	*$0.0000*	*$1,861.0511*	
33021702		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,722.10**	**$3,722.10**
Analyses: Soil, Sludge, and Sediment Total			**$0.00**	**$0.00**	**$3,722.10**	**$3,722.10**

Analyses: Water and Liquids

Cleanup and landscaping is required after completion of remedial activities.-

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	10.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,675.63**	**$2,675.63**
BTEX/MTBE (Mod EPA 602)	6.00 EACH		*$0.0000*	*$0.0000*	*$89.1878*	
33022139		D	70.00%	100.00%		
			$0.00	**$0.00**	**$535.13**	**$535.13**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$3,210.76**	**$3,210.76**

Cleanup and Landscaping

Cleanup and landscaping is required after completion of remediation activities

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
General Area Cleanup	2.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$288.29	**$190.73**	**$0.00**	**$479.02**
Load & Haul Debris, 5 Miles, Dumptruck	10.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$12.46	**$25.81**	**$0.00**	**$38.27**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Seeding, Vegetative Cover	2.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$102.73	**$114.49**	**$3,309.46**	**$3,526.68**
Fertilize, 800 Lbs/Acre, Push Rotary	2.00 ACRE		*$15.0311*	*$30.0266*	*$31.0731*	
18050409		D	70.00%	100.00%		
			$42.95	**$60.05**	**$62.15**	**$165.15**
Watering with 3,000-Gallon Tank Truck, Per Pass	2.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$39.96	**$44.55**	**$4.76**	**$89.27**
Mowing	2.00 ACRE		*$11.2562*	*$3.7814*	*$0.0000*	
18050415		D	70.00%	100.00%		
			$32.16	**$7.56**	**$0.00**	**$39.72**
Cleanup and Landscaping Total			**$518.55**	**$443.19**	**$3,376.36**	**$4,338.11**

Clear and Grub

Require intial clearing for remediation activities

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Light Brush without Grub, Clearing	2.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$65.91	**$41.10**	**$0.00**	**$107.01**
Clear and Grub Total			**$65.91**	**$41.10**	**$0.00**	**$107.01**

Contractor Costs / General Conditions

Support during remediation and construction

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	45.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	45.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,013.45**	**$4,013.45**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Disposable Boot Covers (Tyvek)	50.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$68.68**	**$68.68**
Disposable Gloves (Latex)	50.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$11.38**	**$11.38**
Disposable Coveralls (Tyvek/Polycoated)	50.00 EACH		*$0.0000*	*$0.0000*	*$5.1730*	
33010424		D	70.00%	100.00%		
			$0.00	**$0.00**	**$258.65**	**$258.65**
Temporary Office 20' x 8'	2.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$449.10**	**$449.10**
Temporary Storage Trailer 28' x 10'	2.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$244.42**	**$244.42**
Portable Toilets - Chemical	2.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$237.83**	**$237.83**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	3.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,274.11	**$585.07**	**$0.00**	**$1,859.18**
Contractor Costs / General Conditions Total			**$1,783.76**	**$585.07**	**$8,078.06**	**$10,446.89**

Decontamination Facilities

Support during remediation/construction

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	2.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$6,666.01**	**$6,666.01**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
8' x 36' Decontamination Trailer with 2 Showers, Fans	2.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
DOT Steel Drum, 55 Gallon	6.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$305.74**	**$305.74**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$8,042.00**	**$8,042.00**

Excavation, Trench/Channel

Sediment in trenches to be removed for off-site disposal.

Fencing

see next page

Area will be fenced off during remediation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
6' Galvanized Chain-link Fence	1,400.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$1,674.80	**$15.40**	**$17,758.58**	**$19,448.78**
Swing Gates, Complete	3.00 EACH		*$73.3583*	*$61.3664*	*$291.0877*	
18040115		D	70.00%	100.00%		
			$314.39	**$184.10**	**$873.26**	**$1,371.76**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$2,096.24**	**$200.43**	**$18,753.45**	**$21,050.12**

Groundwater Monitoring Wells

Grondwater Monitoring wells will be used to monitor the groundwater for Natrual Attenuation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Excavation, Trench/Channel						
Sediment in trenches to be removed for offsite disposal.						
Crawler-mounted, 2 CY, 235 Hydraulic Excavator	100.00 HOUR		*$25.2100*	*$92.9693*	*$0.0000*	
17030232		D	70.00%	100.00%		
			$3,601.43	**$9,296.93**	**$0.00**	**$12,898.36**
950, 3 CY, Backfill with Excavated Material	80.00 CY		*$0.2736*	*$0.6184*	*$0.0000*	
17030401		D	70.00%	100.00%		
			$31.27	**$49.47**	**$0.00**	**$80.74**
Gravel, 6" Lifts	80.00 CY		*$1.6037*	*$1.5857*	*$11.2376*	
17030430		D	70.00%	100.00%		
			$183.28	**$126.86**	**$899.01**	**$1,209.14**
580K, 1CY, Backhoe with Front-end Loader	60.00 HOUR		*$20.7273*	*$13.9015*	*$0.0000*	
17030431		D	70.00%	100.00%		
			$1,776.63	**$834.09**	**$0.00**	**$2,610.72**
Wood Sheeting, 8' Deep Excavation	2,400.00 SF		*$2.1155*	*$0.3035*	*$1.3281*	
17030905		D	70.00%	100.00%		
			$7,253.14	**$728.40**	**$3,187.44**	**$11,168.98**
Excavation, Trench/Channel Total			**$12,845.75**	**$11,035.75**	**$4,086.45**	**$27,967.94**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	10.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$37.77	**$56.12**	**$119.33**	**$213.22**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
4" Well, Portland Cement Grout	12.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$19.26**	**$19.26**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
5' Guard Posts, Cast Iron, Concrete Fill	4.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$115.25	**$1.76**	**$117.03**	**$234.03**
Groundwater Monitoring Wells Total			**$3,201.50**	**$4,587.93**	**$2,956.39**	**$10,745.81**

In Situ Biodegradation (Bioventing)

Bioventing will be used to treat the on-site source soils.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
2 1/2", Cast-iron Body, Gate Valve	2.00 EACH		*$18.8127*	*$0.6303*	*$167.9108*	
18050706		D	70.00%	100.00%		
			$53.75	**$1.26**	**$335.82**	**$390.83**
2 1/2", Class 200, PVC Piping	250.00 LF		*$2.2133*	*$0.4611*	*$0.7730*	
19010205		D	70.00%	100.00%		
			$790.46	**$115.28**	**$193.25**	**$1,098.99**
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
Continuous Monitoring and Recording of Air Flow	1.00 EACH		*$0.0000*	*$0.0000*	*$11,416.0320*	
33021507		D	70.00%	100.00%		
			$0.00	**$0.00**	**$11,416.03**	**$11,416.03**
Purchase, 10 HP, 190 SCFM Vapor Extraction Blower	1.00 EACH		*$267.3968*	*$3.1038*	*$6,744.9722*	
33132340		D	70.00%	100.00%		
			$382.00	**$3.10**	**$6,744.97**	**$7,130.07**
4" PVC, Schedule 40, Well Casing	30.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$84.55	**$125.63**	**$87.90**	**$298.09**
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	60.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$751.55	**$1,116.79**	**$0.00**	**$1,868.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
4" Screen, Filter Pack	30.00 LF		*$1.9728*	*$4.1878*	*$12.3067*	
33231402		D	70.00%	100.00%		
			$84.55	**$125.63**	**$369.20**	**$579.38**
Surface Pad, Concrete, 4' x 4' x 4"	4.00 EACH		*$2.8481*	*$0.1893*	*$12.6844*	
33231502		D	70.00%	100.00%		
			$16.27	**$0.76**	**$50.74**	**$67.77**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$3.1709*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$3.17**	**$4.24**
4" Well, Portland Cement Grout	20.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$32.11**	**$32.11**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
4" PVC, Schedule 40, Tee	5.00 EACH		*$37.4394*	*$0.7703*	*$8.4915*	
33270104		D	70.00%	100.00%		
			$267.42	**$3.85**	**$42.46**	**$313.73**
4" PVC, 90 Degree, Elbow	6.00 EACH		*$28.0795*	*$0.5776*	*$5.7318*	
33270114		D	70.00%	100.00%		
			$240.68	**$3.47**	**$34.39**	**$278.54**
In Situ Biodegradation (Bioventing) Total			**$3,412.58**	**$2,595.97**	**$20,732.27**	**$26,740.81**

Landfill Disposal

Sediments from trench will be disposed at an off-site landfill.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Bulk Solid Hazardous Waste Loading Into Truck	371.00 CY		*$0.3727*	*$1.0436*	*$0.0000*	
33190102		D	70.00%	100.00%		
			$197.53	**$387.18**	**$0.00**	**$584.71**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Transport Bulk Solid Non-Hazardous Waste, Maximum 22 Ton (per trip)	371.00 ton		*$0.0000*	*$0.0000*	*$14.0000*	
33190206		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,194.00**	**$5,194.00**
Landfill Nonhazardous Solid Bulk Waste by Ton	371.00 Ton		*$0.0000*	*$0.0000*	*$70.0000*	
33197270		D	70.00%	100.00%		
			$0.00	**$0.00**	**$25,970.00**	**$25,970.00**
	Landfill Disposal Total		**$197.53**	**$387.18**	**$31,164.00**	**$31,748.71**

Load and Haul

Sediments will be loaded and hauled to off-site landfill.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
910, 1.25 CY, Wheel Loader	24.00 HOUR		*$20.2397*	*$15.9824*	*$0.0000*	
17030220		D	70.00%	100.00%		
			$693.93	**$383.58**	**$0.00**	**$1,077.51**
8 CY, Dump Truck	8.00 HOUR		*$13.7468*	*$40.6816*	*$0.0000*	
17030284		D	70.00%	100.00%		
			$157.11	**$325.45**	**$0.00**	**$482.56**
	Load and Haul Total		**$851.04**	**$709.03**	**$0.00**	**$1,560.07**

Overhead Electrical Distribution

Electrical power will be required to operate the bioventing system.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	600.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$3,246.43	**$556.56**	**$856.20**	**$4,659.19**
40' Class 3 Treated Power Pole	8.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$2,702.07	**$463.21**	**$1,988.29**	**$5,153.56**
15 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$308.5710*	*$1.4689*	*$78.5062*	
20020546		D	70.00%	100.00%		
			$881.63	**$2.94**	**$157.01**	**$1,041.58**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**
1" Rigid Steel Conduit	100.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$298.99	**$1.20**	**$112.98**	**$413.17**
Overhead Electrical Distribution Total			**$9,961.26**	**$1,073.59**	**$13,909.84**	**$24,944.70**

Professional Labor

Treatability tests will be required to confirm the bioventing system design as well as provide final performance specifications, prepare and evalutate bids and interface with contractors, agencies and SEDA for the remediation avtivites. Labor includes support during construction and construction management.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem-Senior field techncician	25.00 DAY		*$0.0000*	*$0.0000*	*$89.1878*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,229.70**	**$2,229.70**
Senior Project Manager	45.00 HOUR		*$83.2420*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$5,351.27	**$0.00**	**$0.00**	**$5,351.27**
Senior Contract Administrator	20.00 HOUR		*$52.0400*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$1,486.86	**$0.00**	**$0.00**	**$1,486.86**
Treatability tests.	1.00 LS		*$8,000.0000*	*$4,500.0000*	*$5,500.0000*	
33220129		D	70.00%	100.00%		
			$11,428.57	**$4,500.00**	**$5,500.00**	**$21,428.57**
Senior Project Hydrogeologist	150.00 HOUR		*$72.8370*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$15,607.93	**$0.00**	**$0.00**	**$15,607.93**
Senior Health & Safety Officer	24.00 HOUR		*$39.5400*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$1,355.66	**$0.00**	**$0.00**	**$1,355.66**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Attorney	40.00 HOUR		*$41.6210*	*$0.0000*	*$0.0000*	
33220152		D	70.00%	100.00%		
			$2,378.34	**$0.00**	**$0.00**	**$2,378.34**
Senior Field Technician	200.00 HOUR		*$17.8376*	*$0.0000*	*$0.0000*	
33220159		D	70.00%	100.00%		
			$5,096.46	**$0.00**	**$0.00**	**$5,096.46**
Senior Word Processing/Clerical	20.00 HOUR		*$29.1300*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$832.29	**$0.00**	**$0.00**	**$832.29**
Field Engineer - Average Cost	8.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$13,590.51	**$0.00**	**$0.00**	**$13,590.51**
Site Project Manager - Average Cost	10.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$18,686.96	**$0.00**	**$0.00**	**$18,686.96**
Professional Labor Total			**$75,814.84**	**$4,500.00**	**$7,729.70**	**$88,044.54**

$ 262,719.57

Appendix D
SEAD-26 Cost Backup

Appendix D

Tables D-7 through D-9 SEAD-26 Cost Estimate Summaries

Table D-7

SENECA ARMY DEPOT SEAD 25 & 26 FS
COST ESTIMATE SUMMARY
ALTERNATIVE 26-2 Institutional Controls, Natural Attenuation of Plume.

WBS number	Description	Cost,$
32xxx	**Design** (See 26-2 Capital Cost, Professional Labor)	35,450.13
331xx01	**Mobilization and preparatory work** (See 26-2 Capital Cost, Decontamination ., Fencing)	24,660.24
331xx02	**Monitoring, sampling,testing,and analysis** (See 26-2 Capital Cost , Analyses ;Soil Sludge & Sediment, Groundwater Monitoring Wells)	32,163.72
331xx03	**Site work** (See 26-2 Capital cost, Cleanup and Landscaping)	0
331xx08	**Solids Collection and Containment** (See 26-2, Capital Cost, Excavation)	0
331xx19	**Disposal, Commercial** (See 26-2 Capital cost, Landfill Disposal)	0
331xx22	**General requirements** (See 26-2 Capital cost, Contractor Costs/ General conditions)	17,942.38
332xx	**Engineering During Construction** (See 26-2 Capital Cost, Professional Labor)	0
333xx	**Construction management** (See 26-2 Capital Cost, Professional Labor)	50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST	**160,331.50**
	Location Multiplier, 0.85	136,281.78
	Escalation at 10 % of estimated construction cost	16,033.15
	Overhead and Profit, 13 % of estimated construction c	20,843.10
	Contingency, 20 % of estimated construction cost	32,066.30
	TOTAL ESTIMATED CONSTRUCTION COST	**$ 205,224.32**
342XXX	**Operation and Maintenance (post construction)** Annual cost	25,418.73
	Present worth of O & M costs at 40 years and 5%/yr.	**$ 436,162.5**
		$ 641,386.8

Table D-8

SENECA ARMY DEPOT SEAD 25 & 26 FS
COST ESTIMATE SUMMARY
ALTERNATIVE 26-3, Air Sparging of Plume

WBS number	Description		Cost,$
32xxx	**Design and treatability study** (See 26-3 Capital Cost, Professional Labor)		52,573.71
331xx01	**Mobilization and preparatory work** (See 26-3 Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		55,241.84
331xx02	**Monitoring, sampling,testing,and analysis** (See 26-3 Capital Cost , Analyses ;Soil .., Analyses ; Water, Groundwater monitoring wells)		12,482.95
331xx03	**Site work** (See 26-3 Capital cost, Clear & Grub, Cleanup and Landscaping)		6783
331xx08	**Solids Collection and Containment** (See 26-3 Capital Cost, Excavation)		0
331xx11	**Air Sparging** (See 26-3 Capital Cost, Air sparging)		21,719.15
331xx19	**Disposal, Commercial** (See 26-3 Capital cost, Landfill Disposal)		0
331xx22	**General requirements** (See 26-3 Capital cost, Contractor Costs/ General conditions)		17,942.38
332xx	**Engineering During Construction** (See 26-3 , Capital Cost, Professional Labor)		29,800.00
333xx	**Construction management** (See 26-3 Capital Cost, Professional Labor)		50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**246,658.32**
	Location Multiplier, 0.85		209,659.57
	Escalation at 10 % of estimated construction cost		24,665.83
	Overhead and Profit, 13 % of estimated construction		32,065.58
	Contingency, 20 % of estimated construction cost		49,331.66
	TOTAL ESTIMATED CONSTRUCTION COST		**$ 315,722.65**
342XXX	**Operation and Maintenance (post construction)**		
	(See 26-3, Air sparging)	Annual cost	26,462.11
	(See 26-3 , Balance of O & M costs)	Annual cost	24,717.75
			51,179.86
	Present worth, Air Sparging cost at 10 years and 5 %/yr.		**$ 204,332.5**
	Present worth, balance of O & M cost at 10 years and 5%/yr.		**$ 190,863.1**
			$ 395,195.5
			$ 710,918.2

Table D-9

SENECA ARMY DEPOT SEAD 25 & 26 FS
COST ESTIMATE SUMMARY
ALTERNATIVE 26-4, Air Stripping of Plume

WBS number	Description		Cost,$
32xxx	**Design**		
	(See 26-4 Capital Cost, Professional Labor)		38,999.42
331xx01	**Mobilization and preparatory work**		
	(See 26-4 Capital Cost, Decontamination ..., Fencing, Overhead Electrical Distribution)		55,241.84
331xx02	**Monitoring, sampling,testing,and analysis**		
	(See 26-4 Capital Cost , Analyses ;Soil ..., Analyses ; W water, Groundwater monitoring wells)		13,236.04
331xx03	**Site work**		
	(See 26-4 Capital cost,Clear & Grub, Cleanup and Landscaping)		2,489.02
331xx06	**Groundwater Colllection and Control**		
	(See 26-4 Capaital cost, Discharge to POTW)		14,887.24
331xx08	**Solids Collection and Containment**		
	(See 26-4 Capital Cost, Excavation)		0
331xx11	**Air Stripping**		
	(See 26-4 Capital Cost, Air stripping)		57,141.42
331xx19	**Disposal, Commercial**		
	(See 26-4 Capital cost, Landfill Disposal)		0
331xx22	**General requirements**		
	(See 26-4 Capital cost,Contractor Costs/ General Conditions)		17,942.38
332xx	**Engineering During Construction**		
	(See 26-4 Capital Cost, Professional Labor)		29,800.00
333xx	**Construction management**		
	(See 26-4 Capital Cost, Professional Labor)		50,115.03
	SUBTOTAL ESTIMATED CONSTRUCTION COST		**279,852.39**
	Location Multiplier, 0.85		237,874.53
	Escalation at 10 % of estimated construction cost		27,985.24
	Overhead and Profit, 13 % of estimated construction		36,380.81
	Contingency, 20 % of estimated construction cost		55,970.48
	TOTAL ESTIMATED CONSTRUCTION COST		**$ 358,211.06**
342XXX	**Operation and Maintenance (post construction)**		
	(See 26-4, Air stripping)	Annual cost	10,359.99
	(See 26-4, Balance of O & M costs)	Annual cost	47,062.87
			57,422.86
	Present worth Air Sripping cost at 10 years and 5%/yr.		**$ 79,996.7**
	Present worth, balance of O & M cost at 10 years and 5%/yr.		**$ 363,405.4**
			$ 443,402.1
			$ 801,613.2

Appendix D

SoftBooks SEAD-26 Summary

Parsons Engineering Science, Inc.
30 Dan Road
Canton, MA
(781) 401-3200

RA26-2	
Analyses: Water and Liquids	$1,070.25
Monitoring	$12,685.96
Professional Labor	$11,662.51
Site Total	**$25,418.73**
RA26-2 Capital Costs	
Fencing	$12,648.20
Groundwater Monitoring Wells	$11,412.70
Professional Labor	$35,450.14
Site Total	**$59,511.04**
RA26-3	
Air Sparging	$26,462.11
Analyses: Water and Liquids	$2,140.51
Monitoring	$11,808.51
Professional Labor	$10,768.74
Site Total	**$51,179.86**

RA26-3 Capital Costs	
Air Sparging	$21,719.15
Analyses: Water and Liquids	$1,070.25
Cleanup and Landscaping	$6,622.74
Clear and Grub	$160.52
Contractor Costs / General Conditions	$17,942.38
Decontamination Facilities	$12,012.04
Fencing	$12,189.03
Groundwater Monitoring Wells	$11,412.70
Overhead Electrical Distribution	$31,040.77
Professional Labor	$132,488.74
Site Total	**$246,658.31**
RA26-4	
Air Stripping	$10,359.99
Analyses: Water and Liquids	$1,070.25
Discharge to POTW	$10,743.77
Monitoring	$11,993.12
Professional Labor	$23,255.71
Site Total	**$57,422.85**

RA26-4 Capital Costs

Air Stripping	$57,141.42
Analyses: Water and Liquids	$1,070.25
Cleanup and Landscaping	$2,328.50
Clear and Grub	$160.52
Contractor Costs / General Conditions	$17,942.38
Decontamination Facilities	$12,012.04
Discharge to POTW	$14,887.24
Fencing	$12,189.03
Groundwater Monitoring Wells	$12,165.79
Overhead Electrical Distribution	$31,040.77
Professional Labor	$118,914.45
Site Total	**$279,852.39**
Project Total	**$720,043.17**

Appendix D

SoftBooks SEAD-26 Full Detail

Parsons ES / DYonika / M. Duchesneau
10/9/97

Preliminary cost estimates for the following remediation alternatives: RA26-2 (site 2), Institutional Controls; RA26-3 (site3), Air Sparging Plume; RA26-4 (site4), Air Stripping Plume

Parsons Engineering Science, Inc.
30 Dan Road
Canton, MA
(781) 401-3200

RA26-2

SEAD 26 Fire Training and Demonstration Area. Annual costs for remedial Alternative RA26-2
Soil and Groundwater impacted from petroleum hydrocarbons, SVOC's and Pesticides.
Institutional Controls with monitoring of groundwater for natural attenuation

Analyses: Water and Liquids

Annual analysis of groundwater.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	4.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$1,070.25**	**$1,070.25**

Monitoring

Annual mobilization and collection of groundwater samples,

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**
Per Diem	8.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$768.00**	**$768.00**
Mobilize Crew, 100 Miles, per Person	8.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,902.67**	**$1,902.67**
Organic Vapor Analyzer Rental, per Day	5.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$594.59**	**$594.59**
DO Meter, Portable, Probe, 10' Cable, Quick Readings	1.00 EACH		*$0.0000*	*$0.0000*	*$976.8200*	
33020540		D	70.00%	100.00%		
			$0.00	**$0.00**	**$976.82**	**$976.82**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
40 ml, Clear Vial, Case of 72	1.00 EACH		*$0.0000*	*$0.0000*	*$104.7659*	
33022026		D	70.00%	100.00%		
			$0.00	**$0.00**	**$104.77**	**$104.77**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
Project Manager	44.00 HOUR		*$60.3600*	*$0.0000*	*$0.0000*	
33220101		D	70.00%	100.00%		
			$3,794.06	**$0.00**	**$0.00**	**$3,794.06**
Project Hydrogeologist	44.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220106		D	70.00%	100.00%		
			$3,270.46	**$0.00**	**$0.00**	**$3,270.46**
Health & Safety Officer	4.00 HOUR		*$31.2200*	*$0.0000*	*$0.0000*	
33220113		D	70.00%	100.00%		
			$178.40	**$0.00**	**$0.00**	**$178.40**
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	4.00 EACH		*$0.0000*	*$0.0000*	*$7.0399*	
33232407		D	70.00%	100.00%		
			$0.00	**$0.00**	**$28.16**	**$28.16**
Suspension Cable, Teflon Coated	15.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		D	70.00%	100.00%		
			$0.00	**$0.00**	**$15.34**	**$15.34**
	Monitoring Total		**$7,242.91**	**$0.00**	**$5,443.04**	**$12,685.96**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Professional Labor						
Professional labor to analyze data and coordinate with remediation activity.						
Senior Project Manager	8.00 HOUR		*$83.4300*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$953.49	**$0.00**	**$0.00**	**$953.49**
Senior Contract Administrator	20.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$1,486.57	**$0.00**	**$0.00**	**$1,486.57**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.57	**$0.00**	**$0.00**	**$8,324.57**
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Senior Word Processing/Clerical	16.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$672.00	**$0.00**	**$0.00**	**$672.00**
	Professional Labor Total		**$11,662.51**	**$0.00**	**$0.00**	**$11,662.51**
Site Total			**$18,905.43**	**$0.00**	**$6,513.30**	**$25,418.73**

RA26-2 Capital Costs

Fire Training and Demonstration Pad (SEAD-25) Capital Costs for Remedial Alternative RA26-2
Soil and Groundwater impacted with Petroleum Hydrocarbons, SVOCs & pesticides
Source Controls using Institutional Controls, Natural Attenuation for groundwater plume.

Fencing

Install fencing for remediation activity.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
6' Galvanized Chain-link Fence	800.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$957.03	**$8.80**	**$10,147.76**	**$11,113.59**
6' Swing Gate, 12' Double	2.00 EACH		*$60.2645*	*$25.3900*	*$311.4430*	
18040117		D	70.00%	100.00%		
			$172.18	**$50.78**	**$622.89**	**$845.85**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Hazardous Waste Signing	12.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$321.15	**$2.79**	**$364.82**	**$688.76**
	Fencing Total		**$1,450.36**	**$62.37**	**$11,135.46**	**$12,648.20**

Groundwater Monitoring Wells

Install four groundwater monitoring wells for this remediation project.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" Well, Portland Cement Grout	16.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$25.69**	**$25.69**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**
5' Guard Posts, Cast Iron, Concrete Fill	8.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$230.49	**$3.52**	**$234.06**	**$468.07**
Groundwater Monitoring Wells Total			**$3,392.27**	**$4,701.92**	**$3,318.50**	**$11,412.70**

Professional Labor

Professional labor for administration.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	90.00 HOUR		*$83.2300*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$10,701.00	**$0.00**	**$0.00**	**$10,701.00**
Senior Contract Administrator	40.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$2,973.14	**$0.00**	**$0.00**	**$2,973.14**
Senior Project Hydrogeologist	200.00 HOUR		*$62.4300*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$17,837.14	**$0.00**	**$0.00**	**$17,837.14**
Senior Health & Safety Officer	40.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$2,258.86	**$0.00**	**$0.00**	**$2,258.86**
Senior Word Processing/Clerical	40.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$1,680.00	**$0.00**	**$0.00**	**$1,680.00**
Professional Labor Total			**$35,450.14**	**$0.00**	**$0.00**	**$35,450.14**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Site Total			$40,292.78	$4,764.29	$14,453.97	$59,511.04

RA26-3

SEAD 26 Fire Training and Demonstration Area. Annual costs for remedial alternative RA26-3
Soil and Groundwater impacted from petroleum hydrocarbons, SVOC's and Pesticides
Air Sparging of plume.

Air Sparging

Annual operating costs for air sparging system.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Operational Labor Cost	20.00 DAY		*$626.8065*	*$24.3571*	*$0.0000*	
33132311		D	70.00%	100.00%		
			$17,908.76	**$487.14**	**$0.00**	**$18,395.90**
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
Miscellaneous Electrical Site Usage	12.00 MONTH		*$0.0000*	*$0.0000*	*$237.8340*	
33420106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,854.01**	**$2,854.01**
	Air Sparging Total		**$17,908.76**	**$487.14**	**$8,066.21**	**$26,462.11**

Analyses: Water and Liquids

Annual analysis of groundwater wells.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	8.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,140.51**	**$2,140.51**
	Analyses: Water and Liquids Total		**$0.00**	**$0.00**	**$2,140.51**	**$2,140.51**

Monitoring

Annual monitoring of groundwater wells, mobilization, collection of samples and laboratory reporting .

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Car or Van Mileage Charge	400.00 MILE		*$0.0000*	*$0.0000*	*$0.3568*	
33010104		D	70.00%	100.00%		
			$0.00	**$0.00**	**$142.72**	**$142.72**
Per Diem	8.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$768.00**	**$768.00**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilize Crew, 100 Miles, per Person	8.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,902.67**	**$1,902.67**
Organic Vapor Analyzer Rental, per Day	5.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$594.59**	**$594.59**
DO Meter, Portable, Probe, 10' Cable, Quick Readings	1.00 EACH		*$0.0000*	*$0.0000*	*$976.8200*	
33020540		D	70.00%	100.00%		
			$0.00	**$0.00**	**$976.82**	**$976.82**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
	1.00 EACH		*$0.0000*	*$0.0000*	*$30.0266*	
33022025		D	70.00%	100.00%		
			$0.00	**$0.00**	**$30.03**	**$30.03**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
QA/QC Officer	2.00 HOUR		*$20.2159*	*$0.0000*	*$0.0000*	
33220104		D	70.00%	100.00%		
			$57.76	**$0.00**	**$0.00**	**$57.76**
Project Engineer	44.00 HOUR		*$52.0100*	*$0.0000*	*$0.0000*	
33220105		D	70.00%	100.00%		
			$3,269.20	**$0.00**	**$0.00**	**$3,269.20**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Staff Hydrogeologist	44.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220108		D	70.00%	100.00%		
			$2,484.74	**$0.00**	**$0.00**	**$2,484.74**
Senior Word Processing/Clerical	16.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$672.00	**$0.00**	**$0.00**	**$672.00**
	Monitoring Total		**$6,483.70**	**$0.00**	**$5,324.80**	**$11,808.51**

Professional Labor

Professional labor to evaluate annual performance and coordinate with Vendors / Army /Agencies.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	8.00 HOUR		*$83.2700*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$951.66	**$0.00**	**$0.00**	**$951.66**
Senior Contract Administrator	8.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$594.63	**$0.00**	**$0.00**	**$594.63**
Senior Project Hydrogeologist	80.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$8,324.57	**$0.00**	**$0.00**	**$8,324.57**
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Senior Word Processing/Clerical	16.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$672.00	**$0.00**	**$0.00**	**$672.00**
	Professional Labor Total		**$10,768.74**	**$0.00**	**$0.00**	**$10,768.74**
Site Total			**$35,161.20**	**$487.14**	**$15,531.52**	**$51,179.86**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

RA26-3 Capital Costs

(Sead 26) Fire Training and Demonstration Area. Capital costs for remedial alternative RA26-3.
Soils and Groundwater impacted from petroleum hydrocarbons, SVOC's and pesticides.
Air Sparging of plume.

Air Sparging

Air sparging of plume. An additional well is installed for air injection..

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
Organic Vapor Analyzer Rental, per Day	60.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$7,135.07**	**$7,135.07**
Blower 170 SCFM, 10.3 HP, 10 PSI	1.00 EACH		*$881.0901*	*$17.5189*	*$3,460.4847*	
33139002		D	70.00%	100.00%		
			$1,258.70	**$17.52**	**$3,460.48**	**$4,736.70**
4" PVC, Schedule 40, Well Casing	30.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$84.55	**$125.63**	**$87.90**	**$298.09**
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
4" PVC, Well Plug	1.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$4.13	**$6.14**	**$28.31**	**$38.58**
Hollow-stem Auger, 8" Outside Diameter Borehole for 2" Well	60.00 LF		*$7.1739*	*$15.2287*	*$0.0000*	
33231101		D	70.00%	100.00%		
			$614.91	**$913.72**	**$0.00**	**$1,528.63**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	60.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$751.55	**$1,116.79**	**$0.00**	**$1,868.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	1.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$50.96**	**$50.96**
4" Screen, Filter Pack	16.00 LF		*$1.9728*	*$4.1878*	*$12.3067*	
33231402		D	70.00%	100.00%		
			$45.09	**$67.00**	**$196.91**	**$309.00**
Surface Pad, Concrete, 2' x 2' x 4"	1.00 EACH		*$0.7119*	*$0.0473*	*$3.1709*	
33231504		D	70.00%	100.00%		
			$1.02	**$0.05**	**$3.17**	**$4.24**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	1.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$70.46	**$104.70**	**$241.97**	**$417.12**
5' Guard Posts, Cast Iron, Concrete Fill	2.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$57.62	**$0.88**	**$58.51**	**$117.02**
2" PVC, Schedule 40, Connection Piping	100.00 LF		*$1.6827*	*$0.0346*	*$0.8946*	
33260406		D	70.00%	100.00%		
			$240.39	**$3.46**	**$89.46**	**$333.31**
2" PVC, Schedule 40, Tee	4.00 EACH		*$20.5473*	*$0.9467*	*$1.0766*	
33270102		D	70.00%	100.00%		
			$117.41	**$3.79**	**$4.31**	**$125.51**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" PVC, 90 Degree, Elbow	4.00 EACH		*$28.0795*	*$0.5776*	*$5.7318*	
33270114		D	70.00%	100.00%		
			$160.45	**$2.31**	**$22.93**	**$185.69**
2" Iron Body Check Valve	2.00 EACH		*$24.7106*	*$0.3678*	*$196.5104*	
33270402		D	70.00%	100.00%		
			$70.60	**$0.74**	**$393.02**	**$464.36**
Pressure Gauge	1.00 EACH		*$31.2708*	*$0.4644*	*$98.1353*	
33310209		D	70.00%	100.00%		
			$44.67	**$0.46**	**$98.14**	**$143.27**
	Air Sparging Total		**$4,543.68**	**$3,882.12**	**$13,293.35**	**$21,719.15**

Analyses: Water and Liquids

Analyze groundwater and surface water during remediation activity.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	4.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
	Analyses: Water and Liquids Total		**$0.00**	**$0.00**	**$1,070.25**	**$1,070.25**

Cleanup and Landscaping

landscaping and cleanup is required for this remediation activity.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
General Area Cleanup	3.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$432.43	**$286.10**	**$0.00**	**$718.53**
Load & Haul Debris, 5 Miles, Dumptruck	5.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$6.23	**$12.90**	**$0.00**	**$19.14**
Area Preparation, 67% Level & 33% Slope	3.00 ACRE		*$14.5041*	*$30.5622*	*$0.0000*	
18050101		D	70.00%	100.00%		
			$62.16	**$91.69**	**$0.00**	**$153.85**
Seeding, Vegetative Cover	3.00 ACRE		*$35.9559*	*$57.2455*	*$1,654.7301*	
18050402		D	70.00%	100.00%		
			$154.10	**$171.74**	**$4,964.19**	**$5,290.02**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Fertilize, 800 Lbs/Acre, Push Rotary	3.00 ACRE		*$15.0311*	*$30.0266*	*$31.0731*	
18050409		D	70.00%	100.00%		
			$64.42	**$90.08**	**$93.22**	**$247.72**
Watering with 3,000-Gallon Tank Truck, Per Pass	3.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$59.94	**$66.82**	**$7.13**	**$133.90**
Mowing	3.00 ACRE		*$11.2562*	*$3.7814*	*$0.0000*	
18050415		D	70.00%	100.00%		
			$48.24	**$11.34**	**$0.00**	**$59.59**
Cleanup and Landscaping Total			**$827.52**	**$730.67**	**$5,064.54**	**$6,622.74**

Clear and Grub

Clearing is required fro this activity.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Light Brush without Grub, Clearing	3.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$98.87	**$61.65**	**$0.00**	**$160.52**
Clear and Grub Total			**$98.87**	**$61.65**	**$0.00**	**$160.52**

Contractor Costs / General Conditions

Support during construction.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	90.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	90.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8,640.00**	**$8,640.00**
Disposable Boot Covers (Tyvek)	100.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$137.35**	**$137.35**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Disposable Gloves (Latex)	100.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$22.76**	**$22.76**
Disposable Coveralls (Tyvek)	100.00 EACH		*$0.0000*	*$0.0000*	*$3.5675*	
33010425		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Temporary Office 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$673.65**	**$673.65**
Temporary Storage Trailer 28' x 10'	3.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$366.63**	**$366.63**
Portable Toilets - Chemical	3.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	4.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,698.81	**$780.10**	**$0.00**	**$2,478.91**
Contractor Costs / General Conditions Total			**$2,208.46**	**$780.10**	**$14,953.83**	**$17,942.38**

Decontamination Facilities

Support during construction and remediation.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	3.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$9,999.02**	**$9,999.02**
8' x 36' Decontamination Trailer with 2 Showers, Fans	3.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
DOT Steel Drum, 55 Gallon	8.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$407.65**	**$407.65**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$12,012.04**	**$12,012.04**

Fencing

This activity requires a fenced off area during remediation activity.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
6' Galvanized Chain-link Fence	800.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$957.03	**$8.80**	**$10,147.76**	**$11,113.59**
6' Swing Gate, 12' Double	2.00 EACH		*$60.2645*	*$25.3900*	*$311.4430*	
18040117		D	70.00%	100.00%		
			$172.18	**$50.78**	**$622.89**	**$845.85**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$1,236.26**	**$60.51**	**$10,892.25**	**$12,189.03**

Groundwater Monitoring Wells

This activity requires installation of four new groundwater monitoring wells.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
4" Well, Portland Cement Grout	16.00 LF		*$0.0000*	*$0.0000*	*$1.6054*	
33231812		D	70.00%	100.00%		
			$0.00	**$0.00**	**$25.69**	**$25.69**
4" Well, Bentonite Seal	4.00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**
5' Guard Posts, Cast Iron, Concrete Fill	8.00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$230.49	**$3.52**	**$234.06**	**$468.07**
Groundwater Monitoring Wells Total			**$3,392.27**	**$4,701.92**	**$3,318.50**	**$11,412.70**

Overhead Electrical Distribution

Require installation of electric utilities for air sparging activity.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
477.0 ACSR Conductor	1,000.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$5,410.71	**$927.60**	**$1,427.00**	**$7,765.31**
40' Class 3 Treated Power Pole	12.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$4,053.10	**$694.81**	**$2,982.44**	**$7,730.35**
15 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$308.5710*	*$1.4689*	*$78.5062*	
20020546		D	70.00%	100.00%		
			$881.63	**$2.94**	**$157.01**	**$1,041.58**
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**
1" Rigid Steel Conduit	200.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$597.97	**$2.40**	**$225.96**	**$826.33**
Overhead Electrical Distribution Total			**$13,775.57**	**$1,677.44**	**$15,587.77**	**$31,040.77**

Professional Labor

Treatability tests will be required to confirm air sparging, specify and coordinate installation of equipment, evaluate vendors, coordinate site activities and provide progress reports.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem - senior field engineer	50.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,800.00**	**$4,800.00**
Treatability tests for air sparging	1.00 LS		*$5,000.0000*	*$3,000.0000*	*$4,000.0000*	
33220101		D	70.00%	100.00%		
			$7,142.86	**$3,000.00**	**$4,000.00**	**$14,142.86**
Senior Project Manager	90.00 HOUR		*$83.2800*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$10,707.43	**$0.00**	**$0.00**	**$10,707.43**
Senior Contract Administrator	40.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$2,973.14	**$0.00**	**$0.00**	**$2,973.14**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Hydrogeologist	200.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$20,811.43	**$0.00**	**$0.00**	**$20,811.43**
Senior Health & Safety Officer	40.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$2,258.86	**$0.00**	**$0.00**	**$2,258.86**
Senior Field Technician	400.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220159		D	70.00%	100.00%		
			$25,000.00	**$0.00**	**$0.00**	**$25,000.00**
Senior Word Processing/Clerical	40.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$1,680.00	**$0.00**	**$0.00**	**$1,680.00**
Field Engineer - Average Cost	13.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$22,084.59	**$0.00**	**$0.00**	**$22,084.59**
Site Project Manager - Average Cost	15.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$28,030.44	**$0.00**	**$0.00**	**$28,030.44**
	Professional Labor Total		**$120,688.74**	**$3,000.00**	**$8,800.00**	**$132,488.74**
Site Total			**$146,771.37**	**$14,894.40**	**$84,992.54**	**$246,658.31**

RA26-4

SEAD 26 Fire Training and Demonstration Area. Annual costs for remedial alternative RA26-4.
Soil and Groundwater impacted from petoloeum hydrocarbons, SVOC's and Pesticides.
Air stripping of plume.

Air Stripping

Annual operating costs for air stripping system.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Packing Reconditioning	2.00 EACH		*$749.3216*	*$1,113.5693*	*$0.0000*	
33130701		D	70.00%	100.00%		
			$2,140.92	**$2,227.14**	**$0.00**	**$4,368.06**
Blower and Motor Maintenance and Repair	2.00 EACH		*$216.1483*	*$81.0852*	*$0.0000*	
33410201		D	70.00%	100.00%		
			$617.57	**$162.17**	**$0.00**	**$779.74**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Electrical Charge	87,600.00 KWH		*$0.0000*	*$0.0000*	*$0.0595*	
33420101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$5,212.20**	**$5,212.20**
	Air Stripping Total		**$2,758.49**	**$2,389.31**	**$5,212.20**	**$10,359.99**

Analyses: Water and Liquids

Annual analysisi of groundwater at onsite wells.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Volatile Organic Analysis (EPA 624)	4.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
	Analyses: Water and Liquids Total		**$0.00**	**$0.00**	**$1,070.25**	**$1,070.25**

Discharge to POTW

Annual costs for upkeep and discharge to either POTW or storm drains.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
35 GPM, 1,050 Lb Fill, Disposable carbon	2.00 EACH		*$159.2317*	*$39.0669*	*$3,805.3440*	
33132011		D	70.00%	100.00%		
			$454.95	**$78.13**	**$7,610.69**	**$8,143.77**
Wastewater Disposal Fee	1,300.00 KGAL		*$0.0000*	*$0.0000*	*$2.0000*	
33197102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$2,600.00**	**$2,600.00**
	Discharge to POTW Total		**$454.95**	**$78.13**	**$10,210.69**	**$10,743.77**

Monitoring

Mobilization and travel to site , collect samples, lab reporting.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
Per Diem	8.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$768.00**	**$768.00**
Mobilize Crew, 100 Miles, per Person	4.00 EACH		*$0.0000*	*$0.0000*	*$237.8340*	
33010204		D	70.00%	100.00%		
			$0.00	**$0.00**	**$951.34**	**$951.34**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Organic Vapor Analyzer Rental, per Day	10.00 DAY		*$0.0000*	*$0.0000*	*$118.9178*	
33020303		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.18**	**$1,189.18**
Level "D" PPE Rental per 2-Man CPT Crew	3.00 DAY		*$0.0000*	*$0.0000*	*$285.4008*	
33020645		D	70.00%	100.00%		
			$0.00	**$0.00**	**$856.20**	**$856.20**
40 ml, 16 oz, High-density Polyethylene Bottle, Case of 24	1.00 EACH		*$0.0000*	*$0.0000*	*$76.8917*	
33022031		D	70.00%	100.00%		
			$0.00	**$0.00**	**$76.89**	**$76.89**
Custody Seals, Package of 10	1.00 EACH		*$0.0000*	*$0.0000*	*$1.3438*	
33022034		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1.34**	**$1.34**
Overnight Delivery, 6 - 10 Lb Package	8.00 LB		*$0.0000*	*$0.0000*	*$3.4843*	
33022040		D	70.00%	100.00%		
			$0.00	**$0.00**	**$27.87**	**$27.87**
48 Quart Ice Chest	1.00 EACH		*$0.0000*	*$0.0000*	*$24.5564*	
33022045		D	70.00%	100.00%		
			$0.00	**$0.00**	**$24.56**	**$24.56**
Project Engineer	44.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220105		D	70.00%	100.00%		
			$3,270.46	**$0.00**	**$0.00**	**$3,270.46**
Staff Hydrogeologist	44.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220108		D	70.00%	100.00%		
			$2,484.74	**$0.00**	**$0.00**	**$2,484.74**
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Senior Word Processing/Clerical	16.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$672.00	**$0.00**	**$0.00**	**$672.00**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Disposable Bailer, Polyethylene, 1.5" Outside Diameter x 36"	4.00 EACH		*$0.0000*	*$0.0000*	*$7.0399*	
33232407		D	70.00%	100.00%		
			$0.00	**$0.00**	**$28.16**	**$28.16**
Suspension Cable, Teflon Coated	15.00 FT		*$0.0000*	*$0.0000*	*$1.0227*	
33232422		D	70.00%	100.00%		
			$0.00	**$0.00**	**$15.34**	**$15.34**
	Monitoring Total		**$7,216.68**	**$837.56**	**$3,938.88**	**$11,993.12**

Professional Labor

Professional labor to evaluate annual performance report on progress.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Senior Project Manager	8.00 HOUR		*$83.2800*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$951.77	**$0.00**	**$0.00**	**$951.77**
Senior Contract Administrator	8.00 HOUR		*$52.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$594.63	**$0.00**	**$0.00**	**$594.63**
Senior Project Hydrogeologist	200.00 HOUR		*$72.8400*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$20,811.43	**$0.00**	**$0.00**	**$20,811.43**
Senior Health & Safety Officer	4.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$225.89	**$0.00**	**$0.00**	**$225.89**
Senior Word Processing/Clerical	16.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$672.00	**$0.00**	**$0.00**	**$672.00**
	Professional Labor Total		**$23,255.71**	**$0.00**	**$0.00**	**$23,255.71**
Site Total			**$33,685.83**	**$3,305.00**	**$20,432.02**	**$57,422.85**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

RA26-4 Capital Costs

(Sead 26) Fire Training and Demonstration Area. Capital costs for remedial alternative RA26-4.
Soils and Sediment impacted with Petroleum hydrocarbons, BTEX, SVOC's and pesticides
Natural Attenuation of groundwater Plume

Air Stripping

Air stripping of groundwater plume, carbon absorption not included.

Item	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" Structural Slab on Grade	100.00 SF		*$1.3888*	*$0.1677*	*$1.8464*	
18020320		D	70.00%	100.00%		
			$198.40	**$16.77**	**$184.64**	**$399.81**
6,000 Gallon Horizontal Plastic Sump with 6" NPT Connection and baffle	1.00 EACH		*$440.5450*	*$1,000.0000*	*$6,638.0204*	
19040625		D	70.00%	100.00%		
			$629.35	**$1,000.00**	**$6,638.02**	**$8,267.37**
2", 60 PSI, Polyethylene Pipe	200.00 LF		*$1.3398*	*$0.1942*	*$1.4627*	
19070122		D	70.00%	100.00%		
			$382.80	**$38.84**	**$292.54**	**$714.18**
4' Diameter Electric Automatic Pressure Filter Unit	1.00 EACH		*$1,606.9203*	*$550.2171*	*$6,729.3132*	
33130102		D	70.00%	100.00%		
			$2,295.60	**$550.22**	**$6,729.31**	**$9,575.13**
Iron removal system	1.00 EACH		*$1,606.9203*	*$550.2171*	*$10,341.8797*	
33130103		D	70.00%	100.00%		
			$2,295.60	**$550.22**	**$10,341.88**	**$13,187.70**
Install Air Stripper Tower, 1' - 3' Diameter, 13' - 20' High	1.00 EACH		*$2,620.6572*	*$303.5475*	*$0.0000*	
33130705		D	70.00%	100.00%		
			$3,743.80	**$303.55**	**$0.00**	**$4,047.34**
Internal Parts for Air Stripper, < 20' High	30.00 SF		*$0.0000*	*$0.0000*	*$59.4585*	
33130736		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,783.76**	**$1,783.76**
1" - 3.5" Packing for Air Stripper Tower	30.00 CF		*$0.0000*	*$0.0000*	*$8.9188*	
33130738		D	70.00%	100.00%		
			$0.00	**$0.00**	**$267.56**	**$267.56**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Electrical Controls for Air Stripper	1.00 EACH		*$1,050.7264*	*$65.3464*	*$5,279.9148*	
33130741		D	70.00%	100.00%		
			$1,501.04	**$65.35**	**$5,279.91**	**$6,846.30**
2.0' Diameter Tower, Skid Mount	1.00 EACH		*$0.0000*	*$0.0000*	*$1,260.5202*	
33130753		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,260.52**	**$1,260.52**
High Sump Level Switch for Avoiding Overflow	2.00 EACH		*$0.0000*	*$0.0000*	*$630.2601*	
33231306		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,260.52**	**$1,260.52**
2" Carbon Steel Piping	250.00 LF		*$2.3645*	*$0.0486*	*$2.5330*	
33260102		D	70.00%	100.00%		
			$844.46	**$12.15**	**$633.25**	**$1,489.86**
50' x 6" Brown Gum Rubber, Chemical-resistant, Flexible Hose	1.00 EACH		*$126.7925*	*$2.3329*	*$862.1483*	
33260702		D	70.00%	100.00%		
			$181.13	**$2.33**	**$862.15**	**$1,045.61**
2" Ball Valve, Carbon Steel Trim	4.00 EACH		*$24.9488*	*$0.4281*	*$53.8100*	
33270422		D	70.00%	100.00%		
			$142.56	**$1.71**	**$215.24**	**$359.52**
50 GPM, 100' Head, 3 HP, Centrifugal Pump	1.00 EACH		*$272.5247*	*$4.3182*	*$1,831.9634*	
33290103		D	70.00%	100.00%		
			$389.32	**$4.32**	**$1,831.96**	**$2,225.60**
75 GPM, 2" Discharge, Cast-iron Sump Pump	1.00 EACH		*$329.8982*	*$5.2274*	*$2,433.5246*	
33290402		D	70.00%	100.00%		
			$471.28	**$5.23**	**$2,433.52**	**$2,910.04**
250 CFM, 12" Pressure, 1 1/2 HP, Blower System	1.00 EACH		*$120.3084*	*$2.2119*	*$546.7804*	
33310104		D	70.00%	100.00%		
			$171.87	**$2.21**	**$546.78**	**$720.86**
Blower and Motor Maintenance and Repair	2.00 EACH		*$216.1483*	*$81.0852*	*$0.0000*	
33410201		D	70.00%	100.00%		
			$617.57	**$162.17**	**$0.00**	**$779.74**
	Air Stripping Total		**$13,864.79**	**$2,715.06**	**$40,561.57**	**$57,141.42**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Analyses: Water and Liquids						
analyze groundwater during remediation.						
Volatile Organic Analysis (EPA 624)	4.00 EACH		*$0.0000*	*$0.0000*	*$267.5633*	
33021618		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,070.25**	**$1,070.25**
Analyses: Water and Liquids Total			**$0.00**	**$0.00**	**$1,070.25**	**$1,070.25**
Cleanup and Landscaping						
Cleanup and landscaping is required after remediation activities are completed.						
General Area Cleanup	3.00 ACRE		*$100.9011*	*$95.3650*	*$0.0000*	
17040101		D	70.00%	100.00%		
			$432.43	**$286.10**	**$0.00**	**$718.53**
Load & Haul Debris, 5 Miles, Dumptruck	10.00 CY		*$0.8724*	*$2.5808*	*$0.0000*	
17040103		D	70.00%	100.00%		
			$12.46	**$25.81**	**$0.00**	**$38.27**
Area Preparation, 67% Level & 33% Slope	3.00 ACRE		*$14.5041*	*$30.5622*	*$0.0000*	
18050101		D	70.00%	100.00%		
			$62.16	**$91.69**	**$0.00**	**$153.85**
Seeding, 67% Level & 33% Slope, Hydroseeding	3.00 ACRE		*$39.9561*	*$65.6422*	*$285.4008*	
18050401		D	70.00%	100.00%		
			$171.24	**$196.93**	**$856.20**	**$1,224.37**
Watering with 3,000-Gallon Tank Truck, Per Pass	3.00 ACRE		*$13.9861*	*$22.2741*	*$2.3783*	
18050413		D	70.00%	100.00%		
			$59.94	**$66.82**	**$7.13**	**$133.90**
Mowing	3.00 ACRE		*$11.2562*	*$3.7814*	*$0.0000*	
18050415		D	70.00%	100.00%		
			$48.24	**$11.34**	**$0.00**	**$59.59**
Cleanup and Landscaping Total			**$786.48**	**$678.68**	**$863.34**	**$2,328.50**
Clear and Grub						
Clearing area is required for remediation activity .						
Light Brush without Grub, Clearing	3.00 ACRE		*$23.0699*	*$20.5489*	*$0.0000*	
17010101		D	70.00%	100.00%		
			$98.87	**$61.65**	**$0.00**	**$160.52**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
	Clear and Grub Total		$98.87	$61.65	$0.00	$160.52

Contractor Costs / General Conditions

support during construction.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Van or Pickup Rental	90.00 DAY		*$0.0000*	*$0.0000*	*$35.6751*	
33010102		D	70.00%	100.00%		
			$0.00	**$0.00**	**$3,210.76**	**$3,210.76**
Mobilize Crew, >= 500 Miles, per Person	1.00 EACH		*$0.0000*	*$0.0000*	*$1,189.1700*	
33010201		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,189.17**	**$1,189.17**
Per Diem	90.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$8,640.00**	**$8,640.00**
Disposable Boot Covers (Tyvek)	100.00 PAIR		*$0.0000*	*$0.0000*	*$1.3735*	
33010421		D	70.00%	100.00%		
			$0.00	**$0.00**	**$137.35**	**$137.35**
Disposable Gloves (Latex)	100.00 PAIR		*$0.0000*	*$0.0000*	*$0.2276*	
33010423		D	70.00%	100.00%		
			$0.00	**$0.00**	**$22.76**	**$22.76**
Disposable Coveralls (Tyvek)	100.00 EACH		*$0.0000*	*$0.0000*	*$3.5675*	
33010425		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**
Temporary Office 20' x 8'	3.00 MONTH		*$0.0000*	*$0.0000*	*$224.5510*	
99040101		D	70.00%	100.00%		
			$0.00	**$0.00**	**$673.65**	**$673.65**
Temporary Storage Trailer 28' x 10'	3.00 MONTH		*$0.0000*	*$0.0000*	*$122.2111*	
99040202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$366.63**	**$366.63**
Portable Toilets - Chemical	3.00 MONTH		*$0.0000*	*$0.0000*	*$118.9170*	
99040501		D	70.00%	100.00%		
			$0.00	**$0.00**	**$356.75**	**$356.75**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Construction Photographs	1.00 SET		*$356.7510*	*$0.0000*	*$0.0000*	
99041101		D	70.00%	100.00%		
			$509.64	**$0.00**	**$0.00**	**$509.64**
Surveying - 2-man Crew	4.00 DAY		*$297.2925*	*$195.0239*	*$0.0000*	
99041201		D	70.00%	100.00%		
			$1,698.81	**$780.10**	**$0.00**	**$2,478.91**
Contractor Costs / General Conditions Total			**$2,208.46**	**$780.10**	**$14,953.83**	**$17,942.38**

Decontamination Facilities

support during construction.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1,800 PSI Pressure Washer, 6 HP, 4.8 GPM	3.00 EACH		*$0.0000*	*$0.0000*	*$3,333.0057*	
33170814		D	70.00%	100.00%		
			$0.00	**$0.00**	**$9,999.02**	**$9,999.02**
8' x 36' Decontamination Trailer with 2 Showers, Fans	3.00 MONTH		*$0.0000*	*$0.0000*	*$535.1265*	
33170822		D	70.00%	100.00%		
			$0.00	**$0.00**	**$1,605.38**	**$1,605.38**
DOT Steel Drum, 55 Gallon	8.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33199921		D	70.00%	100.00%		
			$0.00	**$0.00**	**$407.65**	**$407.65**
Decontamination Facilities Total			**$0.00**	**$0.00**	**$12,012.04**	**$12,012.04**

Discharge to POTW

Discharge of air stripper to site sanitary treatment or storm drains.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Medium Brush with Average Grub & Some Trees, Clearing	0.25 ACRE		*$124.1493*	*$256.0403*	*$0.0000*	
17010103		D	70.00%	100.00%		
			$44.34	**$64.01**	**$0.00**	**$108.35**
Demolish Bituminous Pavement with Air Equipment	20.00 CY		*$14.7695*	*$5.1372*	*$0.0000*	
17020203		D	70.00%	100.00%		
			$421.99	**$102.74**	**$0.00**	**$524.73**
Trenching to 48" Deep, Including Backfill & Compaction	222.00 CY		*$2.1669*	*$1.0047*	*$0.0000*	
17030255		D	70.00%	100.00%		
			$687.22	**$223.04**	**$0.00**	**$910.26**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Soil, 5 Miles, Dump Truck, Load/Haul Spoil From Trench	222.00 CY		*$0.7849*	*$1.6768*	*$0.0000*	
17030282		D	70.00%	100.00%		
			$248.93	**$372.25**	**$0.00**	**$621.18**
Compact Soil with Vibrating Plate	222.00 CY		*$1.8449*	*$0.1234*	*$0.0000*	
17030511		D	70.00%	100.00%		
			$585.10	**$27.39**	**$0.00**	**$612.49**
4", Class 50, Bell & Spigot Sanitary Sewer, Cast-iron Pipe	1,000.00 LF		*$1.3319*	*$0.0238*	*$3.8173*	
19020101		D	70.00%	100.00%		
			$1,902.71	**$23.80**	**$3,817.30**	**$5,743.81**
Precast, CIP Base, 4' Diameter, 6' Deep, Manhole	1.00 EACH		*$172.7463*	*$51.5322*	*$331.3798*	
19020201		D	70.00%	100.00%		
			$246.78	**$51.53**	**$331.38**	**$629.69**
35 GPM, 660 Lb Fill, High-density Polyethylene-lined Steel, Permanent	1.00 EACH		*$159.2317*	*$39.0669*	*$5,470.1820*	
33132012		D	70.00%	100.00%		
			$227.47	**$39.07**	**$5,470.18**	**$5,736.72**
Discharge to POTW Total			**$4,364.53**	**$903.84**	**$9,618.86**	**$14,887.24**

Fencing

Temporary fencing of the remediation area is required.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
6' Galvanized Chain-link Fence	800.00 LF		*$0.8374*	*$0.0110*	*$12.6847*	
18040107		D	70.00%	100.00%		
			$957.03	**$8.80**	**$10,147.76**	**$11,113.59**
6' Swing Gate, 12' Double	2.00 EACH		*$60.2645*	*$25.3900*	*$311.4430*	
18040117		D	70.00%	100.00%		
			$172.18	**$50.78**	**$622.89**	**$845.85**
Hazardous Waste Signing	4.00 EACH		*$18.7336*	*$0.2328*	*$30.4015*	
18040501		D	70.00%	100.00%		
			$107.05	**$0.93**	**$121.61**	**$229.59**
Fencing Total			**$1,236.26**	**$60.51**	**$10,892.25**	**$12,189.03**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total

Groundwater Monitoring Wells

Four groundwater monitoring wells will be installed.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Mobilization/Demobilization Drilling Rig & Crew	1.00 LS		*$394.5190*	*$837.5562*	*$0.0000*	
33010101		D	70.00%	100.00%		
			$563.60	**$837.56**	**$0.00**	**$1,401.15**
4" PVC, Schedule 40, Well Casing	120.00 LF		*$1.9728*	*$4.1878*	*$2.9301*	
33230102		D	70.00%	100.00%		
			$338.19	**$502.54**	**$351.61**	**$1,192.34**
4" PVC, Schedule 40, Well Screen	30.00 LF		*$2.6436*	*$5.6118*	*$11.9332*	
33230202		D	70.00%	100.00%		
			$113.30	**$168.35**	**$358.00**	**$639.65**
4" PVC, Well Plug	4.00 EACH		*$2.8934*	*$6.1423*	*$28.3070*	
33230302		D	70.00%	100.00%		
			$16.53	**$24.57**	**$113.23**	**$154.33**
Hollow-stem Auger, 11" Outside Diameter Borehole for 4" Well	120.00 LF		*$8.7681*	*$18.6131*	*$0.0000*	
33231102		D	70.00%	100.00%		
			$1,503.10	**$2,233.57**	**$0.00**	**$3,736.67**
Split Spoon Sample, 2" x 24", During Drilling	30.00 EACH		*$0.0000*	*$0.0000*	*$29.7293*	
33231106		D	70.00%	100.00%		
			$0.00	**$0.00**	**$891.88**	**$891.88**
Standby for Drilling	4.00 EACH		*$49.3149*	*$104.6945*	*$0.0000*	
33231121		D	70.00%	100.00%		
			$281.80	**$418.78**	**$0.00**	**$700.58**
Furnish 55 Gallon Drum for Drill Cuttings & Development Water	4.00 EACH		*$0.0000*	*$0.0000*	*$50.9560*	
33231126		D	70.00%	100.00%		
			$0.00	**$0.00**	**$203.82**	**$203.82**
Surface Pad, Concrete, 2' x 2' x 4"	4.00 EACH		*$0.7119*	*$0.0473*	*$3.1709*	
33231504		D	70.00%	100.00%		
			$4.07	**$0.19**	**$12.68**	**$16.94**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
4" Well, Grout (Annular Seal)	16.00 LF		*$11.2451*	*$23.8712*	*$7.6795*	
33231802		D	70.00%	100.00%		
			$257.03	**$381.94**	**$122.87**	**$761.84**
4" Well, Bentonite Seal	4 00 EACH		*$11.0991*	*$23.5612*	*$43.0874*	
33232102		D	70.00%	100.00%		
			$63.42	**$94.24**	**$172.35**	**$330.02**
Protective Enclosure with Cover	4.00 EACH		*$49.3206*	*$104.6981*	*$241.9667*	
33232201		D	70.00%	100.00%		
			$281.83	**$418.79**	**$967.87**	**$1,668.49**
5' Guard Posts, Cast Iron, Concrete Fill	8 00 EACH		*$20.1681*	*$0.4397*	*$29.2574*	
33232301		D	70.00%	100.00%		
			$230.49	**$3.52**	**$234.06**	**$468.07**
Groundwater Monitoring Wells Total			**$3,653.37**	**$5,084.05**	**$3,428.37**	**$12,165.79**

Overhead Electrical Distribution

Electric utililities are required to operate the air stripping system.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Pole-mounted Transformer, 15 KV - 480/277 3 Phase	1.00 EACH		*$1,437.0323*	*$46.7608*	*$9,428.2279*	
20020101		D	70.00%	100.00%		
			$2,052.90	**$46.76**	**$9,428.23**	**$11,527.89**
477.0 ACSR Conductor	1,000.00 LF		*$3.7875*	*$0.9276*	*$1.4270*	
20020305		D	70.00%	100.00%		
			$5,410.71	**$927.60**	**$1,427.00**	**$7,765.31**
40' Class 3 Treated Power Pole	12.00 EACH		*$236.4308*	*$57.9008*	*$248.5365*	
20020403		D	70.00%	100.00%		
			$4,053.10	**$694.81**	**$2,982.44**	**$7,730.35**
15 KV, 1/0 to 4/0 Conductor, Terminations & Splicing	2.00 EACH		*$308.5710*	*$1.4689*	*$78.5062*	
20020546		D	70.00%	100.00%		
			$881.63	**$2.94**	**$157.01**	**$1,041.58**
150W High Pressure Sodium Fixture	5.00 EACH		*$109.0945*	*$0.5856*	*$273.4257*	
20030601		D	70.00%	100.00%		
			$779.25	**$2.93**	**$1,367.13**	**$2,149.30**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
1" Rigid Steel Conduit	200.00 LF		*$2.0929*	*$0.0120*	*$1.1298*	
20039901		D	70.00%	100.00%		
			$597.97	**$2.40**	**$225.96**	**$826.33**
Overhead Electrical Distribution Total			**$13,775.57**	**$1,677.44**	**$15,587.77**	**$31,040.77**

Professional Labor

Professional labor is required to evaluate vendors, specify equipment and performance criteria, coordinate with vendors, agencies, and army, and provide progress reports.

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Per Diem - senior field engineer	50.00 DAY		*$0.0000*	*$0.0000*	*$96.0000*	
33010202		D	70.00%	100.00%		
			$0.00	**$0.00**	**$4,800.00**	**$4,800.00**
Senior Field Technician	400.00 HOUR		*$43.7500*	*$0.0000*	*$0.0000*	
33220117		D	70.00%	100.00%		
			$25,000.00	**$0.00**	**$0.00**	**$25,000.00**
Senior Project Manager	90.00 HOUR		*$83.2800*	*$0.0000*	*$0.0000*	
33220123		D	70.00%	100.00%		
			$10,707.43	**$0.00**	**$0.00**	**$10,707.43**
Senior Contract Administrator	40.00 HOUR		*$53.0300*	*$0.0000*	*$0.0000*	
33220125		D	70.00%	100.00%		
			$3,030.29	**$0.00**	**$0.00**	**$3,030.29**
Senior Project Hydrogeologist	200.00 HOUR		*$74.6300*	*$0.0000*	*$0.0000*	
33220133		D	70.00%	100.00%		
			$21,322.86	**$0.00**	**$0.00**	**$21,322.86**
Senior Health & Safety Officer	40.00 HOUR		*$39.5300*	*$0.0000*	*$0.0000*	
33220150		D	70.00%	100.00%		
			$2,258.86	**$0.00**	**$0.00**	**$2,258.86**
Senior Word Processing/Clerical	40.00 HOUR		*$29.4000*	*$0.0000*	*$0.0000*	
33220163		D	70.00%	100.00%		
			$1,680.00	**$0.00**	**$0.00**	**$1,680.00**
Field Engineer - Average Cost	13.00 MWK		*$1,189.1700*	*$0.0000*	*$0.0000*	
99010402		D	70.00%	100.00%		
			$22,084.59	**$0.00**	**$0.00**	**$22,084.59**

	Quantity/Unit	Safety Level	Labor	Equipment	Materials	Total
Site Project Manager - Average Cost	15.00 MWK		*$1,308.0870*	*$0.0000*	*$0.0000*	
99110102		D	70.00%	100.00%		
			$28,030.44	**$0.00**	**$0.00**	**$28,030.44**
	Professional Labor Total		**$114,114.45**	**$0.00**	**$4,800.00**	**$118,914.45**
Site Total			$154,102.78	$11,961.32	$113,788.29	$279,852.39
Project Total			$428,919.38	$35,412.16	$255,711.63	$720,043.17

The three data items in the labor and equipment columns are: unit cost, productivity, and total cost. The two data items in the materials column are: unit cost and total cost.

APPENDIX E CONTAMINANT FATE AND TRANSPORT

This section presents site-specific conceptual site models, discusses the impacts present in various media at each site, and explains the means and extent of potential transport of constituents of concern from each site. The section is organized into four separate subsections, the first two address site physical and chemical characteristics at SEAD-25 and SEAD-26, the third section deals with contaminant fate, and the fourth section with contaminant transport.

E.1 CONCEPTUAL SITE MODEL OF SEAD-25

The conceptual site model for SEAD-25 combines both site conditions and expected pollutant behavior into a cohesive model of the site. Taken together, the information collected during the groundwater, surface water, sediment, surface soil, and subsurface soil sampling, as well as survey data and field observations describe the physical characteristics of the site and chemical characteristics of the source areas at SEAD-25. These characteristics become the framework for partitioning and cursory transport models that predict the behavior of constituents of concern at SEAD-25. The conceptual site model is the information described in the following subsections that defines the physical and chemical setting for later modeling discussions.

E.1.1 Physical Site Characterization

The Fire Training and Demonstration Pad (SEAD-25) is located in the east-central portion of SEDA. It encompasses approximately 6-acres and is composed mostly of undeveloped land with a centrally-located crushed shale pad. The site is bounded on the north by grass that is part of a former baseball field, on the east by Administration Drive beyond which is a large stand of deciduous trees, on the south by Ordnance Drive beyond which is a stand of coniferous trees, and on the west by tall grass and low brush (Figure 1-3 of RI). Utilities on the site include a buried water main, a buried electrical line and overhead utilities for phone and electricity.

SEAD-25 is located on a relatively flat terrain in the eastern portion of SEDA. The slightly elevated pad on the site, which is roughly defined by a portion of the 742 foot contour, is superimposed on a generally west-southwest-sloping regional land surface west of Administration Drive. However, east of Administration Drive the land surface slopes gently to the east to a small north-south trending intermittent drainage area, which is beneath a canopy of deciduous trees. Elevations on the site range from greater than 742 feet above mean sea level (MSL) on the pad to 734 feet (MSL) beyond the stand of coniferous trees south and southwest of the site.

The predominant surficial geologic deposits at the site are glacial till, with a significantly small proportion (i.e., the fire training and demonstration pad) of crushed shale fill. The till is dense and clay-rich, and has a variable distribution of sand and gravel. The average thickness of the till on-site is 4.7 feet, and the maximum thickness does not exceed 10 feet.

Black fissile shale with small interbedded limestone layers comprises the bedrock on-site. Regionally, the shale has been relatively unaffected by tectonic events as evidenced by the shallow dip of bedding of approximately 35 feet per mile towards the south (Mozola, 1951). Generally, the upper 2 to 4 feet of shale is highly weathered as a result of glaciation and normal erosion. At SEAD-25 and other sites on the Depot where bedrock was cored, the RQD's for core samples taken from the upper 5 to 8 feet of shale were generally less than 5%. However, data from these sites shows that RQDs generally tend to increase with depth indicating that the shale is more competent and has fewer fractures at depth. The tectonically undisturbed nature of the shales in this area reduces the potential for vertical migration of groundwater in the till/weathered shale aquifer into deeper portions of the competent shale aquifer.

Precipitation data from the nearest monitoring station (the Aurora Research Farm) was assessed to gain a perspective on the seasonal variations in precipitation that would directly impact surface water flow. This data indicates that, historically, June has the greatest amount of precipitation (3.9 inches), and the winter months (January and February) generally have the least amount of precipitation (Figure 1-14 of R-1). Annual precipitation is approximately 30 inches. Surface water flow in drainage ditches on-site feeds into Kendaia Creek, which eventually empties into Seneca Lake approximately 4 miles west of the site. Overall site relief is low, and generally the land surface gradient at SEAD-25 is between 1 and 3 percent.

In the immediate vicinity of the pad, surface water runoff via overland flow is likely to be collected in drainage ditches along Administration Avenue and Ordnance Drive, both of which eventually drain west (Figure 3-1of R-1). Most of the overland flow in the areas northwest of the pad is likely to collect in a well-defined drainage ditch that drains to the southwest into what eventually becomes Kendaia Creek. South of the site, surface water is likely to collect in roadside drainage ditches that parallel Ordnance Drive and Administration Avenue. East of Administration Avenue, surface water collects in a north-south-trending drainage ditch that discharges to the south. These drainage ditches are several of the many ditches that comprise the upper drainage area of Kendaia Creek. No wetland areas were identified on the site.

Glacial till, including the weathered shale immediately below the till, and the underlying competent shales and limestone are the two distinct geologic units at SEAD-25 that store and transmit groundwater. The glacial till and the weathered shale behave as a single unconfined hydrological unit. Groundwater flow within the shallow, unconfined till/weathered shale aquifer is radial on a local scale beneath the pad, however, within this radial flow regime, hydraulic gradients are significantly steeper to the west and south when compared to other directions. Regionally, the groundwater flow direction in the shallow aquifer is believed to be to the west towards Seneca Lake. Seasonal variations in the water table may be responsible for changes in the hydraulic gradients at the site. For example, low water table conditions (i.e, summer/fall) may result in a more strongly developed radial flow regime beneath pad, whereas higher water table conditions (i.e., winter and spring) may dampen the affect of the mounding beneath the pad resulting in a more strongly developed westward hydraulic gradient, which is more indicative of the regional flow regime. Measured hydraulic conductivity's of the shallow aquifer fall within a broad range, which is indicative of the poorly sorted nature of these deposits. The groundwater flow direction in the bedrock aquifer is to the south-southwest on-site. The groundwater at SEAD-25 has been classified by NYSDEC as GA. The best usage of class GA waters is as a source of potable water. Class GA waters are fresh groundwater found in the saturated zone of unconsolidated deposits and consolidated rock or bedrock.

The fate and transport of the constituents of concern is influenced by the interaction with precipitation, the recharge to groundwater and the migration with groundwater. Moisture content in the vadose zone of soil can also influence the rate of biological decomposition and the rate of volatilization. Accordingly, understanding the water balance of the site is helpful in evaluating the contaminant fate and transport at SEAD-2E A water balance was developed for this site using the rational method described in Use of the Water Balance Method for Predicting Leachate Generation from Solid Waste Disposal Sites (EPA, 1975). This procedure calculates the percolation of pore water to groundwater as recharge. Recharge is the difference between the amount of water that infiltrates into the ground minus the actual evapotranspiration and any changes in soil moisture. Infiltration is the difference between precipitation and runoff. The results of these calculations are summarized in Table E-1.

The potential evapotranspiration (PET), was estimated using the procedure described by C.W. Thornthwaite and J.R. Mather in Publications In Climatology, Volume X, Number 3; Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance, (1957). Evapotranspiration is an estimate of the amount of water which is released from the site through both evaporation and plant uptake (transpiration). The methodology begins by determining the Heat Index, which is obtained from either Table 1 or 2 of the Thornthwaite and Mather document.

Table E-1

Monthly Water Balance

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

Note	Parameter (units)	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1	Mean Temperature (°F)	22.5	23.4	32.0	44.8	54.5	64.6	69.1	66.9	60.6	50.4	39.4	27.9	46.3
2	Heat Index	0	0	0	1.7	4.0	7.0	8.5	7.8	5.8	2.9	0.7	0.0	38.4
3	Unadjusted PET (in)	0.000	0.000	0.000	0.039	0.079	0.118	0.134	0.126	0.102	0.063	0.024	0.000	
4	Correction Factor	24.6	24.6	30.9	33.6	37.8	38.1	38.4	35.7	31.2	28.5	24.6	23.7	
5	Adjusted PET (in)	0.0	0.0	0.0	1.3	3.0	4.5	5.1	4.5	3.2	1.8	0.6	0.0	24.0
6	P (in)	1.88	2.16	2.45	2.86	3.17	3.70	3.46	3.18	2.95	2.80	3.15	2.57	34.3
7	Corrected P (in)	0	0	7.1	4.8	3.2	3.7	3.5	3.2	3.0	2.8	3.2	0	34.3
8	C R/O	0.22	0.22	0.22	0.22	0.20	0.18	0.18	0.18	0.18	0.18	0.20	0.22	
9	R/O (in)	0.0	0.0	1.6	1.1	0.6	0.7	0.6	0.6	0.5	0.5	0.6	0.0	6.8
10	I (in)	0.0	0.0	5.5	3.8	2.5	3.0	2.8	2.6	2.4	2.3	2.5	0.0	27.5
11	I-PET(in)	0.0	0.0	5.5	2.5	-0.4	-1.5	-2.3	-1.9	-0.8	0.5	1.9	0.0	3.5
12	negative (I-PET)					-0.4	-1.9	-4.2	-6.1	-6.9				
13	ST (in)	3.1	3.1	3.9	3.9	3.5	2.4	1.3	0.8	0.7	1.2	3.1	3.1	
14	delta ST (in)	0.0	0.0	0.8	0.0	-0.4	-1.1	-1.1	-0.5	-0.1	0.5	1.9	0.0	
15	AET (in)	0.0	0.0	0.0	1.3	3.0	4.1	3.9	3.1	2.5	1.8	0.6	0.0	20.4
16	PERC (in)	0.0	0.0	4.7	2.5	0.0	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	7.1

References:

1. Thornthwaite and Mather, 1957. Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance.
2. EPA, 1975. Use of the Water Balance Method for Predicting Leachate Generation from Solid Waste Disposal Sites.
3. Climate of New York Climatography of the United States No.60 National Ocean and Atmospheric Administration, June 1982. Data for Cornell University, Ithaca, NY.

Notes:

1. Mean temperature (from Reference 3)
2. Heat index values (from Tables 1 and 2 of Thornthwaite and Mather, 1957)
3. PET = Potential Evapotranspiration (from Tables 3 and 4 of Thornthwaite and Mather, 1957)
4. Correction factors (from Table 6 of Thornthwaite and Mather, 1957)
5. Adj. PET = Unadj. PET times Correction Factor
6. P = Precipitation (from Reference 3)
7. Corr. P = Corrected precipitation (rain + melting snow)
8. C R/O = Surface Runoff Coefficient (from EPA, 1975)
9. R/O = Surface Runoff
10. I = Infiltration
11. I-PET = Infiltration minus Potential Evapotranspiration
12. neg (I-PET) = Accumulated Potential Water Loss
13. ST = Soil Moisture Storage (Maximum value of 3.9" obtained from Table 10 of Thornthwaite and Mather, 1957, Other values obtained from Table 9 of EPA, 1975)
14. delta ST = Change in Storage
15. AET = Actual evapotranspiration
16. PERC = Percolation

Mean monthly temperature data was obtained from the nearby meteorological station, the Aurora Research Farm, which is operated by Cornell University.

The data is shown on Line 1 on Table E-1. The monthly Heat Indexes are shown on Line 2 of Table E-1. Heat Indexes are zero when the mean monthly temperature is less than 32^{O}F. From the sum of the monthly Heat Indexes, the unadjusted potential evapotranspiration is obtained from either Table 3 or 4 of the Thornthwaithe and Mather document. The unadjusted potential evapotranspiration values are presented on Line 3 of Table E-1. To change the unadjusted values of potential evapotranspiration into the adjusted monthly potential evapotranspiration, multiply the unadjusted values by a correction factor. The correction factor is expressed in terms of a 12-hour day, which provides an indication of the duration of sunlight for a particular month. Correction factors for the unadjusted potential evapotranspiration are obtained from Table 6 of the same document and depend upon the latitude of the site. This value is presented on Line 4 of Table E-1. The adjusted Potential Evapotranspiration (PET) is then calculated as the product of Lines 3 and 4 of Table E-1.

Although site specific precipitation data was not available, monthly precipitation values from the Aurora Research Farm were used. A comprehensive discussion of the weather data is presented in Table 3-1 of the RI and discussed in Section 3 of the RI.

When the mean monthly temperatures are below 32^{O} F the monthly precipitation values were then corrected to account for precipitation as snowfall in the months of December through March. It was assumed that all of the snowfall remained on the ground as snow, with no evaporation, infiltration, or runoff until March when the snow began to melt. It was also assumed that 60% of the snow (the total precipitation for December, January, and February) melted in March, and therefore entered the water balance as precipitation in addition to the normal monthly precipitation for March. The remaining 40% of the accumulated snowfall was assumed to melt in April.

The total monthly precipitation was then adjusted to account for the percent of water which runs off as overland flow. Line 8, in Table E-1, contains the Runoff Coefficient, C_{RO}. This coefficient is a measure of the amount of precipitation that will runoff from any given area, and will depend on the soils, vegetation, and slopes found at a site. Generally, C_{RO} values range from 0.05 to 0.35 (EPA, 1975). At SEAD-25, the surface soils are primarily silty clay loams, as described in Section 1 of the RI. Much of the area is covered with various grasses, though some of the road areas have no vegetative cover. The site slopes generally range from 1 to 3%. For these conditions, the C_{RO} values range from 0.13 (less than 2% slope) to 0.22 (2-7% slopes). Following EPA guidance (1975), a higher C_{RO} (0.22) was used for the cooler months, and a lower value (0.18) was used for the warmer months. For the transitional months, (May and November), a value of 0.20 was used. Infiltration (I), Line 10, is calculated as the difference between the monthly corrected precipitation values, Line 7, and the calculated runoff values, Line 9. Infiltration (Line 10) minus the adjusted potential evapotranspiration values, Line 5, yields I-PET, Line 11. This value was used to assess periods of time when the soil moisture is decreasing. A positive value of I-PET indicates the amount which is available to increase soil moisture or percolate to groundwater. Negative values indicates that potential evapotranspiration exceeds infiltration and there is a net decrease in the soil moisture.

Soil moisture (ST) is a measurement of the available field moisture and is related to soil type. The available moisture is obtained as the difference between the field capacity, i.e. the point at which water will drain by gravity, and the wilting point, i.e. the point at which water is unavailable for plant uptake. For this site, the available soil maps, shown in Section 1 of this report, indicate the soil type to be a silty loam. From Table 10 of the Thornthwaite and Mather (1957) document. The field capacity for a silty loam is approximately 3.6 inches per foot of root zone. The wilting point for a silty loam is approximately 1.2 inches per foot of root zone. The available soil moisture (ST) is the difference of 3.6 and 1.2 inches per foot or 2.4 inches per foot of root zone. The Soil Survey of Seneca County, New York, (April 1972) indicates that the root zone for this area generally ranges from 18 to 24 inches. This analysis used 1.62 feet (19.4 inches) as the root zone, therefore, the ST value used in these calculations was 3.9 inches as shown on Line 13, which was the product of 2.4 inches per foot of root zone and 1.62 feet of root zone. This initial value is assigned to the last month having a positive value of I-PET, which is the month of April. In other words, the last month that the field capacity of the soil was achieved and drainage occurred was April and the value of 3.9 was set for this month. The water balance then proceeded to calculate the ST for the remaining months.

The Actual Evapotranspiration (AET), Line 15, is a calculated value only when the change in soil moisture is negative. The change is soil moisture is presented on Line 14. If the Heat Index, Line 2 is zero then the AET is also zero. In other words when the temperature is below freezing there is no AET. If the ST, Line 13, is equal to the field capacity, which is the maximum value ST can be, then the AET equals the Adjusted PET, Line 5. In other words, the AET is greatest when the soil moisture is maximum. When the change is soil moisture is negative, i.e. the soil moisture is decreasing, the AET is calculated as:

$$AET = PET + \left(I - PET - \Delta ST\right)$$

where: AET = Actual Evapotranspiration, Line 15;
PET = Adjusted Potential Evapotranspiration, Line 5;
$I\text{-}PET$ = Infiltration minus Adjusted Potential Evapotranspiration, Line 11; and
ΔST = Change in Soil Moisture, Line 14.

Percolation (PERC), Line 16, which is recharge to the groundwater, is calculated as the remainder when the change in soil moisture, Line 14, and the AET, Line 15, is subtracted from I, Line 10.
The results of the water balance analysis indicates that much of the runoff and almost all of the percolation (groundwater recharge) occur in March and April, during the snow melt period. There is continued runoff throughout the time period when the temperature stays above freezing, however, recharge is eliminated by the large amount of water that is released to the atmosphere through evapotranspiration. These estimates are consistent with observations made at the site regarding runoff and groundwater. During field operations, runoff was observed following any major rainfall event. This observation is consistent with expectations since the dense clay rich till soils prevent rapid infiltration. At several sites at SEDA, groundwater water levels measured in the spring have historically been the highest, with the levels dropping substantially throughout the summer months. During the course of the year, water level changes of 3 to 4 feet (and as great as 8 feet) have been observed at theses sites. During the late summer and early fall at SEDA, the groundwater table is the lowest, in some instances the water level appears close to the top of the competent bedrock. Water levels measured in the winter have also been lower than those in the spring, indicating little or no sustained recharge to the shallow aquifer occurs in the summer and fall.

Using the values developed from the water balance for annual runoff, 6.8 inches, and the surface area of SEAD-25, which is approximately 5.7 acres, the total amount of potential runoff is 3.2 acre-feet (or 1.1 million gallons) per year. Much of this flow is captured and diverted away from the site by the surface drainage swales which line the edges of the roads surrounding the site. Based upon these results, the potential for infiltration and vadose zone contaminant transport are considered moderate. Additionally, the model suggests that the volume of runoff may represent a significant transport pathway for constituents of concern in surface soils to surface water and sediments. Consequently, the BTEX and VOC compounds detected in the subsurface soils at SEAD-25 would not be expected to migrate via this pathway.

E.1.2 Chemical Characterization

On the basis of the analytical results obtained for the five media at SEAD-25: sediment (Table 4-14 of RI), surface water (Table 4-12 of RI), groundwater (Table 4-10 of RI), surface soils (Table 4-5 of RI), and subsurface soils (Table 4-7 of RI) at SEAD-25, the most significant impacts to the site are from VOCs. Less significant impacts are from SVOCs, metals, pesticides and PCBs.

In the soil at SEAD-25, volatile organics, specifically BTEX compounds, were found to be pervasive in the subsurface soil on and immediately southwest of the Fire Training and Demonstration Pad; several of the BTEX compound also exceeded their respective TAGM values. Chlorinated compounds, although less significant than BTEX in terms of total concentrations, were also present in the subsurface soils beneath the pad, and TAGM values for several chlorinated compounds were exceeded in some of the samples. The southwestern portion of pad is believed to be the source for the BTEX and chlorinated compounds. SVOCs, predominately polyaromatic hydrocarbons (PAHs), were also found in the surface and subsurface soils on-site. Impacts from metals, pesticides and PCBs, and herbicides in soil are less significant than the impacts from VOCs.

In the shallow groundwater aquifer, BTEX and chlorinated compounds form overlapping plumes. BTEX compounds form a plume that is approximately 200 feet long and originates in the southwestern portion of the Fire Training and Demonstration Pad. Based on the concentrations of BTEX compounds in the array of wells at the site, the plume is not believed to extend beyond Ordnance Drive near the southern perimeter of the site. Several of the BTEX compounds exceeded NYS GA groundwater standards. Chlorinated compounds form a plume that is approximately 130 feet long, but the total concentrations are significantly less than those detected for the BTEX plume. However, several of the chlorinated compounds did exceed their respective GA standards. Like the BTEX plume, the source of the chlorinated plume is the southwestern portion of the pad. No BTEX compounds were detected in any of the bedrock wells. Impacts from SVOCs and metals were less significant; no pesticides, PCBs, or herbicides were detected in the groundwater at SEAD-25.

Generally, surface water impacts were not widespread and many of the chemical constituents analyzed for were non-detect in the surface water samples. SVOCs were found in a few surface water samples, but none were above their respective NYS Class C standards. Also, several metals were found at concentrations that exceeded their standards. No VOCs, pesticides, or PCBs were detected in the surface water samples.

Sediment impacts, like those for surface water, were most significant in the drainage ditch located northwest of the Fire Training and Demonstration Pad. In this ditch, SVOCs and pesticides were pervasive. Sediment criteria exceedences for SVOCs, predominantly PAHs, were almost exclusively found in the drainage ditch; elevated TIC concentrations were also found in the ditch. Several pesticide compounds exceeded their respective NYS sediment criteria and by far the most significant exceedences were, again, in the sediment samples collected from the drainage ditch.

An important point is that the impacts in the drainage ditch are not believed to be caused by past or present activities at SEAD-25. Instead, an alternative source (or sources) for the SVOCs and pesticides in the drainage ditch is likely. Several factors support this. First, the concentrations detected on site are not high enough that they would be possible sources for the impacts detected in the ditch. Second, the surface water drainage patterns at SEAD-25 do not provide for direct impacts to this ditch. Third, a 36-inch diameter culvert is located in a headwall (i.e., at the northeast end of the ditch) where a storm sewer transitions to the open drainage ditch, and it empties surface water into this ditch from upgradient locations near SEDA office and maintenance areas adjacent Administration Drive and 1st, 2nd and 3rd

Avenues. For these reasons, SEAD-25 is not believed to be the source for the elevated SVOCs and pesticides found in the drainage ditch.

E.2 CONCEPTUAL SITE MODEL OF SEAD-26

The conceptual site model for SEAD-26 combines both site conditions and expected pollutant behavior into a cohesive understanding of the site. Taken together, information collected during the groundwater, surface water, sediment, surface soil, and subsurface soil sampling, as well as survey data and field observations, describe the physical characteristics of the site and chemical characteristics of the source areas at SEAD-26. Quantified, these characteristics become the framework for partitioning and cursory transport models that predict the behavior of constituents of concern at SEAD-26. The conceptual site model is the information described in the following subsections that defines the physical and chemical setting for later modeling discussions.

E.2.1 Physical Site Characterization

The Fire Training Pit (SEAD-26) is located in the southeastern portion of SEDA. It is characterized by an elevated, 1,400-foot long, rectangular, grass-covered pad that contains a fire training tower, a storage trailer, a circular burning pit, and a former drum storage area (Figure 1-4 of RI). The fire training tower, storage trailer, and several burned automobiles are located in the north and north-central portion of the site. The centrally-located circular burning pit has a diameter of approximately 75 feet and is surrounded by an approximately 3-foot-high soil berm. The bermed perimeter of the pond is characterized by blackened soil and is void of vegetation. Approximately 50 feet south of the pond are two large, empty cylindrical steel tanks. Farther south is the burned- out fuselage of a helicopter. A former drum storage area is located in the central portion of the far southern end of the site. Additionally, concrete rubble and other debris is located in the southern portion of the site. An oval unpaved road parallels the fenced boundaries within the SEAD-26. The only utility on the site is a fire hydrant which is fed by a buried water line in the northeastern portion of the site.

The site is bound on the west by numerous sets of SEDA railroad tracks beyond which is open grassland, on the south by grassland and low brush, on the north by 7th Street beyond which are numerous warehouse buildings, and on the east by a paved and unpaved storage areas.

The fire pit (i.e., the pond) is located on an elevated rectangular terrain with steep sides on the east, south and west; the northern side is less steep and provides an adequate grade for the unpaved access road. On the site, the pit is defined by a 2 to 3 foot high circular soil berm (Figure 1-4 of RI). Elevations on the site generally range from 750 feet mean sea level (MSL) to 760 feet MSL. Based on the topography surrounding the elevated site, the regional land surface slopes to the west.

The site geology is characterized by gray Devonian shale with a thin weathered zone where it contacts the overlying mantle of Pleistocene till. This stratigraphy is consistent over the entire site and in the site vicinity. However, the entire elevated rectangular pad that constitutes SEAD-26 is composed of fill material. Thus, fill is by far is the most common unit on the site.

The burning pit and surrounding area is composed mostly of fill that is from 6.0 to 14.0 feet thick. On the basis of excavations performed at SEAD-26, the fill contains non-metallic construction debris and boulders as well as metallic debris (e.g., pipes, bucket, steel fragments).

Till is present below the fill that comprises the majority of SEAD-26. The till is distributed across the entire site and surrounding area and ranges in thickness from 1.3 feet to 2.5 feet, although the average thickness of the till on-site is 2.0 feet. The till is generally characterized by brown to olive gray silt and clay, trace of fine sand with few fine to coarse gravel-sized inclusions of weathered shale. Generally, larger diameter weathered shale clasts are more prevalent in basal portions of the till and are probably ripped-up clasts removed by the once-active glacier.

Black fissile shale comprises the bedrock on the site and it was encountered between 6 and 18 feet below the ground surface. The bedrock topography slopes to the west at a gradient of 0.02 ft/ft. Regionally, the shale has been relatively unaffected by tectonic events as evidenced by the shallow dip of the bedding (Mozola, 1951). The upper portion of the shale is highly weathered. The thickness of the weathering ranges between 1.7 and 6 feet, and the site average is 3.2 feet. The characteristics of the competent shale were not observed at SEAD-26 because no bedrock cores were collected. However, it is likely that the bedrock at SEAD-26 is similar to that described at the SEAD-25, located approximately 1 mile north.

Precipitation data from the nearest monitoring station (Aurora Research Farm), was reviewed to gain a perspective on the seasonal variations in rainfall that would directly impact surface water flow. This data indicates that, historically, June has the greatest amount of rainfall, 3.9 inches, and the winter months (January and February) generally have had the least amount of rainfall (Figure 1-13 of RI). Annual rainfall is approximately 30 inches. Surface water flow in drainage ditches in and on the site feed into a main drainage swale near 7th Avenue that empties into an area that comprises the headwaters of Indian Creek; Indian Creek eventually empties into Seneca Lake approximately 4 miles west of the site. Excluding the steep slopes that form the sides of the raised pad, the overall site relief is low, and generally the land surface gradient is between 1 and 3 percent on-site.

Surface water flow directions are controlled predominantly by the changes in relief on the surface of the elevated rectangular pad that comprises SEAD-26. The small circular pond located in the center of the site contains surface water that is collected only from the areas immediately inside the soil berm that encompasses it. Although the pond is very shallow (1 -1.5 feet deep), it is believed to be sustained for much of the year by precipitation events and because of a bentonite liner that forms its base. Beyond the area of the bermed pond, overland surface water flow is likely to be guided down the steep slopes that bound the site on all sides (Figure 3-13 of RI). The swales that are present at the base of the elevated pad are likely to collect surface water that drains from the pad. Surface water flow in the drainage swales is likely to be seasonally intermittent and controlled by precipitation events. No wetland areas were identified on the site.

Till, including the weathered shale immediately below it, and the underlying competent shales and limestone's are the two major geologic units at SEAD-26 that store and transmit groundwater. The fill that comprises the elevated pad is likely to be a media through which infiltration of precipitation occurs, but on the basis of groundwater elevation data, it does not store and transmit large volumes of groundwater. Measured hydraulic conductivity's of the shallow aquifer fall within a broad range, which is indicative of the poorly sorted nature of these deposits; it is likely that the fill contributes to the generally higher conductivity's at SEAD-26 when compared to those measured at SEAD-25. The groundwater flow direction at SEAD-26 is to the west toward Seneca Lake. According to NYSDEC, the groundwater at SEAD-26 has been classified as GA. The best usage of GA waters is as a source of potable water. Class GA waters are fresh groundwater found in the saturated zone of unconsolidated deposits and consolidated rock or bedrock.

The fate and transport of the constituents of concern is influenced by the interaction with precipitation, the recharge to groundwater and the migration with groundwater. Moisture content in the vadose zone of soil can also influence the rate of biological decomposition and the rate of volatilization. Accordingly, understanding the water balance of the site is helpful in evaluating the contaminant fate and transport at SEAD-26.

A water balance was developed for this site using the rational method described in Use of the Water Balance Method for Predicting Leachate Generation from Solid Waste Disposal Sites (EPA, 1975). This procedure calculates the percolation of pore water to groundwater as recharge. Recharge is the difference between the amount of water that infiltrates into the ground minus the actual evapotranspiration and any changes in soil moisture. Infiltration is the difference between precipitation and runoff. The results of these calculations are summarized in Table E-1. The potential evapotranspiration (PET), was estimated using the procedure described by C.W. Thornthwaite and J.R. Mather in Publications In Climatology, Volume X, Number 3; Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance, (1957). The site-specific information needed for the water balance model for SEAD-26 (i.e., soil types and slopes, etc.) is the same that was used for SEAD-25 (please refer to Section E.1.1).

Using the values developed from the water balance for annual runoff, 6.8 inches (0.56 feet), and the surface area of SEAD-26, which is approximately 7.1 acres, the total amount of potential runoff is 4.0 acre-feet (or 1.3 million gallons) per year. Much of this flow is captured and diverted away from the site by the surface drainage swales that line the sides of the pad. Based upon these results, the potential for infiltration and vadose zone contaminant transport are considered moderate. Additionally, the model suggests that the volume of runoff may represent a significant transport pathway for constituents of concern in surface soils to surface water and sediments.

E.2.2 Chemical Characterization

On the basis of the analytical results obtained for the five media at SEAD-26, the most significant impacts to the site are from SVOCs. Less significant impacts are from VOCs, metals, pesticides and PCBs.

In the soil at SEAD-26, SVOCs were ubiquitous. PAHs were found to be pervasive in the surface and subsurface soils and several PAHs exceeded their respective TAGMs. VOCs were present in the surface and subsurface soil samples, however, none of them exceeded their respective TAGM values; the burning pit is believed to be the source for the VOCs. Impacts from pesticides and PCBs, herbicides, nitroaromatics and metals in soil were less significant than the impacts from SVOCs. No compounds from the latter chemical groups exceeded applicable TAGM values.

Generally, the groundwater at SEAD-26 has not been significantly impacted by any of the chemical constituents. Low concentrations of VOCs and SVOCs were detected in the well immediately adjacent to the south side of the pit but, no criteria exceedences were detected for VOCs or SVOCs. Additionally, no pesticides, PCBs, herbicides, or nitroaromatics were detected in the groundwater. Some metals did exceed their criteria values slightly in only one well.

Surface water impacts were not widespread and many of the chemical constituents analyzed for were not present in the samples. Most of the impacts from SVOCs, pesticides, herbicides, and nitroaromatics (which were minor) occurred in the surface water samples from the burning pit, although one compound, a pesticide, exceeded its NYS Class C surface water quality standard at another location. Also, several metals were found at concentrations that exceeded their Class C standards. No VOCs or PCBs were detected in the samples.

Sediment impacts were most significant in the burning pit located in the central portion of the site. In this pit, SVOCs (including TICS) were the most pervasive in the sediment, however, VOCs, pesticides, PCBs, nitroaromatics, and an herbicide compound were also detected. At SEAD-26, there were sediment criteria exceedences for 1 SVOC, 3 pesticides, and 1 PCB compound. Metals impacts were more widespread and not restricted to the burning pit; several metals exceeded their respective TAGMs.

E.3 CONTAMINANT FATE AT SEAD-25 AND SEAD-26

Contaminant fate refers to the chemical characteristics and predictable behaviors of a constituent of concern within different media at a site. This section presents a discussion of chemical-specific fate characteristics at SEAD-25 and SEAD-26 and how that fate controls their distribution at the sites. This discussion will focus on VOCs and SVOCs, the two major compound groups encountered at the sites.

The discussion will first overview general characteristics of the fate of volatile and semivolatile organic compounds and will then present fate modeling results for these compounds. Concentrations of individual VOCs and SVOCs within each media are summarized for each site in Chapter 4 of the RI and listed completely in Appendix H of the RI.

E.3.1 Overview of Compound Fate

Organic compounds, both volatile and semivolatile, are affected by both external site conditions and the compounds' inherent chemical and physical properties. These properties will, in combination, determine the compound state and provide insight into its mobility within a media. Within a matrix, volatile organics do have distinctly different characteristics than semivolatile organic compounds. In the following discussion, the fate of VOCs is discussed before the fate of SVOC.

Fate of Volatile Organic Compounds

Properties of both the compound and the media are important in determining fate. Representative indicators of these properties for selected organic compounds of concern at SEDA are shown in Table E-2. This list of compounds is comprehensive and provides a frame of reference for discussion; not all of the compounds listed were detected at SEAD-25 and SEAD-26.

Compounds in soil usually are mobilized by entering the aqueous phase. The compounds may mix with meteoric water as runoff during rainfall events, or as water percolates through the soil column to the groundwater. Hazardous constituents present in soils may also dissolve directly into the groundwater when the water table is high. In some cases, the contaminants enter the system directly into the water fraction via spills or leaks. Media-specific properties that control

Table E-2

Summary of Fate and Transport Parameters for Selected Organic Compounds of Concern

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

Compound	Solubility (mg/l)	Vapor Pressure (mmHg)	Henry's Law Constant (atm-m³/mol)	Organic Carbon Partition Coefficient, Koc (ml/g)	Octanol-Water Partition Coefficient, Kow
Volatile Organic Compounds					
Methylene Chloride	20000	438	2.03E-03	8.8	20
Acetone	infinite	288	2.06E-05	0.28	0.575
1,1,1-Trichloroethane	1500	123	1.44E-02	152	316
1,1,-Dichloroethane	5500	182	4.31E-03	30	61.7
1,2-Dichloroethene (total)	6300	5.3	6.60E-03	59	123
2-Hexanone	14000	11.6	2.82E-05		
Benzene	1750	95.2	5.59E-03	83	132
Carbon Disulfide	2940	366	1.32E-02	54	100
Chloroform	8200	208	2.87E-03	47	93.3
Chloromethane	6500	4310	4.40E-02	35	0.95
Ethylbenzene	152	7	6.43E-03	1,100	1,410
2-Butanone	353000	70.6	4.35E-05	0.94	1.95
1,2-Dichloroethane	8520	80	9.78E-04	14	30.2
Trichloroethene	1100	75	9.10E-03	126	240
1,1-Dichloroethene	2250	500	3.40E-02	65	53
Tetrachloroethene	150	19	2.59E-02	364	398
Toluene	535	30	6.37E-03	300	537
Xylene (total)	0.3	9	6.91E-03	691	1,450
Semivolatile Organic Compounds					
Phenol	93000	0.341	4.54E-07	14.2	28.8
1,4-dichlorobenzene	79	1.18	2.89E-03	1,700	3,980
2-Methylphenol	25000	0.24	1.50E-06	274	89.1
4-Methylphenol		0.11	4.43E-07	267	85.1
2,4-Dimethylphenol	4200	0.0573	2.38E-06	222	263
Naphthalene	31.7	0.23	1.15E-03	1,300	2,760
2-Methylnaphthalene	25.4	0.0083	5.80E-05	8,500	13,000
Acenaphthylene	3.93	0.029	1.48E-03	2,500	5,010
Acenaphthene	3.42	0.00155	9.20E-05	4,600	10,000

Table E-2

Summary of Fate and Transport Parameters for Selected Organic Compounds of Concern

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

Compound	Solubility (mg/l)	Vapor Pressure (mmHg)	Henry's Law Constant (atm-m³/mol)	Organic Carbon Partition Coefficient, Koc (ml/g)	Octanol-Water Partition Coefficient, Kow
Dibenzofuran				4,160	13,200
2,4-Dinitrotoluene	240	0.0051	5.09E-06	45	100
Diethylphthalate	896	0.0035	1.14E-06	142	316
Fluorene	1.69	0.00071	6.42E-05	7,300	15,800
N-Nitrosodiphenylamine	113		1.40E-06	650	1,350
Pentachlorophenol	14	0.00011	2.75E-06	53,000	100,000
Phenanthrene	1	0.00021	1.59E-04	14,000	28,800
Anthracene	0.045	0.000195	1.02E-03	14,000	28,200
Di-n-butylphthalate	13	0.00001	2.82E-07	170,000	398,000
Fluoranthene	0.206	0.0177	6.46E-06	38,000	79,400
Pyrene	0.132	2.50E-06	5.04E-06	38,000	75,900
Butylbenzylphthalate	2.9	8.60E-06	1.20E-06	28,400	58,900
Benzo(a)anthracene	0.0057	1.50E-07	1.16E-06	1,380,000	398,000
Chrysene	0.0018	6.30E-09	1.05E-06	200,000	407,000
Benzo(b)fluoranthene	0.014	5.00E-07	1.19E-05	550,000	1,150,000
Benzo(k)fluoranthene	0.0043	5.10E-07	3.94E-05	550,000	1,150,000
Benzo(a)pyrene	0.0012	0.000568	1.55E-06	5,500,000	1,150,000
Indeno(1,2,3-cd)pyrene	0.00053	1.00E-10	6.86E-08	1,600,000	3,160,000
Dibenz(a,h)anthracene	0.0005	5.20E-11	7.33E-08	3,300,000	6,310,000
Benzo(g,h,i)perylene	0.0007	1.03E-10	5.34E-08	1,600,000	3,240,000
Pesticides/PCBs					
beta-BHC	0.24	2.80E-07	4.47E-07	3,800	7,940
Heptachlor	0.18	0.0003	8.19E-04	0.00012	25,100
Aldrin	0.18	6.00E-06	1.60E-05	96,000	200,000
Endosulfan I	0.16	0.00001	3.35E-05	2,030	3,550
Heptachlor epoxide	0.35	0.0003	4.39E-04	220	501
Dieldrin	0.195	1.78E-07	4.58E-07	1,700	3,160
4,4'-DDE	0.04	6.50E-06	6.80E-05	4,400,000	10,000,000
Endrin	0.024	2.00E-07	4.17E-06	19,100	218,000
4,4'-DDD	0.16	2.00E-09	3.10E-05	240,000	360,000
Endosulfan sulfate	0.16			2,330	4,570

Table E-2

Summary of Fate and Transport Parameters for Selected Organic Compounds of Concern

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

Compound	Solubility (mg/l)	Vapor Pressure (mmHg)	Henry's Law Constant (atm-m³/mol)	Organic Carbon Partition Coefficient, Koc (ml/g)	Octanol-Water Partition Coefficient, Kow
4,4'-DDT	0.005	5.50E-06	5.13E-04	243,000	1,550,000
alpha-Chlordane	0.56	0.00001	9.63E-06	140,000	2,090
Aroclor-1242	0.24	0.00041	5.60E-04		12,900
Aroclor-1260	0.0027	0.000041	7.10E-03	1,300,000	13,800,000
Herbicides					
Dicamba	4500	2.0E-05	1.30E-09	2.2	3

References:
1. IRP Toxicology Guide
2. Basics of Pump-and-Treat Ground-Water Remediation Technology (EPA, 1990)
3. Handbook of Environmental Fate and Exposure Data (Howard, 1989)
4. Soil Chemistry of Hazardous Materials (Dragun, 1988)
5. Hazardous Waste Treatment, Storage, and Disposal Facilities, Air Emissions Models (EPA, 1989)
6. USATHAMA, 1985
7. Values for Koc not found were estimated by: logKoc = 0.544logKow + 1 377 (Dragun, 1988)

contaminant fate for surface water and groundwater include organic carbon content, charge balance, redox condition, and pH.

Important media-specific properties for soils and sediment include organic carbon content, moisture content, mineralogy, and porosity. Many organic compounds and some metals adsorb more strongly to the organic fraction in the soil or sediment. Therefore, the larger the amount of organics in the soil, the less mobile organic constituents will be. Soils with higher organic content will adsorb more organics than soils with more clays. Generally, surface soils will have a higher organic content than deeper soils, due to the presence of live and dead plant matter at the surface.

One measure of the affinity of a compound for the organic fraction of the soil is the organic carbon partition coefficient, K_{OC}. The K_{OC} is the ratio of the amount of the compound present in the organic fraction to that present in the aqueous fraction. K_{OC} values are presented in Table E-2 for potential contaminants of concern at SEDA. The units used in Table E-2 are milliliters per gram (mL/g). Table E-3 describes the relative relationship between K_{OC} and mobility. The table shows that compounds with a K_{OC} greater than 500 mL/g are generally considered immobile (Dragun, 1988). Generally, VOCs have lower K_{OC} values than most compounds belonging to other chemical groups shown on Table E-2, and therefore, as a group they tend to be the most mobile. Most of the PAHs and pesticides have K_{OC} values well greater than 500 mL/g, and can be considered immobile.

Understanding the type of soils present is useful for estimating the mobility of compounds. The site soils, clay loams, generally have low permeabilities and high water retention capacities. Therefore, dissolved materials tend to move much slower through clay soils than sandy soils. Since adsorption of solutes on soils is controlled by the amount of organic carbon in the soil, soils with a higher organic content will adsorb more organics than soils that are low in carbon but rich in clay. Generally, surface soils, i.e. soils in the agricultural A horizon, have a higher organic content than deeper soils, i.e. soils in the B and C horizon, due to the presence of decomposing plant matter at the surface. In general, the larger the amount of organic matter in the soil, the less mobile the compounds of concern will be.

K_{OC} values are generally determined by experiment, but are often estimated using octanol-water partition coefficients (K_{OW}). Octanol-water partition coefficients are determined in the laboratory, and then converted to K_{OC} via empirical relationships. Like K_{OC}, K_{OW} values are also presented in Table E-2. Since these values are a ratio of concentrations, they are dimensionless.

Meaningful compound-specific properties considered when evaluating the fate of organics are solubility, volatility, degradability, and adsorptivity. Important factors of organics used to assess the degradation include the degradation rate which is a measure of how rapidly a compound will biodegrade; solubility, which helps to determine the availability of the compound to the bacteria

Table E-3

Relative Relationship Between Koc and Mobility

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

Koc	Class	Mobility
>2,000	I	Immobile
500-2,000	II	Low Mobility
150-500	III	Intermediate Mobility
50-150	IV	Mobile
<50	V	Very Mobile

Notes:
1) Koc = Organic carbon partition coefficient
2) Source: Dragun, 1988.

and to hydrolysis reactions; and toxicity, which is a measure of how toxic the compound is to the bacteria present in the soil.

Volatile organic constituents may degrade or decay over time to less soluble compounds. These constituents in soil and groundwater will enter the pore space in the soil vadose zone above the saturated zone. They may then leave the system through off-gasing at the ground surface.

Most volatile organics, as evidenced in Table E-2, have high solubilities. Solubilities range from 0.3 mg/L to 353,000 mg/L (acetone is listed with an immeasurable solubility), most solubilities being on the order of 10^3 mg/L.

For organic constituents, fate is evaluated in terms of degradation or conversion of the compounds. Compounds can biodegrade, hydrolyze, photodegrade, or be converted into other organic compounds. Usually, organic compounds are converted to less hazardous compounds, with carbon dioxide and water being the major end products of aerobic degradation. Occasionally, more hazardous constituents may result from degradation. Photodegradation is only important when the organic compounds are present at the surface and exposed to the sun. At SEDA, both bio- and photodegradation mechanisms may contribute to the degradation of organics.

The tendency of compound to volatilize is usually expressed in terms of a Henry's Law constant K_H. Henry's Law holds in cases where the solute concentration is very low, which is applicable to most constituents found at hazardous waste sites. Henry's Law states that the concentration of a constituent in the vapor phase is directly proportional to the concentration of that constituent in the aqueous phase. The proportionality factor is the Henry's Law constant. Henry's Law constants for a number of the selected organic compounds of concern at SEDA are shown in Table E-2. Generally, for compounds with a Henry's Law constant less than 5×10^{-3} atm-m^3/mol, volatilization from the soils will not be a major pathway (Dragun, 1988). Volatile organic compounds tend to have a low residence time in surface soil and surface water environments. These chemicals can be persistent in groundwater. However, there is evidence that non-chlorinated volatile organic compounds may degrade rapidly in the vadose zone above groundwater plumes (Gas Research Institute - vol. III, 1988). Because it is not the intent of this section to discuss the persistence of all volatile organic compounds, only selected volatile organics that are commonly found or are suspected to have been released to the environment at SEAD-25 and SEAD-26 are discussed below.

This section addresses the contaminant persistence (fate) and focuses on aromatic volatile organic compounds that have been shown to have significantly impacted both SEAD-25 and SEAD-26 (Chapter 4 of RI). Common aromatic volatile organic compounds are benzene, toluene, ethylbenzene and xylene (BTEX) which are associated with petroleum hydrocarbons, including gasoline. Aliphatic (chlorinated) volatile organic compounds associated only with SEAD-25 are TCE and the breakdown products of TCE, including, but not limited to, trans-1,2-dichloroethene (1,2-DCE).

Aromatic Volatile Organics

The following information on aromatic volatile organics was obtained from the document, "Installation Restoration Program Toxicology Guide", Volume 1, October 1985, AD-A171095. Benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds may move through the soil/groundwater system when present at low concentrations (dissolved in water and sorbed on soil) or as a separate organic phase (resulting from a spill of significant quantities of the chemical). In general, transport pathways of low soil concentrations can be assessed by equilibrium partitioning. These calculations predict the partitioning of BTEX compounds among soil particles, soil water and soil air. The portions of BTEX compounds associated with the water and air phases of the soil are more mobile than the adsorbed portions.
The mobility of BTEX compounds in the soil/groundwater system (and their eventual migration into aquifers) is strongly affected by the extent of their sorption on soil particles. In general, sorption on soils is expected to do the following:

- increase with increasing soil organic matter content;
- increase slightly with decreasing temperature;
- increase moderately with increasing salinity of the soil water; and
- decrease moderately with increasing dissolved organic matter content of the soil water.

Based upon octanol-water partition coefficients, for the BTEX compounds (135, 537, 1410, and 1450, respectively) the soil sorption coefficients (K_{OC})s are estimated to be 65, 259, 681, and 691, respectively (The Installation Restoration Program Toxicity Guide, 1985).

Transport of BTEX vapors through the air-filled pores of unsaturated soils is an important transport mechanism for near-surface soils. In general, important soil and environmental properties influencing the rate of volatilization include soil porosity, temperature, convection currents and barometric pressure changes; important physio-chemical properties include the Henry's law constant, the vapor-soil sorption coefficient, and, to a lesser extent, the vapor phase diffusion coefficient.

There are no data from laboratory or field tests showing actual soil volatilization rates. Sorption of the benzene vapors on the soil may slow the vapor phase transport.

The Henry's Law constant (K_H), which provides an indication of a chemical's tendency to volatilize from solution increases significantly with increasing temperature. Moderate increases in K_H are also observed with increasing salinity due to a decrease in solubility of benzene, toluene and ethyl benzene. Sodium, manganese and other mineral salts are present in the groundwater at the site and may increase the Henry's Law constants for some organic compounds.

BTEX compounds under normal environmental conditions are not expected to undergo hydrolysis. Further, benzene and toluene are not expected to be susceptible to oxidation or reduction reactions in the soil/groundwater environment.

According to the Installation Restoration Program Toxicity Guide (1985), available data on the biodegradability of benzene are somewhat contradictory. Certain pure and mixed cultures can apparently degrade benzene under environmental conditions, but the chemical must be considered fairly resistant to biodegradation. Available data indicate that toluene and ethyl benzene are biodegradable in the soil/groundwater environment. No information on the biodegradability of xylene in the soil/groundwater environment is available. However, based upon data for other structurally similar chemicals (e.g., toluene, ethyl benzene), it is expected that xylene would be biodegradable. In most soil/groundwater systems aerobic degradation would be of minimal importance because of the low concentration of microorganisms (at depth) and the low dissolved oxygen (anaerobic) conditions. No data are available on the possibility of anaerobic biodegradation.

<u>Chlorinated Aliphatic Volatile Organics</u>

Aliphatic volatile organic chemicals associated with the SEAD-25 are TCE and the breakdown products of TCE, specifically trans-1,2-dichloroethene, (1,2-DCE). These compounds in soil are only mobile in the aqueous and vapor phases. Compounds entering the vadose zone from the land surface are mixed with precipitation and migrate through the soil, eventually reaching the groundwater table. Volatilization may be a significant phase of migration, provided that there is an ample amount of void (pore) space in the soil through which the vapor can migrate. Volatile constituents enter the air through void spaces in the soil above the saturated zone which may then leave the system through the ground surface.

The solubility, vapor pressure, Henry's Law constant, and Koc of volatile organic compounds determine compound fate at SEAD-25. Specifically, the values of these characteristics are presented in Table E-2.

The solubilities for TCE and trans-1,2 DCE are 1,100 mg/L and 6,300 mg/L. A review of the melting points and boiling points indicates that TCE and the DCE isomers are liquids at room temperature.

Effective aliphatic volatile organic vapor pressures change depending on the site air temperature, relative humidity, and atmospheric pressure. TCE has a vapor pressure of 75 mmHg at 20^{o}C. The vapor pressure of trans-1,2 DCE is incorporated within the vapor pressure of total 1,2 DCE, which is 5.3 mmHg at 20^{o}C. At increased temperatures, the vapor pressure increases, causing more volatilization of the TCE and trans-1,2 DCE. At larger relative humidities, the vapor pressures will decrease. An increased barometric pressure also causes less volatilization.

An important chemical specific property which can be used to understand the potential for chemical migration is Henry's Law. Generally, for compounds with a Henry's Law constant less than 5 x 10^{-3} atm-m^3/mole, volatilization is not expected to be a significant environmental pathway (Dragun, 1988). TCE and its four breakdown products all have Henry's Law constants greater than 5 x 10^{-3} atm-m^3/mole which suggests that volatilization may be a significant mechanism in the partitioning of these volatile chlorinated compounds at high enough groundwater concentrations.

The K_{oc} is the ratio of the amount of the compound present in the organic fraction to that present in the aqueous fraction, at equilibrium. K_{oc} values are presented in Table 3-1 for TCE and its breakdown products. The relationship between K_{oc} and mobility is presented in Table E-3. TCE and the 1,2-DCE isomer have K_{oc} values less than 500 mL/g and are, therefore, considered to be mobile, especially in soils with low organic content. K_{oc} values are generally determined by experiment, but are often estimated using octanol-water partition coefficients (K_{ow}). Octanol-water partition coefficients are determined in the laboratory and then converted to K_{oc} via empirical relationships.

Fate of Semivolatile Organic Compounds

Semivolatile organics are characterized by low vapor pressures and low Henry's Law constants, indicating little potential for volatilization. High sorption coefficients (7,500 mL/g) indicate that these chemicals will tend to stay sorbed to the soil, and will migrate only in conjunction with the soil itself. Most PAHs have K_{oc} values greater than 2,000 mL/g, indicating that they are immobile.

PAH compounds have a high affinity for organic matter and low water solubility. Water solubility tends to decrease and affinity for organic material tends to increase with increasing molecular weight (Gas Research Institute, 1988). Therefore, naphthalene is much more soluble in water than is benzo(a)pyrene. When present in soil or sediments, PAHs tend to remain bound to the soil particles and dissolve only slowly into groundwater or the overlying water column. Because of the high affinity for organic matter, the physical fate of the chemicals is usually controlled by the transport of particulates. Thus, soil, sediment and suspended particulate matter (in air) represent important media for the transport of the chemicals.

Because of their high affinity for organic matter, PAH compounds are readily taken up (bioaccumulated) by living organisms. However, organisms have the potential to metabolize the chemicals and to excrete the polar metabolites (Gas Research Institute, 1988). The ability to do this varies among organisms. Fish appear to have well-developed systems for metabolizing the chemicals. The metabolites are excreted. Shellfish (bi-valves) appear to be less able to metabolize the compounds (Gas Research Institute, 1988). As a result, while PAH compounds are seldom high in fish tissues, they can be high in shellfish tissues.

Phenolic compounds, classified as SVOCs, are highly water soluble and, therefore, easily leach from soil environments into the underlying groundwater. They are not persistent in surface water environments. Phenolics are not as volatile as benzene, xylene or toluene, but can volatilize at a moderate rate. Therefore, there may be some potential for exposure to gases. Non-chlorinated phenolic compounds are not readily bioaccumulated by terrestrial or aquatic biota (Gas Research Institute, 1988).

E.3.2 Partitioning Model of Fugacity

To help understand the fate of VOCs at SEAD-25 and SEAD-26, a partitioning model was performed to determine how the individual VOCs would be expected to partition in three media - soil, groundwater and air.

Following a release, source materials partition into the three environmental media : soil, water, and air. Estimations of phase partitioning at a source can be used to understand the expected fate of the released materials. Compounds found at SEAD-25 include aromatic volatile organics (BTEX) and chlorinated organic compounds (TCE and 1,2 DCE), and at SEAD-26 include mostly aromatic volatile organics (BTEX). The fate of these compounds was determined by Level I equilibrium partitioning calculations using procedures developed by MacKay and Paterson, (1981). Mackay's equilibrium partitioning model was used to predict the partitioning of aromatic and chlorinated compounds within the vadose and saturated soil zones during both the wet and dry seasons.

The partitioning model is based on the concept of fugacity, a thermodynamic property of a chemical. Fugacity is often considered as the tendency of a chemical to escape from one phase into another. Using known chemical/physical properties of the chemicals of interest, i.e. the Henry's constant and the K_{OC}, and the physical properties of the media that these chemicals are released into, i.e. the soil porosity and the moisture content, it is possible to calculate a fugacity value, described as the f term, for each media. Generally, the units of fugacity, f, are expressed in units of pressure, i.e. atmospheres.

The basic premise of the approach described by Mackay is that, at equilibrium, the fugacity of the chemicals in each media (subcompartment) are equal. Secondly, the concentration of each chemical in each media is related to the fugacity by a proportionality constant, Z. The units of Z are in moles/m^3-atm. Since only three media are involved, it is possible to ratio the Z terms for each media to the sum of all the Z values. This provides a percent partitioning ratio which is indicative of the degree that each chemical will partition into each environmental phase.

The analysis has the advantage that it is independent of the actual mass of a chemical in the media. The results represent the relative amounts of a chemical, at equilibrium, which would be expected in a subcompartment. The subcompartments are the soil, water or air phase of the compartment in question.

For this fugacity analysis, the two compartments considered were the unsaturated (vadose) zone of soil, and the saturated zone of soil. The analysis was performed separately for each compartment. For both the vadose zone and saturated soil fugacity models, both soil and water partitioning was considered. Additionally within the vadose zone compartment, the air volume in the soil pores was considered. The atmospheric air above the compartment was excluded.

The Level I partitioning estimation technique, developed by Mackay, is considered to be a batch type analysis. In other words, chemicals are not allowed to pass beyond a defined control volume being considered. It does not account for various dynamic processes, such as biodegradation, but is useful in estimating the fate of released chemicals within the source area. The model does not account for separate phase liquids which may displace moisture within the pore spaces. It is intended to provide an indication of the behavior of the chlorinated organics in the soil under theoretical conditions.

The model involves three basic assumptions:

1. There is no chemical or biological degradation.
2. Chemicals are at equilibrium within the total environmental compartment and each subcompartment
3. Since equilibrium is assumed, there is no unbalanced net flux into or out of subcompartments nor is there any release from the compartment as a whole, i.e. volatilization or leaching.

The partitioning model requires some site specific information about the soils at SEDA The porosity of the soil at Seneca was estimated to be 37.3% (USAEHA Hazardous Waste Study No. 37-26-0479-85, August 1984). Since the moisture content of the soils at Seneca vary during the year, two scenarios were considered, a wet season (23.3 % moisture content in the vadose zone) (USAEHA, 1984) and a dry season (9.4% moisture content in the vadose zone) (Metcalf and Eddy, October 1989). [Hydrologically, the wet season typically occurs during the winter and spring months while the dry season refers to the summer and fall months.] The vadose zone consists of the soil phase, the soil-water phase, and the soil-air phase. By definition, saturated soil contains no soil-air phase. A discussion of the steps required to perform the modeling and the model results follows.
The fugacity calculation begins by establishing the control volume. The control volume for the vadose zone compartment was established by considering one (1) square foot of soil extending

(1) foot into the unsaturated zone. The control volume for the saturated zone was established by considering one (1) square foot of soil extending one (1) foot into the water table.

The amount of water in the upper, unsaturated control volume during the wet season is:

$$\%Water = MC$$

where:

MC = Moisture Content during the wet season, (0.233)

The amount of solids in the control volume during the wet season was estimated as:

$$\%Solids = 1 - \phi$$

where:

ϕ = Soil Porosity, (0.373)

The amount of air estimated in the control volume during the wet season was estimated as:

$$\%Air = 1 - (\%Solids + \%Water)$$

From these estimates, the subcompartment volumes, expressed as percent of the total volume, during the wet season was calculated as:

Volume of Solids - 62.7%,
Volume of Water - 23.3%, and
Volume of Air - 14%.

During the dry season, the moisture content of the unsaturated zone was estimated to be 9.4%, the same analysis yielded subcompartment volumes of:

Volume of Solids (V_{soil}) - 62.7%,
Volume of Water (V_{gw}) - 9.4%, and
Volume of Air (V_{air}) - 27.9%.

The soil pore spaces for the lower saturated soil compartment does not contain any air spaces and therefore the volume of the water in this compartment is equal to the soil porosity, 0.373. The remainder of the soil volume is soil solids. The subcompartment volumes are defined as follows:

Volume of Solids (V_{soil}) - 62.7%, and
Volume of Water (V_{gw}) - 37.3%.

Two chemical-specific inputs are required:

H = Henry's Law Constant (atm m^3/mol) and
K_{oc} = organic carbon partition coefficient.

The media-specific inputs are:

Soil organic carbon content - 0.62%,
Bulk density of soil - 1.8 g/cm^3 , and
Soil temperature - 20^oC.

The next step is to calculate the proportionality constant Z, for each phase, where:

$$C_i = Z_i f_i$$

where:

C_i = the concentration in a given phase (mol/m^3)
Z_i = the proportionality constant for a given phase (mol/m^3-atm)
f_i = the fugacity of a given phase (atm).

The following equations can be used to calculate Z.

1) $$Z_{air} = \frac{1}{RT};$$

2) $$Z_{gw} = \frac{1}{H}; \text{ and}$$

3) $$Z_{soil} = 10^{-8}\left[\frac{oc_{soil} K_{oc} P_{soil}}{H}\right],$$

where:

R = universal gas constant = 8.2 x 10^{-5} m^3-atm/mol-^oK;
T = Temperature (^oK);
H = Henry's Law Constant (atm-m^3/mol);
oc_{soil} = soil organic carbon content (%);
K_{oc} = organic carbon partition coefficient; and
P_{soil} = soil bulk density (g/m^3).

Next, the fraction (F) in each phase is calculated by the three following equations:

$$F_{air} = \frac{V_{air}Z_{air}}{V_{air}Z_{air} + V_{gw}Z_{gw} + V_{soil}Z_{soil}}$$

$$F_{gw} = \frac{V_{gw}Z_{gw}}{V_{air}Z_{air} + V_{gw}Z_{gw} + V_{soil}Z_{soil}}$$

$$F_{soil} = \frac{V_{soil}Z_{soil}}{V_{air}Z_{air} + V_{gw}Z_{gw} + V_{soil}Z_{soil}}$$

For the two compartment calculations of the saturated soil zone models, the air terms are ignored.

BTEX Compounds

To model the fugacity of aromatic volatile organic compounds, each BTEX compound was modeled independently. Table E-4 presents a summary of the BTEX fugacity modeling results for the vadose and saturated zones during both the dry and the wet seasons at SEAD-25. The results presented do not take into account degradation of these chemicals.

Benzene - Model results show on Table E-4 that for the vadose zone during the wet season, benzene typically has 68.8% of its total mass in soils, 27.5% in soil moisture, and 3.8% in the soil gas. For dry season conditions, more benzene mass is present in the soil (78.8%) and soil gas (8.8%) with less mass present in the soil moisture (12.7%). In saturated soils, or those depths within the aquifer that remain saturated regardless of the season, model results show unsurprisingly constant partitioning of benzene mass from season to season. The benzene mass will partition 60.9% into soils and 39.1% into groundwater.

Toluene - In comparison with benzene, the model predicts that toluene in the vadose zone during the wet season has much more of its mass in soils (88.6%), leaving 9.8% in soil moisture, and 1.6% in soil gas. For dry season conditions, most of the mass of toluene is present in the soil (92.6%) with marginal distributions in the soil gas (3.3%) and soil moisture (4.1%). In saturated soils, model results show the same partitioning of toluene mass from season to season. The toluene mass will partition 84.9% into soils and 15.1% into groundwater.

Ethylbenzene - Table E-4 model results show that for the vadose zone during the wet season, ethylbenzene has 96.6% of its total mass in soils, 2.9% in soil moisture, and 0.5% in the soil gas. For dry season conditions, most of the ethylbenzene mass is present in the soil (97.9%) with

Table E-4

Summary of Fugacity Calculations for BTEX

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

VADOSE ZONE - WET SEASON

		Benzene	Toluene	Ethylbenzene	Xylene
1)	Chemical Name	Benzene	Toluene	Ethylbenzene	Xylene
	Assumptions:				
2)	% soil	62.7%	62.7%	62.7%	62.7%
3)	% water	23.3%	23.3%	23.3%	23.3%
4)	%air	14.0%	14.0%	14.0%	14.0%
5)	oc=% organic carbon in soil	0.62	0.62	0.62	0.62
6)	bulk density (g/m³)	1.80E+06	1.80E+06	1.80E+06	1.80E+06
7)	Koc	83	300	1100	691
8)	Henry's Law Constant	5.59E-03	6.37E-03	6.43E-03	6.91E-03
9)	Temperature (°K)	293	293	293	293
	Calculations:				
	Z(soil)	165.70	525.59	1909.18	1116.00
	Z(water)	178.89	156.99	155.52	144.72
	Z(air)	41.62	41.62	41.62	41.62
	Estimated % of Total Mass Of Chemical in Each Compartment				
	Results:				
	F(soil)	68.6%	88.6%	96.6%	94.7%
	F(water)	27.5%	9.8%	2.9%	4.6%
	F(air)	3.8%	1.6%	0.5%	0.8%

Table E-4

Summary of Fugacity Calculations for BTEX

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

SATURATED WET SOIL - WET SEASON

		Benzene	Toluene	Ethylbenzene	Xylene
1)	Chemical Name	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**
	Assumptions:				
2)	% soil	62.7%	62.7%	62.7%	62.7%
3)	% water	37.3%	37.3%	37.3%	37.3%
5)	oc=% organic carbon in soil	0.62	0.62	0.62	0.62
6)	bulk density (g/m^3)	1.80E+06	1.80E+06	1.80E+06	1.80E+06
7)	Koc	83	300	1100	691
8)	Henry's Law Constant	5.59E-03	6.37E-03	6.43E-03	6.91E-03
9)	Temperature (°K)	293	293	293	293
	Calculations:				
	Z(soil)	165.70	525.59	1909.18	1116.00
	Z(water)	178.89	156.99	155.52	144.72
	Estimated % of Total Mass Of Chemical in Each Compartment				
	Results:				
	F(soil)	60.9%	84.9%	95.4%	92.8%
	F(water)	39.1%	15.1%	4.6%	7.2%

Table E-4

Summary of Fugacity Calculations for BTEX

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

VADOSE ZONE - DRY SEASON

		Benzene	Toluene	Ethylbenzene	Xylene
1)	Chemical Name	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**
	Assumptions:				
2)	% soil	62.7%	62.7%	62.7%	62.7%
3)	% water	9.4%	9.4%	9.4%	9.4%
4)	%air	27.9%	27.9%	27.9%	27.9%
5)	oc=% organic carbon in soil	0.62	0.62	0.62	0.62
6)	bulk density (g/m³)	1.80E+06	1.80E+06	1.80E+06	1.80E+06
7)	Koc	83	300	1100	691
8)	Henry's Law Constant	5.59E-03	6.37E-03	6.43E-03	6.91E-03
9)	Temperature (°K)	293	293	293	293
	Calculations:				
	Z(soil)	165.70	525.59	1909.18	1116.00
	Z(water)	178.89	156.99	155.52	144.72
	Z(air)	41.62	41.62	41.62	41.62
	Estimated % of Total Mass Of Chemical in Each Compartment				
	Results:				
	F(soil)	78.5%	92.6%	97.9%	96.5%
	F(water)	12.7%	4.1%	1.2%	1.9%
	F(air)	8.8%	3.3%	0.9%	1.6%

Table E-4

Summary of Fugacity Calculations for BTEX

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

SATURATED DEEP SOIL - DRY SEASON

		Benzene	Toluene	Ethylbenzene	Xylene
1)	Chemical Name	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylene**
	Assumptions:				
2)	% soil	62.7%	62.7%	62.7%	62.70%
3)	% water	37.3%	37.3%	37.3%	37.30%
5)	oc=% organic carbon in soil	0.62	0.62	0.62	0.62
6)	bulk density (g/m³)	1.80E+06	1.80E+06	1.80E+06	1.80E+06
7)	Koc	83	300	1100	691
8)	Henry's Law Constant	5.59E-03	6.37E-03	6.43E-03	6.91E-03
9)	Temperature (°K)	293	293	293	293
	Calculations:				
	Z(soil)	165.70	525.59	1909.18	1116.00
	Z(water)	178.89	156.99	155.52	144.72
	Estimated % of Total Mass Of Chemical in Each Compartment				
	Results:				
	F(soil)	60.9%	84.9%	95.4%	92.8%
	F(water)	39.1%	15.1%	4.6%	7.2%

Notes:

1) Henry's Law Constants and K(oc) values are from Table A-1 of Basics of Pump and Treat Groundwater Remediation Technology (EPA March 1990).

2) The moisture content (wet season) was obtained from USAEHA Hazardous Waste Study No. 37-26-0479-85 (1984).

minimal amounts in the soil moisture (1.2%) and soil gas (0.9%). In saturated soils, or those depths within the aquifer which remain saturated year round, model results show constant partitioning of ethylbenzene mass regardless of the season. The ethylbenzene mass will partition 95.4% into soil and 4.6% into groundwater.

Xylenes - Model results show on Table E-4 that for the wet season, xylene in the vadose zone typically has 94.7% of its total mass in soils, 4.6% in soil moisture, and 0.8% in the soil gas. For dry season conditions, more xylene mass is present in the soil (96.5%) and soil gas (1.6%) with less mass present in the soil moisture (1.9%). In saturated soils, or those depths within the aquifer which remain saturated regardless of the season, model results show unsurprisingly constant partitioning of xylene mass from season to season. The xylene mass will partition 92.8% into soils and 7.2% into groundwater.

To summarize, McKay's fugacity model predicts that ethylbenzene, xylene, toluene and benzene (in this order) will be most prevalent within saturated soils at SEAD-25 and SEAD-26, and benzene, toluene, xylene, and ethylbenzene will be most prevalent in the groundwater Table E-4. It also predicts that the vadose zone will contain mostly ethylbenzene, xylene, toluene, and some benzene in the soils with mostly benzene in soil moisture and soil gas.

Chlorinated Compounds

To model the fugacity of two indicative aliphatic organic compounds at SEAD-25, both trichloroethene (TCE) and trans-1,2-dichloroethylene (trans-1,2-DCE) compounds were modeled independently. Table E-5 presents a summary of the fugacity modeling results for the vadose and saturated zones during both the dry and the wet seasons at SEAD-25. The results presented do not take into account degradation of these chemicals.

TCE - Model results show on Table E-5 that for the wet season, TCE in the vadose zone typically has 75.5% of its total mass in soils, 20.0% in soil moisture, and 4.5% in the soil gas. For dry season conditions, more TCE mass is present in the soil (81.5%) and soil gas (9.8%) with less mass present in the soil moisture (8.7%). In saturated soils, or those depths within the aquifer which remain saturated regardless of the season, model results show unsurprisingly constant partitioning of TCE mass from season to season. The TCE mass will partition 70.3% into soils and 29.7% into groundwater.

1,2- DCE - Model results show on Table E-5 that for the wet season, trans-1,2-DCE in the vadose zone typically has 60.4% of its total mass in soils, 34.1% in soil moisture, and 5.6% in the soil gas. For dry season conditions, more trans-1,2-DCE mass is present in the soil (70.8%) and soil gas (16.1%) with less mass present in the soil moisture (13.1%). In saturated soils, or those depths within the aquifer which remain saturated regardless of the season, model results show

Table E-5

Summary of Fugacity Calculations for Chlorinated Solvents

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

VADOSE ZONE - WET SEASON

1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**
	Assumptions:		
2)	% soil	62.7%	62.7%
3)	% water	23.3%	23.3%
4)	%air	14.0%	14.0%
5)	oc=% organic carbon in soil	0.62	0.62
6)	bulk density (g/m³)	1.80E+06	1.80E+06
7)	Koc	126	59
8)	Henry's Law Constant	9.10E-03	6.56E-03
9)	Temperature (°K)	293	293
	Calculations:		
	Z(soil)	154.52	100.37
	Z(water)	109.89	152.44
	Z(air)	41.62	41.62
	Estimated % of Total Mass Of Chemical in Each Compartment		
	Results:		
	F(soil)	75.5%	60.4%
	F(water)	20.0%	34.1%
	F(air)	4.5%	5.6%

Table E-5

Summary of Fugacity Calculations for Chlorinated Solvents

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

SATURATED WET SOIL - WET SEASON

1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**
	Assumptions:		
2)	% soil	62.7%	62.7%
3)	% water	37.3%	37.3%
5)	oc=% organic carbon in soil	0.62	0.62
6)	bulk density (g/m³)	1.80E+06	1.80E+06
7)	Koc	126	59
8)	Henry's Law Constant	9.10E-03	6.56E-03
9)	Temperature (°K)	293	293
	Calculations:		
	Z(soil)	154.52	100.37
	Z(water)	109.89	152.44
	Estimated % of Total Mass Of Chemical in Each Compartment		
	Results:		
	F(soil)	70.3%	52.5%
	F(water)	29.7%	47.5%

Table E-5

Summary of Fugacity Calculations for Chlorinated Solvents

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

VADOSE ZONE - DRY SEASON

1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**
	Assumptions:		
2)	% soil	62.7%	62.7%
3)	% water	9.4%	9.4%
4)	%air	27.9%	27.9%
5)	oc=% organic carbon in soil	0.62	0.62
6)	bulk density (g/m^3)	1.80E+06	1.80E+06
7)	Koc	126	59
8)	Henry's Law Constant	9.10E-03	6.56E-03
9)	Temperature (°K)	293	293
	Calculations:		
	Z(soil)	154.52	100.37
	Z(water)	109.89	152.44
	Z(air)	41.62	41.62
	Estimated % of Total Mass Of Chemical in Each Compartment		
	Results:		
	F(soil)	81.5%	70.8%
	F(water)	8.7%	16.1%
	F(air)	9.8%	13.1%

Table E-5

Summary of Fugacity Calculations for Chlorinated Solvents

SEAD-25 and SEAD-26 Remedial Investigation
Seneca Army Depot Activity

SATURATED DEEP SOIL - DRY SEASON

1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**
	Assumptions:		
2)	% soil	62.7%	62.7%
3)	% water	37.3%	37.3%
5)	oc=% organic carbon in soil	0.62	0.62
6)	bulk density (g/m³)	1.80E+06	1.80E+06
7)	Koc	126	59
8)	Henry's Law Constant	9.10E-03	6.56E-03
9)	Temperature (°K)	293	293
	Calculations:		
	Z(soil)	154.52	100.37
	Z(water)	109.89	152.44
	Estimated % of Total Mass Of Chemical in Each Compartment		
	Results:		
	F(soil)	70.3%	52.5%
	F(water)	29.7%	47.5%

Notes:
1) Henry's Law Constants and K(oc) values are from Table A-1 of Basics of Pump and Treat Groundwater Remediation Technology (EPA
2) The moisture content (wet season) was obtained from USAEHA Hazardous Waste Study No. 37-26-0479-85 (1984).

unsurprisingly constant partitioning of trans-1,2-DCE mass from season to season. The trans-1,2-DCE mass will partition 52.5% into soils and 47.5% into groundwater. Thus, TCE is relatively mobile and will partition in the water of the soil-groundwater system especially in soils with a low organic content. As discussed earlier, volatilization may also be a significant pathway for TCE near the surface or in the soil-air phase. 1,2-DCE is also considered to be mobile in soil/groundwater systems and volatilization is also considered to be significant near the surface.

The analysis above did not consider degradation of TCE.

Dechlorination and methane production are carried out by anaerobic microbes. Anaerobic conditions are likely to exist in the soils and therefore anaerobic degradation is a likely degradation pathway. Research indicates that under methanogenic conditions TCE is sequentially reduced by dechlorination to DCE isomers, then to vinyl chloride, and eventually to ethane. At each step a chlorine is replaced by hydrogen, and hydrogen chloride is produced. Of the three possible DCE isomers, the cis- and trans- 1,2-dichloroethene isomers are much more prevalent than 1,1-dichloroethene. Both an energy source and an electron, or an electron donor source appear to be necessary for this transformation to take place.

E.4 CONTAMINANT TRANSPORT AT SEAD-25 AND SEAD-26

Constituents detected in samples at SEAD-25 and SEAD-26 were volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metallic compounds. To consider potential hazards associated with these sites, an investigation of individual constituent transport mechanisms is necessary. The discussion that follows focuses on the most prevalent constituents at SEAD-25 and SEAD-26, specifically VOCs and SVOCs.

E.4.1 Introduction

A compound may be present at the site within the air (as vapors or particulates), within the ground (in soils and ground water), or within the water bodies (streams, puddles, ponds, or ditches). Biota exposed to those media at a site may simultaneously be exposed to a hazardous constituent. Transport refers to the movement of hazardous constituents at a site. Transport is driven by both physical and chemical forces is determined by a combination of site and compound specific characteristics, at both the microscopic and macroscopic scale.

Meaningful chemical-specific properties are solubility, volatility, degradability, and adsorptivity. These properties are discussed below. Media specific properties include organic carbon content, porosity, moisture content, bulk density, groundwater velocity, and dispersivity.

Volatile Organics : BTEX Compounds

BTEX compounds (benzene, toluene, ethylbenzene, and xylene) are present in the groundwater at both SEAD-25 and SEAD-26. The previous discussion of fate pathways in Section 3 of this chapter suggests that benzene is highly volatile, weakly adsorbed by soil and has a limited potential for bioaccumulation. Additionally, toluene is highly volatile from aqueous solutions, moderately sorbed to soil and has a low potential for bioaccumulation. Ethyl benzene and xylene are highly volatile from aqueous solutions, may be moderately adsorbed by soil and have a moderate potential for bioaccumulation. BTEX compounds may volatilize from soil surfaces, but that portion not subject to volatilization is likely to be mobile in groundwater.

Benzene is fairly mobile in the soil/groundwater system. Transport with infiltration water is expected particularly in sandy soils and soils with low organic content. Volatilization of material near the surface or in the soil gas may be significant. Transformation processes such as hydrolysis and biodegradation are not significant in natural soils, although biodegradation by acclimated populations has been reported.

Toluene is relatively mobile in soil-water systems, including transport of vapor through air-filled pores as well as transport in solution. Toluene is resistant to hydrolysis but will probably biodegrade easily if microbiological populations are sufficiently numerous and active. Toluene may persist for months to years or more if biodegradation is not possible.

Ethylbenzene is somewhat mobile in soil-water systems, especially in the aqueous phase if sufficient water is present. Volatilization losses through air-filled pores may be a minor loss pathway. Ethylbenzene is resistant to hydrolysis, but will probably biodegrade easily if microbiological populations are sufficiently numerous and active. Ethylbenzene may persist for months to years or more if biodegradation is not possible.

Xylene is relatively mobile in soil-water systems, especially in the aqueous phase. Volatilization through air-filled pores is also possible. Xylene is resistant to hydrolysis but is probably biodegradable. Xylene could persist for months to years.

Volatile Organic Compound : Trichloroethylene (TCE)

Trichloroethylene will be relatively mobile in the soil/groundwater system when present at low concentrations (dissolved in water and sorbed on soil) or as a separate organic phase, e.g., from a spill of significant quantities of the chemical.

Transport pathways can be generally assessed by using an equilibrium partitioning model as shown in Section E.3.2. These calculations predict the partitioning of low soil concentrations of trichloroethylene among soil particles, soil water and soil air. The estimates for an unsaturated topsoil model indicate that a significant amount of the trichloroethylene is expected to be present in the soil-water and the soil-air phases, and thus available to be transported through these phases by bulk transport (e.g. the downward movement of infiltrating water), dispersion and diffusion. Diffusion through the soil-air pores up to the surface, and subsequent removal by wind, may be a significant loss pathway. In saturated, deep soils (containing no soil air and negligible soil organic carbon), a much higher traction of the TCE is likely to be present in the soil-water phase; this will enhance its transport with flowing groundwater.

Based on laboratory studies if the transport and fate of TCE solutions applied to surface soils, the following three conclusions have been drawn. The first conclusion is that most trichloroethylene applied to surface soils will volatilize. Secondly, trichloroethylene percolating through the soil column is minimally retarded by sandy soils. (Or, the organic matter in the soil increases the retardation rate somewhat.) Thirdly, volatilization from the soil column occurs at a rate about ten times lower than a (well-mixed) water column of similar depth.

The mobility of TCE in the soil/groundwater system is inversely related to the extent of TCE sorption on the soil phase. Based on general information on sorption of neutral organic chemicals to soils, one would expect the extent of sorption of trichloroethylene to soils to:

increase with increasing soil organic matter content;
increase slightly with decreasing temperature;
increase moderately with increasing salinity of the soil water;
decrease moderately with increasing dissolved organic matter content of the soil water.

Researchers have shown trichloroethylene sorption will be minimal on sandy soils, somewhat greater on soils with high clay content (due to the higher surface area available), and greatest on soils with a significant organic carbon content (i.e. greater than 0.1% by weight).

Transport of TCE vapors through the air-filled pores of unsaturated soils is an important transport mechanism for near-surface soils. Important soil and environmental properties include soil porosity, temperature, convection currents and barometric pressure changes; important chemical properties include the Henry's Law constant, the vapor-soil sorption coefficient, and , to a lesser extent, the vapor phase diffusion coefficient.

The value of the Henry's Law constant, which represents the tendency of trichloroethylene to volatilize from solution will:

increase significantly with increasing temperature;
increase moderately with increasing salinity of the soil water;

increase or decrease moderately with increasing dissolved organic matter content of the soil and water.

Trichloroethylene under normal environmental conditions does not undergo rapid hydrolysis. However, oxygen can accelerate the decomposition rate. The rate of degradation is not significantly pH-dependent, but it could be increased in the presence of metallic iron. The half-life of trichloroethylene due to chemical degradation in water has been estimated - in two separate studies - to be 10.7 months and 30 months.

Semivolatile Organic Compounds

Among the semivolatile compounds listed as present at SEAD-25 and SEAD-26 from Chapter 4, two are most prevalent. Those two are 2,4-Dimethylphenol and Napthalene. The contaminant transport discussion of semivolatile organic compounds will focus on these two compounds.

The semivolatile organics, pesticides, and PCBs are characterized by low vapor pressures and Henry's Law constants, indicating little potential for volatilization. High sorption coefficients (7,500 ml/g) indicate that these chemicals will be tightly bound up in the soil, and would tend to migrate only in conjunction with the soil itself. Most PAHs have K_{OC} values greater than 2,000 ml/g. indicating that they are immobile.

2,4-Dimethylphenol is fairly mobile in soil-water systems, especially in the aqueous phase. Volatilization through sir-filled pores is not significant. The chemical is resistant to hydrolysis, and likely to not significantly biodegrade in natural environments, causing persistence of months to years and more.

The 2,4-isomer of dimethylphenol may move through the soil/groundwater system when present at low concentrations (dissolved in water and sorbed on soil) or as a separate organic phase (resulting from a spill of significant quantities of the chemical). In general, transport pathways of low soil concentrations can be assessed by estimating equilibrium partitioning. The 2,4-dimethylphenol associated with the water and air phases of the soil is more mobile than the adsorbed portion.

The estimates for the unsaturated topsoil model indicate that nearly all of the chemical (95%) would be associated with the soil particles. Most of the remainder (5%) is predicted to be present in the soil-water phase and can thus migrate by bulk transport, dispersion, and diffusion. For the small portion of 2,4-dimethylphenol in the gaseous phase of the soil (0.0004%), diffusion through the soil-air pores up to the ground surface, and subsequent removal by the wind, will be possible.

In saturated, deep soils (containing no soil air and negligible soil organic carbon), a much higher fraction of the 2,4-dimethylohenol (71%) is likely to be present in the soil-water phase and transported with flowing ground water.

The 2,4-isomer of dimethylphenol is a weak acid which will dissociate slightly in natural waters with elevated pHs (7-9). Under most conditions, however, the chemical will be in its neutral, non-ionized form. The phenolic group can form complexes with dissolved metal cations, and this may influence environmental fate and transport in ways not applicable to other non-reacting organic compounds.

The mobility of 2,4-dimethylphenol in the soil/ground-water system (and its eventual migration into aquifers) is strongly affected by the extent of its sorption on soil particles. In general, sorption on soils is expected to:

increase with increasing soil organic matter content,
increase slightly with decreasing temperature,
increase moderately with increasing salinity of the soil water, and
decrease moderately with increasing dissolved organic matter content of the soil water.

Based upon its octanol-water partitioning coefficient of 200, the soil sorption coefficient (Koc) is estimated to be 96. This is a relatively low number indicative of weak sorption to soils. However, this conclusion is based on the assumption that the chemical acts as a neutral species. As mentioned above, the phenolic group can complex with other cations and any such complexion could significantly alter the sorption properties of the chemical in unpredictable ways.

Transport of 2,4-dimethylphenol vapors through the air-filled pores of unsaturated soils is not expected to be an important transport mechanism because of the chemical's low vapor pressure and relatively high water solubility (which allows it to be carried down with infiltrating water).

The persistence of 2,4-dimethylphenol in soil/ground water systems has not been studied. In most cases, it should be assumed that the chemical will persist for months to years (or more).

2,4-Dimethylphenol under normal environmental conditions is not expected to undergo hydrolysis. The possibility of aqueous phase oxidation, catalyzed by certain dissolved metals such as copper or iron, has been raised, but there is no evidence that such reactions occur under normal environmental conditions.

2,4-Dimethylphenol is likely to be easily biodegraded in biological wastewater treatment plants based on various studies. However, other studies indicate that biodegradation in natural environments may not occur at significant rates. In most soil/ground water systems, the concentration of microorganisms capable of biodegrading chemicals such as 2,4-dimethylphenol is very low and drops off sharply with increasing depth. Thus, biodegradation in the soil/ground water system should be assumed to be of minimal importance except, perhaps, in landfills with active microbiological populations.

Naphthalene may move through the soil/ground water system when present at low concentrations (dissolved in water and sorbed on soil) or as a separate organic phase (resulting from a spill of significant quantities of the chemical). in general, transport pathways of low soil concentrations can be assessed by equilibrium partitioning. These calculations predict the partitioning of naphthalene among soils particles, soil water and soil air. The portions of naphthalene associated with the water and air phases of the soil are more mobile than the adsorbed portion.

The estimates for the unsaturated topsoil model indicate that most of the naphthalene (99%) is expected to be sorbed to the soil. Only a small amount (0.5%) will be present in the soil water phase and available to migrate by bulk transport, dispersion, and diffusion. Very little naphthalene will be in the gaseous phase of the soil (<0.1%).

In saturated, deep soils (containing no soil air and negligible soil organic carbon), a higher fraction of the naphthalene (20%) is expected to be present in the soil-water phase and transported with flowing ground water.

The mobility of naphthalene in the soil/ground water system (and its eventual migration into aquifers) is strongly affected by the extent of its sorption soil particles. In general, sorption on soils is expected to :

increase with increasing soil organic matter content,
increase slightly with decreasing temperature,
increase moderately with increasing salinity of the soil water, and
decrease moderately with increasing dissolved organic matter content of the soil water.

Retardation factors, which represent the ratio of the interstitial water velocity to the pollutant velocity in the soil, have been reported for naphthalene under various conditions. In soil columns containing approximately 2% organic carbon, one study found a retardation coefficient of 23. Another study found retardation factors of 16 to 62 in river sediment (1-2% organic carbon), 2.5-31 in an aquifer close to the river bed (0.1-1% organic carbon), and 1-2.5 in an aquifer far from the river bed (<0.1% organic carbon). Some retardation of naphthalene occurs in soils having 1-2% organic carbon, and little or no retardation occurs in deep soils with an organic carbon content of less than 0.1%.

Transport of naphthalene vapors through the air-filled pores of unsaturated soils is a potentially important transport mechanism for near-surface soils. In general, important soil and environmental properties influencing the rate of volatilization include soil porosity, temperature, convection currents and barometric pressure changes; important physicochemical properties include the Henry's Law constant, the vapor-soil sorption coefficient, and, to a lesser extent, the vapor phase diffusion coefficient.

Volatilization of naphthalene from aqueous solution has been reported to be a significant removal process with rates dependent on current and wind velocities. There are no data from laboratory or field tests showing actual soil volatilization rates for naphthalene; sorption of the naphthalene vapors on the soil may slow the vapor phase transport.

The Henry's Law constant which provides an indication of a chemical's tendency to volatilize from solution, increases significantly with increasing temperature. Moderate increases in Henry's Law constant are also observed with increasing salinity due to a decrease in naphthalene's solubility.

The persistence of naphthalene in soil/ground water systems is not well documented. In most cases, it should be assumed that the chemical will persist for months to years (or more). Naphthalene that has been released into the air will eventually undergo photochemical oxidation.

Naphthalene under normal environmental conditions is not expected to undergo hydrolysis. Furthermore, naphthalene is not expected to be susceptible to oxidation or reduction reactions in the soil/ground water environment. photolysis of naphthalene in surface soils may occur due to the high absorptivities of the compound in the UV/VIS range; however, no specific data were available.

Naphthalene has been reported to be readily susceptible to aerobic biodegradation after an initial period of acclimation. However, the rate and extent of degradation vary considerably depending on environmental conditions. Certain pure and mixed cultures can apparently degrade naphthalene under environmental conditions. Biodegradation in acclimated wastewater treatment plants would be expected to be relatively easy based on some studies. Other studies have demonstrated biodegradation in aqueous systems located near industrial sources of naphthalene; the highest degradation rates were reported in soil-polluted areas or areas receiving continuous input of naphthalene.

Naphthalene does occur in most soils, and soil microbes have been shown to degrade (aerobic) some PAHs. Studies report that biological processes were responsible for the "elimination" of naphthalene during infiltration of river water to ground water. However, in most soil/ground water systems such aerobic degradation would be a minimal importance because of the low concentration of microorganisms (at depth) and the low dissolved oxygen (anaerobic) conditions. No data are available on the possibility of anaerobic biodegradation.

E.4.2 Groundwater Contaminant Transport at SEAD-25

Introduction

A solute transport model was used to simulate groundwater contaminant transport at SEAD-25. Groundwater contaminant transport involves many complex processes including dispersion, advection, adsorption, and anaerobic and aerobic degradation. Depending upon the availability of site data and the understanding of the aquifer system, overlying assumptions may need to be incorporated to model the system. For instance, adsorption may be ruled out if the site data indicates that organic carbon is not present in the aquifer materials, or conversely, a default value may be applied if the aquifer materials are well characterized but no organic carbon data is available.

Groundwater transport modeling was used at SEAD-25 to address the following:

1. The maximum extent of migration of the dissolved contaminant plume over time if no engineered controls or further source reduction measures are implemented at the site (the no-action alternative); or
2. The time required to naturally attenuate the dissolved groundwater concentrations and the source zone contaminants.

The results of the groundwater transport modeling and additional supporting data (i.e., isopleth maps for dissolved oxygen, nitrates, and oxygen reduction potential) will be used to determine if a natural attenuation field program should be considered at SEAD-25 as a remedial action alternative to quantify the natural attenuation occurring at the site.

The primary contaminants detected in soils and groundwater at SEAD-25 are BTEX and chlorinated compounds. The BTEX plume contains the highest groundwater concentrations and extends the farthest from the source area (the fire training pad). A chlorinated hydrocarbon plume was found to be less extensive at lower concentrations than the BTEX plume. As a result, the groundwater transport modeling was applied using the BTEX soil (source zone) and groundwater monitoring data. To further simplify the approach, contaminant transport was modeled as benzene. Benzene has the lowest Koc and the highest solute half-life of the BTEX compounds and therefore incorporates a conservative approach to the modeling. The source zone consists of the area bounded by the fire training pad as shown in Figure 4-2 of the RI. The plume length was estimated from the groundwater BTEX isocontours shown in Figure 4-3 of the RI.

Another simplifying assumption is that the aquifer is more or less homogeneous with isotropic flow conditions. Unconsolidated materials at SEAD-25 are described in Section 3.0 of RI as glacial till with an average thickness of 4.7 feet. The till is characterized by silts and clay with a small percentage of fine to medium sands and shale. Some fill material was found at the fire training pad. The hydraulic conductivities in the till overburden ranged from 1.0 x 10^{-5} cm/sec to 3.4 x 10^{-3} cm/sec. There was no significant vertical flow component identified at SEAD-25.

Discussion of BIOSCREEN Model

BIOSCREEN was selected to model the transport of groundwater contaminants at SEAD-25. It was developed for the Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division by Groundwater Services, Inc. BIOSCREEN is based on the Domenico analytical solute transport model and has the ability to simulate advection, dispersion, adsorption, and aerobic and anaerobic degradation processes. (See Appendix I for a further discussion of the model attributes, assumptions and limitations). The model assumes a fully-penetrating vertical plane source oriented perpendicular to groundwater flow to simulate the release of organics to moving groundwater. Three different model types are simulated by BIOSCREEN:

1. Solute transport without decay,
2. Solute transport with biodegradation modeled as a first-order decay process (simple, lumped-parameter approach),
3. Solute transport with biodegradation modeled as an "instantaneous" biodegradation reaction.

BIOSCREEN incorporates a number of simplifying assumptions and was designed primarily as a screening tool. The BIOSCREEN model may be used to determine if a natural attenuation program should be considered for a site. This model was selected to evaluate the effects of natural attenuation on BTEX in groundwater because of the lack of sufficient data to perform more complex modeling efforts. BIOSCREEN is not intended to be a substitute for detailed mathematical models or for making a final selection of remedial action alternatives. Taking into account these limitations, the model results serve as an initial indicator of the potential for natural attenuation to meet the remedial action objectives established for SEAD-25.

BIOSCREEN uses a simple mass balance approach to estimate the source zone concentration over time based on the mass of dissolved hydrocarbons in the source zone and the rate of hydrocarbons leaving the source zone.

BIOSCREEN relies on specific input parameters to simulate the three model types. Parameters such as seepage velocity may be calculated by the model based upon site specific data such as hydraulic conductivity, hydraulic gradient and effective porosity or the model provides both default values and/or literature sources for input parameters where site data is not available.

The model output for solute transport with no decay uses dispersion in the longitudinal, transverse, and vertical directions as the only attenuation mechanisms. This model is most appropriate for non-degrading solutes such as chlorides. This model is incorporated for comparison purposes to the other two model types to show the relative effects of no biodegradation to biodegradation on the contaminant plume.

The solute transport with first-order decay model type uses a first-order decay coefficient to account for biological degradation as well as dispersivity and adsorbtion factors. The first order decay coefficient is calculated by the model using the relationship shown in Appendix I of the RI from the solute half-life input or the decay coefficient may be input directly if it is known. Dispersivity is calculated as a function of plume length using the relationships shown in Appendix I of the RI. The first order decay coefficient can be used to calibrate the model if solute concentrations from downgradients wells are known. Adsorption is a function of soil bulk density, chemical specific partitioning coefficient, and the fraction of organic carbon. These values may be estimated from literature if site specific data are not available. The first-order decay model does not account for the availability of electron acceptors and does not assume any biodegradation of dissolved constituents in the source zone.

The "Instantaneous" reaction model incorporates electron acceptor and by-products information into the model using a superposition method where contaminant mass concentration in any part of the flowfield is corrected by assuming that for each 3 mg/l of oxygen, 1 mg/l of organic mass is consumed. Similarly, nitrate, sulfate, ferric iron, and methane concentrations are used to model anaerobic biodegradation capacity by using a proportional mass degradation rate based upon the ratio of each electron acceptor to contaminant mass. This model incorporates degradation of the contaminant mass in the source. (See Appendix I of the RI for a more detailed description of the superposition formula and algorithms used in this model type).

Model Input Parameters

Table E-6 summarizes the data input values for the BIOSCREEN model. The total soluble mass in the source area was estimated from BTEX soil sampling data. Round 1 groundwater data were used to calibrate the model. Electron acceptor site data was available for nitrate, oxygen, and ferric iron. Sulfate data was used from the Ash Landfill at the SEDA. Methane data was estimated from the methane data provided in the BIOSCREEN user's manual.

Table E-6
BIOSCREEN Model Input Parameters
SEAD-25

Data Type	Parameter	Value	Units	Data Source
Hydrogeology	Hydraulic Conductivity	2.20E-04	cm/sec	Slug test data from 13 wells
	Hydraulic Gradient	0.02	ft/ft	Calculated from on-site well measurements
	Porosity (effective)	0.2		Estimated from total porosity measurements
Dispersion	Original:			
	Longitudinal Dispersivity	10.4	ft	Calculated by Model
	Transverse Dispersivity	1	ft	Calculated by Model
	Vertical Dispersivity	0	ft	Calculated by Model
	Plume Length	180	ft	Distance from plume center to "toe"
	After Calibration:			
	Longitudinal Dispersivity		ft	na
	Transverse Dispersivity		ft	na
	Vertical Dispersivity		ft	na
Adsorption	Retardation Factor	1.3		Calculated by Model
	Soil Bulk Density	1.65	kg/L	Site Specific Data
	foc	0.0008		Site data and BIOSCREEN User's Manual
	Koc (Benzene)	38		Provided by BIOSCREEN
	Koc (Toluene)	135		Not used
	Koc (Ethylbenzene	95		Not used
	Koc (Xylenes)	240		Not used
Biodegradation	First Order Decay Coeff.	3.5	yr-1	calculated by model using solute half-life
	solute half-life	0.2	yr	estimated from literature and calibrated to on-site data
	Electron Acceptor:	O2		
	Background Concentration	3.42	mg/L	Site Data
	Minimum Concentration	0.14	mg/L	Site Data
	Change in Concentration	3.28	mg/L	calculated
	Electron Acceptor:	NO3		
	Background Concentration	0.16	mg/L	Site Data
	Minimum Concentration	0.005	mg/L	Site Data
	Change in Concentration	0.15	mg/L	calculated
	Electron Acceptor:	SO4		
	Background Concentration	46.4	mg/L	Ash Landfill Data
	Minimum Concentration	na	mg/L	
	Change in Concentration	46.3	mg/L	BIOSCREEN User's Manual
	Electron Acceptor:	Fe		
	Maximum Concentration	5.3	mg/L	Site Data
	Average Concentration	4.9	mg/L	Site Data

Table E-6
BIOSCREEN Model Input Parameters
SEAD-25

Data Type	Parameter	Value	Units	Data Source
	Electron Acceptor:	CH4		
	Maximum Concentration	22.4	mg/L	BIOSCREEN User's Manual
	Average Concentration	6.6	mg/L	BIOSCREEN User's Manual
General	Model Area Length	300	ft	Estimated area affected by plume
	Model Area Width	140	ft	Estimated area affected by plume
	Simulation Time	20	years	Estimated time since release
		40	years	Random
Time = 0 years	Source Concentration			Used to calibrate the model to 1995 data
	Zone 3 width	64	ft	
	Zone 3 Source Conc.		mg/L	na
	Zone 2 width	8	ft	
	Zone 2 Source Conc.		mg/L	na
	Zone 1 width	12	ft	
	Zone 1 Source Conc.		mg/L	na
Time = 20 years	Source Concentration			
	Zone 3 width	64	ft	Estimated From Soil Sampling Locations [1]
	Zone 3 Source Conc.	1.7	mg/L	BTEX Soils Data [2]
	Zone 2 width	8	ft	Estimated From Soil Sampling Locations [1]
	Zone 2 Source Conc.	0.28	mg/L	BTEX Soils Data [2]
	Zone 1 width	12	ft	Estimated From Soil Sampling Locations [1]
	Zone 1 Source Conc.	0.03	mg/L	BTEX Soils Data [2]
Actual Site Data	Distance from Source	0	ft	
	BTEX Concentration	3	mg/L	Monitoring Well MW25-2
	Distance from Source	83	ft	
	BTEX Concentration	0.165	mg/L	Monitoring Well MW25-9
	Distance from Source	178	ft	
	BTEX Concentration	0	mg/L	Monitoring Well MW25-15
Source Data Time = 0 years	Total Soluble Mass	14	kg	Calculated by Model Using Mass Balance Approach
Time = 20 years	Total Soluble Mass	12.5	kg	Site Soil Sampling Data
Source Data	Source Thickness	2.5	ft	Average saturated thickness of Fire Training Pad

Notes:
1. The source zone widths were determined by measuring the contours of the BTEX isopleths shown in Figure 4-3. Refer to the BIOSCREEN User's Manual for the methodology.
2. Because a decaying source was used, the source concentration on the input screen (representing concentrations 20 years ago) were adjusted so the source concentration on the centerline output screen (representing concentrations now) were equal to 3 mg/L.

Model Results

Three model simulations were performed. The simulations were as follows:

1. Calibration Simulation;
2. Predictive Simulation 20 years from 1995; and
3. Predictive Simulation 100 years from 1995.

The first simulation was a calibration run. In this run, the goal was to show that, using reasonable input parameters, the model could reproduce the concentrations in the existing plume (in 1995), assuming that the release occurred 20 years ago (in 1975). This is the estimated time since the initial release based upon available historical operating data for the SEAD-25. The second and third runs evaluated the plume concentrations at 20 years and 100 years from the existing plume conditions (in 1995). All three model types (no degradation, 1st order decay, and instantaneous reaction) were evaluated for SEAD-25 using site specific data from round 1 of the RI.

Calibration Simulation

The calibration involved matching two separate criteria, which were 1) the source mass of BTEX in the plume in 1995, and 2) the dissolved plume concentrations that existed in 1995, both of which were based on data from the RI. Both the source zone mass in soil and the dissolved plume concentrations are expected to have been higher when the release occurred approximately 20 years ago at SEAD-25. During these model runs, a 1st order degradation coefficient that was consistent with those cited in literature was derived. Initially, through trial and error, the source mass (i.e., source zone half-life) was adjusted until after 20 years the resulting mass in the source closely matched the source mass determined using the RI soil samples. After, this was done, the solute source zone concentrations were adjusted slightly until after 20 years the solute concentrations best fit the groundwater concentrations in the plume in 1995. Note that during the calibration, the solute first order decay coefficient (lambda) was initially selected based on values cited in literature. The solute decay rate used in the calibration of the model was 0.92/yr (or 0.002/day), which is consistent with the median decline rate of 0.002/day (based on hundreds of sites in Texas) cited in "*Anaerobic Biodegradation of Organic Chemicals in Groundwater: A Summary of Field and Laboratory Studies*", prepared by Dallas Aronsen and Phillip Howard, Environmental Science Center, Syracuse Research Corporation, North Syracuse, NY, prepared for American Petroleum Institute, Washington, D.C.

The output from the 20 year calibration simulation for the no degradation model showed a plume concentration of nearly constant concentration moving away from the source with very little reduction in concentration at 300 feet from the source along the plume centerline. Conversely, it was evident from these initial model runs that the instantaneous reaction model did not fit the site data, because this model showed that the plume was completely degraded after 4 years, which clearly does not represent the site conditions in 1995. The first-order reaction model, however, fit the actual site plume data well. The model output includes a plume array function and mass balance calculations based on the input data. Figure E-1 and Figure E-2 show the "input screen" and "centerline output", respectively, for the 20 year simulation. Figure E-3 shows the BIOSCREEN array concentration output for the 20 year simulation at SEAD-25. The mass balance shows the actual plume mass as 0.1 Kg BTEX as benzene. BIOSCREEN indicated that the plume under no degradation scenario would contain 1.4 Kg BTEX. Therefore, it calculated a 93% reduction in plume mass by biodegradation. Most of the source mass believed to be in place in 1975 is still there in 1995 (14 Kg vs. 12.6 Kg or 90% left).

To ensure that a conservative approach was being used to model the plume, BIOSCREEN was run again using the only available temporal data from the site, round 2 groundwater data. The round 2 ground water sampling indicated that solute source zone concentration (zone 3 in the model) was almost two times as high as it was in round 1 (3 ppm for round 1 compared to 6.2 ppm for round 2). BIOSCREEN was run again using the new solute source term in zone 3. The results showed that a shorter half-life (or larger 1st order degradation coefficient) was needed to calibrate the model to the Round 2 site data along the centerline of the plume. Thus, the model results from the round 1 data established a more conservative 1st order degradation rate for the site.

The following conclusions were drawn from the calibration results:

- The first-order decay model showed the best fit with the existing conditions for the three centerline monitoring wells at SEAD-25. The first-order decay model does not incorporate a decaying source and the rate of removal from the source area is a function of mass removal as the solute leaches from the source area and starts degrading immediately downgradient of the source.
- The instantaneous reaction model did not correlate with the site groundwater data.
- The non-degrading model shows that the concentrations of BTEX (as benzene) in downgradient wells will steadily decrease farther away from the source with a constant source concentration for the 20 year simulations.
- The model results are probably somewhat conservative estimates of solute transport and solute decay in the plume since the K_{oc} and source-half life for benzene were used to model all BTEX constituents. The K_{oc} value for benzene is lower than toluene, ethylbenzene, or xylenes and would overestimate the mobility of the other BTEX compounds since they have a greater affinity for the organic carbon fraction of the soil. The decay rate, or half life, of benzene is greater than the half-lives of the other BTEX compounds and would result in an over estimation of the time for the dissolved BTEX compounds to decay in the aquifer.

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.3

SEAD-25
SEDA - Cal run 20 yrs
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or 2. Calculate by filling in grey
0.02 cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.
20 → Value calculated by model (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	30.3	(ft/yr)
or		or	
Hydraulic Conductivity	K	2.2E-04	(cm/sec)
Hydraulic Gradient	i	0.02	(ft/ft)
Porosity	n	0.15	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	10.4	(ft)
Transverse Dispersivity*	alpha y	1.0	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	180	(ft)

3. ADSORPTION

Retardation Factor*	R	1.3	0
or		or	
Soil Bulk Density	rho	1.65	(kg/l)
Partition Coefficient	Koc	38	(L/kg)
FractionOrganicCarbon	foc	6.00E-04	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	9.2E-1	(per yr)
or		or	
Solute Half-Life	t-half	0.75	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	3.28	(mg/L)
Delta Nitrate*	NO3	0.15	(mg/L)
Observed Ferrous Iron*	Fe2+	4.9	(mg/L)
Delta Sulfate*	SO4	46.3	(mg/L)
Observed Methane*	CH4	6.6	(mg/L)

5. GENERAL

Modeled Area Length*	300	(ft)
Modeled Area Width*	180	(ft)
Simulation Time*	20	(yr)

L W

6. SOURCE DATA

Source Thickness in Sat.Zone* 2.5 (ft)

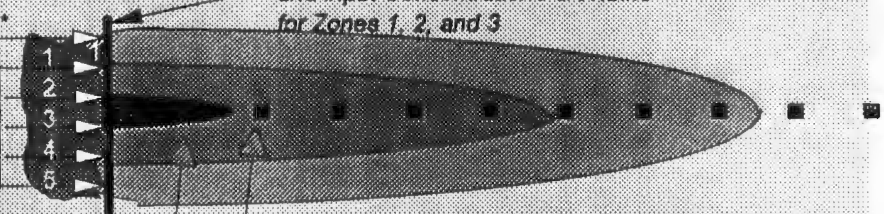
Source Zones:

Width* (ft)	Conc. (mg/L)*
12	0.03
8	0.28
64	3.4
8	0.28
12	0.03

Source Decay (see Help):

SourceHalflife*	10 - 100	(yr)
Soluble Mass	or	
In NAPL, Soil	14	(Kg)

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations at Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	3.0			.165			.005				
Dist. from Source (ft)	0	30	60	90	120	150	180	210	240	270	300

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE

View Output

RUN ARRAY

View Output

Help

Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

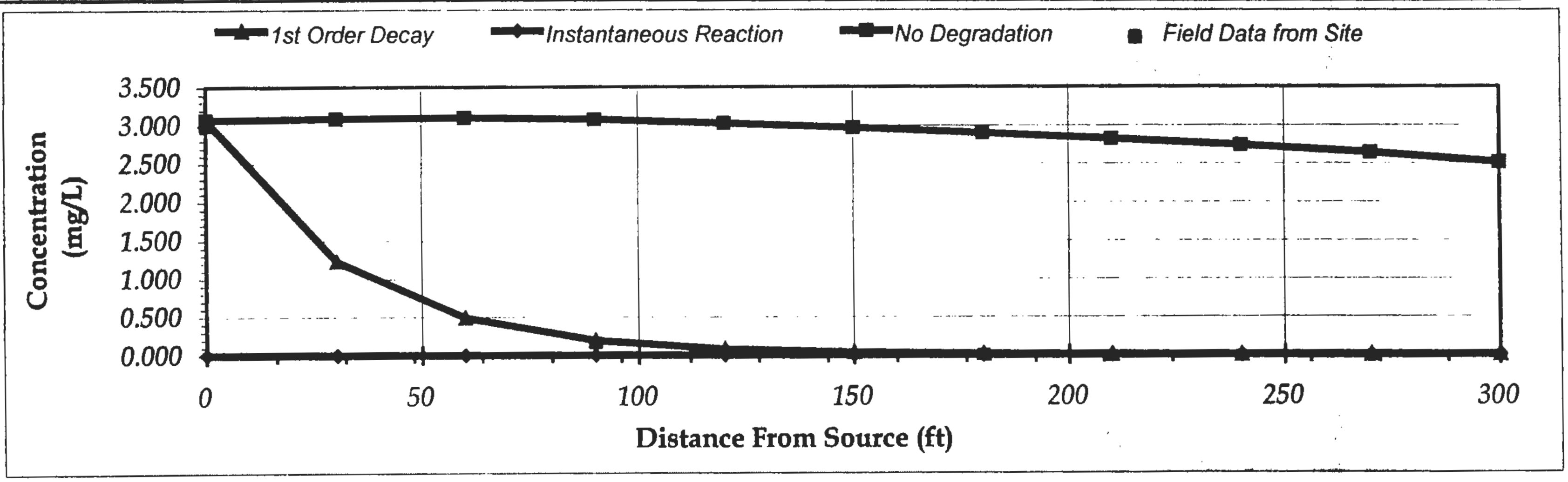
H:\---\seneca\s2526ri\bioscrn\pfm\Calrun20.xls

Figure E-1

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	30	60	90	120	150	180	210	240	270	300
No Degradation	3.069	3.089	3.099	3.076	3.027	2.964	2.894	2.819	2.735	2.635	2.509
1st Order Decay	3.069	1.226	0.488	0.192	0.075	0.029	0.011	0.004	0.002	0.001	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	3.000			0.165			0.005				



Calculate Animation

Time:

20 Years

Return to Input

Recalculate This Sheet

H:\eng\seneca\s2526ri\bioscrn\pfm\Calrun20.xls

Figure E-2

DISSOLVED HYDROCARBON CONCENTRATIONS IN PLUME (mg/L at Z=0)

Transverse Distance (ft) / *Distance from Source (ft)*	0	30	60	90	120	150	180	210	240	270	300
90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
45	0.027	0.088	0.070	0.037	0.017	0.008	0.003	0.001	0.001	0.000	0.000
0	3.069	1.226	0.488	0.192	0.075	0.029	0.011	0.004	0.002	0.001	0.000
-45	0.027	0.088	0.070	0.037	0.017	0.008	0.003	0.001	0.001	0.000	0.000
-90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

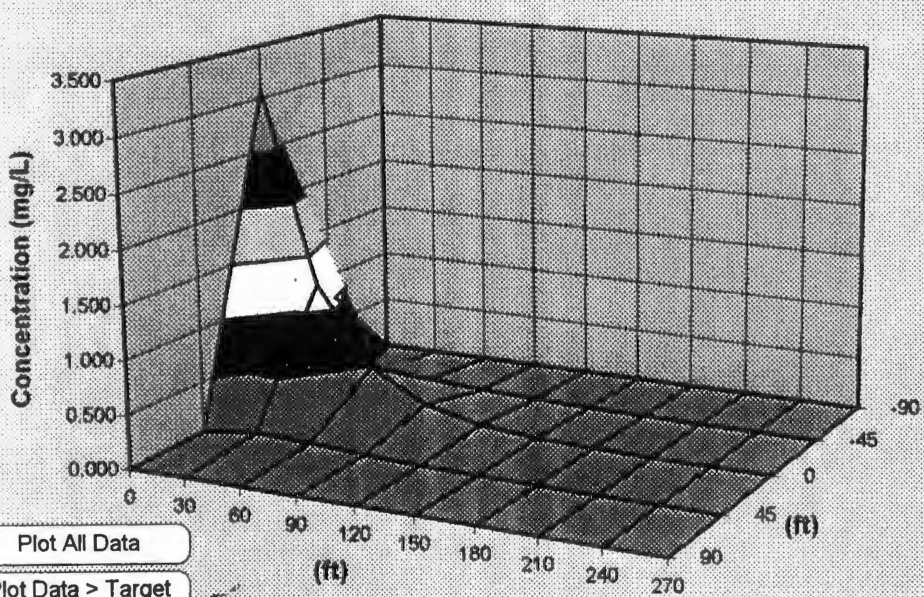
Model to Display:

No Degradation Model

1st Order Decay Model

Instantaneous Reaction Model

Time: **20 Years**   Target Level: **0.005** mg/L   Displayed Model: **1st Order Decay**



Plot All Data

Plot Data > Target

Plume and Source Masses (Order-of-Magnitude Accuracy)

Plume Mass if No Biodegradation	1.4	*(Kg)*
- Actual Plume Mass	0.1	*(Kg)*
Plume Mass Removed by Biodeg	1.3	*(Kg)* (93 %)

Change in Electron Acceptor/Byproduct Masses:

Oxygen	*Nitrate*	*Iron II*	*Sulfate*	*Methane*	
na	na	na	na	na	*(Kg)*

Original Mass in Source (Time = 0 Years)	14.0	*(Kg)*
Mass in Source Now (Time = 20Years)	12.6	*(Kg)*
Current Volume of Groundwater in Plume	0.2	*(ac-ft)*
Flowrate of Water Through Source Zone	0.027	*(ac-ft/yr)*

Mass HELP

Recalculate

H:\--q\seneca\s2526ri\bioscrn\pfm\Calrun20.xls

Figure E-3

- The first-order decay model results are likely to be conservative because the model does not account for decay of the dissolved constituents in the source zone; the model assumes biodegradation starts immediately downgradient of the source, and that it does not depress the concentrations of dissolved organics in the source zone itself.
- The compliance point (0.005 mg/l) for the first-order reaction is approximately 200 feet downgradient of the source along the plume centerline.

Predictive Simulations of Plume

Simulations were also run to represent 20 and 100 years from the current plume conditions (in 1995); these runs were for 40 years and 120 years and they used the same input data as the 20 year calibration simulation. Figures E5-4 and E-5 show the centerline output for these simulation periods. The 20 year simulation showed that the solute source zone concentration decreased and there was a slight shift in the compliance point. The 100 year simulation showed a further reduction in the solute source zone concentration and a shift in the compliance point to 180 feet downgradient along the plume centerline. The model indicates that after 100 years the source zone concentration would decrease to approximately 1.8 mg/l.

Based upon USEPA comments, it is the opinion of the USEPA that the BIOSCREEN model results cannot be used to predict past or future concentrations of contaminants on the site since data are available for only one time period. USEPA states that, the model cannot be calibrated for temporal variation, therefore, it is not possible to realistically assess natural attenuation using this modeling effort.

Additionally, it is also the opinion of the USEPA that because of the many assumptions made regarding the input parameters to the model and the very limited set of site data which were used, the model results should be considered to represent only unverified extrapolations to possible past and future conditions at the site. They further state that it would be inappropriate to use any numerical estimates of future plume size or time to degradation which are generated by the model.

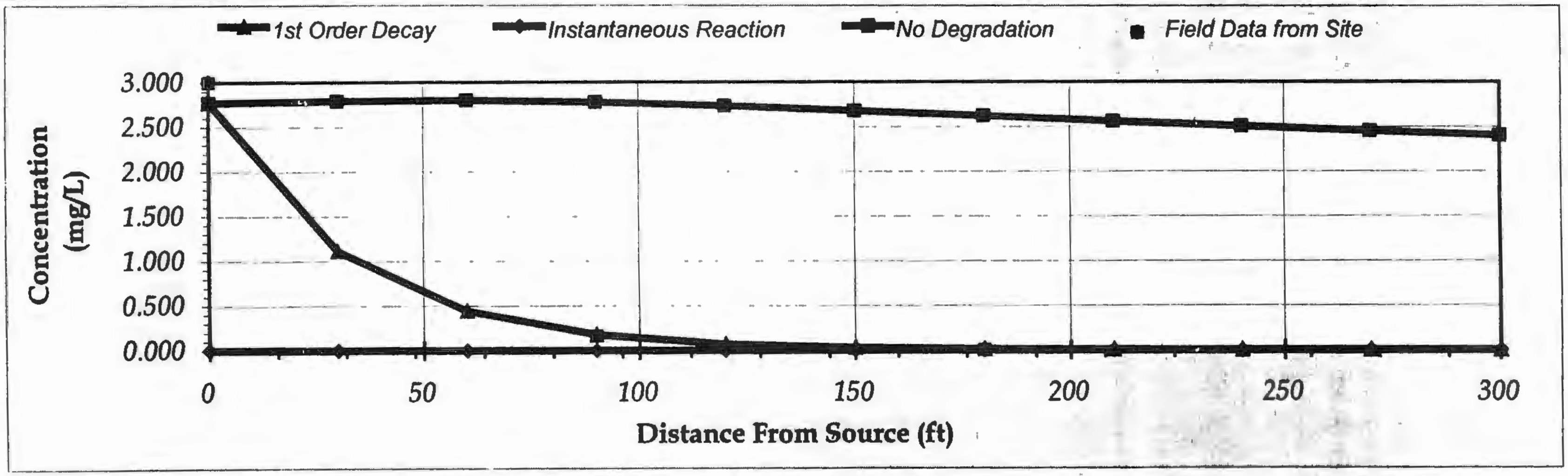
Additional Data Supporting Biodegradation

Additional site characterization data are available that support the validity of the BIOSCREEN modeling results, and provide sufficient evidence that biodegradation is occurring at SEAD-25. Site characterization includes an analysis of site-specific data and preparation of the following items: geologic logs, hydrogeologic sections, potentiometric surface maps and flow nets, contaminant contour maps, electron acceptor and metabolic byproduct contour maps, calculation of hydraulic parameters, retardation coefficients, and anaerobic degradation rate constants.

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	30	60	90	120	150	180	210	240	270	300
No Degradation	2.770	2.788	2.797	2.776	2.733	2.677	2.618	2.559	2.502	2.448	2.397
1st Order Decay	2.770	1.107	0.441	0.174	0.068	0.026	0.010	0.004	0.002	0.001	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	3.000			0.165			0.005				



Calculate Animation

Time:

40 Years

Return to Input

Recalculate This Sheet

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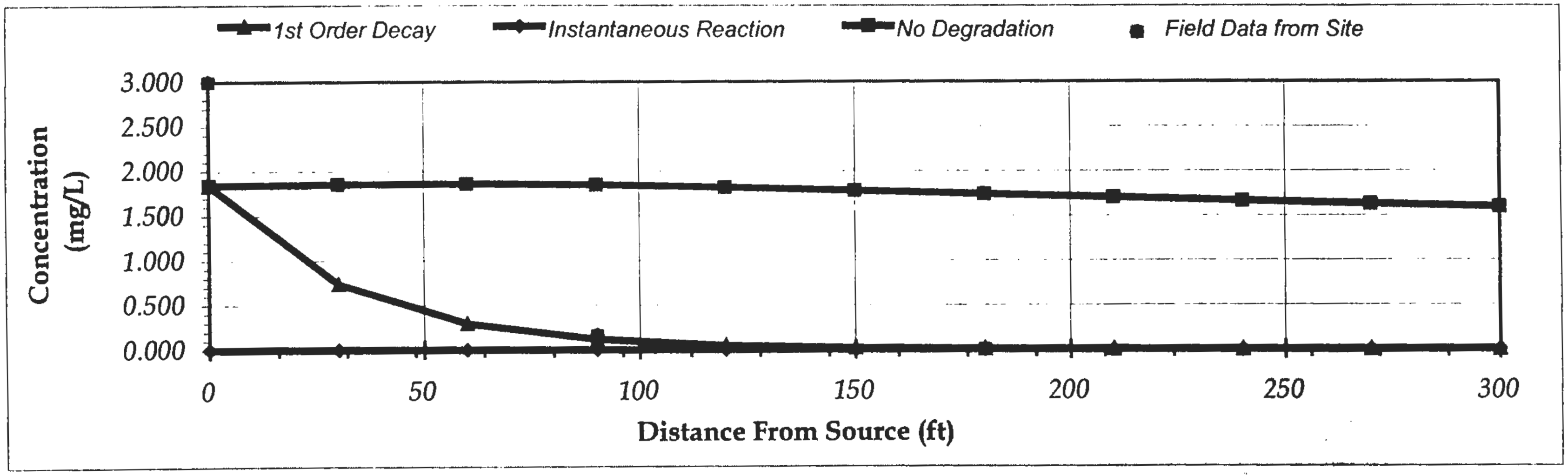
Figure E-4

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

Distance from Source (ft)

TYPE OF MODEL	0	30	60	90	120	150	180	210	240	270	300
No Degradation	1.838	1.850	1.856	1.842	1.813	1.777	1.737	1.698	1.660	1.624	1.591
1st Order Decay	1.838	0.734	0.292	0.115	0.045	0.018	0.007	0.003	0.001	0.000	0.000
Inst. Reaction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Field Data from Site	3.000			0.165			0.005				



Calculate Animation

Time:

120 Years

Return to Input

Recalculate This Sheet

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Figure E-5

Several of these items including contaminant contour maps have been completed as part of this report. This section will present electron acceptor and oxygen/reduction potential contour maps, which have been prepared on the existing BTEX contour map for the shallow aquifer. It has been shown that the extent and distribution of BTEX contamination relative to the electron acceptors can be used to qualitatively document the occurrence of biodegradation. These contour maps provide evidence, in addition to the BIOSCREEN modeling results, that biodegradation is occurring through the processes of aerobic respiration and denitrification.

A detailed explanation of the biodegradation process is presented in the "*Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater*" by Todd Wiedemeier, John T. Wilson and Donald H. Kampbell, Ross N. Miller and Jerry E. Hansen (Air Force Center for Environmental Excellence,1995). The following discussion of electron acceptors and the oxygen reduction potential in the biodegradation process is from that source.

According to Wiedemeier et. al (1995),

> Fuel hydrocarbons biodegrade naturally when an indigenous population of hydrocarbon-degrading microorganisms is present in an aquifer and sufficient concentrations of electron acceptors and nutrients are available to these organisms.(page B5-4)
>
> During biodegradation, these microorganisms transform available nutrients into forms useful for energy and cell reproduction by facilitating the transfer of electrons from donors to acceptors. This results in oxidation of the electron donor and reduction of the electron acceptor. Electron donors include natural organic material and fuel hydrocarbons. Electron acceptors are elements or compounds that occur in relatively oxidized states. The more important electron acceptors in groundwater include dissolved oxygen, nitrate, iron (III), sulfate, and carbon dioxide. (page B5-2)
>
> Soon after fuel hydrocarbon contamination enters the groundwater system, rapid depletion of dissolved oxygen caused by increased levels of microbial respiration results in the establishment of anaerobic conditions within the dissolved contaminant plume. (page B5-18)
>
> A reduction in dissolved oxygen concentrations within an existing BTEX plume is a strong indication that indigenous bacteria are already established and actively biodegrading fuel contamination through aerobic respiration. In general, dissolved oxygen concentrations will be lower than background levels in groundwater that contains BTEX. (page B5-15)

A contour map showing both dissolved oxygen and BTEX contours has been prepared using available site data from SEAD-25 (Figure E-6). The area with depleted dissolved oxygen corresponds with the area of elevated BTEX concentrations.

According to Wiedemeier et. al (1995) anaerobic biodegradation can occur by denitrification, iron (III) reduction, sulfate reduction, or methanogenesis. In a typical aquifer denitrification typically occurs first, followed by iron (III) reduction, sulfate reduction, and methanogenesis.

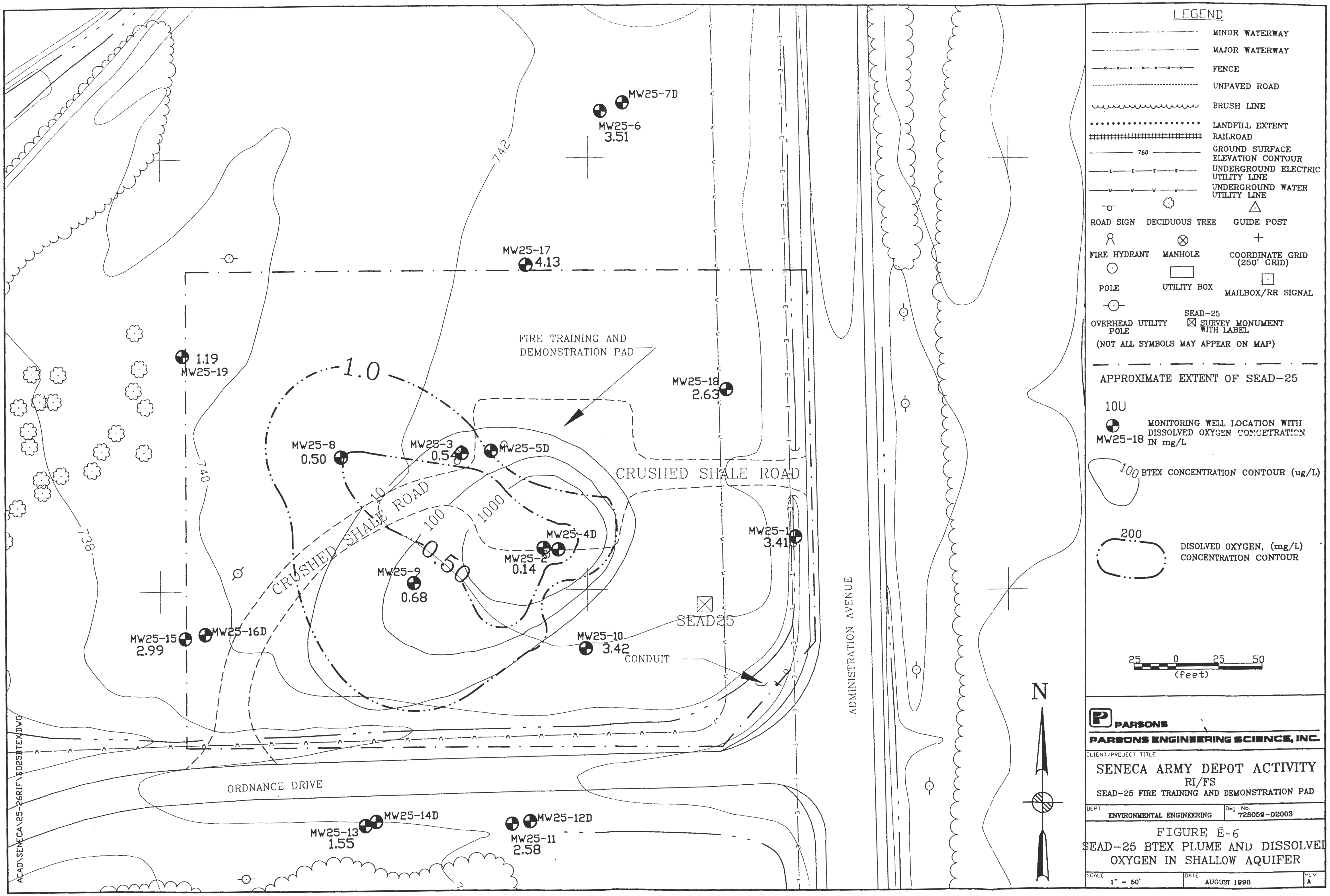
> In areas where denitrification is occurring, there will be a strong correlation between areas with elevated dissolved BTEX concentrations and depleted nitrate concentrations relative to measured background concentrations. The absence of nitrate in contaminated groundwater suggests that nitrate may be functioning as an electron acceptor. Nitrate can only function as an electron acceptor in microbially facilitated BTEX degradation reactions if the groundwater system has been depleted of dissolved oxygen. (page B5-21)

Figure E-7 presents nitrate data from SEAD-25 on the BTEX contour map. This figure shows depleted nitrate concentrations in areas with BTEX contamination. That is, an active zone of anaerobic hydrocarbon biodegradation is present and denitrification is occurring.

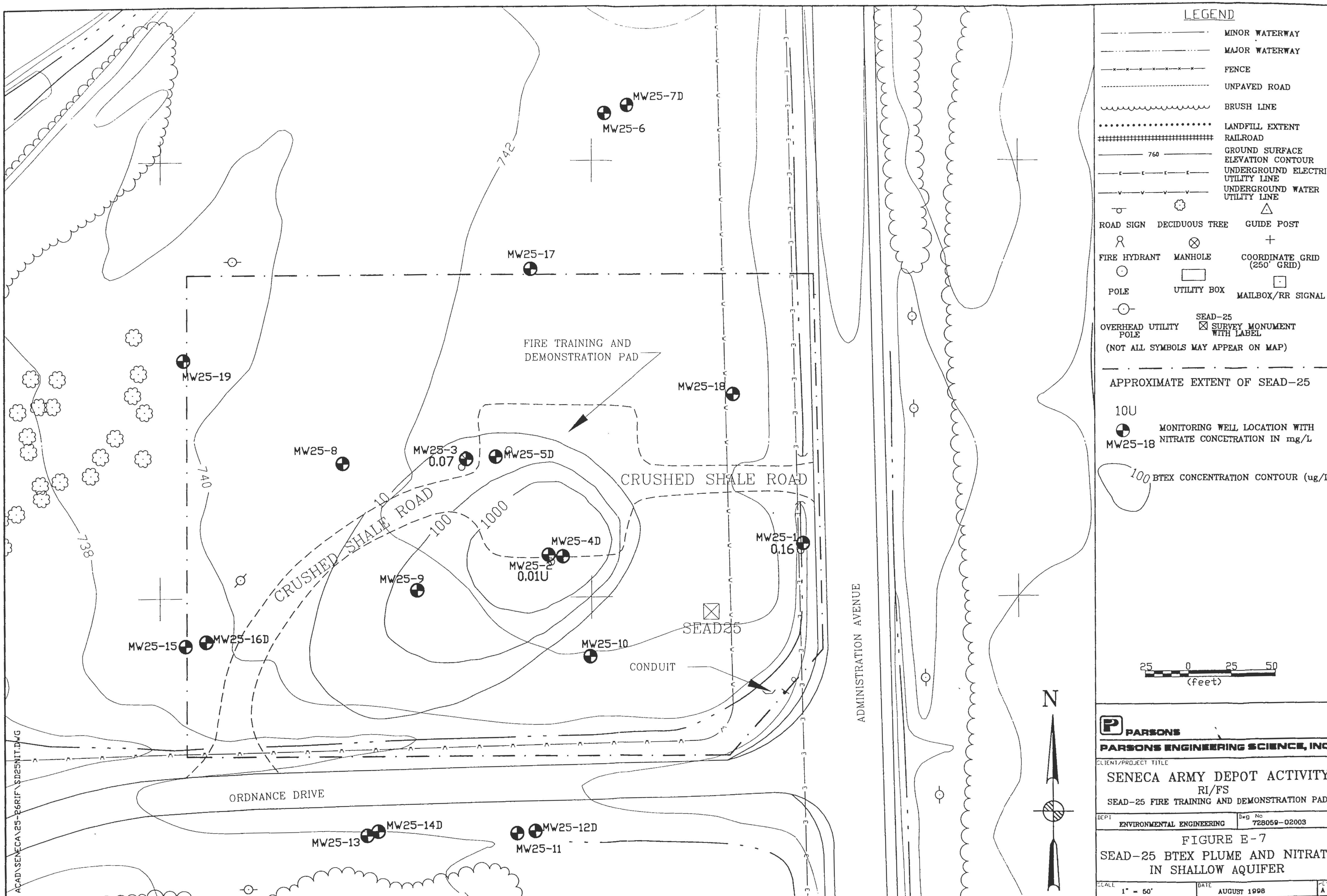
It is now known with a high degree of certainty that BTEX compounds can be degraded in anaerobic groundwater. According to Wiedemeier et al (1995),

> Certain requirements must be met in order for anaerobic bacteria to degrade fuel hydrocarbons including: absence of dissolved oxygen (anaerobic bacteria generally cannot function at dissolved oxygen concentrations greater than about 0.5 mg/L), availability of carbon sources (BTEX), electron acceptors, and essential nutrients; and proper ranges of pH, temperature, salinity, and oxygen/reduction (redox) potential (Eh).(page B5-18)
>
> The oxygen/reduction potential is a measure of the electron activity and is an indicator of the relative tendency of a solution to accept or transfer electrons. As each subsequent electron acceptor is utilized, the groundwater becomes more reducing and the redox potential of the water decreases. Some biological processes operate only within a prescribed range of redox conditions. For example, the reduction of oxygen and nitrate will reduce the oxidizing potential to levels at which iron (III) reduction can occur. The redox potential of groundwater generally ranges from -400 millivolts (mV) to 800 mV. (page B5-12)

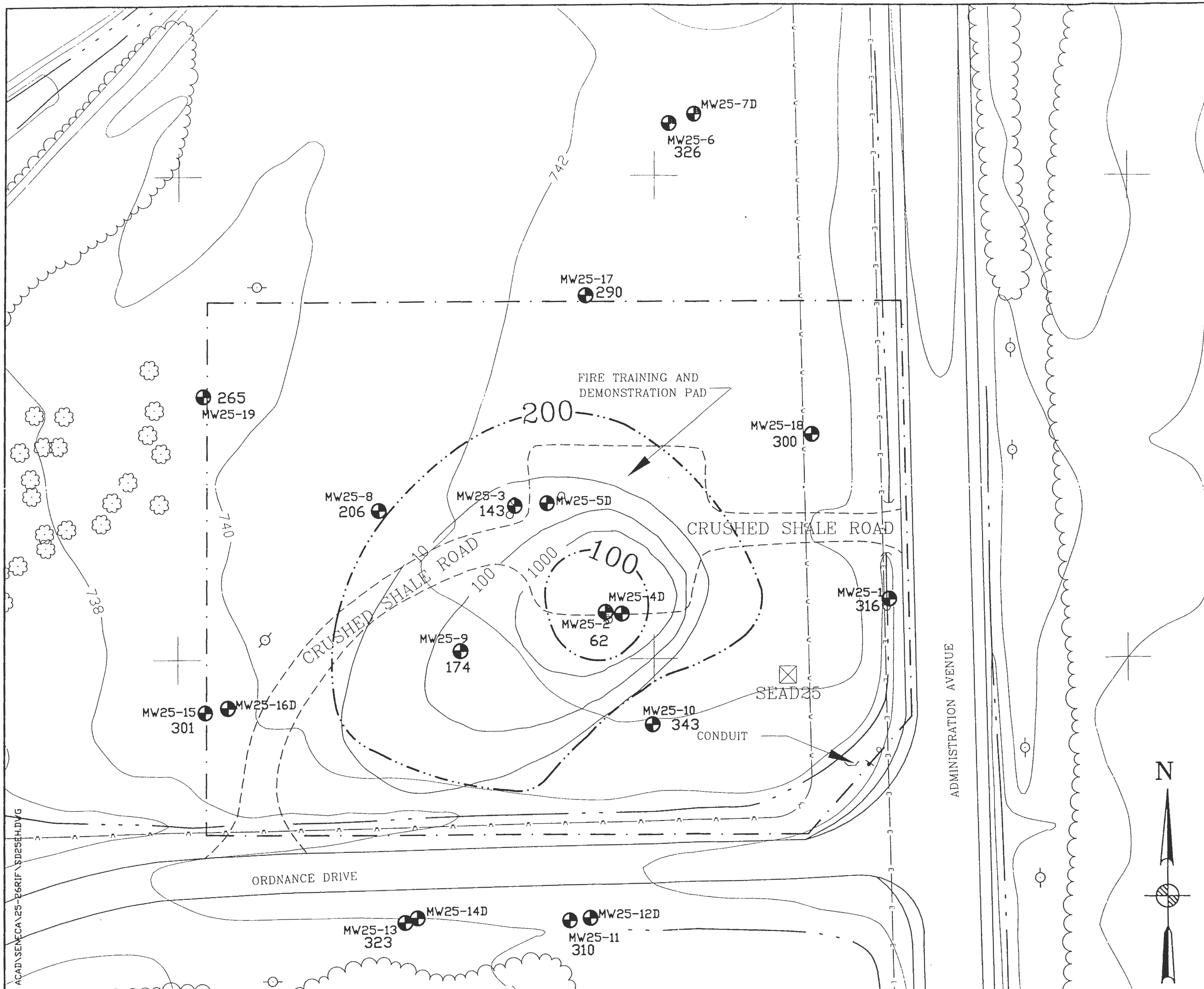
Figure E-8 presents the redox potential contour map for SEAD-25. The redox potential ranges from 62 to 174 millivolts within the boundary of the BTEX plume and ranges from 206 to 343 millivolts outside the BTEX plume.



LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENT
RAILROAD
760
GROUND SURFACE ELEVATION CONTOUR
UNDERGROUND ELECTRIC UTILITY LINE
UNDERGROUND WATER UTILITY LINE
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SEAD-25
SURVEY MONUMENT WITH LABEL
(NOT ALL SYMBOLS MAY APPEAR ON MAP)
APPROXIMATE EXTENT OF SEAD-25
10U
MW25-18
MONITORING WELL LOCATION WITH DISSOLVED OXYGEN CONCETRATION IN mg/L
100
BTEX CONCENTRATION CONTOUR (ug/L)
200
DISOLVED OXYGEN, (mg/L) CONCENTRATION CONTOUR
25 0 25 50
(feet)
N
MW25-7D
MW25-6
3.51
742
740
738
MW25-17
4.13
1.19
MW25-19
FIRE TRAINING AND DEMONSTRATION PAD
1.0
MW25-18
2.63
MW25-8
0.50
MW25-3
0.54
MW25-5D
CRUSHED SHALE ROAD
CRUSHED SHALE ROAD
10
100
1000
0.50
MW25-4D
MW25-2
0.14
MW25-1
3.41
MW25-9
0.68
SEAD25
MW25-15
2.99
MW25-16D
MW25-10
3.42
CONDUIT
ADMINISTRATION AVENUE
ORDNANCE DRIVE
MW25-14D
MW25-13
1.55
MW25-12D
MW25-11
2.58
ACAD\SENECA\25-26RIF\SD25BTEX.DWG
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD
DEPT
ENVIRONMENTAL ENGINEERING
Dwg No.
728059-02003
FIGURE E-6
SEAD-25 BTEX PLUME AND DISSOLVED OXYGEN IN SHALLOW AQUIFER
SCALE
1" = 50'
DATE
AUGUST 1998
REV
A



LEGEND
MINOR WATERWAY
MAJOR WATERWAY
FENCE
UNPAVED ROAD
BRUSH LINE
LANDFILL EXTENT
RAILROAD
GROUND SURFACE ELEVATION CONTOUR
UNDERGROUND ELECTRIC UTILITY LINE
UNDERGROUND WATER UTILITY LINE
ROAD SIGN
DECIDUOUS TREE
GUIDE POST
FIRE HYDRANT
MANHOLE
COORDINATE GRID (250' GRID)
POLE
UTILITY BOX
MAILBOX/RR SIGNAL
OVERHEAD UTILITY POLE
SEAD-25 SURVEY MONUMENT WITH LABEL
(NOT ALL SYMBOLS MAY APPEAR ON MAP)
APPROXIMATE EXTENT OF SEAD-25
10U
MW25-18
MONITORING WELL LOCATION WITH NITRATE CONCETRATION IN mg/L
100 BTEX CONCENTRATION CONTOUR (ug/L)
MW25-7D
MW25-6
742
MW25-17
FIRE TRAINING AND DEMONSTRATION PAD
MW25-19
MW25-18
MW25-8
MW25-3
0.07
MW25-5D
740
CRUSHED SHALE ROAD
CRUSHED SHALE ROAD
10
100
1000
MW25-4D
MW25-2
0.01U
MW25-1
0.16
738
MW25-9
SEAD25
MW25-15
MW25-16D
MW25-10
CONDUIT
ADMINISTRATION AVENUE
ORDNANCE DRIVE
MW25-14D
MW25-13
MW25-12D
MW25-11
ACAD\SENECA\25-26RIF\SD25NIT.DWG
25 0 25 50
(feet)
N
PARSONS
PARSONS ENGINEERING SCIENCE, INC.
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD
DEPT
ENVIRONMENTAL ENGINEERING
Dwg No
728059-02003
FIGURE E-7
SEAD-25 BTEX PLUME AND NITRATE IN SHALLOW AQUIFER
SCALE
1" = 60'
DATE
AUGUST 1998
REV
A



PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
RI/FS
SEAD-25 FIRE TRAINING AND DEMONSTRATION PAD

DEPT.	DWG No
ENVIRONMENTAL ENGINEERING	728059-02003

FIGURE E-8
SEAD-25 BTEX PLUME AND EH IN SHALLOW AQUIFER

SCALE	DATE	REV
1" = 50'	AUGUST 1998	A

E.4.3 Groundwater Contaminant Transport at SEAD-26

Groundwater contaminant transport modeling was performed at SEAD-26 due to the presence of BTEX in at least one well (MW26-7) at the periphery of the fire training pit (source area). The solute transport model was used to assess the following:

1. The maximum extent of migration of the dissolved contaminant plume over time if no engineered controls or further source reduction measures are implemented at the site (the no-action alternative); or
2. The time required to naturally attenuate the dissolved groundwater concentrations and the source zone contaminants.

In order to model the BTEX in groundwater, the following simplifying assumptions were made:

1. To calculate dispersivity, a plume length of 40 feet was assumed. This distance is approximately the distance between MW26-7 and the nearest downgradient well (MW26-3);
2. The groundwater solute transport was modeled as benzene.
3. The source zone (soil) BTEX concentration was assumed to be approximately 10 times the total VOC groundwater concentration measured in MW26-7.
4. The total soluble mass was estimated using the total VOC concentration in MW26-7 and adjusted to fit the first-order decay model results.
5. The aquifer is a fairly homogeneous and isotropic aquifer. The soil boring logs for SEAD-26 indicate that there is fill materials present with varying depths around the site.. The high seepage velocity of 130 ft/yr calculated by BIOSCREEN from the measured average hydraulic conductivity at the site is indicative of the presence of fill materials since this velocity is significantly higher than the till overburden materials found at Seneca.

Discussion of BIOSCREEN Model

The BIOSCREEN model was used to simulate solute transport at SEAD-26. This model was described previously in Section E.4.2. The "instantaneous" reaction model was not used for this model simulation. This was due to the lack of electron acceptor data and the results of the SEAD-25 modeling which showed that the first-order decay model provided the best fit with the on-site groundwater data. Table E-7 summarizes the model input parameters for SEAD-26. The groundwater solute transport was modeled as benzene. Benzene has the lowest Koc of the BTEX compounds.

As stated in Section E.4.2, BIOSCREEN incorporates a number of simplifying assumptions and was designed primarily as a screening tool not as a design or prediction tool. The BIOSCREEN model is appropriate to determine if a natural attenuation program should be considered for a site.

Table E-7

BIOSCREEN Model Input Parameters
SEAD-26

Data Type	Parameter	Value	Units	Data Source
Hydrogeology	Hydraulic Conductivity	6.10E-04	cm/sec	Slug test data from 8 wells
	Hydraulic Gradient	0.02	ft/ft	Calculated from on-site well measurements
	Porosity (effective)	0.15		Estimated from total porosity measurements
Dispersion	Original:			
	Longitudinal Dispersivity	10.4	ft	Calculated by Model
	Transverse Dispersivity	1	ft	Calculated by Model
	Vertical Dispersivity	0	ft	Calculated by Model
	Plume Length	40	ft	Estimated
	After Calibration:			
	Longitudinal Dispersivity		ft	na
	Transverse Dispersivity		ft	na
	Vertical Dispersivity		ft	na
Adsorption	Retardation Factor	1.3		Calculated by Model
	Soil Bulk Density	1.65	kg/L	Estimated
	foc	0.001		Typical, BIOSCREEN Manual
	Koc (Benzene)	38		BIOSCREEN Manual
	Koc (Toluene)	135		BIOSCREEN Manual (Not used)
	Koc (Ethylbenzene	95		BIOSCREEN Manual (Not used)
	Koc (Xylenes)	240		BIOSCREEN Manual (Not used)
Biodegradation	First Order Decay Coeff.	3.5	yr-1	Calculated by model using solute half-life
	solute half-life	0.1	yr	BIOSCREEN Manual (mid-range)
	Electron Acceptor:	O2		
	Background Concentration	0	mg/L	Not used
	Minimum Concentration	0	mg/L	Not used
	Change in Concentration	0	mg/L	Not used
	Electron Acceptor:	NO3		
	Background Concentration	0	mg/L	Not used
	Minimum Concentration	0	mg/L	Not used
	Change in Concentration	0	mg/L	Not used
	Electron Acceptor:	SO4		
	Background Concentration	0	mg/L	Not used
	Minimum Concentration	0	mg/L	Not used
	Change in Concentration	0	mg/L	Not used
	Electron Acceptor:	Fe		
	Maximum Concentration	0	mg/L	Not used
	Average Concentration	0	mg/L	Not used

Table E-7

BIOSCREEN Model Input Parameters
SEAD-26

Data Type	Parameter	Value	Units	Data Source
	Electron Acceptor:	CH4		
	Maximum Concentration	0	mg/L	Not used
	Average Concentration	0	mg/L	Not used
General	Model Area Length	60	ft	Estimated area affected by BTEX plume
	Model Area Width	50	ft	Estimated area affected by BTEX plume
	Simulation Time	20	years	Estimated time since release
Source Zone				
Time = 20 years	Source Concentration	0.06	mg/l	Monitoring Well MW26-7
Actual Groundwater Data	Distance from Source	40	ft	
	BTEX Concentration	0.001	mg/L	Monitoring Well MW26-3
Source Data				
Time = 0 years	Total Soluble Mass	4	kg	Estimated and adjusted for First-order Model
Time = 20 years	Total Soluble Mass	3.7	kg	Estimated by model
	Source Thickness	5	ft	Average saturated thickness in pit

This model was selected to evaluate the effects of natural attenuation on BTEX in groundwater because of the lack of sufficient data to perform more complex modeling efforts. BIOSCREEN is not intended to be a substitute for detailed mathematical models or for making a final selection of remedial action alternatives. Taking into account these limitations, the model results serve only as an initial indicator of the potential for natural attenuation to meet the remedial action objectives established for SEAD-26.

Discussion of Model Results

The results of the BIOSCREEN model simulation for SEAD-26 are based upon limited data and are considered to be somewhat conservative based upon the underlying assumptions discussed. Figure E-9 shows the input screen and Figures E-10 , E-11 and E-12 show the centerline outputs for 20, 40 and 100 year simulations. The 20-year simulation approximates the current site conditions based upon the estimated time of the initial release at SEAD-26. The first-order decay coefficient was calibrated using the solute half-life value to fit the groundwater data from the nearest downgradient well (MW26-3). The first-order decay model fits only the existing conditions for the two monitoring wells at SEAD-26. The first-order decay model predicts that the solute concentration decreases exponentially to non-detectable concentrations at approximately 50 feet downgradient along the plume centerline. The 40 and 100 year simulations using the same input parameters indicates that the plume length shows the same decay characteristics and that the solute concentrations continue to show non-detectable levels at the nearest downgradient well. The rate of downgradient along the plume centerline. The 40 and 100 year simulations using the same input parameters indicates that the plume length shows the same decay characteristics and that the solute concentrations continue to show non-detectable levels at the nearest downgradient well. The rate of degradation of the groundwater source term is also predicted to degrade very slowly with a concentration of approximately 0.05 mg/l in 40 years and 0.04 mg/l in 100 years. Although the first-order decay model assumes biodegradation of the dissolved constituents in the plume, the first-order decay model does not take into account biodegradation of the soluble mass in soils.

It is the opinion of the USEPA that the model results cannot be used to predict past or future concentrations of contaminants on the site since data are available for only one time period. The model cannot be calibrated for temporal variation, therefore, it is not possible to realistically assess natural attenuation using this modeling effort.

It is also the opinion of the USEPA that because of the many assumptions made regarding the input parameters to the model and the very limited set of site data which were used, the model results should be considered to represent only unverified extrapolations to possible past and future conditions at the site. It would be inappropriate to use any numerical estimates of future plume size or time to degradation which are generated by the model.

BIOSCREEN Natural Attenuation Decision Support System

Air Force Center for Environmental Excellence

Version 1.3

SEAD-26
Seneca Army Depot
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
or 2. Calculate by filling in grey
0.02 cells below. (To restore formulas, hit button below).

Variable* → Data used directly in model.

20 → Value calculated by model. (Don't enter any data).

1. HYDROGEOLOGY

Seepage Velocity*	Vs	129.3	(ft/yr)
or		or	
Hydraulic Conductivity	K	2.5E-03	(cm/sec)
Hydraulic Gradient	i	0.01	(ft/ft)
Porosity	n	0.2	(-)

2. DISPERSION

Longitudinal Dispersivity*	alpha x	3.3	(ft)
Transverse Dispersivity*	alpha y	0.3	(ft)
Vertical Dispersivity*	alpha z	0.0	(ft)
or		or	
Estimated Plume Length	Lp	40	(ft)

3. ADSORPTION

Retardation Factor*	R	1.3	(-)
or		or	
Soil Bulk Density	rho	1.7	(kg/l)
Partition Coefficient	Koc	38	(L/kg)
FractionOrganicCarbon	foc	1.00E-03	(-)

4. BIODEGRADATION

1st Order Decay Coeff*	lambda	6.9E+0	(per yr)
or		or	
Solute Half-Life	t-half	0.10	(year)
or Instantaneous Reaction Model			
Delta Oxygen*	DO	0	(mg/L)
Delta Nitrate*	NO3	0	(mg/L)
Observed Ferrous Iron*	Fe2+	0	(mg/L)
Delta Sulfate*	SO4	0	(mg/L)
Observed Methane*	CH4	0	(mg/L)

5. GENERAL

Modeled Area Length*	60	(ft)
Modeled Area Width*	50	(ft)
Simulation Time*	20	(yr)

6. SOURCE DATA

Source Thickness in Sat.Zone* 5 (ft)

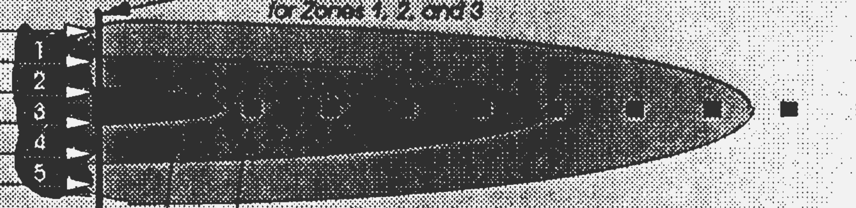
Source Zones:

Zone	Width* (ft)	Conc. (mg/L)*
1	0	0
2	0	0
3	70	0.06
4	0	0
5	0	0

Source Decay (see Help):

SourceHalflife*	200	(yr)
Soluble Mass	or	
In NAPL, Soil	4	(Kg)

Vertical Plane Source: Look at Plume Cross-Section and Input Concentrations & Widths for Zones 1, 2, and 3



View of Plume Looking Down

Observed Centerline Concentrations of Monitoring Wells
If No Data Leave Blank or Enter "0"

7. FIELD DATA FOR COMPARISON

Concentration (mg/L)	.06									.001	0.00
Dist. from Source (ft)	0	6	12	18	24	30	36	42	48	0	6

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | View Output

RUN ARRAY | View Output

Help | Recalculate This Sheet

Paste Example Dataset

Restore Formulas for Vs, Dispersivities, R, lambda, other

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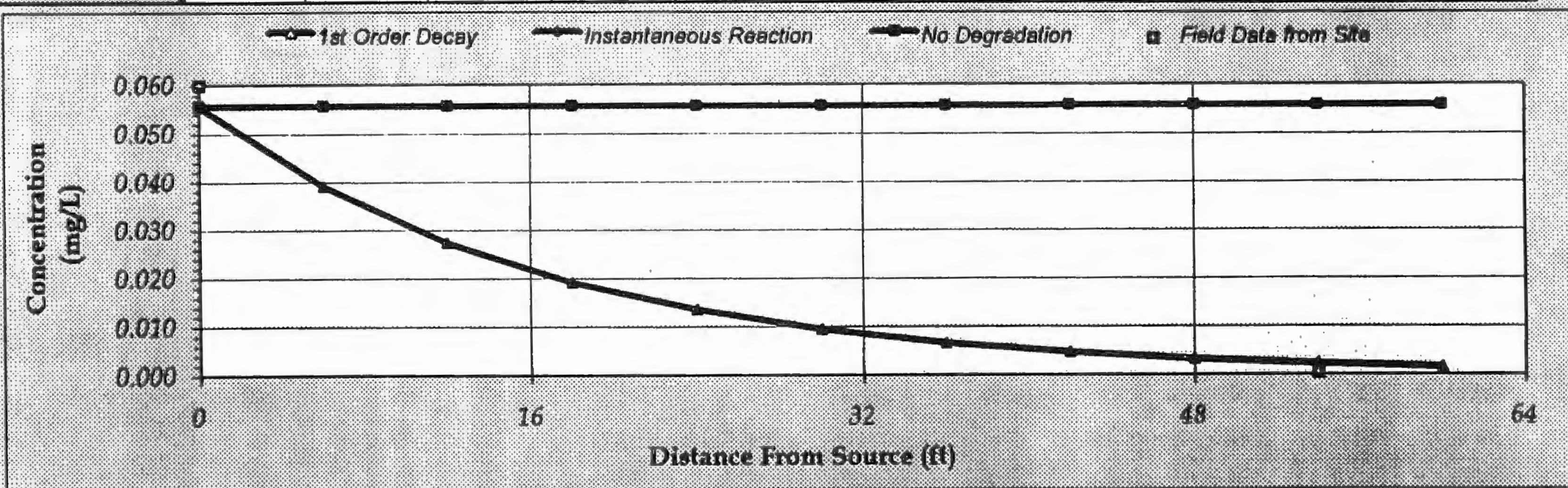
Figure E-9

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

TYPE OF MODEL	Distance from Source (ft)										
	0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056
1st Order Decay	0.056	0.039	0.027	0.019	0.013	0.009	0.007	0.005	0.003	0.002	0.002
Inst. Reaction	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056	0.056
Field Data from Site	0.060									0.001	



Calculate Animation

Time:

20 Years

Return to Input

Recalculate This Sheet

Figure E-10

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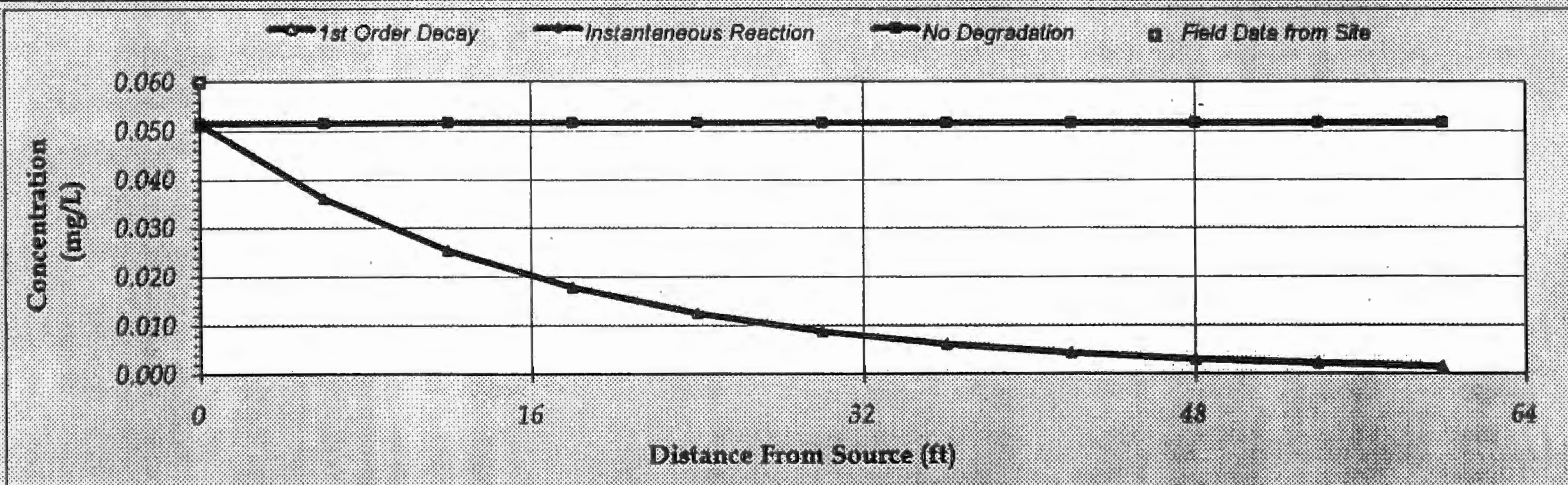
DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.051	0.051	0.051	0.051	0.051	0.052	0.052	0.052	0.052	0.052	0.052
1st Order Decay	0.051	0.036	0.025	0.018	0.012	0.009	0.006	0.004	0.003	0.002	0.001
Inst. Reaction	0.051	0.051	0.051	0.051	0.051	0.052	0.052	0.052	0.052	0.052	0.052
Field Data from Site	0.060										



Calculate Animation

Time:

40 Years

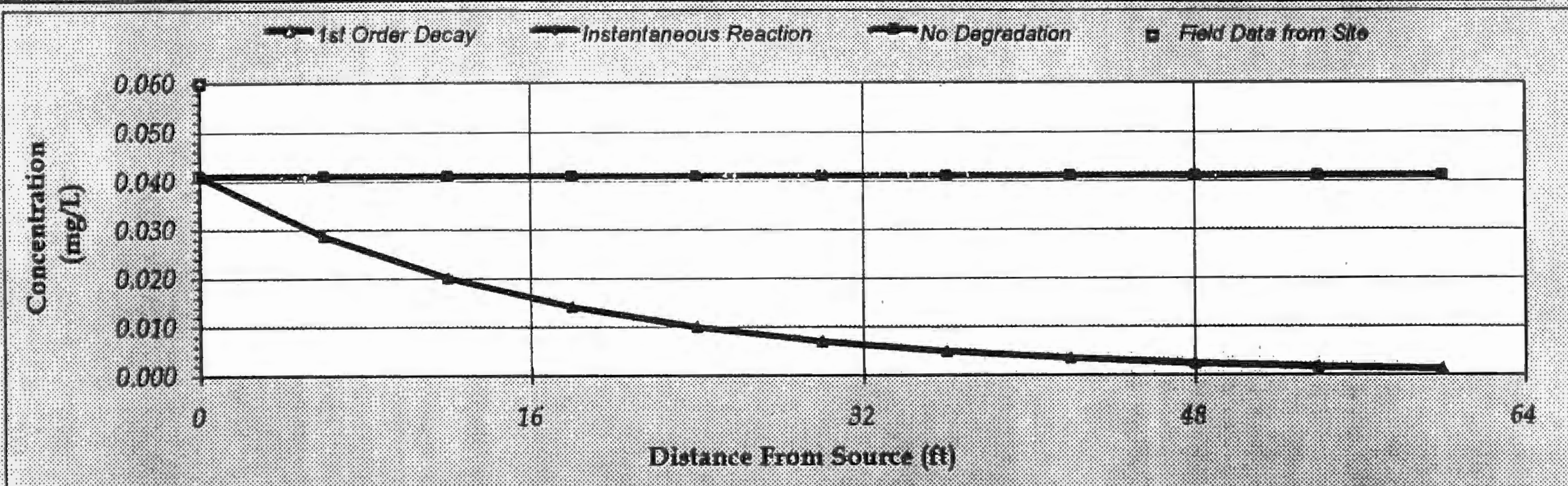
Return to Input

Recalculate This Sheet

Figure E-11

DISSOLVED HYDROCARBON CONCENTRATION ALONG PLUME CENTERLINE (mg/L at Z=0)

	Distance from Source (ft)										
TYPE OF MODEL	0	6	12	18	24	30	36	42	48	54	60
No Degradation	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
1st Order Decay	0.041	0.029	0.020	0.014	0.010	0.007	0.005	0.003	0.002	0.002	0.001
Inst. Reaction	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Field Data from Site	0.060										



Replay Animation

Next Timestep

Prev Timestep

Time:

100 Years

Return to Input

Recalculate This Sheet

Figure E-12

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Appendix F

Sampling Program Analysis Results by Sample Point

Appendix F
SEAD-25 Sampling Program Analysis Results by Sample Point

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

	PARAMETER	LEVEL	SOURCE	UNIT								
				LOC ID:	MW25-1	MW25-1	MW25-1	MW25-1	MW25-10	MW25-10	MW25-11	MW25-11
				SAMP ID:	MW25-4-1	MW25-1-1	MW25-1	25001	MW25-10	25012	MW25-11	25010
				QC CODE:	DU	SA	SA	SA	SA	SA	SA	SA
				STUDY ID:	ESI	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP. DATE:	06-Feb-94	06-Feb-94	22-Nov-95	10-Apr-96	21-Nov-95	31-Mar-96	17-Nov-95	12-Apr-96
					VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
	Volatile Organics											
1	1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
2	1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
3	1,1-Dichloroethene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
4	1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U	10 U	10 U		10 UJ		10 U	
5	2-Butanone		NONE	UG/L	10 U	10 U	10 U	5 UJ	10 UJ	5 UJ	10 UJ	5 U
6	Benzene	0.7	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
7	Bromoform		NONE	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
8	Chloroform	7	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
9	Dibromochloromethane		NONE	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
10	Ethylbenzene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
11	Tetrachloroethene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
12	Toluene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
13	Trichloroethene	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
14	Xylene (total)	5	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
	Semivolatile Organics											
15	2,4-Dimethylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
16	2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
17	2-Methylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
18	3,3'-Dichlorobenzidine		NONE	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 UJ	10 U
19	4-Methylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
20	Fluorene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
21	Naphthalene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
22	Phenanthrene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
23	Phenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	11 UJ	10 U	10 U	10 U
	Pesticides											
24	4,4'-DDD		NONE	UG/L	0.12 U	0.11 U	0.1	0.1 U	0.1 UJ	0.11 U	0.1 U	0.1 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

				LOC ID:	MW25-1	MW25-1	MW25-1	MW25-1	MW25-10	MW25-10	MW25-11	MW25-11
				SAMP ID:	MW25-4-1	MW25-1-1	MW25-1	25001	MW25-10	25012	MW25-11	25010
				QC CODE:	DU	SA	SA	SA	SA	SA	SA	SA
				STUDY ID:	ESI	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP. DATE:	06-Feb-94	06-Feb-94	22-Nov-95	10-Apr-96	21-Nov-95	31-Mar-96	17-Nov-95	12-Apr-96
	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
	Metals											
25	Aluminum		NONE	UG/L	1870 J	894 J	18	34.5 U	99.2	176 J	37.4	92.1
26	Antimony		NONE	UG/L	36.3 J	24.9 J	2.2 U	1.4	2.2 U	2.3 U	2.2 U	1 U
27	Arsenic	25	NYS Class GA	UG/L	1.4 U	1.4 U	2.1 U	4 U	2.1 U	3.5 U	2.1 U	4 U
28	Barium	1000	NYS Class GA	UG/L	121 J	115 J	77.1	71.2	28.9	26.9	42.3	46.2
29	Beryllium		NONE	UG/L	0.4 U	0.4 U	0.27 U	0.1 U	0.27 U	0.13 U	0.27 U	0.1
30	Cadmium	10	NYS Class GA	UG/L	2.1 U	2.1 U	0.3 U	0.3 U	0.3 U	0.32 U	0.3 U	0.3 U
31	Calcium		NONE	UG/L	145000	142000	128000	122000	90700	88800	82700	110000
32	Chromium	50	NYS Class GA	UG/L	2.6 U	2.8 J	0.68	0.7 U	0.62	1.3 U	2.9	0.7 U
33	Cobalt		NONE	UG/L	4.4 U	4.4 U	0.99 U	0.9 U	1 U	1.1 U	1.5	0.9 U
34	Copper	200	NYS Class GA	UG/L	3.1 U	3.1 U	2	1 U	0.88	0.94 U	3.3	1 U
35	Iron	300	NYS Class GA	UG/L	**3200 J**	**1300 J**	27.3	21.7 U	120	280	58.9	126 J
36	Lead	25	NYS Class GA	UG/L	2.7 J	3	3.4	1.9 U	1.5 U	1.1 U	3.6	1.9 U
37	Magnesium		NONE	UG/L	26900	26100	23100	22800	18400	18600	13700	17700
38	Manganese	300	NYS Class GA	UG/L	241	213	31.2	21.8	134	7.2	233	**402**
39	Mercury	2	NYS Class GA	UG/L	0.05 J	0.05 J	0.02 U	0.2 U	0.02 U	0.1 U	0.02 U	0.2 U
40	Nickel		NONE	UG/L	6.8 J	4.4 J	0.99 U	1.6 U	1.1	1.7 U	3.3	1.6 U
41	Potassium		NONE	UG/L	1010 J	906 U	1030	861 J	1490 J	1690	3010 J	2990 J
42	Selenium	10	NYS Class GA	UG/L	0.7 U	0.73 J	3.7 U	3.4 U	3.7 U	3.4 U	3.7 U	3.4 U
43	Sodium	20000	NYS Class GA	UG/L	**54100**	**52900**	**64700 J**	**53100**	7780 J	8990	**110000 J**	**135000**
44	Thallium		NONE	UG/L	1.2 U	1.2 U	3 U	4.7 U	3 U	3.5 U	4.1	4.7 U
45	Vanadium		NONE	UG/L	3.7 U	3.7 U	1.1 U	1.1 U	1.1	1.2 U	1.1	1.1 U
46	Zinc	300	NYS Class GA	UG/L	20.2	12.4 J	6.3	1.7	1.7	2.6	7.6	1.7
	Other Analyses											
47	Nitrate/Nitrite-Nitrogen		NONE	MG/L	0.17	0.16						
48	Total Petroleum Hydrocarbons		NONE	MG/L	0.4 U	0.4 U	0.41 U	0.42 U	0.42 U	0.43 U	0.42 U	0.42 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

				LOC ID:	MW25-12D	MW25-12D	MW25-13	MW25-13	MW25-14D	MW25-14D	MW25-15	MW25-15
				SAMP ID:	MW25-12D	25014	MW25-13	25015	MW25-14D	25016	MW25-15	25011
				QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA
				STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP. DATE:	18-Nov-95	02-Apr-96	17-Nov-95	29-Mar-96	18-Nov-95	29-Mar-96	20-Nov-95	13-Apr-96
	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
	Volatile Organics											
1	1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
2	1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
3	1,1-Dichloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
4	1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U		10 U		10 UJ		10 U	
5	2-Butanone		NONE	UG/L	10 UJ	5 UJ	10 UJ	5 U	10 UJ	5 U	10 UJ	5 U
6	Benzene	0.7	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
7	Bromoform		NONE	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
8	Chloroform	7	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
9	Dibromochloromethane		NONE	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
10	Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
11	Tetrachloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
12	Toluene	5	NYS Class GA	UG/L	10 U	0.6 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ	10 U	0.5 U
13	Trichloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.5 U
14	Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 U	10 UJ	0.5 U	10 U	0.6
	Semivolatile Organics											
15	2,4-Dimethylphenol	5	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
16	2-Methylnaphthalene	50	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
17	2-Methylphenol	5	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
18	3,3'-Dichlorobenzidine		NONE	UG/L	11 UJ	10 U	11 UJ	10 U	10 UJ	10 U	10 J	12 U
19	4-Methylphenol	5	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
20	Fluorene	50	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
21	Naphthalene	50	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
22	Phenanthrene	50	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
23	Phenol	1	NYS Class GA	UG/L	11 U	10 U	11 U	10 U	10 U	10 U	10 U	12 U
	Pesticides											
24	4,4'-DDD		NONE	UG/L	0.11 U	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.1 U	0.11 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

			LOC ID:	MW25-12D	MW25-12D	MW25-13	MW25-13	MW25-14D	MW25-14D	MW25-15	MW25-15
			SAMP ID:	MW25-12D	25014	MW25-13	25015	MW25-14D	25016	MW25-15	25011
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	18-Nov-95	02-Apr-96	17-Nov-95	29-Mar-96	18-Nov-95	29-Mar-96	20-Nov-95	13-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Metals											
25 Aluminum		NONE	UG/L	65.5	97.6 J	16.3	172 J	223	19.5 U	228	186
26 Antimony		NONE	UG/L	2.2 U	2.3 U	2.2 U	2.3 U	2.2 U	2.3 U	2.2 U	1 U
27 Arsenic	25	NYS Class GA	UG/L	2.1 U	3.5 U	2.2	3.5 U	3.8	3.5 U	2.2	4 U
28 Barium	1000	NYS Class GA	UG/L	126	120	71.9	81.7	120	109	36.4	33.2
29 Beryllium		NONE	UG/L	0.27 U	0.13 U	0.27 U	0.13 U	0.27 U	0.13 U	0.27 U	0.1 U
30 Cadmium	10	NYS Class GA	UG/L	0.3 U	0.32 U	0.3 U	0.32 U	0.3 U	0.32 U	0.3 U	0.3 U
31 Calcium		NONE	UG/L	60000	57600	147000	190000	52000	51500	98900	98600
32 Chromium	50	NYS Class GA	UG/L	0.5 U	1.3 U	0.88	1.3 U	1.1	1.3 U	0.61	0.7 U
33 Cobalt		NONE	UG/L	1 U	1.1 U	1 U	2	1 U	1.1 U	0.99 U	1.2
34 Copper	200	NYS Class GA	UG/L	0.7 U	0.94 U	0.95	2	0.7 U	0.94 U	0.69 U	2.2
35 Iron	300	NYS Class GA	UG/L	**302**	**367**	23.5	**321**	**543**	**488**	**327**	**372 J**
36 Lead	25	NYS Class GA	UG/L	1.7	1.1 U	1.5 U	1.1 U	3.2	1.1 U	1.6	1.9 U
37 Magnesium		NONE	UG/L	22000	21000	22200	28700	19900	19600	15900	16100
38 Manganese	300	NYS Class GA	UG/L	48.1	48	246	**376**	43.7	41.1	238	**438**
39 Mercury	2	NYS Class GA	UG/L	0.02 U	0.1 U	0.02 U	0.1 U	0.02 U	0.1 U	0.02 U	0.2 U
40 Nickel		NONE	UG/L	1 U	1.7 U	2.1	3.5	1 U	1.7 U	1.4	2.4
41 Potassium		NONE	UG/L	2120 J	2050	9070 J	4900	2110 J	2400	1770 J	1680 J
42 Selenium	10	NYS Class GA	UG/L	3.7 U	3.4 U	3.7 U	3.4 U	3.7 U	3.4 U	4.8 J	3.4 U
43 Sodium	20000	NYS Class GA	UG/L	**31900 J**	**28800**	**188000 J**	**181000**	**35700 J**	**33100**	3530 J	4560
44 Thallium		NONE	UG/L	3 U	3.5 U	3 U	3.5 U	3 U	3.5 U	3 U	4.7 U
45 Vanadium		NONE	UG/L	1.1 U	1.2 U	1.1 U	1.2 U	1.1	1.2 U	1.1 U	1.1 U
46 Zinc	300	NYS Class GA	UG/L	1.8	1.1 U	2.7	3.1	2.7	1.1 U	2.6	15.5 J
Other Analyses											
47 Nitrate/Nitrite-Nitrogen		NONE	MG/L								
48 Total Petroleum Hydrocarbons		NONE	MG/L	0.48 U	0.42 U	0.41 U	0.4 U	0.39 U	0.41 U	1.2	0.45 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

			LOC ID	MW25-16D	MW25-16D	MW25-17	MW25-17	MW25-18	MW25-18	MW25-19	MW25-19
			SAMP ID	MW25-16D	25018	MW25-17	25019	MW25-18	25020	MW25-19	25021
			QC CODE	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP DATE	20-Nov-95	30-Mar-96	20-Nov-95	30-Mar-96	28-Nov-95	28-Mar-96	21-Nov-95	10-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics											
1 1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
2 1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
3 1,1-Dichloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
4 1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U		10 U		10 U		10 UJ	
5 2-Butanone		NONE	UG/L	10 UJ	5 UJ	10 UJ	5 UJ	10 UJ	5 UJ	10 UJ	5 UJ
6 Benzene	0.7	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
7 Bromoform		NONE	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	6 J	0.5 UJ
8 Chloroform	7	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
9 Dibromochloromethane		NONE	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	3 J	0.5 UJ
10 Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
11 Tetrachloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
12 Toluene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.6 UJ	10 UJ	0.5 UJ
13 Trichloroethene	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
14 Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 UJ	10 U	0.5 UJ	10 U	0.5 UJ	10 UJ	0.5 UJ
Semivolatile Organics											
15 2,4-Dimethylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
16 2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
17 2-Methylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
18 3,3'-Dichlorobenzidine		NONE	UG/L	10 UJ	10 U	10 UJ	10 U	10 U	10 U	10 UJ	10 U
19 4-Methylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
20 Fluorene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
21 Naphthalene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
22 Phenanthrene	50	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
23 Phenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 U
Pesticides											
24 4,4'-DDD		NONE	UG/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.11 U	0.1 UJ	0.1 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

	PARAMETER	LEVEL	SOURCE	UNIT								
				LOC ID:	MW25-16D	MW25-16D	MW25-17	MW25-17	MW25-18	MW25-18	MW25-19	MW25-19
				SAMP ID:	MW25-16D	25018	MW25-17	25019	MW25-18	25020	MW25-19	25021
				QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA
				STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP. DATE:	20-Nov-95	30-Mar-96	20-Nov-95	30-Mar-96	28-Nov-95	28-Mar-96	21-Nov-95	10-Apr-96
					VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
	Metals											
25	Aluminum		NONE	UG/L	170	297	41.8	19.5 U	336	531	74.2	67.4
26	Antimony		NONE	UG/L	2.2 U	2.3 U	2.2 U	2.3 U	2.2 U	2.3 U	2.2 U	1 U
27	Arsenic	25	NYS Class GA	UG/L	2.1 U	3.5 U	2.1 U	3.5 U	2.1 U	3.5 U	2.1 U	4 U
28	Barium	1000	NYS Class GA	UG/L	88 3	87.9	68.5	56	93.6	112	59.3	57.4
29	Beryllium		NONE	UG/L	0.27 U	0.13 U	0.27 U	0 13 U	0.27 U	0.13 U	0.27 U	0 1 U
30	Cadmium	10	NYS Class GA	UG/L	0.43	0.32 U	0.3 U	0.32 U	0.3 U	0.32 U	0.3 U	0 3 U
31	Calcium		NONE	UG/L	77100	76600	98600	90700	155000	164000	106000	103000
32	Chromium	50	NYS Class GA	UG/L	1.6	1 3 U	4.2	1.3 U	5.5	1.3 U	2.3	0 7 U
33	Cobalt		NONE	UG/L	1 U	1 1 U	1 U	1.1 U	3	2	1 U	0 9 U
34	Copper	200	NYS Class GA	UG/L	0.7 U	0.94 U	0.97	0.94 U	2	1.5	2.1	1 U
35	Iron	300	NYS Class GA	UG/L	**483**	**573**	84 8	59.4	**495**	**957**	138	67.3 J
36	Lead	25	NYS Class GA	UG/L	1.5 U	1.1 U	1.5 U	1.1 U	6.4	1.1 U	1 8	1.9 U
37	Magnesium		NONE	UG/L	30200	30000	26700	25200	35400	39200	22500	20800
38	Manganese	300	NYS Class GA	UG/L	56.4	58.7	30	14.8	154	117	202	27 5
39	Mercury	2	NYS Class GA	UG/L	0.02 U	0.1 U	0.02 U	0.1 U	0.02 U	0.1 U	0.02 U	0 2 U
40	Nickel		NONE	UG/L	1.5	1.7 U	3.6	1.7 U	6.6	3.5	2.5	1.6 U
41	Potassium		NONE	UG/L	2200 J	2350	1350 J	885	2380 J	2080	4750 J	1960 J
42	Selenium	10	NYS Class GA	UG/L	3.7 U	3.4 U	3.7 U	3.4 U	3.7 U	3.4 U	3.7 U	3.4 U
43	Sodium	20000	NYS Class GA	UG/L	19300 J	19000	3320 J	2130	**59100 J**	**85300**	8790 J	4060
44	Thallium		NONE	UG/L	3 U	3.5 U	3 U	3.5 U	3 U	3.5 U	3 U	4.7
45	Vanadium		NONE	UG/L	1 1 U	1.2 U	1.1 U	1 2 U	1.2	1.2 U	1.1 U	1 1 U
46	Zinc	300	NYS Class GA	UG/L	2.2	1.8	3.9	1.5	7.6	4.7	2.4	2.7
	Other Analyses											
47	Nitrate/Nitrite-Nitrogen		NONE	MG/L								
48	Total Petroleum Hydrocarbons		NONE	MG/L	0.41 U	0.42 U	0.41 U	0.4 U	0.4 U	0.4 U	0.43 U	0.41 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

			LOC ID:	MW25-2	MW25-2	MW25-2	MW25-3	MW25-3	MW25-3	MW25-4D	MW25-4D
			SAMP ID	MW25-2-1	MW25-2	25002	MW25-3-1	MW25-3	25003	MW25-4D	25200
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	DU
			STUDY ID:	ESI	RI ROUND1	RI ROUND2	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP DATE:	05-Feb-94	29-Nov-95	12-Apr-96	15-Nov-93	19-Nov-95	10-Apr-96	15-Nov-95	01-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics											
1 1,1,1-Trichloroethane	5	NYS Class GA	UG/L	**36**	**25 J**	**37 J**	10 U	10 U	10 U	10 U	0.5 U
2 1,1-Dichloroethane	5	NYS Class GA	UG/L	**8 J**	59 U	100 U	3 J	10 U	10 U	10 U	0.5 U
3 1,1-Dichloroethene	5	NYS Class GA	UG/L	1 J	59 U	100 U	10 U	10 U	10 U	10 U	0.5 U
4 1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	**25**	**37 J**	**40 J**	2 J	10 U	10 U	10 U	
5 2-Butanone		NONE	UG/L	10 U	59 UJ	100 U	10 U	10 UJ	10 U	10 UJ	5 U
6 Benzene	0.7	NYS Class GA	UG/L	**780**	**730**	**1000**	**30**	**5 J**	10 U	10 U	0.5 U
7 Bromoform		NONE	UG/L	10 U	59 U	100 U	10 U	10 U	10 U	10 U	0.5 U
8 Chloroform	7	NYS Class GA	UG/L	**17**	59 U	**12 J**	10 U	10 U	10 U	10 U	0.5 U
9 Dibromochloromethane		NONE	UG/L	10 U	59 U	100 U	10 U	10 U	10 U	10 U	0.5 U
10 Ethylbenzene	5	NYS Class GA	UG/L	**110**	**140**	**520**	**18**	3 J	10 U	10 U	0.5 U
11 Tetrachloroethene	5	NYS Class GA	UG/L	1 J	59 U	100 U	10 U	10 U	10 U	10 U	0.5 U
12 Toluene	5	NYS Class GA	UG/L	**560**	**370**	**1400**	**8 J**	10 U	10 U	10 U	0.7 U
13 Trichloroethene	5	NYS Class GA	UG/L	**10**	**6 J**	100 U	10 U	10 U	10 U	10 U	0.5 U
14 Xylene (total)	5	NYS Class GA	UG/L	**2500**	**1800**	**3300**	**82**	**7 J**	10 U	10 U	0.5 U
Semivolatile Organics											
15 2,4-Dimethylphenol	5	NYS Class GA	UG/L	**86**	**29**	**15 J**	11 U	11 U	10 U	10 U	10 U
16 2-Methylnaphthalene	50	NYS Class GA	UG/L	37	46	**69 J**	11 U	11 U	10 U	10 U	10 U
17 2-Methylphenol	5	NYS Class GA	UG/L	**23 J**	**8 J**	230 U	11 U	11 U	10 U	10 U	10 U
18 3,3'-Dichlorobenzidine		NONE	UG/L	25 U	21 U	230 U	11 U	11 UJ	10 U	10 UJ	10 U
19 4-Methylphenol	5	NYS Class GA	UG/L	**42**	21 U	**33 J**	11 U	11 U	10 U	10 U	10 U
20 Fluorene	50	NYS Class GA	UG/L	1 J	21 U	230 U	11 U	11 U	10 U	10 U	10 U
21 Naphthalene	50	NYS Class GA	UG/L	**86**	**110**	**160 J**	11 U	11 U	10 U	10 U	10 U
22 Phenanthrene	50	NYS Class GA	UG/L	25 U	1 J	230 U	11 U	11 U	10 U	10 U	10 U
23 Phenol	1	NYS Class GA	UG/L	**56**	21 U	230 U	11 U	11 U	10 U	10 U	10 U
Pesticides											
24 4,4'-DDD		NONE	UG/L	0.12 U	0.1 U	0.1 U	0.11 U	0.1 U	0.11 U	0.1 U	0.1 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
			LOC ID:	MW25-2	MW25-2	MW25-2	MW25-3	MW25-3	MW25-3	MW25-4D	MW25-4D
			SAMP ID:	MW25-2-1	MW25-2	25002	MW25-3-1	MW25-3	25003	MW25-4D	25200
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	DU
			STUDY ID:	ESI	RI ROUND1	RI ROUND2	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	05-Feb-94	29-Nov-95	12-Apr-96	15-Nov-93	19-Nov-95	10-Apr-96	15-Nov-95	01-Apr-96
Metals											
25 Aluminum		NONE	UG/L	53.3 J	9.9 U	46.1	2260	134	41.2	142	95.8 J
26 Antimony		NONE	UG/L	22.4 J	2.2 U	1.4	52.7 U	2.2 U	1 U	2.2 U	2.3 U
27 Arsenic	25	NYS Class GA	UG/L	3.8 J	8.9 J	4.9	1 U	2.2	4 U	2.1 U	3.5 U
28 Barium	1000	NYS Class GA	UG/L	74.1 J	115	119	54 J	49.1	44.6	106	100
29 Beryllium		NONE	UG/L	0.4 U	0.27 U	0.1 U	0.31 J	0.27 U	0.1 U	0.27 U	0.13 U
30 Cadmium	10	NYS Class GA	UG/L	2.1 U	0.3 U	0.3 U	3.3 U	0.3 U	0.3 U	0.3 U	0.32 U
31 Calcium		NONE	UG/L	143000	169000	165000	119000	142000	128000	93500	98100
32 Chromium	50	NYS Class GA	UG/L	2.6 U	1.3	0.7 U	5 J	0.5 U	0.7 U	1.7	1.3 U
33 Cobalt		NONE	UG/L	4.4 U	2.7	2.9	7.9 J	3.4	3.3	0.99 U	1.1 U
34 Copper	200	NYS Class GA	UG/L	3.1 U	1.5	1 U	4.4 J	2.3	1.5	0.7 U	0.94 U
35 Iron	300	NYS Class GA	UG/L	**3730**	**5310**	**4550 J**	**4150**	**389**	207 J	**456**	**445**
36 Lead	25	NYS Class GA	UG/L	2 J	10.7	1.9 U	3	2.7	1.9 U	2.6	1.1 U
37 Magnesium		NONE	UG/L	48000	50100	48800	22000	20500	19300	31300	32100
38 Manganese	300	NYS Class GA	UG/L	**1330**	**1540**	**2090**	**2440**	**1490**	**1450**	68.1	69.8
39 Mercury	2	NYS Class GA	UG/L	0.04 U	0.07	0.2 U	0.07 UJ	0.02 U	0.2 U	0.02 U	0.1 U
40 Nickel		NONE	UG/L	4.7 J	5.8	7.2	11.5 J	6.8	6.2	0.99 U	1.7 U
41 Potassium		NONE	UG/L	9950	2280 J	1220 J	4170 J	1930 J	1340 J	2160 J	2030
42 Selenium	10	NYS Class GA	UG/L	0.7 U	3.7 U	3.4 U	0.8 U	3.7 U	3.4 U	3.7 U	3.4 U
43 Sodium	20000	NYS Class GA	UG/L	13100	13600 J	11700	11500	13300 J	11200	13900 J	12000
44 Thallium		NONE	UG/L	1.2 U	3 U	4.7 U	1.8 U	3 U	4.7 U	3 U	3.5 U
45 Vanadium		NONE	UG/L	3.7 U	2	1.8	5.4 J	1.1 U	1.1 U	1.1 U	1.2 U
46 Zinc	300	NYS Class GA	UG/L	31.3	8.9	4.8 J	20	3.2	2.9	2.1	1.1 U
Other Analyses											
47 Nitrate/Nitrite-Nitrogen		NONE	MG/L	0.01 U			0.07				
48 Total Petroleum Hydrocarbons		NONE	MG/L	2	1.7	5.4	1.6	0.41 U	0.38 U	0.39 U	0.39 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

				LOC ID:	MW25-4D	MW25-5D	MW25-5D	MW25-5D	MW25-6	MW25-6	MW25-7D	MW25-7D
				SAMP ID:	25006	MW25-50	MW25-5D	25004	MW25-6	25008	MW25-7D	25009
				QC CODE:	SA	DU	SA	SA	SA	SA	SA	SA
				STUDY ID:	RI ROUND2	RI ROUND1	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP DATE:	01-Apr-96	19-Nov-95	19-Nov-95	11-Apr-96	21-Nov-95	31-Mar-96	22-Nov-95	31-Mar-96
	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
	Volatile Organics											
1	1,1,1-Trichloroethane	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
2	1,1-Dichloroethane	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
3	1,1-Dichloroethene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
4	1,2-Dichloroethene (total)	5	NYS Class GA	UG/L		10 U	10 U		10 UJ		10 U	
5	2-Butanone		NONE	UG/L	5 UJ	10 UJ	10 UJ	5 U	10 UJ	5 UJ	10 U	5 UJ
6	Benzene	0.7	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
7	Bromoform		NONE	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
8	Chloroform	7	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
9	Dibromochloromethane		NONE	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
10	Ethylbenzene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
11	Tetrachloroethene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
12	Toluene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
13	Trichloroethene	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
14	Xylene (total)	5	NYS Class GA	UG/L	0.5 UJ	10 U	10 U	0.5 U	10 UJ	0.5 UJ	10 U	0.5 UJ
	Semivolatile Organics											
15	2,4-Dimethylphenol	5	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
16	2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
17	2-Methylphenol	5	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
18	3,3'-Dichlorobenzidine		NONE	UG/L	10 U	11 U	10 UJ	10 U	11 UJ	10 U	10 U	10 U
19	4-Methylphenol	5	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
20	Fluorene	50	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
21	Naphthalene	50	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
22	Phenanthrene	50	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
23	Phenol	1	NYS Class GA	UG/L	10 U	11 U	10 U	10 U	11 UJ	10 U	10 U	10 U
	Pesticides											
24	4,4'-DDD		NONE	UG/L	0.1 U	0.11 U	0.11 U	0.1 U	0.1 UJ	0.1 U	0.11 U	0.046 J

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Groundwater Analysis Results by Sample Point

			LOC ID:	MW25-4D	MW25-5D	MW25-5D	MW25-5D	MW25-6	MW25-6	MW25-7D	MW25-7D
			SAMP ID:	25006	MW25-50	MW25-5D	25004	MW25-6	25008	MW25-7D	25009
			QC CODE:	SA	DU	SA	SA	SA	SA	SA	SA
			STUDY ID:	RI ROUND2	RI ROUND1	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	01-Apr-96	19-Nov-95	19-Nov-95	11-Apr-96	21-Nov-95	31-Mar-96	22-Nov-95	31-Mar-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Metals											
25 Aluminum		NONE	UG/L	54.8 J	149	149	64 2	162	529	83 7	182 J
26 Antimony		NONE	UG/L	2.3 U	2.2 U	2.2 U	1 U	2.2 U	2.3 U	2.2 U	2.3 U
27 Arsenic	25	NYS Class GA	UG/L	3.5 U	2.1 U	2.1 U	4 U	2.1 U	3.5 U	2.1 U	3.5 U
28 Barium	1000	NYS Class GA	UG/L	99 9	111	111	89	85.6	72.3	192	188
29 Beryllium		NONE	UG/L	0.13 U	0.27 U	0.27 U	0.1 U	0.27 U	0.13 U	0.27 U	0.13 U
30 Cadmium	10	NYS Class GA	UG/L	0.32 U	0.3 U	0.3 U	0.3 U	0.3 U	0.32 U	0 3 U	0.32 U
31 Calcium		NONE	UG/L	97600	130000	130000	120000	133000	118000	123000	122000
32 Chromium	50	NYS Class GA	UG/L	1.3 U	1.4	1.4	0.7 U	2.2	1.3 U	4.7	1 3 U
33 Cobalt		NONE	UG/L	1.1 U	1.1 U	1.1	1.7	1.3	1.1 U	0.99 U	1.1 U
34 Copper	200	NYS Class GA	UG/L	0.94 U	0.69 U	0.69 U	1 U	0.99	1.1 B	0.7 U	1.5
35 Iron	300	NYS Class GA	UG/L	**377**	251	251	162 J	**308**	**623**	**392**	**561**
36 Lead	25	NYS Class GA	UG/L	1.1 U	1.5	1.5	1.9 U	4.4	1.1 U	5.6	1.1 U
37 Magnesium		NONE	UG/L	31900	30500	30500	27300	35900	32900	44900	46500
38 Manganese	300	NYS Class GA	UG/L	68.9	**927**	**927**	**1010**	56	22	96 5	106
39 Mercury	2	NYS Class GA	UG/L	0 1 U	0.02 U	0.02 U	0.2 U	0.02 U	0.1 U	0.02 U	0.1 U
40 Nickel		NONE	UG/L	1.7 U	3 1	3.1	3.7	2.6	1.7 U	5.2	1.7 U
41 Potassium		NONE	UG/L	1990	1430	1430 J	1070 J	1840 J	1420	2170 J	2530
42 Selenium	10	NYS Class GA	UG/L	3.4 U	3.7 U	3.7 U	3.4 U	3.7 U	3.4 U	3.7 U	3.4 U
43 Sodium	20000	NYS Class GA	UG/L	12000	15300 J	15300 J	11900	**20400 J**	16500	18200 J	19000
44 Thallium		NONE	UG/L	3.5 U	3 U	3 U	4.7 U	3 U	3.5 U	3 U	3.5 U
45 Vanadium		NONE	UG/L	1.2 U	1.1 U	1.1 U	1 1 U	1.4	1.2 U	1.1 U	1.2 U
46 Zinc	300	NYS Class GA	UG/L	1.1 U	4.1	4.1	3.4 J	7 5	2.2	5.1	3
Other Analyses											
47 Nitrate/Nitrite-Nitrogen		NONE	MG/L								
48 Total Petroleum Hydrocarbons		NONE	MG/L	0.4 U	0.4 U	0.41 U	0.41 U	0.43 U	0.38 U	0.4 U	0.37 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

-25 Groundwater Analysis Results by Sample Point

			LOC ID.	MW25-8	MW25-8	MW25-9	MW25-9
			SAMP ID.	MW25-8	25005	MW25-9	25007
			QC CODE	SA	SA	SA	SA
			STUDY ID.	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
			MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
			SAMP. DATE:	28-Nov-95	11-Apr-96	19-Nov-95	13-Apr-96
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics							
1 1,1,1-Trichloroethane	5	NYS Class GA	UG/L	10 U	0.5 U	2 J	1 J
2 1,1-Dichloroethane	5	NYS Class GA	UG/L	10 U	0.5 U	2 J	10 UJ
3 1,1-Dichloroethene	5	NYS Class GA	UG/L	10 U	0.5 U	10 U	10 UJ
4 1,2-Dichloroethene (total)	5	NYS Class GA	UG/L	10 U		**6 J**	1 J
5 2-Butanone		NONE	UG/L	10 UJ	3 U	10 UJ	130 J
6 Benzene	0.7	NYS Class GA	UG/L	10 U	0.5 U	**60**	**14 J**
7 Bromoform		NONE	UG/L	10 U	0.5 U	10 U	10 UJ
8 Chloroform	7	NYS Class GA	UG/L	10 U	0.5 U	10 U	10 UJ
9 Dibromochloromethane		NONE	UG/L	10 U	0.5 U	10 U	10 UJ
10 Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 U	**10**	3 J
11 Tetrachloroethene	5	NYS Class GA	UG/L	10 U	0.5 U	10 U	10 UJ
12 Toluene	5	NYS Class GA	UG/L	10 U	0.5 U	**22**	**5 J**
13 Trichloroethene	5	NYS Class GA	UG/L	10 U	0.5 U	10 U	10 UJ
14 Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 U	**73**	**18 J**
Semivolatile Organics							
15 2,4-Dimethylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
16 2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
17 2-Methylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
18 3,3'-Dichlorobenzidine		NONE	UG/L	10 U	10 U	10 UJ	11 U
19 4-Methylphenol	5	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
20 Fluorene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
21 Naphthalene	50	NYS Class GA	UG/L	10 U	10 U	2 J	1 J
22 Phenanthrene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
23 Phenol	1	NYS Class GA	UG/L	10 U	10 U	10 U	11 U
Pesticides							
24 4,4'-DDD		NONE	UG/L	0.1 U	0.11 U	0.1 U	0.11 U

Table F-1a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

-25 Groundwater Analysis Results by Sample Point

			LOC ID:	MW25-8		MW25-8		MW25-9		MW25-9	
			SAMP ID:	MW25-8		25005		MW25-9		25007	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND2		RI ROUND1		RI ROUND2	
			MATRIX:	GROUND WATER		GROUND WATER		GROUND WATER		GROUND WATER	
			SAMP. DATE:	28-Nov-95		11-Apr-96		19-Nov-95		13-Apr-96	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Metals											
25 Aluminum		NONE	UG/L	361		97.3		19.5		485	
26 Antimony		NONE	UG/L	2.2	U	1	U	2.2	U	1	U
27 Arsenic	25	NYS Class GA	UG/L	2.1	U	4	U	2.1	U	4	U
28 Barium	1000	NYS Class GA	UG/L	33.9		32.5		46.8		38	
29 Beryllium		NONE	UG/L	0.27	U	0.1	U	0.27	U	0.1	U
30 Cadmium	10	NYS Class GA	UG/L	0.3	U	0.3	U	0.3	U	0.3	U
31 Calcium		NONE	UG/L	96900		119000		105000		99900	
32 Chromium	50	NYS Class GA	UG/L	1.7		0.7	U	0.5	U	0.77	
33 Cobalt		NONE	UG/L	1.6		0.9	U	2.5		2.4	
34 Copper	200	NYS Class GA	UG/L	2.1		1		0.69	U	1.7	
35 Iron	300	NYS Class GA	UG/L	**396**		104	J	181		**628**	**J**
36 Lead	25	NYS Class GA	UG/L	5.4		1.9	U	1.6		1.9	U
37 Magnesium		NONE	UG/L	15500		19300		24100		22400	
38 Manganese	300	NYS Class GA	UG/L	56		71.1		**764**		**548**	
39 Mercury	2	NYS Class GA	UG/L	0.02	U	0.2	U	0.02	U	0.2	U
40 Nickel		NONE	UG/L	2.1		1.6	U	2.6		3.6	
41 Potassium		NONE	UG/L	989		1360	J	2960	J	2370	J
42 Selenium	10	NYS Class GA	UG/L	3.7	U	3.4	U	3.7	U	3.4	U
43 Sodium	20000	NYS Class GA	UG/L	3370	J	4800		15800	J	11000	
44 Thallium		NONE	UG/L	3	U	4.7	U	3	U	4.7	U
45 Vanadium		NONE	UG/L	1.1	U	1.1	U	1.1	U	1.1	U
46 Zinc	300	NYS Class GA	UG/L	8.8		2.5		1.3		7.1	J
Other Analyses											
47 Nitrate/Nitrite-Nitrogen		NONE	MG/L								
48 Total Petroleum Hydrocarbons		NONE	MG/L	0.4	U	0.43	U	0.43	U	0.43	U

Table F-1b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SB25-10		SB25-11		SB25-12		SB25-13		SB25-14		SB25-15	
			SAMP ID:	SB25-10-00		SB25-11-00		SB25-12-00		SB25-13-00		SB25-14-00		SB25-15-00	
			QC CODE:	SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0	
			BOTTOM:	0.17		0.17		0.17		0.17		0.17		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	09/27/95		10/17/95		10/16/95		10/07/95		10/10/95		10/17/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS															
Acetone	106.7	NYSDEC Prot. GW	UG/KG	12	UJ	13	UJ	12	U	12	U	12	U	12	UJ
SEMIVOLATILE ORGANICS															
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	58	J	430	U	420	U	430	U	410	U	410	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	**65**	**J**	430	U	420	U	430	U	410	U	410	U
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	69	J	430	U	420	U	430	U	410	U	410	UJ
Benzo(g,h,i)perylene	776000	NYSDEC Prot. GW	UG/KG	400	U	430	U	420	U	430	U	51	J	410	U
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	74	J	430	U	420	U	430	U	410	UJ	410	U
Chrysene	388	NYSDEC Prot. GW	UG/KG	82	J	59	J	420	U	430	U	45	J	410	UJ
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	UG/KG	400	U	430	U	420	U	430	U	410	UJ	410	U
Fluoranthene	50000	NYSDEC TAGM 4046	UG/KG	160	J	100	J	74	J	49	J	79	J	66	J
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	400	U	430	U	420	U	430	U	410	U	410	U
Phenanthrene	50000	NYSDEC TAGM 4046	UG/KG	110	J	61	J	420	U	430	U	54	J	410	U
Pyrene	50000	NYSDEC TAGM 4046	UG/KG	150	J	74	J	62	J	48	J	70	J	59	J
PESTICIDES/PCB															
Endosulfan I	873	NYSDEC Prot. GW	UG/KG	2.1	J	1.8	J	2.2	U	2.2	U	2.1	U	2.1	U
Endrin aldehyde			UG/KG	4.1	U	4.3	U	2.3	J	4.3	U	4.1	U	3.2	J
OTHER ANALYSES															
Total Petroleum Hydrocarbons			MG/KG	64		130		37	U	138		72		65	
METALS															
Aluminum	14592.8	NYSDEC Metals	MG/KG	11400		**21900**		**17100**		**15400**		**15400**		**19000**	
Antimony	3.59	NYSDEC Metals	MG/KG	0.7		1.2	J	0.64	J	1	J	0.74	J	0.82	J
Arsenic	7.5	NYSDEC Metals	MG/KG	4.4		6.5	J	5.8	J	6.2	J	5.2	J	6.1	J
Barium	300	NYSDEC Metals	MG/KG	70.5		97.5		101		79.1		72.6		95.8	
Beryllium	0.73	NYSDEC Metals	MG/KG	0.52		**0.8**		**0.8**		0.67		0.65		**0.86**	
Calcium	101904	NYSDEC Metals	MG/KG	3490	J	9790		2840		3300		2790		10900	
Chromium	22.13	NYSDEC Metals	MG/KG	15	J	26	R	22.6	R	20.5	R	19.7	R	25	R
Cobalt	30	NYSDEC Metals	MG/KG	8		9.7		11.6		10		8.8		14.2	
Copper	25	NYSDEC Metals	MG/KG	15.2		19.3	J	17.7		22.6		17.4		19.3	J
Iron	26626.7	NYSDEC Metals	MG/KG	18400		24200		25600		24100		23700		**30900**	
Lead	21.86	NYSDEC Metals	MG/KG	**34.2**		**34.5**		**29.6**		**44.4**		**32.6**		**32.6**	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**3100**		**4620**		**4100**		**4050**		**3600**		**5300**	
Manganese	669.38	NYSDEC Metals	MG/KG	441		573		**859**		412		495		**1250**	
Mercury	0.1	NYSDEC Metals	MG/KG	0.06		**0.13**		0.08		**0.12**		0.04		**0.1**	
Nickel	33.62	NYSDEC Metals	MG/KG	17.4		25.3	J	25.4	J	23.9	J	20.8	J	29.1	J
Potassium	1761.48	NYSDEC Metals	MG/KG	1130		**2660**	**J**	1620	J	1240	J	1370	J	**1900**	**J**
Selenium	2	NYSDEC Metals	MG/KG	1.2	J	1.1	J	0.85	J	0.94	J	1.3	J	1	J
Sodium	103.74	NYSDEC Metals	MG/KG	42.5	U	47.6	U	45.8	U	50.6	U	44.2		50.4	
Thallium	0.28	NYSDEC Metals	MG/KG	**1.1**		**0.77**		0.69	U	**0.86**		0.66	U	1	U
Vanadium	150	NYSDEC Metals	MG/KG	19.9		37.2		29		26.2		26.7		32.4	
Zinc	82.5	NYSDEC Metals	MG/KG	55.6		**84.5**		76.7		74.3		71.1		78.5	

Table F-1b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

-25 Surface Soil Analysis Results by Sample Point

			SB25-16		SB25-7		SB25-7		SB25-8		SB25-9	
			SB25-16-00		SB25-7-00		SB25-7-10		SB25-8-00		SB25-9-00	
			SA		SA		DU		SA		SA	
			RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			0		0		0		0		0	
			0.17		0.17		0.17		0.17		0.17	
			SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			10/23/95		09/25/95		09/25/95		09/26/95		09/26/95	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS												
Acetone	106.7	NYSDEC Prot. GW	12	U	5	J	11	UJ	5	J	3	J
SEMIVOLATILE ORGANICS												
Benzo(a)anthracene	224	EPA Carcinogenic	78	J	380	U	380	U	400	U	400	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	**87**	**J**	380	U	380	U	48	J	400	U
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	86	J	380	U	380	U	57	J	400	U
Benzo(g,h,i)perylene	776000	NYSDEC Prot. GW	61	J	380	U	380	UJ	82	J	400	U
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	96	J	380	U	380	U	400	U	400	U
Chrysene	388	NYSDEC Prot. GW	110	J	380	U	380	U	43	J	400	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	**20**	**J**	380	U	380	U	**42**	**J**	400	U
Fluoranthene	50000	NYSDEC TAGM 4046	200	J	380	U	380	U	52	J	51	J
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	51	J	380	U	380	UJ	55	J	400	U
Phenanthrene	50000	NYSDEC TAGM 4046	130	J	380	U	380	U	400	U	400	U
Pyrene	50000	NYSDEC TAGM 4046	170	J	380	U	380	U	58	J	53	J
PESTICIDES/PCB												
Endosulfan I	873	NYSDEC Prot. GW	1.9	U	2	U	2	U	2.1	U	1.2	J
Endrin aldehyde			8.4	J	3.8	U	3.8	U	4.1	U	4	U
OTHER ANALYSES												
Total Petroleum Hydrocarbons			62		32	U	31	U	80		59	
METALS												
Aluminum	14592.8	NYSDEC Metals	**18400**		12500		12500		**16000**		**14900**	
Antimony	3.59	NYSDEC Metals	0.44	J	0.4		0.4	UJ	0.49	U	0.76	
Arsenic	7.5	NYSDEC Metals	6.3	J	4.3		4.3		5		5	
Barium	300	NYSDEC Metals	75.4		71.3		71.3		88.5		101	
Beryllium	0.73	NYSDEC Metals	**0.92**		0.56		0.56		0.72		**0.74**	
Calcium	101904	NYSDEC Metals	3350		47400	J	47400	J	40300	J	6060	J
Chromium	22.13	NYSDEC Metals	**25.8**	**J**	16.9	J	16.9	J	20.7	J	19.5	J
Cobalt	30	NYSDEC Metals	9.4		8		8		8.5		9	
Copper	25	NYSDEC Metals	**25.8**		15.7		15.7		20.4		15.9	
Iron	26626.7	NYSDEC Metals	**30300**		20500		20500		21300		22800	
Lead	21.86	NYSDEC Metals	15.9	J	11.1		11.1		**35.4**		**37.4**	
Magnesium	1221.77	NYSDEC Metals	**4980**		**11700**		**11700**		**5080**		**3640**	
Manganese	669.38	NYSDEC Metals	308	R	452		452		548		**779**	
Mercury	0.1	NYSDEC Metals	0.01		0.03		0.03		0.05		0.06	
Nickel	33.62	NYSDEC Metals	31.3		22.3		22.3		23		21.3	
Potassium	1761.48	NYSDEC Metals	**1940**	**J**	1110		1110		**1930**		1330	
Selenium	2	NYSDEC Metals	0.68	U	0.63	U	0.66	U	1.3	J	0.83	J
Sodium	103.74	NYSDEC Metals	**124**		59.9		57.5		44.3	U	41	U
Thallium	0.28	NYSDEC Metals	**1.1**		**1.2**		**1.2**		**0.98**		**1.8**	
Vanadium	150	NYSDEC Metals	32.7		21		21		27.7		26.2	
Zinc	82.5	NYSDEC Metals	**84.8**		54.1		54.1		**90.5**		66.6	

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

				LOC_ID:	SB25-1		SB25-1		SB25-1		SB25-10		SB25-10		SB25-11	
				SAMP ID:	SB25-1-01		SB25-1-03		SB25-1-04		SB25-10-01		SB25-10-02		SB25-11-02	
				QC CODE:	SA		SA		SA		SA		SA		SA	
				STUDY ID:	ESI		ESI		ESI		RI ROUND1		RI ROUND1		RI ROUND1	
				TOP:	0		4		6		0.17		2		2	
				BOTTOM:	2		6		8		2		4		4	
				MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
				SAMPLE DATE:	12/03/93		12/03/93		12/03/93		09/27/95		09/27/95		10/17/95	
PARAMETER	LEVEL	SOURCE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
1,2-Dichloroethene (total)				UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
2-Butanone	234	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	UJ	11	U	12	U
Acetone	85.8	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	3	J	11	U	12	UJ
Benzene	46.8	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Carbon Disulfide	2106	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Chloroform	234	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Ethylbenzene	4290	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Methylene Chloride	78	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Toluene	1170	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Trichloroethene	546	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	12	U
Xylene (total)	936	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	2	J	11	U	12	U
SEMIVOLATILE ORGANICS																
1,2,4-Trichlorobenzene	2652	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
1,4-Dichlorobenzene	6630	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
2,4-Dinitrotoluene				UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
2-Chlorophenol	624	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
2-Methylnaphthalene	28392	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	55	J	360	U	500	U	370	U	360	U	380	U
4-Chloro-3-methylphenol	187.2	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
4-Nitrophenol	78	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	1700	U	870	U	1200	U	910	U	880	U	920	U
Acenaphthene	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Acenaphthylene	31980	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Anthracene	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Benzo(a)anthracene	224	EPA Carcinogenic	EPA Carcinogenic	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	EPA Carcinogenic	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Benzo(b)fluoranthene	858	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Benzo(k)fluoranthene	858	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	UJ	380	U
Carbazole				UG/KG	720	U	360	U	500	U	370	U	360	UJ	380	U
Chrysene	312	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	EPA Carcinogenic	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Fluoranthene	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Fluorene	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Indeno(1,2,3-cd)pyrene	2496	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
N-Nitroso-di-n-propylamine				UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
N-Nitrosodiphenylamine (1)				UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Naphthalene	10140	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Pentachlorophenol	780	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	1700	U	870	U	1200	U	910	U	880	U	920	U
Phenanthrene	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Phenol	23.4	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
Pyrene	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	720	U	360	U	500	U	370	U	360	U	380	U
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	NYSDEC TAGM 4046	UG/KG	160	J	63	J	90	J	750	J	360	U	380	U

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
				LOC_ID:	SB25-1		SB25-1		SB25-1		SB25-10		SB25-10		SB25-11	
				SAMP ID:	SB25-1-01		SB25-1-03		SB25-1-04		SB25-10-01		SB25-10-02		SB25-11-02	
				QC CODE	SA		SA		SA		SA		SA		SA	
				STUDY ID:	ESI		ESI		ESI		RI ROUND1		RI ROUND1		RI ROUND1	
				TOP:	0		4		6		0.17		2		2	
				BOTTOM	2		6		8		2		4		4	
				MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
				SAMPLE DATE:	12/03/93		12/03/93		12/03/93		09/27/95		09/27/95		10/17/95	
PESTICIDES/PCB																
4,4'-DDE	2100	EPA Carcinogenic	EPA Carcinogenic	UG/KG	3.6	UJ	3.6	U	3.6	U	3.7	U	3.6	U	3.9	U
4,4'-DDT	1950	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	3.6	UJ	3.6	U	3.6	U	3.7	U	3.6	U	3.9	U
Aroclor-1232	1000	EPA Carcinogenic	EPA Carcinogenic	UG/KG	36	UJ	36	U	36	U	37	U	36	U	39	U
Aroclor-1254	1000	EPA Carcinogenic	EPA Carcinogenic	UG/KG	36	UJ	36	U	36	U	37	U	36	U	39	U
Endosulfan I	702	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	1.8	UJ	1.8	U	1.8	U	1.9	U	1.9	U	2	U
Endrin	78	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	3.6	UJ	3.6	U	3.6	U	3.7	U	3.6	U	3.9	U
Endrin aldehyde				UG/KG	3.6	UJ	3.6	U	3.6	U	3.7	U	3.6	U	3.9	U
Heptachlor epoxide	15.6	NYSDEC Prot. GW	NYSDEC Prot. GW	UG/KG	1.8	UJ	1.8	U	1.8	U	1.9	U	1.9	U	2	U
alpha-Chlordane				UG/KG	1.8	UJ	1.8	U	1.8	U	1.9	U	1.9	U	2	U
OTHER ANALYSES																
Nitrate/Nitrite-Nitrogen				MG/KG	0.2		0.01		0.05							
Total Petroleum Hydrocarbons				MG/KG	1240		68		98		29	U	37	U	41	
METALS																
Aluminum	14592.84	NYSDEC Metals	NYSDEC Metals	MG/KG	9720		10800		8730		**17500**		12100		**16900**	
Antimony	3.59	NYSDEC Metals	NYSDEC Metals	MG/KG	9.9	UJ	9.1	UJ	7.1	UJ	0.56		0.52		0.59	J
Arsenic	7.5	NYSDEC Metals	NYSDEC Metals	MG/KG	4.7		3.8		4.7		4.4		4.9		**7.5**	**J**
Barium	300	NYSDEC Metals	NYSDEC Metals	MG/KG	25	J	62.4		55.5		73.8		62.1		99.8	
Beryllium	0.73	NYSDEC Metals	NYSDEC Metals	MG/KG	0.45	J	0.52	J	0.38	J	0.62		0.61		**0.8**	
Cadmium	1	NYSDEC Metals	NYSDEC Metals	MG/KG	0.62	U	0.57	U	0.44	U	0.06	U	0.05	U	0.05	U
Calcium	101903.8	NYSDEC Metals	NYSDEC Metals	MG/KG	53800		67300		59100		2000	J	44000	J	7080	
Chromium	22.13	NYSDEC Metals	NYSDEC Metals	MG/KG	16		17.6		14.6		21	J	19.2	J	23.5	R
Cobalt	30	NYSDEC Metals	NYSDEC Metals	MG/KG	9.7		9.8		8.7		8.4		11.3		13.7	
Copper	25	NYSDEC Metals	NYSDEC Metals	MG/KG	17		15.6		15.6		12.9		24.7		**31.8**	**J**
Iron	26626.65	NYSDEC Metals	NYSDEC Metals	MG/KG	20400		22100		21100		22100		24700		**30100**	
Lead	21.86	NYSDEC Metals	NYSDEC Metals	MG/KG	21.7	J	7.1	J	11.5	J	12.9		12.3		20.7	
Magnesium	1221.77	NYSDEC Metals	NYSDEC Metals	MG/KG	**6350**		**19600**		**12300**		**3970**		**12700**		**5590**	
Manganese	669.38	NYSDEC Metals	NYSDEC Metals	MG/KG	394		469		435		248		524		**950**	
Mercury	0.1	NYSDEC Metals	NYSDEC Metals	MG/KG	0.06	JR	0.05	JR	0.07	JR	0.02		0.02		0.05	
Nickel	33.62	NYSDEC Metals	NYSDEC Metals	MG/KG	27.1		27.1		23.6		20.8		33.6		**39.2**	**J**
Potassium	1761.48	NYSDEC Metals	NYSDEC Metals	MG/KG	844	J	1230		877		**1900**		1390		**1930**	**J**
Selenium	2	NYSDEC Metals	NYSDEC Metals	MG/KG	0.24	UJ	0.23	UJ	0.19	UJ	1	J	0.57	U	0.6	J
Sodium	103.74	NYSDEC Metals	NYSDEC Metals	MG/KG	**108**	**J**	**156**	**J**	**126**	**J**	41.4		45.4		50.8	
Thallium	0.28	NYSDEC Metals	NYSDEC Metals	MG/KG	0.26	U	0.25	U	0.2	U	**0.82**		**1.1**		**1.1**	
Vanadium	150	NYSDEC Metals	NYSDEC Metals	MG/KG	12.2		16		13.2		29.6		20.1		29.5	
Zinc	82.5	NYSDEC Metals	NYSDEC Metals	MG/KG	44.4		47.7		57.9		55.6		**84.2**		**96.8**	
HERBICIDES																
Dicamba				UG/KG	5.4	U	5.5	U	5.5	U						
MCPP				UG/KG	5700	U	5400	U	5500	U						

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

			SB25-11		SB25-12		SB25-12		SB25-13		SB25-13		SB25-14	
			SB25-11-03		SB25-12-02		SB25-12-03		SB25-13-02		SB25-13-04		SB25-14-01	
			SA		SA		SA		SA		SA		SA	
			RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			4		2		4		0.17		6		0.17	
			6		4		6		3		7.3		2	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			10/17/95		10/16/95		10/16/95		10/08/95		10/07/95		10/10/95	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS														
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
1,2-Dichloroethene (total)			11	U	11	U	11	U	11	U	11	U	12	U
2-Butanone	234	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Acetone	85.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Benzene	46.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Carbon Disulfide	2106	NYSDEC Prot. GW	2	J	11	U	11	U	11	U	11	U	12	U
Chloroform	234	NYSDEC Prot GW	11	U	11	U	11	U	11	U	11	U	12	U
Ethylbenzene	4290	NYSDEC Prot. GW	11	UJ	11	U	11	U	11	U	11	U	12	U
Methylene Chloride	78	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Toluene	1170	NYSDEC Prot. GW	11	UJ	11	U	11	U	11	U	11	U	12	U
Trichloroethene	546	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	12	U
Xylene (total)	936	NYSDEC Prot. GW	69	J	11	U	11	U	11	U	11	U	12	U
SEMIVOLATILE ORGANICS														
1,2,4-Trichlorobenzene	2652	NYSDEC Prot GW	360	U	370	U	1600		360	U	360	U	400	U
1,4-Dichlorobenzene	6630	NYSDEC Prot GW	360	U	370	U	1700		360	U	360	U	400	U
2,4-Dinitrotoluene			360	U	370	U	1600		360	U	360	U	400	U
2-Chlorophenol	624	NYSDEC Prot. GW	360	U	370	U	**2600**		360	U	360	U	400	U
2-Methylnaphthalene	28392	NYSDEC Prot. GW	360	U	370	U	360	U	360	U	360	U	400	U
4-Chloro-3-methylphenol	187.2	NYSDEC Prot. GW	360	U	370	U	**2600**		360	U	360	U	400	U
4-Nitrophenol	78	NYSDEC Prot. GW	880	U	890	U	**1700**		860	U	870	U	960	U
Acenaphthene	50000	NYSDEC TAGM 4046	360	U	370	U	2000		360	U	360	U	400	U
Acenaphthylene	31980	NYSDEC Prot. GW	360	U	370	U	360	U	360	U	360	U	400	U
Anthracene	50000	NYSDEC TAGM 4046	360	U	370	U	360	U	360	U	360	U	400	U
Benzo(a)anthracene	224	EPA Carcinogenic	360	U	370	U	360	U	360	U	360	U	400	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	360	U	370	U	360	U	360	U	360	U	400	U
Benzo(b)fluoranthene	858	NYSDEC Prot. GW	360	U	370	U	360	U	360	U	360	U	400	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	360	U	370	U	360	U	360	U	360	U	120	J
Benzo(k)fluoranthene	858	NYSDEC Prot. GW	360	UJ	370	U	360	U	360	U	360	U	400	UJ
Carbazole			360	U	370	U	360	U	360	U	360	U	400	U
Chrysene	312	NYSDEC Prot. GW	360	U	370	U	360	U	360	U	360	U	400	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	360	U	370	U	360	U	360	U	360	U	400	UJ
Fluoranthene	50000	NYSDEC TAGM 4046	360	U	370	U	360	U	360	U	360	U	400	U
Fluorene	50000	NYSDEC TAGM 4046	360	U	370	U	360	U	360	U	360	U	400	U
Indeno(1,2,3-cd)pyrene	2496	NYSDEC Prot. GW	360	U	370	U	360	U	360	U	360	U	400	U
N-Nitroso-di-n-propylamine			360	U	370	U	1900		360	U	360	U	400	U
N-Nitrosodiphenylamine (1)			360	U	370	U	360	U	360	U	360	U	400	U
Naphthalene	10140	NYSDEC Prot. GW	360	U	370	U	360	U	360	UJ	360	UJ	400	U
Pentachlorophenol	780	NYSDEC Prot. GW	880	UJ	890	U	**2300**		860	U	870	U	960	U
Phenanthrene	50000	NYSDEC TAGM 4046	360	U	370	U	360	U	360	U	360	U	400	U
Phenol	23.4	NYSDEC Prot. GW	360	U	370	U	**2400**		360	U	360	U	400	U
Pyrene	50000	NYSDEC TAGM 4046	360	U	370	U	2000		360	U	360	U	400	U
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	360	U	370	U	360	U	480	U	360	U	400	U

SEAD-25 Subsurface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	SB25-11 SB25-11-03 SA RI ROUND1 4 6 SOIL 10/17/95 VALUE	Q	SB25-12 SB25-12-02 SA RI ROUND1 2 4 SOIL 10/16/95 VALUE	Q	SB25-12 SB25-12-03 SA RI ROUND1 4 6 SOIL 10/16/95 VALUE	Q	SB25-13 SB25-13-02 SA RI ROUND1 0.17 3 SOIL 10/08/95 VALUE	Q	SB25-13 SB25-13-04 SA RI ROUND1 6 7.3 SOIL 10/07/95 VALUE	Q	SB25-14 SB25-14-01 SA RI ROUND1 0.17 2 SOIL 10/10/95 VALUE	Q
PESTICIDES/PCB														
4,4'-DDE	2100	EPA Carcinogenic	3.6	U	3.7	U	3.6	U	3.6	U	3 5	U	3 9	U
4,4'-DDT	1950	NYSDEC Prot. GW	3.6	U	3 7	U	3.6	U	3.6	U	3.5	U	3.9	U
Aroclor-1232	1000	EPA Carcinogenic	36	U	37	U	36	U	36	U	35	U	39	U
Aroclor-1254	1000	EPA Carcinogenic	36	U	37	U	36	U	36	U	35	U	39	U
Endosulfan I	702	NYSDEC Prot. GW	1.9	U	1.9	U	1 9	U	1.8	U	1.8	U	2	U
Endrin	78	NYSDEC Prot GW	3.6	U	3.7	U	3.6	U	3.6	U	3.5	U	3.9	U
Endrin aldehyde			3.6	U	3.7	U	3.6	U	3.6	U	3.5	U	3.9	U
Heptachlor epoxide	15.6	NYSDEC Prot. GW	1.9	U	1.9	U	1 9	U	1.8	U	1 8	U	2	U
alpha-Chlordane			1.9	U	1.9	U	1.9	U	1.8	U	1.8	U	2	U
OTHER ANALYSES														
Nitrate/Nitrite-Nitrogen														
Total Petroleum Hydrocarbons			906		32	U	57		47		32		32	U
METALS														
Aluminum	14592.84	NYSDEC Metals	**14900**		9510		9380		6650		6490		**15200**	
Antimony	3.59	NYSDEC Metals	0.52	J	0.5	J	0.58	J	0.33	J	0.37	J	0.89	J
Arsenic	7.5	NYSDEC Metals	5.9	J	4		5.6	J	3.4	J	4.1	J	5 1	**J**
Barium	300	NYSDEC Metals	73		72 2		86.5		46.5		59		76.1	
Beryllium	0.73	NYSDEC Metals	0.66		0.45		0.46		0.33		0.33		0.6	
Cadmium	1	NYSDEC Metals	0.07	U	0.06	U	0.06	U	0.05	U	0.05	U	0.06	U
Calcium	101903.8	NYSDEC Metals	61900		**104000**		79600		**105000**		92700		3610	
Chromium	22.13	NYSDEC Metals	22.1	R	14.7	R	15.2	R	10.3	R	11.1	R	19.3	R
Cobalt	30	NYSDEC Metals	10 4		7.4		9.8		6.7		6.9		10 2	
Copper	25	NYSDEC Metals	20.1	J	17.4		24.2		15.4		16.3		15.5	
Iron	26626.65	NYSDEC Metals	25200		18100		21000		14000		15300		22800	
Lead	21.86	NYSDEC Metals	11.9		6.5		9.2		4.6		5.1		21 7	
Magnesium	1221.77	NYSDEC Metals	**13000**		**17600**		**17200**		**19300**		**17700**		**4050**	
Manganese	669.38	NYSDEC Metals	428		415		447		371		393		561	
Mercury	0.1	NYSDEC Metals	0.08		0.02		0.04		0.08		0.04		0.04	
Nickel	33.62	NYSDEC Metals	30.4	J	22.8	J	25.5	J	18	J	18.6	J	21.6	**J**
Potassium	1761.48	NYSDEC Metals	**2740**	**J**	**1780**	**J**	1440	J	1350	J	1210	J	1210	**J**
Selenium	2	NYSDEC Metals	0.83	J	0.79	J	0 72	J	0.56	J	0.62	J	0.77	J
Sodium	103.74	NYSDEC Metals	**113**		**104**		79.2		94.7		**106**		38.2	
Thallium	0.28	NYSDEC Metals	0.67	U	0.64	U	0.58	U	0.45	U	0.5	U	0.57	**U**
Vanadium	150	NYSDEC Metals	24.4		16.6		16.4		12.8		11.9		25.2	
Zinc	82.5	NYSDEC Metals	74.1		49		60.9		44.6		49		74.9	
HERBICIDES														
Dicamba														
MCPP														

SEAD-25 Subsurface Soil Analysis Results by Sample Point

			SB25-14		SB25-15		SB25-15		SB25-16		SB25-16		SB25-2	
			SB25-14-02		SB25-15-01		SB25-15-02		SB25-16-01		SB25-16-02		SB25-2-01	
			SA		SA		SA		SA		SA		SA	
			RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI	
			2		0.17		2		0.17		2		0	
			4		2		4		2		4		2	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			10/10/95		10/17/95		10/17/95		10/23/95		10/23/95		12/03/93	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS														
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
1,2-Dichloroethene (total)			11	U	11	U	11	U	12	U	11	U	11	U
2-Butanone	234	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Acetone	85.8	NYSDEC Prot. GW	11	U	25		11	U	12	U	11	U	11	U
Benzene	46.8	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Carbon Disulfide	2106	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Chloroform	234	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	2	J
Ethylbenzene	4290	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Methylene Chloride	78	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Toluene	1170	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Trichloroethene	546	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
Xylene (total)	936	NYSDEC Prot. GW	11	U	11	U	11	U	12	U	11	U	11	U
SEMIVOLATILE ORGANICS														
1,2,4-Trichlorobenzene	2652	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
1,4-Dichlorobenzene	6630	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
2,4-Dinitrotoluene			360	U	380	U	370	U	380	U	370	U	350	U
2-Chlorophenol	624	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
2-Methylnaphthalene	28392	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	40	J
4-Chloro-3-methylphenol	187.2	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
4-Nitrophenol	78	NYSDEC Prot. GW	880	U	930	UJ	900	U	910	U	910	U	860	U
Acenaphthene	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	380	U	370	U	350	U
Acenaphthylene	31980	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
Anthracene	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	380	U	370	U	350	U
Benzo(a)anthracene	224	EPA Carcinogenic	360	U	380	U	370	U	380	U	370	U		
Benzo(a)pyrene	60.9	EPA Carcinogenic	360	U	380	U	370	U	380	U	370	U		
Benzo(b)fluoranthene	858	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	380	U	370	U	350	U
Benzo(k)fluoranthene	858	NYSDEC Prot. GW	360	J	380	U	370	U	380	U	370	U	350	U
Carbazole			360	U	380	UJ	370	U	380	U	370	U	350	U
Chrysene	312	NYSDEC Prot. GW	360	U	380	U	370	U	19	J	370	U	350	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	**360**	**J**	380	U	370	U	380	U	370	U	350	U
Fluoranthene	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	34	J	370	U	350	U
Fluorene	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	380	U	370	U	350	U
Indeno(1,2,3-cd)pyrene	2496	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
N-Nitroso-di-n-propylamine			360	U	380	U	370	U	380	U	370	U	350	U
N-Nitrosodiphenylamine (1)			360	U	380	U	370	U	380	U	370	U	350	U
Naphthalene	10140	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
Pentachlorophenol	780	NYSDEC Prot. GW	880	U	930	UJ	900	U	910	U	910	U	860	U
Phenanthrene	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	23	J	370	U	350	U
Phenol	23.4	NYSDEC Prot. GW	360	U	380	U	370	U	380	U	370	U	350	U
Pyrene	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	32	J	370	U	350	U
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	360	U	380	U	370	U	380	U	370	U	25	J

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	SB25-14		SB25-15		SB25-15		SB25-16		SB25-16		SB25-2	
			SB25-14-02		SB25-15-01		SB25-15-02		SB25-16-01		SB25-16-02		SB25-2-01	
			SA		SA		SA		SA		SA		SA	
			RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI	
			2		0.17		2		0.17		2		0	
			4		2		4		2		4		2	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			10/10/95		10/17/95		10/17/95		10/23/95		10/23/95		12/03/93	
			VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB														
4,4'-DDE	2100	EPA Carcinogenic	3.6	U	3.9	U	3.7	U	3.8	U	3.7	U	3.5	U
4,4'-DDT	1950	NYSDEC Prot. GW	3.6	U	3.9	U	3.7	U	3.8	U	3.7	U	3.5	U
Aroclor-1232	1000	EPA Carcinogenic	36	U	39	U	37	U	38	U	37	U	35	U
Aroclor-1254	1000	EPA Carcinogenic	36	U	39	U	37	U	38	U	37	U	35	U
Endosulfan I	702	NYSDEC Prot. GW	1.9	U	2	U	1.9	U	2	U	1.9	U	1.8	U
Endrin	78	NYSDEC Prot. GW	3.6	U	3.9	U	3.7	U	3.8	U	3.7	U	3.5	U
Endrin aldehyde			3.6	U	3.9	U	3.7	U	3.8	U	3.7	U	3.5	U
Heptachlor epoxide	15.6	NYSDEC Prot. GW	1.9	U	2	U	1.9	U	2	U	1.9	U	1.8	U
alpha-Chlordane			1.9	U	2	U	1.9	U	2	U	1.9	U	1.8	U
OTHER ANALYSES														
Nitrate/Nitrite-Nitrogen													0.02	
Total Petroleum Hydrocarbons			33	U	48		48		73		53		1600	
METALS														
Aluminum	14592.84	NYSDEC Metals	14100		14300		14200		13900		9510		9370	
Antimony	3.59	NYSDEC Metals	0.52	J	0.49	J	0.66	J	0.76	J	0.47	J	7.6	UJ
Arsenic	7.5	NYSDEC Metals	5.6	J	4.1	J	5.8	J	4.4	J	4		4.1	
Barium	300	NYSDEC Metals	70.6		76.2		75.8		66.8		60.5		36.7	
Beryllium	0.73	NYSDEC Metals	0.65		0.69		0.67		0.66		0.46		0.49	**J**
Cadmium	1	NYSDEC Metals	0.05	U	0.06	U	0.07	U	0.06	U	0.04	U	0.48	U
Calcium	101903.8	NYSDEC Metals	60800		**105000**		58600		62300		57800		**112000**	
Chromium	22.13	NYSDEC Metals	19.8	R	20.8	R	20.6	R	20.3	J	14.8	J	15.4	
Cobalt	30	NYSDEC Metals	9.3		8.3		10.3		8.3		9.2		10.5	
Copper	25	NYSDEC Metals	24.9		22.2	J	24.5	J	23.6		21		14.7	
Iron	26626.65	NYSDEC Metals	24200		21800		24100		22100		18300		19100	
Lead	21.86	NYSDEC Metals	9.5		9		19		8.6	J	7.9	J	**26.8**	J
Magnesium	1221.77	NYSDEC Metals	**10600**		**9890**		**13700**		**13000**		**11200**		**8590**	
Manganese	669.38	NYSDEC Metals	408		391		460		375	R	395	R	450	
Mercury	0.1	NYSDEC Metals	**0.12**		0.05		0.08		0.03		0.01		0.06	JR
Nickel	33.62	NYSDEC Metals	28.6	J	28.6	J	31.3	J	28.3		26.3		**46.4**	
Potassium	1761.48	NYSDEC Metals	**2600**	**J**	**2500**	**J**	**2300**	**J**	**2230**	**J**	1460	J	916	
Selenium	2	NYSDEC Metals	0.59	J	0.75	J	0.8	J	0.71	U	0.51	U	0.17	UJ
Sodium	103.74	NYSDEC Metals	78.2		**118**		95.8		81.2		**129**		**128**	J
Thallium	0.28	NYSDEC Metals	0.85	U	0.61	U	0.65	U	0.58	U	**0.63**		0.18	U
Vanadium	150	NYSDEC Metals	24.7		24		23.9		23.9		15.7		12.4	
Zinc	82.5	NYSDEC Metals	67.5		60.9		75.7		**87.4**		62.3		35.4	
HERBICIDES														
Dicamba													5.4	U
MCPP													5400	

SEAD-25 Subsurface Soil Analysis Results by Sample Point

			SB25-2		SB25-2		SB25-2		SB25-3		SB25-3		SB25-3	
			SB25-2-02		SB25-2-03		SB25-20-01		SB25-3-01		SB25-3-02		SB25-3-03	
			SA		SA		DU		SA		SA		SA	
			ESI		ESI		ESI		ESI		ESI		ESI	
			2		4		0		0		2		4	
			4		6		2		2		4		5	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS														
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	19	U	11	U	11	U	170		12	U	11	U
1,2-Dichloroethene (total)			19	U	11	U	11	U	52	U	12	U	11	U
2-Butanone	234	NYSDEC Prot. GW	10	J	11	U	11	U	52	U	8	J	11	U
Acetone	85.8	NYSDEC Prot. GW	39		24		11	U	52	U	40		11	U
Benzene	46.8	NYSDEC Prot. GW	19	U	11	U	11	U	**100**		12	U	4	J
Carbon Disulfide	2106	NYSDEC Prot. GW	19	U	11	U	11	U	52	U	12	U	11	U
Chloroform	234	NYSDEC Prot. GW	19	U	11	U	11	U	52	U	12	U	11	U
Ethylbenzene	4290	NYSDEC Prot. GW	19	U	6	J	11	U	370		12	U	28	
Methylene Chloride	78	NYSDEC Prot. GW	19	U	11	U	11	U	52	U	12	U	11	U
Toluene	1170	NYSDEC Prot. GW	19	U	11	U	11	U	840		4	J	30	
Trichloroethene	546	NYSDEC Prot. GW	19	U	11	U	11	U	38	J	12	U	11	U
Xylene (total)	936	NYSDEC Prot. GW	19	U	37		11	U	**4100**	**J**	49		320	
SEMIVOLATILE ORGANICS														
1,2,4-Trichlorobenzene	2652	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
1,4-Dichlorobenzene	6630	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
2,4-Dinitrotoluene			3600	U	3600	U	500	U	6900	U	400	U	390	U
2-Chlorophenol	624	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
2-Methylnaphthalene	28392	NYSDEC Prot. GW	5100		2800	J	51	J	4700	J	400	U	410	
4-Chloro-3-methylphenol	187.2	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
4-Nitrophenol	78	NYSDEC Prot. GW	8700	U	8700	U	1200	U	17000	U	960	U	950	U
Acenaphthene	50000	NYSDEC TAGM 4046	300	J	220	J	500	U	6900	U	400	U	390	U
Acenaphthylene	31980	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
Anthracene	50000	NYSDEC TAGM 4046	3600	U	3600	U	500	U	6900	U	400	U	390	U
Benzo(a)anthracene	224	EPA Carcinogenic	350	U	3600	U	3600	U	500	U	6900	U	400	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	350	U	3600	U	3600	U	500	U	6900	U	400	U
Benzo(b)fluoranthene	858	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	3600	U	3600	U	500	U	6900	U	400	U	38	J
Benzo(k)fluoranthene	858	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
Carbazole			3600	U	3600	U	500	U	6900	U	400	U	390	U
Chrysene	312	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	34	J
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	3600	U	3600	U	500	U	6900	U	400	U	390	U
Fluoranthene	50000	NYSDEC TAGM 4046	3600	U	3600	U	500	U	6900	U	400	U	38	J
Fluorene	50000	NYSDEC TAGM 4046	3600	U	620	J	500	U	910	J	400	U	69	J
Indeno(1,2,3-cd)pyrene	2496	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
N-Nitroso-di-n-propylamine			3600	U	3600	U	500	U	6900	U	400	U	390	U
N-Nitrosodiphenylamine (1)			960	J	870	J	500	U	1500	J	400	U	390	U
Naphthalene	10140	NYSDEC Prot. GW	390	J	250	J	500	U	1100	J	400	U	130	J
Pentachlorophenol	780	NYSDEC Prot. GW	8700	U	8700	U	1200	U	17000	U	960	U	950	U
Phenanthrene	50000	NYSDEC TAGM 4046	1400	J	1200	J	65	J	2500	J	400	U	200	J
Phenol	23.4	NYSDEC Prot. GW	3600	U	3600	U	500	U	6900	U	400	U	390	U
Pyrene	50000	NYSDEC TAGM 4046	3600	U	3600	U	500	U	380	J	400	U	57	J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	3600	U	3600	U	49	J	480	J	30	J	390	U

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

			SB25-2		SB25-2		SB25-2		SB25-3		SB25-3		SB25-3	
			SB25-2-02		SB25-2-03		SB25-20-01		SB25-3-01		SB25-3-02		SB25-3-03	
			SA		SA		DU		SA		SA		SA	
			ESI		ESI		ESI		ESI		ESI		ESI	
			2		4		0		0		2		4	
			4		6		2		2		4		5	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB														
4,4'-DDE	2100	EPA Carcinogenic	3.6	U	3.6	U	3.6	U	4.3		4	U	3.9	U
4,4'-DDT	1950	NYSDEC Prot. GW	3.6	U	3.6	U	3.6	U	3.4	J	4	U	3.9	U
Aroclor-1232	1000	EPA Carcinogenic	36	U	36	U	36	U	35	U	40	U	39	U
Aroclor-1254	1000	EPA Carcinogenic	36	U	36	U	36	U	35	U	40	U	39	U
Endosulfan I	702	NYSDEC Prot. GW	1.8	U	1.9	U	1.8	U	2.5	J	2	U	2	U
Endrin	78	NYSDEC Prot. GW	3.6	U	3.6	U	3.6	U	3.4	J	4	U	3.9	U
Endrin aldehyde			3.6	U	3.6	U	3.6	U	3.7	J	4	U	3.9	U
Heptachlor epoxide	15.6	NYSDEC Prot. GW	1.8	U	1.9	U	1.8	U	2.8	J	2	U	2	U
alpha-Chlordane			1.8	U	1.9	U	1.8	U	1.8	U	2	U	2	U
OTHER ANALYSES														
Nitrate/Nitrite-Nitrogen			0.01		0.02		0.09		0.04		0.01	U	0.04	
Total Petroleum Hydrocarbons			3000		1920		1270		14800		112		410	
METALS														
Aluminum	14592.84	NYSDEC Metals	9140		8640		7330		6160		**18600**		6310	
Antimony	3.59	NYSDEC Metals	7.6	UJ	6.6	UJ	8.7	UJ	9.2	UJ	12	UJ	4.1	U
Arsenic	7.5	NYSDEC Metals	3.5		3.4		5.4		2.4		5		**8.3**	
Barium	300	NYSDEC Metals	57.1		60.3		32.7	J	82.3		111		64.7	
Beryllium	0.73	NYSDEC Metals	0.43	J	0.36	J	0.48	J	0.42	J	0.65	J	0.28	J
Cadmium	1	NYSDEC Metals	0.47	U	0.73		0.64	J	0.58	U	0.75	U	0.4	U
Calcium	101903.8	NYSDEC Metals	70800		81800		**192000**		**195000**		2760		**141000**	
Chromium	22.13	NYSDEC Metals	14.5		15.8		11.5		11.9		**25.2**		12	
Cobalt	30	NYSDEC Metals	8.2		7.2		9.8		6.3	J	15.8		6.8	J
Copper	25	NYSDEC Metals	21.6		23.3		14.4		16.3		7.6		14.2	J
Iron	26626.65	NYSDEC Metals	18700		16800		14400		11900		**54600**		15400	
Lead	21.86	NYSDEC Metals	13.7	J	14.2	J	**42.6**	**J**	**291**	**J**	15.8	J	**51**	
Magnesium	1221.77	NYSDEC Metals	**12800**		**21000**		**12300**		**11300**		**3980**		**10000**	
Manganese	669.38	NYSDEC Metals	464		407		444		384		622		529	J
Mercury	0.1	NYSDEC Metals	0.03	J	0.05	JR	0.03	J	0.03	J	0.08	JR	0.03	U
Nickel	33.62	NYSDEC Metals	**35.3**		23.7		23		17.5		21.7		18.6	
Potassium	1761.48	NYSDEC Metals	979		1230		1370		1420		1730		769	J
Selenium	2	NYSDEC Metals	0.12	UJ	0.18	UJ	0.21	UJ	0.15	UJ	0.2	UJ	**2.3**	J
Sodium	103.74	NYSDEC Metals	**128**	**J**	**157**	**J**	**181**	**J**	**180**	**J**	55	J	**130**	J
Thallium	0.28	NYSDEC Metals	0.13	U	0.2	U	1.2	U	0.81	U	0.21	U	**0.5**	**J**
Vanadium	150	NYSDEC Metals	14.8		14		11.5		10.1		39.8		11	
Zinc	82.5	NYSDEC Metals	56.7		**94.8**		**97.9**		74.7		43.7		78.4	J
HERBICIDES														
Dicamba			5.4	U	5.5	U	5.5	U	5.3	U	6	U	5.9	U
MCPP			5400	U	5500	U	5500	U	5300	U	6000	U	5900	U

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

			SB25-4		SB25-4		SB25-4		SB25-5		SB25-5		SB25-5		SB25-6	
			SB25-4-01		SB25-4-02		SB25-4-03		SB25-5-01		SB25-5-02		SB25-5-03		SB25-6-01	
			SA		SA		SA		SA		SA		SA		SA	
			ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			0		2		4		0		2		4		0	
			2		4		6		2		4		6		2	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																
1,1,1-Trichloroethane	592 8	NYSDEC Prot. GW	1400	U	11	U	11	U	1300	U	6800	U	1200	U	11	U
1,2-Dichloroethene (total)			1400	U	11	U	11	U	310	J	6800	U	1200	U	11	U
2-Butanone	234	NYSDEC Prot. GW	1400	U	6	J	11	U	1300	U	6800	U	1200	U	11	U
Acetone	85 8	NYSDEC Prot. GW	**1800**		38		19		**2800**		6800	U	**760**	**J**	11	U
Benzene	46.8	NYSDEC Prot. GW	1400	U	11	U	11	U	1300	U	6800	U	1200	U	11	U
Carbon Disulfide	2106	NYSDEC Prot. GW	1400	U	11	U	11	U	1300	U	6800	U	1200	U	11	U
Chloroform	234	NYSDEC Prot. GW	1400	U	9	J	11	U	1300	U	6800	U	1200	U	11	U
Ethylbenzene	4290	NYSDEC Prot. GW	1400	U	11	U	11	U	990	J	**17000**		1200		11	U
Methylene Chloride	78	NYSDEC Prot. GW	1400	U	11	U	11	U	**390**	**J**	6800	U	**160**	**J**	11	U
Toluene	1170	NYSDEC Prot. GW	1400	U	11	U	11	U	820	J	**4500**	**J**	1200	U	11	U
Trichloroethene	546	NYSDEC Prot. GW	1400	U	11	U	11	U	280	J	6800	U	1200	U	11	U
Xylene (total)	936	NYSDEC Prot. GW	**2900**		50		110		**14000**		**130000**		**9000**		11	U
SEMIVOLATILE ORGANICS																
1,2,4-Trichlorobenzene	2652	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
1,4-Dichlorobenzene	6630	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
2,4-Dinitrotoluene			12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
2-Chlorophenol	624	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
2-Methylnaphthalene	28392	NYSDEC Prot GW	2600	J	1500	U	68	J	8900	J	550		7100	J	360	U
4-Chloro-3-methylphenol	187.2	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
4-Nitrophenol	78	NYSDEC Prot. GW	29000	U	3600	U	2000	U	27000	U	1200	U	27000	U	880	U
Acenaphthene	50000	NYSDEC TAGM 4046	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
Acenaphthylene	31980	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	32	J
Anthracene	50000	NYSDEC TAGM 4046	12000	U	1500	U	810	U	11000	U	510	U	11000	U	42	J
Benzo(a)anthracene	224	EPA Carcinogenic	27	J	12000	U	1500	U	810	U	11000	U	510	U	11000	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	390	U	12000	U	1500	U	810	U	11000	U	510	U	11000	U
Benzo(b)fluoranthene	858	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	240	J
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	12000	U	1500	U	810	U	11000	U	510	U	11000	U	200	J
Benzo(k)fluoranthene	858	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	260	J
Carbazole			12000	U	1500	U	810	U	11000	U	510	U	11000	U	26	J
Chrysene	312	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	**350**	**J**
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	12000	U	1500	U	810	U	11000	U	510	U	11000	U	**72**	**J**
Fluoranthene	50000	NYSDEC TAGM 4046	12000	U	1500	U	810	U	11000	U	510	U	11000	U	570	
Fluorene	50000	NYSDEC TAGM 4046	1500	J	170	J	95	J	1900	J	510	U	11000	U	28	J
Indeno(1,2,3-cd)pyrene	2496	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	170	J
N-Nitroso-di-n-propylamine			12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
N-Nitrosodiphenylamine (1)			12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
Naphthalene	10140	NYSDEC Prot. GW	770	J	1500	U	810	U	1500	J	330	J	4300	J	360	U
Pentachlorophenol	780	NYSDEC Prot. GW	29000	U	3600	U	2000	U	27000	U	1200	U	27000	U	880	U
Phenanthrene	50000	NYSDEC TAGM 4046	2700	J	350	J	180	J	4600	J	67	J	1000	J	370	
Phenol	23.4	NYSDEC Prot. GW	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U
Pyrene	50000	NYSDEC TAGM 4046	12000	U	1500	U	810	U	950	J	510	U	11000	U	560	
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	12000	U	1500	U	810	U	11000	U	510	U	11000	U	360	U

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

			SB25-4		SB25-4		SB25-4		SB25-5		SB25-5		SB25-5		SB25-6	
			SB25-4-01		SB25-4-02		SB25-4-03		SB25-5-01		SB25-5-02		SB25-5-03		SB25-6-01	
			SA		SA		SA		SA		SA		SA		SA	
			ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			0		2		4		0		2		4		0	
			2		4		6		2		4		6		2	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93		12/03/93	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																
4,4'-DDE	2100	EPA Carcinogenic	3.9	UJ	3.7	U	4.3	U	4.8	J	3.7	UJ	3.6	U	3.7	U
4,4'-DDT	1950	NYSDEC Prot. GW	3.9	UJ	3.7	U	4.3	U	3.5	UJ	3.7	UJ	3.6	U	4.3	
Aroclor-1232	1000	EPA Carcinogenic	39	UJ	37	U	43	U	35	UJ	37	UJ	36	U	37	U
Aroclor-1254	1000	EPA Carcinogenic	33	J	37	U	43	U	130	J	37	UJ	36	U	37	U
Endosulfan I	702	NYSDEC Prot. GW	2	UJ	1.9	U	2.2	U	1.8	UJ	1.9	UJ	1.9	U	1.9	U
Endrin	78	NYSDEC Prot. GW	3.9	UJ	3.7	U	4.3	U	2.1	J	3.7	UJ	3.6	U	3.7	U
Endrin aldehyde			3.9	UJ	3.7	U	4.3	U	3.5	UJ	3.7	UJ	3.6	U	3.7	U
Heptachlor epoxide	15.6	NYSDEC Prot. GW	2	UJ	1.9	U	2.2	U	2.9	J	1.9	UJ	1.9	U	1.9	U
alpha-Chlordane			2	UJ	1.9	U	2.2	U	2.5	J	1.9	UJ	1.9	U	1.9	U
OTHER ANALYSES																
Nitrate/Nitrite-Nitrogen			0.01	U	0.01	U	0.01		0.01	U	0.01		0.02		0.17	
Total Petroleum Hydrocarbons			5800		770		800		740		27000		2100		99	
METALS																
Aluminum	14592.84	NYSDEC Metals	**19700**		**16600**		7590		13200		**23600**		11600		10600	
Antimony	3.59	NYSDEC Metals	4.2	U	4.5	U	4.6	U	2.5	J	3.8	U	4	U	4.2	U
Arsenic	7.5	NYSDEC Metals	**12.2**		7.4		**9.1**		5.1		**8.3**		**8**		**8.3**	
Barium	300	NYSDEC Metals	57.4		86.1		46.1		61.8		160		81.1		59.1	
Beryllium	0.73	NYSDEC Metals	**0.86**	**J**	**0.82**	**J**	**0.76**	**J**	0.57	J	**1.1**		0.54	J	0.48	**J**
Cadmium	1	NYSDEC Metals	0.41	U	0.43	U	0.44	U	0.24	U	0.37	U	0.39	U	0.41	U
Calcium	101903.8	NYSDEC Metals	5330		17800		**128000**		42600		5120		74200		82500	
Chromium	22.13	NYSDEC Metals	**28.4**		**26.8**		15.8		21.1		**30.4**		17.5		16.9	
Cobalt	30	NYSDEC Metals	11.5		16.8		5.6	J	10.8		14		9.5		11.2	
Copper	25	NYSDEC Metals	**35.7**	**J**	**28.3**	**J**	11.4	J	17.6	J	**34**	**J**	22	J	20.2	**J**
Iron	26626.65	NYSDEC Metals	**38100**		**35200**		14000		24400		**31100**		20700		21400	
Lead	21.86	NYSDEC Metals	**66.4**		16.4		**156**		**77.2**		18		15.6		9.5	
Magnesium	1221.77	NYSDEC Metals	**5210**		**8550**		**21800**		**6590**		**6950**		**17800**		**19600**	
Manganese	669.38	NYSDEC Metals	281	J	**776**	**J**	344	J	433	J	**697**	**J**	423	J	**722**	**J**
Mercury	0.1	NYSDEC Metals	0.04	J	0.04	J	0.04	U	0.03	U	**0.96**		0.04	U	0.03	J
Nickel	33.62	NYSDEC Metals	**34.4**		**47.8**		14.2		30.8		**45.2**		29.1		26.8	
Potassium	1761.48	NYSDEC Metals	1430		1410		**1980**		**1790**		**3250**		**2090**		1480	
Selenium	2	NYSDEC Metals	0.92	J	0.85	J	1.5	J	1	J	0.67	J	0.66	J	0.97	J
Sodium	103.74	NYSDEC Metals	55.2	J	81.3	J	**176**	**J**	97.4	J	98.1	J	**162**	**J**	**269**	J
Thallium	0.28	NYSDEC Metals	**0.51**	**J**	**0.48**	**J**	**0.79**	**J**	**0.55**	**J**	**0.62**	**J**	0.23	J	0.24	**UJ**
Vanadium	150	NYSDEC Metals	34.1		27.5		14.8		17.5		40.8		20.5		18.5	
Zinc	82.5	NYSDEC Metals	72.9	J	**210**	**J**	67	J	51.9	J	60.5	J	76.6	J	71.6	**J**
HERBICIDES																
Dicamba			5.9	U	5.6	U	5.4	U	6.4		5.7	U	5.5	U	5.6	U
MCPP			5900	U	5600	U	5400	U	5300	U	5700	U	5500	U	5600	U

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	SB25-6 SB25-6-02 SA ESI 2 4 SOIL 12/03/93 VALUE	Q	SB25-7 SB25-7-03 SA RI ROUND1 4 6 SOIL 09/25/95 VALUE	Q	SB25-7 SB25-7-04 SA RI ROUND1 6 8 SOIL 09/25/95 VALUE	Q	SB25-8 SB25-8-01 SA RI ROUND1 0.17 2 SOIL 09/26/95 VALUE	Q	SB25-8 SB25-8-02 SA RI ROUND1 2 4 SOIL 09/26/95 VALUE	Q	SB25-9 SB25-9-01 SA RI ROUND1 0.17 2 SOIL 09/26/95 VALUE	Q	SB25-9 SB25-9-02 SA RI ROUND1 2 4 SOIL 09/26/95 VALUE	Q
VOLATILE ORGANICS																
1,1,1-Trichloroethane	592.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
1,2-Dichloroethene (total)			11	U	11	U	11	U	11	U	11	U	11	U	11	U
2-Butanone	234	NYSDEC Prot. GW	11	U	11	UJ	11	UJ	11	UJ	11	UJ	11	UJ	11	UJ
Acetone	85.8	NYSDEC Prot. GW	7	J	4	J	11	UJ	6	J	4	J	11	UJ	11	UJ
Benzene	46.8	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Carbon Disulfide	2106	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Chloroform	234	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Ethylbenzene	4290	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Methylene Chloride	78	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Toluene	1170	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Trichloroethene	546	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
Xylene (total)	936	NYSDEC Prot. GW	11	U	11	U	11	U	11	U	11	U	11	U	11	U
SEMIVOLATILE ORGANICS																
1,2,4-Trichlorobenzene	2652	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
1,4-Dichlorobenzene	6630	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
2,4-Dinitrotoluene			360	U	350	U	360	UJ	370	U	360	U	370	U	370	U
2-Chlorophenol	624	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
2-Methylnaphthalene	28392	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
4-Chloro-3-methylphenol	187.2	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
4-Nitrophenol	78	NYSDEC Prot. GW	870	U	850	U	870	U	910	U	870	U	910	U	910	UJ
Acenaphthene	50000	NYSDEC TAGM 4046	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Acenaphthylene	31980	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Anthracene	50000	NYSDEC TAGM 4046	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Benzo(a)anthracene	224	EPA Carcinogenic	**230**	**J**	360	U	350	U	360	U	370	U	360	U	370	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	**250**	**J**	360	U	350	U	360	U	370	U	360	U	370	U
Benzo(b)fluoranthene	858	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	360	U	350	U	360	UJ	370	U	360	U	370	U	370	U
Benzo(k)fluoranthene	858	NYSDEC Prot GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Carbazole			360	U	350	U	360	U	370	U	360	U	370	U	370	U
Chrysene	312	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Fluoranthene	50000	NYSDEC TAGM 4046	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Fluorene	50000	NYSDEC TAGM 4046	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Indeno(1,2,3-cd)pyrene	2496	NYSDEC Prot. GW	360	U	350	U	360	UJ	370	U	360	U	370	U	370	U
N-Nitroso-di-n-propylamine			360	U	350	U	360	U	370	U	360	U	370	U	370	U
N-Nitrosodiphenylamine (1)			360	U	350	U	360	U	370	U	360	U	370	U	370	U
Naphthalene	10140	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Pentachlorophenol	780	NYSDEC Prot. GW	870	U	850	U	870	U	910	U	870	U	910	U	910	U
Phenanthrene	50000	NYSDEC TAGM 4046	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Phenol	23.4	NYSDEC Prot. GW	360	U	350	U	360	U	370	U	360	U	370	U	370	U
Pyrene	50000	NYSDEC TAGM 4046	360	U	350	U	360	U	370	U	360	U	370	U	370	U
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	360	U	350	U	360	U	370	U	360	U	370	U	370	U

Table F-1c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Subsurface Soil Analysis Results by Sample Point

			SB25-6		SB25-7		SB25-7		SB25-8		SB25-8		SB25-9		SB25-9	
			SB25-6-02		SB25-7-03		SB25-7-04		SB25-8-01		SB25-8-02		SB25-9-01		SB25-9-02	
			SA		SA		SA		SA		SA		SA		SA	
			ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			2		4		6		0.17		2		0.17		2	
			4		6		8		2		4		2		4	
			SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			12/03/93		09/25/95		09/25/95		09/26/95		09/26/95		09/26/95		09/26/95	
PARAMETER	LEVEL	SOURCE	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																
4,4'-DDE	2100	EPA Carcinogenic	3.6	U	3.5	U	3.6	U	3.7	U	3.6	U	3.7	U	3.7	U
4,4'-DDT	1950	NYSDEC Prot. GW	3.6	U	3.5	U	3.6	U	3.7	U	3.6	U	3.7	U	3.7	U
Aroclor-1232	1000	EPA Carcinogenic	36		35	U	36	U	37	U	36	U	37	U	37	U
Aroclor-1254	1000	EPA Carcinogenic	36	U	35	U	36	U	37	U	36	U	37	U	37	U
Endosulfan I	702	NYSDEC Prot GW	1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.9	U	1.9	U
Endrin	78	NYSDEC Prot GW	3.6	U	3.5	U	3.6	U	3.7	U	3.6	U	3.7	U	3.7	U
Endrin aldehyde			3.6	U	3.5	U	3.6	U	3.7	U	3.6	U	3.7	U	3.7	U
Heptachlor epoxide	15.6	NYSDEC Prot GW	1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.9	U	1.9	U
alpha-Chlordane			1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.9	U	1.9	U
OTHER ANALYSES																
Nitrate/Nitrite-Nitrogen			0.01	U												
Total Petroleum Hydrocarbons			112		33		32	U	32	U	31	U	31	U	30	U
METALS																
Aluminum	14592.84	NYSDEC Metals	7070		8020		7550		**15600**		10100		**16400**		13400	
Antimony	3.59	NYSDEC Metals	3	U	0.42	UJ	0.44	U	0.55		0.55		0.58		0.44	
Arsenic	7.5	NYSDEC Metals	4.8		4.1		3.4		5.7		**9.3**		5.3		6.8	
Barium	300	NYSDEC Metals	35		58		52		85.2		60.7		79.9		89.1	
Beryllium	0.73	NYSDEC Metals	0.35	J	0.43		0.39		**0.78**		0.56		**0.73**		**0.76**	
Cadmium	1	NYSDEC Metals	0.29	U	0.06	U	0.06	U	0.06	U	0.05	U	0.06	U	0.06	U
Calcium	101903.8	NYSDEC Metals	**122000**		**120000**	**J**	**133000**	**J**	7490	J	74200	J	2640	J	38700	J
Chromium	22.13	NYSDEC Metals	11.3		13.7	J	12.4	J	22.1	J	16.4	J	**23.5**	**J**	21.8	J
Cobalt	30	NYSDEC Metals	6.6	J	8.2		6.9		14.6		9.5		8.8		18.1	
Copper	25	NYSDEC Metals	12	J	17.7		16.4		21.7		**32.7**		20.7		**30.9**	
Iron	26626.65	NYSDEC Metals	15800		18900		15400		**28100**		24000		**29000**		**30100**	
Lead	21.86	NYSDEC Metals	13.8		7		6.5		17.2		14.8		13.6		18.6	
Magnesium	1221.77	NYSDEC Metals	**22800**		**17400**		**20700**		**5790**		**18300**		**4530**		**9630**	
Manganese	669.38	NYSDEC Metals	610	J	**735**		402		**759**		483		355		**1700**	
Mercury	0.1	NYSDEC Metals	0.04	U	0.02		0.01		0.04		0.02		0.04		0.03	J
Nickel	33.62	NYSDEC Metals	18		26.4		22.4		30.5		29.8		26.5		**53.3**	
Potassium	1761.48	NYSDEC Metals	1060		1280		1430		1420		1590		1490		1300	
Selenium	2	NYSDEC Metals	0.63	J	0.7	U	0.74	U	0.75	U	0.65	U	0.83	J	0.91	
Sodium	103.74	NYSDEC Metals	**186**	**J**	89.1		**110**		40.7	U	99.4		39.2	U	58.6	
Thallium	0.28	NYSDEC Metals	0.21	UJ	**1.1**		0.6	U	**0.96**		**0.73**		**1.3**		**1.6**	
Vanadium	150	NYSDEC Metals	12		13.4		13.7		27.3		20.9		29.3		23.5	
Zinc	82.5	NYSDEC Metals	40.6	J	64.9		65.1		68.4		69.7		57.8		**103**	
HERBICIDES																
Dicamba			5.4	U												
MCPP			5400	U												

Table F-1d
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Surface Water Analysis Results by Sample Point

			LOC ID:	SW25-1		SW25-10		SW25-2		SW25-3		SW25-4		SW25-5	
			SAMP ID:	SW25-1		SW25-10		SW25-2		SW25-3		SW25-4		SW25-5	
			QC CODE:	SA		SA		SA		SA		SA		SA	
			STUDY ID:	PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1	
			MATRIX:	SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
			SAMP. DATE:	06-Oct-95		06-Oct-95		06-Oct-95		22-Oct-95		06-Oct-95		06-Oct-95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Volatile Organics															
1 Acetone		NONE	UG/L	24		10	U	10	U	10	UJ	10	U	10	U
Semivolatile Organics															
1 Di-n-butylphthalate		NONE	UG/L	1	J	10	U	11	U	10	U	10	U	10	U
2 Dibenzofuran		NONE	UG/L	11	U	10	U	11	U	10	U	10	U	10	U
3 Diethylphthalate		NONE	UG/L	11	U	10	U	11	U	10	U	0.5	J	10	U
4 Pyrene		NONE	UG/L	11	U	10	U	1	J	10	U	10	U	10	U
Metals															
1 Aluminum	100	NYS Class C SWQS	UG/L	**1110**		**129**	**J**	**1330**		**953**		**1500**		**1200**	
2 Arsenic	190	NYS Class C SWQS	UG/L	3.5	J	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
3 Barium		NONE	UG/L	18.9	J	35	J	22.4	J	19.5		39.7	J	39.7	J
4 Calcium		NONE	UG/L	22600		55700		31400		33800		52800		53500	
5 Chromium	144.2	NYS Class C SWQS	UG/L	3.3	J	0.5	U	3.3	J	2	J	2.2	J	1.6	J
6 Cobalt	5	NYS Class C SWQS	UG/L	1.6	J	1	U	1.1	J	1	U	1	U	0.99	U
7 Copper	8.1	NYS Class C SWQS	UG/L	**13.2**	**J**	1.6	J	**9.1**	**J**	4.4		3.4	J	2.6	J
8 Iron	300	NYS Class C SWQS	UG/L	**1300**		191		**1450**		**1040**	**J**	**1500**		**837**	
9 Lead	1.8	NYS Class C SWQS	UG/L	**7**		1.5	U	**5.5**		**2.8**		**3.3**		1.5	U
10 Magnesium		NONE	UG/L	1900	J	7540		3680	J	2920		7040		6900	
11 Manganese		NONE	UG/L	38.6		1.9	J	22.3		12.4		18.8		10.4	J
12 Mercury		NONE	UG/L	0.03	J	0.04	J	0.05	J	0.02	U	0.03	J	0.02	J
13 Nickel	68.3	NYS Class C SWQS	UG/L	4	J	1	U	3.9	J	3		2.3	J	2.1	J
14 Potassium		NONE	UG/L	12900		2870	J	9290		6170		3230	J	3910	J
15 Silver	0.1	NYS Class C SWQS	UG/L	0.79	U	0.8	U	0.8	U	0.8	U	0.8	U	0.79	U
16 Sodium		NONE	UG/L	108000		57000		67900		38100		74400		69800	
17 Vanadium	14	NYS Class C SWQS	UG/L	4.7	J	1.1	U	3.9	J	2.5		2.9	J	2.8	J
18 Zinc	56.8	NYS Class C SWQS	UG/L	22.9		2	J	**70.3**		16.5		10	J	6.3	J

Table F-1d
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

-25 Surface Water Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC ID:	SW25-6		SW25-6		SW25-7		SW25-8		SW25-9	
			SAMP ID:	SW25-15		SW25-6		SW25-7		SW25-8		SW25-9	
			QC CODE:	DU		SA		SA		SA		SA	
			STUDY ID:	PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1	
			MATRIX:	SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER		SURFACE WATER	
			SAMP. DATE:	09-Oct-95		09-Oct-95		08-Oct-95		08-Oct-95		08-Oct-95	
Volatile Organics													
1 Acetone		NONE	UG/L	10	U	10	U	10	U	10	U	10	U
Semivolatile Organics													
1 Di-n-butylphthalate		NONE	UG/L	10	U	10	U	0.5	J	10	U	10	U
2 Dibenzofuran		NONE	UG/L	10	U	1	J	10	U	10	U	10	U
3 Diethylphthalate		NONE	UG/L	10	U	10	U	10	U	10	U	10	U
4 Pyrene		NONE	UG/L	10	U	10	U	10	U	10	U	10	U
Metals													
1 Aluminum	100	NYS Class C SWQS	UG/L	25.4	J	25.4	J	41.9	J	39.9	J	29.5	J
2 Arsenic	190	NYS Class C SWQS	UG/L	2.1	U	2.1	U	2.1	U	2.1	U	2.1	U
3 Barium		NONE	UG/L	75.1	J	75.1	J	66.1	J	66.9	J	66.3	J
4 Calcium		NONE	UG/L	105000		105000		94600		95300		95800	
5 Chromium	144.2	NYS Class C SWQS	UG/L	0.54	J	0.5	U	0.5	U	1.1	J	0.5	U
6 Cobalt	5	NYS Class C SWQS	UG/L	0.99	U	0.99	U	0.99	U	0.99	U	0.99	U
7 Copper	8.1	NYS Class C SWQS	UG/L	1.8	J	1.8	J	2.7	J	2.7	J	1.5	J
8 Iron	300	NYS Class C SWQS	UG/L	22.4	J	22.4	J	51.7	J	72.1	J	29.2	J
9 Lead	1.8	NYS Class C SWQS	UG/L	1.5	U	1.5	U	1.5	U	1.5	U	1.5	U
10 Magnesium		NONE	UG/L	13300		13300		11800		11900		11900	
11 Manganese		NONE	UG/L	42.5		42.5		15.7		22.6		15.4	
12 Mercury		NONE	UG/L	0.024	J	0.02	U	0.02	J	0.02	J	0.03	J
13 Nickel	68.3	NYS Class C SWQS	UG/L	0.99	U	0.99	U	1.4	J	1.8	J	0.99	U
14 Potassium		NONE	UG/L	3090	J	3090	J	2880	J	2820	J	2820	J
15 Silver	0.1	NYS Class C SWQS	UG/L	0.794	U	0.79	U	0.8	U	**0.82**	**J**	0.8	U
16 Sodium		NONE	UG/L	213000		213000		192000		187000		187000	
17 Vanadium	14	NYS Class C SWQS	UG/L	1.1	U	1.1	U	1.1	U	1.8	J	1.1	U
18 Zinc	56.8	NYS Class C SWQS	UG/L	5.5	J	5.5	J	4.2	J	3.6	J	3.3	J

Table F-1e
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Sediment Analysis Results by Sample Point

			LOC ID:	SD25-1	SD25-10	SD25-2	SD25-3	SD25-3	SD25-4
			SAMP ID:	SD25-1	SD25-10	SD25-2	SD25-30	SD25-3	SD25-4
			QC CODE:	SA	SA	SA	DU	SA	SA
			STUDY ID:	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
			SAMP. DEPTH TOP:	0	0	0	0	0	0
			SAMP. DEPTH BOT:	0.25	0.17	0.17	0.17	0.17	0.25
			MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			SAMP. DATE:	06-Oct-95	06-Oct-95	06-Oct-95	22-Oct-95	22-Oct-95	06-Oct-95
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics									
1 2-Butanone		NONE	UG/KG	14 U	12 U	14 U	17 U	14 U	15 U
2 Acetone		NONE	UG/KG	7 J	12 U	8 J	17 U	14 U	5 J
3 Carbon Disulfide		NONE	UG/KG	14 U	12 U	14 U	17 U	14 U	15 U
4 Toluene		NONE	UG/KG	14 U	12 U	14 U	17 U	14 U	15 U
Semivolatile Organics									
1 2-Methylnaphthalene		NONE	UG/KG	1700 U	450 U	460 U	440 U	440 U	500 U
2 Acenaphthene	4900	NYS B.A.L.C.T.	UG/KG	130 J	450 U	460 U	440 U	440 U	500 U
3 Acenaphthylene			UG/KG	610 J	450 U	90 J	440 U	440 U	500 U
4 Anthracene			UG/KG	840 J	450 U	180 J	47 J	44 J	500 U
5 Benzo(a)anthracene	45.5	NYS H.H.B.	UG/KG	**3500**	450 U	**600**	**220 J**	**210 J**	500 U
6 Benzo(a)pyrene	45.5	NYS H.H.B.	UG/KG	**3600**	450 U	**770**	**300 J**	**270 J**	500 U
7 Benzo(b)fluoranthene	45.5	NYS H.H.B.	UG/KG	1700 U	450 U	**1200**	**240 J**	**220 J**	500 U
8 Benzo(g,h,i)perylene			UG/KG	1500 J	450 U	550	260 J	240 J	500 U
9 Benzo(k)fluoranthene	45.5	NYS H.H.B.	UG/KG	**6300**	450 U	460 U	**400 J**	**300 J**	500 U
10 Carbazole			UG/KG	270 J	450 U	230 J	440 U	440 U	500 U
11 Chrysene	45.5	NYS H.H.B.	UG/KG	**4900**	450 U	**970**	370 UJ	330 UJ	500 U
12 Di-n-butylphthalate			UG/KG	1700 U	450 U	460 U	440 U	440 U	500 U
13 Dibenz(a,h)anthracene			UG/KG	1200 J	450 U	400 J	120 J	97 J	500 U
14 Dibenzofuran			UG/KG	1700 U	450 U	460 U	440 U	440 U	500 U
15 Fluoranthene	35700	NYS B.A.L.C.T.	UG/KG	7300	450 U	1700	610	560	56 J
16 Fluorene			UG/KG	340 J	450 U	87 J	440 U	440 U	500 U
17 Indeno(1,2,3-cd)pyrene	45.5	NYS H.H.B	UG/KG	**2500**	450 U	**570**	**240 J**	**200 J**	500 U
18 Naphthalene			UG/KG	1700 U	450 U	460 U	440 U	440 U	500 U
19 Phenanthrene	4200	NYS B.A.L.C.T.	UG/KG	3800	450 U	950	310 J	280 J	500 U
20 Pyrene		NONE	UG/KG	9000	450 U	1500	500	520	74 J
Pesticides									
1 4,4'-DDD	0.35	NYS H.H.B.	UG/KG	**16 J**	4.5 U	4.6 U	4.4 U	4.4 U	5 U
2 4,4'-DDE	0.35	NYS H.H.B	UG/KG	**19 J**	4.5 U	**14 J**	**3 J**	**2.4 J**	5 U
3 4,4'-DDT	0.35	NYS H.H.B.	UG/KG	**34**	4.5 U	**18**	**4.2 J**	**2.6 J**	5 U
4 Aldrin	3.5	NYS H.H.B.	UG/KG	**6 J**	2.3 U	2.1 J	2.2 U	2.3 U	2.6 U
5 Endosulfan sulfate			UG/KG	3.6 J	4.5 U	4.6 U	4.4 U	4.4 U	5 U
6 Endrin aldehyde			UG/KG	5.2 U	4.5 U	4.6 U	4.4 U	14 J	5 U
7 Endrin ketone			UG/KG	14 J	4.5 U	4.2 J	4.4 U	4.4 U	5 U
8 Heptachlor	0.028	NYS H.H.B.	UG/KG	2.7 U	2.3 U	2.4 U	2.2 U	2.3 U	2.6 U
9 Heptachlor epoxide	0.028	NYS H.H.B.	UG/KG	**1.9 J**	2.3 U	2.4 U	2.2 U	2.3 U	2.6 U
10 alpha-Chlordane		NONE	UG/KG	2 J	2.3 U	2.4 U	2.3 U	2.2 U	2.6 U
11 beta-BHC		NONE	UG/KG	1.7 J	2.3 U	2.4 U	2.3 U	2.2 U	2.6 U
12 gamma-Chlordane		NONE	UG/KG	2.7 U	2.3 U	2.4 U	2.3 U	2.2 U	2.6 U

Table F-1e
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Sediment Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT	SD25-1	SD25-10	SD25-2	SD25-3	SD25-3	SD25-4
			SAMP ID:	SD25-1	SD25-10	SD25-2	SD25-30	SD25-3	SD25-4
			QC CODE:	SA	SA	SA	DU	SA	SA
			STUDY ID:	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
			SAMP DEPTH TOP:	0	0	0	0	0	0
			SAMP DEPTH BOT:	0.25	0.17	0.17	0.17	0.17	0.25
			MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			SAMP. DATE:	06-Oct-95	06-Oct-95	06-Oct-95	22-Oct-95	22-Oct-95	06-Oct-95
				VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Metals									
1 Aluminum		NONE	MG/KG	10000	10400	9560	12100	15600	10900
2 Antimony	2	Lowest Effect Level	MG/KG	0.87	0.54	0.55	0.57 UJ	0.66 J	0.4 U
3 Arsenic	6	Lowest Effect Level	MG/KG	5.7	**7.3**	4 4	5.1 J	**7.7 J**	4
4 Barium		NONE	MG/KG	58.5	65.4	51.8	65.3	85.7	73.7
5 Beryllium		NONE	MG/KG	0.55	0.54	0.47	0.6	0 8	0.6
6 Cadmium	0 6	Lowest Effect Level	MG/KG	0.06 U	0.07 U	0.04 U	0.08 U	0.05 U	0.05 U
7 Calcium		NONE	MG/KG	89100 J	9940 J	51300 J	17600	16800	8170 J
8 Chromium	26	Lowest Effect Level	MG/KG	17.9 R	18.2 R	15.1 R	18.6 R	24.1 R	16.2 R
9 Cobalt		NONE	MG/KG	8.4	9	7 4	8.9	15.3	7.7
10 Copper	16	Lowest Effect Level	MG/KG	**28.1**	**18.4**	**20.8**	**24**	**35.6 J**	**17.7**
11 Iron	20000	Lowest Effect Level	MG/KG	17200	**20800**	17100	**21900**	**33200**	18900
12 Lead	31	Lowest Effect Level	MG/KG	**94.8**	11.2	**47.7**	20.4	24.5	**34.1**
13 Magnesium		NONE	MG/KG	11500	4260	12300	5690	6490	3830
14 Manganese	460	Lowest Effect Level	MG/KG	389	452	394	411	**711**	370
15 Mercury	0.15	Lowest Effect Level	MG/KG	0.04	0.02	0.05	0.05	0.12	0.05
16 Nickel	16	Lowest Effect Level	MG/KG	**24.3**	**31.5**	**22.2**	**27.4**	**40.9**	**22**
17 Potassium		NONE	MG/KG	1920	1630	1430	1690 J	1870 J	1270
18 Selenium		NONE	MG/KG	0.73 J	0.89 U	0.61 J	0.96 UJ	0.78 J	0 77 J
19 Silver	1	Lowest Effect Level	MG/KG	0.97 U	1.2 U	0.78 U	0.21 U	0.14 U	0.94 U
20 Sodium		NONE	MG/KG	587	85 3	254	460	631	183
21 Thallium		NONE	MG/KG	0.98	0 8	0.45 U	0.78 U	0.54 U	0.87
22 Vanadium		NONE	MG/KG	28	18.7	19 2	22.5	27.9	18.7
23 Zinc	120	Lowest Effect Level	MG/KG	101	71	80 8	88.1	102	66.8
Other Analyses									
1 Total Petroleum Hydrocarbons		NONE	MG/KG	579	135	142	102	92	46 U

Table F-1e
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Sediment Analysis Results by Sample Point

			LOC ID:	SD25-5	SD25-6	SD25-6	SD25-7	SD25-8	SD25-9
			SAMP ID:	SD25-5	SD25-15	SD25-6	SD25-7	SD25-8	SD25-9
			QC CODE:	SA	DU	SA	SA	SA	SA
			STUDY ID:	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
			SAMP. DEPTH TOP:	0	0	0	0	0	0
			SAMP. DEPTH BOT:	0.25	0.17	0.17	0.25	0.25	0.25
			MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			SAMP. DATE:	06-Oct-95	09-Oct-95	09-Oct-95	08-Oct-95	08-Oct-95	08-Oct-95
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics									
1 2-Butanone		NONE	UG/KG	15 U	13 U	2 J	12 J	17 J	15 J
2 Acetone		NONE	UG/KG	15 U	13 U	12 U	26 UJ	39 UJ	36 UJ
3 Carbon Disulfide		NONE	UG/KG	15 U	13 U	12 U	3 J	24 UJ	36 UJ
4 Toluene		NONE	UG/KG	15 U	13 U	12 U	26 UJ	3 J	36 UJ
Semivolatile Organics									
1 2-Methylnaphthalene		NONE	UG/KG	540 U	8100 R	230 J	8900 U	3500 U	190 J
2 Acenaphthene	4900	NYS B.A.L.C T	UG/KG	540 U	8100 R	520 J	1100 J	610 J	260 J
3 Acenaphthylene			UG/KG	540 U	8100 R	770 J	2100 J	3500	2100
4 Anthracene			UG/KG	540 U	830 J	3100	3700 J	3700	2500
5 Benzo(a)anthracene	45.5	NYS H.H.B	UG/KG	540 U	**2200 J**	**5800**	**8500 J**	**9000**	**4500**
6 Benzo(a)pyrene	45.5	NYS H.H.B.	UG/KG	540 U	**2300 J**	**5100**	**12000**	**13000**	**6600**
7 Benzo(b)fluoranthene	45.5	NYS H.H.B.	UG/KG	**64 J**	**1800 J**	**8000**	**25000**	**21000**	**13000**
8 Benzo(g,h,i)perylene			UG/KG	540 U	1600 J	2700	11000	19000	7300
9 Benzo(k)fluoranthene	45.5	NYS H.H.B	UG/KG	540 U	**2500 J**	2200 U	8900 U	3500 U	1700 U
10 Carbazole			UG/KG	540 U	8100 R	1400 J	8900 U	1400 J	1000 J
11 Chrysene	45.5	NYS H.H.B.	UG/KG	**65 J**	**2400 J**	**6800**	**11000**	**11000**	**5700**
12 Di-n-butylphthalate			UG/KG	540 U	2900 J	2200 U	8900 U	3500 U	1700 U
13 Dibenz(a,h)anthracene			UG/KG	540 U	8100 R	1600 J	5900 J	7100	2900
14 Dibenzofuran			UG/KG	540 U	8100 R	440 J	8900 U	540 J	180 J
15 Fluoranthene	35700	NYS B A.L.C.T.	UG/KG	110 J	3700 J	13000	21000	14000	8200
16 Fluorene			UG/KG	540 U	8100 R	1300 J	8900 U	1300 J	550 J
17 Indeno(1,2,3-cd)pyrene	45.5	NYS H H.B.	UG/KG	540 U	**1600 J**	**2400**	**9200**	**14000**	**6900**
18 Naphthalene			UG/KG	540 U	8100 R	320 J	8900 U	440 J	200 J
19 Phenanthrene	4200	NYS B.A.L.C.T.	UG/KG	540 U	1600 J	**9500**	**8300 J**	**5900**	2600
20 Pyrene		NONE	UG/KG	110 J	4000 J	13000	14000	18000	9000
Pesticides									
1 4,4'-DDD	0.35	NYS H.H.B.	UG/KG	5.4 U	**32 J**	**27 J**	**550 J**	**480 J**	**300 J**
2 4,4'-DDE	0.35	NYS H.H.B.	UG/KG	5.4 U	**11 J**	**11 J**	**45 J**	120 UJ	140 UJ
3 4,4'-DDT	0.35	NYS H.H.B.	UG/KG	5.4 U	**16 J**	**15 J**	**93 J**	120 UJ	140 UJ
4 Aldrin	3.5	NYS H H.B.	UG/KG	2.8 U	2.4 J	**4.8 J**	46 UJ	63 UJ	71 UJ
5 Endosulfan sulfate			UG/KG	5.4 U	4 U	4 U	89 UJ	120 UJ	140 UJ
6 Endrin aldehyde			UG/KG	5.4 U	4 U	4 U	89 UJ	120 UJ	140 UJ
7 Endrin ketone			UG/KG	5.4 U	12 J	14 J	52 J	120 UJ	140 UJ
8 Heptachlor	0.028	NYS H.H.B.	UG/KG	2.8 U	2.1 U	2.1 U	**46 J**	63 UJ	71 UJ
9 Heptachlor epoxide	0.028	NYS H.H.B.	UG/KG	2.8 U	**2.4 J**	**2.2 J**	46 UJ	63 UJ	71 UJ
10 alpha-Chlordane		NONE	UG/KG	2.8 U	6.2	6.5	56 J	45 J	64 J
11 beta-BHC		NONE	UG/KG	2.8 U	2.1 U	2.1 U	46 UJ	63 UJ	71 UJ
12 gamma-Chlordane		NONE	UG/KG	2.8 U	7.1 J	7.7 J	62 J	50 J	69 J

Table F-1e
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-25 Sediment Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT						
			LOC ID:	SD25-5	SD25-6	SD25-6	SD25-7	SD25-8	SD25-9
			SAMP ID:	SD25-5	SD25-15	SD25-6	SD25-7	SD25-8	SD25-9
			QC CODE:	SA	DU	SA	SA	SA	SA
			STUDY ID:	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
			SAMP. DEPTH TOP:	0	0	0	0	0	0
			SAMP. DEPTH BOT:	0.25	0.17	0.17	0.25	0.25	0.25
			MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
			SAMP. DATE:	06-Oct-95	09-Oct-95	09-Oct-95	08-Oct-95	08-Oct-95	08-Oct-95
				VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Metals									
1 Aluminum		NONE	MG/KG	14300	1720	2330	3430 J	9310 J	21900 J
2 Antimony	2	Lowest Effect Level	MG/KG	0.7 U	0.54 U	0.4 U	0.86 J	1.4 UJ	**3.4 J**
3 Arsenic	6	Lowest Effect Level	MG/KG	4.9	1.9	2.3	3 J	**6.2 J**	**12.2 J**
4 Barium		NONE	MG/KG	86.1	22	21.3	39.3 J	77.3 J	133 J
5 Beryllium		NONE	MG/KG	0.68	0.16	0.21	0.19 J	0.51 J	1.1 J
6 Cadmium	0.6	Lowest Effect Level	MG/KG	0.1 U	0.16	0.18	**1.2 J**	**2.5 J**	**2.7 J**
7 Calcium		NONE	MG/KG	37100 J	139000 J	169000 J	47100 J	106000 J	55700 J
8 Chromium	26	Lowest Effect Level	MG/KG	21.9 R	7.5 R	**76.6 J**	27.9 R	39.5 R	59 R
9 Cobalt		NONE	MG/KG	9.9	2.3	2.9	3.9 J	8.8 J	26.7 J
10 Copper	16	Lowest Effect Level	MG/KG	**22.5**	10.8	**18.4**	**48.2 J**	**96.6 J**	**116 J**
11 Iron	20000	Lowest Effect Level	MG/KG	**24800**	6590	7390	8020 J	18000 J	**54700 J**
12 Lead	31	Lowest Effect Level	MG/KG	19	**92.2**	**327**	**175 J**	**222 J**	**378 J**
13 Magnesium		NONE	MG/KG	8520	13000	13200	5080 J	12100 J	14400 J
14 Manganese	460	Lowest Effect Level	MG/KG	364	227	277	129 J	328 J	**835 J**
15 Mercury	0.15	Lowest Effect Level	MG/KG	0.05	0.01	0.01 U	0.11 J	**0.22 J**	**0.38 J**
16 Nickel	16	Lowest Effect Level	MG/KG	**32.2**	6.9	8.2	12.3 J	**29.1 J**	**72.6 J**
17 Potassium		NONE	MG/KG	2630	609	739	718 J	2180 J	3270 J
18 Selenium		NONE	MG/KG	1.3 J	0.9 U	0.67 U	1.3 UJ	2.4 UJ	2.9 UJ
19 Silver	1	Lowest Effect Level	MG/KG	1.6 U	1.3 U	0.94 U	**3.4 J**	**6.6 J**	**10.2 J**
20 Sodium		NONE	MG/KG	174	197	205	509 J	485	832 J
21 Thallium		NONE	MG/KG	1.1	0.73 U	0.54 U	1.1 U	1.9 U	2.4 U
22 Vanadium		NONE	MG/KG	25.4	6.1	7.7	17.3 J	42.3 J	84.6 J
23 Zinc	120	Lowest Effect Level	MG/KG	82.5	55.8	60.3	**141 J**	**272 J**	**541 J**
Other Analyses									
1 Total Petroleum Hydrocarbons		NONE	MG/KG	87	1080	1360	6230	7780	2810

Appendix F

SEAD-26 Sampling Program Analysis Results by Sample Point

Table F-2a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Groundwater Analysis Results by Sample Point

				LOC ID	MW26-1	MW26-1	MW26-1	MW26-10	MW26-10	MW26-11	MW26-11
				SAMP ID:	MW26-1-1	MW26-1	26001	MW26-10	26012	MW26-11	26013
				QC CODE:	SA	SA	SA	SA	SA	SA	SA
				STUDY ID:	ESI	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP. DATE	21-Jan-94	13-Nov-95	11-Apr-96	16-Nov-95	27-Mar-96	16-Nov-95	12-Apr-96
	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
1	1,2,4-Trimethylbenzene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
2	1,3,5-Trimethylbenzene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
3	Acetone	50	NYS Class GA	UG/L	10 U	5 U	5 U	5 UJ	5 UJ	5 UJ	5 U
4	Benzene	0.7	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
5	Chloromethane	5	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
6	Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
7	Isopropylbenzene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
8	Naphthalene	50	NYS Class GA	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
9	Toluene	5	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
10	Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
11	n-Butylbenzene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
12	n-Propylbenzene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
13	p-Isopropyltoluene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
14	sec-Butylbenzene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
15	tert-Butylbenzene		NONE	UG/L		0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 UJ	0.5 U
	Semivolatiles										
1	2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	11 U	12 U	11 U	10 U	11 U	12 U
2	Acenaphthene	50	NYS Class GA	UG/L	10 U	11 J	12 U	11 U	10 U	11 U	12 U
3	Dibenzofuran	50	NYS Class GA	UG/L	10 U	11 U	12 U	11 U	10 U	11 U	12 U
4	Diethylphthalate	50	NYS Class GA	UG/L	0.6 J	11 U	12 U	11 U	10 U	11 U	12 U
5	Fluorene	50	NYS Class GA	UG/L	10 U	11 U	12 U	11 U	10 U	11 U	12 U
6	Naphthalene	50	NYS Class GA	UG/L	10 U	11 U	12 U	11 U	10 U	11 U	12 U
7	Phenanthrene	50	NYS Class GA	UG/L	10 U	11 U	12 U	11 U	10 U	11 U	12 U
	Pesticides/PCBs										
1	Endosulfan II		NONE	UG/L	0.12 UJ	0.11 U	0.088 J	0.11 U	0.1 U	0.1 U	0.12 U
2	Heptachlor	0.05	NYS Class GA	UG/L	0.062 UJ	0.054 U	0.03 J	0.054 U	0.05 U	0.052 U	0.058 U
	Metals										
1	Aluminum		NONE	UG/L	188 J	457	38.7	125	19.5 U	144	291
2	Antimony		NONE	UG/L	21.5 U	2.2 U	1.4	2.2 U	2.3 U	2.2 U	1 U
3	Arsenic	25	NYS Class GA	UG/L	0.8 U	2.1 U	4 U	2.1 U	3.5 U	2.1 U	5.7
4	Barium	1000	NYS Class GA	UG/L	31.9 J	33.2	29.9	103	2.6 U	86.5	86.6
5	Beryllium		NONE	UG/L	0.4 U	0.27 U	0.1 U	0.27 U	0.13 U	0.27 U	0.1 U
6	Calcium	10	NYS Class GA	UG/L	**115000**	**121000**	**110000**	**299000**	109 U	**116000**	**106000**
7	Chromium	50	NYS Class GA	UG/L	2.6 U	4.7	0.73	0.5 U	1.3 U	0.82	1.1
8	Cobalt		NONE	UG/L	4.4 U	1.1	0.9 U	1.4	1.1 U	4	5.4
9	Copper	200	NYS Class GA	UG/L	3.1 U	5.7	1 U	1.2	0.94 U	1.3	1.8
10	Iron	300	NYS Class GA	UG/L	286	**867**	58.4 J	202	21.5 U	**1580**	**3540 J**
11	Lead	25	NYS Class GA	UG/L	0.5 U	7.8	1.9 U	1.5 U	1.1 U	1.5 U	1.9 U
12	Magnesium		NONE	UG/L	16700	16600	15500	39000	78.8 U	28700	29700
13	Manganese	300	NYS Class GA	UG/L	**529**	27.5	2.5	**947**	0.62 U	**5780**	**5290**
14	Mercury	2	NYS Class GA	UG/L	0.05 J	0.02 U	0.2 U	0.02 U	0.1 U	0.02 U	0.2 U
15	Nickel		NONE	UG/L	4 U	6.2	1.6 U	3.6	1.7 U	7.1	5.7
16	Potassium		NONE	UG/L	10200	3620	3860 J	33600	98.2 U	82000	86800 J
17	Selenium	10	NYS Class GA	UG/L	0.7 U	3.7 U	3.4 U	3.7 U	3.4 U	3.7 U	3.4 U
18	Sodium	20000	NYS Class GA	UG/L	**30300**	**24600**	**34800**	**30300**	170 U	3680	3430
19	Thallium		NONE	UG/L	1.2 U	4.3	4.7 U	4	3.5 U	3 U	4.7 U
20	Vanadium		NONE	UG/L	3.7 U	1.3 J	1.1 U	1.1 U	1.2 U	1.1 U	1.1 U
21	Zinc	300	NYS Class GA	UG/L	26.7	20.5	3.1 J	3.7	1.1 U	5.1	7 J
	Other Analyses										
1	Nitrate/Nitrite-Nitrogen		NONE	MG/L	1.18						
2	Total Petroleum Hydrocarbons		NONE	MG/L	0.41 U	0.39 U	0.43 U	0.41 U	0.4 U	0.4 U	0.45 U

Table F-2a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

-26 Groundwater Analysis Results by Sample Point

	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
				LOC ID:	MW26-3	MW26-3	MW26-3	MW26-4	MW26-4	MW26-4	MW26-4
				SAMP ID:	MW26-3-1	MW26-3	26003	MW26-4-1	MW26-4	26004	26006
				QC CODE:	SA	SA	SA	SA	SA	DU	SA
				STUDY ID:	ESI	RI ROUND1	RI ROUND2	ESI	RI ROUND1	RI ROUND2	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP. DATE:	22-Jan-94	05-Nov-95	09-Apr-96	22-Jan-94	08-Nov-95	09-Apr-96	09-Apr-96
1	1,2,4-Trimethylbenzene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
2	1,3,5-Trimethylbenzene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
3	Acetone	50	NYS Class GA	UG/L	10 U	5 UJ	5 UJ	10 U	5 U	5 UJ	5 UJ
4	Benzene	0.7	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.5 UJ	0.5 UJ
5	Chloromethane	5	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.5 UJ	0.5 UJ
6	Ethylbenzene	5	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.5 UJ	0.5 UJ
7	Isopropylbenzene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
8	Naphthalene	50	NYS Class GA	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
9	Toluene	5	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.4 J	0.4 UJ
10	Xylene (total)	5	NYS Class GA	UG/L	10 U	0.5 UJ	0.5 UJ	10 U	0.5 U	0.5 UJ	0.5 UJ
11	n-Butylbenzene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
12	n-Propylbenzene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
13	p-Isopropyltoluene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
14	sec-Butylbenzene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
15	tert-Butylbenzene		NONE	UG/L		0.5 UJ	0.5 UJ		0.5 U	0.5 UJ	0.5 UJ
	Semivolatiles										
1	2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U	11 U	10 U	10 U
2	Acenaphthene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U	11 U	10 U	10 U
3	Dibenzofuran	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U	11 U	10 U	10 U
4	Diethylphthalate	50	NYS Class GA	UG/L	10 U	10 U	10 U	0.5 J	11 U	10 U	10 U
5	Fluorene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U	11 U	10 U	10 U
6	Naphthalene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U	11 U	10 U	10 U
7	Phenanthrene	50	NYS Class GA	UG/L	10 U	10 U	10 U	11 U	11 U	10 U	10 U
	Pesticides/PCBs										
1	Endosulfan II		NONE	UG/L	0.11 UJ	0.1 U	0.1 U	0.11 UJ	0.11 U	0.1 U	0.11 U
2	Heptachlor	0.05	NYS Class GA	UG/L	0.054 UJ	0.051 U	0.052 U	0.055 UJ	0.053 U	0.052 U	0.055 U
	Metals										
1	Aluminum		NONE	UG/L	665	342	121	73300	22	34.5 U	34.5 U
2	Antimony		NONE	UG/L	21.6 U	2.2 U	1 U	21.5 U	2.2 U	1 U	1 U
3	Arsenic	25	NYS Class GA	UG/L	1.3 J	2.1 U	4 U	**32.6**	2.1 U	4 U	4 U
4	Barium	1000	NYS Class GA	UG/L	83.8 J	76.3	69.8	399	83	70.6	71.6
5	Beryllium		NONE	UG/L	0.4 U	0.27 U	0.1 U	3.4 J	0.27 U	0.1 U	0.1 U
6	Calcium	10	NYS Class GA	UG/L	**194000**	**184000**	**183000**	**199000**	**180000**	**166000**	**168000**
7	Chromium	50	NYS Class GA	UG/L	2.6 U	4	0.7 U	**122**	0.5 U	0.7 U	0.7 U
8	Cobalt		NONE	UG/L	4.4 J	1 U	0.9 U	62.2	1 U	0.9 U	0.9 U
9	Copper	200	NYS Class GA	UG/L	3.1 U	2.3	1 U	92	2.3	1.4	1.8
10	Iron	300	NYS Class GA	UG/L	**858**	**554**	169 J	**145000**	20	28.1	21.7 U
11	Lead	25	NYS Class GA	UG/L	0.61 J	2.3 J	1.9 U	**32.9**	1.5 U	1.9 U	1.9 U
12	Magnesium		NONE	UG/L	36500	33600	33600	60900	30600	29400	29800
13	Manganese	300	NYS Class GA	UG/L	**4280**	**3540**	**2100**	**2770**	1.1	10	10.1
14	Mercury	2	NYS Class GA	UG/L	0.04 U	0.02 U	0.2 U	0.14 J	0.02 U	0.2 U	0.2 U
15	Nickel		NONE	UG/L	4.7 J	21.8	2.7	163	1.3	1.6 U	1.6 U
16	Potassium		NONE	UG/L	4480 J	3370	3020 J	108000	96200	85600 J	86800 J
17	Selenium	10	NYS Class GA	UG/L	0.85 J	3.7 U	3.4 U	2 J	3.7 U	3.4 U	3.4 U
18	Sodium	20000	NYS Class GA	UG/L	11600	9960	9170	14600	14200	12200	12400
19	Thallium		NONE	UG/L	1.2 U	3.3	4.7 U	1.2 U	4.3	4.7 U	4.7 U
20	Vanadium		NONE	UG/L	3.7 U	1.1 U	1.1 U	110	1.1 U	1.1 U	1.1 U
21	Zinc	300	NYS Class GA	UG/L	13.9 J	7.3 J	2.3	**355**	1.6	1.1	1.1
	Other Analyses										
1	Nitrate/Nitrite-Nitrogen		NONE	MG/L	0.04			3.6			
2	Total Petroleum Hydrocarbons		NONE	MG/L	0.41	0.38 U	0.39 U	0.37 U	0.43 U	0.41 U	0.4 U

Table F-2a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

-26 Groundwater Analysis Results by Sample Point

	PARAMETER	LEVEL	SOURCE	UNIT							
				LOC ID	MW26-5	MW26-5	MW26-6	MW26-6	MW26-7	MW26-7	MW26-7
				SAMP ID	MW26-5	26007	MW26-6	26008	MW26-70	MW26-7	26009
				QC CODE	SA	SA	SA	SA	DU	SA	SA
				STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP DATE:	05-Nov-95	27-Mar-96	05-Nov-95	26-Mar-96	14-Nov-95	14-Nov-95	28-Mar-96
				UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
1	1,2,4-Trimethylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	6	11	17
2	1,3,5-Trimethylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	2	3	7
3	Acetone	50	NYS Class GA	UG/L	5 UJ	5 R	5 UJ	5 R	5 U	5	5 R
4	Benzene	0.7	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	**1**	**2**	**1**
5	Chloromethane	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.7
6	Ethylbenzene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	**6**	**7**	**8**
7	Isopropylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	3	3	5
8	Naphthalene	50	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	6	10	15
9	Toluene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U
10	Xylene (total)	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	2	2	**5**
11	n-Butylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	0.5 U	0.5 U	3
12	n-Propylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	3	3	6
13	p-Isopropyltoluene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	2	3	6
14	sec-Butylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	2	2	4
15	tert-Butylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 UJ	0.5 U	0.5 U	0.3 J	0.6
	Semivolatiles										
1	2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	11 U	11 U	11 U	10	7 J	10 U
2	Acenaphthene	50	NYS Class GA	UG/L	10 U	11 U	11 U	11 U	4 J	3 J	7 U
3	Dibenzofuran	50	NYS Class GA	UG/L	10 U	11 U	11 U	11 U	3 J	3 J	4 U
4	Diethylphthalate	50	NYS Class GA	UG/L	10 U	11 U	11 U	11 U	10 U	10 U	25 U
5	Fluorene	50	NYS Class GA	UG/L	10 U	11 U	11 U	11 U	5 J	5 J	7 U
6	Naphthalene	50	NYS Class GA	UG/L	10 U	11 U	11 U	11 U	14	11	18 U
7	Phenanthrene	50	NYS Class GA	UG/L	10 U	11 U	11 U	11 U	2 J	4 J	5 U
	Pesticides/PCBs										
1	Endosulfan II		NONE	UG/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 UJ	0.1 UJ	0.1 U
2	Heptachlor	0.05	NYS Class GA	UG/L	0.052 U	0.052 U	0.052 U	0.05 U	0.052 UJ	0.052 UJ	0.05 U
	Metals										
1	Aluminum		NONE	UG/L	26.7	262	26.3	88.2 J	429	286	54.1 J
2	Antimony		NONE	UG/L	2.2 U	2.3 U	2.2 U	2.3 U	2.2 U	2.2 U	2.3 U
3	Arsenic	25	NYS Class GA	UG/L	2.1 U	3.5 U	2.1 U	3.5 U	19.5	18	10
4	Barium	1000	NYS Class GA	UG/L	90.6	65.7	68.3	41.1	122	124	78.3
5	Beryllium		NONE	UG/L	0.27 U	0.13 U	0.27 U	0.13 U	0.27 U	0.27 U	0.13 U
6	Calcium	10	NYS Class GA	UG/L	**226000**	**195000**	**100000**	**87200**	**141000**	**141000**	**91000**
7	Chromium	50	NYS Class GA	UG/L	0.5 U	1.3 U	0.5 U	1.3 U	5.9	5.5	1.3 U
8	Cobalt		NONE	UG/L	1.5	1.1 U	0.99 U	1.1 U	1.5	1.5	1.1
9	Copper	200	NYS Class GA	UG/L	0.7 U	1.1	0.69 U	0.94 U	0.98	0.85	0.94 U
10	Iron	300	NYS Class GA	UG/L	28.8	**461**	44.8	191	**7180**	**7250**	**7410**
11	Lead	25	NYS Class GA	UG/L	1.5 U	1.1 U	1.5 U	1.1 U	1.8	1.5 U	1.1 U
12	Magnesium		NONE	UG/L	39400	34000	22000	18700	18200	18100	10600
13	Manganese	300	NYS Class GA	UG/L	**947**	197	**908**	**457**	**4130**	**4190**	**3530**
14	Mercury	2	NYS Class GA	UG/L	0.02 U	0.1 U	0.02 U	0.1 U	0.02 U	0.02 U	0.1 U
15	Nickel		NONE	UG/L	2.8	1.9	2.2	1.7 U	15.5 J	7.5	1.7 U
16	Potassium		NONE	UG/L	9060	5320	6930	4850	4230	4210	3430
17	Selenium	10	NYS Class GA	UG/L	3.7 U	3.4 U	3.7 U	3.4 U	3.7 U	3.7 U	3.4 U
18	Sodium	20000	NYS Class GA	UG/L	16600	11800	5370	3980	12400	12400	5760
19	Thallium		NONE	UG/L	7.6	3.5 U	5.4	3.5 U	4.8	3.1	3.5 U
20	Vanadium		NONE	UG/L	1.1 J	1.2 U	1.1 U	1.2 U	1.2 J	1.1 U	1.2 U
21	Zinc	300	NYS Class GA	UG/L	2.2	3.8	2.2	5.2	6.8 J	8.8 J	1.5
	Other Analyses										
1	Nitrate/Nitrite-Nitrogen		NONE	MG/L							
2	Total Petroleum Hydrocarbons		NONE	MG/L	0.42 U	0.43 U	0.39 U	0.41 U	0.4 U	0.39 U	0.8

Table F-2a
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

-26 Groundwater Analysis Results by Sample Point

				LOC ID:	MW26-8	MW26-8	MW26-9	MW26-9
				SAMP ID:	MW26-8	26010	MW26-9	26011
				QC CODE:	SA	SA	SA	SA
				STUDY ID:	RI ROUND1	RI ROUND2	RI ROUND1	RI ROUND2
				MATRIX:	GROUND WATER	GROUND WATER	GROUND WATER	GROUND WATER
				SAMP DATE:	06-Nov-95	28-Mar-96	13-Nov-95	27-Mar-96
	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q
1	1,2,4-Trimethylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
2	1,3,5-Trimethylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
3	Acetone	50	NYS Class GA	UG/L	5 UJ	5 R	5 U	5 R
4	Benzene	0.7	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
5	Chloromethane	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
6	Ethylbenzene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
7	Isopropylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
8	Naphthalene	50	NYS Class GA	UG/L	0.5 UJ	0.3 J	0.5 U	0.5 UJ
9	Toluene	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
10	Xylene (total)	5	NYS Class GA	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
11	n-Butylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
12	n-Propylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
13	p-Isopropyltoluene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
14	sec-Butylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
15	tert-Butylbenzene		NONE	UG/L	0.5 UJ	0.5 U	0.5 U	0.5 UJ
	Semivolatiles							
1	2-Methylnaphthalene	50	NYS Class GA	UG/L	10 U	10 U	11 U	10 U
2	Acenaphthene	50	NYS Class GA	UG/L	10 U	10 U	11 U	10 U
3	Dibenzofuran	50	NYS Class GA	UG/L	10 U	10 U	11 U	10 U
4	Diethylphthalate	50	NYS Class GA	UG/L	10 U	10 U	11 U	10 U
5	Fluorene	50	NYS Class GA	UG/L	10 U	10 U	11 U	10 U
6	Naphthalene	50	NYS Class GA	UG/L	10 U	10 U	11 U	10 U
7	Phenanthrene	50	NYS Class GA	UG/L	10 U	10 U	11 U	10 U
	Pesticides/PCBs							
1	Endosulfan II		NONE	UG/L	0.11 U	0.1 U	0.1 U	0.1 U
2	Heptachlor	0.05	NYS Class GA	UG/L	0.055 U	0.05 U	0.05 U	0.051 U
	Metals							
1	Aluminum		NONE	UG/L	35.9	168 J	371	19.5 U
2	Antimony		NONE	UG/L	2.2 U	2.3 U	2.2 U	2.3 U
3	Arsenic	25	NYS Class GA	UG/L	2.1 U	3.5 U	2.1 U	3.5 U
4	Barium	1000	NYS Class GA	UG/L	74.8	52.8	79.6	2.6 U
5	Beryllium		NONE	UG/L	0.27 U	0.13 U	0.27 U	0.13 U
6	Calcium	10	NYS Class GA	UG/L	**170000**	**147000**	**146000**	109 U
7	Chromium	50	NYS Class GA	UG/L	0.51	1.3 U	18.9	1.3 U
8	Cobalt		NONE	UG/L	1.4	1.1 U	1.5	1.1 U
9	Copper	200	NYS Class GA	UG/L	1.1	0.94 U	5.6	0.94 U
10	Iron	300	NYS Class GA	UG/L	41.8	**318**	**664**	21.5 U
11	Lead	25	NYS Class GA	UG/L	1.5 U	1.1 U	12.8	1.1 U
12	Magnesium		NONE	UG/L	22300	19500	18900	78.8 U
13	Manganese	300	NYS Class GA	UG/L	**646**	22.8	**375**	0.62 U
14	Mercury	2	NYS Class GA	UG/L	0.02 U	0.1 U	0.02 U	0.1 U
15	Nickel		NONE	UG/L	2.6	1.7 U	14.5	1.7 U
16	Potassium		NONE	UG/L	6170	3860	8690	98.2 U
17	Selenium	10	NYS Class GA	UG/L	3.7 U	3.4 U	3.7 U	3.4 U
18	Sodium	20000	NYS Class GA	UG/L	8780	10500	16100	170 U
19	Thallium		NONE	UG/L	3.2	3.5 U	3 U	3.5 U
20	Vanadium		NONE	UG/L	1.2 J	1.2 U	1.1 U	1.2 U
21	Zinc	300	NYS Class GA	UG/L	2.2	1.8	18.7 J	1.1 U
	Other Analyses							
1	Nitrate/Nitrite-Nitrogen		NONE	MG/L				
2	Total Petroleum Hydrocarbons		NONE	MG/L	0.43 U	0.42 U	0.4 U	0.41 U

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SB26-10		SB26-11		SB26-12		SB26-5		SB26-6		SB26-7		SB26-8		SB26-9	
			SAMP ID:	SB26-10-00		SB26-11-00		SB26-12-00		SB26-5-00		SB26-6-00		SB26-7-00		SB26-8-00		SB26-9-00	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.17		0.17		0.17		0.17		0.17		0.17		0.17		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	09/20/95		10/19/95		10/18/95		09/24/95		09/23/95		09/23/95		09/21/95		09/25/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																			
1,1-Dichloroethene	388	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	10	U	11	UJ	11	U
Acetone	106.7	NYSDEC Prot. GW	UG/KG	20		11	UJ	11	U	11	UJ	11	UJ	10	UJ	11	UJ	11	UJ
Benzene	58.2	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	10	U	11	UJ	11	U
Carbon Disulfide	2619	NYSDEC Prot. GW	UG/KG	11	U	11	U	2	J	11	U	11	U	10	U	11	UJ	11	U
Chlorobenzene	1649	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	10	U	11	UJ	11	U
Chloroform	291	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	10	U	2	J	11	U
Methylene Chloride	97	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	10	J	10	U	11	UJ	11	U
Toluene	1455	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	10	U	11	UJ	11	U
Trichloroethene	679	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	10	U	11	UJ	11	U
Xylene (total)	1164	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	11	U	11	U	10	U	11	UJ	11	U
SEMIVOLATILE ORGANICS																			
1,2,4-Trichlorobenzene	3298	NYSDEC Prot. GW	UG/KG	350	U	360	U	1800	U	440	U	730	U	350	U	350	U	1200	U
2,4,5-Trichlorophenol	97	NYSDEC Prot. GW	UG/KG	840	U	870	U	4400	U	1100	U	1800	U	840	U	850	J	2900	U
2,4-Dinitrophenol	194	NYSDEC Prot. GW	UG/KG	840	U	870	U	4400	U	1100	U	1800	U	840	U	850	U	2900	U
2-Methylnaphthalene	35308	NYSDEC Prot. GW	UG/KG	55	J	360	U	1800	U	440	U	730	U	350	U	350	U	1200	U
2-Nitroaniline	417.1	NYSDEC Prot. GW	UG/KG	840	J	870	J	4400	J	1100	U	1800	U	840	U	850	U	2900	U
2-Nitrophenol	320.1	NYSDEC Prot. GW	UG/KG	350	U	360	J	1800	U	440	U	730	U	350	U	350	U	1200	U
3,3'-Dichlorobenzidine			UG/KG	350	U	360	U	1800	J	440	J	730	J	350	U	350	J	1200	U
3-Nitroaniline	485	NYSDEC Prot. GW	UG/KG	840	U	870	U	4400	U	1100	U	1800	U	840	U	850	U	2900	U
4,6-Dinitro-2-methylphenol			UG/KG	840	J	870	U	4400	U	1100	U	1800	U	840	U	850	U	2900	U
4-Chloro-3-methylphenol	232.8	NYSDEC Prot. GW	UG/KG	350	U	360	U	1800	U	440	U	730	U	350	U	350	U	1200	U
4-Chloroaniline	213.4	NYSDEC Prot. GW	UG/KG	350	U	360	U	1800	U	440	U	730	U	350	U	350	U	1200	U
4-Nitroaniline			UG/KG	840	U	870	U	4400	U	1100	U	1800	J	840	U	850	U	2900	U
Acenaphthene	50000	NYSDEC TAGM 4046	UG/KG	85	J	360	U	1800	U	150	J	730	U	350	U	350	U	540	J
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	200	J	360	U	1800	U	290	J	730	U	58	J	350	U	840	J
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	810		360	U	1800	U	1200		180	J	440		36	J	2000	
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	650		360	U	1800	U	1200		190	J	340	J	37	J	2200	
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	690		360	U	1800	U	2400		310	J	440		66	J	4300	
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	540		360	U	1800	U	1200		250	J	320	J	42	J	1900	
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	460	J	360	U	1800	U	440	U	730	U	430		350	U	1200	U
Butylbenzylphthalate	50000	NYSDEC TAGM 4046	UG/KG	350	U	360	U	1800	U	440	U	730	J	350	U	350	J	1200	U
Carbazole			UG/KG	290	J	360	U	1800	U	210	J	730	U	350	U	350	U	610	J
Chrysene	388	NYSDEC Prot. GW	UG/KG	690		360	U	1800	J	1200		150	J	380		39	J	2400	
Di-n-butylphthalate	7857	NYSDEC Prot. GW	UG/KG	350	U	360	U	1800	U	440	U	730	U	350	U	350	U	1200	U
Dibenz(a,h)anthracene	160050000	NYSDEC Prot. GW	UG/KG	310	J	360	U	1800	U	410	J	76	J	120	J	350	U	720	J
Dibenzofuran	6014	NYSDEC Prot. GW	UG/KG	37	J	360	U	1800	U	440	U	730	U	350	U	350	U	190	J
Fluoranthene	1843000	NYSDEC Prot. GW	UG/KG	1900		360	U	1800	U	2500		310	J	700		64	J	5500	
Fluorene	339500	NYSDEC Prot. GW	UG/KG	91	J	360	U	1800	U	120	J	730	U	350	U	350	U	440	J
Hexachlorobutadiene			UG/KG	350	U	360	J	1800	U	440	U	730	U	350	U	350	U	1200	U
Hexachlorocyclopentadiene			UG/KG	350	U	360	J	1800	U	440	U	730	U	350	U	350	U	1200	U
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	490		360	U	1800	U	910		190	J	270	J	350	U	1400	
Isophorone	4268	NYSDEC Prot. GW	UG/KG	350	U	360	J	1800	U	440	U	730	U	350	U	350	U	1200	U
Naphthalene	12610	NYSDEC Prot. GW	UG/KG	36	J	360	U	1800	U	440	U	730	U	350	U	350	U	1200	U
Nitrobenzene	194	NYSDEC Prot. GW	UG/KG	350	U	360	U	1800	U	440	U	730	U	350	U	350	U	1200	U
Pentachlorophenol	970	NYSDEC Prot. GW	UG/KG	840	U	870	U	4400	U	1100	U	1800	U	840	U	850	U	2900	U
Phenanthrene	213400	NYSDEC Prot. GW	UG/KG	860		360	U	1800	U	1300		180	J	250	J	38	J	4000	
Pyrene	645050	NYSDEC Prot. GW	UG/KG	1200		360	U	230	J	2700		390	J	710		62	J	5100	
bis(2-Ethylhexyl)phthalate	421950	NYSDEC Prot. GW	UG/KG	400		360	U	1800	U	440	U	730	U	350	UJ	350	UJ	1200	U

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SB26-10		SB26-11		SB26-12		SB26-5		SB26-6		SB26-7		SB26-8		SB26-9	
			SAMP ID:	SB26-10-00		SB26-11-00		SB26-12-00		SB26-5-00		SB26-6-00		SB26-7-00		SB26-8-00		SB26-9-00	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0	
			BOTTOM:	0.17		0.17		0.17		0.17		0.17		0.17		0.17		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	09/20/95		10/19/95		10/18/95		09/24/95		09/23/95		09/23/95		09/21/95		09/25/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																			
4,4'-DDD	2900	EPA Carcinogenic	UG/KG	5.4	J	3.6	U	3.3	J	3.5	U	2	J	3.5	U	3.5	U	3.3	J
4,4'-DDE	2100	EPA Carcinogenic	UG/KG	4.8	J	3.6	U	3.3	J	3.5	U	3.6	U	3.5	U	2.8	J	8.3	J
4,4'-DDT	2100	EPA Carcinogenic	UG/KG	7	J	3.6	U	4.1	J	2.1	J	3.6	U	5.8	J	1.8	J	5	
Dieldrin	44	EPA Carcinogenic	UG/KG	3.4	U	3.6	U	2.4	J	3.5	U	3.6	U	3.5	U	3.5	U	3.6	U
Endosulfan I	873	NYSDEC Prot. GW	UG/KG	1.8	U	1.8	U	4.3	J	1.8	U	1.2	J	1.8	U	0.22	J	1.9	U
Endosulfan II	873	NYSDEC Prot. GW	UG/KG	5.7	J	3.6	U	19	J	3.5	J	0.59	J	2.8	J	3.5	U	3.6	U
Endosulfan sulfate	970	NYSDEC Prot. GW	UG/KG	5.4	J	3.6	U	3.6	U	3.8	J	4.8		7	J	3.5	U	5.9	J
Endrin	97	NYSDEC Prot. GW	UG/KG	3.4	U	3.6	U	3.6	U	3.5	U	3.6	U	8		3.5	U	3.6	U
Endrin aldehyde			UG/KG	3.4	U	3.6	U	12	J	2.1	J	5.3	J	9.7	J	3.5	U	8.7	J
Endrin ketone			UG/KG	3.4	U	3.6	U	3.9		3.5	U	3.6	U	13		3.5	U	3.6	U
Heptachlor	97	NYSDEC Prot. GW	UG/KG	1.8	U	1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.8	U	1.9	U
Heptachlor epoxide	19.4	NYSDEC Prot. GW	UG/KG	1.4	J	1.8	U	2.8	J	1.8	U	1.2	J	1.8	U	1.8	U	1.9	U
Methoxychlor			UG/KG	18	U	18	U	18	U	18	U	19	U	18	U	18	U	19	U
alpha-Chlordane			UG/KG	1.8	U	1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.8	U	1.9	U
beta-BHC	194	NYSDEC Prot. GW	UG/KG	1.8	U	1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.8	U	1.9	U
delta-BHC	291	NYSDEC Prot. GW	UG/KG	1.8	U	1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.8	U	1.9	U
gamma-Chlordane	540	EPA Carcinogenic	UG/KG	1.8	U	1.8	U	1.8	U	1.8	U	1.9	U	1.8	U	1.8	U	1.9	U
OTHER ANALYSES																			
Nitrate/Nitrite-Nitrogen			MG/KG																
Total Petroleum Hydrocarbons			MG/KG	1480		41		2090		342		1830		225		79.6		238	
NITROAROMATICS																			
2,4-Dinitrotoluene			UG/KG																
4-amino-2,6-Dinitrotoluene			UG/KG																
HMX			UG/KG																
METALS																			
Aluminum	14592.84	NYSDEC Metals	MG/KG	6380		4700		424		10300		8670		6820		9360		10100	
Antimony	3.59	NYSDEC Metals	MG/KG	0.51	J	0.41	UJ	0.37	U	0.76	J	0.61	J	0.79	J	0.44	J	0.45	J
Arsenic	7.5	NYSDEC Metals	MG/KG	4.2		5		3.7		6.8		4.8		**7.6**		5.6		5.1	
Barium	300	NYSDEC Metals	MG/KG	49.6		34.9		22.5		54.5		52.8		54.9		65.5		56.3	
Beryllium	0.73	NYSDEC Metals	MG/KG	0.45		0.35		0.18		0.51		0.42		0.57		0.45		0.49	
Cadmium	1	NYSDEC Metals	MG/KG	0.05	U	0.06	U	0.08		0.05	U	0.1		0.05	U	0.06	U	0.05	U
Calcium	101903.8	NYSDEC Metals	MG/KG	58000		**196000**		**305000**	J	52800		**161000**		86000		49100		66100	
Chromium	22.13	NYSDEC Metals	MG/KG	13.8	J	8.5	J	1.7	J	18.5	J	14.6	J	19	J	16	J	17.8	J
Cobalt	30	NYSDEC Metals	MG/KG	8.2		7.8		2.7	J	11.5		8.6		12.8		9.6		11.6	
Copper	25	NYSDEC Metals	MG/KG	17.2		15.9		10.1		20.5		23.9		24.1		11.9		24.8	
Cyanide	0.3	NYSDEC Metals	MG/KG	0.52	U	0.59	U	0.41	U	0.53	U	0.51	U	0.48	U	0.52	U	0.52	U
Iron	26626.65	NYSDEC Metals	MG/KG	18700		10700		2910		24700		20200		24800		22600		22700	
Lead	21.86	NYSDEC Metals	MG/KG	14.7		6	J	0.25	UJ	**22.4**		**46.3**		**101**		**25.8**		21.3	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**7210**		**11500**		**7450**		**7530**		**9890**		**10600**		**10500**		**7820**	
Manganese	669.38	NYSDEC Metals	MG/KG	430		318		207		577		489		473		529		483	
Mercury	0.1	NYSDEC Metals	MG/KG	0.03		0.02	J	0.03		0.04		0.02		0.02		0.06		0.03	
Nickel	33.62	NYSDEC Metals	MG/KG	23.9		23.2		9	J	31		24.9		**35.2**		25.3		33.3	
Potassium	1761.48	NYSDEC Metals	MG/KG	1010		1080		406	J	1240		1190		1580		1090		930	
Selenium	2	NYSDEC Metals	MG/KG	0.66	UJ	0.69	U	0.63	U	0.68	J	0.66	UJ	0.63	UJ	0.69	UJ	0.64	J
Silver	0.4	NYSDEC Metals	MG/KG	0.14	U	0.15	U	0.14	U	0.12	U	0.14	U	0.14	U	0.15	U	0.13	U
Sodium	103.74	NYSDEC Metals	MG/KG	41.2		86.4		**176**		64.6		**115**		**114**		87.3		55.1	
Thallium	0.28	NYSDEC Metals	MG/KG	**0.77**	J	0.56	U	**0.79**		0.46	U	**0.53**	UJ	**0.79**	J	0.56	U	0.48	U
Vanadium	150	NYSDEC Metals	MG/KG	14.2		10.2	J	4.4	J	15.8		13.2		19.1		14.4		14.6	
Zinc	82.5	NYSDEC Metals	MG/KG	77.7	J	50		15.4		**88.5**	J	**89.7**	J	**109**	J	63.7	J	**95.1**	J
HERBICIDES																			
2,4,5-T	1843	NYSDEC Prot. GW	UG/KG																
2,4-D	485	NYSDEC Prot. GW	UG/KG																

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-1		SS26-10		SS26-10		SS26-11		SS26-12		SS26-13		SS26-14		SS26-15		SS26-15	
			SAMP ID:	SS26-1-1		SS26-10		SS26-50		SS26-11		SS26-12		SS26-13		SS26-14		SS26-15		SS26-53	
			QC CODE:	SA		SA		DU		SA		SA		SA		SA		SA		DU	
			STUDY ID:	ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0.17		0.17		0.17		0.17		0.17		0.17		0		0	
			BOTTOM:	0.2		0.33		0.33		0.33		0.33		0.33		0.33		0.17		0.17	
			MATRIX:	URFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/25/93		10/04/95		10/04/95		10/04/95		10/04/95		10/04/95		10/04/95		10/23/95		10/23/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																					
1,1-Dichloroethene	388	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	2	J	11	U	12	U	12	U
Acetone	106.7	NYSDEC Prot. GW	UG/KG	10	J	12	U	11	U	12	U	11	U	10	U	4	J	12	U	12	U
Benzene	58.2	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	3	J	11	U	12	U	12	U
Carbon Disulfide	2619	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	10	U	11	U	12	U	12	U
Chlorobenzene	1649	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	4	J	11	U	12	U	12	U
Chloroform	291	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	10	U	11	U	12	U	12	U
Methylene Chloride	97	NYSDEC Prot. GW	UG/KG	11	J	12	U	11	U	12	U	11	U	10	U	11	U	12	U	12	U
Toluene	1455	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	4	J	11	U	12	U	12	U
Trichloroethene	679	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	4	J	11	U	12	U	12	U
Xylene (total)	1164	NYSDEC Prot. GW	UG/KG	11	UJ	12	U	11	U	12	U	11	U	10	U	11	U	12	U	12	U
SEMIVOLATILE ORGANICS																					
1,2,4-Trichlorobenzene	3298	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
2,4,5-Trichlorophenol	97	NYSDEC Prot. GW	UG/KG	46000	U	920	U	910	U	890	U	870	U	830	U	5900	U	910	U	940	U
2,4-Dinitrophenol	194	NYSDEC Prot. GW	UG/KG	46000	U	920	U	910	U	890	U	870	U	830	U	5900	U	910	U	940	U
2-Methylnaphthalene	35308	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
2-Nitroaniline	417.1	NYSDEC Prot. GW	UG/KG	46000	U	920	U	910	U	890	U	870	U	830	U	5900	U	910	U	940	U
2-Nitrophenol	320.1	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
3,3'-Dichlorobenzidine			UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
3-Nitroaniline	485	NYSDEC Prot. GW	UG/KG	46000	U	920	U	910	U	890	U	870	U	830	U	**5900**	**J**	910	U	940	U
4,6-Dinitro-2-methylphenol			UG/KG	46000	U	920	U	910	U	890	U	870	U	830	U	5900	U	910	U	940	U
4-Chloro-3-methylphenol	232.8	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
4-Chloroaniline	213.4	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
4-Nitroaniline			UG/KG	46000	U	920	U	910	U	890	U	870	U	830	U	5900	U	910	U	940	U
Acenaphthene	50000	NYSDEC TAGM 4046	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	990	J	220	J	84	J
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	1400	J	350	J	180	J
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	19000	U	66	J	58	J	66	J	76	J	340	U	**3000**		**1200**		**620**	
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	19000	U	59	J	**84**	**J**	**64**	**J**	**72**	**J**	340	U	**2500**	**J**	**1100**		**650**	
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	19000	U	58	J	71	J	73	J	84	J	340	U	**3100**		**1500**		960	
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	19000	U	55	J	95	J	57	J	74	J	340	U	1400	J	870		490	
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	19000	U	60	J	88	J	59	J	61	J	340	U	**1900**	**J**	960		420	
Butylbenzylphthalate	50000	NYSDEC TAGM 4046	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
Carbazole			UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	1400	J	230	J	140	J
Chrysene	388	NYSDEC Prot. GW	UG/KG	19000	U	70	J	65	J	71	J	84	J	340	U	**3300**		**1300**		**680**	
Di-n-butylphthalate	7857	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	60	J	360	U	340	U	2400	U	380	U	48	J
Dibenz(a,h)anthracene	160050000	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	**580**	**J**	380	U	**240**	**J**
Dibenzofuran	6014	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	340	J	64	J	390	U
Fluoranthene	1843000	NYSDEC Prot. GW	UG/KG	19000	U	130	J	140	J	170	J	190	J	340	U	11000		2900		1600	
Fluorene	339500	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	600	J	170	J	55	J
Hexachlorobutadiene			UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
Hexachlorocyclopentadiene			UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	19000	U	44	J	54	J	48	J	51	J	340	U	1300	J	810		500	
Isophorone	4268	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
Naphthalene	12610	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
Nitrobenzene	194	NYSDEC Prot. GW	UG/KG	19000	U	380	U	370	U	370	U	360	U	340	U	2400	U	380	U	390	U
Pentachlorophenol	970	NYSDEC Prot. GW	UG/KG	46000	U	920	U	910	U	890	U	870	U	830	U	5900	U	910	U	940	U
Phenanthrene	213400	NYSDEC Prot. GW	UG/KG	19000	U	49	J	80	J	99	J	83	J	340	U	7800		1800		720	
Pyrene	645050	NYSDEC Prot. GW	UG/KG	1700	J	120	J	120	J	120	J	160	J	39	J	7600		2600		1100	
bis(2-Ethylhexyl)phthalate	421950	NYSDEC Prot. GW	UG/KG	19000	U	250	J	370	U	120	J	97	J	57	J	2400	U	380	UJ	390	U

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-1		SS26-10		SS26-10		SS26-11		SS26-12		SS26-13		SS26-14		SS26-15		SS26-15	
			SAMP ID:	SS26-1-1		SS26-10		SS26-50		SS26-11		SS26-12		SS26-13		SS26-14		SS26-15		SS26-53	
			QC CODE:	SA		SA		DU		SA		SA		SA		SA		SA		DU	
			STUDY ID	ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0 17		0 17		0.17		0 17		0.17		0.17		0		0	
			BOTTOM:	0.2		0.33		0.33		0.33		0.33		0.33		0.33		0.17		0 17	
			MATRIX:	URFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/25/93		10/04/95		10/04/95		10/04/95		10/04/95		10/04/95		10/04/95		10/23/95		10/23/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																					
4,4'-DDD	2900	EPA Carcinogenic	UG/KG	22		3 8	U	3.7	U	3.7	U	3.6	U	3.4	U	3.6	U	2 4	J	3.9	U
4,4'-DDE	2100	EPA Carcinogenic	UG/KG	17	J	3.8	U	3.7	U	3.7	U	3.6	U	4.3		13		2.6	J	2.3	J
4,4'-DDT	2100	EPA Carcinogenic	UG/KG	18	U	3.8	U	3.7	U	3.7	U	3.6	U	3.4	U	15		3.7	J	2.6	J
Dieldrin	44	EPA Carcinogenic	UG/KG	18	U	3.8	U	3.7	U	3.7	U	3.6	U	3.4	U	3.6	U	3.8	U	3 9	U
Endosulfan I	873	NYSDEC Prot GW	UG/KG	9.4	U	2	U	1.9	U	1.9	U	1.9	U	1.8	U	1.9	U	1 9	U	2	U
Endosulfan II	873	NYSDEC Prot. GW	UG/KG	35	J	3.8	U	3.7	U	3.7	U	3.6	U	3.4	U	3.6	U	27	J	3 9	U
Endosulfan sulfate	970	NYSDEC Prot GW	UG/KG	21	J	3.8	U	3.7	U	3.7	U	3.6	U	3.4	U	3.6	U	13	J	3 1	J
Endrin	97	NYSDEC Prot. GW	UG/KG	18	U	3 8	U	3.7	U	3.7	U	3.6	U	3.4	U	3.6	U	3 8	U	3.9	U
Endrin aldehyde			UG/KG	18	U	3 8	U	3 7	U	3.7	U	3.6	U	3.4	U	3.6	U	5.6	J	12	J
Endrin ketone			UG/KG	18	U	3.8	U	3 7	U	3.7	U	3.6	U	3.4	U	3.6	U	3.8	U	3.9	U
Heptachlor	97	NYSDEC Prot GW	UG/KG	9.4	U	2	U	1.9	U	1.9	U	1 9	U	1.8	U	1.9	U	3.8		2	U
Heptachlor epoxide	19.4	NYSDEC Prot GW	UG/KG	9 4	U	2	U	1 9	U	1.9	U	1.9	U	1.8	U	1.9	U	1.9	U	2	U
Methoxychlor			UG/KG	94	U	20	U	19	U	19	U	19	U	18	U	19	U	19	U	20	U
alpha-Chlordane			UG/KG	9.4	U	2	U	1.9	U	1.9	U	1.9	U	1.8	U	1.9	U	2.1	J	2	U
beta-BHC	194	NYSDEC Prot. GW	UG/KG	9 4	U	2	U	1 9	U	1.9	U	1.9	U	1.8	U	1.9	U	1.9	U	2	U
delta-BHC	291	NYSDEC Prot. GW	UG/KG	9 4	U	2	U	1 9	U	1.9	U	1 9	U	1.8	U	1.9	U	1.9	U	2	U
gamma-Chlordane	540	EPA Carcinogenic	UG/KG	5.9	J	2	U	1.9	U	1.9	U	1.9	U	1.8	U	1.9	U	1.8	J	2	U
OTHER ANALYSES																					
Nitrate/Nitrite-Nitrogen			MG/KG	0 85																	
Total Petroleum Hydrocarbons			MG/KG	76		31 7	U	33.1		30.4	U	32.6		47.5		67.1		34		36	
NITROAROMATICS																					
2,4-Dinitrotoluene			UG/KG	290	J																
4-amino-2,6-Dinitrotoluene			UG/KG	130	U																
HMX			UG/KG	130	U																
METALS																					
Aluminum	14592.84	NYSDEC Metals	MG/KG	1750		**16700**		**15500**		**16000**		**15800**		**14800**		**16600**		**14700**		**15600**	
Antimony	3.59	NYSDEC Metals	MG/KG	8.9	UJ	0.51	J	0.76	J	0.49	UJ	0.4	UJ	0.62	J	0.93	J	0.32	UJ	1.8	J
Arsenic	7.5	NYSDEC Metals	MG/KG	3 3		**8.5**	**J**	6.6	J	6.3	J	7.1	J	5.7	J	**7.7**	**J**	**8.9**	**J**	**7.5**	J
Barium	300	NYSDEC Metals	MG/KG	73.9		76.5		79.8		77.1		80.2		51.1		82		65.7		72.2	
Beryllium	0.73	NYSDEC Metals	MG/KG	0.25	J	0.7		0.68		**0.73**		0.7		**0.77**		**0.84**		0.62		0.65	
Cadmium	1	NYSDEC Metals	MG/KG	0.56	J	0.07	U	0.07	U	0.07	U	0.06	U	0.05	U	0.06		0.04	U	0.05	U
Calcium	101903.8	NYSDEC Metals	MG/KG	**293000**		12600		8820		11800		11700		33200		45300		46700		22800	
Chromium	22.13	NYSDEC Metals	MG/KG	3.8		24.7	R	22.5	R	23.7	R	22.8	R	26.5	R	25.7	R	21.5	J	**23.4**	J
Cobalt	30	NYSDEC Metals	MG/KG	2.7	J	10.7		12.2		11.7		12.6		16		13.9		10.6		12.6	
Copper	25	NYSDEC Metals	MG/KG	12.8		22		20.8		24.9		24.4		**32.4**		22.2		19.2		**32.6**	
Cyanide	0.3	NYSDEC Metals	MG/KG	0.54	U	0.59	U	0.54	U	0.59	U	0.56	U	0.54	U	0.53	U	0.57	U	0.44	U
Iron	26626.65	NYSDEC Metals	MG/KG	3510		**29600**		**27200**		**28400**		**29800**		**31100**		**26900**		26300		**30600**	
Lead	21.86	NYSDEC Metals	MG/KG	6.8		15.9	J	17.2	J	20	J	18.7	J	**34.1**	**J**	**33.2**	**J**	17.8		18.5	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**7980**		**6130**		**5620**		**6100**		**6340**		**7950**		**8440**		**11900**		7070	
Manganese	669.38	NYSDEC Metals	MG/KG	213		562		652		624		619		445		605		603		621	
Mercury	0.1	NYSDEC Metals	MG/KG	0.02	U	0.05		0.06		0.05		0.05		0.02		0.04		0.04		0.04	
Nickel	33.62	NYSDEC Metals	MG/KG	12.2		**34.3**		32.1		32.9		33.3		**48.8**		**35.9**		29		33 2	
Potassium	1761.48	NYSDEC Metals	MG/KG	1030		**2510**	**J**	**2380**	**J**	**2440**	**J**	**2200**	**J**	1550	J	**2750**	**J**	**2530**		**2190**	
Selenium	2	NYSDEC Metals	MG/KG	0.23	U	0.81	U	0.83	U	0.82	U	0.7		0.65	U	0.77		0.55	UJ	0 63	UJ
Silver	0.4	NYSDEC Metals	MG/KG	1.1	UJ	0.18	U	0.18	U	0.18	U	0.15	U	0.26		0.16		0.12	U	0.14	U
Sodium	103.74	NYSDEC Metals	MG/KG	**224**	**J**	43.9	U	45	U	44.3	U	36.8	U	45.4		54.3		68.7		33.9	U
Thallium	0.28	NYSDEC Metals	MG/KG	2.5	UJ	**1.3**		0.67	U	**0.7**		**1**		0.53	U	**0.97**		**1.1**		**0.93**	
Vanadium	150	NYSDEC Metals	MG/KG	12.2		26.3		25.1		26.2		26.2		21.9		29		22.9		23.6	
Zinc	82.5	NYSDEC Metals	MG/KG	**96.9**		**114**		**105**		**114**		**103**		**97.2**		**172**		**99.2**		**99.2**	
HERBICIDES																					
2,4,5-T	1843	NYSDEC Prot. GW	UG/KG	15																	
2,4-D	485	NYSDEC Prot. GW	UG/KG	55	U																

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID.	SS26-16		SS26-17		SS26-18		SS26-19		SS26-2		SS26-20		SS26-21		SS26-22		SS26-23	
			SAMP ID:	SS26-16		SS26-17		SS26-18		SS26-19		SS26-2-1		SS26-20		SS26-21		SS26-22		SS26-23	
			QC CODE	SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0		0	
			BOTTOM	0.17		0.17		0.17		0.17		0.2		0.17		0.17		0.17		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/22/95		10/22/95		10/22/95		10/22/95		10/25/93		10/22/95		10/22/95		10/21/95		10/21/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																					
1,1-Dichloroethene	388	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	U	12	UJ	12	U	11	U	11	U	11	U
Acetone	106.7	NYSDEC Prot. GW	UG/KG	13	U	10	J	7	J	8	J	12	UJ	19		7	J	31		11	UJ
Benzene	58.2	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	U	12	UJ	12	U	11	U	11	U	11	U
Carbon Disulfide	2619	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	U	12	UJ	12	U	11	U	11	U	11	U
Chlorobenzene	1649	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	UJ	12	UJ	12	U	11	U	11	UJ	11	UJ
Chloroform	291	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	U	12	UJ	12	U	11	U	11	U	11	U
Methylene Chloride	97	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	U	7	J	12	U	11	U	11	U	11	U
Toluene	1455	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	U	12	UJ	12	U	11	U	11	U	11	U
Trichloroethene	679	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	12	U	12	UJ	12	U	11	U	11	U	11	U
Xylene (total)	1164	NYSDEC Prot. GW	UG/KG	13	U	12	U	12	U	2	J	12	UJ	12	U	11	U	11	UJ	11	UJ
SEMIVOLATILE ORGANICS																					
1,2,4-Trichlorobenzene	3298	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
2,4,5-Trichlorophenol	97	NYSDEC Prot. GW	UG/KG	1000	U	970	U	940	U	1100	U	9800	U	990	U	940	U	960	U	910	U
2,4-Dinitrophenol	194	NYSDEC Prot. GW	UG/KG	1000	U	970	U	940	U	1100	U	9800	U	990	U	940	U	960	U	910	U
2-Methylnaphthalene	35308	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	590	J	410	U	390	U	400	U	370	U
2-Nitroaniline	417.1	NYSDEC Prot. GW	UG/KG	1000	U	970	U	940	U	1100	U	9800	U	990	U	940	U	960	U	910	U
2-Nitrophenol	320.1	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
3,3'-Dichlorobenzidine			UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
3-Nitroaniline	485	NYSDEC Prot. GW	UG/KG	1000	U	970	U	940	U	1100	U	9800	U	990	U	940	U	960	U	910	U
4,6-Dinitro-2-methylphenol			UG/KG	1000	U	970	U	940	U	1100	U	9800	U	990	U	940	U	960	U	910	U
4-Chloro-3-methylphenol	232.8	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
4-Chloroaniline	213.4	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
4-Nitroaniline			UG/KG	1000	U	970	U	940	U	1100	U	9800	U	990	U	940	U	960	U	910	U
Acenaphthene	50000	NYSDEC TAGM 4046	UG/KG	56	J	400	U	390	U	440	U	4000	U	410	U	78	J	180	J	370	U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	79	J	400	U	390	U	440	U	4000	U	410	U	120	J	310	J	370	U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	**420**		23	J	29	J	57	J	4000	U	410	U	**330**	**J**	**1100**		370	U
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	**450**		28	J	31	J	**65**	**J**	4000	U	410	U	**320**	**J**	**1100**		370	U
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	520		33	J	37	J	80	J	4000	U	19	J	390		**1200**		370	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	340	J	20	J	24	J	47	J	4000	U	410	U	190	J	740		370	U
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	460		27	J	36	J	63	J	4000	U	410	U	280	J	1000		370	U
Butylbenzylphthalate	50000	NYSDEC TAGM 4046	UG/KG	410	U	400	UJ	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
Carbazole			UG/KG	71	J	400	U	390	U	440	U	4000	U	410	U	89	J	210	J	370	U
Chrysene	388	NYSDEC Prot. GW	UG/KG	**470**		32	J	39	J	69	J	4000	U	410	U	360	J	**1200**		370	U
Di-n-butylphthalate	7857	NYSDEC Prot. GW	UG/KG	410	U	400	U	31	J	33	J	4000	U	410	U	26	J	400	U	370	U
Dibenz(a,h)anthracene	160050000	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
Dibenzofuran	6014	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	41	J	58	J	370	U
Fluoranthene	1843000	NYSDEC Prot. GW	UG/KG	1000		46	J	66	J	120	J	4000	U	32	J	880		2800		370	U
Fluorene	339500	NYSDEC Prot. GW	UG/KG	36	J	400	U	390	U	440	U	4000	U	410	U	70	J	150	J	370	U
Hexachlorobutadiene			UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
Hexachlorocyclopentadiene			UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	310	J	400	U	23	J	41	J	4000	U	410	U	180	J	710		370	U
Isophorone	4268	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
Naphthalene	12610	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
Nitrobenzene	194	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U
Pentachlorophenol	970	NYSDEC Prot. GW	UG/KG	1000	U	970	U	940	U	1100	U	9800	U	990	U	940	U	960	U	910	U
Phenanthrene	213400	NYSDEC Prot. GW	UG/KG	500		400	U	25	J	40	J	4000	U	410	U	630		1700		370	U
Pyrene	645050	NYSDEC Prot. GW	UG/KG	890		39	J	50	J	96	J	720	J	29	J	640		2200		370	U
bis(2-Ethylhexyl)phthalate	421950	NYSDEC Prot. GW	UG/KG	410	U	400	U	390	U	440	U	4000	U	410	U	390	U	400	U	370	U

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-16		SS26-17		SS26-18		SS26-19		SS26-2		SS26-20		SS26-21		SS26-22		SS26-23	
			SAMP ID:	SS26-16		SS26-17		SS26-18		SS26-19		SS26-2-1		SS26-20		SS26-21		SS26-22		SS26-23	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0		0	
			BOTTOM:	0.17		0.17		0.17		0.17		0.2		0.17		0.17		0.17		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/22/95		10/22/95		10/22/95		10/22/95		10/25/93		10/22/95		10/22/95		10/21/95		10/21/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																					
4,4'-DDD	2900	EPA Carcinogenic	UG/KG	4.1	U	4	U	3.9	U	4.4	U	19	U	4	U	2.5	J	4	U	3.7	U
4,4'-DDE	2100	EPA Carcinogenic	UG/KG	30		16		2	J	12		14	J	4	U	5.7	J	18		3.7	U
4,4'-DDT	2100	EPA Carcinogenic	UG/KG	25		16		3.9	U	11		19	U	4	U	5.4	J	12		3.7	U
Dieldrin	44	EPA Carcinogenic	UG/KG	4.1	U	4	U	3.9	U	4.4	U	19	U	4	U	3.9	U	4	U	3.7	U
Endosulfan I	873	NYSDEC Prot. GW	UG/KG	2.1	U	2.1	U	2	U	2.3	U	9.6	U	2.1	U	2	U	2	U	1.9	U
Endosulfan II	873	NYSDEC Prot. GW	UG/KG	4.1	U	4	U	3.9	U	4.3	J	60	J	4	U	3.9	U	4	U	3.7	U
Endosulfan sulfate	970	NYSDEC Prot. GW	UG/KG	4.1	U	4	U	3.9	U	2.4	J	23	J	4	U	4.4	J	4.5	J	3.7	U
Endrin	97	NYSDEC Prot. GW	UG/KG	4.1	U	4	U	3.9	U	4.4	U	19	U	4	U	3.9	U	4	U	3.7	U
Endrin aldehyde			UG/KG	4.1	U	4	U	3.9	U	3.3	J	23	J	4	U	3.9	U	4	U	3.7	U
Endrin ketone			UG/KG	4.1	U	4	U	3.9	U	4.4	U	19	U	4	U	3.9	U	4	U	3.7	U
Heptachlor	97	NYSDEC Prot. GW	UG/KG	1.2	J	2.1	U	2	U	1.8	J	9.6	U	1.2	J	2	U	2	U	1.7	J
Heptachlor epoxide	19.4	NYSDEC Prot. GW	UG/KG	2.1	U	2.1	U	2	U	2.3	U	9.6	U	2.1	U	2	U	2	U	1.9	U
Methoxychlor			UG/KG	21	U	21	U	20	U	23	U	96	U	21	U	20	U	20	U	19	U
alpha-Chlordane			UG/KG	2.1	U	2.1	U	2	U	2.3	U	9.6	U	2.1	U	2	U	2	U	1.9	U
beta-BHC	194	NYSDEC Prot. GW	UG/KG	2.1	U	2.1	U	2	U	2.3	U	9.6	U	2.1	U	2	U	2	U	1.3	J
delta-BHC	291	NYSDEC Prot. GW	UG/KG	2.1	U	2.1	U	2	U	2.3	U	9.6	U	2.1	U	2	U	2	U	1.9	U
gamma-Chlordane	540	EPA Carcinogenic	UG/KG	2.1	U	2.1	U	2	U	2.3	U	7.8	J	2.1	U	2	U	2	U	1.9	U
OTHER ANALYSES																					
Nitrate/Nitrite-Nitrogen			MG/KG									0.22									
Total Petroleum Hydrocarbons			MG/KG	214		74		76		119		71		99		159		75		69	
NITROAROMATICS																					
2,4-Dinitrotoluene			UG/KG									330	J								
4-amino-2,6-Dinitrotoluene			UG/KG									130	U								
HMX			UG/KG									99	J								
METALS																					
Aluminum	14592.84	NYSDEC Metals	MG/KG	14000		12100		14000		13600		1560		**15300**		13000		7820		5070	
Antimony	3.59	NYSDEC Metals	MG/KG	0.45	UJ	0.42	UJ	0.43	UJ	0.37	UJ	10.9	UJ	0.47	UJ	0.44	UJ	0.52	UJ	0.39	UJ
Arsenic	7.5	NYSDEC Metals	MG/KG	7.3	J	5.3	J	5.8	J	6	J	6.5		**8.4**	J	7	J	3.7		**9.5**	J
Barium	300	NYSDEC Metals	MG/KG	79.3		60.6		63.7		84.5		45.7		77.9		77.7		35		33.8	
Beryllium	0.73	NYSDEC Metals	MG/KG	0.68		0.57		0.61		0.68		0.2	J	0.69		0.62		0.39		0.4	
Cadmium	1	NYSDEC Metals	MG/KG	0.06	U	0.06	U	0.06	U	0.05	U	0.68	U	0.06	U	0.06	U	0.07	U	0.05	U
Calcium	101903.8	NYSDEC Metals	MG/KG	37900		16600		12200		25200		**284000**		7640		32400		71100		**249000**	
Chromium	22.13	NYSDEC Metals	MG/KG	22.1	J	18.7	J	21.4	J	20.6	J	3.9		**23.6**	J	20.8	J	14.1	J	6.8	J
Cobalt	30	NYSDEC Metals	MG/KG	14.9		10.4		11.2		12.1		3.6	J	10.5		12.8		8.1		5.9	
Copper	25	NYSDEC Metals	MG/KG	24.3		18.6		18.6		**25.4**		11.8		20.3		22.8		14.5		22.4	
Cyanide	0.3	NYSDEC Metals	MG/KG	0.57	U	0.54	U	0.57	U	0.66	U	0.56	U	0.55	U	0.39	U	0.56	U	0.46	U
Iron	26626.65	NYSDEC Metals	MG/KG	**28100**		24900		**27100**		25300		5970		**28900**		**27200**		16700		9640	
Lead	21.86	NYSDEC Metals	MG/KG	**28.7**		17.9		18.2		**31.4**		3.4		16.7		21.6		19.9		5.1	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**8250**		**8710**		**6160**		**6970**		**8180**		**5880**		**6940**		7690		**4450**	
Manganese	669.38	NYSDEC Metals	MG/KG	**693**		512		520		595		212		491		624		294		219	
Mercury	0.1	NYSDEC Metals	MG/KG	0.05		0.06		0.07		0.07		**0.87**		0.06		0.06		0.07		0.05	
Nickel	33.62	NYSDEC Metals	MG/KG	**38.6**		28.5		31.3		32.6		13.4	R	32.7		33.2		27.3		23.6	
Potassium	1761.48	NYSDEC Metals	MG/KG	**2140**		1530		**1780**		**2170**		849	J	**2270**		**1960**		1490		**2060**	
Selenium	2	NYSDEC Metals	MG/KG	0.75	UJ	0.71	UJ	0.72	UJ	0.62	UJ	0.24	J	0.8	UJ	0.73	UJ	0.87	UJ	0.65	UJ
Silver	0.4	NYSDEC Metals	MG/KG	0.16	U	0.15	U	0.16	U	0.13	U	1.4	UJ	0.17	U	0.16	U	0.19	U	0.14	U
Sodium	103.74	NYSDEC Metals	MG/KG	40.7	U	38.4	U	39.1	U	33.3	U	**236**	J	43.1	U	39.7	U	52.3		96.2	
Thallium	0.28	NYSDEC Metals	MG/KG	**1.1**		**1.1**		**0.62**		**0.73**		2.6	UJ	**0.83**		**0.96**		0.71	U	0.53	U
Vanadium	150	NYSDEC Metals	MG/KG	23.2		18.7		21.5		22.9		8.5	J	24		20.7		13.2		11.8	
Zinc	82.5	NYSDEC Metals	MG/KG	**178**		**130**		**93.3**		**227**		35.5	R	**100**		**112**		48.7		26.5	
HERBICIDES																					
2,4,5-T	1843	NYSDEC Prot. GW	UG/KG									220									
2,4-D	485	NYSDEC Prot. GW	UG/KG									260									

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE																			
			LOC_ID:	SS26-24		SS26-25		SS26-26		SS26-27		SS26-28		SS26-29		SS26-3		SS26-3		SS26-30	
			SAMP ID:	SS26-24		SS26-25		SS26-26		SS26-27		SS26-28		SS26-29		SS26-3-1		SS26-9-1		SS26-30	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		DU		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI		ESI		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0		0	
			BOTTOM:	0.17		0.17		0.17		0.17		0.17		0.17		0.2		0.2		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/19/95		10/21/95		10/21/95		10/19/95		10/24/95		10/19/95		10/25/93		10/25/93		10/21/95	
			UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																					
1,1-Dichloroethene	388	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	10	U	11	U	11	U	11	UJ	11	UJ	11	U
Acetone	106.7	NYSDEC Prot. GW	UG/KG	14	U	11	UJ	11	U	13		11	U	11	UJ	11	UJ	11	UJ	11	U
Benzene	58.2	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	10	U	11	U	11	U	11	UJ	11	UJ	11	U
Carbon Disulfide	2619	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	10	U	11	U	11	U	11	UJ	11	UJ	11	U
Chlorobenzene	1649	NYSDEC Prot. GW	UG/KG	11	U	11	UJ	11	UJ	10	U	11	U	11	U	11	UJ	11	UJ	11	U
Chloroform	291	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	10	U	11	U	11	U	11	UJ	11	UJ	11	UJ
Methylene Chloride	97	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	10	U	11	U	11	U	6	J	11	UJ	11	U
Toluene	1455	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	10	U	11	U	2	J	11	UJ	11	UJ	11	U
Trichloroethene	679	NYSDEC Prot. GW	UG/KG	11	U	11	U	11	U	10	U	11	U	11	U	11	UJ	11	UJ	11	U
Xylene (total)	1164	NYSDEC Prot. GW	UG/KG	11	U	11	UJ	11	UJ	10	U	11	U	6	J	11	UJ	11	UJ	11	UJ
SEMIVOLATILE ORGANICS																					
1,2,4-Trichlorobenzene	3298	NYSDEC Prot. GW	UG/KG	360	J	390	U	1500	U	350	J	6200	U	360	J	45000	U	38000	U	1900	U
2,4,5-Trichlorophenol	97	NYSDEC Prot. GW	UG/KG	870	U	950	U	3500	U	860	U	15000	U	880	U	10000	U	95000	U	4500	U
2,4-Dinitrophenol	194	NYSDEC Prot. GW	UG/KG	870	U	950	U	3500	U	860	U	15000	U	880	U	10000	U	95000	U	4500	U
2-Methylnaphthalene	35308	NYSDEC Prot. GW	UG/KG	360	U	390	U	100	J	350	U	480	J	360	U	45000	U	38000	U	1900	U
2-Nitroaniline	417.1	NYSDEC Prot. GW	UG/KG	**870**	**J**	950	U	3500	U	**860**	**J**	15000	U	**880**	**J**	10000	U	95000	U	4500	U
2-Nitrophenol	320.1	NYSDEC Prot. GW	UG/KG	**360**	**J**	390	U	1500	U	**350**	**J**	6200	U	**360**	**J**	45000	U	38000	U	1900	U
3,3'-Dichlorobenzidine			UG/KG	360	J	390	U	1500	U	350	J	6200	U	360	J	45000	U	38000	U	1900	U
3-Nitroaniline	485	NYSDEC Prot. GW	UG/KG	870	U	950	U	3500	U	860	U	15000	U	880	U	10000	U	95000	U	4500	U
4,6-Dinitro-2-methylphenol			UG/KG	870	U	950	U	3500	U	860	U	15000	U	880	U	10000	U	95000	U	4500	U
4-Chloro-3-methylphenol	232.8	NYSDEC Prot. GW	UG/KG	360	U	390	U	1500	U	350	U	6200	U	360	U	45000	U	38000	U	1900	U
4-Chloroaniline	213.4	NYSDEC Prot. GW	UG/KG	360	U	390	U	1500	U	350	U	6200	U	360	U	45000	U	38000	U	1900	U
4-Nitroaniline			UG/KG	870	U	950	U	3500	U	860	U	15000	U	880	U	10000	U	95000	U	4500	U
Acenaphthene	50000	NYSDEC TAGM 4046	UG/KG	360	U	390	U	720	J	350	U	6200	U	41	J	45000	U	38000	U	560	J
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	360	U	390	U	1600		350	U	6200	U	180	J	45000	U	38000	U	1200	J
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	120	J	20	J	**3300**		350	U	6200	U	**650**		45000	U	38000	U	**4700**	
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	**110**	**J**	22	J	**2300**		350	U	6200	U	**600**		45000	U	38000	U	**4400**	
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	130	J	28	J	**2600**		350	U	6200	U	660		45000	U	38000	U	**5000**	
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	74	J	20	J	1200	J	350	U	6200	U	480		45000	U	38000	U	2800	
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	90	J	23	J	**2300**		350	J	6200	U	470	J	45000	U	38000	U	**4200**	
Butylbenzylphthalate	50000	NYSDEC TAGM 4046	UG/KG	360	U	390	U	1500	U	350	U	6200	U	360	U	45000	U	38000	U	1900	U
Carbazole			UG/KG	360	U	390	U	1200	J	350	U	6200	U	140	J	45000	U	38000	U	660	J
Chrysene	388	NYSDEC Prot. GW	UG/KG	140	J	25	J	**3300**		350	U	6200	U	**650**		45000	U	38000	U	**4900**	
Di-n-butylphthalate	7857	NYSDEC Prot. GW	UG/KG	360	U	390	U	1500	U	350	U	6200	U	360	U	6200	J	38000	U	1900	U
Dibenz(a,h)anthracene	160050000	NYSDEC Prot. GW	UG/KG	360	U	390	U	**150**	**J**	350	U	6200	U	**230**	**J**	45000	U	38000	U	**230**	**J**
Dibenzofuran	6014	NYSDEC Prot. GW	UG/KG	360	U	390	U	480	J	350	U	6200	U	360	U	45000	U	38000	U	160	J
Fluoranthene	1843000	NYSDEC Prot. GW	UG/KG	270	J	39	J	9300		350	U	6200	U	1200		45000	U	38000	U	11000	
Fluorene	339500	NYSDEC Prot. GW	UG/KG	360	U	390	U	960	J	350	U	6200	U	43	J	45000	U	38000	U	460	J
Hexachlorobutadiene			UG/KG	360	J	390	U	1500	U	350	J	6200	U	360	J	45000	U	38000	U	1900	U
Hexachlorocyclopentadiene			UG/KG	360	J	390	U	1500	U	350	J	6200	U	360	J	45000	U	38000	U	1900	U
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	76	J	390	U	1200	J	350	U	6200	U	500		45000	U	38000	U	2800	
Isophorone	4268	NYSDEC Prot. GW	UG/KG	360	J	390	U	1500	U	350	J	6200	U	360	J	45000	U	38000	U	1900	U
Naphthalene	12610	NYSDEC Prot. GW	UG/KG	360	U	390	U	1500	U	350	U	6200	U	360	U	45000	U	38000	U	1900	U
Nitrobenzene	194	NYSDEC Prot. GW	UG/KG	360	U	390	U	1500	U	350	U	6200	U	360	U	45000	U	38000	U	1900	U
Pentachlorophenol	970	NYSDEC Prot. GW	UG/KG	870	U	950	U	3500	U	860	U	15000	U	880	U	10000	U	95000	U	4500	U
Phenanthrene	213400	NYSDEC Prot. GW	UG/KG	130	J	20	J	8900		350	U	430	J	490		45000	U	38000	U	5400	
Pyrene	645050	NYSDEC Prot. GW	UG/KG	250	J	34	J	7400		350	U	440	J	990		2500	J	3400	J	8500	
bis(2-Ethylhexyl)phthalate	421950	NYSDEC Prot. GW	UG/KG	220	J	390	U	1500	U	350	U	6200	UJ	210	J	45000	U	38000	U	1900	U

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-24	SS26-25	SS26-26	SS26-27	SS26-28	SS26-29	SS26-3	SS26-3	SS26-30
			SAMP ID:	SS26-24	SS26-25	SS26-26	SS26-27	SS26-28	SS26-29	SS26-3-1	SS26-9-1	SS26-30
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	DU	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	ESI	ESI	RI ROUND1
			TOP:	0	0	0	0	0	0	0	0	0
			BOTTOM:	0.17	0.17	0.17	0.17	0.17	0.17	0.2	0.2	0.17
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL
			SAMPLE DATE:	10/19/95	10/21/95	10/21/95	10/19/95	10/24/95	10/19/95	10/25/93	10/25/93	10/21/95
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
PESTICIDES/PCB												
4,4'-DDD	2900	EPA Carcinogenic	UG/KG	3.6 U	3.9 U	3.6 U	4.7 J	9.2 J	3.6 U	7.4 U	19 U	3.7 U
4,4'-DDE	2100	EPA Carcinogenic	UG/KG	3.6 U	4	17	140	2.9 J	3.6 U	4.4 J	19 U	3.7 U
4,4'-DDT	2100	EPA Carcinogenic	UG/KG	3.6 U	3.9 U	5.7	66	4.7 J	2.4 J	7.4 U	19 U	2.6 J
Dieldrin	44	EPA Carcinogenic	UG/KG	3.6 U	3.9 U	3.6 U	3.5 U	4.4 J	3.6 U	4.2 J	19 U	2.5 J
Endosulfan I	873	NYSDEC Prot. GW	UG/KG	2.8	2 U	1.9 U	1.8 U	5.6 J	1.8 U	5.3 J	9.7 U	1.9 U
Endosulfan II	873	NYSDEC Prot. GW	UG/KG	3.6 U	3.9 U	3.6 U	3.7	19 J	3.6 U	7.4 U	19 U	3.7 U
Endosulfan sulfate	970	NYSDEC Prot. GW	UG/KG	3.6 U	3.9 U	5.4 J	3.5 U	17 J	3.6 J	7.4 U	19 U	3.7 J
Endrin	97	NYSDEC Prot. GW	UG/KG	3.6 U	3.9 U	3.6 U	3.5 U	2.6 J	3.6 U	7.4 U	19 U	3.7 U
Endrin aldehyde			UG/KG	3.6 U	3.9 U	3.7 J	3.5 U	14 J	2.3 J	15 J	17 J	3.7 U
Endrin ketone			UG/KG	3.6 U	3.9 U	3.6 U	3.5 U	5.4 J	3.6 U	7.4 U	19 U	3.7 U
Heptachlor	97	NYSDEC Prot. GW	UG/KG	1.8 U	2 U	1.3 J	1.8 U	1.9 U	1.8 U	3.8 U	9.7 U	1.9 U
Heptachlor epoxide	19.4	NYSDEC Prot. GW	UG/KG	1.8 U	2 U	1.9 U	1.8 U	2.1 J	1.8 U	3.8 U	9.7 U	1.8 J
Methoxychlor			UG/KG	18 U	20 U	19 U	18 U	19 U	18 U	21 J	97 U	19 U
alpha-Chlordane			UG/KG	1.8 U	2 U	1.9 U	1.8 U	1.9 U	1.8 U	3.8 U	9.7 U	1.9 U
beta-BHC	194	NYSDEC Prot. GW	UG/KG	1.8 U	2 U	1.9 U	1.8 U	1.9 U	1.8 U	3.8 U	9.7 U	1.9 U
delta-BHC	291	NYSDEC Prot. GW	UG/KG	1.8 U	2 U	1.9 U	1.8 U	1.9 U	1.8 U	3.8 U	9.7 U	1.9 U
gamma-Chlordane	540	EPA Carcinogenic	UG/KG	1.8 U	2 U	1.9 U	1.8 U	2.6 J	1.8 U	3.8 U	9.7 U	1.9 U
OTHER ANALYSES												
Nitrate/Nitrite-Nitrogen			MG/KG							0.05	0.12	
Total Petroleum Hydrocarbons			MG/KG	73	49	61	139	2220	345	21000	17900	34 U
NITROAROMATICS												
2,4-Dinitrotoluene			UG/KG							420 J	400 J	
4-amino-2,6-Dinitrotoluene			UG/KG							130 J	130 UJ	
HMX			UG/KG							110 J	130 UJ	
METALS												
Aluminum	14592.84	NYSDEC Metals	MG/KG	6690	3570	8690	6750	1560	13100	2050	1640	16200
Antimony	3.59	NYSDEC Metals	MG/KG	0.38 UJ	0.41 UJ	0.37 UJ	0.45 UJ	0.4 UJ	0.38 UJ	7.4 UJ	8.5 UJ	0.41 J
Arsenic	7.5	NYSDEC Metals	MG/KG	8.2	3.9	4.3 J	4.7	3	6.8	6	7.5	5.9 J
Barium	300	NYSDEC Metals	MG/KG	42.4	30.6	40.9	28.3	17	77.4	18 J	17.3 J	74.6
Beryllium	0.73	NYSDEC Metals	MG/KG	0.49	0.27	0.47	0.42	0.18	0.64	0.24 J	0.22 J	0.77
Cadmium	1	NYSDEC Metals	MG/KG	0.05 U	1.2	0.05 U	0.06 U	0.05 U	0.05 U	0.47 U	0.53 U	0.05 U
Calcium	101903.8	NYSDEC Metals	MG/KG	208000 J	259000	117000	169000	280000	79000	271000	285000	30600
Chromium	22.13	NYSDEC Metals	MG/KG	11.1 J	6.9 J	16.9 J	12.6 J	3.1 J	26.3 J	3.9	3.5	27.3 J
Cobalt	30	NYSDEC Metals	MG/KG	9.4	5.7	9.4	9.4	2.2	11.6	2.8 J	3.1 J	16.7
Copper	25	NYSDEC Metals	MG/KG	26.2	10.2	23.3	15.3	8	25	10.5	11.6	31.3
Cyanide	0.3	NYSDEC Metals	MG/KG	0.64 U	0.34 U	0.43 U	0.61 U	0.46 U	0.61 U	0.56	0.56 U	0.51 U
Iron	26626.65	NYSDEC Metals	MG/KG	15800	7150	18400	15200	2920	25600	3270	3880	31700
Lead	21.86	NYSDEC Metals	MG/KG	7.7 J	11.8	19.6	16.9 J	0.27 U	42.6 J	3.2	3.7	14.4
Magnesium	1221.77	NYSDEC Metals	MG/KG	5390	17200	16100	15600	6140	9420	7810	9370	8160
Manganese	669.38	NYSDEC Metals	MG/KG	331	307	308	516	176	499	198	241	580
Mercury	0.1	NYSDEC Metals	MG/KG	0.04 J	0.02	0.03	0.04 J	0.01	0.02 J	0.04 U	0.38	0.04
Nickel	33.62	NYSDEC Metals	MG/KG	30.3	15	33	27.1	9.1	34.2	56 R	14.1 R	48.2
Potassium	1761.48	NYSDEC Metals	MG/KG	1070	2030	1780	1280	1220	1870	1170	1010	2460
Selenium	2	NYSDEC Metals	MG/KG	0.64 U	0.69 UJ	0.62 UJ	0.75 U	0.67 UJ	0.64 U	0.23 U	0.35 J	0.61 UJ
Silver	0.4	NYSDEC Metals	MG/KG	0.14 U	0.15 U	0.13 U	0.16 U	0.15 U	0.14 U	0.95 UJ	1.1 UJ	0.13 U
Sodium	103.74	NYSDEC Metals	MG/KG	80.2	128	93.4	116	120	126	218 J	238 J	85.8
Thallium	0.28	NYSDEC Metals	MG/KG	0.53	0.56 U	0.51 U	0.74	0.58	0.88	2.5 UJ	1.5 UJ	0.78
Vanadium	150	NYSDEC Metals	MG/KG	12.2 J	10.2	14.4	14 J	7.8	21.3 J	10.5	9.2	22.8
Zinc	82.5	NYSDEC Metals	MG/KG	88.1	503	141	124	15.9	106	105 R	31.3 R	102
HERBICIDES												
2,4,5-T	1843	NYSDEC Prot. GW	UG/KG							11	5.7 U	
2,4-D	485	NYSDEC Prot. GW	UG/KG							56 U	57 U	

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-31	SS26-32	SS26-33	SS26-34	SS26-34	SS26-35	SS26-36	SS26-37	SS26-38
			SAMP ID:	SS26-31	SS26-32	SS26-33	SS26-34	SS26-52	SS26-35	SS26-36	SS26-37	SS26-38
			QC CODE:	SA	SA	SA	SA	DU	SA	SA	SA	SA
			STUDY ID:	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1
			TOP:	0	0	0	0	0	0	0	0	0
			BOTTOM:	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
			MATRIX:	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL	SURFACE SOIL
			SAMPLE DATE:	10/21/95	10/21/95	10/19/95	10/22/95	10/22/95	10/21/95	10/21/95	10/19/95	10/21/95
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
VOLATILE ORGANICS												
1,1-Dichloroethene	388	NYSDEC Prot. GW	UG/KG	11 U	11 U	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Acetone	106.7	NYSDEC Prot. GW	UG/KG	11 UJ	11 UJ	11 UJ	11 U	2 J	7 J	1 J	3 J	4 J
Benzene	58.2	NYSDEC Prot. GW	UG/KG	11 U	11 U	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Carbon Disulfide	2619	NYSDEC Prot. GW	UG/KG	11 U	11 U	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Chlorobenzene	1649	NYSDEC Prot. GW	UG/KG	11 U	11 UJ	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Chloroform	291	NYSDEC Prot. GW	UG/KG	11 U	11 U	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Methylene Chloride	97	NYSDEC Prot. GW	UG/KG	11 U	11 U	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Toluene	1455	NYSDEC Prot. GW	UG/KG	2 J	11 U	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Trichloroethene	679	NYSDEC Prot GW	UG/KG	11 U	11 U	11 U	11 U	11 U	13 U	11 U	10 U	11 U
Xylene (total)	1164	NYSDEC Prot. GW	UG/KG	7 J	11 UJ	11 U	11 U	11 U	13 U	11 U	10 U	11 U
SEMIVOLATILE ORGANICS												
1,2,4-Trichlorobenzene	3298	NYSDEC Prot. GW	UG/KG	390 U	480 U	370 J	920 U	1200 U	430 J	370 J	360 U	380 U
2,4,5-Trichlorophenol	97	NYSDEC Prot. GW	UG/KG	940 U	1200 U	900 U	2200 U	3000 U	1000 U	890 U	870 U	930 U
2,4-Dinitrophenol	194	NYSDEC Prot. GW	UG/KG	940 U	1200 U	900 U	2200 U	3000 U	1000 U	**890 J**	**870 J**	**930 J**
2-Methylnaphthalene	35308	NYSDEC Prot GW	UG/KG	390 U	480 U	370 U	55 J	68 J	430 U	370 U	360 U	380 U
2-Nitroaniline	417.1	NYSDEC Prot. GW	UG/KG	940 U	1200 U	**900 J**	2200 U	3000 U	**1000 J**	**890 J**	**870 J**	**930 J**
2-Nitrophenol	320.1	NYSDEC Prot. GW	UG/KG	390 U	480 U	**370 J**	920 U	1200 U	**430 J**	**370 J**	**360 J**	**380 J**
3,3'-Dichlorobenzidine			UG/KG	390 U	480 U	370 J	920 U	1200 U	430 J	370 U	360 U	380 U
3-Nitroaniline	485	NYSDEC Prot. GW	UG/KG	940 U	1200 U	900 U	2200 U	3000 U	1000 U	890 U	870 U	930 U
4,6-Dinitro-2-methylphenol			UG/KG	940 U	1200 U	900 U	2200 U	3000 U	1000 U	890 U	870 U	930 U
4-Chloro-3-methylphenol	232.8	NYSDEC Prot GW	UG/KG	390 U	480 U	370 U	920 U	1200 U	430 U	**370 J**	360 U	**380 J**
4-Chloroaniline	213.4	NYSDEC Prot. GW	UG/KG	390 U	480 U	370 U	920 U	1200 U	430 U	370 U	**360 J**	380 U
4-Nitroaniline			UG/KG	940 U	1200 U	900 U	2200 U	3000 U	1000 U	890 U	870 U	930 U
Acenaphthene	50000	NYSDEC TAGM 4046	UG/KG	390 U	340 J	370 U	920 U	1200 U	430 U	370 U	360 U	380 U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	390 U	420 J	40 J	64 J	1200 U	430 U	370 U	360 U	380 U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	390 U	**1100**	150 J	**310 J**	160 J	430 U	370 U	360 U	380 U
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	390 U	**1000**	**150 J**	**320 J**	**240 J**	430 U	370 U	360 U	380 U
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	390 U	**1100**	190 J	300 J	220 J	430 U	370 U	360 U	380 U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	20 J	730	110 J	430 J	400 J	430 U	370 U	36 J	380 U
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	390 U	**1100**	100 J	320 J	220 J	430 J	370 U	360 U	380 U
Butylbenzylphthalate	50000	NYSDEC TAGM 4046	UG/KG	390 U	480 U	370 U	920 U	1200 U	430 U	370 U	360 U	380 U
Carbazole			UG/KG	390 U	410 J	370 U	920 U	1200 U	430 U	370 U	360 J	380 U
Chrysene	388	NYSDEC Prot. GW	UG/KG	390 U	**1200**	170 J	300 J	210 J	430 U	370 J	360 U	380 J
Di-n-butylphthalate	7857	NYSDEC Prot. GW	UG/KG	390 U	480 U	370 U	920 U	1200 U	430 U	370 U	360 U	380 U
Dibenz(a,h)anthracene	160050000	NYSDEC Prot. GW	UG/KG	390 U	480 U	**41 J**	920 U	1200 U	430 U	370 U	360 U	380 U
Dibenzofuran	6014	NYSDEC Prot. GW	UG/KG	390 U	120 J	370 U	920 U	1200 U	430 U	370 U	360 U	380 U
Fluoranthene	1843000	NYSDEC Prot. GW	UG/KG	390 U	3600	380	520 J	260 J	46 J	370 U	360 U	380 U
Fluorene	339500	NYSDEC Prot. GW	UG/KG	390 U	260 J	370 U	920 U	1200 U	430 U	370 U	360 U	380 U
Hexachlorobutadiene			UG/KG	390 U	480 U	370 J	920 U	1200 U	430 J	370 U	360 U	380 U
Hexachlorocyclopentadiene			UG/KG	390 U	480 U	370 J	920 U	1200 U	430 J	370 J	360 U	380 U
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	390 U	680	110 J	290 J	250 J	430 U	370 U	37 J	380 U
Isophorone	4268	NYSDEC Prot. GW	UG/KG	390 U	480 U	370 J	920 U	1200 U	430 J	370 J	360 J	380 J
Naphthalene	12610	NYSDEC Prot. GW	UG/KG	390 U	480 U	370 U	920 U	1200 U	430 U	370 U	360 U	380 U
Nitrobenzene	194	NYSDEC Prot. GW	UG/KG	390 U	480 U	370 U	920 U	1200 U	430 U	**370 J**	**360 J**	**380 J**
Pentachlorophenol	970	NYSDEC Prot. GW	UG/KG	940 U	1200 U	900 U	2200 U	3000 U	1000 U	890 U	870 U	930 U
Phenanthrene	213400	NYSDEC Prot. GW	UG/KG	390 U	2800	160 J	280 J	140 J	430 U	370 U	360 U	380 U
Pyrene	645050	NYSDEC Prot. GW	UG/KG	22 J	2600	290 J	500 J	270 J	430 U	370 U	360 U	380 U
bis(2-Ethylhexyl)phthalate	421950	NYSDEC Prot. GW	UG/KG	390 U	480 U	110 J	920 U	1200 U	430 U	370 U	360 U	380 U

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-31		SS26-32		SS26-33		SS26-34		SS26-34		SS26-35		SS26-36		SS26-37		SS26-38	
			SAMP ID:	SS26-31		SS26-32		SS26-33		SS26-34		SS26-52		SS26-35		SS26-36		SS26-37		SS26-38	
			QC CODE:	SA		SA		SA		SA		DU		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0		0	
			BOTTOM:	0.17		0.17		0.17		0.17		0.17		0.17		0.17		0.17		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/21/95		10/21/95		10/19/95		10/22/95		10/22/95		10/21/95		10/21/95		10/19/95		10/21/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																					
4,4'-DDD	2900	EPA Carcinogenic	UG/KG	3.9	U	3.6	U	3.7	U	13	J	10	J	4.3	U	3.7	U	3.5	U	3.8	U
4,4'-DDE	2100	EPA Carcinogenic	UG/KG	3.9	U	2.8	J	5.9		5.7	J	5.7	J	4.3	U	3.7	U	2.9	J	3.8	U
4,4'-DDT	2100	EPA Carcinogenic	UG/KG	3.9	U	2.2	J	2.6	J	15	J	7.9	J	4.3	U	3.7	U	3.5	U	3.8	U
Dieldrin	44	EPA Carcinogenic	UG/KG	3.9	U	3.6	U	3.7	U	1.9	J	3.7	U	4.3	U	3.7	U	3.5	U	3.8	U
Endosulfan I	873	NYSDEC Prot. GW	UG/KG	2	U	1.9	U	1.9	U	1.9	U	1.9	U	2.2	U	1.9	U	1.8	U	2	U
Endosulfan II	873	NYSDEC Prot. GW	UG/KG	3.9	U	3.6	U	3.7	U	2	J	6.3		4.3	U	3.7	U	3.5	U	3.8	U
Endosulfan sulfate	970	NYSDEC Prot. GW	UG/KG	3.9	U	4		3.7	U	8.8	J	6	J	4.3	U	3.7	U	3.5	U	3.8	U
Endrin	97	NYSDEC Prot. GW	UG/KG	3.9	U	3.6	U	3.7	U	3.7	U	3.7	U	4.3	U	3.7	U	3.5	U	3.8	U
Endrin aldehyde			UG/KG	3.9	U	3.6	U	3.7	U	8.7	J	3.3	U	4.3	U	3.7	U	2.4	J	3.8	U
Endrin ketone			UG/KG	3.9	U	3.6	U	3.7	U	2.6	J	4.5	J	4.3	U	3.7	U	3.5	U	3.8	U
Heptachlor	97	NYSDEC Prot. GW	UG/KG	2	U	1.9	U	1.9	U	1.9	U	1.5	J	2.2	U	1.9	U	1.8	U	2	U
Heptachlor epoxide	19.4	NYSDEC Prot. GW	UG/KG	2	U	1.9	U	1.4	J	1.9	J	1.9	U	2.2	U	1.9	U	1.1	J	2	U
Methoxychlor			UG/KG	20	U	19	U	19	U	19	U	19	U	22	U	19	U	18	U	20	U
alpha-Chlordane			UG/KG	2	U	1.9	U	1.9	U	1.9	U	1.9	U	2.2	U	1.9	U	1.8	U	2	U
beta-BHC	194	NYSDEC Prot. GW	UG/KG	2	U	1.9	U	1.9	U	1.9	U	1.9	U	2.2	U	1.9	U	1.8	U	2	U
delta-BHC	291	NYSDEC Prot. GW	UG/KG	2	U	1.9	U	1.2	J	1.9	U	1.9	U	2.2	U	1.9	U	1.8	U	2	U
gamma-Chlordane	540	EPA Carcinogenic	UG/KG	2	U	1.9	U	1.9	U	1.9	U	1.9	U	2.2	U	1.9	U	1.8	U	2	U
OTHER ANALYSES																					
Nitrate/Nitrite-Nitrogen			MG/KG																		
Total Petroleum Hydrocarbons			MG/KG	315		108		81		647		564		82		36		50		62	
NITROAROMATICS																					
2,4-Dinitrotoluene			UG/KG																		
4-amino-2,6-Dinitrotoluene			UG/KG																		
HMX			UG/KG																		
METALS																					
Aluminum	14592.84	NYSDEC Metals	MG/KG	5550		10900		12400		6980		6180		**17200**		9080		6870		6670	
Antimony	3.59	NYSDEC Metals	MG/KG	0.3	UJ	0.37	UJ	0.38	UJ	0.46	UJ	0.28	UJ	0.42	UJ	0.55	J	0.38	UJ	0.53	J
Arsenic	7.5	NYSDEC Metals	MG/KG	2.8		4.8	J	5.3		4.3	J	4.6	J	5.6		**12.2**		5.8		**10.2**	
Barium	300	NYSDEC Metals	MG/KG	39.1		46.2		62.2		122		113		74		47.1		35.2		40.5	
Beryllium	0.73	NYSDEC Metals	MG/KG	0.35		0.55		0.62		0.42		0.42		0.64		0.61		0.47		0.51	
Cadmium	1	NYSDEC Metals	MG/KG	0.04	U	0.05	U	0.05	U	0.06	U	0.04	U	0.06	U	0.05	U	0.05	U	0.07	U
Calcium	101903.8	NYSDEC Metals	MG/KG	**210000**		87700		82200		**153000**		**155000**		41600		**194000**		**258000**	J	**260000**	J
Chromium	22.13	NYSDEC Metals	MG/KG	9.4	J	18.7	J	20.8	J	12.4	J	9.5	J	21.2	J	12.3	J	11	J	9.4	J
Cobalt	30	NYSDEC Metals	MG/KG	5.2		12.1		12.3		8.6		6.6		8		8.5		7.1		7	
Copper	25	NYSDEC Metals	MG/KG	15.5		22.5		**25.1**		17.9		14.3		17.5		**29.3**		17		**25.4**	
Cyanide	0.3	NYSDEC Metals	MG/KG	0.45	U	0.48	U	0.61	U	0.49	U	0.56	U	0.63	U	0.42	U	0.54	U	0.67	U
Iron	26626.65	NYSDEC Metals	MG/KG	10100		23400		24600		14600		11800		21800		14100		10300		11800	
Lead	21.86	NYSDEC Metals	MG/KG	10.6		14.7		17.6	J	**43.7**		**30.5**		14.5	J	10	J	7.1	J	6.4	J
Magnesium	1221.77	NYSDEC Metals	MG/KG	**6760**		**15900**		**9180**		**13700**		**13200**		**11700**		**4760**		**16300**		**6000**	
Manganese	669.38	NYSDEC Metals	MG/KG	285		525		467		378		351		432		283		305		266	
Mercury	0.1	NYSDEC Metals	MG/KG	0.03		0.03		0.04	J	0.03		0.03		0.07	J	0.04	J	0.02	J	0.03	J
Nickel	33.62	NYSDEC Metals	MG/KG	16.8		**36.2**		**37.9**		23.1		18.4		20.8		33.3		25.3		28.4	
Potassium	1761.48	NYSDEC Metals	MG/KG	1440		**2020**		**1810**		1720		1620		**2530**		**3020**		**2560**		**2250**	
Selenium	2	NYSDEC Metals	MG/KG	0.5	UJ	0.61	UJ	0.63	U	0.77	UJ	0.46	UJ	0.7	U	0.6	U	0.64	U	0.82	U
Silver	0.4	NYSDEC Metals	MG/KG	0.11	U	0.13	U	0.14	U	0.17	U	0.1	U	0.15	U	0.13	U	0.14	U	0.18	U
Sodium	103.74	NYSDEC Metals	MG/KG	**104**		83.8		**107**		89.9		102		68.8		91.9		**154**		64	
Thallium	0.28	NYSDEC Metals	MG/KG	**0.54**		0.5	U	0.51	U	0.62	U	**0.47**		**0.65**		**0.66**		0.52	U	**0.7**	
Vanadium	150	NYSDEC Metals	MG/KG	11.5		17.9		20	J	14.6		10.7		28.6	J	20.1	J	17.6	J	15.7	J
Zinc	82.5	NYSDEC Metals	MG/KG	39.5		**111**		**127**		71.7		54.1		**155**		33		81.1		28.1	
HERBICIDES																					
2,4,5-T	1843	NYSDEC Prot. GW	UG/KG																		
2,4-D	485	NYSDEC Prot. GW	UG/KG																		

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-39		SS26-4		SS26-40		SS26-41		SS26-42		SS26-43		SS26-44		SS26-45		SS26-46	
			SAMP ID:	SS26-39		SS26-4-1		SS26-40		SS26-41		SS26-42		SS26-43		SS26-44		SS26-45		SS26-46	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0		0	
			BOTTOM:	0.17		0.2		0.17		0.17		0.17		0.17		0.17		0.17		0.17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE	10/21/95		10/25/93		10/21/95		10/20/95		10/20/95		10/20/95		10/20/95		10/20/95		10/20/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																					
1,1-Dichloroethene	388	NYSDEC Prot. GW	UG/KG	13	U	10	U	12	U	11	U	11	U	12	U	12	U	12	U	12	U
Acetone	106.7	NYSDEC Prot. GW	UG/KG	22	J	10	U	5	J	11	UJ	11	U	12	U	12	U	12	U	12	U
Benzene	58.2	NYSDEC Prot. GW	UG/KG	13	U	10	U	12	U	11	U	11	U	12	U	12	U	12	U	12	U
Carbon Disulfide	2619	NYSDEC Prot. GW	UG/KG	13	U	10	U	12	U	11	U	11	U	12	U	12	U	12	U	12	U
Chlorobenzene	1649	NYSDEC Prot. GW	UG/KG	13	UJ	10	U	12	U	11	UJ	11	U	12	U	12	U	12	U	12	U
Chloroform	291	NYSDEC Prot. GW	UG/KG	13	U	10	U	12	U	11	U	11	U	12	U	12	U	12	U	12	U
Methylene Chloride	97	NYSDEC Prot. GW	UG/KG	13	U	10	U	12	U	11	U	11	U	12	U	12	U	12	U	12	U
Toluene	1455	NYSDEC Prot. GW	UG/KG	13	UJ	10	U	12	U	11	UJ	11	U	12	U	12	U	12	U	12	U
Trichloroethene	679	NYSDEC Prot GW	UG/KG	13	U	10	U	12	U	11	U	11	U	12	U	12	U	12	U	12	U
Xylene (total)	1164	NYSDEC Prot. GW	UG/KG	13	UJ	10	U	12	U	11	UJ	11	U	12	U	12	U	12	U	12	U
SEMIVOLATILE ORGANICS																					
1,2,4-Trichlorobenzene	3298	NYSDEC Prot. GW	UG/KG	400	U	450	U	400	U	360	U	390	U	390	U	380	U	370	U	400	U
2,4,5-Trichlorophenol	97	NYSDEC Prot. GW	UG/KG	960	U	1100	U	960	U	870	U	940	U	940	U	920	U	900	U	960	U
2,4-Dinitrophenol	194	NYSDEC Prot. GW	UG/KG	**960**	**J**	1100	U	**960**	**J**	**870**	**J**	**940**	**J**	**940**	**J**	**920**	**J**	900	U	960	U
2-Methylnaphthalene	35308	NYSDEC Prot. GW	UG/KG	400	U	41	J	400	U	360	U	390	U	390	U	380	U	370	U	400	U
2-Nitroaniline	417.1	NYSDEC Prot GW	UG/KG	**960**	**J**	1100	U	**960**	**J**	**870**	**J**	940	U	**940**	**J**	**920**	**J**	900	U	960	U
2-Nitrophenol	320.1	NYSDEC Prot. GW	UG/KG	**400**	**J**	450	U	**400**	**J**	**360**	**J**	**390**	**J**	**390**	**J**	**380**	**J**	370	U	400	U
3,3'-Dichlorobenzidine			UG/KG	400	U	450	U	400	U	360	J	390	J	390	J	380	J	370	U	400	U
3-Nitroaniline	485	NYSDEC Prot. GW	UG/KG	960	U	1100	U	960	U	870	U	**940**	**J**	940	U	920	U	900	U	960	U
4,6-Dinitro-2-methylphenol			UG/KG	960	U	1100	U	960	U	870	U	940	U	940	U	920	U	900	U	960	U
4-Chloro-3-methylphenol	232.8	NYSDEC Prot. GW	UG/KG	**400**	**J**	450	U	**400**	**J**	360	U	390	U	390	U	380	U	370	U	400	U
4-Chloroaniline	213.4	NYSDEC Prot. GW	UG/KG	400	U	450	U	400	U	**360**	**J**	**390**	**J**	**390**	**J**	**380**	**J**	370	U	400	U
4-Nitroaniline			UG/KG	960	U	1100	U	960	U	870	U	940	U	940	U	920	U	900	U	960	U
Acenaphthene	50000	NYSDEC TAGM 4046	UG/KG	400	U	180	J	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	56	J	240	J	400	U	360	U	220	J	390	U	40	U	76	J	61	J
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	210	J	**750**		91	J	50	J	**740**		50	J	130	J	**280**	**J**	170	J
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	**180**	**J**	**720**		**93**	**J**	54	J	**620**		**61**	**J**	**120**	**J**	**260**	**J**	**170**	**J**
Benzo(b)fluoranthene	1067	NYSDEC Prot GW	UG/KG	400	U	780		83	J	47	J	540		43	J	110	J	640		210	J
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	150	J	250	J	71	J	53	J	500		53	J	96	J	230	J	170	J
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	540		690		110	J	66	J	720		78	J	140	J	370	U	110	J
Butylbenzylphthalate	50000	NYSDEC TAGM 4046	UG/KG	400	U	450	U	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Carbazole			UG/KG	63	J	230	J	400	J	360	U	82	J	390	U	48	U	370	U	400	U
Chrysene	388	NYSDEC Prot. GW	UG/KG	230	J	**940**		99	J	64	J	**760**		60	J	150	J	260	J	160	J
Di-n-butylphthalate	7857	NYSDEC Prot. GW	UG/KG	400	U	450	U	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Dibenz(a,h)anthracene	160050000	NYSDEC Prot. GW	UG/KG	**51**	**J**	450	U	400	U	360	U	**220**	**J**	390	U	380	U	**100**	**J**	**68**	**J**
Dibenzofuran	6014	NYSDEC Prot GW	UG/KG	400	U	62	J	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Fluoranthene	1843000	NYSDEC Prot. GW	UG/KG	530		2300		160	J	110	J	1700		100	J	370	J	660		410	
Fluorene	339500	NYSDEC Prot. GW	UG/KG	400	U	130	J	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Hexachlorobutadiene			UG/KG	400	U	450	U	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Hexachlorocyclopentadiene			UG/KG	400	U	450	U	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	150	J	390	J	72	J	49	J	500		44	J	91	J	200	J	140	J
Isophorone	4268	NYSDEC Prot. GW	UG/KG	400	J	450	U	400	J	360	J	390	J	390	J	380	J	370	U	400	U
Naphthalene	12610	NYSDEC Prot. GW	UG/KG	400	U	450	U	400	U	360	U	390	U	390	U	380	U	370	U	400	U
Nitrobenzene	194	NYSDEC Prot. GW	UG/KG	400	U	450	U	**400**	**J**	**360**	**J**	**390**	**J**	**390**	**J**	**380**	**J**	370	U	400	U
Pentachlorophenol	970	NYSDEC Prot. GW	UG/KG	960	J	1100	U	960	U	870	U	940	U	940	U	920	U	900	U	960	U
Phenanthrene	213400	NYSDEC Prot. GW	UG/KG	300	J	1600		57	J	60	J	610		40	J	230	J	280	J	230	J
Pyrene	645050	NYSDEC Prot. GW	UG/KG	380	J	1900		120	J	78	J	1200		70	J	240	J	520		320	J
bis(2-Ethylhexyl)phthalate	421950	NYSDEC Prot. GW	UG/KG	400	U	450	U	400	U	360	U	270	J	240	J	380	U	380	J	400	U

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-39		SS26-4		SS26-40		SS26-41		SS26-42		SS26-43		SS26-44		SS26-45		SS26-46	
			SAMP ID:	SS26-39		SS26-4-1		SS26-40		SS26-41		SS26-42		SS26-43		SS26-44		SS26-45		SS26-46	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	0		0		0		0		0		0		0		0		0	
			BOTTOM:	0.17		0.2		0.17		0.17		0 17		0.17		0.17		0.17		0 17	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/21/95		10/25/93		10/21/95		10/20/95		10/20/95		10/20/95		10/20/95		10/20/95		10/20/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																					
4,4'-DDD	2900	EPA Carcinogenic	UG/KG	4	U	3.6	U	4	U	3.6	UJ	3.9	U	3.9	U	3.8	U	3.7	U	4	U
4,4'-DDE	2100	EPA Carcinogenic	UG/KG	3 6	J	6	J	5.8		3.4	J	2.5	J	2.4	J	3.8	U	3.7	U	4	U
4,4'-DDT	2100	EPA Carcinogenic	UG/KG	4	U	3.6	U	2.2	J	3.6	UJ	2.3	J	1.9	J	3.8	U	3.7	U	4	U
Dieldrin	44	EPA Carcinogenic	UG/KG	4	U	3.6	U	4	U	3.6	UJ	3.9	U	3.9	U	3.8	U	3.7	U	4	U
Endosulfan I	873	NYSDEC Prot. GW	UG/KG	2	U	1.8	U	2.1	U	1.9	UJ	2	U	2	U	2	U	1.9	U	2	U
Endosulfan II	873	NYSDEC Prot. GW	UG/KG	4	U	3.6	U	4	U	3.6	UJ	3.9	U	3.9	U	3.8	U	3.7	U	17	J
Endosulfan sulfate	970	NYSDEC Prot. GW	UG/KG	4	U	3.6	U	4	U	3.6	UJ	3.9	U	3.9	U	3.8	U	3.7	U	4	U
Endrin	97	NYSDEC Prot. GW	UG/KG	4	U	3.6	U	4	U	3.6	UJ	3.9	U	3.9	U	3.8	U	3.7	U	4	U
Endrin aldehyde			UG/KG	4	U	3 6	U	4	U	3.6	UJ	3.9	U	3.9	U	3.8	U	3.7	U	8	J
Endrin ketone			UG/KG	4	U	3.6	U	4	U	3.6	UJ	3.9	U	3.9	U	3.8	U	3.7	U	4	U
Heptachlor	97	NYSDEC Prot. GW	UG/KG	2	U	1 8	U	2.1	U	1.9	UJ	2	U	2	U	2	U	1.9	U	2.9	
Heptachlor epoxide	19.4	NYSDEC Prot GW	UG/KG	2	U	1.8	U	2.1	U	1.9	UJ	2	U	2	U	2	U	1.9	U	2	U
Methoxychlor			UG/KG	20	U	18	U	21	U	19	UJ	20	U	20	U	20	U	19	U	20	U
alpha-Chlordane			UG/KG	2	U	1 8	U	2.1	U	1.9	UJ	2	U	2	U	2	U	1.9	U	1.2	J
beta-BHC	194	NYSDEC Prot. GW	UG/KG	2	U	1.8	U	2.1	U	1.9	UJ	2	U	2	U	2	U	1.9	U	2	U
delta-BHC	291	NYSDEC Prot. GW	UG/KG	2	U	1 8	U	2.1	U	1.9	UJ	2	U	2	U	2	U	1.9	U	2	U
gamma-Chlordane	540	EPA Carcinogenic	UG/KG	2	U	1.8	U	2.1	U	1.9	UJ	2	U	2	U	2	U	1.9	U	2	U
OTHER ANALYSES																					
Nitrate/Nitrite-Nitrogen			MG/KG			0.07															
Total Petroleum Hydrocarbons			MG/KG	51		880		35		69		94		41		49		43		140	
NITROAROMATICS																					
2,4-Dinitrotoluene			UG/KG			130	U														
4-amino-2,6-Dinitrotoluene			UG/KG			130	U														
HMX			UG/KG			130	U														
METALS																					
Aluminum	14592.84	NYSDEC Metals	MG/KG	**17000**		10900		8120		7880		13100		**17700**		**15300**		**18000**		**15100**	
Antimony	3.59	NYSDEC Metals	MG/KG	0 4	UJ	8.1	UJ	0.47	UJ	0.44	UJ	0.51	UJ	0.46	UJ	0.47	UJ	0.39	UJ	0.37	UJ
Arsenic	7.5	NYSDEC Metals	MG/KG	5.8		**9.6**		4.6		5.6		**9.5**		7.4		6.6		6.5	J	5.8	J
Barium	300	NYSDEC Metals	MG/KG	61.2		70 1		33.8		36.7		64.1		77.9		82		99.7		79.3	
Beryllium	0.73	NYSDEC Metals	MG/KG	**0.83**		0.48	J	0.46		0.48		0.65		**0.82**		**0.74**		**0.75**		0.66	
Cadmium	1	NYSDEC Metals	MG/KG	0.05	U	0.51	U	0.06	U	0.06	U	0.07	U	0.06	U	0.06	U	0.05	U	0.05	U
Calcium	101903.8	NYSDEC Metals	MG/KG	49500		48100		**107000**		**177000**		65900		12100		20500		7770		31000	
Chromium	22.13	NYSDEC Metals	MG/KG	**28.9**	J	17.6		14	J	13.3	J	21.8	J	**27.1**	J	**24.4**	J	**23.9**	J	21.8	J
Cobalt	30	NYSDEC Metals	MG/KG	15.8		9.7		9.4		8.6		11.2		14.7		13.5		12.6		11	
Copper	25	NYSDEC Metals	MG/KG	**31.2**		19.3		16.5		14.9		**25.5**		**28.1**		23.3		19.6		20	
Cyanide	0.3	NYSDEC Metals	MG/KG	0.66	U	0.52	U	0.68	U	0.64	U	0.55	U	0.56	U	0.6	U	0.55	U	0 59	U
Iron	26626.65	NYSDEC Metals	MG/KG	**31600**		22100		16700		14100		**27400**		**32000**		**31700**		**26900**		25500	
Lead	21.86	NYSDEC Metals	MG/KG	**25.1**	J	20.8		21 1	J	15.5	J	18.6	J	**22**	J	21.6	J	17.8		14 8	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**9280**		**7180**		**12500**		**18200**		**9320**		**7320**		**6460**		**5160**		**7010**	
Manganese	669.38	NYSDEC Metals	MG/KG	517		398		357		478		**682**		544		**731**		**788**		516	
Mercury	0.1	NYSDEC Metals	MG/KG	0.02	J	0.02	J	0.04	J	0.02	J	0.04	J	0.04	J	0.09	J	0.07		0.05	
Nickel	33.62	NYSDEC Metals	MG/KG	**54.9**		30.3	R	27.6		22.7		32.6		**43.8**		**35.8**		30		29.8	
Potassium	1761.48	NYSDEC Metals	MG/KG	**2600**		1400		1530		**2140**		**1950**		**2640**		1570		**3070**		**2450**	
Selenium	2	NYSDEC Metals	MG/KG	0.67	U	0.19	U	0.79	U	0.74	U	0.86	U	0.91		0.79	U	0.66	UJ	0.62	UJ
Silver	0.4	NYSDEC Metals	MG/KG	0.14	U	1	UJ	0.17	U	0.16	U	0.19	U	0.17	U	0.17	U	0.14	U	0.13	U
Sodium	103.74	NYSDEC Metals	MG/KG	101		**125**	J	**126**		**116**		**132**		67.1		42.9	U	35.6	U	62.3	
Thallium	0.28	NYSDEC Metals	MG/KG	**0.82**		0.21	UJ	0.64	U	0.6	U	**0.95**		**1.1**		**1.1**		**1.3**		**0.74**	
Vanadium	150	NYSDEC Metals	MG/KG	26.2	J	17.3		14.4	J	17.9	J	21.4	J	28.2	J	22.4	J	29.5		24.3	
Zinc	82.5	NYSDEC Metals	MG/KG	**149**		75.9	R	62		70.4		**101**		**117**		**103**		**106**		**120**	
HERBICIDES																					
2,4,5-T	1843	NYSDEC Prot. GW	UG/KG			5.4	U														
2,4-D	485	NYSDEC Prot. GW	UG/KG			54	U														

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

			LOC_ID:	SS26-47		SS26-5		SS26-6		SS26-7		SS26-8		SS26-9		TP26-4		TP26-5	
			SAMP ID:	SS26-47		SS26-5-1		SS26-6-1		SS26-7-1		SS26-8-1		SS26-9		TP26-4-1		TP26-5-1	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		ESI		ESI		ESI		ESI		RI ROUND1		ESI		ESI	
			TOP:	0		0		0		0		0		0.17					
			BOTTOM:	0.17		0.2		0.2		0.2		0.2		0.33		0.25		0.25	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE:	10/20/95		10/25/93		10/25/93		10/25/93		10/25/93		10/04/95		11/17/93		11/17/93	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																			
1,1-Dichloroethene	388	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Acetone	106.7	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Benzene	58.2	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Carbon Disulfide	2619	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Chlorobenzene	1649	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Chloroform	291	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Methylene Chloride	97	NYSDEC Prot. GW	UG/KG	11	U	6	J	10	U	5	J	12	U	11	U	12	U	12	U
Toluene	1455	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Trichloroethene	679	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
Xylene (total)	1164	NYSDEC Prot. GW	UG/KG	11	U	10	U	10	U	11	U	11	U	11	U	12	U	12	U
SEMIVOLATILE ORGANICS																			
1,2,4-Trichlorobenzene	3298	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
2,4,5-Trichlorophenol	97	NYSDEC Prot. GW	UG/KG	910	U	830	U	2700	U	840	U	850	U	900	U	930	U	950	U
2,4-Dinitrophenol	194	NYSDEC Prot. GW	UG/KG	910	U	830	U	2700	U	840	U	850	U	900	U	930	U	950	U
2-Methylnaphthalene	35308	NYSDEC Prot. GW	UG/KG	370	U	26	J	1100	U	350	U	350	U	370	U	380	U	390	U
2-Nitroaniline	417.1	NYSDEC Prot. GW	UG/KG	910	U	830	U	2700	U	840	U	850	U	900	U	930	U	950	U
2-Nitrophenol	320.1	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
3,3'-Dichlorobenzidine			UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
3-Nitroaniline	485	NYSDEC Prot. GW	UG/KG	910	U	830	U	2700	U	840	U	850	U	900	U	930	U	950	U
4,6-Dinitro-2-methylphenol			UG/KG	910	U	830	U	2700	U	840	U	850	U	900	U	930	U	950	U
4-Chloro-3-methylphenol	232.8	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
4-Chloroaniline	213.4	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
4-Nitroaniline			UG/KG	910	U	830	U	2700	U	840	U	850	U	900	U	930	U	950	U
Acenaphthene	50000	NYSDEC TAGM 4046	UG/KG	370	U	340	U	150	J	350	U	350	U	370	U	380	U	390	U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	370	U	340	U	480	J	350	U	24	J	370	U	380	U	390	U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	370	U	340	U	**3700**		18	J	130	J	44	J	33	J	52	J
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	370	U	46	J	**3400**		350	U	**130**	**J**	47	J	31	J	52	J
Benzo(b)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	370	U	90	J	**4000**		350	U	130	J	44	J	33	J	55	J
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	370	U	42	J	900	J	350	U	100	J	40	J	23	J	34	J
Benzo(k)fluoranthene	1067	NYSDEC Prot. GW	UG/KG	370	U	39	J	**3500**		350	U	130	J	51	J	35	J	45	J
Butylbenzylphthalate	50000	NYSDEC TAGM 4046	UG/KG	370	U	340	U	210	J	350	U	350	U	370	U	380	U	390	U
Carbazole			UG/KG	370	U	340	U	570	J	350	U	350	U	370	U	380	U	390	U
Chrysene	388	NYSDEC Prot. GW	UG/KG	370	U	31	J	**4300**		28	J	150	J	54	J	38	J	60	J
Di-n-butylphthalate	7857	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
Dibenz(a,h)anthracene	160050000	NYSDEC Prot. GW	UG/KG	370	U	340	U	**750**	**J**	350	U	**30**	**J**	370	U	380	U	390	U
Dibenzofuran	6014	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
Fluoranthene	1843000	NYSDEC Prot. GW	UG/KG	370	U	340	U	7000		26	J	310	J	94	J	71	J	150	J
Fluorene	339500	NYSDEC Prot. GW	UG/KG	370	U	340	U	130	J	350	U	350	U	370	U	380	U	390	U
Hexachlorobutadiene			UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
Hexachlorocyclopentadiene			UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
Indeno(1,2,3-cd)pyrene	3104	NYSDEC Prot. GW	UG/KG	370	U	44	J	1500		350	U	66	J	370	U	23	J	34	J
Isophorone	4268	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
Naphthalene	12610	NYSDEC Prot. GW	UG/KG	370	U	24	J	1100	U	350	U	350	U	370	U	380	U	390	U
Nitrobenzene	194	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	350	U	350	U	370	U	380	U	390	U
Pentachlorophenol	970	NYSDEC Prot. GW	UG/KG	910	U	830	U	2700	U	840	U	850	U	900	U	930	U	950	U
Phenanthrene	213400	NYSDEC Prot. GW	UG/KG	370	U	340	U	2700		350	U	140	J	58	J	31	J	68	J
Pyrene	645050	NYSDEC Prot. GW	UG/KG	370	U	19	J	6200		26	J	250	J	110	J	66	J	110	J
bis(2-Ethylhexyl)phthalate	421950	NYSDEC Prot. GW	UG/KG	370	U	340	U	1100	U	48	J	53	J	100	J	380	U	390	U

Table F-2b
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC_ID:	SS26-47		SS26-5		SS26-6		SS26-7		SS26-8		SS26-9		TP26-4		TP26-5	
			SAMP ID:	SS26-47		SS26-5-1		SS26-6-1		SS26-7-1		SS26-8-1		SS26-9		TP26-4-1		TP26-5-1	
			QC CODE	SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID	RI ROUND1		ESI		ESI		ESI		ESI		RI ROUND1		ESI		ESI	
			TOP:	0		0		0		0		0		0.17					
			BOTTOM:	0.17		0.2		0.2		0.2		0.2		0.33		0.25		0.25	
			MATRIX:	SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL		SURFACE SOIL	
			SAMPLE DATE	10/20/95		10/25/93		10/25/93		10/25/93		10/25/93		10/04/95		11/17/93		11/17/93	
PESTICIDES/PCB																			
4,4'-DDD	2900	EPA Carcinogenic	UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
4,4'-DDE	2100	EPA Carcinogenic	UG/KG	3.7	U	3.4	U	6.7	U	3	J	3.5	U	3.7	U	3.8	U	3.9	U
4,4'-DDT	2100	EPA Carcinogenic	UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
Dieldrin	44	EPA Carcinogenic	UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
Endosulfan I	873	NYSDEC Prot. GW	UG/KG	1.9	U	1.8	U	3.5	U	1.8	U	1.8	U	1.9	U	2	U	2	U
Endosulfan II	873	NYSDEC Prot. GW	UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
Endosulfan sulfate	970	NYSDEC Prot. GW	UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
Endrin	97	NYSDEC Prot. GW	UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
Endrin aldehyde			UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
Endrin ketone			UG/KG	3.7	U	3.4	U	6.7	U	3.5	U	3.5	U	3.7	U	3.8	U	3.9	U
Heptachlor	97	NYSDEC Prot. GW	UG/KG	1.9	U	1.8	U	3.5	U	1.8	U	1.8	U	1.9	U	2	U	2	U
Heptachlor epoxide	19.4	NYSDEC Prot. GW	UG/KG	1.9	U	1.8	U	3.5	U	1.8	U	1.8	U	1.9	U	2	U	2	U
Methoxychlor			UG/KG	19	U	18	U	35	U	18	U	18	U	19	U	20	U	20	U
alpha-Chlordane			UG/KG	1.9	U	1.8	U	3.5	U	1.8	U	1.8	U	1.9	U	2	U	2	U
beta-BHC	194	NYSDEC Prot. GW	UG/KG	1.9	U	1.4	J	3.5	U	1.8	U	1.8	U	1.9	U	2	U	2	U
delta-BHC	291	NYSDEC Prot. GW	UG/KG	1.9	U	1.8	U	3.5	U	1.8	U	1.8	U	1.9	U	2	U	2	U
gamma-Chlordane	540	EPA Carcinogenic	UG/KG	1.9	U	1.8	U	3.5	U	1.8	U	1.8	U	1.9	U	2	U	2	U
OTHER ANALYSES																			
Nitrate/Nitrite-Nitrogen			MG/KG			0.14		0.04		0.44		0.09				0.08		0.55	
Total Petroleum Hydrocarbons			MG/KG	35		117		97		330		260		28.6	U	68		42	
NITROAROMATICS																			
2,4-Dinitrotoluene			UG/KG			130	UJ	130	UJ	130	UJ	130	UJ			130	U	130	U
4-amino-2,6-Dinitrotoluene			UG/KG			130	UJ	130	UJ	130	UJ	130	UJ			130	U	130	U
HMX			UG/KG			130	UJ	120	J	130	UJ	130	UJ			130	U	130	U
METALS																			
Aluminum	14592.84	NYSDEC Metals	MG/KG	**18600**		5830		2650		5490		9400		13600		11000		**15000**	
Antimony	3.59	NYSDEC Metals	MG/KG	0.39	UJ	7	UJ	8	UJ	8.8	UJ	7.4	UJ	0.53	J	7	UJ	12.4	UJ
Arsenic	7.5	NYSDEC Metals	MG/KG	7.1	J	3.8		**10.8**		4.9		**7.5**		6.7	J	**9**		5.6	
Barium	300	NYSDEC Metals	MG/KG	85.2		21.5	J	25.8	J	90.7		36.1		76.3		58.1		94	
Beryllium	0.73	NYSDEC Metals	MG/KG	**0.82**		0.22	J	0.23	J	0.33	J	0.47	J	0.68		0.49	J	**0.73**	**J**
Cadmium	1	NYSDEC Metals	MG/KG	0.05	U	0.44	U	0.5	U	0.55	U	0.46	U	0.04	U	0.44	U	0.77	U
Calcium	101903.8	NYSDEC Metals	MG/KG	4660		44200		**213000**		**222000**		**157000**		41300		14100		5330	
Chromium	22.13	NYSDEC Metals	MG/KG	**26.2**	**J**	8.9		**31.1**		10.6		15.2		20	R	17.8		**23.4**	
Cobalt	30	NYSDEC Metals	MG/KG	12.2		4.5	J	5.7	J	6.6	J	8.4		10.7		9.9		13.3	
Copper	25	NYSDEC Metals	MG/KG	**25.2**		16.5		**259**		19		22.5		24.6		12.4		23	
Cyanide	0.3	NYSDEC Metals	MG/KG	0.6	U	0.51	U	0.5	U	0.51	U	0.54	U	0.57	U	0.58	U	0.54	U
Iron	26626.65	NYSDEC Metals	MG/KG	**29700**		11900		**70200**		13500		17200		**26800**		23200		**28500**	
Lead	21.86	NYSDEC Metals	MG/KG	12.8		8.7		**522**		**58.5**		16.1		**24.8**	**J**	10.3		19.5	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**5560**		**15500**		**12800**		**18200**		**8460**		**5760**		**5020**		**5250**	
Manganese	669.38	NYSDEC Metals	MG/KG	639		264		536		365		297		566		421		**694**	
Mercury	0.1	NYSDEC Metals	MG/KG	0.05		**0.55**		0.02	U	**0.53**		0.09		0.04		0.03	U	0.06	
Nickel	33.62	NYSDEC Metals	MG/KG	**34.1**		14.8	R	20.1	R	19.4	R	31.6	R	30		26.7		**34.9**	
Potassium	1761.48	NYSDEC Metals	MG/KG	**3500**		1050		1050		**2070**		**1970**		**2080**	**J**	1090		1740	
Selenium	2	NYSDEC Metals	MG/KG	0.65	UJ	0.21	U	0.19	U	0.14	U	0.15	J	0.61		0.37	J	0.32	J
Silver	0.4	NYSDEC Metals	MG/KG	0.14	U	0.89	UJ	1	UJ	1.1	UJ	0.94	UJ	0.11	U	0.89	UJ	1.6	UJ
Sodium	103.74	NYSDEC Metals	MG/KG	36.8		**104**	**J**	**212**	**J**	**241**	**J**	**183**	**J**	32.8		56.4	J	46.8	J
Thallium	0.28	NYSDEC Metals	MG/KG	**1.2**		0.23	UJ	0.2	UJ	1.5	UJ	1.5	UJ	**0.49**		0.25	U	0.18	U
Vanadium	150	NYSDEC Metals	MG/KG	31.5		12.4		11		14.8		17.4		23.5		16		24.9	
Zinc	82.5	NYSDEC Metals	MG/KG	**103**		51.5	R	164	R	278	R	283	R	**101**		80.7		**91.5**	
HERBICIDES																			
2,4,5-T	1843	NYSDEC Prot. GW	UG/KG			5.2	U	5.1	U	5.3	U	5.4	U			5.8	U	6	U
2,4-D	485	NYSDEC Prot. GW	UG/KG			52	U	51	U	53	U	54	U			58	U	60	U

Table F-2c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	SB26-1		SB26-1		SB26-10		SB26-10		SB26-11		SB26-11		SB26-12		SB26-12		SB26-2	
			SAMP ID:	SB26-1-1		SB26-1-2		SB26-10-03		SB26-10-04		SB26-11-03		SB26-11-06		SB26-12-04		SB26-12-08		SB26-2-1	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		ESI	
			TOP:	0		2		4		6		4		10		6		14		0	
			BOTTOM:	2		4		6		8		6		12		8		16		2	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	11/17/93		11/17/93		09/20/95		09/20/95		10/19/95		10/19/95		10/18/95		10/18/95		11/18/93	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																					
2-Butanone	93	NYSDEC Prot. GW	UG/KG	11	U	11	U	13	UJ	12	UJ	16	J	4	U	1500	U	12	U	11	U
Acetone	34.1	NYSDEC Prot. GW	UG/KG	11	U	11	U	13	UJ	12	UJ	**75**	**J**	22		1800	U	8	J	25	U
Carbon Disulfide	837	NYSDEC Prot. GW	UG/KG	11	U	11	U	13	UJ	12	UJ	1	J	11	U	1500	U	12	U	11	U
Ethylbenzene	1705	NYSDEC Prot. GW	UG/KG	11	U	11	U	13	UJ	12	UJ	12	U	11	U	1500	U	12	U	11	U
Methylene Chloride	31	NYSDEC Prot. GW	UG/KG	11	U	11	U	13	UJ	12	UJ	12	U	11	U	1500	U	12	U	11	U
Toluene	465	NYSDEC Prot. GW	UG/KG	11	U	11	U	13	UJ	12	UJ	12	U	11	U	1500	U	12	U	11	U
Xylene (total)	372	NYSDEC Prot. GW	UG/KG	11	U	11	U	13	UJ	12	UJ	12	U	11	U	1500	U	12	U	11	U
SEMIVOLATILE ORGANICS																					
2,4,5-Trichlorophenol	31	NYSDEC Prot. GW	UG/KG	880	U	920	U	930	U	950	U	940	U	890	U	3200	U	2000	U	880	U
2-Methylnaphthalene	11284	NYSDEC Prot. GW	UG/KG	360	U	380	U	380	U	390	U	390	U	370	U	2100		820	U	360	U
2-Nitroaniline	133.3	NYSDEC Prot. GW	UG/KG	880	U	920	U	**930**	**J**	**950**	**J**	**940**	**J**	**890**	**J**	**3200**	**J**	**2000**	**J**	880	U
2-Nitrophenol	102.3	NYSDEC Prot. GW	UG/KG	360	U	380	U	380	U	390	U	**390**	**J**	**370**	**J**	1300	U	820	U	360	U
3,3'-Dichlorobenzidine			UG/KG	360	U	380	U	380	U	390	U	390	U	370	U	1300	J	820	J	360	U
4,6-Dinitro-2-methylphenol			UG/KG	880	U	920	U	930	J	950	J	940	U	890	U	3200	U	2000	U	880	U
Acenaphthene	27900	NYSDEC Prot. GW	UG/KG	360	U	380	U	380	U	390	U	390	U	370	U	250	J	820	U	360	U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	360	U	380	U	46	J	79	J	390	U	370	U	1300	U	820	U	360	U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	31	J	380	U	180	J	190	J	390	U	370	U	1300	U	820	U	360	U
Benzo(a)pyrene	60 9	EPA Carcinogenic	UG/KG	34	J	380	U	**210**	**J**	**360**	**J**	390	U	370	U	1300	U	820	U	360	U
Benzo(b)fluoranthene	341	NYSDEC Prot GW	UG/KG	36	J	380	U	200	J	320	J	390	U	370	U	1300	U	820	U	360	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	360	U	380	U	420		1100		390	U	370	U	1300	U	820	U	360	U
Benzo(k)fluoranthene	341	NYSDEC Prot. GW	UG/KG	36	J	380	U	220	J	200	J	390	U	370	U	1300	U	820	U	360	U
Butylbenzylphthalate	37820	NYSDEC Prot. GW	UG/KG	360	U	380	U	380	U	390	U	390	U	370	U	1300	U	820	U	360	U
Carbazole			UG/KG	360	U	380	U	41	J	58	J	390	U	370	U	1300	U	820	U	360	U
Chrysene	124	NYSDEC Prot. GW	UG/KG	42	J	380	U	**190**	**J**	**210**	**J**	390	U	370	U	**1300**	**J**	**820**	**J**	360	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	UG/KG	360	U	380	U	**100**	**J**	**230**	**J**	390	U	370	U	1300	U	820	U	360	U
Dibenzofuran	1922	NYSDEC Prot. GW	UG/KG	360	U	380	U	380	U	390	U	390	U	370	U	1300	U	820	U	360	U
Fluoranthene	50000	NYSDEC TAGM 4046	UG/KG	69	J	380	U	330	J	310	J	390	U	370	U	1300	U	820	U	52	J
Fluorene	50000	NYSDEC TAGM 4046	UG/KG	360	U	380	U	380	U	390	U	390	U	370	U	320	J	820	U	360	U
Hexachlorobutadiene			UG/KG	360	U	380	U	380	U	390	U	390	J	370	J	1300	U	820	U	360	U
Hexachlorocyclopentadiene			UG/KG	360	U	380	U	380	U	390	U	390	J	370	J	1300	U	820	U	360	U
Indeno(1,2,3-cd)pyrene	992	NYSDEC Prot. GW	UG/KG	360	U	380	U	350	J	810		390	U	370	U	1300	U	820	U	360	U
Isophorone	1364	NYSDEC Prot. GW	UG/KG	360	U	380	U	380	U	390	U	390	J	370	J	1300	U	820	U	360	U
Naphthalene	4030	NYSDEC Prot. GW	UG/KG	360	U	380	U	380	U	390	U	390	U	370	U	1300	U	820	U	360	U
Phenanthrene	50000	NYSDEC TAGM 4046	UG/KG	24	J	380	U	170	J	240	J	390	U	370	U	810	J	130	J	31	J
Pyrene	50000	NYSDEC TAGM 4046	UG/KG	56	J	380	U	250	J	260	J	390	U	370	U	1300	U	120	J	44	J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	UG/KG	360	U	380	U	1300		200	J	84	U	370	U	1300	U	530	J	700	

SEAD-26 Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	SB26-1	SB26-1	SB26-10	SB26-10	SB26-11	SB26-11	SB26-12	SB26-12	SB26-2
			SAMP ID:	SB26-1-1	SB26-1-2	SB26-10-03	SB26-10-04	SB26-11-03	SB26-11-06	SB26-12-04	SB26-12-08	SB26-2-1
			QC CODE:	SA	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID:	ESI	ESI	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	RI ROUND1	ESI
			TOP:	0	2	4	6	4	10	6	14	0
			BOTTOM:	2	4	6	8	6	12	8	16	2
			MATRIX:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			SAMPLE DATE:	11/17/93	11/17/93	09/20/95	09/20/95	10/19/95	10/19/95	10/18/95	10/18/95	11/18/93
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
PESTICIDES/PCB												
4,4'-DDE	1364	NYSDEC Prot GW	UG/KG	3 J	3.8 U	3.8 U	4 U	3.8 U	3.7 U	3.9 U	4.1 U	2.7 J
4,4'-DDT	775	NYSDEC Prot. GW	UG/KG	3 5 J	3.8 U	3.8 U	4 U	3.8 U	3.7 U	3.9 U	4.1 U	3.6 U
Endosulfan sulfate	310	NYSDEC Prot. GW	UG/KG	3.6 U	3.8 U	3.8 U	4 U	3.8 U	3.7 U	3.9 U	4.1 U	3.6 U
Endrin aldehyde			UG/KG	3.6 U	3.8 U	2.2 J	2.2 J	3.8 U	3.7 U	3.9 U	4.1 U	3.6 U
OTHER ANALYSES												
Nitrate/Nitrite-Nitrogen			MG/KG	0 43	0.48							0.05
Total Petroleum Hydrocarbons			MG/KG	43	38	100	141	51	34	659	634	42
METALS												
Aluminum	14592.84	NYSDEC Metals	MG/KG	5560	9040	11400	15300	15700	8220	11500	11500	5230
Antimony	3.59	NYSDEC Metals	MG/KG	7.3 UJ	6 7 UJ	0.7 J	0.49 J	0.44 UJ	0.36 UJ	0.33 U	0.39 U	9.1 UJ
Arsenic	7.5	NYSDEC Metals	MG/KG	3.2	5.3	7.8	5.9	6	4.2	8.7 J	6.3 J	6.5 J
Barium	300	NYSDEC Metals	MG/KG	73.2	43.7	144	64.8	96 3	87.1	71.5	71.4	21.1 J
Beryllium	0.73	NYSDEC Metals	MG/KG	0.35 J	0 41 J	0.73	0.67	0.75	0.41	0.6	0.57	0.32 J
Cadmium	1	NYSDEC Metals	MG/KG	0.46 U	0.42 U	0.49	0.04 U	0.06 U	0 05 U	0.05 U	0.05 U	0.57 U
Calcium	101903.8	NYSDEC Metals	MG/KG	293000	47300	29900	10400	6230	86100	49600	9200	238000
Chromium	22.13	NYSDEC Metals	MG/KG	10 3	15 7	23.7 J	21.9 J	24.6 J	13.1 J	18.5 J	19.4 J	8.8
Cobalt	30	NYSDEC Metals	MG/KG	5.9 J	9.5	11.9	11.3	14.7	8.2	11.1 J	11.3 J	5.6 J
Copper	25	NYSDEC Metals	MG/KG	9.7	14.3	20.3	26	24.6	20.4	26	25.5	10.6
Iron	26626.65	NYSDEC Metals	MG/KG	8770	19100	28400	29500	31400	18000	25600	26900	11400
Lead	21.86	NYSDEC Metals	MG/KG	6.33	8.5	516	276	12 8 J	6.9 J	9.5	15	10.3
Magnesium	1221.77	NYSDEC Metals	MG/KG	29100	9160	8470	5220	5750	14700	6610	6780	7790
Manganese	669.38	NYSDEC Metals	MG/KG	309	551	653	391	641	579	1140	530	442
Mercury	0.1	NYSDEC Metals	MG/KG	0.02 U	0.02 U	0.09	0.05	0.04	0.02 J	0.04	0.06	0.03 UJ
Nickel	33.62	NYSDEC Metals	MG/KG	31 6 R	23.9	30.5	34.7	39.8	22.6	29.4 J	35.7 J	17.5
Potassium	1761.48	NYSDEC Metals	MG/KG	1710	901	2230	1690	1540	1660	879 J	1200 J	882
Selenium	2	NYSDEC Metals	MG/KG	0.13 UJ	0.26 J	0.78 J	1.1 J	0.74 U	0.61 U	0.92	0.66 U	0 14 UJ
Silver	0.4	NYSDEC Metals	MG/KG	0.92 UJ	0.85 UJ	0.15 U	0.11 U	0.16 U	0.13 U	0.12 U	0.14 U	1.2 U
Sodium	103.74	NYSDEC Metals	MG/KG	192 J	108 J	62.3	48.7	39.9 U	96.1	168	44.8	163 J
Thallium	0.28	NYSDEC Metals	MG/KG	0.73 U	0.17 U	1 J	0.85 J	1	0.92	0.59	0.53 U	0.2 U
Vanadium	150	NYSDEC Metals	MG/KG	12.7	14.4	25.1	21	23.9 J	14.1 J	18.1 J	19.3 J	10.9
Zinc	82.5	NYSDEC Metals	MG/KG	283 R	90.6	379 J	127 J	94.5	52.2	72.3	99.9	29 5
HERBICIDES												
Dicamba			UG/KG	5.5 U	5.7 U							5.5 U
MCPA			UG/KG	5500 U	5700 U							5500 U
MCPP			UG/KG	5500 U	5700 U							5500 U

SEAD-26 Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	SB26-2		SB26-2		SB26-2		SB26-3		SB26-3		SB26-3		SB26-4		SB26-4		SB26-4	
			SAMP ID:	SB26-2-2		SB26-2-3		SB26-2-5		SB26-3-1		SB26-3-2		SB26-3-3		SB26-4-1		SB26-4-2		SB26-4-3	
			QC CODE:	SA		SA		DU		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	8		10		0		0		6		10		0		2		6	
			BOTTOM:	10		12		2		2		8		12		2		4		8	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	11/18/93		11/18/93				11/18/93		11/18/93		11/18/93		11/19/93		11/19/93		11/19/93	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																					
2-Butanone	93	NYSDEC Prot. GW	UG/KG	12	U	12	U	10	U	12	U	12	U	13	U	11	U	11	U	12	U
Acetone	34.1	NYSDEC Prot. GW	UG/KG	13	U	12	U	10	U	12	U	12	U	13	U	11	U	11	U	12	U
Carbon Disulfide	837	NYSDEC Prot. GW	UG/KG	12	U	12	U	10	U	12	U	12	U	13	U	11	U	11	U	12	U
Ethylbenzene	1705	NYSDEC Prot. GW	UG/KG	12	U	12	U	10	U	12	U	12	U	13	U	11	U	11	U	12	U
Methylene Chloride	31	NYSDEC Prot. GW	UG/KG	12	U	12	U	10	U	12	U	12	U	13	U	11	U	11	U	12	U
Toluene	465	NYSDEC Prot. GW	UG/KG	12	U	12	U	3	J	12	U	12	U	13	U	11	U	11	U	12	U
Xylene (total)	372	NYSDEC Prot. GW	UG/KG	12	U	12	U	10	U	12	U	12	U	13	U	11	U	11	U	12	U
SEMIVOLATILE ORGANICS																					
2,4,5-Trichlorophenol	31	NYSDEC Prot. GW	UG/KG	990	U	940	U	850	U	930	U	980	U	930	UJ	910	U	900	U	930	U
2-Methylnaphthalene	11284	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
2-Nitroaniline	133 3	NYSDEC Prot. GW	UG/KG	990	U	940	U	850	U	930	U	980	U	930	UJ	910	U	900	U	930	U
2-Nitrophenol	102.3	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
3,3'-Dichlorobenzidine			UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
4,6-Dinitro-2-methylphenol			UG/KG	990	U	940	U	850	U	930	U	980	U	930	UJ	910	U	900	U	930	U
Acenaphthene	27900	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	410	U	390	U	350	U	380	U	45	J	380	UJ	370	U	370	U	380	U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	410	U	390	U	350	U	380	U	65	J	380	UJ	370	U	370	U	28	J
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	410	U	390	U	350	U	380	U	55	J	380	UJ	370	U	370	U	40	J
Benzo(b)fluoranthene	341	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	42	J	380	UJ	370	U	370	U	33	J
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Benzo(k)fluoranthene	341	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	51	J	380	UJ	370	U	370	U	41	J
Butylbenzylphthalate	37820	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Carbazole			UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Chrysene	124	NYSDEC Prot. GW	UG/KG	410	U	390	U	27	J	380	U	69	J	380	UJ	370	U	370	U	46	J
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Dibenzofuran	1922	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Fluoranthene	50000	NYSDEC TAGM 4046	UG/KG	410	U	390	U	30	J	380	U	170	J	380	UJ	24	J	370	U	71	J
Fluorene	50000	NYSDEC TAGM 4046	UG/KG	410	U	390	U	350	U	380	U	22	J	380	UJ	370	U	370	U	380	U
Hexachlorobutadiene			UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Hexachlorocyclopentadiene			UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Indeno(1,2,3-cd)pyrene	992	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Isophorone	1364	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Naphthalene	4030	NYSDEC Prot. GW	UG/KG	410	U	390	U	350	U	380	U	400	U	380	UJ	370	U	370	U	380	U
Phenanthrene	50000	NYSDEC TAGM 4046	UG/KG	410	U	390	U	22	J	380	U	190	J	380	UJ	370	U	370	U	64	J
Pyrene	50000	NYSDEC TAGM 4046	UG/KG	410	U	390	U	48	J	380	U	130	J	380	UJ	30	J	370	U	64	J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	UG/KG	410	U	500	U	660		380	U	400	U	230	J	930		820		380	U

Table F-2c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Subsurface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC_ID:	SB26-2		SB26-2		SB26-2		SB26-3		SB26-3		SB26-3		SB26-4		SB26-4		SB26-4	
			SAMP ID:	SB26-2-2		SB26-2-3		SB26-2-5		SB26-3-1		SB26-3-2		SB26-3-3		SB26-4-1		SB26-4-2		SB26-4-3	
			QC CODE:	SA		SA		DU		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	8		10		0		0		6		10		0		2		6	
			BOTTOM:	10		12		2		2		8		12		2		4		8	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	11/18/93		11/18/93				11/18/93		11/18/93		11/18/93		11/19/93		11/19/93		11/19/93	
PESTICIDES/PCB																					
4,4'-DDE	1364	NYSDEC Prot. GW	UG/KG	4.1	U	3.9	U	3.2	J	3.8	U	4	U	3.8	U	3.7	U	3.7	U	3.8	U
4,4'-DDT	775	NYSDEC Prot. GW	UG/KG	4.1	U	3.9	U	3.5	U	3.8	U	4	U	3.8	U	3.7	U	3.7	U	3.8	U
Endosulfan sulfate	310	NYSDEC Prot. GW	UG/KG	4.1	U	3.9	U	3.5	U	3.8	U	4	U	3.8	U	3.7	U	3.7	U	3.8	U
Endrin aldehyde			UG/KG	4.1	U	3.9	U	3.5	U	3.8	U	4	U	3.8	U	3.7	U	3.7	U	3.8	U
OTHER ANALYSES																					
Nitrate/Nitrite-Nitrogen			MG/KG	0.26		2.2		0.1		0.14		1.06		0.07		0.75		0.37		1.55	
Total Petroleum Hydrocarbons			MG/KG	74		52		57		69		71		74		90		65		66	
METALS																					
Aluminum	14592.84	NYSDEC Metals	MG/KG	**21000**		14200		7900		13700		14400		12900		14300		13800		**15300**	
Antimony	3.59	NYSDEC Metals	MG/KG	11.5	UJ	11.5	UJ	8.8	UJ	10.4	UJ	12.5	UJ	6.6	UJ	9.2	UJ	9.3	UJ	11.4	UJ
Arsenic	7.5	NYSDEC Metals	MG/KG	**8.8**	J	**7.6**	J	5.3	J	**8.3**	J	**8.4**	J	6.7	J	**13**	J	**10.3**	J	**10.2**	J
Barium	300	NYSDEC Metals	MG/KG	83.6		90.8		102	J	77.1		93.2		57.5		87.3		62.4		74.3	
Beryllium	0.73	NYSDEC Metals	MG/KG	**0.97**	J	0.67	J	0.46	J	0.69	J	0.66	J	0.61	J	0.67	J	0.61	J	**0.73**	J
Cadmium	1	NYSDEC Metals	MG/KG	0.72	U	0.72	U	0.55	U	0.65	U	0.78	U	0.41	U	0.57	U	0.58	U	0.71	U
Calcium	101903.8	NYSDEC Metals	MG/KG	2090		17800		**189000**		25600		20100		2820		28000		17500		14500	
Chromium	22.13	NYSDEC Metals	MG/KG	**32.4**		21.9		13.9		20.7		20.9		21.4		**22.7**		**22.2**		**23.5**	
Cobalt	30	NYSDEC Metals	MG/KG	17.5		11		10.1		10.8		7.9	J	11.8		15.8		12		14.8	
Copper	25	NYSDEC Metals	MG/KG	24.4		24		14.3		20.6		18.3		23.2		**28.6**		18.9		24.1	
Iron	26626.65	NYSDEC Metals	MG/KG	**44100**		**33700**		15500		**28400**		25900		**29600**		**31700**		**29000**		**33200**	
Lead	21.86	NYSDEC Metals	MG/KG	10.3		**27**		15.5		20.7		14.9		10.5		14.6		11.7		13.1	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**7210**		**4700**		**18100**		**8760**		**4810**		**5290**		**6910**		**6330**		**6290**	
Manganese	669.38	NYSDEC Metals	MG/KG	279		**712**		433		466		561		486		**696**		541		668	
Mercury	0.1	NYSDEC Metals	MG/KG	0.05	J	0.03	UJ	0.03	UJ	0.03	J	0.03	J	0.03	J	0.04	J	0.04	J	0.03	J
Nickel	33.62	NYSDEC Metals	MG/KG	**46.2**		32.4		29.2		29.7		29.1		**34.7**		**35.2**		32.8		**38.5**	
Potassium	1761.48	NYSDEC Metals	MG/KG	1490		**1960**		1710		1140		1130	J	1110		1370		1140		1390	
Selenium	2	NYSDEC Metals	MG/KG	0.32	J	0.16	UJ	0.14	UJ	0.48	J	0.79	J	0.18	UJ	0.37	J	0.58	J	0.28	J
Silver	0.4	NYSDEC Metals	MG/KG	1.5	U	1.5	U	1.1	U	1.3	U	1.6	U	0.84	U	1.2	U	1.2	U	1.4	U
Sodium	103.74	NYSDEC Metals	MG/KG	67.1	J	**220**	J	**175**	J	71.6	J	60.9	J	56.8	J	**119**	J	87.6	J	78	J
Thallium	0.28	NYSDEC Metals	MG/KG	0.28	U	0.24	U	1	U	0.21	U	0.26	U	0.27	U	0.23	U	0.14	U	0.26	U
Vanadium	150	NYSDEC Metals	MG/KG	28		27.4		15.9		22.2		21.8		19.5		20.1		18.6		22.2	
Zinc	82.5	NYSDEC Metals	MG/KG	69.3		**201**		54.8		64.9		78.2		72.5		**84.9**		72.4		**115**	
HERBICIDES																					
Dicamba			UG/KG	6.3	U	5.9	U	5.3	U	5.8	U	6.1	U	5.8	U	5.7	U	5.8		5.8	U
MCPA			UG/KG	6300	U	5900	U	5300	U	5800	U	6100	U	5800	U	5700	U	29000		5800	
MCPP			UG/KG	6300	U	5900	U	5300	U	5800	U	6100	U	5800	U	5700	U	5600	U	5800	U

Table F-2c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	SB26-5		SB26-5		SB26-6		SB26-6		SB26-7		SB26-7		SB26-8		SB26-8		SB26-9		SB26-9	
			SAMP ID:	SB26-5-03		SB26-5-05		SB26-6-04		SB26-6-06		SB26-7-03		SB26-7-07		SB26-8-04		SB26-8-05		SB26-9-04		SB26-9-05	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	4		8		6		10		4		12		6		8		6		8	
			BOTTOM:	6		10		8		12		6		14		8		10		8		10	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	09/24/95		09/24/95		09/23/95		09/23/95		09/23/95		09/24/95		09/21/95		09/21/95		09/25/95		09/25/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS																							
2-Butanone	93	NYSDEC Prot. GW	UG/KG	12	U	11	U	12	U	11	U	1400	U	1400	U	11	UJ	11	UJ	11	UJ	11	UJ
Acetone	34.1	NYSDEC Prot. GW	UG/KG	12	UJ	11	UJ	12	UJ	11	U	1400	U	1400	U	11	UJ	11	UJ	**120**	**J**	5	J
Carbon Disulfide	837	NYSDEC Prot. GW	UG/KG	12	U	11	U	12	U	11	U	1400	U	1400	UJ	11	UJ	11	UJ	11	U	11	U
Ethylbenzene	1705	NYSDEC Prot. GW	UG/KG	12	U	11	U	12	U	11	U	360	J	1400	U	11	UJ	11	UJ	11	U	11	U
Methylene Chloride	31	NYSDEC Prot. GW	UG/KG	12	U	11	U	12	U	11	U	1400	U	1400	U	11	UJ	11	UJ	**365**	**J**	11	U
Toluene	465	NYSDEC Prot. GW	UG/KG	12	U	11	U	12	U	11	U	1400	U	1400	U	11	UJ	11	UJ	11	U	11	U
Xylene (total)	372	NYSDEC Prot. GW	UG/KG	12	U	11	U	12	U	11	U	310	J	1400	U	11	UJ	2	J	11	U	11	U
SEMIVOLATILE ORGANICS																							
2,4,5-Trichlorophenol	31	NYSDEC Prot. GW	UG/KG	940	U	950	U	930	U	910	U	4800	U	4500	U	**930**	**J**	**850**	**J**	880	U	900	U
2-Methylnaphthalene	11284	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	5300		4200		380	U	350	U	360	U	370	U
2-Nitroaniline	133.3	NYSDEC Prot. GW	UG/KG	940	U	950	U	930	U	910	U	4800	U	4500	U	930	U	850	U	880	U	900	U
2-Nitrophenol	102.3	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
3,3'-Dichlorobenzidine			UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	J	350	J	360	U	370	U
4,6-Dinitro-2-methylphenol			UG/KG	940	U	950	U	930	U	910	U	4800	U	4500	U	930	U	850	U	880	U	900	U
Acenaphthene	27900	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	530	J	380	J	380	U	350	U	360	U	370	U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	390	U	49	J	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Benzo(a)pyrene	60 9	EPA Carcinogenic	UG/KG	42	J	50	J	380	U	370	U	2000	U	1900	U	380	U	350	U	38	J	370	U
Benzo(b)fluoranthene	341	NYSDEC Prot. GW	UG/KG	78	J	94	J	62	J	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	390	U	43	J	380	U	370	U	2000	U	1900	U	380	J	350	J	360	U	370	U
Benzo(k)fluoranthene	341	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	41	J	370	U
Butylbenzylphthalate	37820	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	J	350	J	360	U	370	U
Carbazole			UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Chrysene	124	NYSDEC Prot. GW	UG/KG	41	J	55	J	45	J	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Dibenzofuran	1922	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	520	J	1900	U	380	U	350	U	360	U	370	U
Fluoranthene	50000	NYSDEC TAGM 4046	UG/KG	39	J	96	J	68	J	370	U	270	J	1900	U	380	U	350	U	48	J	370	U
Fluorene	50000	NYSDEC TAGM 4046	UG/KG	390	U	390	U	380	U	370	U	1200	J	870	J	380	U	350	U	360	U	370	U
Hexachlorobutadiene			UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Hexachlorocyclopentadiene			UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	J	370	J
Indeno(1,2,3-cd)pyrene	992	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Isophorone	1364	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	2000	U	1900	U	380	U	350	U	360	U	370	U
Naphthalene	4030	NYSDEC Prot. GW	UG/KG	390	U	390	U	380	U	370	U	850	J	350	J	380	U	350	U	360	U	370	U
Phenanthrene	50000	NYSDEC TAGM 4046	UG/KG	390	U	70	J	53	J	370	U	1900	J	1700	J	380	U	350	U	360	U	370	U
Pyrene	50000	NYSDEC TAGM 4046	UG/KG	390	U	85	J	73	J	370	U	300	J	240	J	380	U	350	U	360	U	370	U
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	UG/KG	390	U	150	J	380	UJ	370	UJ	2000	U	1900	UJ	380	UJ	350	UJ	360	U	370	U

Table F-2c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	SB26-5		SB26-5		SB26-6		SB26-6		SB26-7		SB26-7		SB26-8		SB26-8		SB26-9		SB26-9	
			SAMP ID:	SB26-5-03		SB26-5-05		SB26-6-04		SB26-6-06		SB26-7-03		SB26-7-07		SB26-8-04		SB26-8-05		SB26-9-04		SB26-9-05	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1		RI ROUND1	
			TOP:	4		8		6		10		4		12		6		8		6		8	
			BOTTOM:	6		10		8		12		6		14		8		10		8		10	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	09/24/95		09/24/95		09/23/95		09/23/95		09/23/95		09/24/95		09/21/95		09/21/95		09/25/95		09/25/95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																							
4,4'-DDE	1364	NYSDEC Prot. GW	UG/KG	3.9	U	3.9	U	3.8	U	3.7	U	4	U	3.7	U	3.8	U	3.5	U	3.6	U	3.7	U
4,4'-DDT	775	NYSDEC Prot. GW	UG/KG	3 9	U	3.9	U	3 8	U	3.7	U	4	U	3.7	U	3.8	U	3.5	U	3.6	U	3.7	U
Endosulfan sulfate	310	NYSDEC Prot. GW	UG/KG	3 9	U	3.9	U	3.8	U	3 7	U	4	U	2.6	J	3.8	U	3.5	U	3 6	U	3.7	U
Endrin aldehyde			UG/KG	10	J	3.9	U	3.8	U	3.7	U	5	J	3.7	U	3.8	U	3.5	U	3.6	U	3.7	U
OTHER ANALYSES																							
Nitrate/Nitrite-Nitrogen			MG/KG																				
Total Petroleum Hydrocarbons			MG/KG	33.5	U	30.7	U	86.3		43.7		911		1280		208		56.5		30.4	U	32.3	U
METALS																							
Aluminum	14592.84	NYSDEC Metals	MG/KG	13700		**16900**		14100		13100		14400		**15700**		**15600**		**14800**		**16200**		**15800**	
Antimony	3.59	NYSDEC Metals	MG/KG	0 62	J	0.7	J	0.76	J	0.57	J	0.69	J	0.54	J	0.5	J	0.45	J	0.62	J	0.48	J
Arsenic	7.5	NYSDEC Metals	MG/KG	6		6.7		5.7		5.2		4.7		**10.8**		**7.5**		5.3		**8.3**		**8.1**	**J**
Barium	300	NYSDEC Metals	MG/KG	67.7		56.5		68		57.7		48.8		42.9		112		46.5		80.7		63	
Beryllium	0 73	NYSDEC Metals	MG/KG	0.72		0.64		0.64		0.59		0.58		0.51		**0.86**		0.59		**0.77**		0.7	
Cadmium	1	NYSDEC Metals	MG/KG	0.06	U	0.06	U	0.06	U	0.05	U	0.06	U	0.04	U	0.05	U	0.04	U	0.06	U	0.06	U
Calcium	101903.8	NYSDEC Metals	MG/KG	9780		18700		34600		4740		5600		6320		4470		3290		3780		2150	
Chromium	22.13	NYSDEC Metals	MG/KG	20.4	J	**22.9**	**J**	20.9	J	19.4	J	17.4	J	18.5	J	**25**	**J**	22.1	J	26 2	R	26	R
Cobalt	30	NYSDEC Metals	MG/KG	12.5		13.5		10.9		10.3		12.1		11.4		17.2		15.9		14.9		17.7	
Copper	25	NYSDEC Metals	MG/KG	**28.4**		16.4		21.2		18.9		13.6		15.8		21.8		13.2		**26.8**		22 7	
Iron	26626.65	NYSDEC Metals	MG/KG	26300		**30500**		25900		25200		24600		25500		**33400**		**31100**		**32900**		**36700**	
Lead	21.86	NYSDEC Metals	MG/KG	14.6		12		10.6		10		14.7		8.6		14.9		9.5		14.4	J	12.9	J
Magnesium	1221.77	NYSDEC Metals	MG/KG	**5960**		**6190**		**8500**		**4660**		**4420**		**4630**		**5380**		**5530**		**5660**		**5950**	
Manganese	669.38	NYSDEC Metals	MG/KG	494		606		506		448		500		383		**1260**		493		**746**		667	
Mercury	0.1	NYSDEC Metals	MG/KG	0.05		0.05		0.03		0.07		0.03		0.01		0.05		0.03		0.03		0.02	
Nickel	33.62	NYSDEC Metals	MG/KG	30.8		33.2		31.2		29.8		26		28.3		**41.8**		**35.1**		**40**		**39.8**	
Potassium	1761.48	NYSDEC Metals	MG/KG	1390		1310		**1770**		1270		940		925		1720		1120		**2450**	**J**	**1850**	**J**
Selenium	2	NYSDEC Metals	MG/KG	0.73	UJ	0.78	J	0.77	UJ	0.63	UJ	0.73	UJ	0.61	J	1.1	J	0.55	UJ	0.73	U	0.76	U
Silver	0 4	NYSDEC Metals	MG/KG	0.16	U	0.16	U	0.17	U	0.14	U	0.16	U	0.1	U	0.13	U	0.12	U	0.16	U	0.18	
Sodium	103.74	NYSDEC Metals	MG/KG	39.6	U	39.7	U	46.5		33.9	U	39.4	U	30.7		33.1	U	29.9	U	39.7	U	41.8	
Thallium	0 28	NYSDEC Metals	MG/KG	0.59	U	**1.4**	**J**	**0.77**	**J**	**0.7**	**J**	0.59	U	**0.75**	**J**	**0.85**	**J**	**0.89**	**J**	**0.76**		**0.68**	
Vanadium	150	NYSDEC Metals	MG/KG	22.2		20.5		22		19.3		16 3		15.5		25.8		16.8		26 9		22.7	
Zinc	82.5	NYSDEC Metals	MG/KG	**105**	**J**	**115**	**J**	**85.2**	**J**	**95.3**	**J**	66.6	J	68.5	J	66.7	J	60.8	J	**94.7**		81.6	
HERBICIDES																							
Dicamba			UG/KG																				
MCPA			UG/KG																				
MCPP			UG/KG																				

Table F-2c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	TP26-1	TP26-1	TP26-2	TP26-2	TP26-3	TP26-3	TP26-4	TP26-5	TP26-6	TP26-6
			SAMP ID:	TP26-1-1	TP26-1-2	TP26-2-1	TP26-2-2	TP26-3-1	TP26-3-2	TP26-4-2	TP26-5-2	TP26-6-1	TP26-6-2
			QC CODE.	SA	SA	SA	SA	SA	SA	SA	SA	SA	SA
			STUDY ID	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI
			TOP:	0	5	0	5	0	6.5			0	5
			BOTTOM:	0.7	5	0.7	5	1	7.2	3	3	0.7	5
			MATRIX:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			SAMPLE DATE:	11/18/93	11/18/93	11/18/93	11/18/93	11/17/93	11/17/93	11/17/93	11/17/93	11/18/93	11/18/93
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
VOLATILE ORGANICS													
2-Butanone	93	NYSDEC Prot. GW	UG/KG	11 U	12 U	11 U	19	12 U	12 U	12 U	12 U	12 U	12 U
Acetone	34.1	NYSDEC Prot. GW	UG/KG	11 U	12 U	11 U	78	12 U	12 U	12 U	12 U	12 U	12 U
Carbon Disulfide	837	NYSDEC Prot. GW	UG/KG	11 U	12 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Ethylbenzene	1705	NYSDEC Prot. GW	UG/KG	11 U	12 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Methylene Chloride	31	NYSDEC Prot. GW	UG/KG	11 U	12 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Toluene	465	NYSDEC Prot. GW	UG/KG	11 U	12 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Xylene (total)	372	NYSDEC Prot. GW	UG/KG	11 U	12 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
SEMIVOLATILE ORGANICS													
2,4,5-Trichlorophenol	31	NYSDEC Prot. GW	UG/KG	6100 U	910 U	5800 U	990 U	980 U	980 U	890 U	940 U	890 U	1000 U
2-Methylnaphthalene	11284	NYSDEC Prot. GW	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
2-Nitroaniline	133.3	NYSDEC Prot. GW	UG/KG	6100 U	910 U	5800 U	990 U	980 U	980 U	890 U	940 U	890 U	1000 U
2-Nitrophenol	102.3	NYSDEC Prot. GW	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
3,3'-Dichlorobenzidine			UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
4,6-Dinitro-2-methylphenol			UG/KG	6100 U	910 U	5800 U	990 U	980 U	980 U	890 U	940 U	890 U	1000 U
Acenaphthene	27900	NYSDEC Prot GW	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	2500 U	370 U	2400 U	22 J	400 U	400 U	370 U	390 U	370 U	420 U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	2500 U	370 U	160 J	71 J	400 U	37 J	22 J	390 U	100 J	34 J
Benzo(a)pyrene	60.9	EPA Carcinogenic	UG/KG	2500 U	370 U	**200 J**	**86 J**	400 U	36 J	20 J	390 U	**110 J**	38 J
Benzo(b)fluoranthene	341	NYSDEC Prot. GW	UG/KG	2500 U	370 U	130 J	83 J	400 U	29 J	21 J	390 U	94 J	28 J
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	2500 U	370 U	2400 U	410 U	400 U	21 J	370 U	390 U	56 J	420 U
Benzo(k)fluoranthene	341	NYSDEC Prot. GW	UG/KG	2500 U	370 U	190 J	75 J	400 U	39 J	24 J	390 U	120 J	34 J
Butylbenzylphthalate	37820	NYSDEC Prot. GW	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Carbazole			UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Chrysene	124	NYSDEC Prot. GW	UG/KG	2500 U	370 U	**180 J**	97 J	400 U	43 J	25 J	390 U	120 J	37 J
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	UG/KG	2500 U	370 U	2400 U	**29 J**	400 U	400 U	370 U	390 U	370 U	420 U
Dibenzofuran	1922	NYSDEC Prot. GW	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Fluoranthene	50000	NYSDEC TAGM 4046	UG/KG	2500 U	370 U	300 J	170 J	30 J	79 J	45 J	390 U	250 J	62 J
Fluorene	50000	NYSDEC TAGM 4046	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Hexachlorobutadiene			UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Hexachlorocyclopentadiene			UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Indeno(1,2,3-cd)pyrene	992	NYSDEC Prot. GW	UG/KG	2500 U	370 U	2400 U	69 J	400 U	24 J	370 U	390 U	65 J	420 U
Isophorone	1364	NYSDEC Prot. GW	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Naphthalene	4030	NYSDEC Prot. GW	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U
Phenanthrene	50000	NYSDEC TAGM 4046	UG/KG	2500 U	370 U	2400 U	120 J	400 U	31 J	22 J	390 U	95 J	420 U
Pyrene	50000	NYSDEC TAGM 4046	UG/KG	2500 U	370 U	250 J	130 J	29 J	64 J	43 J	390 U	220 J	61 J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	UG/KG	2500 U	370 U	2400 U	410 U	400 U	400 U	370 U	390 U	370 U	420 U

Table F-2c
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	TP26-1		TP26-1		TP26-2		TP26-2		TP26-3		TP26-3		TP26-4		TP26-5		TP26-6		TP26-6	
			SAMP ID.	TP26-1-1		TP26-1-2		TP26-2-1		TP26-2-2		TP26-3-1		TP26-3-2		TP26-4-2		TP26-5-2		TP26-6-1		TP26-6-2	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI		ESI	
			TOP:	0		5		0		5		0		6.5						0		5	
			BOTTOM	0.7		5		0 7		5		1		7.2		3		3		0.7		5	
			MATRIX:	SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	11/18/93		11/18/93		11/18/93		11/18/93		11/17/93		11/17/93		11/17/93		11/17/93		11/18/93		11/18/93	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB																							
4,4'-DDE	1364	NYSDEC Prot. GW	UG/KG	6.4		3.7	U	3.6	U	4.1	U	4	U	4	U	3.7	U	3.9	U	2.8	J	4.1	U
4,4'-DDT	775	NYSDEC Prot. GW	UG/KG	3 7	U	3 7	U	3.6	U	4.1	U	4	U	4	U	3.7	U	3.9	U	1.6	J	4.1	U
Endosulfan sulfate	310	NYSDEC Prot. GW	UG/KG	3.7	U	3.7	U	3.6	U	4.1	U	4	U	4	U	3.7	U	3 9	U	3.7	U	4.1	U
Endrin aldehyde			UG/KG	3.7	U	3 7	U	3.6	U	4.1	U	4	U	4	U	3.7	U	3.9	U	3.7	U	4.1	U
OTHER ANALYSES																							
Nitrate/Nitrite-Nitrogen			MG/KG	0 32		0.72		0 03		0.5		1.8		2.1		0.03		0.17		0.55		0.53	
Total Petroleum Hydrocarbons			MG/KG	87		71		72		230		49		80		76		42		86		550	
METALS																							
Aluminum	14592.84	NYSDEC Metals	MG/KG	13100		10000		10000		13200		4680		**15600**		11200		**15700**		8060		**15900**	
Antimony	3.59	NYSDEC Metals	MG/KG	8	UJ	10 5	UJ	9.1	UJ	12.3	UJ	6.4	UJ	9.5	UJ	6.8	UJ	8.8	UJ	10.1	UJ	10.1	UJ
Arsenic	7.5	NYSDEC Metals	MG/KG	6 8	J	5 9	J	**10**	J	6.4	J	5.8		5.6		**7.7**		6.7		6.6	J	**9**	J
Barium	300	NYSDEC Metals	MG/KG	105		67 3		38 2		119		48.5		94.8		70.2		107		45.7		81 4	
Beryllium	0.73	NYSDEC Metals	MG/KG	0.62	J	0 47	J	0.48	J	0 7	J	0.28	J	**0.76**	J	0.5	J	**0.81**	J	0.46	J	**0.77**	J
Cadmium	1	NYSDEC Metals	MG/KG	0.5	U	0 66	U	0.57	U	0.77	U	0.4	U	0.59	U	0.43	U	0.55	U	0.63	U	0.63	U
Calcium	101903.8	NYSDEC Metals	MG/KG	18500		65400		9330		41800		**227000**		7500		16300		9500		**116000**		6100	
Chromium	22.13	NYSDEC Metals	MG/KG	20.2		15.2		16.5		19 7		6.9		22.1		18.4		**24.2**		12.1		**25.1**	
Cobalt	30	NYSDEC Metals	MG/KG	12.5		8 7	J	10		11.4	J	3	J	10.6		12		13.2		7.9	J	14 3	
Copper	25	NYSDEC Metals	MG/KG	18		23.5		13.9		23.5		8.6		18.6		13.5		**27.3**		14.5		**29.1**	
Iron	26626.65	NYSDEC Metals	MG/KG	**28300**		20400		22200		25500		12000		23800		23200		**32500**		17200		**38100**	
Lead	21.86	NYSDEC Metals	MG/KG	13.6		11.9		6.5		**66.8**		17.4		18.4		13.6		**23.8**		15		13.5	
Magnesium	1221.77	NYSDEC Metals	MG/KG	**5340**		**15300**		**4720**		**5030**		**120000**		**4480**		**5130**		**5850**		**9180**		**6250**	
Manganese	669.38	NYSDEC Metals	MG/KG	**814**		433		461		**951**		**1740**		657		535		**821**		487	R	507	R
Mercury	0.1	NYSDEC Metals	MG/KG	0.04	UJ	0.03	UJ	0.01	UJ	**0.11**	J	**0.18**		0.02	U	0.03	J	0.04	J	0.02	J	0.03	J
Nickel	33.62	NYSDEC Metals	MG/KG	31.1		28.7		25.5		30.2		7.8		27.3		27.3		**34.2**		23		**40.6**	
Potassium	1761.48	NYSDEC Metals	MG/KG	950		1180		573	J	**1840**		867		**1850**		1220		1330		1050		1570	
Selenium	2	NYSDEC Metals	MG/KG	0.25	J	0.57	J	0.31	J	0.72	J	0.57	J	0 39	J	0.31	J	0.44	J	0.82	J	0.29	J
Silver	0.4	NYSDEC Metals	MG/KG	1	U	1.3	U	1.1	U	1.6	U	0.81	UJ	1.2	UJ	0.87	UJ	1.1	UJ	1.3	U	1.3	U
Sodium	103.74	NYSDEC Metals	MG/KG	60 9	J	**110**	J	56.7	J	93.8	J	**247**	J	58.9	J	74.8	J	55.2	J	101	J	52.6	J
Thallium	0.28	NYSDEC Metals	MG/KG	0.2	U	0.25	U	0.23	U	0.29	U	0.23	U	0.27	U	0.26	U	0.25	U	0.26	U	0.26	U
Vanadium	150	NYSDEC Metals	MG/KG	18.5		16.3		12.8		21.1		17.1		26.8		16.8		28.1		13.1		25.4	
Zinc	82.5	NYSDEC Metals	MG/KG	80.7		60 1		59.6		**135**		**130**		76		69.2		**96.9**		70.3		**88.1**	
HERBICIDES																							
Dicamba			UG/KG	9.1		5.7	U	5.4	U	6.2	U	6.1	U	6.1	U	5.5	U	5.9	U	5.6	U	6.3	U
MCPA			UG/KG	8100		5700	U	5400	U	6200	U	6100	U	6100	U	5500	U	5900	U	5600	U	6300	U
MCPP			UG/KG	5700	U	5700	U	5400	U	6200	U	6100	U	13000		5500	U	5900	U	5600	U	6300	U

Table F-2c
Seneca Army Depot Activity
EAD-25 and 26 FEASIBILITY STUDY

Subsurface Soil Analysis Results by Sample Point

			LOC_ID:	TP26-7		TP26-7		TP26-8		TP26-8	
			SAMP ID:	TP26-7-1		TP26-7-2		TP26-8-1		TP26-8-2	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI	
			TOP:	0		5		0		5	
			BOTTOM:	0.7		5		0.7		5	
			MATRIX:	SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE	11/18/93		11/18/93		11/19/93		11/19/93	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
VOLATILE ORGANICS											
2-Butanone	93	NYSDEC Prot. GW	UG/KG	11	U	12	U	11	U	12	U
Acetone	34.1	NYSDEC Prot GW	UG/KG	11	U	12	U	11	U	12	U
Carbon Disulfide	837	NYSDEC Prot. GW	UG/KG	11	U	12	U	11	U	12	U
Ethylbenzene	1705	NYSDEC Prot. GW	UG/KG	11	U	12	U	11	U	12	U
Methylene Chloride	31	NYSDEC Prot GW	UG/KG	11	U	12	U	11	U	12	U
Toluene	465	NYSDEC Prot. GW	UG/KG	11	U	12	U	11	U	12	U
Xylene (total)	372	NYSDEC Prot. GW	UG/KG	11	U	12	U	11	U	12	U
SEMIVOLATILE ORGANICS											
2,4,5-Trichlorophenol	31	NYSDEC Prot. GW	UG/KG	910	U	990	U	6000	U	980	U
2-Methylnaphthalene	11284	NYSDEC Prot. GW	UG/KG	370	U	410	U	2500	U	400	U
2-Nitroaniline	133 3	NYSDEC Prot. GW	UG/KG	910	U	990	U	6000	U	980	U
2-Nitrophenol	102.3	NYSDEC Prot GW	UG/KG	370	U	410	U	2500	U	400	U
3,3'-Dichlorobenzidine			UG/KG	370	U	410	U	2500	U	400	U
4,6-Dinitro-2-methylphenol			UG/KG	910	U	990	U	6000	U	980	U
Acenaphthene	27900	NYSDEC Prot. GW	UG/KG	42	J	410	U	820	J	400	U
Anthracene	50000	NYSDEC TAGM 4046	UG/KG	61	J	410	U	1400	J	400	U
Benzo(a)anthracene	224	EPA Carcinogenic	UG/KG	**280**	**J**	410	U	**4500**		400	U
Benzo(a)pyrene	60 9	EPA Carcinogenic	UG/KG	**270**	**J**	410	U	**3900**		**62**	**J**
Benzo(b)fluoranthene	341	NYSDEC Prot. GW	UG/KG	300	J	410	U	**4800**		400	U
Benzo(g,h,i)perylene	50000	NYSDEC TAGM 4046	UG/KG	160	J	410	U	910	J	77	J
Benzo(k)fluoranthene	341	NYSDEC Prot GW	UG/KG	270	J	410	U	**3500**		400	U
Butylbenzylphthalate	37820	NYSDEC Prot. GW	UG/KG	370	U	410	U	2500	U	400	U
Carbazole			UG/KG	40	J	410	U	1100	J	400	U
Chrysene	124	NYSDEC Prot. GW	UG/KG	**320**	**J**	410	U	**4400**		400	U
Dibenz(a,h)anthracene	14.3	EPA Carcinogenic	UG/KG	370	U	410	U	**1100**	**J**	400	U
Dibenzofuran	1922	NYSDEC Prot. GW	UG/KG	370	U	410	U	240	J	400	U
Fluoranthene	50000	NYSDEC TAGM 4046	UG/KG	770		410	U	13000		23	J
Fluorene	50000	NYSDEC TAGM 4046	UG/KG	25	J	410	U	600	J	400	U
Hexachlorobutadiene			UG/KG	370	U	410	U	2500	U	400	U
Hexachlorocyclopentadiene			UG/KG	370	U	410	U	2500	U	400	U
Indeno(1,2,3-cd)pyrene	992	NYSDEC Prot GW	UG/KG	190	J	410	U	**2600**		400	U
Isophorone	1364	NYSDEC Prot. GW	UG/KG	370	U	410	U	2500	U	400	U
Naphthalene	4030	NYSDEC Prot. GW	UG/KG	370	U	410	U	2500	U	400	U
Phenanthrene	50000	NYSDEC TAGM 4046	UG/KG	370	J	410	U	7300		400	U
Pyrene	50000	NYSDEC TAGM 4046	UG/KG	610		410	U	8500		38	J
bis(2-Ethylhexyl)phthalate	50000	NYSDEC TAGM 4046	UG/KG	370	U	410	U	2500	U	400	U

Table F-2c
Seneca Army Depot Activity
EAD-25 and 26 FEASIBILITY STUDY

Subsurface Soil Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC_ID:	TP26-7		TP26-7		TP26-8		TP26-8	
			SAMP ID:	TP26-7-1		TP26-7-2		TP26-8-1		TP26-8-2	
			QC CODE:	SA		SA		SA		SA	
			STUDY ID:	ESI		ESI		ESI		ESI	
			TOP:	0		5		0		5	
			BOTTOM:	0.7		5		0.7		5	
			MATRIX:	SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE:	11/18/93		11/18/93		11/19/93		11/19/93	
PESTICIDES/PCB											
4,4'-DDE	1364	NYSDEC Prot. GW	UG/KG	3.7	U	4	U	3.7	U	4	U
4,4'-DDT	775	NYSDEC Prot GW	UG/KG	3.7	U	4	U	3.7	U	4	U
Endosulfan sulfate	310	NYSDEC Prot. GW	UG/KG	3.7	U	4	U	3.7	U	4	U
Endrin aldehyde			UG/KG	3 7	U	4	U	3.7	U	4	U
OTHER ANALYSES											
Nitrate/Nitrite-Nitrogen			MG/KG	1.08		0.43		0.12		0.52	
Total Petroleum Hydrocarbons			MG/KG	63		72		137		113	
METALS											
Aluminum	14592.84	NYSDEC Metals	MG/KG	8550		10000		13700		**20500**	
Antimony	3.59	NYSDEC Metals	MG/KG	10.9	UJ	12.4	UJ	7	UJ	12.5	UJ
Arsenic	7.5	NYSDEC Metals	MG/KG	**8.1**	J	**7.6**	J	6.4	J	5.4	J
Barium	300	NYSDEC Metals	MG/KG	43.6		53		69.2		109	
Beryllium	0.73	NYSDEC Metals	MG/KG	0.44	J	0.48	J	0.59	J	**0.96**	J
Cadmium	1	NYSDEC Metals	MG/KG	0.68	U	0.78	U	0.44	U	0.78	U
Calcium	101903.8	NYSDEC Metals	MG/KG	40600		79300		42100		4090	
Chromium	22.13	NYSDEC Metals	MG/KG	13.2		14.3		21.7		**26.3**	
Cobalt	30	NYSDEC Metals	MG/KG	7.1	J	7 1	J	11.1		12.5	
Copper	25	NYSDEC Metals	MG/KG	17.1		13.1		21.3		21.8	
Iron	26626.65	NYSDEC Metals	MG/KG	18200		18600		**27500**		**26900**	
Lead	21.86	NYSDEC Metals	MG/KG	12		16.2		13.1		18	
Magnesium	1221 77	NYSDEC Metals	MG/KG	**4760**		**26900**		**8260**		**4760**	
Manganese	669.38	NYSDEC Metals	MG/KG	596	R	573	R	594	R	1260	R
Mercury	0.1	NYSDEC Metals	MG/KG	0.04	J	0.05	J	0.04	J	0.07	J
Nickel	33.62	NYSDEC Metals	MG/KG	19.8		20.3		**35.4**		32.1	
Potassium	1761.48	NYSDEC Metals	MG/KG	721	J	964	J	1290		**2090**	
Selenium	2	NYSDEC Metals	MG/KG	0.41	J	0.33	J	0.57	J	0.59	J
Silver	0 4	NYSDEC Metals	MG/KG	1.4	U	1.6	U	0.88	U	1.6	U
Sodium	103.74	NYSDEC Metals	MG/KG	90.7	J	**117**	J	**117**	J	64.2	J
Thallium	0.28	NYSDEC Metals	MG/KG	0.26	U	0.28	U	0.18	U	0.28	U
Vanadium	150	NYSDEC Metals	MG/KG	12.3		15.4		19.6		31.1	
Zinc	82.5	NYSDEC Metals	MG/KG	50.9		62.7		78		**88.2**	
HERBICIDES											
Dicamba			UG/KG	5.6	U	6 1	U	5.6	U	6.1	U
MCPA			UG/KG	5800		6100	U	5600	U	6100	U
MCPP			UG/KG	7600		6100	U	5600	U	6100	U

Table F-2c
Seneca Army Depot Activity
EAD-25 and 26 FEASIBILITY STUDY

Subsurface Soil Analysis Results by Sample Point

			LOC ID	TP26-7		TP26-7		TP26-8		TP26-8	
			SAMP ID	TP26-7-1		TP26-7-2		TP26-8-1		TP26-8-2	
			QC CODE	SA		SA		SA		SA	
			STUDY ID	ESI		ESI		ESI		ESI	
			TOP	0		5		0		5	
			BOTTOM	0 7		5		0 7		5	
			MATRIX	SOIL		SOIL		SOIL		SOIL	
			SAMPLE DATE	11/18/93		11/18/93		11/19/93		11/19/93	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
PESTICIDES/PCB											
4,4'-DDE	1361	NYSDEC Prot GW	UG/KG	3 7	U	4	U	3 7	U	4	U
4,4'-DDT	775	NYSDEC Prot GW	UG/KG	3.7	U	4	U	3 7	U	4	U
Endosulfan sulfate	310	NYSDEC Prot GW	UG/KG	3 7	U	4	U	3 7	U	4	U
Endrin aldehyde			UG/KG	3.7	U	4	U	3.7	U	4	U
OTHER ANALYSES											
Nitrate/Nitrite-Nitrogen			MG/KG	1 08		0 43		0.12		0.52	
Total Petroleum Hydrocarbons			MG/KG	63		72		137		113	
METALS											
Aluminum	14592.84	NYSDEC Metals	MG/KG	8550		10000		13700		**20500**	
Antimony	3 59	NYSDEC Metals	MG/KG	10 9	UJ	12 4	UJ	7	UJ	12 5	UJ
Arsenic	7 5	NYSDEC Metals	MG/KG	**8.1**	J	**7.6**	J	6 4	J	5.4	J
Barium	300	NYSDEC Metals	MG/KG	43.6		53		69 2		109	
Beryllium	0 73	NYSDEC Metals	MG/KG	0.44	J	0.48	J	0 59	J	**0.96**	J
Cadmium	1	NYSDEC Metals	MG/KG	0.68	U	0 78	U	0.44	U	0 78	U
Calcium	101903 8	NYSDEC Metals	MG/KG	40600		79300		42100		4090	
Chromium	22 13	NYSDEC Metals	MG/KG	13 2		14.3		21 7		**26.3**	
Cobalt	30	NYSDEC Metals	MG/KG	7 1	J	7 1	J	11 1		12 5	
Copper	25	NYSDEC Metals	MG/KG	17.1		13 1		21.3		21.8	
Iron	26626 65	NYSDEC Metals	MG/KG	18200		18600		**27500**		**26900**	
Lead	21 86	NYSDEC Metals	MG/KG	12		16 2		13.1		18	
Magnesium	1221 77	NYSDEC Metals	MG/KG	**4760**		**26900**		**8260**		**4760**	
Manganese	669 38	NYSDEC Metals	MG/KG	596	R	573	R	594	R	1260	R
Mercury	0 1	NYSDEC Metals	MG/KG	0 04	J	0.05	J	0 04	J	0.07	J
Nickel	33 62	NYSDEC Metals	MG/KG	19.8		20 3		**35.4**		32.1	
Potassium	1761 48	NYSDEC Metals	MG/KG	721	J	964	J	1290		**2090**	
Selenium	2	NYSDEC Metals	MG/KG	0.41	J	0 33	J	0 57	J	0.59	J
Silver	0 4	NYSDEC Metals	MG/KG	1.4	U	1.6	U	0.88	U	1.6	U
Sodium	103 74	NYSDEC Metals	MG/KG	90.7	J	**117**	J	**117**	J	64.2	J
Thallium	0 28	NYSDEC Metals	MG/KG	0.26	U	0 28	U	0.18	U	0.28	U
Vanadium	150	NYSDEC Metals	MG/KG	12 3		15 4		19.6		31.1	
Zinc	82 5	NYSDEC Metals	MG/KG	50.9		62.7		78		**88.2**	
HERBICIDES											
Dicamba			UG/KG	5.6	U	6 1	U	5 6	U	6 1	U
MCPA			UG/KG	5800		6100	U	5600	U	6100	U
MCPP			UG/KG	7600		6100	U	5600	U	6100	U

Table F-2d
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Surface Water Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT							
			LOC ID:	SW26-1	SW26-1	SW26-10	SW26-10	SW26-11	SW26-2	SW26-3
			SAMP ID:	SW200-1	SW26-1	SW26-100	SW26-10	SW26-11	SW26-2	SW26-3
			QC CODE:	DU	SA	DU	SA	SA	SA	SA
			STUDY ID:	ESI	ESI	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
			MATRIX:	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER
			SAMP. DATE:	01-Nov-93	01-Nov-93	18-Oct-95	18-Oct-95	21-Oct-95	07-Oct-95	08-Oct-95
				VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics										
1 Acetone		NONE	UG/L	NS	10 U	10 U	12	10 U	10 U	10 U
Semivolatile Organics										
1 Carbazole		NONE	UG/L		20 U	10 U	20 U	11 U	10 J	10 J
2 Di-n-butylphthalate		NONE	UG/L		20 U	10 U	20 U	11 U	10 U	10 U
3 Diethylphthalate		NONE	UG/L		20 U	10 U	20 U	11 U	10 U	10 U
Pesticides										
1 Endrin aldehyde		NONE	UG/L		0.07 J	0.1 U	0.1 U	0.11 U	0.1 U	0.1 U
2 Heptachlor	0.001	NYS Class C SWQS	UG/L		0.05 UJ	0.052 U	0.052 U	0.057 U	0.05 U	0.052 U
3 beta-BHC		NONE	UG/L		0.05 UJ	0.064 J	0.05 J	0.057 U	0.05 U	0.052 U
4 gamma-Chlordane		NONE	UG/L		0.05 UJ	0.05 U	0.05 J	0.057 U	0.05 U	0.052 U
Herbicides										
1 2,4-DB		NONE	UG/L		2.9					
Nitroaromatics										
1 2,4-Dinitrotoluene		NONE	UG/L		3.5					
Metals										
1 Aluminum	100	NYS Class C SWQS	UG/L		44.5 U	80.3	**103 J**	**403 J**	**161 J**	**582 J**
2 Arsenic	190	NYS Class C SWQS	UG/L		7 J	7.4	6.2	2.1 U	2.1 U	2.1 U
3 Barium		NONE	UG/L		84.4 J	57.7	50.7	17.8	26	27.5
4 Calcium		NONE	UG/L		61200	46800	41400	33600	61500	80500
5 Chromium	205.3	NYS Class C SWQS	UG/L		2.5 U	0.5 U	0.5 U	1.1 R	0.5 U	0.5
6 Cobalt	5	NYS Class C SWQS	UG/L		4.9 U	1 U	1 U	1 U	1 U	0.99 U
7 Copper	11	NYS Class C SWQS	UG/L		3.7 U	0.7 U	0.7 U	0.93	1.1	2.1
8 Cyanide	5.2	NYS Class C SWQS	UG/L		**8.5**	5 U	5 U	5 U	5 U	5 U
9 Iron	300	NYS Class C SWQS	UG/L		**2940 J**	**560 J**	**497 J**	**466 J**	152	**755 J**
10 Lead	3.2	NYS Class C SWQS	UG/L		2.8 J	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
11 Magnesium		NONE	UG/L		4530 J	3230	2880	3620	7520	12300
12 Manganese		NONE	UG/L		55.5	9.9 J	7.6 J	10.3 J	8 J	16.9 J
13 Mercury		NONE	UG/L		0.07 U	0.03 J	0.02 U	0.02 U	0.02 U	0.02 U
14 Nickel	94.5	NYS Class C SWQS	UG/L		6.3 J	3.3	3.1	2.4	1.6	2.3
15 Potassium		NONE	UG/L		2510 J	3520	3160	3210	2100	2960
16 Sodium		NONE	UG/L		4670 J	3170 J	2950 J	898 J	2370 J	1590
17 Vanadium	14	NYS Class C SWQS	UG/L		3.3 U	1.1 U	1.1 U	1.4	1.1 U	1.1 U
18 Zinc	81.9	NYS Class C SWQS	UG/L		7.1 J	8.6 J	6.8 J	6.3 J	8.1 J	7.5 J
Other Analyses										
1 Nitrate/Nitrite-Nitrogen		NONE	MG/L		0.03					
2 Total Petroleum Hydrocarbons		NONE	MG/L	4.17	4	3.8	3.1	0.41 U	0.38 U	0.31 U

Table F-2d
neca Army Depot Activity
5 and 26 FEASIBILITY STUDY

e Water Analysis Results by Sample Point

			LOC ID:	SW26-4	SW26-5	SW26-6	SW26-7	SW26-8	SW26-9
			SAMP ID	SW26-4	SW26-5	SW26-6	SW26-7	SW26-8	SW26-9
			QC CODE:	SA	SA	SA	SA	SA	SA
			STUDY ID:	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
			MATRIX:	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER	SURFACE WATER
			SAMP DATE:	06-Oct-95	06-Oct-95	06-Oct-95	06-Oct-95	21-Oct-95	06-Oct-95
PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
Volatile Organics									
1 Acetone		NONE	UG/L	10 U	10 U	10 U	10 U	10 U	10 U
Semivolatile Organics									
1 Carbazole		NONE	UG/L	10 J	15 U	10 J	10 J	11 U	10 J
2 Di-n-butylphthalate		NONE	UG/L	10 U	15 U	10 U	10 U	11 U	1 J
3 Diethylphthalate		NONE	UG/L	3 J	15 U	10 U	10 U	11 U	10 U
Pesticides									
1 Endrin aldehyde		NONE	UG/L	0.1 U	0.1 U	0.11 U	0.1 U	0.11 U	0.1 U
2 Heptachlor	0.001	NYS Class C SWQS	UG/L	**0.03 J**	0.052 U	0.053 U	0.052 U	0.054 U	0.052 U
3 beta-BHC		NONE	UG/L	0.051 U	0.052 U	0.053 U	0.052 U	0.054 U	0.052 U
4 gamma-Chlordane		NONE	UG/L	0.051 U	0.052 U	0.053 U	0.052 U	0.054 U	0.052 U
Herbicides									
1 2,4-DB		NONE	UG/L						
Nitroaromatics									
1 2,4-Dinitrotoluene		NONE	UG/L						
Metals									
1 Aluminum	100	NYS Class C SWQS	UG/L	41.9	**128 J**	**174 J**	**735 J**	**2140 J**	**217 J**
2 Arsenic	190	NYS Class C SWQS	UG/L	2.1 U	3.8	2.3	2.2	2.9	2.1 U
3 Barium		NONE	UG/L	29.3	24.4	23.2	28.9	28.5	28.5
4 Calcium		NONE	UG/L	92400	44900	43400	46300	23700	62000
5 Chromium	205.3	NYS Class C SWQS	UG/L	0.5 U	4.1 R	3.8 R	29.2 R	167 R	0.5 U
6 Cobalt	5	NYS Class C SWQS	UG/L	0.99 U	0.99 U	1 U	1 U	3.5	1 U
7 Copper	11	NYS Class C SWQS	UG/L	1.2	1.1	1.6	3.1	4	3.6
8 Cyanide	5.2	NYS Class C SWQS	UG/L	5 U	5 U	5 U	5 U	5 U	5 U
9 Iron	300	NYS Class C SWQS	UG/L	52.5	150	196 J	**1720 J**	**6910 J**	**322 J**
10 Lead	3.2	NYS Class C SWQS	UG/L	1.5 U	1.5 U	1.5 U	2.1 J	**6.4**	1.5 U
11 Magnesium		NONE	UG/L	20900	4470	4360	5220	5240	7780
12 Manganese		NONE	UG/L	43.8 J	10.2 J	10.9 J	42.7 J	128 J	16.4 J
13 Mercury		NONE	UG/L	0.02 J	0.02 U	0.02 J	0.03 J	0.06 J	0.02 U
14 Nickel	94.5	NYS Class C SWQS	UG/L	1.2	2.1	3.1	35.9	**209**	1.3
15 Potassium		NONE	UG/L	4050	3040	3420	5400	4000	5650
16 Sodium		NONE	UG/L	2650 J	1490	1420	2120 J	1360	2820
17 Vanadium	14	NYS Class C SWQS	UG/L	1.1 U	1.1 U	1.1 U	2.3	8.2	1.3
18 Zinc	81.9	NYS Class C SWQS	UG/L	2.6	**219 J**	**202 J**	**160 J**	**142 J**	62.6 J
Other Analyses									
1 Nitrate/Nitrite-Nitrogen		NONE	MG/L						
2 Total Petroleum Hydrocarbons		NONE	MG/L	0.38	0.38 U	0.37 U	0.36 U	0.37 U	0.39 U

Table F-2e
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Sediment Analysis Results by Sample Point

				LOC ID:	SD26-1	SD26-1	SD26-10	SD26-10	SD26-11	SD26-2
				SAMP ID:	SD200-1	SD26-1	SD26-100	SD26-10	SD26-11	SD26-2
				QC CODE:	DU	SA	DU	SA	SA	SA
				STUDY ID:	ESI	ESI	PHASE 1	PHASE 1	PHASE 1	PHASE 1
				SAMP. DEPTH TOP:	0	0	0	0	0	0
				SAMP. DEPTH BOT:	0.5	0.5	0.17	0.17	0.17	0.25
				MATRIX:	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				SAMP. DATE:	01-Nov-93	01-Nov-93	18-Oct-95	18-Oct-95	21-Oct-95	07-Oct-95
	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
	Volatile Organics									
1	2-Butanone		NONE	UG/KG	NS	23	1900 U	1200 J	15 UJ	13 U
2	Acetone		NONE	UG/KG	NS	26	1900 U	2900 U	15 UJ	13 U
3	Ethylbenzene		NONE	UG/KG	NS	13 U	540 J	310 J	15 U	13 U
4	Xylene (total)		NONE	UG/KG	NS	13 U	3600	2400	15 U	13 U
	Semivolatile Organics									
1	2,4-Dinitrotoluene		NONE	UG/KG		7800 U	79000 R	98000 R	680 U	530 U
2	2-Methylnaphthalene		NONE	UG/KG		420 J	19000 J	33000 J	680 U	530 U
3	2-Nitroaniline		NONE	UG/KG		19000 U	190000 R	240000 R	1700 U	1300 U
4	2-Nitrophenol		NONE	UG/KG		7800 U	79000 R	98000 R	680 U	530 U
5	3,3'-Dichlorobenzidine		NONE	UG/KG		7800 U	79000 R	98000 R	680 U	530 U
6	3-Nitroaniline		NONE	UG/KG		19000 U	190000 R	240000 R	1700 U	1300 U
7	4-Nitroaniline		NONE	UG/KG		19000 U	190000 R	240000 R	1700 U	1300 U
8	Acenaphthene	5502	NYS B.A.L.C.T.	UG/KG	N	7800 U	**11000 J**	79000 R	130 J	530 U
9	Acenaphthylene		NONE	UG/KG		7800 U	79000 R	98000 R	680 U	69 J
10	Anthracene		NONE	UG/KG		7800 U	79000 R	98000 R	260 J	180 J
11	Benzo(a)anthracene	51.09	NYS H.H.B.	UG/KG	N	7800 U	98000 R	79000 R	**560 J**	**440 J**
12	Benzo(a)pyrene	51.09	NYS H.H.B.	UG/KG	N	7800 U	98000 R	79000 R	**470 J**	**370 J**
13	Benzo(b)fluoranthene	51.09	NYS H.H.B.	UG/KG	N	7800 U	98000 R	79000 R	**470 J**	**650**
14	Benzo(g,h,i)perylene		NONE	UG/KG	N	7800 U	98000 R	79000 R	290 J	520 J
15	Benzo(k)fluoranthene	51.09	NYS H.H.B.	UG/KG	N	7800 U	98000 R	79000 R	**490 J**	**800**
16	Butylbenzylphthalate		NONE	UG/KG	N	7800 U	98000 R	79000 R	680 U	530 U
17	Carbazole		NONE	UG/KG	N	7800 U	98000 R	79000 R	400 J	90 J
18	Chrysene	51.09	NYS H.H.B.	UG/KG	N	7800 U	98000 R	79000 R	**560 J**	**980**
19	Dibenz(a,h)anthracene		NONE	UG/KG	N	7800 U	98000 R	79000 R	130 J	130 J
20	Fluoranthene	40086	NYS B.A.L.C.T.	UG/KG	N	7800 U	98000 R	79000 R	1500	2800
21	Fluorene		NONE	UG/KG	N	7800 U	16000 J	11000 J	86 J	530 U
22	Hexachlorobutadiene		NONE	UG/KG	N	7800 U	98000 R	79000 R	680 U	530 U
23	Hexachlorocyclopentadiene		NONE	UG/KG	N	7800 U	98000 R	79000 R	680 U	530 U
24	Indeno(1,2,3-cd)pyrene	51.09	NYS H.H.B.	UG/KG	N	7800 U	98000 R	79000 R	**330 J**	**320 J**
25	Isophorone		NONE	UG/KG	N	7800 U	98000 R	79000 R	680 J	530 U
26	Naphthalene		NONE	UG/KG	N	7800 U	98000 R	79000 R	680 U	530 U
27	Phenanthrene	4716	NYS B.A.L.C.T.	UG/KG	N	420 J	**30000 J**	**20000 J**	1100	370 J
28	Phenol	19.65	NYS B.A.L.C.T.	UG/KG	N	7800 U	98000 R	79000 R	680 U	530 U
29	Pyrene		NONE	UG/KG	N	7800 U	98000 R	79000 R	1200	2000
30	bis(2-Ethylhexyl)phthalate	7860	NYS B.A.L.C.T.	UG/KG	N	7800 U	98000 R	79000 R	680 U	530 U
	Pesticides									
1	4,4'-DDD	0.39	H.H.B.	UG/KG	N	3.9 U	40 U	39 U	6.8 U	5.3 U
2	4,4'-DDE	0.39	H H.B	UG/KG	N	**13 J**	40 U	**76 J**	**4.3 J**	5.3 U
3	4,4'-DDT	0.39	H.H.B.	UG/KG	N	3.9 U	40 U	39 U	6.8 U	5.3 U
4	Aroclor-1260	0.03	H.H.B.	UG/KG	N	39 U	400 U	**1100 J**	68 U	53 U
5	Dieldrin	3.93	H.H.B.	UG/KG	N	3.8 J	40 U	39 U	6.8 U	5.3 U
6	Endosulfan I	1.18	B.A.L.C.T.	UG/KG	N	2 U	20 U	20 U	3.5 U	2.7 U
7	Endosulfan II	1.18	B.A.L.C.T.	UG/KG	N	**4.4 J**	**46 J**	39 U	6.8 U	5.3 U
8	Endosulfan sulfate		NONE	UG/KG	N	3.9 U	52 J	80	6.8 U	5.3 U
9	Endrin	31.44	NYS W.B.C	UG/KG	N	6.5 J	40 U	39 U	6.8 U	5.3 U
10	Endrin aldehyde		NONE	UG/KG	N	3.9 U	99 J	81 J	6.8 U	5.3 U
11	Endrin ketone		NONE	UG/KG	N	3.9 U	23 J	39 U	6.8 U	4.2 J
12	Heptachlor epoxide	0.03	H.H.B.	UG/KG	N	**6.4 J**	**26**	20 U	3.5 U	2.7 U
13	alpha-BHC		NONE	UG/KG	N	2 U	11 J	20 U	3.5 U	2.7 U
14	beta-BHC		NONE	UG/KG	N	2 U	20 U	20 U	3.5 U	2.7 U
15	gamma-BHC (Lindane)		NONE	UG/KG	N	2 U	17 J	20 U	3.5 U	2.7 U
16	gamma-Chlordane		NONE	UG/KG	N	2 U	20 U	20 U	3.5 U	2.7 U

Table F-2e
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Sediment Analysis Results by Sample Point

			LOC ID:	SD26-1		SD26-1		SD26-10		SD26-10		SD26-11		SD26-2	
			SAMP ID:	SD200-1		SD26-1		SD26-100		SD26-10		SD26-11		SD26-2	
			QC CODE:	DU		SA		DU		SA		SA		SA	
			STUDY ID:	ESI		ESI		PHASE 1		PHASE 1		PHASE 1		PHASE 1	
			SAMP. DEPTH TOP:	0		0		0		0		0		0	
			SAMP. DEPTH BOT:	0.5		0.5		0.17		0.17		0.17		0.25	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
			SAMP. DATE:	01-Nov-93		01-Nov-93		18-Oct-95		18-Oct-95		21-Oct-95		07-Oct-95	
PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Herbicides															
1 2,4,5-T		NONE	UG/KG			21									
Nitroaromatics															
1 2,4-Dinitrotoluene		NONE	UG/KG			660	J								
2 HMX		NONE	UG/KG			72	J								
Metals															
1 Aluminum		NONE	MG/KG			1270		1330		681		15300		12600	
2 Antimony	2	Lowest Effect Level	MG/KG			9.6	U	0.44	U	0.27	U	0.8	UJ	0.57	UJ
3 Arsenic	6	Lowest Effect Level	MG/KG			**14.6**		3.4		3.7		**8.2**		3.9	J
4 Barium		NONE	MG/KG			26	J	28.9		21		118		43	
5 Beryllium		NONE	MG/KG			0.15	J	0.25		0.19		0.83		0.49	
6 Cadmium	0.6	Lowest Effect Level	MG/KG			0.6	U	0.2		0.31		0.11	U	0.08	U
7 Calcium		NONE	MG/KG			313000		250000	J	267000	J	12300		27100	
8 Chromium	26	Lowest Effect Level	MG/KG			2.5		3	J	2.1	J	25.1	J	20.4	R
9 Cobalt		NONE	MG/KG			2.5	J	2.6	J	2.8	J	11.6		10.6	
10 Copper	16	Lowest Effect Level	MG/KG			10.9		12.2		**17.6**		**23.9**		13.3	
11 Iron	20000	Lowest Effect Level	MG/KG			3170		3140		3070		**29400**		**23700**	
12 Lead	31	Lowest Effect Level	MG/KG			8.3		13.7		9.4		**31.6**	J	6	J
13 Magnesium		NONE	MG/KG			7270		6640		7230		5770		5700	
14 Manganese	460	Lowest Effect Level	MG/KG			190		168		190		**803**		247	
15 Mercury	0.15	Lowest Effect Level	MG/KG			0.01	J	0.03		0.02		0.08	J	0.05	
16 Nickel	16	Lowest Effect Level	MG/KG			10.5		10	J	9.9	J	**34.4**		**27.6**	
17 Potassium		NONE	MG/KG			784	J	768	J	472	J	1500		1300	J
18 Selenium		NONE	MG/KG			0.37	J	0.75	U	0.45	U	1.3	U	0.96	U
19 Silver	1	Lowest Effect Level	MG/KG			1.2	U	0.16	U	0.1	U	0.29	U	0.21	U
20 Sodium		NONE	MG/KG			231	J	128		146		73	U	51.9	U
21 Thallium		NONE	MG/KG			2.3	U	0.61	U	0.37	U	1.1	U	0.78	U
22 Vanadium		NONE	MG/KG			7.6	J	8.3		4.6	J	26.5	J	17.3	
23 Zinc	120	Lowest Effect Level	MG/KG			34.3		66.9		65.4		**126**		94.4	
Other Analyses															
1 Nitrate/Nitrite-Nitrogen		NONE	MG/KG			0.02									
2 Total Petroleum Hydrocarbons		NONE	MG/KG	22000		20000		76300		74800		256		100	

Table F-2e
Seneca Army Depot Activity
SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Sediment Analysis Results by Sample Point

	PARAMETER	LEVEL	SOURCE	UNIT							
				LOC ID	SD26-3	SD26-4	SD26-5	SD26-6	SD26-7	SD26-8	SD26-9
				SAMP ID	SD26-3	SD26-4	SD26-5	SD26-6	SD26-7	SD26-8	SD26-9
				QC CODE	SA	SA	SA	SA	SA	SA	SA
				STUDY ID	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
				SAMP. DEPTH TOP	0	0	0	0	0	0	0
				SAMP. DEPTH BOT	0.25	0.17	0.17	0.17	0.17	0.17	0.17
				MATRIX	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
				SAMP. DATE	08-Oct-95	06-Oct-95	06-Oct-95	06-Oct-95	06-Oct-95	21-Oct-95	06-Oct-95
	PARAMETER	LEVEL	SOURCE	UNIT	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q	VALUE Q
	Volatile Organics										
1	2-Butanone		NONE	UG/KG	16 U	14 U	20 U	12 U	15 U	15 U	13 U
2	Acetone		NONE	UG/KG	16 U	3 J	20 U	12 U	15 U	8 J	13 U
3	Ethylbenzene		NONE	UG/KG	16 U	14 U	20 U	12 U	15 U	15 U	13 U
4	Xylene (total)		NONE	UG/KG	16 U	14 U	20 U	12 U	15 U	15 U	13 U
	Semivolatile Organics										
1	2,4-Dinitrotoluene		NONE	UG/KG	480 U	460 U	520 J	440 J	480 U	440 U	450 U
2	2-Methylnaphthalene		NONE	UG/KG	480 U	460 U	520 U	440 U	480 U	440 U	450 U
3	2-Nitroaniline		NONE	UG/KG	1200 U	1100 U	1200 U	1100 U	1200 U	1100 J	1100 U
4	2-Nitrophenol		NONE	UG/KG	480 U	460 U	520 U	440 U	480 U	440 J	450 U
5	3,3'-Dichlorobenzidine		NONE	UG/KG	480 U	460 U	520 U	440 J	480 U	440 U	450 U
6	3-Nitroaniline		NONE	UG/KG	1200 U	1100 U	1200 J	1100 U	1200 U	1100 U	1100 U
7	4-Nitroaniline		NONE	UG/KG	1200 U	1100 U	1200 U	1100 J	1200 U	1100 U	1100 U
8	Acenaphthene	5502	NYS B.A.L.C.T.	UG/KG	480 U	460 U	520 U	440 U	480 U	440 U	450 U
9	Acenaphthylene		NONE	UG/KG	480 U	460 U	89 J	440 U	480 U	440 U	450 U
10	Anthracene		NONE	UG/KG	58 J	460 U	170 J	46 J	480 U	440 U	450 U
11	Benzo(a)anthracene	51.09	NYS H.H.B	UG/KG	**140 J**	460 U	**450 J**	**190 J**	480 U	440 U	**59 J**
12	Benzo(a)pyrene	51.09	NYS H.H.B.	UG/KG	**140 J**	460 U	**610**	**200 J**	**53 J**	440 U	**110 J**
13	Benzo(b)fluoranthene	51.09	NYS H.H.B.	UG/KG	**140 J**	460 U	**1200**	**370 J**	**96 J**	**94 J**	**230 J**
14	Benzo(g,h,i)perylene		NONE	UG/KG	100 J	55 J	750	180 J	480 U	440 U	450 U
15	Benzo(k)fluoranthene	51.09	NYS H.H.B.	UG/KG	**170 J**	460 U	**750**	**280 J**	**59 J**	440 U	**140 J**
16	Butylbenzylphthalate		NONE	UG/KG	480 U	460 U	520 J	440 J	480 J	440 U	450 J
17	Carbazole		NONE	UG/KG	480 U	460 U	52 J	440 U	480 U	440 U	450 U
18	Chrysene	51 09	NYS H.H.B.	UG/KG	**170 J**	460 U	**1000**	**340 J**	**67 J**	**53 J**	**170 J**
19	Dibenz(a,h)anthracene		NONE	UG/KG	480 U	460 U	220 J	440 U	480 U	440 U	450 U
20	Fluoranthene	40086	NYS B.A.L C T.	UG/KG	370 J	51 J	750	330 J	75 J	69 J	130 J
21	Fluorene		NONE	UG/KG	480 U	460 U	520 U	440 U	480 U	440 U	450 U
22	Hexachlorobutadiene		NONE	UG/KG	480 U	460 U	520 U	440 U	480 U	440 J	450 U
23	Hexachlorocyclopentadiene		NONE	UG/KG	480 U	460 U	520 J	440 U	480 U	440 J	450 U
24	Indeno(1,2,3-cd)pyrene	51.09	NYS H H.B.	UG/KG	**98 J**	460 U	**500 J**	**150 J**	480 U	440 U	**72 J**
25	Isophorone		NONE	UG/KG	480 U	460 U	520 U	440 U	480 U	440 J	450 U
26	Naphthalene		NONE	UG/KG	480 U	460 U	520 J	440 J	480 J	440 U	450 U
27	Phenanthrene	4716	NYS B.A.L.C.T.	UG/KG	210 J	460 U	100 J	75 J	480 U	440 U	450 U
28	Phenol	19.65	NYS B.A.L.C T.	UG/KG	480 U	460 U	**520 J**	**440 J**	**480 J**	440 U	**450 J**
29	Pyrene		NONE	UG/KG	280 J	460 U	810	350 J	71 J	57 J	130 J
30	bis(2-Ethylhexyl)phthalate	7860	NYS B.A.L.C T.	UG/KG	480 U	460 U	55 J	440 U	480 U	440 U	450 U
	Pesticides										
1	4,4'-DDD	0.39	H.H.B.	UG/KG	4.8 U	4.6 U	**7.3 J**	4.4 U	4.9 U	4.5 U	4.5 U
2	4,4'-DDE	0.39	H.H.B.	UG/KG	4.8 U	4.6 U	**4.8 J**	4.4 U	**2.6 J**	**5.4 J**	**15**
3	4,4'-DDT	0.39	H.H.B.	UG/KG	4.8 U	4.6 U	**8.9 J**	4.4 U	4.9 U	**4.7**	**4.2 J**
4	Aroclor-1260	0.03	H.H.B.	UG/KG	48 U	46 U	51 U	44 U	49 U	45 U	45 U
5	Dieldrin	3.93	H.H.B.	UG/KG	4.8 U	4.6 U	5.1 U	4.4 U	4.9 U	4.5 U	4.5 U
6	Endosulfan I	1.18	B.A.L.C.T.	UG/KG	2.5 U	2.4 U	2.6 U	2.3 U	2.5 U	**3.1 J**	2.3 U
7	Endosulfan II	1.18	B.A.L.C.T.	UG/KG	4.8 U	4.6 U	**6.1 J**	4.4 U	4.9 U	4.5 U	4.5 U
8	Endosulfan sulfate		NONE	UG/KG	4.8 U	4.6 U	5.1 U	4.4 U	4.9 U	4.5 U	4.5 U
9	Endrin	31.44	NYS W.B.C.	UG/KG	4.8 U	4.6 U	5.1 U	4.4 U	4.9 U	4.5 U	4.5 U
10	Endrin aldehyde		NONE	UG/KG	4.8 U	4.6 U	5.1 U	4.4 U	4.9 U	4.5 U	4.5 U
11	Endrin ketone		NONE	UG/KG	4.8 U	4.6 U	26 J	3.8 J	4.9 U	4.5 U	4.5 U
12	Heptachlor epoxide	0.03	H.H.B.	UG/KG	2.5 U	2.4 U	2.6 U	2.3 U	2.5 U	2.3 U	2.3 U
13	alpha-BHC		NONE	UG/KG	2.5 U	2.4 U	2.6 U	2.3 U	2.5 U	2.3 U	2.3 U
14	beta-BHC		NONE	UG/KG	2.5 U	2.4 U	1.9 J	2.3 U	2.5 U	2.3 U	2.3 U
15	gamma-BHC (Lindane)		NONE	UG/KG	2.5 U	2.4 U	2.6 U	2.3 U	2.5 U	2.3 U	2.3 U
16	gamma-Chlordane		NONE	UG/KG	2.5 U	2.4 U	1.3 J	2.3 U	2.5 U	2.3 U	2.3 U

Table F-2e

Seneca Army Depot Activity

SEAD-25 and 26 FEASIBILITY STUDY

SEAD-26 Sediment Analysis Results by Sample Point

PARAMETER	LEVEL	SOURCE	UNIT	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
			LOC ID	SD26-3		SD26-4		SD26-5		SD26-6		SD26-7		SD26-8		SD26-9	
			SAMP ID:	SD26-3		SD26-4		SD26-5		SD26-6		SD26-7		SD26-8		SD26-9	
			QC CODE:	SA		SA		SA		SA		SA		SA		SA	
			STUDY ID:	PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1		PHASE 1	
			SAMP. DEPTH TOP:	0		0		0		0		0		0		0	
			SAMP. DEPTH BOT:	0.25		0.17		0.17		0.17		0.17		0.17		0.17	
			MATRIX:	SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT		SEDIMENT	
			SAMP DATE	08-Oct-95		06-Oct-95		06-Oct-95		06-Oct-95		06-Oct-95		21-Oct-95		06-Oct-95	
Herbicides																	
1 2,4,5-T		NONE	UG/KG														
Nitroaromatics																	
1 2,4-Dinitrotoluene		NONE	UG/KG														
2 HMX		NONE	UG/KG														
Metals																	
1 Aluminum		NONE	MG/KG	11100		14400		10200		11600		6410		9810		10800	
2 Antimony	2	Lowest Effect Level	MG/KG	0.33	UJ	0.49	UJ	0.47	UJ	0.39	J	0.61	UJ	0.53	J	0.5	UJ
3 Arsenic	6	Lowest Effect Level	MG/KG	3.8	J	5.1	J	**7**	J	**11**	J	3.7		**24.8**		4.5	J
4 Barium		NONE	MG/KG	61.3		74.2		59.2		53		38.7		54.1		49.6	
5 Beryllium		NONE	MG/KG	0.49		0.64		0.46		0.52		0.23		0.49		0.46	
6 Cadmium	0.6	Lowest Effect Level	MG/KG	0.04	U	0.07	U	0.06	U	0.05	U	0.08		0.06	U	0.07	U
7 Calcium		NONE	MG/KG	56500		8840		34000		28700		26500		6700		10200	
8 Chromium	26	Lowest Effect Level	MG/KG	16.7	R	20.2	R	65.7	R	101	R	32.3	R	22.2	J	18	R
9 Cobalt		NONE	MG/KG	7.2		9.9		10.5		12.1		4		13.4		8.9	
10 Copper	16	Lowest Effect Level	MG/KG	15.6		**19**		**16.2**		**16.5**		9.2		**22.1**		**20.1**	
11 Iron	20000	Lowest Effect Level	MG/KG	17300		**23000**		16000		**23600**		8780		**25400**		**22900**	
12 Lead	31	Lowest Effect Level	MG/KG	14.7	J	12.8	J	18.1	J	18.6	J	10	J	17.5	J	27.3	J
13 Magnesium		NONE	MG/KG	4600		4790		5550		5610		2410		4580		4440	
14 Manganese	460	Lowest Effect Level	MG/KG	269		329		263		333		137		**906**		230	
15 Mercury	0.15	Lowest Effect Level	MG/KG	0.01	U	**0.19**		0.01		0.04		0.07		0.02	J	0.02	
16 Nickel	16	Lowest Effect Level	MG/KG	**22.1**		**27**		**66.6**		**108**		**31.9**		**38.5**		**25.4**	
17 Potassium		NONE	MG/KG	1680	J	2040	J	2190	J	1760	J	1640	J	905		1730	J
18 Selenium		NONE	MG/KG	0.55	U	0.9		0.8	U	0.61		1	U	0.71	U	0.84	U
19 Silver	1	Lowest Effect Level	MG/KG	0.12	U	0.18	U	0.17	U	0.13	U	0.23		0.15	U	0.18	U
20 Sodium		NONE	MG/KG	29.8	U	44.2	U	43.1	U	44.4		64.2		38.5	U	45.2	U
21 Thallium		NONE	MG/KG	0.49		0.78		0.81		0.56		0.83	U	0.58	U	0.68	U
22 Vanadium		NONE	MG/KG	17		24.5		20.3		21.1		11.2		15.6	J	16.9	
23 Zinc	120	Lowest Effect Level	MG/KG	79.2		73.7		**505**		**426**		**182**		**325**		**352**	
Other Analyses																	
1 Nitrate/Nitrite-Nitrogen		NONE	MG/KG														
2 Total Petroleum Hydrocarbons		NONE	MG/KG	109		38.6	U	84.1		37.7	U	76.1		62		101	

Appendix G
Risk Reduction Calculations

List of Tables for Appendix G

APPENDIX G RISK REDUCTION CALCULATIONS

Human health risk did not meet EPA target risk values under the future on-site construction worker or the future residential scenario for SEAD-25. Since both industrial and residential scenarios were considered in the FS, human health risk was re-calculated to verify that remedial alternatives implemented at SEAD-25 would satisfy risk goals. Human health risk for each of the three scenarios developed (current site worker, future residential, future on-site construction worker) at SEAD-25 was re-calculated to simulate conditions after remedial action implementation, using the methods described in the Section 6.0 of the Remedial Investigation. For each media, new exposure point concentrations (EPCs) were generated which predicted exposure after remedial action. These new EPCs were used as inputs to the risk assessment calculations. The following sections describe how the EPCs were generated and provide the supporting risk assessment calculations which support the overall risk values for each alternative which are presented in Tables 2-11, -12, -13, -14 and Table 5-1A.

G.1 SOIL

The area to be remediated at SEAD-25 for soil included samples SB25-3, -4, and -5. EPCs were re-calculated in accordance with procedures outlined in Section 6.2.4 of the RI, by removing data from these locations data from the database. The EPCs used in the BRA and those re-calculated for use in assessing risk after implementation of soil remediation are shown in Table G-1. Tables G-2 through G-19 present the intake and risk tables for soil exposure pathways.

G.2 GROUNDWATER

In order to assess human health risk due to groundwater exposure pathways after implementation of remedial action for groundwater, clean up goals were used as EPCs for constituents of concern. The EPCs used in the BRA and those re-calculated for use in assessing risk after implementation of groundwater remediation are shown in Table G-20. Tables G-21 through G-27 present the intake and risk tables for the groundwater exposure pathways.

G.3 SEDIMENT

The area to be remediated at SEAD-25 for sediment included all sample points except SD25-10. EPCs could not be re-calculated by removing the majority of the sediment data from the database and using the procedures outlined in Section 6.2.4 of the RI. Because of the statistical analysis involved, at least three data points are needed to perform such analysis of the data. Therefore, the data from SD25-10 was used as the EPCs. When compounds were not detected, one-half of the MDL was used as the EPC. The EPCs used in the BRA and those used re-calculated for use in assessing risk after implementation of sediment remediation are shown in Table G-28. Tables G-29 through G-32 present the intake and risk tables for sediment exposure pathways.

G.4 SURFACE WATER

In order to assess human health risk due to surface water exposure pathways after implementation of remedial action for sediment, clean up goals for surface water were used as EPCs for constituents of concern. The EPCs used in the BRA and those re-calculated for use in assessing risk after implementation of sediment remediation are shown in Table G-33. Tables G-34 through G-35 present the intake and risk tables for the surface water exposure pathway.

G.5 CALCULATION OF RISK FOR ALTERNATIVES

The resulting human health risk remaining at the site after implementation of each of the alternatives developed in Section 5.0 is presented in Table 5-1A. Alternatives RA25-1 and RA25-2 resulted in a reduction in risk under the residential scenario only since these alternatives incorporated reduction in groundwater contaminant concentrations due to natural attenuation. Groundwater exposure pathways apply to only the residential scenario. Alternatives RA25-3 through RA25-6 resulted in reduction of risk under all scenarios, since these alternatives incorporated reduction of contaminant concentrations in soil. Soil exposure pathways apply to all scenarios. Alternatives RA25-3R and RA25-3AR (residential alternatives) resulted in further reduction of risk to future residents since contaminant concentrations in sediment and surface water would be reduced under these alternatives. Sediment and surface water exposure pathways apply to the future residential scenario only.

Table G-1
Comparison of Exposure Point Concentrations Used in Calculating Risk After Implementation of Soil Remedial Actions
Seneca Army Depot, Romulus, New York - SEAD 25

Compound	EPC calculated in Baseline Risk Assessment RI Report May 1998 (1) mg/kg	EPCs calculated after removal of SB25-3,4,5 (2) mg/kg
Volatiles		
1,1,1-Trichloroethane	8.10E-02	5.90E-03
Dichloroethene, 1,2- (total)	6.00E-02	5.90E-03
Butanone, 2-	6.80E-03	6.02E-03
Acetone	1.60E-01	8.59E-03
Benzene	7.60E-02	5.90E-03
Carbon Disulfide	5.90E-03	5.97E-03
Chloroform	6.90E-03	5.83E-03
Ethylbenzene	1.80E-01	5.92E-03
Methylene Chloride	5.10E-02	5.90E-03
Toluene	1.20E-01	5.90E-03
Trichloroethene	6.10E-02	5.90E-03
Xylene (total)	3.70E+00	9.29E-03
Semivolatiles		
1,2,4-Trichlorobenzene	8.97E-01	3.75E-01
1,4-Dichlorobenzene	9.01E-01	3.78E-01
2,4-Dinitrotoluene	8.97E-01	3.75E-01
2-Chlorophenol	9.38E-01	4.02E-01
Methylnaphthalene, 2-	1.07E+00	4.08E-01
4-Chloro-3-methylphenol	9.38E-01	4.02E-01
4-Nitrophenol	1.67E+00	8.25E-01
Acenaphthene	7.46E-01	2.71E-01
Benzo(a)anthracene	2.18E-01	2.05E-01
Benzo(a)pyrene	2.08E-01	2.07E-01
Benzo(b)fluoranthene	2.06E-01	2.12E-01
Benzo(g,h,i)perylene	2.09E-01	2.11E-01
Benzo(k)fluoranthene	3.36E-01	3.26E-01
Chrysene	2.21E-01	2.19E-01
Dibenz(a,h)anthracene	3.19E-01	3.03E-01
Fluoranthene	1.99E-01	2.04E-01
Fluorene	4.78E-01	2.80E-01
Indeno(1,2,3-cd)pyrene	2.11E-01	2.10E-01
N-Nitrosodiphenylamine	6.77E-01	2.65E-01
N-Nitrosodipropylamine	9.10E-01	3.83E-01
Naphthalene	4.05E-01	2.17E-01
Pentachlorophenol	2.10E+00	8.50E-01
Phenanthrene	5.71E-01	3.04E-01
Phenol	9.30E-01	3.97E-01
Pyrene	7.42E-01	4.04E-01
bis(2-Ethylhexyl)phthalate	6.32E-01	3.47E-01
Pesticides/PCBs		
DDD, 4,4'-	2.13E-03	1.96E-03
DDT, 4,4'-	1.99E-03	1.96E-03
Aroclor-1254	2.30E-02	1.96E-02
Endosulfan I	1.11E-03	1.09E-03
Endrin	2.00E-03	1.96E-03
Endrin aldehyde	2.25E-03	2.28E-03
Heptachlor epoxide	1.13E-03	1.01E-03
alpha-Chlordane	1.05E-03	1.01E-03
Herbicides		
Dicamba	3.35E-03	2.99E-03
MCPP	3.02E+00	3.45E+00
Metals		
Lead	3.83E-02	2.39E-02
Selenium	1.09E-03	7.40E-04
Thallium	7.92E-04	9.04E-04

(1) EPCs calculated as described in Section 6.2.4 of RI Report, May 1998
(2) EPCs re-calculated after removing data from Samples SB25-3,4, and 5 from database
Results in Tables G-2 through G-19.

EPC - Exposure Point Concentration
BRA - Baseline Risk Assessment

TABLE G-2

Exposure Point Concentrations
Soil Medium
Reasonable Maximum Exposure (RME)
Seneca Army Depot, Romulus, NY - SEAD 25

COMPOUND	SURFACE SOIL EPC Data mg/kg
Volatile Organics	
Acetone	6.66E-03
Semivolatile Organics	
Benzo(a)anthracene	2.75E-01
Benzo(a)pyrene	2.87E-01
Benzo(b)fluoranthene	2.71E-01
Benzo(g,h,i)perylene	2.85E-01
Benzo(k)fluoranthene	2.50E-01
Chrysene	2.57E-01
Dibenz(a,h)anthracene	5.15E-01
Fluoranthene	1.40E-01
Indeno(1,2,3-cd)pyrene	3.10E-01
Phenanthrene	2.53E-01
Pyrene	1.18E-01
Pesticides	
Endosulfan I	1.54E-03
Endrin aldehyde	4.16E-03
Metals	
Lead	3.76E+01
Selenium	1.17E+00
Thallium	1.15E+00

TABLE G-3

CALCULATION OF VOLATILE ORGANIC COMPOUNDS IN AMBIENT AIR
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

COMPOUND	Air [C] Onsite (mg/m³)	Soil Conc (mg/kg)	Soil Conc (ug/kg)	Vapor Pressure (mm Hg)	Molecular Weight (g/mole)	Initial ER(ps) (g/sec)	Contam. Mass Excav Rate (g/sec)	Substitute Maximum ER(ps) (g/sec)	Soil Conc (g/cm3)	C/P	ER(diff) (g/sec)	ER(tot) (g/sec)	Pore Space Conc *Cv* (ug/m3)	Partial Pressure *Pi* (mm Hg)
Volatile Organics														
1,1,1-Trichloroethane	2.0E-03	5.9E-03	5.9	123	133.41	1.67	1.23E-04	4.06E-05	9E-09	4E-06	1.14E-04	1.55E-04	1.59E+04	0.0022
1,2-Dichloroethene (total)	2.3E-03	5.9E-03	5.9	324	96.94	4.41	1.23E-04	4.06E-05	9E-09	3E-06	1.35E-04	1.75E-04	1.59E+04	0.0031
2-Butanone	2.6E-03	6.0E-03	6.023	100	72.12	1.36	1.25E-04	4.14E-05	9E-09	2E-06	1.61E-04	2.02E-04	1.63E+04	0.0042
Acetone	4.1E-03	8.6E-03	9	266	58.08	3.62	1.79E-04	5.91E-05	1E-08	2E-06	2.56E-04	3.15E-04	2.32E+04	0.0074
Benzene	2.5E-03	5.9E-03	5.902	95	78.11	1.30	1.23E-04	4.06E-05	9E-09	2E-06	1.51E-04	1.91E-04	1.59E+04	0.0038
Carbon Disulfide	2.5E-03	6.0E-03	6.0	366	76.14	4.98	1.24E-04	4.10E-05	9E-09	2E-06	1.55E-04	1.96E-04	1.61E+04	0.0039
Chloroform	2.1E-03	5.8E-03	5.8	208	119.39	2.83	1.22E-04	4.01E-05	9E-09	4E-06	1.19E-04	1.60E-04	1.57E+04	0.0025
Ethylbenzene	2.2E-03	5.9E-03	5.919	10	106.16	0.14	1.23E-04	4.07E-05	9E-09	3E-06	1.29E-04	1.70E-04	1.60E+04	0.0028
Methylene Chloride	2.4E-03	5.9E-03	5.903	362	84.94	4.93	1.23E-04	4.06E-05	9E-09	3E-06	1.44E-04	1.85E-04	1.59E+04	0.0035
Toluene	2.3E-03	5.9E-03	5.903	30	92.13	0.41	1.23E-04	4.06E-05	9E-09	3E-06	1.38E-04	1.79E-04	1.59E+04	0.0032
Trichloroethene	2.0E-03	5.9E-03	5.903	75	131.38	1.02	1.23E-04	4.06E-05	9E-09	4E-06	1.15E-04	1.56E-04	1.59E+04	0.0023
Xylene (total)	3.5E-03	9.3E-03	9.288	8	106.16	0.11	1.94E-04	6.39E-05	1E-08	3E-06	2.02E-04	2.66E-04	2.51E+04	0.0044

Excavation Rate = 0.0139 m3/sec
Soil Bulk Density = 1.5 g/cm3
Exposed Surface Area = 115 m2

$$C = \frac{E}{(U)\,(W)\,(H)}$$

Variables:
E = emission rate, g/sec
U = wind speed, m/sec
W = crosswind width of the area source, m (assume 100 meter area)
H=mixing height, m (assume 1.75 m to breathing zone)

TABLE G-4)

AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
SITE WORKER EXPOSURE (CURRENT LAND USE)

SEAD-25 Remedial Investigation
Seneca Army Depot Activity

COMPOUND	SURFACE SOIL EPC Data mg/kg	AVERAGE PM10 (ug/m³)	CONVERSION FACTOR (kg/ug)	AMBIENT AIR CALCULATED EPC (mg/m³)
Volatile Organics				
Acetone	6.66E-03	4.30E+01	1.00E-09	2.86E-10
Semivolatile Organics				
Benzo(a)anthracene	2.75E-01	4.30E+01	1.00E-09	1.18E-08
Benzo(a)pyrene	2.87E-01	4.30E+01	1.00E-09	1.23E-08
Benzo(b)fluoranthene	2.71E-01	4.30E+01	1.00E-09	1.17E-08
Benzo(g,h,i)perylene	2.85E-01	4.30E+01	1.00E-09	1.23E-08
Benzo(k)fluoranthene	2.50E-01	4.30E+01	1.00E-09	1.07E-08
Chrysene	2.57E-01	4.30E+01	1.00E-09	1.11E-08
Dibenz(a,h)anthracene	5.15E-01	4.30E+01	1.00E-09	2.22E-08
Fluoranthene	1.40E-01	4.30E+01	1.00E-09	6.02E-09
Indeno(1,2,3-cd)pyrene	3.10E-01	4.30E+01	1.00E-09	1.33E-08
Phenanthrene	2.53E-01	4.30E+01	1.00E-09	1.09E-08
Pyrene	1.18E-01	4.30E+01	1.00E-09	5.07E-09
Pesticides				
Endosulfan I	1.54E-03	4.30E+01	1.00E-09	6.61E-11
Endrin aldehyde	4.16E-03	4.30E+01	1.00E-09	1.79E-10
Metals				
Lead	3.76E+01	4.30E+01	1.00E-09	1.62E-06
Selenium	1.17E+00	4.30E+01	1.00E-09	5.02E-08
Thalium	1.15E+00	4.30E+01	1.00E-09	4.93E-08

EQUATION: **Calculated Air EPC (mg/m3) = Soil EPC x PM10 x CF**

Variables:	**Assumptions:**
PM10 = Particulate Diameter with aerodynamics diameter <10 microns	**Average value - 43 ug/m3**
CF = Conversion Factor	**10-9 kg/ug**

TABLE G-5

AMBIENT AIR EXPOSURE POINT CONCENTRATIONS
CONSTRUCTION WORKER EXPOSURE (CURRENT LAND USE)

SEAD-25 Remedial Investigation
Seneca Army Depot Activity

COMPOUND	SURFACE AND SUB-SURFACE SOIL EPC Data mg/kg	AVERAGE PM10 (ug/m³)	CONVERSION FACTOR (kg/ug)	AMBIENT AIR CALCULATED EPC (mg/m³)
Volatile Organics				
1,1,1-Trichloroethane	5.90E-03	4.30E+01	1.00E-09	2.54E-10
Dichloroethene, 1,2- (total)	5.90E-03	4.30E+01	1.00E-09	2.54E-10
Butanone, 2-	6.02E-03	4.30E+01	1.00E-09	2.59E-10
Acetone	8.59E-03	4.30E+01	1.00E-09	3.69E-10
Benzene	5.90E-03	4.30E+01	1.00E-09	2.54E-10
Carbon Disulfide	5.97E-03	4.30E+01	1.00E-09	2.57E-10
Chloroform	5.83E-03	4.30E+01	1.00E-09	2.51E-10
Ethylbenzene	5.92E-03	4.30E+01	1.00E-09	2.55E-10
Methylene Chloride	5.90E-03	4.30E+01	1.00E-09	2.54E-10
Toluene	5.90E-03	4.30E+01	1.00E-09	2.54E-10
Trichloroethene	5.90E-03	4.30E+01	1.00E-09	2.54E-10
Xylene (total)	9.29E-03	4.30E+01	1.00E-09	3.99E-10
Semivolatiles				
1,2,4-Trichlorobenzene	3.75E-01	4.30E+01	1.00E-09	1.61E-08
1,4-Dichlorobenzene	3.78E-01	4.30E+01	1.00E-09	1.62E-08
2,4-Dinitrotoluene	3.75E-01	4.30E+01	1.00E-09	1.61E-08
2-Chlorophenol	4.02E-01	4.30E+01	1.00E-09	1.73E-08
Methylnaphthalene, 2-	4.08E-01	4.30E+01	1.00E-09	1.75E-08
4-Chloro-3-methylphenol	4.02E-01	4.30E+01	1.00E-09	1.73E-08
4-Nitrophenol	8.25E-01	4.30E+01	1.00E-09	3.55E-08
Acenaphthene	2.71E-01	4.30E+01	1.00E-09	1.17E-08
Benzo(a)anthracene	2.05E-01	4.30E+01	1.00E-09	8.83E-09
Benzo(a)pyrene	2.07E-01	4.30E+01	1.00E-09	8.89E-09
Benzo(b)fluoranthene	2.12E-01	4.30E+01	1.00E-09	9.11E-09
Benzo(g,h,i)perylene	2.11E-01	4.30E+01	1.00E-09	9.09E-09
Benzo(k)fluoranthene	3.26E-01	4.30E+01	1.00E-09	1.40E-08
Chrysene	2.19E-01	4.30E+01	1.00E-09	9.42E-09
Dibenz(a,h)anthracene	3.03E-01	4.30E+01	1.00E-09	1.30E-08
Fluoranthene	2.04E-01	4.30E+01	1.00E-09	8.79E-09
Fluorene	2.80E-01	4.30E+01	1.00E-09	1.20E-08
Indeno(1,2,3-cd)pyrene	2.10E-01	4.30E+01	1.00E-09	9.02E-09
N-Nitrosodiphenylamine	2.65E-01	4.30E+01	1.00E-09	1.14E-08
N-Nitrosodipropylamine	3.83E-01	4.30E+01	1.00E-09	1.65E-08
Naphthalene	2.17E-01	4.30E+01	1.00E-09	9.34E-09
Pentachlorophenol	8.50E-01	4.30E+01	1.00E-09	3.66E-08
Phenanthrene	3.04E-01	4.30E+01	1.00E-09	1.31E-08
Phenol	3.97E-01	4.30E+01	1.00E-09	1.71E-08
Pyrene	4.04E-01	4.30E+01	1.00E-09	1.74E-08
bis(2-Ethylhexyl)phthalate	3.47E-01	4.30E+01	1.00E-09	1.49E-08
Pesticides/PCBs				
DDD, 4,4'-	1.96E-03	4.30E+01	1.00E-09	8.43E-11
DDT, 4,4'-	1.96E-03	4.30E+01	1.00E-09	8.42E-11
Aroclor-1254	1.96E-02	4.30E+01	1.00E-09	8.42E-10
Endosulfan I	1.09E-03	4.30E+01	1.00E-09	4.67E-11
Endrin	1.96E-03	4.30E+01	1.00E-09	8.42E-11
Endrin aldehyde	2.28E-03	4.30E+01	1.00E-09	9.82E-11
Heptachlor epoxide	1.01E-03	4.30E+01	1.00E-09	4.32E-11
alpha-Chlordane	1.01E-03	4.30E+01	1.00E-09	4.32E-11
Dicamba	2.99E-03	4.30E+01	1.00E-09	1.29E-10
Metals				
Lead	2.39E-02	4.30E+01	1.00E-09	1.03E-09
Selenium	7.40E-04	4.30E+01	1.00E-09	3.18E-11
Thallium	9.04E-04	4.30E+01	1.00E-09	3.89E-11

EQUATION: **Calculated Air EPC (mg/m3) = Soil EPC x PM10 x CF**

Variables:	**Assumptions:**
PM10 = Particulate Diameter with aerodynamics diameter <10 microns	**Average value - 43 ug/m3**
CF = Conversion Factor	**10-9 kg/ug**

TABLE G-6

CALCULATION OF INTAKE FROM INHALATION OF DUST IN AMBIENT AIR
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)

SEAD-25 Remedial Investigation
Seneca Army Depot Activity

Analyte	Intake (Nc) (mg/kg-day)	Intake (Car) (mg/kg-day)	EPC Air (mg/m³)	Inhalation Rate (m³/day)	Exposure Frequency (days/year)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	
								Nc	Car
Volatile Organics									
1,1,1-Trichloroethane	4.96E-11		2.54E-10	20	250	1	70	365	25,550
Dichloroethene, 1,2- (total)			2.54E-10	20	250	1	70	365	25,550
Butanone, 2-	5.07E-11		2.59E-10	20	250	1	70	365	25,550
Acetone			3.69E-10	20	250	1	70	365	25,550
Benzene	4.97E-11	7.09E-13	2.54E-10	20	250	1	70	365	25,550
Carbon Disulfide	5.02E-11		2.57E-10	20	250	1	70	365	25,550
Chloroform		7.01E-13	2.51E-10	20	250	1	70	365	25,550
Ethylbenzene	4.98E-11		2.55E-10	20	250	1	70	365	25,550
Methylene Chloride	4.97E-11	7.10E-13	2.54E-10	20	250	1	70	365	25,550
Toluene	4.97E-11		2.54E-10	20	250	1	70	365	25,550
Trichloroethene		7.10E-13	2.54E-10	20	250	1	70	365	25,550
Xylene (total)			3.99E-10	20	250	1	70	365	25,550
Semivolatiles									
1,2,4-Trichlorobenzene	3.15E-09		1.61E-08	20	250	1	70	365	25,550
1,4-Dichlorobenzene	3.18E-09		1.62E-08	20	250	1	70	365	25,550
2,4-Dinitrotoluene			1.61E-08	20	250	1	70	365	25,550
2-Chlorophenol			1.73E-08	20	250	1	70	365	25,550
Methylnaphthalene, 2-			1.75E-08	20	250	1	70	365	25,550
4-Chloro-3-methylphenol			1.73E-08	20	250	1	70	365	25,550
4-Nitrophenol			3.55E-08	20	250	1	70	365	25,550
Acenaphthene			1.17E-08	20	250	1	70	365	25,550
Benzo(a)anthracene			8.83E-09	20	250	1	70	365	25,550
Benzo(a)pyrene			8.89E-09	20	250	1	70	365	25,550
Benzo(b)fluoranthene			9.11E-09	20	250	1	70	365	25,550
Benzo(g,h,i)perylene			9.09E-09	20	250	1	70	365	25,550
Benzo(k)fluoranthene			1.40E-08	20	250	1	70	365	25,550
Chrysene			9.42E-09	20	250	1	70	365	25,550
Dibenz(a,h)anthracene			1.30E-08	20	250	1	70	365	25,550
Fluoranthene			8.79E-09	20	250	1	70	365	25,550
Fluorene			1.20E-08	20	250	1	70	365	25,550
Indeno(1,2,3-cd)pyrene			9.02E-09	20	250	1	70	365	25,550
N-Nitrosodiphenylamine			1.14E-08	20	250	1	70	365	25,550
N-Nitrosodipropylamine			1.65E-08	20	250	1	70	365	25,550
Naphthalene			9.34E-09	20	250	1	70	365	25,550
Pentachlorophenol			3.66E-08	20	250	1	70	365	25,550
Phenanthrene			1.31E-08	20	250	1	70	365	25,550
Phenol			1.71E-08	20	250	1	70	365	25,550
Pyrene			1.74E-08	20	250	1	70	365	25,550
bis(2-Ethylhexyl)phthalate			1.49E-08	20	250	1	70	365	25,550
Pesticides/PCBs									
DDD, 4,4'-			8.43E-11	20	250	1	70	365	25,550
DDT, 4,4'-		2.35E-13	8.42E-11	20	250	1	70	365	25,550
Aroclor-1254		2.35E-12	8.42E-10	20	250	1	70	365	25,550
Endosulfan I			4.67E-11	20	250	1	70	365	25,550
Endrin			8.42E-11	20	250	1	70	365	25,550
Endrin aldehyde			9.82E-11	20	250	1	70	365	25,550
Heptachlor epoxide		1.21E-13	4.32E-11	20	250	1	70	365	25,550
alpha-Chlordane		1.21E-13	4.32E-11	20	250	1	70	365	25,550
Dicamba			1.29E-10	20	250	1	70	365	25,550
MCPP			ERR	20	250	1	70	365	25,550
Metals									
Lead			1.03E-09	20	250	1	70	365	25,550
Selenium			3.18E-11	20	250	1	70	365	25,550
Thallium			3.89E-11	20	250	1	70	365	25,550

EQUATION: **Intake (mg/kg-day) =**

$$\frac{CA \times IR \times EF \times ED}{BW \times AT}$$

Variables:	**Assumptions:**
CA = Chemical Concentration in Air (mg/m³)	Calculated Air EPC Data - RME
IR = Inhalation Rate (m³/day)	20 (all receptors)
EF = Exposure Frequency (days/yr)	250 (RME Construction Workers)
ED = Exposure Duration (years)	1 (Upper bound period of Construction Worker)
BW = Bodyweight (kg)	70 (Adult Male)
AT = Averaging Time (days)	1 x 365 (Nc) 70 x 365 (Car)

Note Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-7

CALCULATION OF INTAKE FROM THE INGESTION OF ONSITE SOILS (DAILY)
SITE WORKER EXPOSURE (CURRENT LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	30 Year Intake (Nc) (mg/kg-day)	30 Year Intake (Car) (mg/kg-day)	EPC Soil (mg/kg)	Ingestion Rate (mg soil/day)	Conv. Factor (kg/mg)	Fraction Ingested (unitless)	Exposure Frequency (days/year)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days) Nc	Averaging Time (days) Car
Volatile Organics											
Acetone	5.2E-10		6.66E-03	100	1.0E-06	1	20	25	70	9,125	25,550
Semivolatile Organics											
Benzo(a)anthracene		7.7E-09	2.75E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Benzo(a)pyrene		8.0E-09	2.87E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Benzo(b)fluoranthene		7.6E-09	2.71E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Benzo(g,h,i)perylene			2.85E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Benzo(k)fluoranthene		7.0E-09	2.50E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Chrysene		7.2E-09	2.57E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Dibenz(a,h)anthracene		1.4E-08	5.15E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Fluoranthene	1.1E-08		1.40E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Indeno(1,2,3-cd)pyrene		8.7E-09	3.10E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Phenanthrene			2.53E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Pyrene	9.2E-09		1.18E-01	100	1.0E-06	1	20	25	70	9,125	25,550
Pesticides											
Endosulfan I	1.2E-10		1.54E-03	100	1.0E-06	1	20	25	70	9,125	25,550
Endrin aldehyde			4.16E-03	100	1.0E-06	1	20	25	70	9,125	25,550
Metals											
Lead			3.76E+01	100	1.0E-06	1	20	25	70	9,125	25,550
Selenium	9.1E-08		1.17E+00	100	1.0E-06	1	20	25	70	9,125	25,550
Thallium	9.0E-08		1.15E+00	100	1.0E-06	1	20	25	70	9,125	25,550

EQUATION: Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables:	**Assumptions:**
CS = Chemical Concentration in Soil (mg soil/kg)	EPC Soil Data - RME
IR = Ingestion Rate (mg soil/day)	100 (RME Site Worker)
CF = Conversion Factor (10-6 kg/mg)	10-6
FI = Fraction Ingested (unitless)	1 (All Receptors)
EF = Exposure Frequency (days/years)	20 (RME Site Worker)
ED = Exposure Duration (years)	25 (RME Site Worker)
BW = Bodyweight (kg)	70 (Adult male)
AT = Averaging Time (days)	25 x 365 (Nc) 70 x 365 (Car)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-8

CALCULATION OF INTAKE FROM THE INGESTION OF ONSITE SOILS (DAILY)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Intake (Nc) (mg/kg-day)	Adult Intake (Nc) (mg/kg-day)	Adult/Child Intake * (Car) (mg/kg-day)	EPC Soil (mg/kg)	Child Ingestion Rate (mg soil/day)	Adult Ingestion Rate (mg soil/day)	Conv. Factor (kg/mg)	Fraction Ingested (unitless)	Exposure Frequency (days/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child(Nc)	Averaging Time (days) Adult(Nc)	Averaging Time (days) Car
Volatile Organics																
Acetone	8.5E-08	9.1E-09		6.66E-03	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Semivolatile Organics																
Benzo(a)anthracene			4.3E-07	2.75E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Benzo(a)pyrene			4.5E-07	2.87E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Benzo(b)fluoranthene			4.2E-07	2.71E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Benzo(g,h,i)perylene				2.85E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Benzo(k)fluoranthene			3.9E-07	2.50E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Chrysene			4.0E-07	2.57E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Dibenz(a,h)anthracene			8.1E-07	5.15E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Fluoranthene	1.8E-06	1.9E-07		1.40E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Indeno(1,2,3-cd)pyrene			4.9E-07	3.10E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Phenanthrene				2.53E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Pyrene	1.5E-06	1.6E-07		1.18E-01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Pesticides																
Endosulfan I	2.0E-08	2.1E-09		1.54E-03	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Endrin aldehyde				4.16E-03	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Metals																
Lead				3.76E+01	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Selenium	1.5E-05	1.6E-06		1.17E+00	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550
Thallium	1.5E-05	1.6E-06		1.15E+00	200	100	1.0E-06	1	350	6	24	15	70	2,190	8,760	25,550

EQUATION: Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables:	Assumptions:
CS = Chemical Concentration in Soil (mg soil/kg)	EPC Soil Data - RME
IR = Ingestion Rate (mg soil/day)	100 (RME Adult)/ 200 (RME Child)
CF = Conversion Factor (10-6 kg/mg)	10-6
FI = Fraction Ingested (unitless)	1
EF = Exposure Frequency (days/years)	350 (RME all residents)
ED = Exposure Duration (years)	30 (RME at 1 Residence)
BW = Bodyweight (kg)	70 (Adult male)/ 15 (Child 6-7)
AT = Averaging Time (days)	6 x 365 Child 24 x 365 Adult (NC) 70 x 365 (C)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

* Adult and Child intakes weighted according to Risk Assessment Guidance for Superfund (RAGS) Part B (USEPA 1991).
The term (IR x ED / BW) in the intake equation, above is calculated as: [IR(child) x ED(child) / BW(child) + IR(adult) x ED(adult) / BW(adult)]

TABLE G-9

CALCULATION OF INTAKE FROM INGESTION OF SURFACE & SUBSURFACE SOIL
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	30 Year Intake (Nc) (mg/kg-day)	30 Year Intake (Car) (mg/kg-day)	EPC Total Soils (mg/kg)	Ingestion Rate (mg soil/day)	Conv. Factor (kg/mg)	Fraction Ingested (unitless)	Exposure Frequency (days/year)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days)	
										Nc	Car
Volatile Organics											
1,1,1-Trichloroethane	2.8E-08		5.90E-03	480	1.0E-06	1	250	1	70	365	25,550
Dichloroethene, 1,2- (total)	2.8E-08		5.90E-03	480	1.0E-06	1	250	1	70	365	25,550
Butanone, 2-	2.8E-08		6.02E-03	480	1.0E-06	1	250	1	70	365	25,550
Acetone	4.0E-08		8.59E-03	480	1.0E-06	1	250	1	70	365	25,550
Benzene	2.8E-08	4.0E-10	5.90E-03	480	1.0E-06	1	250	1	70	365	25,550
Carbon Disulfide	2.8E-08		5.97E-03	480	1.0E-06	1	250	1	70	365	25,550
Chloroform	2.7E-08	3.9E-10	5 83E-03	480	1.0E-06	1	250	1	70	365	25,550
Ethylbenzene	2.8E-08		5.92E-03	480	1.0E-06	1	250	1	70	365	25,550
Methylene Chloride	2.8E-08	4 0E-10	5.90E-03	480	1.0E-06	1	250	1	70	365	25,550
Toluene	2.8E-08		5.90E-03	480	1 0E-06	1	250	1	70	365	25,550
Trichloroethene		4.0E-10	5.90E-03	480	1.0E-06	1	250	1	70	365	25,550
Xylene (total)	4.4E-08		9.29E-03	480	1.0E-06	1	250	1	70	365	25,550
Semivolatiles											
1,2,4-Trichlorobenzene	1.8E-06		3.75E-01	480	1.0E-06	1	250	1	70	365	25,550
1,4-Dichlorobenzene		2.5E-08	3.78E-01	480	1.0E-06	1	250	1	70	365	25,550
2,4-Dinitrotoluene	1 8E-06	2.5E-08	3.75E-01	480	1.0E-06	1	250	1	70	365	25,550
2-Chlorophenol	1.9E-06		4.02E-01	480	1.0E-06	1	250	1	70	365	25,550
Methylnaphthalene, 2-	1.9E-06		4.08E-01	480	1.0E-06	1	250	1	70	365	25,550
4-Chloro-3-methylphenol			4.02E-01	480	1.0E-06	1	250	1	70	365	25,550
4-Nitrophenol			8.25E-01	480	1.0E-06	1	250	1	70	365	25,550
Acenaphthene	1.3E-06		2.71E-01	480	1.0E-06	1	250	1	70	365	25,550
Benzo(a)anthracene		1.4E-08	2.05E-01	480	1.0E-06	1	250	1	70	365	25,550
Benzo(a)pyrene		1.4E-08	2.07E-01	480	1.0E-06	1	250	1	70	365	25,550
Benzo(b)fluoranthene		1.4E-08	2.12E-01	480	1.0E-06	1	250	1	70	365	25,550
Benzo(g,h,i)perylene			2.11E-01	480	1.0E-06	1	250	1	70	365	25,550
Benzo(k)fluoranthene		2.2E-08	3.26E-01	480	1.0E-06	1	250	1	70	365	25,550
Chrysene		1.5E-08	2.19E-01	480	1.0E-06	1	250	1	70	365	25,550
Dibenz(a,h)anthracene		2.0E-08	3.03E-01	480	1.0E-06	1	250	1	70	365	25,550
Fluoranthene	9.6E-07		2.04E-01	480	1.0E-06	1	250	1	70	365	25,550
Fluorene	1.3E-06		2.80E-01	480	1.0E-06	1	250	1	70	365	25,550
Indeno(1,2,3-cd)pyrene		1.4E-08	2.10E-01	480	1.0E-06	1	250	1	70	365	25,550
N-Nitrosodiphenylamine		1.8E-08	2.65E-01	480	1.0E-06	1	250	1	70	365	25,550
N-Nitrosodipropylamine		2.6E-08	3.83E-01	480	1.0E-06	1	250	1	70	365	25,550
Naphthalene	1.0E-06		2.17E-01	480	1.0E-06	1	250	1	70	365	25,550
Pentachlorophenol	4.0E-06	5.7E-08	8.50E-01	480	1.0E-06	1	250	1	70	365	25,550
Phenanthrene			3.04E-01	480	1.0E-06	1	250	1	70	365	25,550
Phenol	1.9E-06		3.97E-01	480	1.0E-06	1	250	1	70	365	25,550
Pyrene	1.9E-06		4.04E-01	480	1.0E-06	1	250	1	70	365	25,550
bis(2-Ethylhexyl)phthalate	1.6E-06	2.3E-08	3.47E-01	480	1.0E-06	1	250	1	70	365	25,550
Pesticides/PCBs											
DDD, 4,4'-		1.3E-10	1.96E-03	480	1.0E-06	1	250	1	70	365	25,550
DDT, 4,4'-	9.2E-09	1.3E-10	1.96E-03	480	1.0E-06	1	250	1	70	365	25,550
Aroclor-1254	9.2E-08	1.3E-09	1.96E-02	480	1.0E-06	1	250	1	70	365	25,550
Endosulfan I	5.1E-09		1.09E-03	480	1.0E-06	1	250	1	70	365	25,550
Endrin	9.2E-09		1.96E-03	480	1.0E-06	1	250	1	70	365	25,550
Endrin aldehyde			2.28E-03	480	1.0E-06	1	250	1	70	365	25,550
Heptachlor epoxide	4.7E-09	6.7E-11	1.01E-03	480	1.0E-06	1	250	1	70	365	25,550
alpha-Chlordane	4.7E-09	6.7E-11	1.01E-03	480	1.0E-06	1	250	1	70	365	25,550
Herbicides											
Dicamba	1 4E-08	2.0E-10	2.99E-03	480	1.0E-06	1	250	1	70	365	25,550
MCPP	1.6E-05	2.3E-07	3.45E+00	480	1.0E-06	1	250	1	70	365	25,550
Metals											
Lead	1.1E-07	1.6E-09	2.39E-02	480	1.0E-06	1	250	1	70	365	25,550
Selenium	3.5E-09	5.0E-11	7.40E-04	480	1.0E-06	1	250	1	70	365	25,550
Thallium	4.2E-09	6.1E-11	9.04E-04	480	1.0E-06	1	250	1	70	365	25,550

Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables:	Assumptions:
CS = Chemical Concentration in Soil (mg soil/kg)	EPC - Soil Data (RME)
IR = Ingestion Rate (mg soil/day)	480 (RME Construction Worker)
CF = Conversion Factor (10-6 kg/mg)	10-6
FI = Fraction Ingested (unitless)	1 (All Receptors)
EF = Exposure Frequency (days/years)	250 (RME Construction Worker)
ED = Exposure Duration (years)	1 (Upper bound limit for Construction Worker)
BW = Bodyweight (kg)	70 (Adult male)
AT = Averaging Time (days)	1 x 365 (Nc) 70 x 365 (Car)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-10

CALCULATION OF ABSORBED DOSE FROM DERMAL CONTACT TO ONSITE SOIL (DAILY)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Absorbed Dose (Nc) (mg/kg-day)	Adult Absorbed Dose (Nc) (mg/kg-day)	Adult/Child Absorbed Dose (Car) (mg/kg-day)	EPC Soil (mg/kg)	Conv. Factor (kg/mg)	Child Skin Surface Area Contact (cm²/event)	Adult Skin Surface Area Contact (cm²/event)	Adherence Factor (mg soil/cm²)	Absorption Factor (unitless)	Exposure Frequency (events/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child(Nc)	Averaging Time (days) Adult(Nc)	Averaging Time (days) Car
Volatile Organics																	
Acetone				6.66E-03	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Semivolatile Organics																	
Benzo(a)anthracene				2.75E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Benzo(a)pyrene				2.87E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Benzo(b)fluoranthene				2.71E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Benzo(g,h,i)perylene				2.85E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Benzo(k)fluoranthene				2.50E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Chrysene				2.57E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Dibenz(a,h)anthracene				5.15E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Fluoranthene				1.40E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Indeno(1,2,3-cd)pyrene				3.10E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Phenanthrene				2.53E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Pyrene				1.18E-01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Pesticides																	
Endosulfan I				1.54E-03	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Endrin aldehyde				4.16E-03	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Metals																	
Lead				3.76E+01	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Selenium				1.17E+00	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550
Thallium				1.15E+00	1.0E-06	2,300	5,800	1.0		350	6	24	15	70	2,190	8,760	25,550

EQUATION: Absorbed Dose (mg/kg-day) =

$$\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Variables:	Assumptions:	Variables:	Assumptions:
CS = Chemical Concentration in Soil (mg soil/kg)	EPC Soil Data - RME	EF = Exposure Frequency (events/year)	350 (RME - All Residents)
CF = Conversion Factor (10-6 kg/mg)	10-6	ED = Exposure Duration (years)	30 (RME at 1 Residence)
SA = Surface Area Contact (cm²)	2,300/5,800 (RME Child/Adult)	BW = Bodyweight (kg)	15 kg (child) 70 kg (adult)
AF =Soil to Skin Adherence Factor (mg/cm²)	1.0 (RME all receptors)	AT = Averaging Time (days)	6 x 365 Child 24 x 365 Adult (Nc), 70 x 365 (Car)
ABS = Absorption Factor (unitless)	Compound Specific PCBs and Cd (EPA, 1992b) (Default Assumption 0% = 0.0)		

Notes:

Cells in this table were intentionally left blank due to a lack of toxicity data or absorption factor.

USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since credible absorption factors (ABS) are not available for other chemicals of concern.

TABLE G-11

CALCULATION OF ABSORBED DOSE FROM DERMAL CONTACT TO SURFACE & SUBSURFACE SOIL
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Absorbed Dose (Nc) (mg/kg-day)	Absorbed Dose (Car) (mg/kg-day)	EPC Total Soils (mg/kg)	Conv. Factor (kg/mg)	Skin Surface Area Contact (cm^2)	Adherence Factor (mg soil/cm^2)	Absorption Factor (unitless)	Exposure Frequency (days/year)	Exposure Duration (years)	Body Weight (kg)	Averaging Time (days) Nc	Averaging Time (days) Car
Volatile Organics												
1,1,1-Trichloroethane			5.90E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Dichloroethene, 1,2- (total)			5.90E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Butanone, 2-			6.02E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Acetone			8.59E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Benzene			5.90E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Carbon Disulfide			5.97E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Chloroform			5.83E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Ethylbenzene			5.92E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Methylene Chloride			5.90E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Toluene			5.90E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Trichloroethene			5.90E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Xylene (total)			9.29E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Semivolatiles												
1,2,4-Trichlorobenzene			3.75E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
1,4-Dichlorobenzene			3.78E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
2,4-Dinitrotoluene			3.75E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
2-Chlorophenol			4.02E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Methylnaphthalene, 2-			4.08E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
4-Chloro-3-methylphenol			4.02E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
4-Nitrophenol			8.25E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Acenaphthene			2.71E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Benzo(a)anthracene			2.05E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Benzo(a)pyrene			2.07E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Benzo(b)fluoranthene			2.12E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Benzo(g,h,i)perylene			2.11E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Benzo(k)fluoranthene			3.26E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Chrysene			2.19E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Dibenz(a,h)anthracene			3.03E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Fluoranthene			2.04E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Fluorene			2.80E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Indeno(1,2,3-cd)pyrene			2.10E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
N-Nitrosodiphenylamine			2.65E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
N-Nitrosodipropylamine			3.83E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Naphthalene			2.17E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Pentachlorophenol			8.50E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Phenanthrene			3.04E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Phenol			3.97E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Pyrene			4.04E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
bis(2-Ethylhexyl)phthalate			3.47E-01	1.0E-06	4,290	1.0		250	1	70	365	25,550
Pesticides/PCBs												
DDD, 4,4'-			1.96E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
DDT, 4,4'-			1.96E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Aroclor-1254	4.93E-08	7.04E-10	1.96E-02	1.0E-06	4,290	1.0	0.06	250	1	70	365	25,550
Endosulfan I			1.09E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Endrin			1.96E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Endrin aldehyde			2.28E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Heptachlor epoxide			1.01E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
alpha-Chlordane			1.01E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
Herbicides												
Dicamba			2.99E-03	1.0E-06	4,290	1.0		250	1	70	365	25,550
MCPP			3.45E+00	1.0E-06	4,290	1.0		250	1	70	365	25,550
Metals												
Lead			2.39E-02	1.0E-06	4,290	1.0		250	1	70	365	25,550
Selenium			7.40E-04	1.0E-06	4,290	1.0		250	1	70	365	25,550
Thallium			9.04E-04	1.0E-06	4,290	1.0		250	1	70	365	25,550

EQUATION: Absorbed Dose (mg/kg-day) = $\dfrac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Variables:	Assumptions:	Variables:	Assumptions:
CS = Chemical Concentration in Soil (mg soil/kg)	EPC - Soil Data (RME)	EF = Exposure Frequency (days/year)	250 (RME Construction Worker)
CF = Conversion Factor (10-6 kg/mg)	10-6	ED = Exposure Duration (years)	1 (Upper bound limit for CW)
SA = Surface Area Contact (cm^2)	4,290 (RME Adult Worker)	BW = Bodyweight (kg)	70 (Adult Male)
AF =Soil to Skin Adherence Factor (mg/cm^2)	1.0 (RME - All Receptors)	AT = Averaging Time (days)	1 x 365 (Nc) 70 x 365 (Car)
ABS = Absorption Factor (unitless)	Applicable for PCBs and Cadmium (EPA, 1992b)		

Notes:

Cells in this table were intentionally left blank due to a lack of toxicity data or absorption factor.

USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since credible absorption factors (ABS) are not available for other chemicals of concern.

TABLE G-12
CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM INHALATION OF VOLATILE ORGANICS IN AMBIENT AIR
SITE WORKER EXPOSURE (CURRENT LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	CDI (Nc) (mg/kg-day)	CDI (Car) (mg/kg-day)	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Hazard Quotient	Cancer Risk
Volatile Organics						
1,1,1-Trichloroethane	3.7E-09		2.9E-01	NA	1E-08	
1,2-Dichloroethene (total)			NA	NA		
2-Butanone	7.8E-10		2.9E-01	NA	3E-09	
Acetone			NA	NA		
Benzene	2.8E-09	9.9E-10	1.7E-03	2.9E-02	2E-06	3E-11
Carbon Disulfide		2.0E-09	NA	3.9E-03		8E-12
Chloroform	2.5E-09		2.0E-01	NA	1E-08	
Ethylbenzene	7.2E-10		2.9E-01	NA	3E-09	
Methylene Chloride	5.9E-09	2.1E-09	8.6E-01	1.7E-03	7E-09	4E-12
Toluene	4.9E-09		1.1E-01	NA	4E-08	
Trichloroethene		9.4E-10	NA	6.0E-03		6E-12
Xylene (total)			NA	NA		
Total HQ & CR					**2E-06**	**5E-11**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic) / Reference Concentration
Cancer Risk = Chronic Daily Intake (Cancinogenic) x Inhalation Slope Factor

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-13
CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM THE INGESTION OF ONSITE SOILS (DAILY)
SITE WORKER EXPOSURE (CURRENT LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	CDI (Nc) (mg/kg-day)	CDI (Car) (mg/kg-day)	Oral RfD (mg/kg-day)	Oral Slope Factor (mg/kg-day)-1	Hazard Quotient	Cancer Risk
Volatile Organics						
Acetone	5.2E-10		1.0E-01	NA	5E-09	
Semivolatile Organics						
Benzo(a)anthracene		7.7E-09	NA	7.3E-01		6E-09
Benzo(a)pyrene		8.0E-09	NA	7.3E+00		6E-08
Benzo(b)fluoranthene		7.6E-09	NA	7.3E-01		6E-09
Benzo(g,h,i)perylene			NA	NA		
Benzo(k)fluoranthene		7.0E-09	NA	7.3E-02		5E-10
Chrysene		7.2E-09	NA	7.3E-03		5E-11
Dibenz(a,h)anthracene		1.4E-08	NA	7.3E+00		1E-07
Fluoranthene	1.1E-08		4.0E-02	NA	3E-07	
Indeno(1,2,3-cd)pyrene		8.7E-09	NA	7.3E-01		6E-09
Phenanthrene			NA	NA		
Pyrene	9.2E-09		3.0E-02	NA	3E-07	
Pesticides						
Endosulfan I	1.2E-10		6.0E-03	NA	2E-08	
Endrin aldehyde			NA	NA		
Metals						
Lead			NA	NA		
Selenium	9.1E-08		5.0E-03	NA	2E-05	
Thallium	9.0E-08		8.0E-05	NA	1E-03	
Totals - HQ & CR					**1E-03**	**2E-07**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic)/ Reference Dose (Oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (Oral)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-14

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM INHALATION OF VOLATILE ORGANICS IN AMBIENT AIR
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child CDI (Nc) (mg/kg-day)	Adult CDI (Nc) (mg/kg-day)	Adult/Child CDI (Car) (mg/kg-day)	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Child Hazard Quotient	Adult Hazard Quotient	Cancer Risk
Volatile Organics								
1,1,1-Trichloroethane	2.7E-07	5.9E-08		2.9E-01	NA	9E-07	2E-07	
1,2-Dichloroethene (total)				NA	NA			
2-Butanone	5.6E-08	1.2E-08		2.9E-01	NA	2E-07	4E-08	
Acetone				NA	NA			
Benzene	2.0E-07	4.4E-08	3.2E-08	1.7E-03	2.9E-02	1E-04	3E-05	9E-10
Carbon Disulfide			6.6E-08	NA	3.9E-03			3E-10
Chloroform	1.8E-07	4.1E-08		2.0E-01	NA	9E-07	2E-07	
Ethylbenzene	5.2E-08	1.2E-08		2.9E-01	NA	2E-07	4E-08	
Methylene Chloride	4.3E-07	9.5E-08	6.9E-08	8.6E-01	1.7E-03	5E-07	1E-07	1E-10
Toluene	3.6E-07	7.8E-08		1.1E-01	NA	3E-06	7E-07	
Trichloroethene			3.1E-08	NA	6.0E-03			2E-10
Xylene (total)				NA	NA			
Total HQ & CR						**1E-04**	**3E-05**	**1E-09**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic) / Reference Concentration
Cancer Risk = Chronic Daily Intake (Cancinogenic) x Inhalation Slope Factor

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-15

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS FROM THE INGESTION OF ONSITE SOILS (DAILY) RESIDENTIAL EXPOSURE (FUTURE LAND USE) REASONABLE MAXIMUM EXPOSURE (RME) SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg-day)	Child CDI (Nc) (mg/kg-day)	Adult/Child CDI (Car) (mg/kg-day)	Oral RfD (mg/kg-day)	Oral Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Volatile Organics								
Acetone	9.12E-09	8.5E-08		1.0E-01	NA	9E-08	9E-07	
Semivolatile Organics								
Benzo(a)anthracene			4.3E-07	NA	7.3E-01			3E-07
Benzo(a)pyrene			4.5E-07	NA	7.3E+00			3E-06
Benzo(b)fluoranthene			4.2E-07	NA	7.3E-01			3E-07
Benzo(g,h,i)perylene				NA	NA			
Benzo(k)fluoranthene			3.9E-07	NA	7.3E-02			3E-08
Chrysene			4.0E-07	NA	7.3E-03			3E-09
Dibenz(a,h)anthracene			8.1E-07	NA	7.3E+00			6E-06
Fluoranthene	1.92E-07	1.8E-06		4.0E-02	NA	5E-06	4E-05	
Indeno(1,2,3-cd)pyrene			4.9E-07	NA	7.3E-01			4E-07
Phenanthrene				NA	NA			
Pyrene	1.62E-07	1.5E-06		3.0E-02	NA	5E-06	5E-05	
Pesticides								
Endosulfan I	2.11E-09	2.0E-08		6.0E-03	NA	4E-07	3E-06	
Endrin aldehyde				NA	NA			
Metals								
Lead				NA	NA			
Selenium	1.60E-06	1.5E-05		5.0E-03	NA	3E-04	3E-03	
Thallium	1.57E-06	1.5E-05		8.0E-05	NA	2E-02	2E-01	
Totals - HQ & CR						**2E-02**	**2E-01**	**1E-05**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic)/ Reference Dose (Oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (Oral)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-16

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM INHALATION OF VOLATILE ORGANICS IN AMBIENT AIR
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	CDI (Nc) (mg/kg-day)	CDI (Car) (mg/kg-day)	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Hazard Quotient	Cancer Risk
Volatile Organics						
1,1,1-Trichloroethane	3.9E-04		2.9E-01	NA	1E-03	
1,2-Dichloroethene (total)			NA	NA		
2-Butanone	5.1E-04		2.9E-01	NA	2E-03	
Acetone			NA	NA		
Benzene	4.9E-04	7.0E-06	1.7E-03	2.9E-02	3E-01	2E-07
Carbon Disulfide		7.1E-06	NA	3.9E-03		3E-08
Chloroform	4.1E-04		2.0E-01	NA	2E-03	
Ethylbenzene	4.3E-04		2.9E-01	NA	2E-03	
Methylene Chloride	4.7E-04	6.7E-06	8.6E-01	1.7E-03	5E-04	1E-08
Toluene	4.6E-04		1.1E-01	NA	4E-03	
Trichloroethene		5.6E-06	NA	6.0E-03		3E-08
Xylene (total)			NA	NA		
Total HQ & CR					**3E-01**	**3E-07**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic) / Reference Concentration
Cancer Risk = Chronic Daily Intake (Cancinogenic) x Inhalation Slope Factor

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-17

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM INHALATION OF DUST IN AMBIENT AIR
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)

SEAD-25 Remedial Investigation
Seneca Army Depot Activity

Analyte	CDI (Nc) (mg/kg-day)	CDI (Car) (mg/kg-day)	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Hazard Quotient	Cancer Risk
Volatile Organics						
1,1,1-Trichloroethane	4.96E-11		2.86E-01	NA	2E-10	
Dichloroethene, 1,2- (total)			NA	NA		
Butanone, 2-	5.07E-11		2.86E-01	NA	2E-10	
Acetone			NA	NA		
Benzene	4.97E-11	7.09E-13	1.71E-03	2.91E-02	3E-08	2E-14
Carbon Disulfide	5.02E-11		2.00E-01	NA	3E-10	
Chloroform		7.01E-13	NA	8.05E-02		6E-14
Ethylbenzene	4.98E-11		2.86E-01	NA	2E-10	
Methylene Chloride	4.97E-11	7.10E-13	8.57E-01	1.65E-03	6E-11	1E-15
Toluene	4.97E-11		1.14E-01	NA	4E-10	
Trichloroethene		7.10E-13	NA	6.00E-03		4E-15
Xylene (total)			NA	NA		
Semivolatiles						
	0.00E+00	0.00E+00				
1,2,4-Trichlorobenzene	3.15E-09		5.70E-02	NA	6E-08	
1,4-Dichlorobenzene	3.18E-09		2.29E-01	NA	1E-08	
2,4-Dinitrotoluene			NA	NA		
2-Chlorophenol			NA	NA		
Methylnaphthalene, 2-			NA	NA		
4-Chloro-3-methylphenol			NA	NA		
4-Nitrophenol			NA	NA		
Acenaphthene			NA	NA		
Benzo(a)anthracene			NA	NA		
Benzo(a)pyrene			NA	NA		
Benzo(b)fluoranthene			NA	NA		
Benzo(g,h,i)perylene			NA	NA		
Benzo(k)fluoranthene			NA	NA		
Chrysene			NA	NA		
Dibenz(a,h)anthracene			NA	NA		
Fluoranthene			NA	NA		
Fluorene			NA	NA		
Indeno(1,2,3-cd)pyrene			NA	NA		
N-Nitrosodiphenylamine			NA	NA		
N-Nitrosodipropylamine			NA	NA		
Naphthalene			NA	NA		
Pentachlorophenol			NA	NA		
Phenanthrene			NA	NA		
Phenol			NA	NA		
Pyrene			NA	NA		
bis(2-Ethylhexyl)phthalate			NA	NA		
Pesticides/PCBs						
DDD, 4,4'-			NA	NA		
DDT, 4,4'-		2.35E-13	NA	3.40E-01		8E-14
Aroclor-1254		2.35E-12	NA	4.00E-01		9E-13
Endosulfan I			NA	NA		
Endrin			NA	NA		
Endrin aldehyde			NA	NA		
Heptachlor epoxide		1.21E-13	NA	9.10E+00		1E-12
alpha-Chlordane		1.21E-13	NA	1.30E+00		2E-13
Dicamba			NA	NA		
MCPP			NA	NA		
Metals						
Lead			NA	NA		
Selenium			NA	NA		
Thallium			NA	NA		
Total HQ & CR					1E-07	2E-12

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic) / Reference Concentration
Cancer Risk = Chronic Daily Intake (Cancinogenic) x Inhalation Slope Factor

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-18

**CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM INGESTION OF SURFACE & SUBSURFACE SOIL
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25**

Analyte	CDI (Nc) (mg/kg-day)	CDI (Car) (mg/kg-day)	RfD (mg/kg-day)	Oral Slope Factor (mg/kg-day)-1	Hazard Quotient	Cancer Risk
Volatile Organics						
1,1,1-Trichloroethane	2.8E-08		2.0E-02	NA	1E-06	
Dichloroethene, 1,2- (total)	2.8E-08		9.0E-03	NA	3E-06	
Butanone, 2-	2.8E-08		6.0E-01	NA	5E-08	
Acetone	4.0E-08		1.0E-01	NA	4E-07	
Benzene	2.8E-08	4.0E-10	3.0E-03	2.9E-02	9E-06	1E-11
Carbon Disulfide	2.8E-08		1.0E-01	NA	3E-07	
Chloroform	2.7E-08	3.9E-10	1.0E-02	6.1E-03	3E-06	2E-12
Ethylbenzene	2.8E-08		1.0E-01	NA	3E-07	
Methylene Chloride	2.8E-08	4.0E-10	6.0E-02	7.5E-03	5E-07	3E-12
Toluene	2.8E-08		2.0E-01	NA	1E-07	
Trichloroethene		4.0E-10	NA	1.1E-02		4E-12
Xylene (total)	4.4E-08		2.0E+00	NA	2E-08	
Semivolatiles						
1,2,4-Trichlorobenzene	1.8E-06		1.0E-02	NA	2E-04	
1,4-Dichlorobenzene		2.5E-08	NA	2.4E-02		6E-10
2,4-Dinitrotoluene	1.8E-06	2.5E-08	2.0E-03	6.8E-01	9E-04	2E-08
2-Chlorophenol	1.9E-06		5.0E-03	NA	4E-04	
Methylnaphthalene, 2-	1.9E-06		4.0E-02	NA	5E-05	
4-Chloro-3-methylphenol			NA	NA		
4-Nitrophenol			NA	NA		
Acenaphthene	1.3E-06		6.0E-02	NA	2E-05	
Benzo(a)anthracene		1.4E-08	NA	7.3E-01		1E-08
Benzo(a)pyrene		1.4E-08	NA	7.3E+00		1E-07
Benzo(b)fluoranthene		1.4E-08	NA	7.3E-01		1E-08
Benzo(g,h,i)perylene			NA	NA		
Benzo(k)fluoranthene		2.2E-08	NA	7.3E-02		2E-09
Chrysene		1.5E-08	NA	7.3E-03		1E-10
Dibenz(a,h)anthracene		2.0E-08	NA	7.3E+00		1E-07
Fluoranthene	9.6E-07		4.0E-02	NA	2E-05	
Fluorene	1.3E-06		4.0E-02	NA	3E-05	
Indeno(1,2,3-cd)pyrene		1.4E-08	NA	7.3E-01		1E-08
N-Nitrosodiphenylamine		1.8E-08	NA	4.9E-03		9E-11
N-Nitrosodipropylamine		2.6E-08	NA	7.0E+00		2E-07
Naphthalene	1.0E-06		4.0E-02	NA	3E-05	
Pentachlorophenol	4.0E-06	5.7E-08	3.0E-02	1.2E-01	1E-04	7E-09
Phenanthrene			NA	NA		
Phenol	1.9E-06		6.0E-01	NA	3E-06	
Pyrene	1.9E-06		3.0E-02	NA	6E-05	
bis(2-Ethylhexyl)phthalate	1.6E-06	2.3E-08	2.0E-02	1.4E-02	8E-05	3E-10
Pesticides/PCBs						
DDD, 4,4'-		1.3E-10	NA	3.4E-01		4E-11
DDT, 4,4'-	9.2E-09	1.3E-10	5.0E-04	3.4E-01	2E-05	4E-11
Aroclor-1254	9.2E-08	1.3E-09	2.0E-05	2.0E+00	5E-03	3E-09
Endosulfan I	5.1E-09		6.0E-03	NA	9E-07	
Endrin	9.2E-09		3.0E-04	NA	3E-05	
Endrin aldehyde			NA	NA		
Heptachlor epoxide	4.7E-09	6.7E-11	1.3E-05	9.1E+00	4E-04	6E-10
alpha-Chlordane	4.7E-09	6.7E-11	6.0E-05	1.3E+00	8E-05	9E-11
Herbicides						
Dicamba	1.4E-08	2.0E-10	3.0E-02	NA	5E-07	
MCPP	1.6E-05	2.3E-07	1.0E-03	NA	2E-02	
Metals						
Lead	1.1E-07	1.6E-09	NA	NA		
Selenium	3.5E-09	5.0E-11	5.0E-03	NA	7E-07	
Thallium	4.2E-09	6.1E-11	8.0E-05	NA	5E-05	
Totals - HQ & CR					**2E-02**	**5E-07**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic)/ Reference Dose (Oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (Oral)

Note Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-19

**CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM DERMAL CONTACT TO SURFACE & SUBSURFACE SOIL
CONSTRUCTION WORKER EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25**

Analyte	CDI (Nc) (mg/kg-day)	CDI (Car) (mg/kg-day)	Dermal RfD (mg/kg-day)	Dermal Slope Factor (mg/kg-day)-1	Hazard Quotient	Cancer Risk
Volatile Organics						
1,1,1-Trichloroethane			2.00E-02	NA		
Dichloroethene, 1,2- (total)			9.00E-03	NA		
Butanone, 2-			6.00E-01	NA		
Acetone			1.00E-01	NA		
Benzene			2.85E-03	3.05E-02		
Carbon Disulfide			6.30E-02	NA		
Chloroform			1.00E-02	6.10E-03		
Ethylbenzene			8.50E-02	NA		
Methylene Chloride			5.88E-02	7.65E-03		
Toluene			2.00E-01	NA		
Trichloroethene			NA	1.22E-02		
Xylene (total)			1.80E+00	NA		
Semivolatiles						
1,2,4-Trichlorobenzene			1.00E-02	NA		
1,4-Dichlorobenzene			NA	2.40E-02		
2,4-Dinitrotoluene			2.00E-03	6.80E-01		
2-Chlorophenol			5.00E-03	NA		
Methylnaphthalene, 2-			4.00E-02	NA		
4-Chloro-3-methylphenol			NA	NA		
4-Nitrophenol			NA	0.00E+00		
Acenaphthene			6.00E-02	NA		
Benzo(a)anthracene			NA	7.30E-01		
Benzo(a)pyrene			NA	1.83E+01		
Benzo(b)fluoranthene			NA	7.30E-01		
Benzo(g,h,i)perylene			NA	NA		
Benzo(k)fluoranthene			NA	7.30E-02		
Chrysene			NA	7.30E-03		
Dibenz(a,h)anthracene			NA	7.30E+00		
Fluoranthene			4.00E-02	NA		
Fluorene			4.00E-02	NA		
Indeno(1,2,3-cd)pyrene			NA	7.30E-01		
N-Nitrosodiphenylamine			NA	4.90E-03		
N-Nitrosodipropylamine			NA	7.00E+00		
Naphthalene			4.00E-02	NA		
Pentachlorophenol			3 00E-02	1 20E-01		
Phenanthrene			NA	NA		
Phenol			5.40E-01	NA		
Pyrene			3.00E-02	NA		
bis(2-Ethylhexyl)phthalate			1.00E-02	2.80E-02		
Pesticides/PCBs						
DDD, 4,4'-			NA	1.70E+00		
DDT, 4,4'-			1.00E-04	1.70E+00		
Aroclor-1254	4 93E-08	7.04E-10	1.80E-05	2.22E+00	3E-03	2E-09
Endosulfan I			6.00E-03	NA		
Endrin			3.00E-04	NA		
Endrin aldehyde			NA	NA		
Heptachlor epoxide			1 30E-05	9.10E+00		
alpha-Chlordane			6.00E-05	1 30E+00		
Herbicides						
Dicamba			3.00E-02	NA		
MCPP			NA	NA		
Metals						
Lead			NA	NA		
Selenium			4.50E-03	NA		
Thallium			8.00E-05	NA		
Totals - HQ & CR					**3E-03**	**2E-09**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic)/ Reference Dose (Oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (Oral)

Notes:
Cells in this table were intentionally left blank due to a lack of toxicity data or absorption factor.
USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since credible absorption factors (ABS) are not available for other chemicals of concern

Table G-20
Comparison of Exposure Point Concentrations Used in Calculating Risk After Implementation of Groundwater Remedial Actions
Seneca Army Depot, Romulus, New York - SEAD 25

COMPOUND	EPC calculated n Baseline Risk Assessmen RI Report May 1998 (1) mg/kg	EPCs After Achieving Clean-Up Goals (mg/L) NYSDEC AWQS-GA TOGs - June 1998	Source
Volatile Organics			
Trichloroethane, 1,1,1-	1.86E-02	5.00E-03	NYSDEC AWQS GA
Dichloroethane, 1,1-	7.49E-03	5.00E-03	NYSDEC AWQS GA
Dichloroethene, 1,1-	8.18E-04	8.18E-04	BRA EPC
Dichloroethene, 1,2- (total	1.28E-02	5.00E-03	NYSDEC AWQS GA
Butanone, 2-	9.93E-03	9.93E-03	BRA EPC
Benzene	3.71E-01	1.00E-03	NYSDEC AWQS GA
Bromoform	5.74E-03	5.74E-03	BRA EPC
Chloroform	1.61E-02	7.00E-03	NYSDEC AWQS GA
Dibromochloromethane	2.88E-03	2.88E-03	BRA EPC
Ethylbenzene	7.58E-02	5.00E-03	NYSDEC AWQS GA
Tetrachloroethene	8.18E-04	8.18E-04	BRA EPC
Toluene	2.01E-01	5.00E-03	NYSDEC AWQS GA
Trichloroethene	9.55E-03	5.00E-03	NYSDEC AWQS GA
Xylene (total)	1.28E+00	5.00E-03	NYSDEC AWQS GA
Semivolatiles			
2,4-Dimethylphenol	8.78E-03	1.00E-03	NYSDEC AWQS GA
Methylnaphthalene, 2-	9.81E-03	9.81E-03	BRA EPC
Dichlorobenzidine, 3,3'-	8.59E-03	5.00E-03	NYSDEC AWQS GA
Fluorene	5.59E-03	5.59E-03	BRA EPC
Naphthalene	1.51E-02	1.00E-02	NYSDEC AWQS GA
Phenanthrene	5.59E-03	5.59E-03	BRA EPC
Phenol	9.81E-03	1.00E-03	NYSDEC AWQS GA

(1) EPCs calculated as described in Section 6.2.4 of RI Report, May 1998

EPC - Exposure Point Concentration
BRA - Baseline Risk Assessment

TABLE G-21

CALCULATION OF INTAKE FROM INGESTION OF GROUNDWATER (DAILY)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Intake (Nc) (mg/kg-day)	Adult Intake (Nc) (mg/kg-day)	Adult/Child Intake * (Car) (mg/kg-day)	EPC Groundwater (mg/l)	Child Ingestion Rate (liters/day)	Adult Ingestion Rate (liters/day)	Exposure Frequency (days/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days)		
												Child(Nc)	Adult(Nc)	Car
Volatile Organics														
Trichloroethane, 1,1,1-	3.20E-04	1.37E-04		5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Dichloroethane, 1,1-	3.20E-04	1.37E-04		5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Dichloroethene, 1,1-	5.23E-05	2.24E-05	1.22E-05	8.18E-04	1	2	350	6	24	15	70	2,190	8,760	25,550
Dichloroethene, 1,2- (total)	3.20E-04	1.37E-04		5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Butanone, 2-	6.34E-04	2.72E-04		9.93E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Benzene	6.39E-05	2.74E-05	1.49E-05	1.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Bromoform	3.67E-04	1.57E-04	8.53E-05	5.74E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Chloroform	4.47E-04	1.92E-04	1.04E-04	7.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Dibromochloromethane	1.84E-04	7.88E-05	4.28E-05	2.88E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Ethylbenzene	3.20E-04	1.37E-04		5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Tetrachloroethene	5.23E-05	2.24E-05	1.22E-05	8.18E-04	1	2	350	6	24	15	70	2,190	8,760	25,550
Toluene	3.20E-04	1.37E-04		5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Trichloroethene			7.44E-05	5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Xylene (total)	3.20E-04	1.37E-04		5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Semivolatiles														
2,4-Dimethylphenol	6.39E-05	2.74E-05		1.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Methylnaphthalene, 2-	6.27E-04	2.69E-04		9.81E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Dichlorobenzidine, 3,3'-			7.44E-05	5.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Fluorene	3.57E-04	1.53E-04		5.59E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Naphthalene	6.39E-04	2.74E-04		1.00E-02	1	2	350	6	24	15	70	2,190	8,760	25,550
Phenanthrene				5.59E-03	1	2	350	6	24	15	70	2,190	8,760	25,550
Phenol	6.39E-05	2.74E-05		1.00E-03	1	2	350	6	24	15	70	2,190	8,760	25,550

EQUATION: **Intake (mg/kg-day) =** $\dfrac{\mathbf{CW \times IR \times EF \times ED}}{\mathbf{BW \times AT}}$

Variables:

CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Bodyweight (kg)
AT = Averaging Time (days)

Assumptions:

EPC - Groundwater Data - RME
1 (Child), 2 (Adult) RME Consumption Rates of GW)
350 (RME Resident)
30 (RME at 1 Residence)
15 (Child), 70 (Adult)
6 x 365 Child, 24 x 365 Adult(Nc), 70 x 365(Car)

Note:
* Adult and Child intakes weighted according to Risk Assessment Guidance for Superfund (RAGS) Part B (USEPA 1991).
The term (IR x ED / BW) in the intake equation, above is calculated as: [IR(child) x ED(child) / BW(child) + IR(adult) x ED(adult) / BW(adult)]

TABLE G-22

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS FROM INGESTION OF GROUNDWATER (DAILY) RESIDENTIAL EXPOSURE (FUTURE LAND USE) REASONABLE MAXIMUM EXPOSURE (RME) SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg/day)	Child CDI (Nc) (mg/kg/day)	Adult/Child CDI (Car) (mg/kg/day)	RfD (mg/kg/day)	Oral Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Volatile Organics								
Trichloroethane, 1,1,1-	1.37E-04	3.20E-04		2.00E-02	NA	7E-03	2E-02	
Dichloroethane, 1,1-	1.37E-04	3.20E-04		1.00E-01	NA	1E-03	3E-03	
Dichloroethene, 1,1-	2.24E-05	5.23E-05	1.22E-05	9.00E-03	6.00E-01	2E-03	6E-03	7E-06
Dichloroethene, 1,2- (total)	1.37E-04	3.20E-04		9.00E-03	NA	2E-02	4E-02	
Butanone, 2-	2.72E-04	6.34E-04		6.00E-01	NA	5E-04	1E-03	
Benzene	2.74E-05	6.39E-05	1.49E-05	3.00E-03	2.90E-02	9E-03	2E-02	4E-07
Bromoform	1.57E-04	3.67E-04	8.53E-05	2.00E-02	7.90E-03	8E-03	2E-02	7E-07
Chloroform	1.92E-04	4.47E-04	1.04E-04	1.00E-02	6.10E-03	2E-02	4E-02	6E-07
Dibromochloromethane	7.88E-05	1.84E-04	4.28E-05	2.00E-02	8.40E-02	4E-03	9E-03	4E-06
Ethylbenzene	1.37E-04	3.20E-04		1.00E-01	NA	1E-03	3E-03	
Tetrachloroethene	2.24E-05	5.23E-05	1.22E-05	1.00E-02	5.00E-02	2E-03	5E-03	6E-07
Toluene	1.37E-04	3.20E-04		2.00E-01	NA	7E-04	2E-03	
Trichloroethene			7.44E-05	NA	1.10E-02			8E-07
Xylene (total)	1.37E-04	3.20E-04		2.00E+00	NA	7E-05	2E-04	
Semivolatiles								
2,4-Dimethylphenol	2.74E-05	6.39E-05		2.00E-02	NA	1E-03	3E-03	
Methylnaphthalene, 2-	2.69E-04	6.27E-04		4.00E-02	NA	7E-03	2E-02	
Dichlorobenzidine, 3,3'-			7.44E-05	NA	4.50E-01			3E-05
Fluorene	1.53E-04	3.57E-04		4.00E-02	NA	4E-03	9E-03	
Naphthalene	2.74E-04	6.39E-04		4.00E-02	NA	7E-03	2E-02	
Phenanthrene				NA	NA			
Phenol				6.00E-01	NA			
Totals - HQ & CR						**9E-02**	**2E-01**	**5E-05**

Hazard Quotient = **Chronic Daily Intake (Noncarcinogenic) /Reference Dose (oral)**
Cancer Risk = **Chronic Daily Intake (Carcinogenic) x Slope Factor (oral)**

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

TABLE G-23

CALCULATION OF ABSORBED DOSE
FROM DERMAL CONTACT TO GROUNDWATER (while Showering)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Absorbed Dose (Nc) (mg/kg-day)	Adult Absorbed Dose (Nc) (mg/kg-day)	Adult/Child Absorbed Dose (Car) ** (mg/kg-day)	EPC - Cderm* Groundwater (mg/l)	Absorbed Dose/Event (mg-cm²/event)	Child Skin Surface Area Contact (cm²)	Adult Skin Surface Area Contact (cm²)	Permeability Coefficient *Kp* (cm/hr)	Exposure Time (hours/day)	Exposure Frequency (days/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Volumetric Conv. Factor (1 liter/1000 cm³)	Tau	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child(Nc)	Averaging Time (days) Adult(Nc)	Averaging Time (days) Car
Volatile Organics																			
Trichloroethane, 1,1,1-	1.83E-05	9.82E-06		1.76E-03	3.12E-08	9,180	23,000	1.7E-02	0.25	350	6	24	1E-03	0.57	15	70	2,190	8,760	25,550
Dichloroethane, 1,1-	1.72E-05	9.24E-06		4.03E-03	2.93E-08	9,180	23,000	8.9E-03	0.25	350	6	24	1E-03	0.35	15	70	2,190	8,760	25,550
Dichloroethene, 1,1-	1.96E-06	1.05E-06	5.29E-07	2.59E-04	3.34E-09	9,180	23,000	1.6E-02	0.25	350	6	24	1E-03	0.34	15	70	2,190	8,760	25,550
Dichloroethene, 1,2- (total)	1.67E-05	8.94E-06		3.52E-03	2.84E-08	9,180	23,000	1.0E-02	0.25	350	6	24	1E-03	0.34	15	70	2,190	8,760	25,550
Butanone, 2-	1.77E-05	9.52E-06		9.91E-03	3.02E-08	9,180	23,000	4.5E-03	0.25	350	6	24	1E-03	0.24	15	70	2,190	8,760	25,550
Benzene	6.50E-06	3.49E-06	1.75E-06	7.48E-04	1.11E-08	9,180	23,000	2.1E-02	0.25	350	6	24	1E-03	0.26	15	70	2,190	8,760	25,550
Bromoform	2.04E-05	1.10E-05	5.51E-06	5.59E-03	3.48E-08	9,180	23,000	2.6E-03	0.25	350	6	24	1E-03	3.00	15	70	2,190	8,760	25,550
Chloroform	3.02E-05	1.62E-05	8.14E-06	6.09E-03	5.14E-08	9,180	23,000	8.9E-03	0.25	350	6	24	1E-03	0.47	15	70	2,190	8,760	25,550
Dibromochloromethane	1.10E-05	5.90E-06	2.96E-06	2.75E-03	1.87E-08	9,180	23,000	3.9E-03	0.25	350	6	24	1E-03	1.60	15	70	2,190	8,760	25,550
Ethylbenzene	1.33E-04	7.15E-05		3.55E-03	2.27E-07	9,180	23,000	7.4E-02	0.25	350	6	24	1E-03	0.39	15	70	2,190	8,760	25,550
Tetrachloroethene	9.57E-06	5.14E-06	2.58E-06	2.59E-04	1.63E-08	9,180	23,000	4.8E-02	0.25	350	6	24	1E-03	0.90	15	70	2,190	8,760	25,550
Toluene	7.36E-05	3.95E-05		3.57E-03	1.25E-07	9,180	23,000	4.5E-02	0.25	350	6	24	1E-03	0.32	15	70	2,190	8,760	25,550
Trichloroethene			7.66E-06	2.95E-03	4.84E-08	9,180	23,000	1.6E-02	0.25	350	6	24	1E-03	0.55	15	70	2,190	8,760	25,550
Xylene (total)	9.51E-06	5.11E-06		3.41E-03	1.62E-08	9,180	23,000	5.5E-03	0.25	350	6	24	1E-03	0.39	15	70	2,190	8,760	25,550
Semivolatiles																			
2,4-Dimethylphenol	8.51E-06	4.57E-06		1.00E-03	1.45E-08	9,180	23,000	1.5E-02	0.25	350	6	24	1E-03	0.49	15	70	2,190	8,760	25,550
Methylnaphthalene, 2-	3.25E-06	1.74E-06		9.81E-03	5.53E-09	9,180	23,000	5.1E-04	0.25	350	6	24	1E-03	0.64	15	70	2,190	8,760	25,550
Dichlorobenzidine, 3,3'-			1.13E-05	4.88E-03	7.17E-08	9,180	23,000	1.7E-02	0.25	350	6	24	1E-03	0.39	15	70	2,190	8,760	25,550
Fluorene	7.68E-04	4.12E-04		5.57E-03	1.31E-06	9,180	23,000	1.8E-01	0.25	350	6	24	1E-03	0.89	15	70	2,190	8,760	25,550
Naphthalene	3.86E-04	2.07E-04		9.48E-03	6.58E-07	9,180	23,000	6.9E-02	0.25	350	6	24	1E-03	0.53	15	70	2,190	8,760	25,550
Phenanthrene				5.30E-03	2.07E-06	9,180	23,000	2.7E-01	0.25	350	6	24	1E-03	1.10	15	70	2,190	8,760	25,550
Phenol	4.64E-06	2.49E-06		9.93E-04	7.91E-09	9,180	23,000	5.5E-03	0.25	350	6	24	1E-03	1.10	15	70	2,190	8,760	25,550

EQUATION:

$$\frac{DA \times SA \times EF \times ED}{BW \times AT}$$

Variables:	Assumptions:	Variables:	Assumptions:
DA = Absorbed Dose per Event (mg/cm²-event)	Calculated from EPA, 1992	ED = Exposure Duration (years)	30 (RME at 1 Residence)
SA = Surface Area Contact (cm²)	9,180 (Child), 23,000 (Adult) RME Body Surface Area	BW = Body Weight (kg)	15 (Child), 70 (Adult)
Kp = Permeability Coefficient (cm/hr)	Compound Specific, EPA, 1992	CF = Volumetric Conv. Factor	0.001
EF = Exposure Frequency (days/year)	350 (RME Adult Resident)	AT = Averaging Time (days)	6 x 365(Nc)(Child), 24 x 365(Nc)(Adult), 70 x 365(Car)
B, Tau = Compound-Specific Constants	From EPA, 1992	ET = Exposure Time (hrs/day)	.25 (RME for Showering)

Notes:

Cells in this table were intentionally left blank due to a lack of toxicity data

* Cderm is the concentration of chemical available for dermal absorption after accounting for partitioning between the air and water in the shower. The calculation of Cderm is shown in Table 6-40.

** Adult and Child intakes weighted according to Risk Assessment Guidance for Superfund (RAGS) Part B (USEPA 1991).

The term (SA x ED / BW) in the intake equation, above is calculated as [SA(child) x ED(child) / BW(child) + SA(adult) x ED(adult) / BW(adult)]

TABLE G-24

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS FROM DERMAL CONTACT TO GROUNDWATER (while Showering) RESIDENTIAL EXPOSURE (FUTURE LAND USE) REASONABLE MAXIMUM EXPOSURE (RME) SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg/day)	Child CDI (Nc) (mg/kg/day)	Adult/Child CDI (Car) (mg/kg/day)	Dermal RfD (mg/kg/day)	Dermal Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Volatile Organics								
Trichloroethane, 1,1,1-	9.82E-06	1.83E-05		2.00E-02	NA	5E-04	9E-04	
Dichloroethane, 1,1-	9.24E-06	1.72E-05		1.00E-01	NA	9E-05	2E-04	
Dichloroethene, 1,1-	1.05E-06	1.96E-06	5.29E-07	8.10E-03	6.67E-01	1E-04	2E-04	4E-07
Dichloroethene, 1,2- (total)	8.94E-06	1.67E-05		9.00E-03	NA	1E-03	2E-03	
Butanone, 2-	9.52E-06	1.77E-05		6.00E-01	NA	2E-05	3E-05	
Benzene	3.49E-06	6.50E-06	1.75E-06	2.85E-03	3.05E-02	1E-03	2E-03	5E-08
Bromoform	1.10E-05	2.04E-05	5.51E-06	1.50E-02	1.05E-02	7E-04	1E-03	6E-08
Chloroform	1.62E-05	3.02E-05	8.14E-06	1.00E-02	6.10E-03	2E-03	3E-03	5E-08
Dibromochloromethane	5.90E-06	1.10E-05	2.96E-06	1.50E-02	1.12E-01	4E-04	7E-04	3E-07
Ethylbenzene	7.15E-05	1.33E-04		8.50E-02	NA	8E-04	2E-03	
Tetrachloroethene	5.14E-06	9.57E-06	2.58E-06	9.00E-03	5.56E-02	6E-04	1E-03	1E-07
Toluene	3.95E-05	7.36E-05		2.00E-01	NA	2E-04	4E-04	
Trichloroethene			7.66E-06	NA	1.22E-02			9E-08
Xylene (total)	5.11E-06	9.51E-06		1.80E+00	NA	3E-06	5E-06	
Semivolatiles								
2,4-Dimethylphenol				2.00E-02	NA			
Methylnaphthalene, 2-	1.74E-06	3.25E-06		4.00E-02	NA	4E-05	8E-05	
Dichlorobenzidine, 3,3'-			1.13E-05	NA	4.50E-01			5E-06
Fluorene	4.12E-04	7.68E-04		4.00E-02	NA	1E-02	2E-02	
Naphthalene	2.07E-04	3.86E-04		4.00E-02	NA	5E-03	1E-02	
Phenanthrene				NA	NA			
Phenol				5.40E-01	NA			
Totals - HQ & CR						**2E-02**	**4E-02**	**6E-06**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic) /Reference Dose (oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (oral)

Notes:
Cells in this table were intentionally left blank due to a lack of toxicity data or absorption factor.

TABLE G-25

CALCULATION OF INTAKE FROM INHALATION OF GROUNDWATER (while Showering)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Intake (Nc) (mg/kg-day)	Adult Intake (Nc) (mg/kg-day)	Adult/Child Intake * (Car) (mg/kg-day)	EPC Air (mg/m³)	Child Inhalation Rate (m³/hr)	Adult Inhalation Rate (m³/hr)	Exposure Frequency (hrs/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child(Nc)	Averaging Time (days) Adult(Nc)	Averaging Time (days) Car
Volatile Organics														
Trichloroethane, 1,1,1-	1.5E-04	7.3E-05		2.57E-02	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Dichloroethane, 1,1-	4.4E-05	2.2E-05		7.69E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Dichloroethene, 1,1-			6.5E-06	4.42E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Dichloroethene, 1,2- (total)				1.17E-02	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Butanone, 2-	5.6E-07	2.8E-07		9.70E-05	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Benzene	1.1E-05	5.7E-06	2.9E-06	1.99E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Bromoform			1.7E-06	1.13E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Chloroform			1.1E-05	7.17E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Dibromochloromethane				1.02E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Ethylbenzene	6.6E-05	3.3E-05		1.15E-02	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Tetrachloroethene			6.5E-06	4.42E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Toluene	6.5E-05	3.2E-05		1.14E-02	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Trichloroethene			2.4E-05	1.62E-02	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Xylene (total)				1.26E-02	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Semivolatiles														
2,4-Dimethylphenol				8.49E-07	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Methylnaphthalene, 2-				8.33E-06	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Dichlorobenzidine, 3,3'-				9.13E-04	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Fluorene				1.28E-04	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Naphthalene				4.10E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Phenanthrene				2.29E-03	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550
Phenol				5.67E-05	0.36	0.83	87.5	6	24	15	70	2,190	8,760	25,550

EQUATION: Intake (mg/kg-day) =

$$\frac{CA \times IR \times EF \times ED}{BW \times AT}$$

Variables:

CA = Chemical Concentration in Air (mg/m³)
IR = Inhalation Rate (m³/hr)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Bodyweight (kg)
AT = Averaging Time (days)

Assumptions:

EPC - Groundwater Data - RME
0.83 (Adult) .36 (Child)
87.5 (.25 hrs/day x 350 days/yr)
30 (RME at 1 Residence)
15 (Child), 70 (Adult)
6 x 365(Nc)(Child), 24 x 365(Nc)(Adult), 70 x 365(Car)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data

* Adult and Child intakes weighted according to Risk Assessment Guidance for Superfund (RAGS) Part B (USEPA 1991).
The term (IR x ED / BW) in the intake equation, above is calculated as: [IR(child) x ED(child) / BW(child) + IR(adult) x ED(adult) / BW(adult)]

TABLE G-26

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM INHALATION OF GROUNDWATER (while Showering)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg/day)	Child CDI (Nc) (mg/kg/day)	Adult/Child CDI (Car) (mg/kg-day)	Inhalation RfD (mg/kg/day)	Inhalation Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Volatile Organics								
Trichloroethane, 1,1,1-	7.3E-05	1.5E-04		2.9E-01	NA	3E-04	5E-04	
Dichloroethane, 1,1-	2.2E-05	4.4E-05		1.4E-01	NA	2E-04	3E-04	
Dichloroethene, 1,1-			6.49E-06	NA	1.8E-01			1E-06
Dichloroethene, 1,2- (total)				NA	NA			
Butanone, 2-	2.8E-07	5.6E-07		2.9E-01	NA	1E-06	2E-06	
Benzene	5.7E-06	1.1E-05	2.93E-06	1.7E-03	2.9E-02	3E-03	7E-03	9E-08
Bromoform			1.66E-06	NA	3.9E-03			6E-09
Chloroform			1.05E-05	NA	8.1E-02			8E-07
Dibromochloromethane				NA	NA			
Ethylbenzene	3.3E-05	6.6E-05		2.9E-01	NA	1E-04	2E-04	
Tetrachloroethene			6.49E-06	NA	2.0E-03			1E-08
Toluene	3.2E-05	6.5E-05		1.1E-01	NA	3E-04	6E-04	
Trichloroethene			2.38E-05	NA	6.0E-03			1E-07
Xylene (total)				NA	NA			
Semivolatiles								
2,4-Dimethylphenol				NA	NA			
Methylnaphthalene, 2-				NA	NA			
Dichlorobenzidine, 3,3'-				NA	NA			
Fluorene				NA	NA			
Naphthalene				NA	NA			
Phenanthrene				NA	NA			
Phenol				NA	NA			
Totals - HQ & CR						**4E-03**	**8E-03**	**2E-06**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic) /Reference Dose (oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (oral)

Notes:
Cells in this table were intentionally left blank due to a lack of toxicity data or absorption factor.

TABLE G-27

CALCULATION OF AIR CONCENTRATION IN SHOWER
FROM VOLATILIZATION OF GROUNDWATER (daily)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	EPC Air All-Site Wells (mg/m^3)	Time of Shower -Ts (min)	Flow Rate of Shower - Fw (L/min)	EPC - RME Groundwater (mg/l)	Flow Rate of Air in Shower-Fa (m^3/min)	Volume of Bathroom-Vb (m^3)	Henry Laws Constant-H (m^3-atm/mol)	Asymptotic Air Conc.-Cinf (mg/m^3)	Rate Constant-K (1/min)	Efficiency of Release-E (unitless)	Efficiency of Release for TCE E-TCE	Henry Laws Constant-TCE (m^3-atm/mol)	Fraction Emitted* (percent)	Cderm** (Water) (mg/l)
Volatile Organics														
Trichloroethane, 1,1,1-	2.57E-02	15	19	5.00E-03	2.4	12	1.44E-02	3.76E-02	0.20	0.95	0.6	0.0091	64.87%	1.76E-03
Dichloroethane, 1,1-	7.69E-03	15	19	5.00E-03	2.4	12	4.31E-03	1.12E-02	0.20	0.28	0.6	0.0091	19.42%	4.03E-03
Dichloroethene, 1,1-	4.42E-03	15	19	8.18E-04	2.4	12	3.40E-02	6.48E-03	0.20	1.00	0.6	0.0091	68.33%	2.59E-04
Dichloroethene, 1,2- (total)	1.17E-02	15	19	5.00E-03	2.4	12	6.56E-03	1.71E-02	0.20	0.43	0.6	0.0091	29.55%	3.52E-03
Butanone, 2-	9.70E-05	15	19	9.93E-03	2.4	12	2.74E-05	1.42E-04	0.20	0.0018	0.6	0.0091	0.12%	9.91E-03
Benzene	1.99E-03	15	19	1.00E-03	2.4	12	5.59E-03	2.92E-03	0.20	0.37	0.6	0.0091	25.18%	7.48E-04
Bromoform	1.13E-03	15	19	5.74E-03	2.4	12	5.52E-04	1.65E-03	0.20	0.036	0.6	0.0091	2.49%	5.59E-03
Chloroform	7.17E-03	15	19	7.00E-03	2.4	12	2.87E-03	1.05E-02	0.20	0.19	0.6	0.0091	12.93%	6.09E-03
Dibromochloromethane	1.02E-03	15	19	2.88E-03	2.4	12	9.90E-04	1.49E-03	0.20	0.065	0.6	0.0091	4.46%	2.75E-03
Ethylbenzene	1.15E-02	15	19	5.00E-03	2.4	12	6.43E-03	1.68E-02	0.20	0.42	0.6	0.0091	28.97%	3.55E-03
Tetrachloroethene	4.42E-03	15	19	8.18E-04	2.4	12	2.59E-02	6.48E-03	0.20	1.00	0.6	0.0091	68.33%	2.59E-04
Toluene	1.14E-02	15	19	5.00E-03	2.4	12	6.37E-03	1.66E-02	0.20	0.42	0.6	0.0091	28.70%	3.57E-03
Trichloroethene	1.62E-02	15	19	5.00E-03	2.4	12	9.10E-03	2.38E-02	0.20	0.60	0.6	0.0091	41.00%	2.95E-03
Xylene (total)	1.26E-02	15	19	5.00E-03	2.4	12	7.04E-03	1.84E-02	0.20	0.46	0.6	0.0091	31.72%	3.41E-03
Semivolatiles														
2,4-Dimethylphenol	8.49E-07	15	19	1.00E-03	2.4	12	2.38E-06	1.24E-06	0.20	0.00016	0.6	0.0091	0.01%	1.00E-03
Methylnaphthalene, 2-	8.33E-06	15	19	9.81E-03	2.4	12	5.12E-04	1.22E-05	0.20	0.00016	0.6	0.0091	0.01%	9.81E-03
Dichlorobenzidine, 3,3'-	9.13E-04	15	19	5.00E-03	2.4	12	8.33E-07	1.34E-03	0.20	0.034	0.6	0.0091	2.31%	4.88E-03
Fluorene	1.28E-04	15	19	5.59E-03	2.4	12	6.42E-05	1.87E-04	0.20	0.0042	0.6	0.0091	0.29%	5.57E-03
Naphthalene	4.10E-03	15	19	1.00E-02	2.4	12	1.15E-03	6.00E-03	0.20	0.076	0.6	0.0091	5.18%	9.48E-03
Phenanthrene	2.29E-03	15	19	5.59E-03	2.4	12	1.59E-04	3.36E-03	0.20	0.076	0.6	0.0091	5.18%	5.30E-03
Phenol	5.67E-05	15	19	1.00E-03	2.4	12	4.54E-07	8.30E-05	0.20	0.010	0.6	0.0091	0.72%	9.93E-04

Concentration in Air (mg/m^3) = Cinf[1+(1/(kTs)(exp(-kTs)-1)]

Asymptotic Air Conc. - Cinf (mg/m^3) = [(E)(Fw)(Ct)]/Fa

Rate Constant - k (L/min) = Fa/Vb

Efficiency of Release - E (unitless) = (E-tce)(H)/(H-tce)

*** Fraction Emitted (fe) = (EPCair x Fa) / (EPCgw x Fw)**

**** Cderm = EPCgw x (1 - fe)**

Variables:

CA = Chemical Concentration in Air (mg/m^3)
Ts = Time of Shower (minutes)
Fw = Flow Rate of Shower (L/min)
Fa = Flow Rate of Air in Shower (m^3/min)
Vb = Volume of Bathroom (m^3)

Assumptions:

EPC - Groundwater Data - RME
15 (RME default)
19 (Estimated RME)
2.4 (Average Air Flow)
12 (Average Bathroom Volume)

Table G-28
Comparison of Exposure Point Concentrations Used in Calculating Risk After Implementation of Sediment Remedial Actions
Seneca Army Depot, Romulus, New York - SEAD 25

Compound	EPC calculated n Baseline Risk Assessmen RI Report May 1998 (1) mg/kg	EPCs assuming source removal (2) mg/kg
Volatile Organics		
2-Butanone	1.14E-02	6.00E-03
Acetone	7.56E-03	6.00E-03
Carbon Disulfide	8.43E-03	6.00E-03
Toluene	8.43E-03	6.00E-03
Semivolatile Organics		
2-Methylnaphthalene	2.49E-01	4.50E-01
Acenaphthene	6.26E-01	4.50E-01
Acenaphthylene	4.72E+00	4.50E-01
Anthracene	1.63E+01	4.50E-01
Benzo(a)anthracene	4.89E+01	4.50E-01
Benzo[a]pyrene	8.42E+01	4.50E-01
Benzo(b)fluoranthene	3.83E+03	4.50E-01
Benzo(g,h,i)perylene	8.43E+01	4.50E-01
Benzo[k]fluoranthene	1.48E+01	4.50E-01
Carbazole	1.39E+00	4.50E-01
Chrysene	2.33E+02	4.50E-01
Di-n-butylphthalate	1.68E+00	4.50E-01
Dibenz(a,h)anthracene	1.92E+01	4.50E-01
Dibenzofuran	4.03E-01	4.50E-01
Fluoranthene	1.18E+03	4.50E-01
Fluorene	1.34E+00	4.50E-01
Indeno[1,2,3-cd]pyrene	6.35E+01	4.50E-01
Naphthalene	3.28E-01	4.50E-01
Phenanthrene	4.50E+00	4.50E-01
Pyrene	9.84E+00	4.50E-01
Pesticides		
4,4'-DDD	4.62E+01	2.25E-03
4,4'-DDE	7.41E-02	2.25E-03
4,4'-DDT	2.88E-01	2.25E-03
Aldrin	4.99E-03	1.15E-03
Endosulfan sulfate	2.89E-03	2.25E-03
Endrin aldehyde	5.06E-03	2.25E-03
Endrin ketone	6.46E-02	2.25E-03
Heptachlor	3.50E-02	1.15E-03
Heptachlor epoxide	1.80E-03	1.15E-03
alpha-Chlordane	3.78E-01	1.15E-03
beta-BHC	1.43E-03	1.15E-03
gamma-Chlordane	5.40E-01	1.15E-03
Metals		
Aluminum	1.38E+04	1.04E+01
Antimony	1.63E+00	5.40E-04
Arsenic	7.23E+00	7.30E-03
Barium	8.54E+01	6.54E-02
Beryllium	7.02E-01	5.40E-04
Cadmium	1.13E+02	3.50E-05
Calcium	8.43E+04	9.94E+00
Chromium	2.47E+01	1.82E-02
Cobalt	1.62E+01	9.00E-03
Copper	7.58E+01	1.84E-02
Iron	3.45E+04	2.08E+01
Lead	1.91E+02	1.12E-02
Magnesium	1.14E+04	4.26E+00
Manganese	5.15E+02	4.52E-01
Mercury	3.98E-01	2.00E-05
Nickel	4.80E+01	3.15E-02
Potassium	2.21E+03	1.63E+00
Selenium	1.03E+00	4.45E-04
Silver	3.83E+01	6.00E-04
Sodium	5.23E+02	8.53E-02
Thallium	9.34E-01	8.00E-04
Vanadium	4.91E+01	1.87E-02
Zinc	2.65E+02	7.10E-02

(1) EPCs calculated as described in Section 6.2.4 of RI Report, May 1998
(2) Since all samples points except for SD25-10 exceeded clean-up goals, and would therefore be removed, data from SD25-10 was used as the EPC (1/2 MDL used if ND).

EPC - Exposure Point Concentration
BRA - Baseline Risk Assessment

10/30/98

TABLE G-29

CALCULATION OF ABSORBED DOSE FROM DERMAL CONTACT TO ONSITE SEDIMENT
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Absorbed Dose (Nc) (mg/kg-day)	Adult Absorbed Dose (Nc) (mg/kg-day)	Adult/Child Absorbed Dose (Car)* (mg/kg-day)	EPC Sediment (mg/kg)	Conv. Factor (kg/mg)	Child Skin Surface Area Contact (cm^2/event)	Adult Skin Surface Area Contact (cm^2/event)	Adherence Factor (mg sed/cm^2)	Absorption Factor (unitless)	Exposure Frequency (events/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child(Nc)	Averaging Time (days) Adult(Nc)	Averaging Time (days) Car
Volatile Organics																	
2-Butanone				6.00E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Acetone				6.00E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Carbon Disulfide				6.00E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Toluene				6.00E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Semivolatile Organics																	
2-Methylnaphthalene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Acenaphthene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Acenaphthylene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Anthracene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Benzo(a)anthracene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Benzo[a]pyrene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Benzo(b)fluoranthene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Benzo(g,h,i)perylene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Benzo[k]fluoranthene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Carbazole				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Chrysene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Di-n-butylphthalate				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Dibenz(a,h)anthracene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Dibenzofuran				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Fluoranthene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Fluorene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Indeno[1,2,3-cd]pyrene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Naphthalene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Phenanthrene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Pyrene				4.50E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Pesticides																	
4,4'-DDD				2.25E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
4,4'-DDE				2.25E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
4,4'-DDT				2.25E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Aldrin				1.15E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Endosulfan sulfate				2.25E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Endrin aldehyde				2.25E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Endrin ketone				2.25E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Heptachlor				1.15E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Heptachlor epoxide				1.15E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
alpha-Chlordane				1.15E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
beta-BHC				1.15E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
gamma-Chlordane				1.15E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550

TABLE G-29 (CON'T)

CALCULATION OF ABSORBED DOSE FROM DERMAL CONTACT TO ONSITE SEDIMENT
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Absorbed Dose (Nc) (mg/kg-day)	Adult Absorbed Dose (Nc) (mg/kg-day)	Adult/Child Absorbed Dose (Car)* (mg/kg-day)	EPC Sediment (mg/kg)	Conv. Factor (kg/mg)	Child Skin Surface Area Contact (cm²/event)	Adult Skin Surface Area Contact (cm²/event)	Adherence Factor (mg sed/cm²)	Absorption Factor (unitless)	Exposure Frequency (events/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child(Nc)	Adult(Nc)	Car
Metals																	
Aluminum				1.04E+01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Antimony				5.40E-04	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Arsenic	1.3E-10	1.1E-10	4.9E-11	7.30E-03	1.0E-06	2,170	8,680	1.0	0.001	45	6	24	15	70	2,190	8,760	25,550
Barium				6.54E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Beryllium				5.40E-04	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Cadmium	6.2E-12	5.4E-12		3.50E-05	1.0E-06	2,170	8,680	1.0	0.01	45	6	24	15	70	2,190	8,760	25,550
Calcium				9.94E+00	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Chromium				1.82E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Cobalt				9.00E-03	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Copper				1.84E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Iron				2.08E+01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Lead				1.12E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Magnesium				4.26E+00	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Manganese				4.52E-01	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Mercury				2.00E-05	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Nickel				3.15E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Potassium				1.63E+00	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Selenium				4.45E-04	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Silver				6.00E-04	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Sodium				8.53E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Thallium				8.00E-04	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Vanadium				1.87E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550
Zinc				7.10E-02	1.0E-06	2,170	8,680	1.0		45	6	24	15	70	2,190	8,760	25,550

EQUATION: Absorbed Dose (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Variables:	Assumptions:	Variables:	Assumptions:
CS = Chemical Concentration in Sediment (mg/kg)	EPC - Sediment Data - RME	EF = Exposure Frequency (events/year)	45 (RME - All Residents)(Assessor derived)
CF = Conversion Factor (10-6 kg/mg)	10-6	ED = Exposure Duration (years)	30 (RME at 1 Residence)
SA = Surface Area Contact (cm²)	2,170/8,680 (RME Child/Adult)	BW = Bodyweight (kg)	15 kg (child) 70 kg (adult)
AF =Soil to Skin Adherence Factor (mg/cm²)	1.0 (RME all receptors)	AT = Averaging Time (days)	6 x 365 Child 24 x 365 Adult (Nc), 70 x 365 (Car)
ABS = Absorption Factor (unitless)	Compound Specific		

Notes:
Cells in this table were intentionally left blank due to a lack of toxicity data or absorption factor.
USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since credible absorption factors (ABS) are not available for other chemicals of concern.
* Adult and Child intakes weighted according to Risk Assessment Guidance for Superfund (RAGS) Part B (USEPA 1991).
The term (SA x ED / BW) in the intake equation, above is calculated as: [SA(child) x ED(child) / BW(child) + SA(adult) x ED(adult) / BW(adult)]

TABLE G-30

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS
FROM DERMAL CONTACT TO SEDIMENT
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg-day)	Child CDI (Nc) (mg/kg-day)	Adult/Child CDI (Car) (mg/kg-day)	Dermal RfD (mg/kg-day)	Dermal Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Volatile Organics								
2-Butanone				6.0E-01	NA			
Acetone				1.0E-01	NA			
Carbon Disulfide				1.0E-01	NA			
Toluene				2.0E-01	NA			
Semivolatile Organics								
2-Methylnaphthalene				NA	NA			
Acenaphthene				6.0E-02	NA			
Acenaphthylene				NA	NA			
Anthracene				3.0E-01	NA			
Benzo(a)anthracene				NA	3.7E-01			
Benzo[a]pyrene				NA	1.8E+01			
Benzo(b)fluoranthene				NA	3.7E-01			
Benzo(g,h,i)perylene				NA	NA			
Benzo[k]fluoranthene				NA	7.3E-02			
Carbazole				NA	2.0E-02			
Chrysene				NA	3.7E-02			
Di-n-butylphthalate				9.0E-02	NA			
Dibenz(a,h)anthracene				NA	3.7E+00			
Dibenzofuran				NA	NA			
Fluoranthene				4.0E-02	NA			
Fluorene				4.0E-02	NA			
Indeno[1,2,3-cd]pyrene				NA	7.3E-01			
Naphthalene				NA	NA			
Phenanthrene				NA	NA			
Pyrene				3.0E-02	NA			
Pesticides								
4,4'-DDD				5.0E-04	2.4E-01			
4,4'-DDE				NA	NA			
4,4'-DDT				5.0E-04	3.4E-01			
Aldrin				3.0E-05	1.7E+01			
Endosulfan sulfate				5.0E-05	NA			
Endrin aldehyde				NA	NA			
Endrin ketone				NA	NA			
Heptachlor				5.0E-04	4.5E+00			
Heptachlor epoxide				1.3E-05	9.1E+00			
alpha-Chlordane				6.0E-05	1.3E+00			
beta-BHC				NA	1.8E+00			
gamma-Chlordane				NA	NA			
Metals								
Aluminum				NA	NA			
Antimony				4.0E-04	NA			
Arsenic	1.1E-10	1.3E-10	4.9E-11	3.1E-04	1.7E+00	4E-07	4E-07	8E-11
Barium				7.0E-01	NA			
Beryllium				5.0E+00	4.3E-03			
Cadmium	5.4E-12	6.2E-12		8.3E-03	NA	6E-10	7E-10	
Calcium				NA	NA			
Chromium				1.0E-04	NA			
Cobalt				NA	NA			
Copper				8.0E-02	NA			
Iron				NA	NA			
Lead				NA	NA			
Magnesium				NA	NA			
Manganese				5.0E-03	NA			
Mercury				3.0E-04	NA			
Nickel				4.0E-01	NA			
Potassium				NA	NA			
Selenium				8.3E-03	NA			
Silver				5.0E-03	NA			
Sodium				NA	NA			
Thallium				8.0E-05	NA			
Vanadium				7.0E-03	NA			
Zinc				6.0E-01	NA			
Totals - HQ & CR						4E-07	4E-07	8E-11

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic)/ Reference Dose (Oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (Oral)

Note Cells in this table were intentionally left blank due to a lack of toxicity data
USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since credible absorption factors (ABS) are not available for other chemicals of concern

TABLE G-31

CALCULATION OF INTAKE FROM THE INGESTION OF ONSITE SEDIMENT
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Intake (Nc) (mg/kg-day)	Adult Intake (Nc) (mg/kg-day)	Adult/Child Intake * (Car) (mg/kg-day)	EPC Sediment (mg/kg)	Child Ingestion Rate (mg sed/day)	Adult Ingestion Rate (mg sed/day)	Conv. Factor (kg/mg)	Fraction Ingested (unitless)	Exposure Frequency (days/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child(Nc)	Averaging Time (days) Adult(Nc)	Averaging Time (days) Car
Volatile Organics																
2-Butanone	9 9E-09	1.1E-09		6 00E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Acetone	9 9E-09	1 1E-09		6.00E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Carbon Disulfide	9.9E-09	1.1E-09		6.00E-03	200	100	1 0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Toluene	9 9E-09	1.1E-09		6.00E-03	200	100	1 0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Semivolatile Organics																
2-Methylnaphthalene				4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Acenaphthene	7 4E-07	7.9E-08		4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Acenaphthylene				4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Anthracene	7.4E-07	7 9E-08		4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Benzo(a)anthracene			9.1E-08	4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Benzo[a]pyrene			9.1E-08	4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Benzo(b)fluoranthene			9.1E-08	4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Benzo(g,h,i)perylene				4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Benzo[k]fluoranthene			9.1E-08	4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Carbazole			9 1E-08	4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Chrysene			9 1E-08	4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Di-n-butylphthalate	7.4E-07	7 9E-08		4.50E-01	200	100	1 0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Dibenz(a,h)anthracene			9.1E-08	4 50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Dibenzofuran				4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Fluoranthene	7 4E-07	7.9E-08		4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Fluorene	7.4E-07	7.9E-08		4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Indeno[1,2,3-cd]pyrene			9.1E-08	4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Naphthalene				4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Phenanthrene				4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Pyrene	7.4E-07	7 9E-08		4.50E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Pesticides																
4,4'-DDD	3.7E-09	4.0E-10	4.5E-10	2.25E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
4,4'-DDE				2.25E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
4,4'-DDT	3.7E-09	4.0E-10	4.5E-10	2.25E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Aldrin	1.9E-09	2.0E-10	2.3E-10	1.15E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Endosulfan sulfate	3.7E-09	4.0E-10		2.25E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Endrin aldehyde				2.25E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Endrin ketone				2.25E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Heptachlor	1.9E-09	2.0E-10	2.3E-10	1.15E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Heptachlor epoxide	1.9E-09	2.0E-10	2.3E-10	1.15E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
alpha-Chlordane	1.9E-09	2.0E-10	2.3E-10	1.15E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
beta-BHC			2.3E-10	1.15E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
gamma-Chlordane				1.15E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550

TABLE G-31 (CON'T)

CALCULATION OF INTAKE FROM THE INGESTION OF ONSITE SEDIMENT
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Intake (Nc) (mg/kg-day)	Adult Intake (Nc) (mg/kg-day)	Adult/Child Intake * (Car) (mg/kg-day)	EPC Sediment (mg/kg)	Child Ingestion Rate (mg sed/day)	Adult Ingestion Rate (mg sed/day)	Conv. Factor (kg/mg)	Fraction Ingested (unitless)	Exposure Frequency (days/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days)		
														Child(Nc)	Adult(Nc)	Car
Metals																
Aluminum				1.04E+01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Antimony	8.9E-10	9.5E-11		5.40E-04	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Arsenic	1.2E-08	1.3E-09	1.5E-09	7.30E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Barium	1.1E-07	1.2E-08		6.54E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Beryllium	8.9E-10	9.5E-11	1 1E-10	5.40E-04	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Cadmium	5.8E-11	6.2E-12		3.50E-05	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Calcium				9.94E+00	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Chromium	3.0E-08	3.2E-09		1.82E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Cobalt				9.00E-03	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Copper	3 0E-08	3.2E-09		1 84E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Iron				2.08E+01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Lead				1.12E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Magnesium				4.26E+00	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Manganese	7.4E-07	8.0E-08		4.52E-01	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Mercury	3.3E-11	3.5E-12		2.00E-05	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Nickel	5.2E-08	5.5E-09		3.15E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Potassium				1.63E+00	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Selenium	7.3E-10	7 8E-11		4.45E-04	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Silver	9 9E-10	1.1E-10		6.00E-04	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Sodium				8.53E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Thallium	1.3E-09	1.4E-10		8.00E-04	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Vanadium	3.1E-08	3.3E-09		1 87E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550
Zinc	1.2E-07	1 3E-08		7.10E-02	200	100	1.0E-06	1	45	6	24	15	70	2,190	8,760	25,550

EQUATION: **Intake (mg/kg-day) =**

$$\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$$

Variables:

CS = Chemical Concentration in Sediment (mg sediment/kg)
IR = Ingestion Rate (mg sediment/day)
CF = Conversion Factor (10-6 kg/mg)
FI = Fraction Ingested (unitless)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Bodyweight (kg)
AT = Averaging Time (days)

Assumptions:

EPC - Sediment Data - RME
100 (RME Adult)/ 200 (RME Child)
10-6
1
45 (RME all residents) equals surface water exposure
30 (RME at 1 Residence)
70 (Adult male)/ 15 (Child 6-7)
6 x 365 Child 24 x 365 Adult (NC), 70 x 365 (C)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
* Adult and Child intakes weighted according to Risk Assessment Guidance for Superfund (RAGS) Part B (USEPA 1991).
The term (IR x ED / BW) in the intake equation, above is calculated as: [IR(child) x ED(child) / BW(child) + IR(adult) x ED(adult) / BW(adult)]

TABLE G-32

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS FROM THE INGESTION OF ONSITE SEDIMENT RESIDENTIAL EXPOSURE (FUTURE LAND USE) REASONABLE MAXIMUM EXPOSURE (RME) SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg-day)	Child CDI (Nc) (mg/kg-day)	Adult/Child CDI (Car) (mg/kg-day)	RfD (mg/kg-day)	Oral Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Volatile Organics								
2-Butanone	1.06E-09	9.9E-09		6.0E-01	NA	2E-09	2E-08	
Acetone	1.06E-09	9.9E-09		1.0E-01	NA	1E-08	1E-07	
Carbon Disulfide	1.06E-09	9.9E-09		1.0E-01	NA	1E-08	1E-07	
Toluene	1.06E-09	9.9E-09		2.0E-01	NA	5E-09	5E-08	
Semivolatile Organics								
2-Methylnaphthalene				NA	NA			
Acenaphthene	7.93E-08	7.4E-07		6.0E-02	NA	1E-06	1E-05	
Acenaphthylene				NA	NA			
Anthracene	7.93E-08	7.4E-07		3.0E-01	NA	3E-07	2E-06	
Benzo(a)anthracene			9.1E-08	NA	7.3E-01			7E-08
Benzo[a]pyrene			9.1E-08	NA	7.3E+00			7E-07
Benzo(b)fluoranthene			9.1E-08	NA	7.3E-01			7E-08
Benzo(g,h,i)perylene				NA	NA			
Benzo[k]fluoranthene			9.1E-08	NA	7.3E-02			7E-09
Carbazole			9.1E-08	NA	2.0E-02			2E-09
Chrysene			9.1E-08	NA	7.3E-02			7E-09
Di-n-butylphthalate	7.93E-08	7.4E-07		1.0E-01	NA	8E-07	7E-06	
Dibenz(a,h)anthracene			9.1E-08	NA	7.3E+00			7E-07
Dibenzofuran				NA	NA			
Fluoranthene	7.93E-08	7.4E-07		4.0E-02	NA	2E-06	2E-05	
Fluorene	7.93E-08	7.4E-07		4.0E-02	NA	2E-06	2E-05	
Indeno[1,2,3-cd]pyrene			9.1E-08	NA	7.3E-01			7E-08
Naphthalene				NA	NA			
Phenanthrene				NA	NA			
Pyrene	7.93E-08	7.4E-07		3.0E-02	NA	3E-06	2E-05	
Pesticides								
4,4'-DDD	3.96E-10	3.7E-09	4.5E-10	5.0E-04	2.4E-01	8E-07	7E-06	1E-10
4,4'-DDE				NA	NA			
4,4'-DDT	3.96E-10	3.7E-09	4.5E-10	5.0E-04	3.4E-01	8E-07	7E-06	2E-10
Aldrin	2.03E-10	1.9E-09	2.3E-10	3.0E-05	1.7E+01	7E-06	6E-05	4E-09
Endosulfan sulfate	3.96E-10	3.7E-09		5.0E-05	NA	8E-06	7E-05	
Endrin aldehyde				NA	NA			
Endrin ketone				NA	NA			
Heptachlor	2.03E-10	1.9E-09	2.3E-10	5.0E-04	4.5E+00	4E-07	4E-06	1E-09
Heptachlor epoxide	2.03E-10	1.9E-09	2.3E-10	1.3E-05	9.1E+00	2E-05	1E-04	2E-09
alpha-Chlordane	2.03E-10	1.9E-09	2.3E-10	6.0E-05	1.3E+00	3E-06	3E-05	3E-10
beta-BHC			2.3E-10	NA	1.8E+00			4E-10
gamma-Chlordane				NA	NA			

TABLE G-32 (CON'T)

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS FROM THE INGESTION OF ONSITE SEDIMENT RESIDENTIAL EXPOSURE (FUTURE LAND USE) REASONABLE MAXIMUM EXPOSURE (RME) SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg-day)	Child CDI (Nc) (mg/kg-day)	Adult/Child CDI (Car) (mg/kg-day)	RfD (mg/kg-day)	Oral Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Metals								
Aluminum				NA	NA			
Antimony	9.51E-11	8.9E-10		4.0E-04	NA	2E-07	2E-06	
Arsenic	1.29E-09	1.2E-08	1.5E-09	3.0E-04	1.8E+00	4E-06	4E-05	3E-09
Barium	1.15E-08	1.1E-07		7.0E-02	NA	2E-07	2E-06	
Beryllium	9.51E-11	8.9E-10	1.1E-10	5.0E-03	4.3E+00	2E-08	2E-07	5E-10
Cadmium	6.16E-12	5.8E-11		5.0E-04	NA	1E-08	1E-07	
Calcium				NA	NA			
Chromium	3.21E-09	3.0E-08		5.0E-03	NA	6E-07	6E-06	
Cobalt				NA	NA			
Copper	3.24E-09	3.0E-08		4.0E-02	NA	8E-08	8E-07	
Iron				NA	NA			
Lead				NA	NA			
Magnesium				NA	NA			
Manganese	7.96E-08	7.4E-07		5.0E-03	NA	2E-05	1E-04	
Mercury	3.52E-12	3.3E-11		3.0E-04	NA	1E-08	1E-07	
Nickel	5.55E-09	5.2E-08		2.0E-02	NA	3E-07	3E-06	
Potassium				NA	NA			
Selenium	7.84E-11	7.3E-10		5.0E-03	NA	2E-08	1E-07	
Silver	1.06E-10	9.9E-10		5.0E-03	NA	2E-08	2E-07	
Sodium				NA	NA			
Thallium	1.41E-10	1.3E-09		8.0E-05	NA	2E-06	2E-05	
Vanadium	3.29E-09	3.1E-08		7.0E-03	NA	5E-07	4E-06	
Zinc	1.25E-08	1.2E-07		3.0E-01	NA	4E-08	4E-07	
Totals - HQ & CR						**7E-05**	**6E-04**	**2E-06**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic)/ Reference Dose (Oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (Oral)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

Table G-33
Comparison of Exposure Point Concentrations Used in Calculating Risk After Implementation of Surface Water Remedial Actions
Seneca Army Depot, Romulus, New York - SEAD 25

COMPOUND	EPC calculated n Baseline Risk Assessmen RI Report May 1998 (1) mg/kg	EPCs After Achieving Clean-Up Goals (mg/L) NYSDEC SWQS-C	Source
Volatile Organics			
Acetone	9.54E-03	9.54E-03	BRA EPC
Semivolatile Organics			
Di-n-butylphthalate	1.08E-02	1.08E-02	BRA EPC
Dibenzofuran	7.30E-03	7.30E-03	BRA EPC
Diethylphthalate	1.00E-02	1.00E-02	BRA EPC
Pyrene	7.19E-03	7.19E-03	BRA EPC
Metals			
Aluminum	2.23E+01	2.23E+01	BRA EPC
Arsenic	1.66E-03	1.66E-03	BRA EPC
Barium	5.75E-02	5.75E-02	BRA EPC
Calcium	8.18E+01	8.18E+01	BRA EPC
Chromium	2.16E-03	2.16E-03	BRA EPC
Cobalt	8.92E-04	8.92E-04	BRA EPC
Copper	7.91E-03	7.91E-03	BRA EPC
Iron	1.79E+01	1.79E+01	BRA EPC
Lead	6.00E-03	1.80E-03	NYSDEC SWQS-C
Magnesium	1.03E+01	1.03E+01	BRA EPC
Manganese	2.72E-02	2.72E-02	BRA EPC
Mercury	3.30E-05	3.30E-05	BRA EPC
Nickel	2.76E-03	2.76E-03	BRA EPC
Potassium	7.62E+00	7.62E+00	BRA EPC
Silver	5.08E-04	5.08E-04	BRA EPC
Sodium	1.58E+02	1.58E+02	BRA EPC
Vanadium	2.96E-03	2.96E-03	BRA EPC
Zinc	4.49E-02	4.49E-02	BRA EPC

(1) EPCs calculated as described in Section 6.2.4 of RI Report, May 1998

EPC - Exposure Point Concentration
BRA - Baseline Risk Assessment

TABLE G-34

CALCULATION OF ABSORBED DOSE FROM DERMAL CONTACT TO SURFACE WATER (while Wading)
RESIDENTIAL EXPOSURE (FUTURE LAND USE)
REASONABLE MAXIMUM EXPOSURE (RME)
SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Child Absorbed Dose (Nc) (mg/kg-day)	Adult Absorbed Dose (Nc) (mg/kg-day)	Adult/Child Absorbed Dose (Car)* (mg/kg-day)	Absorbed Dose/Event (mg-cm²-event)	EPC Surface W. (mg/l.)	Child Skin Surface Area Contact (cm²)	Adult Skin Surface Area Contact (cm²)	Kp Permeability Coefficient (cm/hr)	Exposure Time (hours/day)	Exposure Frequency (days/year)	Child Exposure Duration (years)	Adult Exposure Duration (years)	Volumetric Conv. Factor (1 liter/1000 cm³)	B (unitless)	Tau (hours)	Child Body Weight (kg)	Adult Body Weight (kg)	Averaging Time (days) Child (Nc)	Averaging Time (days) Adult (Nc)	Averaging Time (days) Car
Volatile Organics																				
Acetone	1 3E-07	1.1E-07		7 50E-09	9.54E-03	2,170	8,680	5.7E-04	1	45	6	24	1.0E-03	5.9E-05	1.9E-01	15	70	2,190	8,760	25,550
Semivolatile Organics																				
Di-n-butylphthalate	3.6E-05	3.1E-05		2.03E-06	1.08E-02	2,170	8,680	3.3E-02	1	45	6	24	1.0E-03	1.3E+00	4.30	15	70	2,190	8,760	25,550
Dibenzofuran				2.92E-06	7.30E-03	2,170	8,680	1.5E-01	1	45	6	24	1.0E-03	1.3E+00	9 3E-01	15	70	2,190	8,760	25,550
Diethylphthalate	3 4E-06	2.9E-06		1.88E-07	1.00E-02	2,170	8,680	4.8E-03	1	45	6	24	1.0E-03	3.0E-02	2.00	15	70	2,190	8,760	25,550
Pyrene	1.4E-04	1.2E-04		7.81E-06	7.19E-03	2,170	8,680	3.2E-01	1	45	6	24	1 0E-03	7.6E+00	1.48	15	70	2,190	8,760	25,550
Metals																				
Aluminum				2.23E-05	2.23E+01	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Arsenic	3 0E-08	2.5E-08	1 1E-08	1.66E-09	1.66E-03	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Barium	1.0E-06	8.8E-07		5.75E-08	5.75E-02	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Calcium				8 18E-05	8.18E+01	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Chromium	3.9E-08	3.3E-08		2 16E-09	2.16E-03	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Cobalt				3.57E-10	8.92E-04	2,170	8,680	4.0E-04	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Copper	1.4E-07	1.2E-07		7.91E-09	7.91E-03	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Iron	3.2E-04	2.7E-04		1.79E-05	1.79E+01	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Lead				7 20E-12	1 80E-03	2,170	8,680	4.0E-06	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Magnesium				1.03E-05	1.03E+01	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Manganese	4.8E-07	4.2E-07		2.72E-08	2.72E-02	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Mercury	5.9E-10	5.0E-10		3.30E-11	3.30E-05	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Nickel	4.9E-09	4.2E-09		2.76E-10	2.76E-03	2,170	8,680	1.0E-04	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Potassium				7.62E-06	7.62E+00	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Silver	5.4E-09	4.7E-09		3.05E-10	5.08E-04	2,170	8,680	6.0E-04	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Sodium				1.58E-04	1.58E+02	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Vanadium	5.3E-08	4.5E-08		2.96E-09	2.96E-03	2,170	8,680	1.0E-03	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550
Zinc	4.8E-07	4.1E-07		2.69E-08	4.49E-02	2,170	8,680	6.0E-04	1	45	6	24	1.0E-03			15	70	2,190	8,760	25,550

EQUATION: **Absorbed Dose (mg/kg-day) =** $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Variables:	Assumptions:	Variables:	Assumptions:
DA = Absorbed Dose per Event (mg-cm²/event)	Calculated from EPA, 1992	EF = Exposure Frequency (days/year)	45 (Upper bound limit)
SA = Surface Area Contact (cm²)	8,680/2,170 (RME Adult/Child)	ED = Exposure Duration (years)	30 (RME at 1 Residence)
Kp = Permeability Coefficient (cm/hour)	Compound Specific, EPA, 1992	CF = Vol. Conv. Factor (1 L/1000 cm³)	0.001
ET = Exposure Time (hours/day)	1 (RME all residents)	BW = Bodyweight (kg)	70 (Adult) 30 (Child)
Tao = Lag time (hours)	Compound Specific, EPA, 1992	AT = Averaging Time (days)	6 x 365 Child 24 x 365 Adult (Nc), 70 x 365 (Car)
		B = Bunge Model Value	Compound Specific, EPA, 1992

Note Cells in this table were intentionally left blank due to a lack of toxicity data.
* Adult and Child intakes weighted according to Risk Assessment Guidance for Superfund (RAGS) Part B (USEPA 1991).
The term (SA x ED / BW) in the intake equation, above is calculated as: [SA(child) x ED(child) / BW(child) + SA(adult) x ED(adult) / BW(adult)]

TABLE G-35

CALCULATION OF NONCARCINOGENIC AND CARCINOGENIC RISKS FROM DERMAL CONTACT TO SURFACE WATER (WHILE WADING) RESIDENTIAL EXPOSURE (FUTURE LAND USE) REASONABLE MAXIMUM EXPOSURE (RME) SENECA ARMY DEPOT, ROMULUS, NEW YORK - SEAD 25

Analyte	Adult CDI (Nc) (mg/kg)	Child CDI (Nc) (mg/kg)	Adult/Child CDI (Car) (mg/kg)	Dermal RfD (mg/kg/day)	Dermal Slope Factor (mg/kg-day)-1	Adult Hazard Quotient	Child Hazard Quotient	Cancer Risk
Volatile Organics								
Acetone	1.1E-07	1.3E-07		1.0E-01	NA	1E-06	1E-06	
Semivolatile Organics								
Di-n-butylphthalate	3.1E-05	3.6E-05		9.0E-02	NA	3E-04	4E-04	
Dibenzofuran				NA	NA			
Diethylphthalate	2.9E-06	3.4E-06		8.0E-01	NA	4E-06	4E-06	
Pyrene	1.2E-04	1.4E-04		3.0E-02	NA	4E-03	5E-03	
Metals								
Aluminum				NA	NA			
Arsenic	2.5E-08	3.0E-08	1.12E-08	2.4E-04	1.9E+00	1E-04	1E-04	2E-08
Barium	8.8E-07	1.0E-06		3.5E-03	NA	3E-04	3E-04	
Calcium				NA	NA			
Chromium	3.3E-08	3.9E-08		1.0E-04	NA	3E-04	4E-04	
Cobalt				NA	NA			
Copper	1.2E-07	1.4E-07		2.4E-02	NA	5E-06	6E-06	
Iron	2.7E-04	3.2E-04		3.0E-01	NA	9E-04	1E-03	
Lead				NA	NA			
Magnesium				NA	NA			
Manganese	4.2E-07	4.8E-07		1.5E-03	NA	3E-04	3E-04	
Mercury	5.0E-10	5.9E-10		3.0E-06	NA	2E-04	2E-04	
Nickel	4.2E-09	4.9E-09		8.0E-04	NA	5E-06	6E-06	
Potassium				NA	NA			
Silver	4.7E-09	5.4E-09		1.0E-03	NA	5E-06	5E-06	
Sodium				NA	NA			
Vanadium	4.5E-08	5.3E-08		7.0E-05	NA	6E-04	8E-04	
Zinc	4.1E-07	4.8E-07		7.5E-02	NA	5E-06	6E-06	
Totals - HQ & CR						**7E-03**	**8E-03**	**2E-08**

Hazard Quotient = Chronic Daily Intake (Noncarcinogenic)/Reference Dose (oral)
Cancer Risk = Chronic Daily Intake (Carcinogenic) x Slope Factor (oral)

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

Appendix H
Response to Comments

Response to Comments
United States Environmental Protection Agency (USEPA), July 30, 1998
Draft Feasibility Study (FS) - Fire Training and Demonstration Pad (SEAD 25)
and the Fire Training Pit and Area (SEAD-26)
at the
Seneca Army Depot Activity, Romulus, NY

NO ACTION AND INSTITUTIONAL CONTROLS ALTERNATIVES

Comment #1 In the discussion of these two alternatives, there seems to be an implication that these two alternatives have different effects on the contaminated groundwater. For instance, in Section 3.2 Assembly of Alternatives, the text notes that for alternative RA25-1 (the No-Action Alternative), that it "could allow for the off-site migration of contaminated groundwater." Under Alternative RA25-2 (Institutional Controls, Natural Attenuation and Sediment Removal), the text implies that off-site migration would be prevented because "Quarterly groundwater monitoring would continue to determine if natural degradation of the plume is taking place and assure that there is no additional pollution of the groundwater through leaching." The fact that groundwater monitoring may determine that there is no additional pollution of the groundwater does not prevent it from happening. Neither of these alternatives contains elements that would address groundwater migration from the site, so by definition, their effect (or lack of effect) would be the same.

Response #1 Acknowledged. We agree that neither alternative proposes a constructed means of treating groundwater contamination. The text of this section has been modified to indicate that the fundamental difference between the approaches of the two alternatives in addressing groundwater is that in Alternative RA25-1, if groundwater migrated off-site, it would go undetected whereas in Alternative RA25-2, it would be detected and could be addressed. Similar changes were made in the discussion of Alternatives RA26-1 and RA26-2.

The sentence quoted above has been modified to say "Quarterly groundwater monitoring would continue to determine if natural degradation of the plume is taking place and would provide a detection mechanism for off-site migration of contaminants indicating that action must be taken."

Under either scenario, some natural attenuation of groundwater would occur according to modeling results presented in Appendix E.

Comment #2 The text includes a similar approach in the detailed analysis of alternatives (Section 5.0) in the "Permanence" and "Compliance with ARARS" sections. In Section 5.2.4 Permanence, it states that the "No-Action alternative does not provide a permanent solution since no treatment will occur," whereas in Section 5.3.4 Permanence, it states that "The natural attenuation (i.e., institutional controls) alternative does provide a permanent solution to groundwater and soil contamination over the course of time even though no treatment will occur." Similarly, it is claimed in the "Compliance with ARARS" sections that the No-action alternative will not comply with ARARs for groundwater but that the Institutional controls alternative will. Both alternatives will have an equal affect on the groundwater and it is incorrect to attempt to differentiate them by suggesting otherwise in these sections.

Response #2 Agreed. The text in these sections has been modified to say that natural attenuation under either alternative, will eventually comply with ARARs for groundwater. The text has been modified to clarify that institutional controls alternative is considered slightly more protective since any off site migration of contamination would be detected due to the incorporation of a monitoring program. Although the monitoring program would not prevent the off-site migration, it would provide warning that action must be taken at the site to curb further migration.

SECTION 2.5.2 SCREENING OF TECHNOLOGIES

Comment #1 Bioventing and air sparging are applicable technologies for the unsaturated soil and groundwater contamination respectively at SEAD-25 and SEAD-26. Generally speaking, both technologies are highly dependent on the geologic and hydrogeologic conditions present at a site. Both remedial systems are designed to transform the diffusion controlled release of contamination to one where connective flow and transport predominate. This is done by supplying nutrients and the electron acceptor, typically oxygen in the form of air, to the zone of contamination where degradation can occur by physical, chemical, or biological reactions. Typically, in-situ technologies such as bioventing and air sparging are ineffective at sites where silt and clay soils are present, due to their low porosity and transmissivity. The nutrients and oxygen are not efficiently transferred to the impacted zones and the contamination is not readily removable as vapor or liquid.

Response #1 Acknowledged. Bioventing and air sparging rely on similar principles of volatilization and biodegradation of contaminants. The site contaminants at the sites have been shown to be either readily volatilized or biodegraded. We agree that the effectiveness of the technology is dependent on the geologic and hydrogeologic conditions at the site. In standard soil vapor extraction the rate of contaminant removal is directly related to the volume of soil gas extracted. However, in bioventing applications, the soil gas permeability and grain size distribution are less likely to limit the rate of hydrocarbon degradation. What is important is that the system is designed to provide oxygen at a rate that exceeds biological respiration rates. Soil gas exchange rates of less than one pore volume per day are generally sufficient to satisfy this biological oxygen demand (Hinchee and Miller, 1991). In an article by Downey et. al. (1992), bioventing was shown to be effective in low permeability soils consisting of clays and silts at TPH contaminated sites. Pilot studies conducted showed that oxygen flow and diffusion into low permeability soils was more than sufficient to maintain the aerobic biodegradation rates measured and these rates reduced contaminant concentrations over several years. In addition, the volumes of soil and groundwater affected at SEAD-25 and 26 are relatively small and exist at shallow depths. Therefore, we feel that bioventing and air sparging are applicable technologies for this site capable of being effective for the nature and extent of contamination present.

Comment #2 Section 1.2. 1.1 states that the predominant surficial geology unit at the Seneca Army Depot is a dense silty clay till. Therefore, it is impractical to consider a remedial strategy which includes bioventing and air sparging at SEAD-25 and SEAD-26 without taking actions to increase the permeability of the soil. Pneumatic fracturing is an innovative technology that has been used successfully to increase the permeability in of geologic materials such as those encountered at SEAD-25 and SEAD-26. If bioventing or air sparging are pursued as remedial alternatives, it is recommended that pilot testing of pneumatic fracturing or a similar technique be considered prior to and in combination with the testing of bioventing or air sparging.

Response #2 Acknowledged. Pilot testing would be necessary prior to implementation of this technology for several reasons, one of which is the low permeability of the soils. Pilot testing protocols have been described in Section 4.0. Evaluation of fracturing techniques would be considered, if the results of the treatability study indicate that there is inadequate performance at this site due to the low permeability of the soils. However, bioventing has been shown to be effective at sites where there are low permeability soils without the use of fracturing techniques (Downey, et.al., 1992).

SECTION 3.3.4 RA25-3 BIOVENTING OF SOIL, AIR SPARGING OF PLUME, AND SEDIMENT REMOVAL

Comment #1 An issue that was not discussed in this section is the need for pilot testing and the strategy to be implemented if the pilot testing indicates that bioventing or air sparging are not feasible. Bioventing and air sparging, like most in-situ technologies, require pilot testing prior to the design or operation of a full-scale remedial system. This is important when a limiting factor such as low permeable soil is present. This issue could not be adequately addressed in the screening criteria due to the format and scoring criteria associated with the NYSDEC TAGM. It is debatable if bioventing or air sparging are "somewhat reliable in meeting the specified process efficiencies or process goals" given the low permeable soil and the absence of a discussion regarding efforts to increase the permeability of the soil. The RA25-3 option may have resulted in a score of less than 8 if this technical issue was factored into the scoring criteria. This should be reviewed and amended as appropriate.

Response #1 Acknowledged. The text in this section has been revised to discuss the need for treatability studies and addresses the issue of the low permeability soils at the site. However, although the text acknowledges that low permeability soils are present at the site, it states that bioventing has been shown to be effective in low permeability soils. Please refer to response to Comment #1 under Section 2.5.2. In an article by Downey et. al. (1992), bioventing was shown to be effective in low permeability soils consisting of clays and silts at TPH contaminated sites. Pilot studies conducted showed that oxygen flow and diffusion into low permeability soils was more than sufficient to maintain the aerobic biodegradation rates measured and these rates reduces contaminant concentrations over several years. We agree that treatability studies must be conducted prior to implementation to better assess the technologies' implementability at SEDA, however. For the above reasons, the RA25-3 option was not re-evaluated.

SECTION 4.3.1 TREATABILITY STUDIES DESCRIPTION - Bioventing

Comment #1 The discussion regarding the pilot testing appears technically correct as recited from the "Test Plan and Testing Protocol for Bioventing". However, the site conditions at SEAD-25 and SEAD-26 are not discussed as they relate to the protocol and the performance of the pilot testing, it is also unclear from a review of the text if any pilot testing will be conducted. The issue of low soil permeability is not addressed and there is no mention of implementing fracturing techniques to compensate for this site condition. The lengthy discussion of methods and procedures is immaterial given the limits of bioventing in clay soils without the aid of hydraulic or pneumatic fracturing.

Response #1 Acknowledged. Section 4.0, Treatability Studies, has been revised to be more site specific. Pilot testing would be necessary prior to implementation of this technology for several reasons, one of which is the low permeability of the soils. The text has been revised to reflect this. Evaluation of fracturing techniques would be considered if the results of the treatability study indicate that there is inadequate performance at this site due to the low permeability of the soils. However, bioventing has been shown to be effective at sites where there are low permeability soils without the use of fracturing techniques (Downey, et.al., 1992). Please refer to response to Comment #1, Section 2.5.2.

Comment #2 The other item to note is the mode of operation for the bioventing system. Bioventing can be performed through air injection, air extraction, or a combination of both. The injection only scenario would require an evaluation of the potential for migration of contaminated gases. Utilizing the extraction mode of operation typically generates off-gas which require treatment prior to being discharged to the atmosphere. A pilot test should study both the extraction and combination modes of operation. The time of year and associated water table elevation for a pilot test is also important and the rationale for the timing of a pilot test should be provided. The presence of a shallow water table may create difficulties in controlling moisture of the subsurface soil. These site specific issues should be evaluated during the FS and considered during the screening process.

Response #2 Acknowledged. The proposed mode of operation for the bioventing system is air injection and the text in Section 5.0 has been modified to clarify this. According to "Test Plan and Testing Protocol for Bioventing", air injection is the recommended mode of operation. Air injection does not result in a direct discharge of volatile organics to the atmosphere and is less expensive to operate and maintain. Such systems do not produce condensate, liquid wastes, nor a contaminated air stream. Therefore, only this mode will be evaluated during the treatability study. Regarding the timing of the treatability study, the study will be conducted over the span of one year to evaluate the effects of the fluctuating water table on the effectiveness of the remedy. Contaminated soils are within the upper six feet of the soil. Although the groundwater table may rise within this zone during certain times of the year, this upper six foot region constitutes the vadose zone during other times of the year. Therefore, a one year treatability study should allow for the evaluation of the effect the groundwater table has on the effectiveness of bioventing.

Comment #3 This section does not indicate which areas of SEAD-25 and SEAD-26 will require bioventing. The approximate areas to be remediated should be presented and used during the screening process.

Response #3 Acknowledged. The area to be remediated is presented in Section 2, Figure 2-1. The text of Section 4.0 has been modified to reference the remediation boundary delineated in Section 2.0 of the report. Bioventing is not proposed in an alternative at SEAD-26, since soil is not identified as a medium of concern.

Comment #4 It may be premature at the Feasibility Study phase to predict that a pilot study of bioventing in dense till without fracturing will be sufficient to prepare a final design. Generally speaking, pilot tests are performed primarily to demonstrate the feasibility of an innovative technology under site-specific conditions and the resulting data are used for preliminary design purposes or to conduct long-term studies. If bioventing is deemed feasible after a pilot test, a longer-term field test may be warranted to produce more conclusive data before a full scale system is designed.

Response #4 Acknowledged. The bioventing pilot study proposed will be conducted over the course of one year. The pilot study will be comprised of a series of soil permeability testing and in situ respiration testing. Assuming the results of each phase of the pilot study indicate that the technology is effective, we feel that the results from a one year study are sufficient to design a full-scale system. We have performed such full-scale design using similar protocols on many sites we have studied in the past. Of course, if we do not feel that adequate information was obtained to conduct a full-scale design, further study would be conducted to obtain the necessary information. No modification has been made to the text.

<u>SECTION 4.3.2 TREATABILITY STUDIES DESCRIPTION - Air Sparging</u>

Comment #1 The above comments concerning the need for a pilot test also apply for the air sparging technology except that it is recommended that an air sparging pilot test should include the use of small trenches at SEAD-25. This approach would simulate the full-scale system operation described in Section 3.3.4. Given the site geology, the use of trenches at SEAD-25 as compared to vertical wells appears feasible and appropriate.

Response #1 Acknowledged. For the reasons given above in support of the effectiveness of bioventing in low permeability soils, the effectiveness of air sparging in low permeability soils is also supported. Text has been added to this section to explain where air sparging is proposed for SEAD-25 and -26. Text exists at the end of Section 4.0 explaining that trench tests would be conducted to estimate groundwater collection rates and potential treatment throughputs.

Comment #2 However, it is considered technically impractical to consider air sparging at water table depths in the range of 4 to 6 feet below ground surface due to the potential of short-circuiting with the surface. It is generally accepted that the screened interval of the air sparging injection well be located a minimum of one to two feet below the depth of contamination. Given that the contamination includes the vadose zone and continues to the top of the bedrock, it is necessary to determine where the screened interval can be located. This issue should also be considered and addressed in this section. The shallow water table also creates difficulties for vapor extraction due to the potential for the process piping to be partially submerged at various times throughout the year based on seasonal water table fluctuations. Thus, at some times of the year, the contaminant vapors which are created by air sparging may not be recovered by a vapor extraction system.

Response #2 Acknowledged. We agree with EPA's concerns with respect to the depth of the fluctuating groundwater table and location of the screened interval and believe these factors should be evaluated during the treatability study. Discussion of the location of the air sparging injection wells has been added to the text. It is proposed that air sparging injection wells would be placed as deep as possible on top of the bedrock. Our opinion is that this technology may be more limited by the depth of the groundwater from bedrock than the water table depth below the ground surface. By placing the well screen as deep as possible within the aquifer and minimizing the screen length (possibly using horizontal wells), the goal would be to maintain air injection below the saturated zone throughout the seasonal groundwater fluctuations experienced at the sites. The use of screens as short as 1 foot has been proposed. Since air exits through the top of the screened interval, where the pressure head is at a minimum, the use of longer screened intervals does not significantly add to the effectiveness of the process (Markley, et. al., 1992).

Air sparging is not always operated in conjunction with vapor extraction wells. According to Johnson, et. al., 1993, this is the case where the injected air flow rate is so low that contaminant vapors are degraded as they pass through the unsaturated zone. It is expected that air flow rates will be low at these sites due to the tight soils and the low concentration of volatiles. The implementation of soil vapor extraction wells would be evaluated during treatability studies. However, alternatives developed in Sections 5 and 6 which incorporate air sparging assume that vapor extraction systems will not be incorporated as part of this technology.

Comment #3 Text should be added to the FS which discusses the potential impact that air sparging can have on existing groundwater flow patterns. Mounding of the groundwater table in the area of air injection can result from the operation of air sparging systems. This issue is particularly important due to the high water conditions present at both sites.

Response #3 Acknowledged. The text currently states that water table mounding effects will be measured during the treatability study. Text in Section 5.4.6 discusses the potential impact that air sparging can have on groundwater flow patterns.

APPENDIX D, COST ANALYSIS

Comment #1 The level of detail given in this cost analysis is not warranted for the amount of information known about the proposed alternatives. This kind of estimate would be considered appropriate for a project which has gone through at least preliminary design, if not final design. This level of detail before a treatability study has been conducted could mislead readers concerning its accuracy. An estimate of the accuracy of these costs should be provided.

Response #1 Acknowledged. A 20% contingency was added to the capital cost of each alternative. Text has been added to Sections 5 and 6 to explain this. In addition, text has been added to Section 5 and 6 to explain that the cost estimates for those alternatives incorporating either bioventing or air sparging are subject to greater uncertainty since implementation will be based on treatability study results.

APPENDIX E - GROUNDWATER MODELING REPORT:

Comment #1 This section should also be revised to address EPA's July 13, 1998 comments on the Remedial Investigation Report for SEADs 25 & 26.

Response #1 Agreed. This section has been updated as requested.

Specific Comments

Comment #1 No list of references was included in the document.

Response #1 Agreed. A list of references has been provided.

Comment #2 Section 1.1.1: The first sentence should be clarified - "...have been combined into a single two separate operable unit."

Response #2 Agreed. This sentence has been clarified to read "have been separated into two separate operable units."

Comment #3 Figure 1-4, SEAD26: SEDA's April 8, 1997 letter notified EPA and the DEC of their intentions to remove burned automobiles, an old helicopter fuselage, old above ground tanks and numerous 55-gallon drums from SEAD 26. EPA's May 5, 1997 response requests documentation of the items removed, their locations within SEAD 26 and how they were disposed of. Figure 1-4 still shows these items and at the time of EPA's June 17, 1998 site visit, it appeared that no action had been taken. If any housekeeping activities have occurred, the FS figures and text should be updated and the proper documentation should be provided to EPA. If they have not yet taken place, the FS should discuss that they will occur at a later date.

Response #3 Acknowledged. The debris at SEAD-26 has not been removed to date. The figure has been updated to more accurately reflect the location of debris.

Comment #4 Page 2-7: The metals exceedances in groundwater at SEAD 25 should also be mentioned.

Response #4 Disagree. As shown in Table 2-1a and as described in Section 6.2.3 (page 6-28) of the RI report, only four metals were detected in groundwater samples above site background concentrations at SEAD-25 (arsenic, cadmium, selenium and thallium). Furthermore, statistical analysis showed that at the 97.5% confidence level, no portion of the site have concentrations of the analytes larger than those found in portions of background areas. No groundwater samples exceeded NYSDEC AWQS-GA standards for these four metals. Only arsenic, cadmium and selenium have NYSDEC promulgated AWQS standards for class GA groundwater. A footnote has been added to Table 2-1a to provide clarification.

Comment #5 Page 2-8: The text states that Lead, Selenium and Thallium were the only metals exceeding TAGMs in SEAD 25 subsurface soils, but Table 4-4 of the Remedial Investigation Report show that most metals exceed TAGMs in subsurface soils. Clarification should be provided.

Response #5 Agreed. The text has been modified and a footnote has been added to Table 2-1c to provide clarification. Lead, selenium and thallium were the only metals to exceed either TAGMs or background concentrations, whichever is higher, in SEAD 25 subsurface soils. Table 4-4 only evaluated constituents whose concentrations exceeded TAGMs. Since background concentrations are often greater than TAGMs, Table 4-4 listed greater number of constituents. The determination of constituents in soil which exceed background concentrations is provided in Section 6.2.3 of the RI report.

Comment #6 Page 2-28: SEAD 26 Groundwater: The metals exceedances and no cleanup should be discussed in greater detail.

Response #6 Acknowledged. According to Section 7.2.3 of the RI report, "Only potassium is found at concentrations in portions of the SEAD-26 groundwater that tend to be greater than those in portions of the background areas." (p. 7-43). Since no NYSDEC AWQS exists for potassium, groundwater remediation is not prompted by the presence of potassium in the groundwater. Groundwater remediation is incorporated into the alternatives at SEAD-26 to reduce the concentrations of BTEX compounds as explained in Section 2.2.5.2. No change has been made to the text.

Comment #7 Page 2-28: Soil cleanup goals: The first sentence is not true. Metals exceed groundwater ARARs and are present in soil at levels that exceed TAGMS. The Army's justification for the statement, "...there is no need for a remedial action addressing soil contamination," is not accurate.

Response #7 Disagree. Please refer to response to comment #6 above which addressed metals in groundwater which exceed ARARs. As explained on page 2-28 (now p. 2-31) of the FS, TAGMs are to be considered (TBCs) and are not used to determine the necessity of remediation. Since there is not significant metals contamination above background in the groundwater, the soil does not appear to be a source of groundwater contamination. Therefore, soil will not be addressed. No change has been made to the text.

Institutional Controls

Comment #1 Deed restrictions should not be screened regardless of Army regulations but should be maintained as part of the written record for this property. (Note that deed restrictions are not screened in the groundwater remediation table [Table 2-14]).

Response #1 Agree. Table 2-13 (now referred to as Table 2-15) has been modified to retain deed restrictions.

Comment #2 Expected future conditions are not a sufficient reason to eliminate monitoring as a technology for institutional control. Periodic monitoring is prudent, particularly if no soil is to be removed.

Response #2 Disagree. The activities which provided the source of contamination at this site have ceased. Therefore, there is no cause for a significant detrimental change in the soil/sediment from activities on site and we do not believe that soil monitoring is necessary. Groundwater monitoring is a component of institutional controls for groundwater as shown in Table 2-16 (formerly Table 2-14) and would be used to monitor the groundwater conditions at the site.

Comment #3 Alternative Water supply is screened on Table 2-13 because "no current drinking water supply is affected," yet it is retained in Table 2-14 as "applicable." There should be no difference between the two alternatives.

Response #3 Agree. Alternative Water Supply has been screened in Table 2-14.

Ex-Situ Treatment

Comment #1 For the Physical-Solidification processes, most of which were screened because of "soils with high oil contents," it has not been established what a "high oil content" is and whether such levels exist on the site.

Response #1 Agreed. There are organic constituents in the soil, but whether these constituents constitute a high oil content is debatable. However, physical solidification processes are usually used to stabilize inorganic contaminants. In addition, due the presence of VOCs at the site, the implementation of stabilization may result in unacceptable emissions. Solidification technologies remained screened, but the rationale has been modified to reflect the above discussion.

Comment #2 Table 2-l a. The following Ambient Water Quality Standards (AWQS) for some listed contaminants should be noted:

Contaminant	AWQS (ug/l)
2-butanone (methyl ethyl ketone)	50
Bromoform	50
Dibromochloromethane	50
Thallium	4
3,3-Dichlorobenzidine	5

Please note that the Maximum Contaminant Level (MCL) for chromium on page C-5 is 0.1 milligrams per liter (mg/l).

Response #2 Acknowledged. The ambient water quality standards listed on Table 2-1a are NYSDEC AWQS for Class GA groundwater. According to 6 NYCRR Parts 701-705, there are no promulgated NYSDEC AWQS standards for Class GA groundwater for most of the compounds listed above. The values listed above have been adopted by NYSDEC as guidance values for MEK, bromoform, and dibromochloromethane, but are not ARARs. The guidance value for Thallium is now 0.5 ug/L according to the June 1998 update of the "Ambient Water Quality Standards and Guidance Values", TOGS 1.1.1. However, these guidance values have been added to Table 2-1a. A standard of 5 ug/L for 3,3'-dichlorobenzindine was assigned in the latest version of TOGS 1.1.1 and has been added to Table 2-1a. Other modifications have been made to this table to correspond with the updated AWQS and guidance values. For example, the AWQS for benzene increased from 0.7 ug/L to 1 ug/L. One correction was also made to the table. There is no AWQS or guidance value for 2-methylnaphthalene in groundwater, as indicated in the draft version of this report.

The MCL for chromium on page C-5 has been corrected.

Table 2-14. Groundwater Remediation:

Comment #1 In-situ Treatment: What are the "Unfavorable subsurface conditions" that caused the aerobic and anaerobic treatment systems to be screened out? If conditions were sufficient to retain air sparging, they should also be sufficient to maintain the other types of in-situ treatment.

Response #1 Agreed. This table has been modified to combine aerobic in situ treatment and air sparging, using air sparging as a type of aerobic in situ treatment. Anaerobic in situ treatment has been retained. Natural attenuation is retained as an example of anaerobic in situ treatment. Screening comments have been modified within the table.

Comment #2 The description of anaerobic treatment is incorrect; oxygen is not supplied to the microbes.

Response #2 Agreed. This description has been corrected.

Section 3.3.5 RA25-4 Source Removal, Sediment Removal, off-site Disposal, and Natural Attenuation of Plume

Comment #1 Page 3-12: Air stripping of groundwater is discussed in this section. Is the heading incorrect or the text?

Response #1 Agreed. The text is incorrect. The discussion of air stripping has been moved to Section 3.3.7 which discusses RA25-5 Source Removal, Off-Site Disposal, and Air Stripping of Plume. The text has been changed.

On-Site Treatment

Comment #1 Neutralization is a pH adjustment operation, not a formation of a metal hydroxide, which is precipitation.

Response #1 Agreed. The heading of this alternative has been changed to Precipitation in Table 2-16 (formerly Table 2-14).

HUMAN HEALTH RISK

SEAD 25

Comment #1 The risk assessment identified future residential groundwater use to be associated with an excess lifetime cancer risk of 2 E-04 (two-in-ten thousand) and a Hazard Index = 4. The FS states that the site is designated for commercial land-use, which would eliminate a future residential groundwater ingestion exposure pathway. This reasoning seems more appropriate for an exposure pathway associated with a stationary matrix, such as future residential soil/sediment ingestion. Since the groundwater below the site is mobile, it may over time migrate to the adjacent residential housing area.

Response #1 Acknowledged. SEDA, in complying with Army guidance, has only considered scenarios for future land use as outlined in the Land Reuse Plan for the site. Future land use has been designated as industrial. Under most of the alternatives developed in this FS for industrial scenarios (all except the No Action alternatives), some type of institutional controls or monitoring has been incorporated to prevent the groundwater exposure pathway. Groundwater is included as part of the remedy at SEAD-25 based on ARAR exceedances (not risk, as you note). However, as discussed during the BCT conference call on September 15, 1998, more recent Army guidance has been issued instructing us to consider alternatives which do not incorporate institutional controls, and therefore include residential scenarios.

Residential alternatives have been incorporated into this document (see Section 2 and Section 5.10) which show that risks under these alternatives would be reduced to within acceptable EPA target risk values for a future resident.

Comment #2 The risk assessment identified inhalation of volatile organic compounds (secondary to soil-borne vaporization) for the future on-site construction worker to be associated with an HI=7. However, pages 2-3 and 5-34 and other locations throughout the FS state that there are no unacceptable risk levels under the current and intended future land use scenarios and "non-carcinogenic human health risks values are within the EPA target range" (i.e. Hazard Index less than 1). Obviously, these statements are inconsistent with the Risk Assessment. Table 6-71 illustrates the Hazard Index (HI) for the construction worker inhalation pathway. The primary contributing agent is benzene with HI equal to 5. The text should be corrected where ever these incorrect statements occur.

Response #2 Agreed. Since the draft version of the FS was issued, significant updates were made to the BRA. The text throughout the document has been revised to reflect the updates to the RI and risk assessment.

Since the soil at SEAD-25 had already been identified as a media of concern based on ARARs, no additional remedial action has been proposed at SEAD-25 as a result of the risk associated with the RI updates. Please also note that a minor calculation error was made in calculating the hazard index for the future on-site construction worker in the RI (May, 1998). Replacement pages have been submitted under separate cover.

ECOLOGICAL RISK

General Comments

SEAD-25

Comment #1 The discussion of ecological risk-based remedial action Objectives for SEAD-25 should include all contaminants having ecological quotients (EQ) greater than 1. This will ensure that all contaminants potentially posing ecological risk will be addressed.. As listed in Section 2.2.3 of the FS report, chemicals with EQs greater than I include 6 polycyclic aromatic hydrocarbons (PAHs), aldrin, heptachlor, heptachlor epoxide, DDT, DDD, DDE, and 12 metals.

Response #1 Acknowledged. In the draft version of this FS, an ecological quotient of ten was selected as appropriate based on ecological quotient guidelines for assessing the risk posed by contaminants (Menzie, C. J. Cura, J. Freshman and S. Svirsky, 1993). According to these guidelines, EQs less than 10 present a small potential for environmental effects. However, significant changes have been made to the FS with respect to ecological risk. In order to update this document and make it consistent with the Final Remedial Investigation Report (May, 1998), media of interest based on ecological risk have been re-evaluated. The results of the ecological risk assessment (ERA) presented in the RI report (Parsons ES, May 1998) concluded that there is negligible risk to the ecosystem of the SEAD-25 and -26 study areas. The ERA included both a qualitative and quantitative assessment of the ecological status of the Unit. During field evaluation, no overt acute toxic impacts were evidenced during the field evaluation. The quantitative ecological risk evaluation, which involved comparisons of the ecological assessment endpoint exposures with the toxicity reference values, initially suggested that a slight possibility exists for the contaminants of potential concern (COPCs) to present a small potential for environmental effects due to sediment at SEAD-25 and due to sediment, soil and surface water at SEAD-26. In addition, four inorganic elements present in the sediment presented a potential for greater exposure to result in environmental effects at SEAD-25 and one phthalate, one herbicide and three inorganics present in the sediment presented a potential for greater exposure to result in environmental effects at SEAD-26. However, the effects from all of these analytes have not been observed during fieldwork, i.e. the ecological community appears diverse and normal. Furthermore, upon considering the weight of evidence presented in the Ecological Risk Summary section of the RI (Sections 6.6.12.4 and 7.6.12.4 of the RI), and the very conservative assumptions used in the ERA, the COPCs identified at SEAD-25 and SEAD-26 are considered to pose negligible risk to the ecosystem of the SEAD-25 and -26 study areas.

In addition to those reasons discussed in the RI, the following reasons for excluding sediment as a media of interest based on ecological risk are:

1. The presence of PAHs at SEAD-25 may be due to sources other than past activities at SEADs-25. This is apparent by the increasing PAH concentrations upstream of SEAD-25. PAH concentrations downstream of SEAD-25 decrease.
2. A significant portion of the ecological risk calculated in the RI for SEADs-25 and 26, was to aquatic receptors. As discussed in the RI, the ecological quotients calculated for aquatic receptors are very conservative since the sediment criteria that were used in their calculations are based upon a continuous exposure of aquatic organisms to these contaminants. Aquatic organisms are unlikely to occur in the drainage ditches of the unit as the conditions in the ditches are not aquatic in nature. Surface water in the ditches at SEADs-25 and -26 is ephemeral and is only present after heavy rains. Stormwater discharge from the base has been tested and does not predict ecological risk. This discharge runs through the drainage ditches at SEADs-25 and -26. Therefore, no

ecological risk impacts are predicted at the point where sediment from these areas may eventually come in contact with aquatic receptors (i.e. at Kendaia Creek).

In the Draft Final version of the FS submitted, alternatives have been developed which meet human health risk target values under a residential scenario. Because the sediment at SEAD-25 contributes to human health at SEAD-25, sediment is a media of interest in these alternatives. For these alternatives, clean up goals for sediment have been established for those compounds which most significantly contribute to human health risk and are set at the values provided in "NYS Technical Guidance for Screening Contaminated Sediments". Figure 2-1 depicts the areas of sediment remediation which would be included under these alternatives (Case II according to Table 2-10). The area in Case II would also include any constituents having an EQ less than 1 based on the quantitative portion of the BRA.

Comment #2 Section 2.2.5 of the FS incorrectly states that "any contaminant that had an ecological quotient greater than 10 was considered to be an unacceptable risk." As a result, Section 2.2.5.1 of the FS lists only DDD, lead, and silver as the chemicals with proposed sediment cleanup goals. There is no proposed sediment cleanup value for heptachlor although its EQ is 33.

Response #2 Acknowledged. Please see response to Comment #1 directly above.

Comment #3 Proper justification should be provided in the FS for selecting chemicals posing unacceptable ecological risk and for proposing sediment cleanup goals. Any discrepancy between the Ecological Risk Assessment and the Feasibility Study Reports should be addressed. Any figures and remediation volume estimates should be corrected as appropriate.

Response #3 Agreed. Please see response to Comment #1 above.

<u>SEAD-26</u>

Comment #1 The discussion of ecological risk-based remedial action objectives for SEAD- 26 should include all contaminants having ecological quotients (EQ) greater than 1. This will ensure that all contaminants potentially posing ecological risk will be addressed. As listed in-Section 2.2.3 of the FS report, chemicals with EQs greater than I include 8 polycyclic aromatic hydrocarbons (PAHs), phenol, Aroclor-1260, Endosulfan I and II, heptachlor epoxide, BEHP, DDT, DDD, DDE, arsenic, copper, iron, lead, manganese, mercury, nickel, and zinc.

Response #1 Acknowledged. Please see response to Comment #1 under Ecological Risk, General Comments, SEAD-25.

Comment #2 Section 2.2.5 of the FS incorrectly states that "any contaminant that had an ecological quotient greater than 10 was considered to be an unacceptable risk."

Based on this criterion, benzo(b)fluoranthene, chrysene, and phenol would have been selected as posing unacceptable ecological risk; these ecological quotients are found in Table 7-94 of the RI report. However, Section 2.2.5.2 of the FS lists phenol, endosulfan II, and heptachlor epoxide as the chemicals with proposed sediment cleanup goals.

Response #2 Acknowledged. Please see response to Comment #1 under Ecological Risk, General Comments, SEAD-25.

Comment #3 Proper justification should be provided in the FS for selecting chemicals posing unacceptable ecological risk and for proposing sediment cleanup goals. Any discrepancy between the Ecological Risk Assessment and the Feasibility Study Reports should be addressed. Any figures and remediation volume estimates should be corrected as appropriate.

Response #3 Acknowledged. Please see response to Comment #1 under Ecological Risk, General Comments, SEAD-25.

Comment #4 The rationale that contaminants are "not considered to pose any additional risk" from their presence in certain media because they were found in all media is not justified. Contaminants may be found in all media because they have migrated from a contaminated source or their naturally-occurring levels are elevated. It is the remedial project manager's decision to eliminate contaminants based on naturally-occurring background levels.

Response #4 Acknowledged. This rationale has been re-evaluated and the text revised.

Specific Comments

Comment #1 Page 2-4, Sediment section, 2nd sentence - The presence of heptachlor at a high concentration in one sample could be interpreted as the identification of a hot spot. It would be helpful if the FS stated how many total sediment samples were taken at SEAD-25 to determine the significance of one high hit.

Response #1 Acknowledged. The total number of samples collected is provided in Tables 2-1 and 2-2. No change has been made to the text.

Comment #2 Page 2-5, Soil section, 2nd sentence and Sediment section, 7th sentence - See comment 1 above about potential hot spots.

Response #2 Acknowledged. The total number of samples collected is provided in Tables 2-1 and 2-2. No change has been made to the text.

Comment #3 Page 2-7, SEAD-25 Surface Soil section - The fact that contaminants found in the surface soil were not found in the underlying groundwater does not justify elimination of the soil pathway as a source to surface water and sediment.

Response #3 Agreed. However, surface water and sediment do not exhibit risk based on the intended future use of the site. Since soil (including surface soils) is addressed in the remedial alternatives for SEAD-25, no change has been made to the text.

Comment #4 Page 2-26, Section 2.2.5, 5th sentence - The EPA target risk level for ecological risk assessments is a Hazard Index of 1 not 10. Any Hazard Index above 1 indicates that there is a potential -for ecological risk.

Response #4 Acknowledged. Please see response to Comment #1 under Ecological Risk, General Comments, SEAD-25.

Comment #5 Page 2-27, last paragraph. Several polycyclic aromatic hydrocarbons such as benzo(a)pyrene and chrysene are found in both SEAD-25 surface soil and sediment. It seems likely that past fire control activities performed in this area are the likely source of these compounds. They should be included in the text as sediment contaminants of concern.

Response #5 Acknowledged. Please see response to Comment #1 under Ecological Risk, General Comments, SEAD-25. Benzo(a)pyrene has been added as a constituent of concern for sediment based on human health for the residential alternatives.

Comment #6 Page 2-28, Section 2.2.5.2. SEAD-26 Soil Cleanup Goals - If contaminants in soil are posing a potential terrestrial ecological risk, the soil pathway should not be eliminated from remediation.

Response #6 Acknowledged. Please see response to Comment #1 under Ecological Risk, General Comments, SEAD-25.

Comment #7 Table 2-3 and 2-4, Sediment Cleanup Goals - The sediment cleanup goals should not be based on an additional factor of 1 0. They should be the same as the screening criteria.

Response #7 Acknowledged. Please see response to Comment #1 under Ecological Risk, General Comments, SEAD-25.

Comment #8 Page 2-32, 2nd bullet a. This statement should read "Reduce risk to ecology of SEAD-25 by mitigating exposure pathways due to contact with pesticides and metals in the sediment." b. What is the source of these chemicals in the sediment? If soil is the source, shouldn't soil remediation be proposed?

Response #8 Acknowledged. This text has been deleted from the revised FS. Soil remediation is proposed at SEAD-25.

<u>RCRA ARARS:</u>

<u>SEAD-25</u>

<u>Alternative RA25-2:</u>

Institutional Controls, Natural Attenuation of Plume, and Sediment Removal

Comment #1 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste) would be applicable, to any removal, management, and disposal of source area sediment. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste).

Response #1 Acknowledged. 40 CFR Part 262 is listed in Table C-1 for RA25-2. Since off-site treatment or disposal is no longer a component of this alternative, 40 CFR Part 263 is not applicable, but is applicable to those alternatives where off-site treatment or disposal is a component.

Comment #2 40 C.F.R. Part 264, Subpart M (Land Treatment) would be applicable for any on site treatment of soil exceeding the Toxicity Characteristic Leaching Procedure (TCLP) 40 C.F.R. Part 268 Land Disposal Restrictions would be applicable for the onsite disposal of the sediment.

Response #2 Acknowledged. 40 CFR Part 264 is listed in Table C-1 for RA25-2. 40 CFR Part 268 is not considered applicable for this alternative since sediment removal has been removed as a component from this alternative. The text of Section C.4.4 has been changed so that 40 CFR Part 264 is designated applicable.

Comment #3 Groundwater monitoring regulations under 40 C.F.R. Part 264, Subpart F standards are applicable to long-term monitoring of the site. These standards provide guidance for well construction and placement, sample collection and analysis procedures applicable to the remedial action.

Response #3 Agree. This ARAR is listed in Table C-1 for RA25-2. The text in Section C.4.4 has been changed so that 40 CFR Part 264, Subpart F is designated applicable.

<u>Alternative RA25-3:</u>

Bioventing of Soil, Air Sparging, of Plume, and Sediment Removal

Comment #1 Groundwater monitoring regulations under 40 C.F.R. Part 264, Subpart F standards are applicable to long-term monitoring of the site. These standards provide guidance for well construction and placement, sample collection and analysis procedures applicable to the remedial action.

Response #1 Agree. This ARAR is listed in Table C-1 for RA25-3. The text in Section C.4.4 has been changed so that 40 CFR Part 264, Subpart F is designated applicable.

Comment #2 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of hazardous Waste) would be applicable, to any removal, management, and disposal of the reactive zone spent materials. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste) as well as 40 C.F.R. Part 264 Subpart L (Waste Piles) would be applicable.

Response #2 Acknowledged. 40 CFR Part 262 is listed in Table C-1 for RA25-3. 40 CFR Part 263 is not applicable to this alternative since sediment removal has been eliminated from the alternative. However, 40 CFR Part 262 has been designated as applicable for alternatives RA25-3R and RA25-3AR, which do incorporate sediment removal.

Alternative RA25-4:

Source Removal, Sediment Removal, Off-Site Disposal, and Natural Attenuation of Plume

Comment #1 Groundwater monitoring regulations under 40 C.F.R. Part 264, Subpart F standards are applicable to long-term monitoring of the site. These standards provide guidance for well construction and placement, sample collection and analysis procedures applicable to the remedial action.

Response #1 Agreed. This ARAR is listed in Table C-1 for RA25-4. The text in Section C.4.4 has been changed so that 40 CFR Part 264, Subpart F is designated applicable.

Comment #2 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste) would be applicable, to any removal, management, and disposal of the reactive zone spent materials. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste) as well as 40 C.F.R. Part 264 Subpart N (Landfills) would be applicable.

Response #2 Agreed. These ARARs are listed in Table C-1 for RA25-4. The text in Section C.4.4 has been changed so that these two regulations are designated applicable.

Comment #3 40 C.F.R. Part 268 Land Disposal Restrictions would be applicable for the onsite disposal of the sediment.

Response #3 Acknowledged. Sediment removal is no longer a component of this remedy. Therefore, this ARAR is not applicable for RA25-4.

Alternative RA25-5:

Source Removal, Sediment Removal, Off-Site Disposal, and Air Stripping of Plume

Comment #1 Groundwater monitoring regulations under 40 C.F.R. Part 264, Subpart F standards are applicable to long-term monitoring of the site. These standards provide guidance for well construction and placement, sample collection and analysis procedures applicable to the remedial action.

Response #1 Agreed. This ARAR is listed in Table C-1 for RA25-5. The text in Section C.4.4 has been changed so that 40 CFR Part 264, Subpart F is designated applicable.

Comment #2 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste) would be applicable, to any removal, management, and disposal of the reactive zone spent materials. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste) would be applicable.

Response #2 Agreed. These ARARs are listed in Table C-1 for RA25-5. The text in Section C.4.4 has been changed so that these two regulations are designated applicable.

Comment #3 40 C.F.R. Part 264 Subpart J (Tank Systems) and Subpart M (Land Treatment) would be applicable to any treatment of groundwater on site.

Response #3 Agreed. These ARARs are listed in Table C-1 for RA25-5. Subpart J of 40 CFR Part 264 has been added to text in Section C.4.4.

Comment #4 The regulations specified in 40 C.F.R. Part 264 Subpart AA, BB, and CC (Organic Air Emission Standards) would be applicable to any air discharges due to treatment of the groundwater on site.

Response #4 Agreed. This ARAR has been added in Table C-1 for RA25-5. This regulation has been added to the text in Section C.4.4. and to Table C-1.

<u>Alternative RA25-6:</u>

Source Removal, Sediment Removal, Off-Site Disposal, and Air Sparging

Comment #1 Groundwater monitoring regulations under 40 C.F.R. Part 264, Subpart F standards are applicable to long-term monitoring of the site. These standards provide guidance for well construction and placement, sample collection and analysis procedures applicable to the remedial action.

Response #1 Agreed. This ARAR is listed in Table C-1 for RA25-6. The text in Section C.4.4 has been changed so that 40 CFR Part 264, Subpart F is designated applicable.

Comment #2 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste) would be applicable, to any removal, management, and disposal of the reactive zone spent materials. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste) would be applicable.

Response #2 Agreed. These ARARs are listed in Table C-1 for RA25-6. The text in Section C.4.4 has been changed so that these two regulations are designated applicable.

Comment #3 40 C.F.R. Part 264 Subpart J (Tank Systems) and Subpart M (Land Treatment) would be applicable to any treatment of groundwater on site.

Response #3 Agreed. These ARARs are listed in Table C-1 for RA25-5. Subpart J of 40 CFR Part 264 has been added to text in Section C.4.4.

Comment #4 The regulations specified in 40 C.F.R. Part 264 Subpart AA, BB, and CC (Organic Air Emission Standards) would be applicable to any air discharges due to treatment of the groundwater on site.

Response #4 Agreed. This ARAR has been added in Table C-1 for RA25-6. This regulation has been added to the text in Section C.4.4. and to Table C-1.

SEAD-26

Alternative RA26-2:

Institutional Controls, Natural Attenuation of Plume, and Sediment Removal

Comment #1 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste) would be applicable, to any removal, management, and disposal of source area sediment. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste).

Response #1 Acknowledged. 40 CFR Part 262 is listed in Table C-2 for RA26-2. Since off-site treatment or disposal is no longer a component of this alternative, 40 CFR Part 263 is not applicable, but is applicable to those alternatives where off-site treatment or disposal is a component.

Comment #2 40 C.F.R. Part 264, Subpart M (Land Treatment) would be applicable for any on site treatment of soil exceeding the Toxicity Characteristic Leaching Procedure (TCLP) 40 C.F.R. Part 268 Land Disposal Restrictions would be applicable for the onsite disposal of the sediment.

Response #2 Acknowledged. 40 CFR Part 264 is listed in Table C-2 for RA26-2. 40 CFR Part 268 is not considered applicable for this alternative since sediment removal has been removed as a component from this alternative. The text of Section C.4.4 has been changed so that 40 CFR Part 264 is designated applicable.

Alternative RA26-3:

Air Sparging of Plume and Sediment Removal

Comment #1 Groundwater monitoring regulations under 40 C.F.R. Part 264, Subpart F standards are applicable to long-term monitoring of the site. These standards provide guidance for well construction and placement, sample collection and analysis procedures applicable to the remedial action.

Response #1 Agreed. This ARAR is listed in Table C-2 for RA26-3. The text in Section C.4.4 has been changed so that 40 CFR Part 264, Subpart F is designated applicable.

Comment #2 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste) would be applicable, to any removal, management, and disposal of the sediment. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste) would be applicable.

Response #2 Acknowledged. 40 CFR Part 262 is listed in Table C-2 for RA26-3. Since off-site treatment or disposal is no longer a component of this alternative, 40 CFR Part 263 is not applicable, but is applicable to those alternatives where off-site treatment or disposal is a component.

Comment #3 It is not clear as to whether Soil Vapor Extraction will be used, if so 40 C.F.R. Part 264 Subpart J (Tank Systems) and Subpart M (Land Treatment) may be relevant and appropriate to any treatment of groundwater on site.

Response #3 Agreed. No soil vapor extraction will be used. 40 CFR 264 is listed in Table C-2 for RA26-3.

Comment #4 The regulations specified in 40 C.F.R. Part 264 Subpart AA, BB, and CC (Organic Air Emission Standards) would be applicable to any air discharges due to treatment of the groundwater on site.

Response #4 Agreed. This ARAR has been added in Table C-2 for RA26-3. This regulation has been added to the text in Section C.4.4. and to Table C-2.

Alternative RA26-4:

Air Stripping of Plume and Sediment Removal

Comment #1 Groundwater monitoring regulations under 40 C.F.R. Part 264, Subpart F standards are applicable to long-term monitoring of the site. These standards provide guidance for well construction and placement, sample collection and analysis procedures applicable to the remedial action.

Response #1 Agreed. This ARAR is listed in Table C-2 for RA26-4. The text in Section C.4.4 has been changed so that 40 CFR Part 264, Subpart F is designated applicable.

Comment #2 The regulations specified in 40 C.F.R. Part 262 (Standards Applicable to Generators of Hazardous Waste) would be applicable, to any removal, management, and disposal of the sediment. In addition, if excavated material is removed off-site for treatment or disposal, 40 C.F.R. Part 263 (Standards Applicable to Transporters of Hazardous Waste)would be applicable.

Response #2 Acknowledged. 40 CFR Part 262 is listed in Table C-2 for RA26-4. Since off-site treatment or disposal is no longer a component of this alternative, 40 CFR Part 263 is not applicable, but is applicable to those alternatives where off-site treatment or disposal is a component.

Comment #3 40 C.F.R. Part 264 Subpart J (Tank Systems) and Subpart M (Land Treatment) would be applicable to any treatment of groundwater on site.

Response #3 Agreed. These ARARs are listed in Table C-2 for RA26-4. Subpart J of 40 CFR Part 264 has been added to text in Section C.4.4.

Comment #4 The regulations specified in 40 C.F.R. Part 264 Subpart AA, BB, and CC (Organic Air Emission Standards) would be applicable to any air discharges due to treatment of the groundwater on site.

Response #4 Agreed. This ARAR has been added in Table C-2 for RA26-4. This regulation has been added to the text in Section C.4.4. and to Table C-2.

Response to Comments
New York Department of Environmental Conservation
on
Draft Feasibility Study dated May 5, 1998
Fire Training and Demonstration Pad (SEAD-25) & Fire Training Pit and Area (SEAD-26)
Seneca Army Depot Activity, Romulus, NY

General Comments

Comment #1 There are numerous statements and conclusions presented in the report with which we disagree regarding the potential future risks to human health and the environment from the contaminated media at SEAD-25 and SEAD-26. The NYSDEC disagrees that maximum Remedial Action Objectives should be based upon "an acceptable risk for the intended land use" (page 2-31); we disagree that an "intended use" risk level should be the maximum initial remedial goal. However, we find the nature and extent of contamination subjected to remedial feasibility analysis to be acceptable (with the minor addition of sediment mentioned below). Because the Draft Feasibility Study (FS) presents alternatives that, when implemented, would remediate the site to a level acceptable to the NYSDEC, we suggest that a plan to remediate SEAD-25 and SEAD-26 can proceed without the resolution (at this site and time) of these non-technical issues, which would cause significant delay. Although we disagree with some of the reasoning contained within the earlier sections of the report, we feel that the scope and analysis of remedial alternatives presented is fundamentally acceptable.

Response #1 Acknowledged.

Comment #2 The decision by Parsons Engineering Science (Parsons ES) to set a sediment cleanup goal for lead at ten times the known effect level raises several concerns. Besides lacking a supporting reference, this level is above the severe effects level in the Fish & Wildlife Guidance (110 gpm) and is an order of magnitude above the remedial criteria for sediment utilized at the Open Burning Grounds. (The practice of using Open Burning Grounds remedial goals for this project appears to be supported by Parsons ES discussion on page 2-27 and 2-28 of this document). Regardless, the issue may be made moot for this site by defining geographically the extent of necessary sediment remediation. The NYSDEC agrees that the sediment removal indicated on Figure 2-1 is appropriate with the addition of sediment between sample location SWSD25-7 and SWSD25-6, as Table 2-8 indicates the result of sample SD25-6 is above the cleanup criteria using either definition of unacceptable lead contamination. The volume and cost of sediment removal should be modified accordingly throughout the FS.

Response #2 Acknowledged. In the draft version of this FS, the basis for selecting cleanup goals for sediment at ten times the L.E.L was to achieve a resulting ecological quotient of less than 10, once the clean up goal was achieved. An ecological quotient of ten was selected as appropriate based on ecological quotient guidelines for assessing the risk posed by contaminants (Menzie, C. J. Cura, J. Freshman and S. Svirsky, 1993). According to these guidelines, EQs less than 10 present a small potential for environmental effects.

Regardless, sediment clean up goals have been revised in the Draft Final version of this document. In order to update this document and make it consistent with the Final Remedial Investigation Report (May, 1998), sediment as a media of interest has been re-evaluated. The results of the ecological risk assessment (ERA) presented in the RI report (Parsons ES, May 1998) concluded that there is negligible risk to the ecosystem of the SEAD-25 and -26 study areas. The ERA included both a qualitative and quantitative assessment of the ecological status of the Unit. During field evaluation, no overt acute toxic impacts were evidenced during the field evaluation. The quantitative ecological risk evaluation, which involved comparisons of the ecological assessment endpoint exposures with the toxicity reference values, initially suggested that a slight possibility exists for the contaminants of potential concern (COPCs) to present a small potential for environmental effects due to sediment at SEAD-25 and due to sediment, soil and surface water at SEAD-26. In addition, four inorganic elements present in the sediment presented a potential for greater exposure to result in environmental effects at SEAD-25 and one phthalate, one herbicide and three inorganics present in the sediment presented a potential for greater exposure to result in environmental effects at SEAD-26. However, the effects from all of these analytes have not been observed during fieldwork, i.e. the ecological community appears diverse and normal. Furthermore, upon considering the weight of evidence presented in the Ecological Risk Summary section of the RI (Sections 6.6.12.4 and 7.6.12.4 of the RI), and the very conservative assumptions used in the ERA, the COPCs identified at SEAD-25 and SEAD-26 are considered to pose negligible risk to the ecosystem of the SEAD-25 and -26 study areas.

In addition to those reasons discussed in the RI, the following reasons for excluding sediment as a media of interest based on ecological risk are:

1. The presence of PAHs at SEAD-25 may be due to sources other than past activities at SEADs-25. This is apparent by the increasing PAH concentrations upstream of SEAD-25. PAH concentrations downstream of SEAD-25 decrease.

2. A significant portion of the ecological risk calculated in the RI for SEADs-25 and 26, was to aquatic receptors. As discussed in the RI, the ecological quotients calculated for aquatic receptors are very conservative since the sediment criteria that were used in their calculations are based upon a continuous exposure of aquatic organisms to these contaminants. Aquatic organisms are unlikely to occur in the drainage ditches of the unit as the conditions in the ditches are not aquatic in nature. Surface water in the ditches at SEADs-25 and -26 is ephemeral and is only present after heavy rains. Stormwater discharge from the base has been tested and does not predict ecological risk. This discharge runs through the drainage ditches at SEADs-25 and -26. Therefore, no ecological risk impacts are predicted at the point where sediment from these areas may eventually come in contact with aquatic receptors (i.e. at Kendaia Creek).

In the Draft Final version of the FS, alternatives have been developed which meet human health risk target values under a residential scenario. Because the sediment at SEAD-25 contributes to human health at SEAD-25, sediment is a media of interest in these alternatives. For these alternatives, the State's recommendation to include the area between SD25-7 and SD25-6 has been has been incorporated (as shown in Figure 2-1 of the revised FS). Clean up goals for sediment have been established for those compounds which most significantly contribute to human health risk and are set at the values provided in "NYS Technical Guidance for Screening Contaminated Sediments". Lead is included as a constituent of concern in sediment under the residential alternative, and the clean up goal has been set at the L.E.L.

Comment #3 Tables C-1 and C-2 of Appendix C list 6 NYCRR Part 375 as a chemical-specific ARAR for this project. It is also an action-specific ARAR. The NYSDEC feels that this ARAR is applicable to each remedial action alternative analyzed. Tables C-1 and C-2 should be corrected to reflect this, or an explanation should be offered as to why Parsons ES feels this ARAR is not acceptable. Section C.2.6 should also be updated to correct the omission of this ARAR.

Response #3 Agreed. Table C-1 and C-2 and Section C.2.6 have been updated to include this ARAR as action-specific.

Specific Comments

Comment #1 Section 1.1.1, Operable Units. There is a typographical error on the last line.

Response #1 Agreed. The text has been modified.

Comment #2 Section 2.4.3, Groundwater. The reference to Appendix A in the first paragraph of the SEAD-25 subsection should actually refer the reader to Appendix B.

Response #2 Agreed. The text has been modified.

Comment #3 Table 2-13. This table appears to conflict with Table 2-14 on whether alternative water supply institutional controls are an applicable technology.

Response #3 Agreed. These tables have been renumbered 2-15 and 2-16. Alternative water supply has been screened in both tables.

Comment #4 Table 2-14. The treated water disposal response action would not require a SPDES permit, but rather would need to meet the substantive requirements of such a permit.

Response #4 Agreed. The table has been modified accordingly.

Comment #5 Section 6.2.5, Compliance with ARARs. The first sentence of this section does not convey a clear point. It appears to state that the alternatives comply with something that doesn't exist.

Response #5 Agreed. The text in this section has been modified.

Comment #6 Table D-1. Should the number of years to air strip groundwater under Alternative 25-4 be one year, rather than the listed two years? Also, this table needs to include information on air stripping, sediment removal and soil removal for the SEAD-26 alternatives.

Response #6 Agreed. The number of years to air strip groundwater under this alternative is one. Text and costs have been modified accordingly. In addition, Table D-1 has modified to include the information on air stripping, sediment removal and soil removal for the SEAD-26 alternatives.

Comment #7 Table D-4. Please confirm the present worth calculation for the balance of the O&M. The total seems too low with respect to the annual cost offered.

Response #7 Acknowledged. The present worth calculation has been checked and the value is correct.

Response to Comments
from
U.S. Army Corps of Engineers - Huntsville
Draft Remedial Investigation (RI)
Fire Training and Demonstration Pad (SEAD-25) & Fire Training Pit and Area (SEAD-26)
Seneca Army Depot Activity, Romulus, NY
Comments Dated January 13, 1998

General Comments

Comment #1 In the risk assessment summary for SEAD-26 recommend including discussion of the segregation of organ specific effects for the HI (I assume this was done as allowed by RAGs in the risk assessment). Since the HI is just over unity this may have some bearing on the risk management decision.

Response #1 Acknowledged. Segregation of organ specific effects for the HI was not performed in the risk assessment for SEAD-26. If the fact that the HI for the child receptor under the residential scenario is just over one affects risk management decisions in the opinion of the regulators, this issue may be pursued. In the draft final FS document issued, this issue did not impact risk management decisions. The remedial alternatives developed for SEAD-26 were said to meet risk criteria for all scenarios (industrial as well as residential). All risk criteria were met, except for the hazard index discussed above, which was only slightly exceeded.

Comment #2 Since the ecological risk assessment showed negligible effects and a healthy ecosystem it is not clear why remedial action levels were developed for ecological receptors. A decision to not consider ecological receptors in this FS is readily justified in the case of these sites. Recommend consideration of excluding ecological receptors in this FS, exceedance of benchmark criteria does not indicate that cleanup for protection of ecological resources is indicated.

Response #2 Agreed. The draft final FS has been modified accordingly. Ecological receptors are not considered. Conclusions drawn from the RI were included in the text of Section 2 to support this change. Please refer to Comment #1 under Ecological Risk, General Comments, SEAD-25 in Responses to EPA comments.

Comment #3 Given that the sediment removal remedy is proposed for protection of ecological resources, the short term and long term protectiveness of the remedy should be evaluated in terms of these receptors, as well as impacts to human health. There is no discussion of the potential impacts that this remedy may have on ecological receptors. As stated in my previous comment I disagree with the risk management decision to evaluate alternatives for sediments in this FS, but if the alternative remains it should be evaluated properly for protection of ecological resources.

Response #3 Agreed. Please see response to Comment #2 above.

Comment #4 I disagree with the way the alternatives were assembled together. It does not seem necessary to group the sediment removal alternative with all of the groundwater remediation alternatives, as remedial actions would be taking place for very different reasons (and as stated earlier sediment removal seems unnecessary). Recommend evaluation of an additional alternative(s) that includes groundwater remediation in the absence of sediment removal. Otherwise, this FS does not lend itself to consideration of treatment of one media and not the other during remedy selection.

Response #4 Acknowledged. Sediment removal has been removed from the alternatives originally proposed in the FS. However, two residential alternatives (alternatives which meet the risk criteria under a future on-site resident scenario) have been developed and these do incorporate sediment removal.

Comment #5 There are a few minor contradictions in this document that seem to be a result of the parallel development of two sites and the size of the document. The conflicts do not seem to affect the results so they will not be enumerated here.

Response #5 Acknowledged.

Comment #6 Section 3.3.2. The surface water exceedance for lead is mentioned only for the no-action alternative. Concern for surface water is replaced by concern for sediments in the other alternatives.

Response #6 Acknowledged. For the reasons given in Section 2 of the FS, the surface water exceedance is no longer considered justification for remedial action. The reference to the surface water exceedance has been deleted from Section 3.3.2.

Comment #7 Section 3.3.5. The air stripping discussion is misplaced it should be in 3.3.6. Natural degradation should be discussed here.

Response #7 Agreed. The text has been revised.

Comment #8 Section 3.3.5. The high chlorine percentage of the contaminants would be hard on the metallic components of an oxidation system. Chlorine is aggressive to stainless steels, mild steels and catalysts.

Response #8 Acknowledged. A thermal oxidizer is not considered in the detailed analysis of alternatives. Therefore, no text change has been made here.

Comment #9 Section 6.5.1. Air strippers force the transfer of volatiles from water to air by violent agitation. See Treybal.

Response #9 Acknowledged.

Comment #10 Section 6.5.5. Treatability studies and consideration of off-gas emissions should be included in the recommendations.

Response #10 Acknowledged. Treatability studies and off-gas emissions are discussed within respective alternative development when applicable.

Comment #11 In this chapter (including the tables), and throughout the document the acronym "AWQS" is used in relation to New York State water quality regulations. NYSDEC regulations does not use this acronym. Instead, they use "WQS" for "water quality standards" (they do not use the "ambient" part). For accuracy purposes, it is recommended that the correct acronym "WQS" be used when referring to NYSDEC standards.

Response #11 Acknowledged. Since the latest version of TOGS 1.1.1 (June 1998) is entitled "Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations", we have decided to leave the acronym as is.

<u>Comments for Appendix C</u>

Some general comments regarding the Appendix C ARAR evaluation follow which should be incorporated into the document to give a more accurate evaluation of ARARs for potential remediation actions:

Comment #1 Most of the chemical-specific ARARs given, are in fact, action-specific. For example, air quality standards and water quality regulations (other than MCLs and other water quality standards actually driving the cleanup) are action-specific and would not come into play until a remedial action is undertaken. The same applies to soil quality standards such as 40 CFR 268 LDRs.

Response #1 Agreed. We have re-categorized many of the chemical-specific ARARs to be action-specific.

Comment #2 National Ambient Air Quality Standards (NAAQS) are not applicable to any remedial actions taken at the site. They are standards not to be exceeded by air quality regions and are not directly applicable to sources. They are not intended as actual emission limits from air emission sources. At most, they might be seen as "relevant and appropriate" only in that any remedial action implementation must not cause an exceedance of the standard within its respective air quality region (but again, this does not mean that the standard is the emission limit for any remedial action... air dispersion modeling and consideration of other air pollutant sources in the area must be done to determine impacts to regional air quality and establish emission limits).

Response #2 Agreed. We have re-assigned this ARAR as relevant and appropriate.

Comment #3 For many of the standards discussed in the text, the citation is missing the Title portion. For example, the correct citation for an EPA regulation is "40 CFR ____", for OSHA standards, it is "29 CFR ___" and for DOT it is "49 CFR ___". Most of the EPA standards are correct, but the OSHA and DOT standards are all missing the numerical Title reference.

Response #3 Agreed. The text has been changed to include the Title references.