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U.S. ARMY ENGINEER DIVISION
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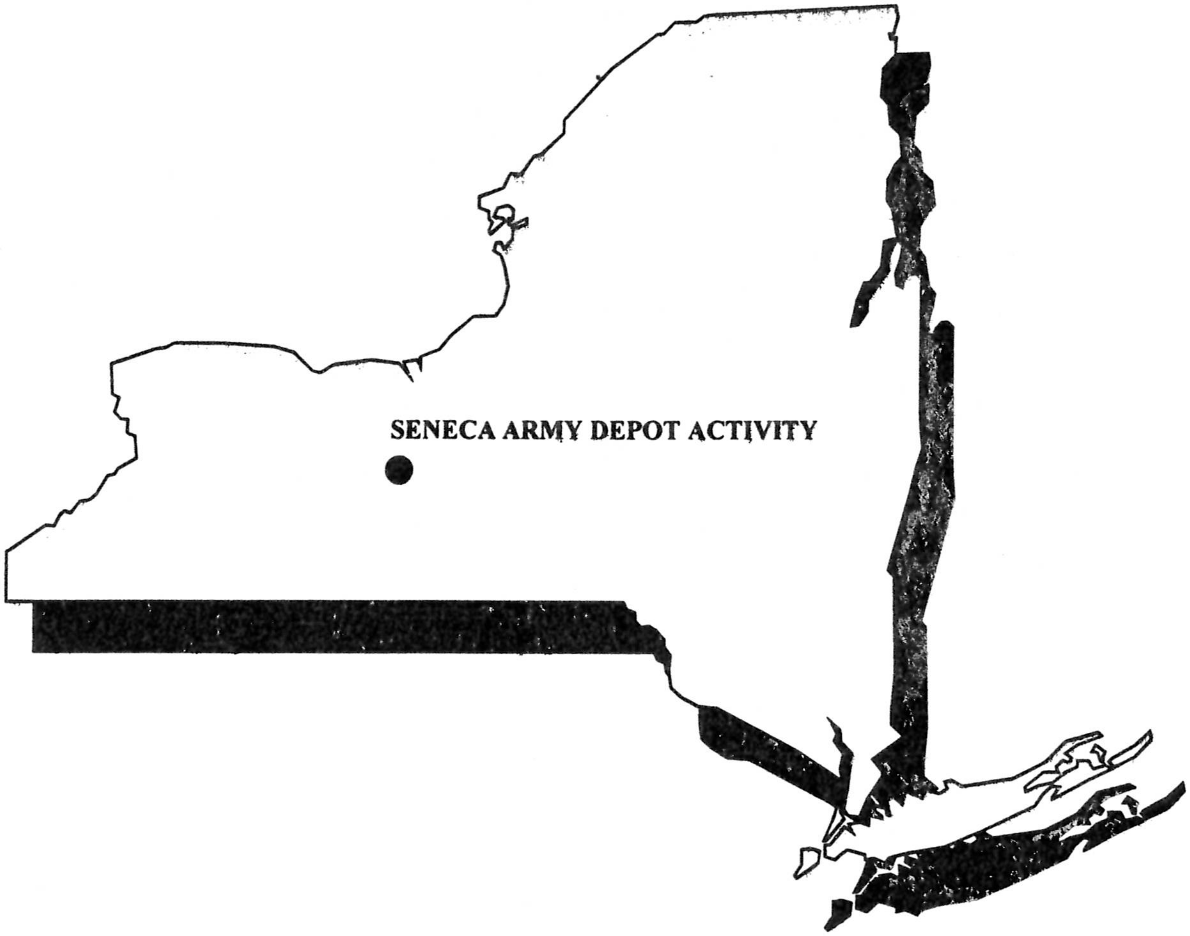

DRAFT

WORK PLAN FOR THE REMEDIAL INVESTIGATION AT THREE EBS SITES IN THE PLANNED INDUSTRIAL DEVELOPMENT AREA, SENECA ARMY DEPOT ACTIVITY

CONTRACT NO. DACA87-95-D-0031
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DRAFT

WORK PLAN
FOR THE REMEDIAL INVESTIGATION (RI) AT THREE EBS SITES IN THE PLANNED INDUSTRIAL DEVELOPMENT AREA,
SENECA ARMY DEPOT ACTIVITY
ROMULUS, NEW YORK

Prepared For:

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Acronyms and Abbreviations

1,1DCE	1,1-dichloroethene
1,2-DCE	cis- and trans- 1,2-dichloroethene
ARAR	applicable or relevant and appropriate requirements
ASTM	American Society for Testing and Materials
AWQS	Ambient Water Quality Standard
bgs	below grade surface or below ground surface
BRA	Baseline Risk Assessment
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene and xylene
CERCLA	Comprehensive Environmental Responsibility, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CFR	Code of Federal regulations
CLP	Contract Laboratory Program
cm	centimeter or centimeters
DoD	Department of Defense
DQO	Data Quality Objective
DRMO	Defense Reutilization and Materials Office\
dup or DU	duplicate sample designator
e.g.,	for example
EB	equipment blank sample designator
EBS	Environmental Baseline Survey
ECL	Environmental Conservation Law
Eh	redox potential
et seq	and the following one
FB	field blank sample designator
Fe	chemical symbol for Iron
FFA	Federal Facilities Agreement
FOIL	Freedom of Information Law
FPPA	Farmland Protection Policy Act
FSAP	Field Sampling and Analysis Plan
gpm	gallon per minute or gallons per minute
H	Henry's law constant
H	Herbicides
HEA	Health Effect Assessment
hr	hour or hours
HWR	Hazardous Waste Remediation
i.e.,	that is
IAG	Interagency Agreement
IRIS	Integrated Risk Information System

Acronyms and Abbreviations
(continued)

kg/hectare	kilogram or kilograms per hectare
K_{oc}	organic carbon partition coefficient
K_{ow}	octanol-water partition coefficient
LRA	Local Development Authority
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	milligram or milligrams per Liter
mL/g	milliliter or milligrams per gram
mm Hg	millimeters of mercury
mol/m^3-atm	mole or moles per cubic meter-atmosphere
MS	matrix spike sample designation
MSD	matrix spike duplicate sample designation
MV	millivolt or millivolts
NEPA	National Environmental Policy Act
NGVD	National Geodetic Vertical Datum
nm	nanometer
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NYCRR	New York State Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OB	Open Burn
OCP	Organochlorine Pesticides
OPP	Organophosphorous Pesticides
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Planned Industrial Development
POTW	Publicly-Owned Treatment Works
ppm	part or parts per million
QA/QC	Quality Assurance/Quality Control
QAMS	Quality Assurance Management Staff
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SD	Sediment sample designation
SEC	Secondary Drinking Water Guidance Value
SEDA	Seneca Army Depot Activity
SPDES	State Pollutant Discharge Elimination System
SSHP	Site-specific Safety and Health Plan

Acronyms and Abbreviations
(continued)

SVOC	Semivolatile Organic Compound
SW	Surface Water sample designation
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TB	trip blank sample designator
TBC	to be considered
TCE	trichloroethylene or trichloroethene
TCL	Target Compound List
TIC	Tentatively Identified Compound
TOG	Technical Operating Guidance
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
USC	United States Code
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
VOC	Volatile Organic Compound
Zn	chemical symbol for Zinc
$\mu g/cm^2$	microgram or micrograms per square centimeter

1 INTRODUCTION

The purpose of this work plan is to define and describe a Remedial Investigation (RI) that is proposed for two sites, one (i.e., SEAD-121C) located within the Planned Industrial Development (PID) and one (i.e., SEAD-121I) located in the Warehouse Area (henceforth, collectively referred to as the PID Area), at the former Seneca Army Depot Activity (SEDA) in Romulus, New York. The goal of the proposed RI at the two sites is to expand upon the amount of information and data that are available so that decisions pertinent to the nature, extent and the potential severity of contamination present at these sites, and possible remedial actions needed to alleviate potential threats identified, may be made. Preliminary data describing site conditions were developed as part of an Environmental Baseline Survey (EBS) that was conducted at these sites in 1998. Results and findings of the EBS, and other historic information known about the two sites, provide the basis for the proposed RI. Data and information developed as a result of the implementation and completion of the work identified in the following document will be combined with the existing data set and the resulting data set will provide the basis of recommendations pertinent to each site's future deposition. The proposed RI at each site will include an historical information review, the sampling and analysis of soil, groundwater, surface water and sediment samples, and the subsequent evaluation and assessment of all of the available data.

The two sites that are the subjects of the proposed RI include the Depot's Defense Reutilization and Marketing Office Yard (SEAD-121C) and the Cosmoline Oil Disposal Area (SEAD-121I). SEAD 121C is located in the part of the Depot where the future land use is designated as Planned Industrial Development, while SEAD-121I is located in the portion of the Depot where the future designated land use is Warehousing. Both of these sites are located in the east central portion of the Depot, near the main gate into the Depot from New York State Highway Route 96. The Army previously used the area surrounding the two sites for base command, industrial, maintenance, warehousing, and storage activities.

The proposed RI at the two PID Area sites will be performed in accordance with requirements and guidance of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as set forth in the Interim Final "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" (EPA, 1988). Conducted work will also comply with the latest guidance from the US Environmental Protection Agency (USEPA), New York State Department of Environmental Conservation (NYSDEC), and the Department of Defense's (DoD's) Base Realignment and Closure (BRAC) Office. All fieldwork will be conducted in accordance with the Generic Installation Remedial Investigation/Feasibility Study (RI\FS) Work Plan for Seneca Army Depot Activity (Parsons, 1995). The Generic Work Plan describes in detail how the proposed fieldwork will be performed.

2 SCOPING OF THE INVESTIGATION

This section describes the current understanding of SEAD-121C and SEAD-121I based upon the existing knowledge of the sites. This includes the development of a conceptual model for each site describing all known contaminant sources and receptor pathways based upon actual sampling data. These conceptual models will be used to develop and implement additional studies that may be required to fully assess risks to human health and the environment. Other considerations that are discussed are data quality objectives (DQOs) and potential remedial actions for the two SEADs. These considerations will also be integrated into the scoping process to ensure that adequate data is collected to complete the RI process, which includes a Baseline Risk Assessment (BRA). The BRA provides an evaluation of the potential threat to human health and the environment in the absence of remedial action. The objectives of the BRA are to identify contaminants of concern, to assess the toxicity of these contaminants, to evaluate the threat to human health, and to characterize potential risks to the environment.

2.1 CONCEPTUAL SITE MODEL

The conceptual site model for the two SEADs located in the PID Area takes into account site conditions and accepted pollutant behavior to formulate an understanding of the sites. These will serve as a basis for determining necessary additional studies for the RI. The model was developed after a preliminary evaluation of the following three items:

- Historical usage;
- Physical site characteristics: This considers the physical aspects of environmental conditions and the effect these conditions may have on potential pollutant migration. These include groundwater characteristics, surface water run-off characteristics and local terrain; and
- Environmental fate of constituents: This considers the fate and transport of residual materials in the environment based upon known chemical and physical properties.

2.1.1 Site History and Usage

The SEDA lies between Cayuga and Seneca Lakes in New York's Finger Lake Region, near the communities of Romulus and Varick, NY. SEDA encompasses approximately 10,600 acres of historic farmland and contains more than 900 buildings that provide more than 4.4 million square feet of space, including approximately 1.3 million square feet of storage space. SEDA was originally constructed and opened in 1941, and continued its military mission until September of 2000. The mission of the facility throughout its history included receipt, storage, distribution, maintenance, and demilitarization of conventional ammunition, explosives and special weapons. **Figure 2-1** shows the location of the SEDA.

The SEDA was proposed for inclusion as a Federal Facility site on the National Priority List (NPL) in July of 1989; the Depot's listing was approved and it was finalized in August of 1990. In accordance with requirements of Section 120 of CERCLA (Title 42, *U.S. Code*, Sec. 9620), the US Army, the USEPA, and the NYSDEC negotiated and signed a Federal Facilities Agreement (FFA) or an Interagency Agreement (IAG) governing site investigation and remediation of the Depot in January 1993.

The SEDA was selected for closure under the DoD's BRAC process in January of 1995. A majority of the Depot was approved for the 1995 BRAC list in October of 1995. The Depot's mission closure date was September 30, 1999, with an installation closure date of September 30, 2000. A small enclave at SEDA remains open to this date, and this is used to store hazardous materials and ores.

In accordance with the requirements of the BRAC process, the Seneca County Board of Supervisors established, in October 1995, the Seneca Army Depot Local Redevelopment Authority (LRA). The primary responsibility assigned to the LRA was to plan and oversee the redevelopment of the Depot. The Reuse Plan and Implementation Strategy for Seneca Army Depot was adopted by the LRA and approved by the Seneca County Board of Supervisors on October 22, 1996. Under this plan and subsequent amendment, areas within the Depot were classified according to their most likely future use. The use classification defined by the LRA include:

- housing;
- institutional;
- industrial;
- warehousing;
- conservation/recreational land;
- an area designated for a future prison;
- an area for an airfield, special events, institutional, and training; and
- an area to be transferred from one federal entity to another (i.e., an area for the existing navigational LORAN transmitter).

A map summarizing the LRA's recommended future land use of areas at SEDA is presented as **Figure 2-2**.

Also in accordance with requirements of BRAC, the Army retained Woodward-Clyde Federal Services (Woodward-Clyde) to prepare an Environmental Baseline Survey for the SEDA. Under this process, Woodward-Clyde classified discrete areas of real property at SEDA that are subject to transfer into one of seven standard environmental condition definitions consistent with the Community Environmental Response Facilitation Act (CERFA – Public Law 102-426), which amends Section 120 of CERCLA. The results of Woodward-Clyde's effort were documented in the US Army Base Realignment and Closure 95 Program Report that was issued on October 30, 1996. This report served as part of the basis for subsequent decisions made regarding land use. Within this report, SEAD-121C, the Defense Reutilization and Marketing Office (i.e., DRMO) Yard, was assigned the classification of 78(6)HS/HR, which indicates that it is a category 6 parcel (i.e., "Areas where storage, release, disposal, or migration of hazardous substances or petroleum products has occurred, but required removal or remedial actions have not yet been initiated"), and where available information suggests that hazardous substance storage (i.e., HS) and hazardous substance release or disposal (i.e., HR) has occurred. Additionally, two parcels of land (i.e., 74(6)HS/HR(P) and 76(6)HS/HR(P)) identified as part of SEAD-121I, the Rumored Cosmoline Oil Disposal Area, were classified as category 6 properties where available information suggested that hazardous substance storage (i.e., HS) and hazardous substance release or disposal (i.e., HR) including PCBs (i.e., P), has occurred. In accordance with requirements of CERFA, land classified as either category 5, 6, or 7 land is not suitable for transfer until necessary investigations and remedial actions, if necessary, are complete.

2.1.2 Site Characteristics

2.1.2.1 Geology

SEDA is located within one distinct unit of glacial till that covers the entire area between the western shore of Cayuga Lake and the eastern shore of Seneca Lake. The till is consistent across the entire depot although it ranges in thickness from less than 2 feet to as much as 15 feet with the average being only a few feet thick. This till is generally characterized by brown to gray-brown silt, clay and fine sand with few fine to coarse gravel-sized inclusions of weathered shale. Larger diameter weathered shale clasts (as large as 6-inches in diameter) are more prevalent in basal portions of the till and are probably rip-up clasts removed by the active glacier during the late Pleistocene era. The general Unified Soil Classification System (USCS) description of the till on-site is as follows: Clay-silt, brown; slightly plastic, small percentage of fine to medium sand, small percentage of fine to coarse gravel-sized gray shale clasts, dense and mostly dry in place, till, (ML). Grain size analyses performed by Metcalf & Eddy (1989) on glacial till samples collected during the installation of monitoring wells at SEDA show a wide distribution of grain sizes. The glacial tills in this area have a high percentage of silt and clay with trace amounts of fine gravel. A zone of gray weathered shale of variable thickness is present below the till in almost all locations at SEDA. This zone is characterized by fissile shale with a large amount of brown interstitial silt and clay.

This underlying bedrock below weathered shale is a member of the Ludlowville Formation of the Devonian age Hamilton Group. The Hamilton Group, 600 to 1,500 feet thick, is divided into four formations. They are, from oldest to youngest, the Marcellus, Skaneateles, Ludlowville, and Moscow formations. The western portion of SEDA is generally located in the Ludlowville Formation while the eastern portion is located in the younger Moscow Formation. Gray, calcareous shales, mudstones and thin limestones with numerous zones of abundant invertebrate fossils characterize the Ludlowville and Moscow formations. 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. **Figure 2-3** displays the stratigraphic section of Paleozoic rocks of Central New York. Three known predominant joint directions, N60°E, N30°W, and N20°E are present within this unit (Mozola, 1951).

2.1.2.2 Hydrogeology

Available 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. Regionally, four distinct hydrologic water-bearing units have been identified (Mozola A.J., 1951). These include two distinct shale formations, a series of limestone units, and unconsolidated beds of Pleistocene glacial drift.

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

Surface drainage from SEDA flows to five primary creeks. In the southern portion of the Depot, the surface drainage flows through man-made drainage ditches and streams into Indian and Silver Creeks. These creeks then merge and flow into Seneca Lake just south of the SEDA airfield. The central part and administration area of the SEDA drain into Kendaia Creek. Kendaia Creek flows in a predominant westerly direction, and discharges into Seneca Lake at a location north of Pontius Point and the SEDA' Lake Shore Housing Area. The majority of the northwestern and north-central portion of the SEDA drains into Reeder Creek. Reeder Creek flow predominantly northwesterly and leaves the Depot at a point that is north of the Open Detonation Area (i.e., SEAD-45) and west of the former Weapons Storage Area or the "Q" (i.e., SEAD-12) before it turns to the west and flows into Seneca Lake. The northeastern portion of the Depot, which includes a marshy area called the Duck Pond, drains into

Kendig Creek and then flows north into the Cayuga-Seneca Canal and to Cayuga Lake. Other minor creeks are also present and drain portions of the Depot.

Data from site quarterly groundwater monitoring program indicate that the saturated thickness of the till/weathered shale overburden aquifer is variable, ranging between 1 and 8.5 feet. However, the aquifer's thickness appears to be influenced by the hydrologic cycle and some monitoring wells dry up completely during portions of the year. Based upon a review of two years of data, the variations of the water table elevations are likely a seasonal phenomenon. The overburden aquifer is thickest during the spring recharge months and thinnest during the summer and early fall. During late fall and early winter, the saturated thickness increases. Although rainfall is fairly consistent at SEDA, averaging approximately 3 inches per month, evapo-transpiration is a likely reason for the large fluctuations observed in the saturated thickness of the over-burden aquifer.

Regional precipitation is derived principally from cyclonic storms that pass from the interior of the country through the St. Lawrence Valley. Seneca, Cayuga, and Ontario Lakes provide a significant amount of the winter precipitation and moderate the local climate. Annual snowfall amounts are approximately 100 inches. Wind velocities are moderate, but during the winter months, there are numerous days with sufficient winds to cause blowing and drifting snow. The most frequently occurring wind directions are southerly (summer) and north-northwesterly (winter) (**Figure 2-4**).

2.1.3 Area Specific Characteristics

The surface elevation of the PID Area varies from roughly 720 to 760 feet (NGVD 1929). Overall the land in the PID Area, and the Depot as a whole, slopes gently towards Seneca Lake (elevation 445 feet, NGVD 1929) which is located approximately 9,000 feet to the west of the PID Area. **Figure 2-5** presents a US Geological Survey (USGS) topographic map encompassing the PID Area.

A thin, clay-rich layer of glacial till overlies the shale bedrock within the PID Area. The local overburden groundwater flow may follow the general trend of the land towards the west and Seneca Lake. The overburden groundwater flow in the vicinity of SEAD-121I may also be locally influenced by Kendaia Creek, which bounds the site along its northwest bound. The overburden groundwater flow in the vicinity of SEAD 121C is suspected to be westerly, although the potential influences of drainage culverts and storm sewers located around this site is not known at this time.

Aerial photographs encompassing the locations of SEADs 121C and 121I in April 1968, April and May 1985, and December 1993 were obtained and evaluated.

2.13.1 SEAD-121C, the DRMO Yard

2.1.3.1.1 Site Conditions

SEAD-121C is comprised of a triangularly shaped gravel lot located in the eastern portion of the Depot (**Figure 2-6**). Building 360 and the entrance gate are located on the eastern side of the area. Building T-355 is located in the central part of the yard and is used for storage. The south and northwest perimeters are fenced, and drainage ditches are found outside the fences. The surface of the DRMO Yard is graded to allow surface water to drain toward the ditches. Interviews with Depot personnel indicate a history of rapid turnaround of material and vehicles stored in this area, and it was common for vehicles including military trailers, trucks, and heavy equipment to be parked along the south and northwest fences and in the central area. A 70-foot by 20-foot concrete barrier containment area was previously located at the southwest corner of the site and this cell was occasionally filled with material (e.g., scrap metal, wood debris, ordnance components, batteries, tiles, oil filters, auto parts, paint cans, and other debris) scraped from the yard. Portions of the DRMO Yard were also used for the storage of old tires. Storage cells made of concrete blocks were also located in the northeastern portion of the site.

2.1.3.1.2 Aerial Photograph Interpretations

Examination of the 1968 photographs of SEAD-121C suggests that the operations of that time included a single building that was located in an area that was accessed by poorly defined dirt roads, and surrounded by areas that were sparsely vegetated. There is evidence of outdoor storage activities located to the south and west of the single site building.

The 1985 photograph shows that a second, larger site building has been added to the area, and this is located to the east of the original site building. This photograph also shows that there is continuing evidence of outdoor storage on what now appears to be a well-defined pad, located to the west of the original site building. Generally, the area of SEAD-121C appears to be free of any vegetation except for a few large shrubs or trees that are located along the creek that forms the SEAD's northwestern boundary.

Review of the 1993 aerial photograph shows largely the same detail as the 1985 photograph, only with better resolution since the photograph was taken at a lower altitude. The two site buildings, and the storage area to the west of the original site building, are still evident and it now appears that the entire area, exclusive of the area of the buildings, is dirt covered and unvegetated.

2.1.3.1.3 Previous Investigation of the Site

The previous investigation of SEAD-121C included the collection of four surface soil samples (i.e., 0 to 0.2 feet bgs), the advancement and sampling of four soil borings, and the advancement, installation, and sampling of two temporary monitoring wells. Each of these sample collection pointes were placed in areas that were suspected to have been impacted by the historic activities conducted in the DRMO Yard.

The four surface soil samples were placed at locations downgradient of parking and storage areas and near the location of the former storage cells. Each of these samples was collected from a depth of 0 to 0.2 feet bgs (beneath vegetative cover material if present).

One soil boring was placed along the northwest fence, in a location where surface water flows from the site into an adjacent drainage ditch. The second soil boring was placed near the storage cells that are located in the northeast portion of the SEAD, approximately 200 feet north of Buildings T-355 and 360. The third soil boring was placed southwest of the corner of Building T-355 where historic spills were suspected to have occurred. The fourth soil boring was placed downgradient of the parking/storage area that is located in the extreme southwestern corner of the SEAD. Each of the soil borings was advanced to a depth of auger refusal, which varied from 4.3 feet bgs at location SB121C-1 to 7.7 feet bgs at location SB121C-3. Weathered bedrock was typically encountered at a depth of 4 to 5 feet bgs at each soil boring location.

One of the temporary monitoring wells was located downgradient of surface water drainage channel and the containment area that is located in the southwestern corner of the SEAD. The second temporary monitoring well was placed south of Building T-355 and the parking area.

All soil samples and groundwater samples collected during the EBS sampling event were analyzed for TCL VOCs, TCL SVOCs, TCL organo-chlorine pesticides and polychlorinated biphenyls (OCP/PCBs), total petroleum hydrocarbons (TPH) and Target Analyte List (TAL) Metals.

2.1.3.1.4 Results of Previous Investigation

Data from the prior investigation of SEAD-121C were submitted to the US EPA and the NYSDEC in May 1999 as part of the report titled "Investigation of Environmental Baseline Survey Non-Evaluated Sites SEAD-119(A), SEAD-122(A,B,C,D,E), SEAD-123(A,B,C,D,E,F), SEAD-46, SEAD-68, SEAD-120(A,B,C,D,E,F,G,H,I,J), and SEAD-121(A,B,C,D,E,F,G,H,I)" (Parsons 1999). A complete set of the analytical results obtained during the previous investigation at SEAD-121C is provided as **Tables A-1** and **A-2** in **Appendix A** of this document. Summary data for soil from the previous investigation, highlighting only those contaminants detected in samples and providing comparisons of the available results to NYSDEC's TAGM #4046 soil cleanup objective values, are provided in **Table 2-1**. A comparable presentation of the available groundwater data versus the lowest value reported for either NYSDEC's category GA groundwater standard, the federal Maximum Contaminant Level (MCL), or the federal secondary drinking water guidance values (SEC) is provided in **Table 2-2**. A summary discussion of the results is provided below.

Soil

Four VOCs, including acetone, benzene, chloroform, and toluene, were detected in one or more soil samples collected from SEAD-121C; however, none of the detected concentrations for VOCs were found at levels that exceeded their respective NYSDEC soil cleanup objective level. Toluene was the most frequently detected VOC, present in 13 of the 14 samples collected. Toluene and acetone were both detected at a maximum concentration of 28 µg/Kg, which represents the maximum concentration found for any VOC in the soil at this SEAD.

Twenty-six SVOCs were detected in one or more of the soil samples collected from SEAD-121C. Of the 26 compound detected, four [i.e., benzo(a)anthracene – 2 times, benzo(a)pyrene – 4 times, chrysene – 1 time, and dibenz(a,h)anthracene – 6 times] were found at concentrations exceeding their respective NYSDEC soil cleanup objective values. Samples containing SVOCs at concentrations above their respective NYSDEC soil cleanup objective values included samples collected from the surface as well as subsurface locations within the SEAD. Five compounds [i.e., benzo(a)anthracene, bis(2-ethylhexyl)phthalate, chrysene fluoranthene, and pyrene) were detected in 12 of the 14 samples collected. The maximum concentration measured for any SVOC within SEAD-121C was 820 µg/Kg, and this concentration was found for both fluoranthene and pyrene in the same sample collected at location SS121C-3, which was located adjacent to the north end of Building 360.

Total Petroleum Hydrocarbons (TPH) were found in 12 of the 14 soil samples collected at concentrations ranging from 18.5 to 482 mg/Kg. The highest concentration detected for TPH was found at the same sampling location (i.e., SS121C-3), which was mentioned above as containing the highest concentrations for SVOCs. Other high TPH concentrations were also found in the surface soil sample collected from SB121C-4 in the southwestern corner of the SEAD.

Twelve OCPs/PCBs were also detected one or more times in soil samples collected from SEAD-121C; however, none of the detected pesticide or PCB compounds were found at concentrations that exceeded NYSDEC's recommended soil cleanup objective value. Nine of the detected OCPs/PCBs were found in the each of the surface soil samples collected from locations SS121C-3 and SS121C-4, both of which are located in the northeastern portion of the site north of Buildings 360 and T-355.

Twenty-two of the TAL metals were detected in one or more of the soil samples collected from SEAD-121C as part of the EBS investigation. Of the 22 metals detected, 14, including antimony, barium, cadmium, calcium, chromium, copper, iron, lead, mercury, nickel, silver, sodium, thallium, and zinc, were found at levels exceeding their respective NYSDEC soil cleanup objective levels.

Groundwater

Seven VOCs were detected in groundwater samples collected from SEAD-121C. Of the seven compound found, only one, 1,4-dichloroebenze was observed at a level exceeding its comparative value (i.e. the lowest value among NYSDEC's GA groundwater standard, the federal MCL or the federal SEC), in this case, NYSDEC's GA standard. A concentration of 36 μg/L was found for this compound in the sample collected from temporary well MW121C-2, which was located in the south-central portion of the SEAD, south of Building T-355.

Eight SVOCs were detected in groundwater samples collected from SEAD-121C; however, none of the measured concentrations exceeded any of the comparative criteria values identified.

Nineteen pesticides were detected in groundwater samples collected from the temporary monitoring wells installed in SEAD-121C. Nine of these compounds were detected at concentrations above their respective NYSDEC GA groundwater standards. Exceedances were noted in both of the temporary wells. Although PCBs were analyzed for, they were not detected in any of the groundwater samples collected from SEAD-121C.

Eighteen metals were detected in groundwater samples collected from SEAD-121C, and of those detected, four (i.e., aluminum, iron, manganese, and iron) were detected at concentrations exceeding either their NYSDEC GA standard, or their federal MCL or SEC.

2.1.3.2 SEAD-121I, Rumored Cosmoline Oil Disposal Area

2.1.3.2.1 Site Conditions

SEAD-121I consists of four rectangular grassy areas that are bounded by 3rd and 7th Streets and Avenues C and D. To the east and west of the four rectangular plots are two rows of buildings used for warehousing. A railroad spur line enters the SEAD from the south and extends to the northern end of the SEAD where it terminates near the intersection of 3rd Street and Avenue C. Two sidings off the main spur line, one located in the second (south to north) block and one in the fourth (south to north) block, are found to the east of the main spur line. Information provided by the Army indicates that the spur and sidings were used for delivery of equipment and machinery that was frequently packed in Cosmoline (oil). During delivery and unpacking of the equipment and machinery, oil from the packing was commonly released to the ground. Available information also indicates that two of the four areas were periodically used for the storage of piles of ferro-manganese ores. The piles of ore were staged directly on the ground surface; thus, it is presumed that fines released by erosion or abrasion and soluble materials released via storm water impact, infiltration and percolation could have reached the underlying and surrounding soils. Once released to the ground, it is presumed that some of the released Cosmoline or ore constituents may have migrated to the storm drains located in this area.

2.1.3.2.2 Aerial Photograph Interpretation

The April 1968 photographs of this SEAD indicate that each of the rectangular blocks is generally void of materials and sparsely vegetated. Extended length, dark colored features that span almost the entire length of the second and fourth blocks (from north to south) and extend roughly halfway across the west-east expanse of the blocks are also observed. Both of these extended features appear to be comprised of a variable number of shorter length segment pieces that have been staged next to each other in parallel. These features are presumed to be the ore piles that were reportedly staged in this SEAD for storage. There is no evidence of a surrounding "halo" of surface darkening that would be indicative of pile erosion of run-off of fine materials.

An extended length, but thin, light colored object is also observed present in the third block, again located along the western edge of the block near what is believed to be the railroad spur line. Unlike the darker objects observed in the second and fourth blocks, this feature does not appear to be segmented, and it does not appear to contain objects that have been placed in parallel. Based on the location and shape of this object, it is presume that it is a paved loading apron or loading dock that is adjacent to the railroad spur line used to load and unload materials to railroad cars. To the east of the apron or loading dock, and extending from the center of the third block to its southern end, is an area where the ground surface appears to be dirt covered and which contains a small amount of open-air storage that is in evidence along the east side of the area. A single small building, structure, or vehicle (e.g., trailer, storage van, conex) is also observed along the eastern side of the first block (i.e., northern-most) of this SEAD, while two small structures are seen midway along the eastern side of the second block. Three small vehicles or structures are observed in the third block, while no extra structures are observed in the last, most southerly situated block of the SEAD.

Examination of the 1985 infrared photographs for SEAD-121I shows minor changes in the conditions of the four-block area. The long, dark shaped features previously observed in the second and fourth blocks of the SEAD are still present, although the one previously identified in the southern-most block is now two-toned, suggesting that either the northern two-thirds are now covered with some form of vegetation or a tarp. The extended light colored feature observed in the third block of the SEAD in the 1968 photograph is now missing, as is the darker dirt covered area that was located to the east of this structure. In addition, all of the smaller out-buildings or structures are also missing, and it appears that the ground surface within each of the blocks is less disturbed, although still not heavily vegetated.

Review of the 1993 photograph of SEAD-121I shows a number of changes have occurred in SEAD-121I. First, a large covered structure is located in the northeast corner of the northern-most block of the SEAD, near the intersection of Avenue D and 3rd Street. Within the first block and to the south of the building, there is evidence of extensive outdoor storage of materials, although the material observed does not include drums or cylindrical-shaped objects. Most of the outdoor storage appears to be rectangular in shape, indicative of either storage boxes or structures such as conex containers. The large dark object previously observed to be present in the second block of the SEAD still appears to be largely present, although its color, width, and length have all changed. It now appears that various segments of the initial feature have been removed. Similarly, the extended, dark feature previously observed present in the fourth block of the SEAD, has now been extensively removed, leaving little evidence of the what is presumed to be the former ore pile. Within the third block of the SEAD, there is again considerable evidence of open-air storage of box-like objects, focused primarily in the central and eastern most portions of the block. There is also evidence of the loading apron or dock, although this feature has aged and deteriorated.

2.1.3.2.3 Previous Investigation of the Site

Four surface soil samples and two samples of soil residue found in drainage culverts were collected from SEAD-121I as part of the EBS investigation. A single surface soil sample (i.e., 0 to 0.2 feet bgs) was collected from depressed areas within each of the four rectangular areas (i.e., a total of four samples).

One sample of soil residue found in the drainage culvert was collected from a location downgradient of the materials staging area that is located between Building 343 and Building 331. The second soil residue sample was collected from a culvert located downgradient of the staging area between Building 329 and 341. The locations of all EBS sampling points are identified on **Figure 2-7**.

Samples collected from the Rumored Cosmoline Oil Disposal Area were analyzed for TCL SVOCs and TPH.

2.1.3.2.4 Results of Previous Investigation

Data from the prior investigation of SEAD-121I were submitted to the US EPA and the NYSDEC in May 1999 as part of the report titled "Investigation of Environmental Baseline Survey Non-Evaluated Sites SEAD-119(A), SEAD-122(A,B,C,D,E), SEAD-123(A,B,C,D,E,F), SEAD-46, SEAD-68, SEAD-120(A,B,C,D,E,F,G,H,I,J), and SEAD-121(A,B,C,D,E,F,G,H,I)" (Parsons 1999). A complete set of the analytical results obtained during the previous investigation at SEAD-121I is provided in **Tables A-3** and **A-4** in **Appendix A** of this document. Summary data for soil from the previous investigation, highlighting only those contaminants detected in samples and providing comparisons of the available results to NYSDEC's recommended soil cleanup objective levels are provided in **Table 2-3**. A comparable presentation of the available soil residue versus NYSDEC's recommended soil cleanup objectives is provided in **Table 2-4**. A summary discussion of the results is provided below.

Soil

Twenty SVOCs compounds were detected one or more times in the four shallow soil samples collected from SEAD-121I. Of the 20 analytes identified, seven exceeded their respective NYSDEC recommended soil cleanup objective levels in the samples. Six of the SVOCs found to exceed their cleanup objective levels did so in all four of the soil samples collected. The last SVOC observed to exceed cleanup objective value [i.e., indeno(1,2,3-cd)pyrene] was only detected at a high concentration in the sample collected from the block located between Buildings 342 and 330. This same sample (i.e., sample SS121I-2) also contained the maximum concentration measured for the other six SVOCs that exceeded their cleanup objective levels.

TPH was detected in three of the soil samples collected, excluding sample SS121I-4 (i.e., located in the southern most cell between Buildings 328 and 340), at concentrations ranging from 43.9 mg/Kg to 452 mg/Kg.

Soil Residue Deposited in Drainage Culverts

Nineteen SVOCs were detected in the two, soil residue samples collected from drainage culverts within SEAD-121I. Seven of the detected SVOCs were found at concentrations above their respective NYSDEC recommended soil cleanup objective levels. Six [i.e., benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, and dibenz(a,h)anthracene] of the seven SVOCs found at concentrations exceeding cleanup objective levels were equivalent to the compounds found at elevated concentrations in the surface soil samples collected from within SEAD-121I. The last SVOC found at elevated concentrations in the drainage culvert residue samples was fluorene that was found at comparable levels to those seen in the soil samples.

TPH was also detected in both of the drainage culvert residue samples collected at concentrations ranging from 136 mg/Kg to 370 mg/Kg. There is currently no NYSDEC criterion for TPH.

2.2 ENVIRONMENTAL FATE OF CONSTITUENTS

The balance of this document focuses on defining an RI program that will be conducted to provide information and data that can be used to document whether releases of hazardous materials that have occurred at the two units located in the PID Area pose a threat to human health or the environment. Based on the information and data that is available for these sites, the proposed RI will be designed to include tailored investigations of:

- surficial and subsurface soil located in and immediately around both sites;
- deposited soil and debris that has accumulated in man-made drainage culverts and channels in and in the immediate vicinity of both sites;
- groundwater that is upgradient and downgradient of SEAD-121C;
- surface water runoff that may be present within each site, and in receiving surface water bodies that are upgradient and downgradient of both sites; and
- sediment that is located in receiving surface water bodies upgradient and downgradient of SEAD-121C.

Directed chemical analyses will be completed on the collected environmental samples to provide information pertinent to the nature and extent of residual contamination that remains at each site. Specific analyses that will be performed may include analysis of aqueous and solid phase materials for volatile and semivolatile organic compounds, organo-chlorine and organophosphorous pesticides, herbicides, polychlorinated biphenyls, metals, total petroleum hydrocarbons and other classical environmental indicators (e.g., total organic carbon content).

The focus of the planned investigations at SEAD-121C, the DRMO Yard, is associated with the potential release of chemicals from the myriad of materials that have historically been stored or staged at the site pending sale or dispersal by the Army. Preliminary sampling indicates that a number of semivolatile organic compounds and metals are present in the soil at concentrations above NYSDEC's soil cleanup objective levels. Furthermore, the limited groundwater sampling previously conducted indicates that concentrations of one VOC (i.e., 1,4-dichlorobenzene), several pesticides, and metals are also present in the groundwater at levels exceeding state or federal standards. Thus, the focus of the proposed expanded sampling program will include additional evaluations of surface and subsurface soil, groundwater, and surface water runoff from the site, as well as soil and debris that has been deposited in man-made drainage channels or culverts or in the creek that runs adjacent to the site. Samples will be analyzed for volatile and semivolatile organic compounds, pesticides and herbicides, PCBs, and metals as well as classic environmental indicators (e.g., total organic carbon and total petroleum hydrocarbons).

The focus of the planned investigations at SEAD-121I, the Rumored Cosmoline Oil Disposal Area, is associated with the potential release of oil-like chemicals used during the receipt, shipment, and handling of materials for transport. Additionally, since ore piles have been staged in this area for extended periods of time, samples will be collected for metal determinations. Environmental matrices of concern will include surface and subsurface soils, surface water run-off, and soil and debris that has been transported to site drainage lines and culverts. Groundwater sampling is not proposed because it is not expected that the local groundwater table will be intercepted above auger refusal.

The following sections present a general discussion of contaminant fate and how these fate guidelines will be used to evaluate the contaminants present in the subject sites (i.e., SEADs 121C and 121I) in the PID Area at the SEDA. This discussion will focus on a variety of constituents including volatile organic compounds, semivolatile organic compounds, pesticides/PCBs, herbicides, and metals.

2.2.1 Volatile Organic Compounds (VOCs)

This section addresses the contaminant persistence (fate and transport) and focuses on VOCs, which have been identified as constituents of concern in one (i.e., 121C) of the two PID sites. Chlorinated VOCs (aliphatic compounds) associated with the SEDA include trichloroethene (TCE) and the breakdown products of TCE, [i.e., including cis- and trans-1,2-dichloroethene (1,2-DCE), 1,1-dichloroethene (1,1-DCE), and vinyl chloride]. Common aromatic VOCs found at the SEDA are benzene, toluene, ethyl benzene, and xylenes (BTEX), which are typically associated with petroleum hydrocarbons products such as gasoline and oils.

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, Management of Manufactured Gas Plant Sites, Volume III, Risk Assessment, May 1988, GRI-87/0260.3).

Major exposure routes of interest include the ingestion of groundwater and the inhalation of the gases. The latter can be important in situations involving the excavation of pits or the entrainment of soil gas into buildings. There is little potential for these chemicals to accumulate in aquatic or terrestrial biota.

2.2.1.1 Chlorinated Aliphatic VOCs

Table 2-5 presents the information that will serve as a basis for predicting the likely environmental fate of the chlorinated substances at the SEDA. The most volatile of the chlorinated compounds being examined at this site is vinyl chloride, with a vapor pressure of 2,300 millimeters of mercury (mm Hg) at 20 degrees Celsius (^{o}C). TCE has a vapor pressure of 59 mm Hg at 20^{o}C. Consequently, volatilization represents a significant environmental pathway, provided that there is an ample amount of air 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 that may then leave the system through the ground surface.

An important chemical specific property that can be used to understand the potential for chemical migration is Henry's Law. At low concentrations and equilibrium, Henry's Law states that the concentration in the vapor phase is directly proportional to the concentration in the aqueous phase. The Henry's constant is the proportionality factor between the vapor and liquid phase concentrations. Henry's constants for selected organic compounds of concern detected are presented in **Table 2-5**. Generally, for compounds with a Henry's Constant less than 5×10^{-3} atmosphere – cubic meters per mole (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 Constants greater than 5×10^{-3} atm-m^3/mole which suggests that volatilization will be a significant mechanism in the partitioning of these volatile chlorinated compounds.

Compounds in soil are most mobile in the aqueous and air phases. Compounds enter the groundwater as precipitation migrates through the soil and mixes with these materials, eventually recharging to groundwater. The solubilities for these compounds range from 1,100 milligrams per Liter (mg/L) for TCE to 6,300 mg/L for trans-1,2-DCE that is sufficient to cause impacts to the groundwater. A review of the melting points and boiling points indicate that vinyl chloride is a gas at ambient temperatures, and TCE and the DCE isomers are liquids at room temperature.

The affinity of a compound to sorb to the organic fraction of soil is estimated from 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, at equilibrium. K_{oc} values are presented in **Table 2-5** for TCE and its breakdown products. The relationship between K_{oc} and mobility is presented in **Table 2-6**. Compounds with a K_{oc} between 500 milliliters per gram (mL/g) and 2,000 mL/g are generally considered low mobility compounds and those with a K_{oc} value greater than 2,000 mL/g are considered to be immobile (Dragun, 1988). TCE, the DCE isomers and vinyl chloride all have K_{oc} values less than 500 mL/g and are therefore, considered to be mobile. 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.

Understanding the type of soils that are present at a site is useful for estimating the mobility of compounds. SEAd-121C's and SEAD-121I's site soils, which are predominantly clay loams, generally have low permeability 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 present in the soil, the less mobile the compounds of concern will be.

Compounds degrade through a variety of mechanisms, including biodegradation, hydrolysis, photodecomposition, and are converted to other organic degradation products. Biodegradation is considered to be the most likely transformation pathway for TCE, since the reaction kinetics are the fastest of the mechanisms considered. Known biological breakdown products of TCE include vinyl chloride and 1,2-DCE. The degradation rate, which is a measure of how fast a compound degrades, is influenced by several factors including: solubility, which determines the availability of the compound to the bacteria; temperature; oxygen concentrations; moisture content; substrate concentrations; and toxicity, which is a measure of how toxic the compound is to the bacteria. For estimating simplicity, degradation has been assumed to be a first-order reaction, which will allow degradation rates to be expressed as first-order rate constants or half-lives. A half-life refers to the time it takes half of the mass of the organic constituent to degrade to either an intermediate compound or to carbon dioxide and water. A detailed analysis of biodegradation would evaluate the complete pathway. Half-lives for selected organic compounds that have a potential to be detected at SEDA are shown in **Table 2-5**. The first-order degradation rate is often assumed to be independent of the mass of the constituent present in order to facilitate modeling, but in reality, as the mass of a compound decreases, the degradation rate will also decrease.

Following a release, source materials partition into the three (3) environmental media (i.e., soil, water and air). Estimations of phase partitioning at the source can be used to understand the expected fate of the released materials. The fate of the chlorinated chemicals found at SEDA can be determined by Level I equilibrium partitioning calculations following procedures developed by MacKay and Paterson (1981).

The partitioning model is based on the concept of fugacity, a thermodynamic property of a chemical. Fugacity is often considered as the tendency of the chemical to escape from one phase into another. Using known chemical/physical properties of the contaminants of interest (i.e., the Henry's Constant and the K_{OC}), and the physical properties (i.e., the soil porosity and the moisture content) of the media into which the chemical is released, 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 chemical in each media (sub compartment) is equal. Secondly, the concentration of the chemical in each media is related to the fugacity by proportionality constant, Z. The units of Z are moles per cubic meter-atmosphere (mol/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 yields a percent partitioning ratio that is indicative of the degree that the 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, that would be expected in a sub compartment. The sub compartments are the soil, water, or air phase of the compartment in question.

For this analysis two compartments were considered. One compartment considered was the unsaturated (i.e., vadose) zone of soil, and the second compartment considered was the saturated zone of soil. The analysis was performed separately for each compartment.

The Level I partitioning estimation technique, developed by Mackay, is considered 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 it is useful in estimating the fate of released chemicals within the source area. The model does not account for separate phase liquids that 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 sub compartment.
3. Since equilibrium is assumed, there is no unbalanced net flux into or out of sub compartments nor is there any release from the compartment as a whole, i.e., volatilization or leaching.

The compartments chosen were the vadose zone and the saturated deep soil. The only air volume considered was that air present in the pores of the vadose zone. The atmospheric air above the compartment was excluded.

MacKay's equilibrium partitioning model was used to predict the partitioning of TCE, trans-1,2-DCE, and vinyl chloride among soil-solids, soil-water, and soil-air using data collected from the SEDA's Ash Landfill. The porosity of the soil at the SEDA was estimated to be 37.3% (USAEHA Hazardous Waste Study No. 37-26-0479-85, August 1984). Since the moisture content of the soil at SEDA varies during the year, two scenarios were considered: a wet season (23.3 % moisture content in the vadose zone, (Source: USAEHA, 1984), and a dry season (9.4% moisture content in the vadose zone, Source: Metcalf and Eddy, October 1989). 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 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 square foot of soil extending one foot into the unsaturated zone. The control volume for the saturated zone was established by considering one square foot of soil extending one 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 sub compartment volumes, expressed as percent of the total volume, during the wet season were 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%: using the same analysis as is described above with this new moisture content value yields sub compartment 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 sub compartment volumes are defined as follows:

- Volume of Solids (V_{soil}) - 62.7%
- 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 - 0.1% (assumed for both vadose zone and saturated soil)
- Bulk density of soil - 1.8 g/cm^3
- Soil temperature - 20^oC

The next step is to calculate the proportionality constant Z, for each phase, where:

$C_i = Z_i f_i$

and

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) $Z_{air} = 1/RT$
2) Z_{gw} - 1/H
3) $Z_{soil} = 10^{-8} (oc_{\ soil}) (K_{oc}) (P_{soil})/H$

where:

R = universal gas constant = 8.2×10^{-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
P_{soil} = soil bulk density (g/m^3)

Next, the fraction (F) in each phase is calculated by the 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 the air terms are ignored.

Table 2-7 contains the results of the partitioning model. In the vadose zone, TCE is expected to partition in the soil-water phase from 27.5% to 54.5%, depending on the season. The partitioning of TCE in the soil-air phase is from 12.4% to 30.9%. As expected, TCE partitions more in the soil-water phase during the wet season than the dry season. Conversely, during the dry season, when there is more vapor space in the soil, there is more TCE in the soil-air phase. The amount of TCE remaining in the soil ranges from 33.1% to 41.6%. In the saturated soil, the partitioning percentage of TCE is 27.6% in the soil with the remainder in the soil water phase (72.4%).

The partitioning model also considered trans-1,2-DCE, a TCE breakdown product, and vinyl chloride, a breakdown product of DCE. It was determined that in unsaturated soils, a significant amount (i.e., 39.7% to 69.1%) of DCE will be present in the soil-water phase. In the saturated soil, as much as 84.9% of the DCE is expected to be in the soil-water phase. Since vinyl chloride is a gas at room temperature a much greater percentage of vinyl chloride was found in the soil-air phase, 85.7% during the wet season and 61.5% during the dry season.

The results of these partitioning analyses indicate that chlorinated solvents found at SEDA will be partitioned into the soil-water and the soil-air space.

The previous analysis did not consider degradation of these chemicals. **Figure 2-8** provides a summary of the identified breakdown products resulting from the environmental biodegradation of TCE. Anaerobic microbes carry out dechlorination and methane production. Anaerobic conditions are likely to exist in the soils; 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 ethene. At each step, a hydrogen molecule replaces a chlorine molecule, and hydrogen chloride is produced. Of the three possible DCE isomers, the cis- and trans-1,2-dichloroethene isomers are much more prevalent than the 1,1-dichloroethene isomer. Both an energy source and an electron, or an electron-donor source appears to be necessary for this transformation to occur. Compounds with a greater degree of halogenation are more likely to undergo dehalogenation, suggesting that vinyl chloride, with one remaining chlorine is not as likely to degrade to ethene as TCE is to degrade to DCE.

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. Hydrolysis is not expected to be significant in natural soils due to slow reaction mechanisms.

DCE and vinyl chloride are also considered to be mobile in soil/groundwater systems and volatilization is also considered to be significant near the surface. However, unlike TCE and DCE, partitioning of vinyl chloride in the soil-air phase dominates the expected partitioning pathways and most of the vinyl chloride will likely be volatilized from the surface of the soil.

2.2.1.2 Aromatic Volatile Organics

The following information was obtained from the document, "Installation Restoration Program Toxicology Guide", Volume 1, October 1985, AD-A171095.

Benzene, toluene, ethyl benzene, and xylenes (BTEX) compounds may move through the soil/groundwater system when present (i.e., 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.

2.2.1.2.1 Partitioning in the Environment

Benzene

The estimate from the unsaturated topsoil model indicates that most of the benzene (88%) is expected to be sorbed to the soil. A much smaller (yet significant) amount (7%) will be present in the soil water phase and can thus migrate by bulk transport (e.g., the downward movement of infiltrating water), dispersion and diffusion. For the portion of benzene in the gaseous phase of the soil (5%), diffusion through the soil-air pores up to the ground surface, and subsequent removal by wind, will be a significant loss pathway. There is no significant difference in the partitioning calculated for 25°C and 10°C.

In saturated, deep soils containing no soil air and negligible soil organic carbon, a much higher fraction of the benzene (79%) is likely to be present in the soil water phase and transported with flowing groundwater.

Toluene

The estimates from the unsaturated topsoil model indicate that nearly all of the toluene (97%) is sorbed to the soil. A much smaller amount (2%) will be present in the soil water phase and can thus migrate by bulk transport (e.g., the downward movement of infiltrating water). For the portion of toluene in the gaseous phase of the soil (1.6%), diffusion through the soil pore spaces up to the ground surface, and subsequent removal by wind, will be a moderate loss pathway. There is no significant difference in the partitioning calculated for 25°C and 10°C.

In saturated, deep soils containing no soil air and negligible soil organic carbon, a much higher fraction of the toluene (48%) is likely to be present in the soil water phase and transported with flowing groundwater.

Ethyl benzene

The estimates from the unsaturated topsoil model indicate that nearly all of the ethyl benzene (98%) is sorbed to the soil. A much smaller amount (0.75%) is expected to be present in the soil water. For the portion of ethyl benzene in the gaseous phase of the soil (0.7%), diffusion through the soil air pores up to the ground surface, and subsequent removal by wind, will be a significant loss pathway. There is no significant difference in the partitioning calculated for 25°C and 10°C.

In saturated, deep soils containing no soil air and negligible soil organic carbon, a much higher fraction of the ethyl benzene (26%) is likely to be present in the soil water phase and transported with flowing groundwater.

Xylene

The estimates from the unsaturated topsoil model indicate that nearly all of the xylene (98.8%) will be sorbed to the soil. A much smaller amount (0.7%) is expected to be present in the soil water phase and thus available to migrate by bulk transport (e.g., the downward movement of infiltrating water), dispersion and diffusion. For the portion of xylene in the gaseous phase of the soil (0.5%), diffusion through the soil-air pores up to the ground surface, and subsequent removal by wind, will be a significant loss pathway.

In saturated, deep soils containing no soil air and negligible soil organic carbon, a much higher fraction of the xylene (26%) is likely to be present in the soil water phase and transported with flowing groundwater.

2.2.1.2.2 Sorption on Soils

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:

- 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 (i.e., 135, 537, 1410, and 1450, respectively) the soil sorption coefficients (K_{OC})s are estimated to be 65, 259, 681, and 691, respectively for benzene, toluene, ethyl benzene and xylene.

2.2.1.2.3 Volatilization from Soils

In general, important soil and environmental properties influencing the rate of volatilization of BTE include soil porosity, temperature, convection currents and barometric pressure changes; important physio-chemical properties include the Henry's law constant, the vapor-soil diffusion coefficient, and, to a lesser extent, the vapor phase diffusion coefficient.

There are no data from laboratory or field test, showing actual soil volatilization rates. Sorption of the benzene vapors on the soil may slow the vapor phase transport.

The Henry's law constant (H), which provides an indication of a chemical's tendency to volatilize from solution increases significantly with increasing temperature. Moderate increases in H are also observed with increasing salinity due to a decrease in solubility of benzene, toluene and ethyl benzene.

2.2.1.2.4 Transformation Processes in Soil/Groundwater Systems

The persistence of BTEX compounds in soil/groundwater systems is not well documented. In most cases, it should be assumed that the chemical would persist for months to years (or more). Benzene, toluene and ethyl benzene that have been released into the air will eventually undergo photochemical oxidation; tropospheric lifetimes on the order of a few hours to a few days have been estimated for benzene and 15 hours for toluene and ethyl benzene.

Under normal environmental conditions, BTEX compounds 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.

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.

2.2.1.2.5 Primary Routes of Exposure From Soil/Groundwater Systems

The above discussion of fate pathways suggests that benzene is highly volatile, weakly adsorbed by soil, and has a limited potential for bioaccumulation. 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. These fate characteristics suggest several potential exposure pathways.

Volatilization of BTEX compounds from a disposal site, particularly during drilling, restoration or construction activities, could result in inhalation exposures. Additionally, volatilization of BTEX into buildings situated over groundwater plumes or spill sites could result in inhalation exposure of people residing, visiting, or working within the building. Finally, the potential for groundwater contamination is high, particularly in sandy soils.

BTEX compounds also possess the potential for movement in soil/groundwater systems. Thus, the compounds may eventually reach surface waters by this mechanism, suggesting several other exposure pathways:

- Groundwater and surface water may be used as drinking water supplies, resulting in exposures from direct ingestion and inhalation during showers;
- Aquatic organisms residing in these waters may be consumed, also resulting in ingestion exposure through bioaccumulation;
- Recreational use of impacted surface water may result in dermal exposure;
- Domestic animals may consume or be dermally exposed to contaminated ground or surface waters; the consumption of meats and poultry could then result in ingestion exposures.

In general, exposures associated with surface water contamination are expected to be lower than exposures from drinking contaminated groundwater. The Henry's law constants for BTEX compounds indicate that they will volatilize upon reaching surface waters. Therefore, surface water concentrations would be significantly lower than groundwater.

2.2.2 Semivolatile Organic Compounds (SVOCs)

Total petroleum hydrocarbons and PAHs are the SVOCs that were detected most frequently in the samples collected for the two PID Area sites.

2.2.2.1 Fuel Oils

The following discussion of fuel oils was obtained from the "Installation Restoration Program Toxicity Guide", Volume III, July, 1987.

Fuel oils have various uses for which they are specifically formulated. Fuel oil number 1 is used almost exclusively for domestic heating. Fuel oil number 2 is used as a general-purpose domestic or commercial fuel in atomizing type burners. Number 4 oil is used in commercial or industrial burner installations not equipped with preheating facilities. Numbers 5 and 6 oil are used in furnaces and boilers of utility power plants, ships, locomotives, metallurgical operations and industrial power plants.

Diesel fuel is available in different grades. Number 1-D is used for engines in service requiring frequent speed and load changes. Number 2-D is used for engines in industrial and heavy mobile service while number 4-D is used in low and medium speed engines.

Composition

The discussion of fuel oil in this chapter largely focuses on diesel fuel. Limited information on residual fuel oils, which are generally defined as the product remaining after the removal of the appreciable quantities of the more volatile components is included but environmental fate data are not specifically addressed. Residual fuel oils are expected to be extremely complex in composition, with higher concentrations of the many high molecular weight asphaltic compounds and impurities present in the original crude oils. Available data suggest sulfur values ranging from 0.18 to 4.36% by weight; trace element data indicate that concentrations of many elements vary by one or more orders of magnitude. The environmental transport and transformation of the high molecular weight organics is expected to be minimal and is not addressed in detail.

Diesel fuel is usually that fraction of petroleum that distills after kerosene in the 200°C to 400°C range. Several commercial grades of diesel fuels are obtained by blending various feedstocks to achieve established specifications. Due to differences in feedstocks, refining methods, and blending practices, the composition of diesel fuel samples is expected to be highly variable. Sulfur content has been reported to vary by several orders of magnitude (0-0.57% by weight): similar variations have been documented for a number of trace elements.

Diesel fuel is predominantly a mixture of C_{10} through C_{19} hydrocarbons. Composition by chemical class has been reported to be approximately 64% aliphatic hydrocarbons (straight chain alkanes and cycloalkanes), 1-2% olefinic hydrocarbons and 35% aromatic hydrocarbons, including alkyl benzenes and 2-3 ring aromatics. Petroleum distillates may contain many non-hydrocarbon components in varying concentrations.

Fuel oils also contain a number of additives used as ignition improvers, combustion catalysts, antioxidants, flow improvers, metal deactivators, detergents and emulsifiers. Many compounds added to fuel oils are similar to those added to gasoline.

2.2.2.2 Polynuclear Aromatic Hydrocarbons (PAHs)

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. When present in soil or sediment, PAHs tend to remain bound to the soil particles and dissolve only slowly into the 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 particles. Thus, soil, sediment and suspended particulate matter (in air) represents important media for the transport of the chemicals. Fate and transport parameters for selected SVOCs are presented in **Table 2-5**.

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. 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. As a result, while PAH compounds are seldom high in fish tissues, they can be high in shellfish tissues.

Several factors can degrade PAH compounds in the environment. Biodegradation on soil microorganisms is an important process affecting the concentrations of the chemicals in soil, sediment and water. Volatilization may also occur. This mechanism is effective for the lighter molecular weight compounds. However, the volatilization of higher molecular weight PAH compounds occurs slowly.

2.2.3 Organochlorine and Organophosphorous Pesticides (OCPs and OPPs)

It is not the intent of this section to discuss the persistence of all pesticides and PCBs; therefore, only selected pesticides that are commonly found or are suspected to have been released to the environment at SEDA are discussed below.

Chlordane

The following information was obtained from "Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Vol. III, Pesticides (ed. Philip H. Howard, Lewis Publishers, 1991).

Chlordane has been released in the past into the environment primarily from its application as an insecticide. Technical grade chlordane is a mixture of at least 50 compounds. If released to soil, chlordane may persist for long periods of time. Under field conditions, the mean degradation rate has been observed to range from 4.05-28.33 percent per year (%/yr) with a mean half-life of 3.3 years. Chlordane is expected to be generally immobile or only slightly mobile in soil based on field tests, soil column leaching tests and K_{OC} estimations; however, its detection in various qualities of groundwater in NJ and elsewhere indicates that movement to groundwater can occur. Adsorption to sediment is expected to be a major fate process based on soil adsorption data, estimated Koc values [24,600-15,500 Liters per Kilogram (L/Kg)], and extensive sediment monitoring data. The presence of chlordane in sediment core samples suggests that chlordane may be very persistent in the adsorbed state in the aquatic environment.

If released to water, chlordane is not expected to undergo significant hydrolysis, oxidation or direct photolysis. Sensitized photolysis in the water column may be possible, however. Chlordane is expected to be very persistent in aquatic environments based on the results of a river die-away test that showed that 85% of the material originally detected in the sample placed in a sealed glass jar was still present after two weeks exposure to sunlight and artificial light. This level persisted through week 8 of the experiment.

Although sufficient biodegradation data are not available, it has been suggested that chlordane is very slowly biotransformed in the environment that is consistent with the long persistence periods observed under field conditions. Bioconcentration is expected to be important based on experimental BCF values that are generally above 3,200.

If chlordane is released to the atmosphere, it is expected to be predominantly in the vapor phase. Chlordane will react in the vapor-phase with photochemically produced hydroxyl radicals at an estimated half-life rate of 6.2 hours (hr) suggesting that this reaction is the dominant chemical removal process. Soil volatility tests have shown that chlordane can volatilize significantly from soil surfaces, particularly if they are moist, on which it has been sprayed; however, shallow incorporation into soil will greatly restrict volatile losses.

The detection of chlordane in the atmosphere at remote locations (e.g., the northern Pacific and Atlantic Oceans; Arctic atmosphere) indicates that long-range transport occurs. It has been estimated that 96% of the airborne reservoir of chlordane exists in the sorbed state which may explain why its long-range transport is possible without chemical transformation. The detection of chlordane in rainwater and its observed dry deposition at various rural locations indicates that physical removal via wet and dry deposition occurs in the environment.

DDD

The following information was obtained from "The Installation Restoration Program Toxicology Guide," Vol. III, Arthur D. Little, Inc., June 1987.

DDD, no longer manufactured commercially, is still found as an impurity in the pesticide DDT and the miticide dicofol. It is also the major breakdown product of DDT under anaerobic conditions. The p,p' isomer of DDD is the third largest component of the technical DDT product after the two DDT isomers accounting for greater than 4% of the mixture. It is present in somewhat lower concentrations in dicofol. In one study of several dicofol products, DDD was present in amounts ranging from 0.1 to 2.5% of the amount of dicofol.

Like DDT, DDD is expected to be highly immobile in the soil/groundwater environment when present at low dissolved concentrations. Bulk quantities of DDD dissolved in an organic solvent could be transported through the unsaturated zone as a result of a spill or the improper disposal of excess formulations. However, the extremely low solubility of DDD and its strong tendency to sorb to soil organic carbon results in a very slow transport rate in soils.

In general, transport pathways can be assessed using an equilibrium-partitioning model. These calculations predict the partitioning of low concentrations of DDD among soil particles, soil water, and soil air. Due to its strong sorption to soil, virtually all of the DDD partitions to the soil particles of unsaturated top and negligible amounts to the soil air or water. Even in saturated deep soil, which is assumed to contain no soil air, and a smaller organic carbon fraction, almost all of the DDD is retained on the soil.

DDD, like DDT, is characterized by a strong tendency to sorb to soil organic carbon. While only one measured K_{OC} value for DDD was found (log $K_{OC} = 5.38$), it is consistent with the value obtained for DDT, as would be expected based on the similarity of their structures and their octanol-water partition coefficients (DDD log $K_{OW} = 5.56$). As with all neutral organic chemicals, the extent of DDD sorption is proportional to the soil organic carbon content. In soils with little organic carbon (e.g., sand, mineral clays), the extent of sorption may also depend upon such soil properties as surface area, cation exchange capacity, and degree of hydration.

The sorption of DDD to soils is lessened and thus its mobility is enhanced by the presence of dissolved organic matter in solution. The apparent solubility of DDT was increased several times in solutions containing humic and fulvic acids. Because the sorption behavior of DDD is expected to be much like that of DDT, its mobility in natural waters may be several times greater than predicted (though probably still small) if dissolved organic matter is present. In waters containing large concentrations of dissolved organic matter, such as swamps and bogs, this may be especially important.

The vapor pressures of the p,p' and o,p' - isomers of DDD at $30^{o}C$ have been measured as 1.3×10^{-9} and 2.5×10^{-9} atm, respectively. The Henry's law constant estimated by use of the average vapor pressure of the two isomers and an aqueous solubility of 20 ppb is 3.1×10^{-5} atm m^3/mol. This value is almost identical to that found for DDT and roughly an order of magnitude less than that found for DDE.

Experimental evidence indicates that DDT volatilization from water occurs at about one-third the rate for DDT, which may seem at odds with the similar estimates for the Henry's law constants for these two compounds. Given the uncertainties involved in measuring both the aqueous solubilities and the vapor pressures of these compounds, from which H is estimated, the findings cannot be considered inconsistent. Using a factor of one-third for the difference in the rate of volatilization of DDD and DDT, a volatilization half-life for DDD ranging from a day to less than a month has been estimated.

Volatilization of DDD from soils can be expected to be much slower than from water because of the strong tendency of DDD to sorb to soil. Using wet riverbed quartz sand in 15 mm deep petri dishes, Ware et. al. Time measured volatilization losses of p,p'-DDD (present initially at 10 ppm) that corresponded to a volatilization half-life of roughly 170 days, slightly more than twice that for p,p'-DDT under the same conditions. Because these experiments were conducted with a relatively thin layer of soil that contained a small organic carbon fraction, the actual volatilization rate of DDD in the field would be expected to be lower. If the relative volatilization rates of DDD and DDT in the field were the same as those observed by Ware et. al., the volatilization half-life of DDD from soil could be assumed to be double the value of one to several years for DDT.

Hydrolysis of DDD can be expected to be extremely slow under environmental conditions. Over the pH range typical of natural waters (pH 5-9), Wolfe et al. found the pseudo-first-order rate constant (k_{obs}) at 27^{o}C could be expressed as:

$$k_{obs} = 1.1 \times 10^{-10} + 1.4 \times 10^{-3} \cdot [OH^-]$$

where k_{obs} is in s^{-1} and $[OH^-]$, the concentration of the hydroxide ion, in moles/liter. Hydrolysis half-lives of roughly 1.6, 88, and 190 years at pH 9, 7, and 5, respectively, correspond to the rate constant estimated from this equation. These estimates are consistent with the observations of Eichelberger and Lichtenberg that no DDD, initially present in river water at 20 ppb, degraded over an eight week period (within 2.5%).

No information was found on the photolysis of DDD in natural waters. Direct photolysis of DDD (i.e., in pure water) is believed to be slower than that for DDT, which is estimated to have a half-life of over 150 years. However, DDT in natural water has been estimated to have a photolysis half-life of 5 days when exposed to sunlight in mid-June; DDD might be expected to have a similar half-life based on the similar structure of the two chemicals.

Data on the biodegradation of DDD are limited. In aquatic systems, biotransformation is believed to be slow, although a model ecosystem study has shown DDD to be more biodegradable than either DDT or DDE. The ketone analogue of DDD (i.e., p,p'-dichlorobenzophenone) has been suggested as the end product of the biodegradation of DDD in the environment. DDD undergoes dehydrochlorination to 2,2-bis-(p-chlorophenyl)-1-chloroethylene, reduction to 2,2-bis-(p-chlorophenyl)-1-chlorethane, dehydrochlorination to 2,2-bis-(p-chlorophenyl)-ethylene, reduction to 1,1-bis-(p-chlorophenyl)-ethane and eventual oxidation to bis-(p-chlorophenyl)-acetic acid (DDA), the ultimate excretory product of higher animals. DDD has also been observed to degrade in anaerobic sewage sludge.

The above discussion of fate pathways suggests that DDD is moderately volatile, very strongly sorbed to soil, and has a high potential for bioaccumulation. Information on the fate and transport parameters (i.e., solubility, vapor pressure, Henry's Law Constant, K_{OC}, K_{OW}, half-life and BCF) are provided in **Table 2-6**.

DDE

The following information was obtained from "The Installation Restoration Program Toxicology Guide," Vol. III, Arthur D. Little, Inc., June 1987.

The presence of DDE in the environment is primarily the result of the use of the insecticide DDT and the miticide dicofol. DDE is the principal degradation product of DDT under aerobic conditions, and it has been found to equal roughly 1-3% of the weight of dicofol in the technical mixture. Like DDT, DDE exists as both an o,p' and a p,p' isomer, with the o,p' and the p,p' isomers of DDT degrading to the respective DDE isomer. Because technical DDT consists of 65-80% p,p' - DDT and 15-21% o,p'-DDT, the p,p'-DDE isomer might be expected to predominate in the environment. In dicofol, however, the o,p' isomer typically makes up 80-90% of the DDE present. The two isomers of DDE are considered individually below where data are available.

Like DDT, DDE is expected to be highly immobile in the soil/groundwater environment. Bulk quantities of DDE dissolved in an organic solvent (e.g., as a contaminant in dicofol) could be transported through the unsaturated zone as a result of a spill or improper disposal of excess formulations. However, the extremely low solubility of DDE in water and its strong tendency to sorb to soils would result in a very slow transport rate in soils.

In general, transport pathways can be assessed by using an equilibrium-partitioning model. These calculations predict the partitioning of low concentrations of DDE among soil particles, soil water and soil air. Due to its strong tendency to sorb to soil, virtually all of the DDE partitions to the soil particles of unsaturated topsoil, with negligible amounts associated with the soil water or air. Even in saturated deep soil, which is assumed to contain no soil air and a smaller organic carbon fraction, almost all of the DDE is retained on the soil.

DDE is characterized by a strong tendency to sorb to organic matter in soils and in sediments. Arthur D. Little reported that only one value, log K_{OC} = 5.17 was found in the literature for the soil organic carbon partition coefficient. A log K_{OC} value of roughly 5 has been suggested based on log K_{OW} measurements of 5.69 for the p,p' isomer and 5.78 for the o,p' isomer. Using the geometric mean of these K_{OW} values and a regression equation, a log K_{OC} value of 5.41 is estimated. As with all neutral organic chemicals, the extent of sorption is proportional to the soil organic carbon content. In soils with little organic carbon (e.g., sand, mineral clays), the extent of sorption may also depend upon soil properties such as surface area, cation exchange capacity, and degree of hydration.

The apparent sorption of DDE to soils and sediments (like that of DDT) is lessened, and thus its mobility is enhanced by the presence of dissolved organic matter. DDT concentrations were found to be higher in aqueous solutions containing humic and fulvic acids. Because the sorption behavior of DDE is expected to be much like that of DDT, its mobility, i.e., desorption from sediment to water, in natural waters may be several times greater than predicted (though probably still small) if dissolved organic matter is present. In waters containing large concentrations of dissolved organic matter such as swamps and bogs, this may be especially important.

The vapor pressure of p,p'- isomer of DDE at 20^{o}C has been given as 8.7 x 10^{-9} atm and that of the o,p' isomer as 8.2 x 10^{-9} atm. A value of somewhat lower than eight times the vapor pressure of DDT has been suggested. Using the average vapor pressures for the two isomers to estimate the Henry's law constant, a value of 1.9 x 10^{-4} atm·m^{3}/mol is obtained.

This estimate is roughly an order of magnitude larger than the Henry's law constant for DDT. Because volatilization losses for DDT are expected to be important, the same is also true for DDE. DDE has been found to volatilize from distilled and natural waters five times faster than DDT. Since the volatilization half-life for DDT has been reported to range from several hours to several days proportionately shorter half-lives would be expected for DDE.

In soils, volatilization of DDE is much slower. Using wet river bed, quartz sand in 15 mm deep petri dishes, Ware et al. measured volatilization losses of p,p'-DDE (present initially at 10 ppm) that corresponded to a half-life of roughly 40 days. This value may be more indicative of an upper limit of the volatilization rate because soils of higher organic matter content would tend to sorb more of the DDE, and the rate of volatilization would be expected to be lower from thicker layers of soil. In the same study and under the same conditions, the o,p' isomer of DDT took 50% longer to reach half its initial concentration; p,p'-DDT took twice as long. This suggests that the volatilization of DDE in the field may occur at a rate somewhat greater than that for DDT, which has been found to have a volatilization half-life of one to several years. The observation that the volatilization rate of DDE from soil is not several times the rate for DDT, given that it has an order of magnitude larger Henry's law constant, may be explained by its strong sorption to soil, which tends to impede volatilization.

DDE is the hydrolysis product of DDT and is quite resistant to further hydrolysis. A hydrolysis half-life of over 120 years at pH 5 and 27^{o}C has been given. Thus, hydrolysis is not expected to be an environmentally significant process.

Several studies have examined the aqueous photolysis of DDE. Zepp and Schlotzhauer found that DDE in the aqueous phase of sediment suspensions exposed to ultraviolet light of wavelength > 300 nm had a half-life of roughly 13 to 17 hours. Under the same conditions, DDE equilibrated with sediment for 60 days (i.e., sorbed to the sediment) photodegraded much more slowly. To reach 25% of its initial concentration, roughly seven half-lives were needed instead of the expected two, and little further degradation occurred. The authors suggested that over time, part of the DDE diffused into the sediment particles and became unavailable for photolysis. Chen et al. found the thin film photodegradation rate of p,p'-DDE to be about 90% of that for p,p'-DDT, and the half-life of DDE in aquatic systems at 40^{o}N latitude has been estimated to range from one day in summer to six days in winter. These findings suggest that photolysis of DDE may be an important loss process, as it is for DDT. However, for photolysis to occur, the chemical must be exposed to sunlight, which often is not the case for a large fraction of the amount sorbed to soils or deep sediments.

The biological degradation of DDE in aquatic environments is believed to occur very slowly if at all. In modeling the fate of DDE in a quarry, Di Toro and Paquin considered biodegradation to be insignificant compared to loss by photolysis and volatilization. The half-life for biodegradation in sediments has also been found to be extremely slow. Using radiolabeled p,p'-DDE mixed with river sediment, Lee and Ryan measured a half-life of 1100 days based on the evolution of CO_2. In short, photolysis appears to be the only degradation process that affects DDE significantly under environmental conditions.

Information on the fate and transport parameters (i.e., solubility, vapor pressure, Henry's Law Constant, K_{oc}, K_{ow}, half-life and BCF) is provided in **Table 2-6**.

DDT

The following information was obtained from "The Installation Restoration Program Toxicology Guide," Vol. III, Arthur D. Little, Inc., June 1987.

From 1946 to 1972, DDT was one of the most widely used agricultural insecticides in the world. During this time, DDT played an important role in many phases of agriculture and in the eradication of malaria, typhus and plague. As of January 1, 1973, all uses of DDT in the United States were cancelled with the exception of emergency public health; however, it is still used extensively in some tropical countries.

DDT is expected to be highly immobile in the soil/groundwater environment. Bulk quantities of DDT dissolved in an organic solvent could be transported through the unsaturated zone due to a spill or improper disposal of excess formulations. However, the extremely low solubility of DDT and its strong tendency to sorb to soils results in a very slow transport rate in soils.

In general, transport pathways can be assessed by using an equilibrium-partitioning model. These calculations predict the partitioning of low soil concentrations of DDT among soil particles, soil water, and soil air. Due to its strong tendency to sorb to soil, virtually all of the DDT partitions to the soil particles of the unsaturated top soil, with negligible amounts associated with the soil water or air. Even in saturated deep soil, which is assumed to contain no soil air and a smaller organic carbon fraction, almost all of the DDT is retained on the soil.

DDT is characterized by a strong tendency to sorb to organic carbon. Kadeg et. al. report an arithmetic mean K_{OC} of 670,200 for 17 reported values; the corresponding geometric mean was log $K_{OC} = 5.48$. As with all neutral organic chemicals, the extent of sorption is proportional to the soil organic carbon content. In soils with little organic carbon, the extent of sorption may also depend upon soil properties such as surface area, cation exchange capacity, and degree of hydration.

The apparent sorption of DDT to soils and sediments is lessened, and thus its mobility is enhanced, by the presence of dissolved organic matter in solution. Caron et. al. found the sorption of DDT to a natural freshwater sediment to be reduced by 75% in the presence of 6.95 mg/L of dissolved organic carbon (in the form of humic acid extracted from another sediment). Using p,p'`-DDT, Chiou et al. observed the apparent water solubility to be significantly enhanced (roughly 2-5 times) in the presence of 100 mg/L of humic and fulvic acids. Sorption will decrease with increasing water solubility. The partitioning of p,p'-DDT between soil-derived humic acid and water was approximately 4 times greater than with soil fulvic acids and 5-7 times greater than with aquatic (freshwater) humic and fulvic acids. These findings indicated that the mobility of DDT in natural waters may be several times greater than predicted (though probably still small) when the effect of dissolved organic matter is present. In waters containing large concentrations of dissolved organic material, such as swamps and bogs, this may be especially important.

The vapor pressure of DDT at 25°C has been given as 2.6×10^{-10} atm with estimates of its Henry's law constant at 25°C ranging from 2.8×10^{-5} to 2.0×10^{-6} atm·m^3/mol. Volatilization is expected to be an important loss process in aquatic environments with the half-life for DDT on the order of several hours to several days. The presence of sediment particles, which would adsorb DDT from solution, would significantly reduce volatilization losses.

In soils, volatilization is much slower. Jury et al. using soil of 1.25% organic carbon to which DDT was applied uniformly to a depth of 1 centimeter (cm) at the rate of 1 Kilogram per hectare (kg/hectare), calculated volatilization half-lives of 497 and 432 days when water evaporation rates were 0.0 and 5.0 mm/day, respectively. The corresponding figures when the same quantity of DDT was mixed to a depth of 10 cm were 2300 and 2069 days.

Similar results were obtained by Lichtenstein et al. who studied the persistence of technical DDT (84% p,p', 15% o,p') in agricultural loam soil with crops over a 15 year period. Calculated half-lives for both isomers fell between 4.0 and 4.7 years for DDT applied at 10 pounds/acre; somewhat longer half-lives were measured for applications of 100 pounds/acre. These half-lives should be taken as upper limits of the volatilization rate since other processes such as leaching and degradation contribute to the DDT loss.

In tropical soils, the loss of DDT has been found to be much more rapid. El Zorgani found a half-life of less than three weeks for DDT applied at an initial concentration of 6.65 parts per million (ppm) to the soil surface beneath a cotton crop in the Sudan. The loss of the o,p' isomer was several times greater than for the p,p' isomer; and insignificant fraction of the loss could be accounted for by conversion to p,p'-DDE. A half-life 110 days has been reported for DDT in Kenya where it was found to sublime directly into the atmosphere without conversion to DDE.

The rate at which DDT degrades in the soil/groundwater environment is dependent on the conditions under which it is present. The pH strongly affects the rate of aqueous hydrolysis. Over the pH range typical of natural waters (pH 5-9), Wolfe et al. found the pseudo-first-order rate constant (k_{obs}) at 27^oC could be expressed as:

$$k_{obs} = 1.9 \text{ x } 10^{-9} + 9.9 \text{ x } 10^{-3} \cdot [OH^-]$$

where k_{obs} is in s^{-1} and $[OH^-]$, the concentration of the hydroxide ion, is in moles/liter. Hydrolysis half-lives of roughly 81 days, 8 years and 12 years at pH 9, 7, and 5, respectively, result from the rate constant obtained from this equation. The hydrolysis product of p,p'-DDT is p,p'-DDE.

A photolysis half-life of 5 days was measured for DDT when it was present in natural water exposed to summer sunlight, although no photolysis was observed when the chemical was present in pure water. Again, p,p'-DDE is a degradation product. Chen et al. observed a similar half-life of 8 days for p,p'-DDT applied as a thin film ($0.67\ \mu g/cm^2$) to glass plates and exposed to light of environmentally important wavelengths (maximum intensity at 300 nm). The degradation of DDT by ultraviolet light was found to be more effective when the DDT was present in humus-free soil than in soil containing humus.

DDT has been found to undergo abiotic, reductive dehalogenation to DDD in the presence of Fe(II) porphyrin. It has been suggested that the Fe(III) porphyrin, which results from the oxidation of the Fe(II) porphyrin in this process, is reconverted to the Fe(II) porphyrin in the presence of reduced organic material. Dehydrochlorination of DDT to DDE (removal of a hydrogen and chlorine atom to form a double bond) has also been observed in model systems containing reduced porphyrins and in the natural environment.

Gambrell et al. found the degradation of DDT to be little affected by pH but greatly affected by redox conditions. Under reducing conditions (Eh = 150 mV), over 90% of the DDT was degraded within a few days. The authors note that this is an unusually rapid rate.

The half-life for the decomposition of DDT in aerobic soils has been reported to be in the range of 10-14 years compared to half-lives of 28-33 days in moist soils incubated under anaerobic conditions. DDE is the major degradation product in aerobic soil, and it is believed to be produced predominantly by chemical processes. Under anaerobic conditions DDD is the major metabolite.

The bacterial and fungal cometabolism of DDT has been observed in the laboratory and has been suggested to be potentially important in the field as well. In these reactions, bacteria that are not able to use DDT as their sole carbon source grow on non-chlorinated analogues of DDT, but degrade DDT in the process.

Information on the fate and transport parameters of DDT (i.e., solubility, vapor pressure, Henry's Law Constant, K_{OC}, K_{OW}, half-life and BCF) are provided in **Table 2-6**.

Endosulfan

The following information was obtained from "Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Vol. III, Pesticides (ed. Philip H. Howard, Lewis Publishers, 1991).

Endosulfan is used as an insecticide against a variety of insects on a variety of crops. Technical endosulfan is composed of α-endosulfan and β-endosulfan. Release of endosulfan isomers to soil will most likely result in biodegradation and in hydrolysis, especially under alkaline conditions. Endosulfan isomers on the soil surface may photolyze. Volatilization and leaching are not expected to be significant due to the high estimated soil-sorption coefficients of the isomers. When release to water, the endosulfan isomers are expected to hydrolyze readily under alkaline conditions, and more slowly at neutral and acidic pH values (α half-lives=35.4 and 150.6 days for pH 7 and 5.5, respectively; β half-lives=37.5 and 187.3 days for pH 7 and 5.5, respectively). Volatilization and biodegradation are also expected to be significant. Endosulfan released to the atmosphere will react with photochemically generated hydroxyl radicals with an estimated half-life of 1.23 hr. Bioaccumulation of endosulfan is expected to be insignificant. Human exposure results primarily from food, and by occupational exposure.

Lindane

The following information was obtained from "Handbook of Environmental Fate and Exposure Data for Organic Chemicals, Vol. III, Pesticides (ed. Philip H. Howard, Lewis Publishers, 1991).

Lindane is used as an insecticide on hardwood logs and lumber, seeds, vegetables and fruits, woody ornamentals, hardwood forests, livestock and pets, and existing structures. When released to water, lindane is not expected to volatilize significantly. Lindane released to acidic or neutral water is not expected to hydrolyze significantly; but significant hydrolysis may occur in water with basic pH. At a pH of 9.3, the hydrolysis half-life of lindane in water was measured to be about 4 days (95 hr). Release of lindane to soil will most likely result in volatilization and slow leaching of lindane to groundwater. Lindane in the atmosphere is likely to be subject to dry and wet deposition. The estimated half-life for the reaction of vapor phase lindane with atmospheric hydroxyl radicals is 2.3 days. Lindane may slowly biodegrade in aerobic media and will rapidly degrade under anaerobic conditions. Lindane has been reported to photodegrade in water, but photolysis is not considered a major environmental fate process. Lindane will bioconcentrate slightly in fish. Human exposure results primarily from food.

2.2.4 Polychlorinated Biphenyls (PCBs)

The following information was obtained from "The Installation Restoration Program Toxicology Guide", Vol. II, Arthur D. Little, Inc., June 1987.

This section provides a general review of the environmental fate of polychlorinated biphenyl (PCBs) mixtures marketed in the U.S. under the name Aroclor® (Aroclor® 1016, 1242, 1254, and 1260).

Aroclor® compounds are very inert, thermally and chemically stable compounds with dielectric properties. They have been used in nominally closed systems as heat transfer liquids, hydraulic fluids and lubricants, and in open-ended systems in which they came in direct contact with the environment as plasticizers, surface coatings, inks, adhesives, pesticide extenders and for microencapsulation of dyes for carbonless duplicating paper. In 1974, use of PCBs in the United States was limited to closed systems [i.e., approximately 70% of PCBs produced were used in capacitors while the remaining 30% were utilized in transformers].

The environmental behavior of the Aroclor® mixtures is a direct function of their relative composition with respect to the individual chlorinated biphenyl species. It is important to remember that Aroclor® formulations are mixtures and the physical properties and chemical behavior of mixtures cannot be precisely defined. The individual PCBs in a pure state are generally solids at room temperature; however, due to melting point depression, Aroclor® mixtures are oily to resinous liquids at ambient temperatures.

Individual PCBs vary widely in their physical and chemical properties according to the degree of chlorination and position of the chlorines on the biphenyl structure. In general, as chlorine content increases, adsorption increases while transport and transformation processes decrease. Except for

Aroclor® 1016, the last two digits in the Aroclor® number identification denote the approximate chlorine content by weight percent. The specific PCB distribution measured in environmental samples may be distorted and may not correspond to the specific Aroclor® mixture responsible for the contamination. For this reason, most of the fate and transport discussion will focus on the chlorinated biphenyl species rather than the Aroclor® mixtures.

In general, transport pathways can be assessed using an equilibrium partitioning model. These calculations predict the partitioning of low concentrations of the PCB mixtures among soil particles, soil water and soil air; portions associated with the water and air phases of the soil have higher mobility than the adsorbed portion. Estimates for the unsaturated topsoil model indicate that almost all (>99.99%) of the Aroclor® formulations are expected to be associated with the stationary phase. Much less than 1% is expected to partition to the soil-water phase; therefore, only a small portion would be available to migrate by bulk transport (e.g., the downward movement of infiltrating water), dispersion and diffusion. An insignificant portion of the Aroclor® formulations is expected in the gaseous phase of the soil; diffusion of vapors through the soil-air pores up to the ground surface is not expected to be important. In saturated, deep soils (containing no soil air and negligible soil organic carbon), sorption is still expected to be the most significant fate process. Overall, groundwater underlying PCB-contaminated soils is not expected to be vulnerable to contamination.

Adsorption to soils and sediments is the major fate process affecting PCBs in the environment. PCB sorption has been studied and reviewed in a number of reports. In general, the rate of adsorption by soil materials was found to be rapid and conformed to the Freundich adsorption equation; adsorption capacity was highly correlated with organic content, surface area, and clay content of the soil materials; PCBs were reported to be unable to penetrate into the inner surfaces of clay materials. Desorption of sorbed PCB is not expected to be rapid.

Distribution coefficients for PCBs on suspended solids in Saginaw Bay have been reported to range from 4×10^4 to 9×10^4. In general, higher chlorinated isomers are more strongly sorbed; however, preferential adsorption is also dependent on ring position of the substituted chlorine; values for K_{oc} range from approximately 10^5 for dichlorobiphenyl to 10^9 for octachlorobiphenyl.

Experimental studies on the mobility of Aroclor® 1242 and 1254 in soil materials indicate that these PCBs were adsorbed strongly and remained immobile when leached with water or aqueous leachate from a waste disposal site. However, they were found to be highly mobile when leached with carbon tetrachloride. The mobilities of the PCBs were highly correlated with their solubilities in the leaching solvent and the organic content of the soil material. It should be noted that even with carbon tetrachloride, a high percentage of the PCBs were retained on the soil while some moved with the solvent front.

Additional studies were performed using different solvents and varying amounts of water. Relatively small amounts of water (9%) in methanol were shown to significantly reduce the mobility of PCBs compared to the mobility in the pure solvent.

In summary, the available data indicate that sorption of PCBs, particularly the higher chlorinated biphenyls, onto soil materials will be rapid and strong. In the absence of organic solvents, leaching is not expected to be important, and PCBs are expected to be immobile in the soil/groundwater system; PCBs will be much more mobile in the presence of organic solvents. In the case of large spills of PCB/solvent mixtures, the soil and aqueous phases may become saturated resulting in a separate oily phase that may be more mobile.

Transport of PCB vapors through the air-filled pores of unsaturated soils is not expected to be a rapid transport pathway. Modeling results indicate that a very small fraction of PCB loading will be present in the soil-air phase. On the other hand, volatilization (mostly from aqueous systems) and atmospheric transport are thought to account for the widespread, almost ubiquitous, distribution of PCBs in the environment. Several studies have shown that vapor phase transport can be a significant process for loss of PCBs from water bodies. Adsorption to organic matter, however, has been shown to compete strongly with volatilization. Adsorption onto suspended sediment has been presented as an explanation for the lower rates of volatilization exhibited for natural water bodies compared to estimated rates. Volatilization from soil was reported to be slow compared to volatilization from sand or PCB solution.

Calculated half-lives for the volatilization of Aroclor® 1242, 1248, 1254, and 1260 from 1 mm water column have been reported to range from 9.5 hours to 12.1 hours; other authors have reported half-lives on the order of 3-4 hours for di- and tetrachlorobiphenyls. Volatilization of Aroclor® 1260 from river water was reported to be only 67% after 12 weeks; after addition of sediment, the loss dropped to 34% after 12 weeks. The Henry's law constants and volatilization half-lives do not vary widely with degree of chlorination of the PCBs.

The available data indicate that due to low water solubility, volatilization of water-borne PCBs not sorbed to sediment or suspended solids may be significant; when sorbed to soils/sediments, volatilization will be drastically reduced. However, since other fate and transport processes in the soil environment are relatively slow, volatilization of PCBs sorbed on surface soils may occur. Elevated airborne concentrations of PCBs have been measured near PCB disposal area.

PCBs have been reported to be strongly resistant to chemical degradation by oxidation or hydrolysis. However, they have been shown to be susceptible to photolytic and biological degradation. Baxter and Sutherland have shown that successive biochemical and photochemical processes contribute to the degradation of PCBs in the environment. Experimental results indicate that the highly chlorinated PCBs can be photolytically degraded, resulting in the formation of lower chlorinated species and substituted products, as well as potential formation of biphenylenes and chlorinated dibenzofurans; the presence of oxygen retards the photolytic degradation of PCBs.

There is some doubt as to the applicability of these photolysis experiments to environmental conditions, since they were generally carried out in organic solvents, often in the presence of other additives. However, since the rate of photolytic dechlorination is greatest for the highly chlorinated species (i.e., those species that are most resistant to biodegradation), photolytic degradation, although slow, may be a significant transformation process for these molecules. Furthermore, since they are rapidly adsorbed to soils, these highly chlorinated PCBs may be concentrated in the surface layers and their actual photolysis rates may be higher than expected.

Microbial degradation has been reported to be an important transformation process for PCBs. In general, the lower chlorinated PCBs were more easily degraded than the higher chlorinated species. Position of chlorine substitution on the biphenyl molecule also affected the rate of PCB degradation. Biodegradability of PCBs has been reported to be a function of the number of carbon-hydrogen bonds available for hydroxylation by microbial oxidation; adjacent unchlorinated carbons have been shown to facilitate metabolism through formation of arene oxide intermediates. Both aerobic oxidative biodegradation and anaerobic dechlorination have been identified as PCB transformation processes in Hudson River sediments. Composting studies indicate that aerobic systems exhibited greater PCB reductions than anaerobic systems (42 to 48% vs. 18 to 28% reduction after two weeks).

The biodegradation of Aroclor® 1016, 1242, 1254, and 1260 is a function of their relative content of the lower chlorinated biphenyls. Aroclor® 1016 and 1242 are largely comprised of di-, tri- and tetra-chloro biphenyls, which have been shown to be biodegraded in microbial cultures, aquatic systems, and soils at fairly rapid rates. Aroclor® 1254 and 1260 are largely comprised of higher chlorinated species and are expected to be resistant to biodegradation. In fact, Liu reported that an increase of chlorination from monochlorobiphenyls to predominantly trichlorobiphenyls (Aroclor® 1016 and 1242) and pentachlorobiphenyls (Aroclor® 1254) resulted in a corresponding decrease in degradation from 100% to 29% and 19%, respectively; similar results were reported by other authors. In an experiment with reservoir sediment, Aroclor® 1254 was degraded approximately 50% in six weeks. Using an acclimated semi-continuous activated sludge experiment with 48-hour exposure, degradation rates of 33%, 26% and 19% were determined for Aroclor® 1016, 1242, and 1254, respectively.

A study of the fate of Aroclor® 1254 in soil and groundwater after an accidental spill showed essentially no reduction in Aroclor® 1254 concentration due to biodegradation after two years. On the other hand, other authors reported moderate biodegradation of Aroclor® 1254 in soils (40% degraded in 112 days) and no degradation of Aroclor® 1260 (primarily hexa- and heptachlorobiphenyls). The presence of the lower chlorinated biphenyls has been shown to actually increase the rate of biodegradation of the higher PCBs through co-metabolism.

In summary, most studies have reported substantial PCB degradation in aqueous solutions; biodegradation rates are greatest for the lower chlorinated species. While adsorption of PCBs by soil and competition by native soil organisms may alter the degradation rate, several authors have reported substantial PCB degradation in soil systems. Mixed cultures of PCB-degrading microbes have been isolated from PCB-contaminated soils, suggesting that PCBs will be degraded to some extent in the environment.

2.2.5 Herbicides

It is not the intent of this section to discuss the persistence of all herbicides; therefore, only selected herbicide compounds such as those that are common or are suspected to have been used at SEDA are discussed below. The information on herbicides below was obtained from the "Handbook of Environmental Fate and Exposure Data for Organic Chemicals" (ed. Philip H. Howard, Lewis Publishers, Inc., 1991).

2,4-D

2,4-D is released into the environment through its use in herbicide formulations, as a hydrolysis product of 2,4-D esters, or from spills. If released on land, 2,4-D will probably readily biodegrade (typical half-lives <1 day to several weeks). Its adsorption to soils will depend on organic content and pH of soils (pKa of 2,4-D = 2.64-3.31), but it will not be expected to appreciably adsorb to soils. Leaching to groundwater will likely be a significant process in coarse-grained sandy soils with low organic content or with very basic soils. If released to water it will be lost primarily due to biodegradation (typical half-lives 10 to >50 days). It will be more persistent in oligotrophic waters and in waters where high concentrations are released. Degradation will be rapid in sediments (half-life <1 day). It will not bioconcentrate in aquatic organisms or appreciably adsorb to sediments, especially at basic pHs. If released in air it will be subject to photooxidation (estimated half-life of 1 day) and rainout. Human exposure will be primarily to those workers involved in the manufacture and used of 2,4-D, as well as those who work in and live near fields sprayed and treated with 2,4-D or its mixtures. Exposure may also occur through ingestion of contaminated food products and drinking water.

2,4,5-T

The amount of 2,4,5-T used annually in the U.S. prior to 1983 was estimated in 1985 to be approximately 204,000 pounds per year. Use of 2,4,5-T has been severely restricted in the United

States, however, since 1985. The USEPA may classify some or all applications as Restricted Use Pesticides. Release of 2,4,5-T to the environment may have occurred during its use as a herbicide and it can form in the environment as a hydrolysis product of its herbicide esters. Other sources of release may have included losses during formulation, packaging or disposal of 2,4,5-T, its esters and the acaracide, tetradifon. Since 2,4,5-T has a pKa of 2.88 it will be found in the dissociated form in all environmental media. If released in soil, 2,4,5-T can biodegrade and its mobility is expected to vary from highly mobile in sandy soil to slightly mobile in muck (due to adsorption of humic acids and other organic matter). Removal by biodegradation apparently limits the extent of leaching, however, and groundwater contamination is likely only by rapid flow through large channels and deep soil cracks. 2,4,5-Trichlorophenol and 2,4,5-trichloranisole are the primary microbial degradation products of 2,4,5-T. Chemical hydrolysis in moist soils and volatilization from dry and moist surfaces should not be significant. The persistence of 2,4,5-T in soil is reported to vary between 14 to 300 days, but usually does not exceed one full growing season regardless of the application rate. Degradation under anaerobic conditions in flooded soils is much slower (half-life less than or equal to 48 weeks) than in field moist soils. The half-lives for 2,4,5-T degradation in six soils ranged from 6.6 to 31 days (average 42 days). The persistence 2,4,5-T may be greater in soil that received large amounts of the herbicide. If released to water, photochemical decomposition, volatilization and biodegradation of 2,4,5-T appear to be the dominant removal mechanisms. The primary degradation product of 2,4,5-T in water is 2,4,5-trichlorophenol. The aquatic near surface half-life for direct photolysis has been calculated to be 15 days during summer at latitude 40°. Humic substances can photosensitize 2,4,5-T and humic induced photoreactions may dominate photodegradation processes when humic substance concentrations exceed 15 mg/L of organic C/L. Primary photodegradation products are 2,4,5-trichlorophenol and 2-hydroxy-4,5-dichlorophenoxyacetic acid. Adsorption of 2,4,5-T to humic acids in suspended solids and sediments may be significant. Oxidation, chemical hydrolysis, volatilization and bioaccumulation should not be significant. If released to the atmosphere, 2,4,5-T should exist as fine droplets and adsorbed on airborne particulates. 2,4,5-T has the potential to undergo: a) direct photolysis due to UV absorption at >290 nm; b) a reaction with photochemically generated hydroxyl radicals (estimated vapor phase half-life = 1.12 days); or c) be physically removed by settling out or washout in rainfall. The most probable route of exposure to 2,4,5-T would be inhalation and dermal exposure of workers involved in the manufacture, handling or application of 2,4,5-T, related ester compounds or certain tetradifon formulations which contain 2,4,5-T.

2.2.6 Metals

In general, metals tend to be persistent and relatively insoluble in the environment. The behavior of metals in soil is unlike organic compounds in many aspects. For example, volatilization of metals from soil is not considered a realistic mechanism for contaminant migration and thus, is not considered here. However, leaching and sorption will be considered.

Leaching of metals from soil is controlled by numerous factors. The most important consideration for leaching of metals is the chemical form of the metal (i.e., base metal or cation) present in the soil. The leaching of metals from soil is substantial if the metal exists as a soluble salt. Metallic salts have been identified as a component of such items as tracer ammunition, igniter compositions, incendiary ammunition, flares, colored smoke and primer explosive compositions. In particular, barium nitrate, lead stearate, lead carbonate, and mercury fulminate are potential metal salts or complexes that are components of ammunition that may have been tested or disposed of at SEDA. During the burning of these materials, a portion of these salts oxidize to their metallic oxide forms. In general, metal oxides are considered less likely to leach elemental metals than metallic salts. Upon contact with surface water or precipitation, the metal salts may be dissolved, increasing their mobility and increasing the potential for leaching to the groundwater.

Metals may also exist in the base metallic form as a component of the projectiles tested or disposed of at SEDA. Bullets are composed mainly of lead, and may contain varying amounts of antimony, cadmium, copper, selenium, and zinc. Metals that exist in base metallic form, bullet or projectile casings for example, will tend to dissolve much more slowly than the metallic salts.

Oxidation and reduction involves the change of the valence state of the metals and has a large influence on the other fate mechanisms. A good example of the variation in contamination fate due to oxidation and reduction changes is iron. Iron (Fe) normally exists in one of two valence states, +2 and +3 [Fe(II) and Fe(III)]. Fe(II) is far more soluble than Fe(III) and therefore has a greater mobility.

Soil pH is often correlated with potential metal migration. If the soil pH is greater than 6.5, most metals are fairly immobile, particularly those normally present as cations. This is because at higher pH values, metals form insoluble carbonate and hydroxide complexes. Metals would be most mobile in highly acidic soil (pH of less than 5).

A RI was performed at the Open Burn (OB) Grounds at SEDA in 1992 within which more than 50 surface soil samples and over 300 subsurface soil samples were collected. The pH values of the surface soil samples ranged from 5 to 8.4, and the pH of subsurface soil samples ranged from 7 to 9 (Parsons ES, 1995). The soil at the OB Grounds is lithologically similar to the soil found throughout the SEDA, therefore, metals in the soil at the PID Area are expected to be primarily present in insoluble forms. A detailed evaluation of select metals (barium, copper, lead, mercury, and zinc) is given below.

Barium

Barium is a highly reactive metal that occurs naturally only in the combined state. Most barium released to the environment from industrial sources is in forms that do not become widely dispersed. Barium in soil may be taken up to a small extent either by vegetation, or transported through soil with infiltration of precipitation. Barium is not very mobile in most soil systems. Generally, the higher the level of organic matter present, the greater the adsorption or barium. The presence of calcium carbonate will also limit mobility, since barium will form $BaCO_3$, an insoluble carbonate. In aquatic media, barium is likely to precipitate out of solution as an insoluble salt, or adsorb to suspended particulate matter. Sedimentation of suspended solids removes a large portion of the barium from surface waters. Barium in sediment is found largely in the form of barium sulfate. Bioconcentration in freshwater aquatic organisms is minimal.

Copper

Copper is considered to be among the more mobile of the metals in surface environments. Seasonal fluctuations have been observed in surface water, copper concentrations, with higher levels being found in fall and winter, and lower levels in the spring and summer. Copper is not expected to volatilize from water. Copper is strongly accumulated by all plants and animals, but is probably not biomagnified. The degree of persistence of copper in soil depends on the soil characteristics and the forms of copper present. For example, in soil of low organic content, soluble copper compounds may move into groundwater at a significant rate. On the other hand, the presence of organic complexing agents may restrict movement in soil, and copper may be immobilized in the form of various inorganic complexes. Copper is not expected to volatilize from soil. Several processes including: formation of complexes, especially with humic substances; sorption to hydrous metal oxides, clays, and organic materials; and bioaccumulation determine the fate of copper in aquatic environments. Organic complexes of copper are more easily adsorbed on clay and other surfaces than the free form. The aquatic fate of copper is highly dependent on factors such as pH, oxidation-reduction potential, concentration of organic matter, and the presence of other metals. With regard to the latter, it has been demonstrated that co-precipitation of copper with hydrous oxides of iron and manganese effectively scavenges copper from solution, although in most surface waters organic materials prevail over inorganic ions in complexing copper.

Lead

Lead is extremely persistent in both water and soil. Environmental fate processes may transform one lead compound to another; however, lead is generally present in the metallic and +2 oxidation state, and will form lead oxides. It is largely associated with suspended solids and sediment in aquatic systems, and it occurs in relatively immobile forms in soil. Lead that has been released to soil may become airborne as a result of fugitive dust generation.

Mercury

Elemental mercury is insoluble in water and binds tightly to soil particles giving it a relatively low mobility. Bacterial and fungal organisms and soil under anaerobic conditions in sediment are capable of methylating mercury. Methyl mercury, which is soluble in water, is a mobile substance and can then be ingested or absorbed. Until altered by biological processes, the primary transport method for mercury is the erosion and transportation of soil and sediment (Gough, et al., 1979). Mercury most likely exists at SEDA in the elemental state as a result of the testing or demolition of munitions containing mercury fuses. Although a mercury salt, mercury fulminate, was used in the past as a priming explosive; however, it has not been commonly used since 1925 (Dunstan and Bell, 1972), and its environmental fate will not be considered at the site. Mercury is also semivolatile and may become airborne.

Zinc

Zinc is stable in dry air, but upon exposure to moist air will form a white coating composed of basic carbonate. Zinc loses electrons becomes oxidized in aqueous environments. In the environment, zinc is found primarily in the +2 oxidation state. Elemental zinc is insoluble; most zinc compounds show negligible solubility as well, with the exception of elements (other than fluoride) from Group VII of the Periodic Table compounded with zinc (i.e., $ZnCl_2$, ZnI_2) showing a general 4:1 compound to water solubility level. In contaminated waters, zinc often complexes with a variety of organic and inorganic ligands. Therefore, the overall mobility of zinc in an aqueous environment, or through moist-to-wet soil, may be accelerated by compounding/complexing reactions.

Zinc has a tendency to adsorb to soil, sediment and suspended solids in water. Adsorption to sediments and suspended solids is the primary fate for zinc in aqueous environments, and will greatly limit the amount of solubilized zinc. All organisms accumulate zinc. Zinc concentrations in air are relatively low except near industrial sources. Volatilization is not an important process from soil or water.

2.3 PRELIMINARY IDENTIFICATION OF POTENTIAL RECEPTORS AND EXPOSURE SCENARIOS

2.3.1 Introduction

This section identifies the source areas, release mechanisms, potential exposure pathways, and the potential human and environmental receptors at SEADs 121C and 121I based upon the results of the conceptual site model, which was described in previous sections. The intended future land use for these sites is planned for industrial development.

2.3.2 Potential Source Areas and Release Mechanisms

The largest potential sources of contaminants for SEADs 121C and 121I are the presence of residual materials abandoned at the individual sites or deposition of contaminants in site soils due to releases that may have occurred during the performance of operations and activities in each area. Potential release mechanisms from the likely source areas include: 1) release of abandoned materials to the soil; 2) infiltration and percolation through the soil to the groundwater; 3) volatilization from the soil and groundwater to the air; 4) precipitation runoff via overland flow and surface erosion to surface water and receiving water body sediment; and 5) fugitive emission of site debris and soil as dusts.

2.3.3 Potential Exposure Pathways and Receptors

The potential exposure pathways from sources to receptors are shown in **Figure 2-9**. There are eight receptor populations for potential releases of contaminants within the Planned Development Area:

- Current site workers,
- Future industrial workers,
- Future construction workers,
- Daycare Center worker,
- Daycare Center student (child),
- Trespasser (child),
- Terrestrial biota on or near the site, and
- Aquatic biota that may live in receiving surface water bodies (e.g., Kendaia Creek) downgradient of the sites.

The exposure pathways and media of exposure are described below as they may affect the various receptors.

Dust Inhalation and Dermal Contact. Inhalation of impacted dust and dermal contact with impacted soil is a potential exposure pathway for current and future site workers, future construction workers, daycare center workers and students, site trespassers, and terrestrial biota depending on the amount of vegetation and/or pavement covering the surface of the site. Fugitive dusts would not be expected to be transported beyond the SEDA boundary.

Surficial soil and dust could become airborne due to vehicular traffic or wind erosion. Persons at, or near, the sites could inhale particulates that have been contaminated with on-site material.

Incidental Soil Ingestion. Incidental ingestion of waste material and soil is a potential exposure pathway for current and future industrial site workers, future construction workers, future daycare center workers and students, site trespassers, and terrestrial biota

Groundwater Ingestion, Inhalation, and Dermal Contact. There is an existing potable water distribution system that services the PID Area. The source of the potable water in this system is derived from locations external to the Depot, and away from the PID Area. The groundwater beneath the two PID sites is not currently used as a drinking water source and connection to other potable groundwater aquifers has not been demonstrated. Therefore, ingestion of, inhalation of, and dermal contact with the shallow groundwater are not current exposure pathways for on-site workers or terrestrial biota. Furthermore, these pathways are not considered to be applicable to future users (e.g., daycare center students or workers, or industrial workers) of the sites as it is likely that the existing potable water supply will continue to service the PID Area.

A shallow groundwater aquifer has not been identified at SEAD-121I, based on the limited sampling that has been conducted in this area to date. A shallow aquifer has been identified beneath SEAD-121C. Therefore, it is possible that future construction activities at either site could extend into the shallow groundwater aquifer. As such, construction workers could be exposed to the groundwater underlying the sites. Therefore, ingestion of, dermal contact, and inhalation of volatile compounds present in the groundwater may represent a potential route of exposure to all future construction workers. Comparably, future trespassers to the construction site could ingest, have dermal contact with, or inhale volatile vapors released from groundwater underlying the site.

Residential communities surrounding the Depot use potable water wells for drinking water supplies and irrigation, which however unlikely, could be a possible route of exposure to any contaminants released as a result of the activities conducted at the two PID Area sites. However, the apparent groundwater flow direction in the PID area is from the east to the west, so any contaminated groundwater would first have to flow a distance of more that 10,000 feet through the center of the Depot before it reached any surrounding residential property. Furthermore, off-site potable well water supplies used by surrounding residents are more than likely derived from bedrock wells rather than overburden wells. If this is so, this would further reduce the potential impacts of future groundwater contamination from the SEDA. Therefore, ingestion, direct contact or inhalation of groundwater is not considered a potential exposure pathway for off-site residents.

Ingestion and Dermal Exposure to Surface Water Runoff and Sediment. Human receptors of impacted surface water and sediment include current and future on-site workers, future construction workers, and trespassers who may incidentally ingest or come in contact with the surface water and sediment. Dermal exposure to surface water and sediments represent exposure pathways for persons wading in on-site portions of any surface water body (i.e., stream or creek) receiving run-off flow from the storm water culverts at the sites. Wading in a creek or stream is possible for persons fishing in portions of a creek or stream and for children playing in the creek or stream. Ingestion of edible fish caught in a surface water body could result in human exposure through bioaccumulation and biomagnification of the contaminants in the surface and sediments. Traditional daycare operations would tend to preclude contact of students or workers with surface water or sediment, as outdoor play and activities are minimal during wet and mud seasons and generally exclude areas surrounding surface water bodies for safety reasons.

The primary environmental receptors of any impacted surface and sediment are the biota of the low-lying areas, drainage swales, and ponds. Organisms that feed on the biota may be affected due to bioaccumulation of pollutants from the surface water and sediment. Terrestrial biota that drink from and come in contact with impacted surface waters may be affected.

2.4 PRELIMINARY IDENTIFICATION OF ARARs AND TBC CRITERIA

2.4.1 Introduction

Section 121(d)(1) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA), requires that remedial actions must attain a degree of cleanup that assures the safety of human health and protection of the environment. Moreover, all potential applicable or relevant and appropriate requirements (ARARs) must be outlined. ARARs include federal standards, requirements, and criteria, and limitations under state environmental or facility siting regulations that are more stringent than federal standards. Although the requirements of CERCLA Section 121 generally apply as a matter of law only to remedial actions, USACE's policy for response actions is that ARARs will be identified and complied with to the maximum extent practicable.

Non-promulgated advisories or guidance documents issued by federal or state governments do not have the status of potential ARARs. However, these "to be considered" (TBC) criteria may be used in determining the necessary level of cleanup for human safety and protection of the environment. Potential ARARs and TBCs for the Planned Industrial Area are listed in the following sections.

2.4.2 Sources of Chemical-Specific ARARs

Federal:

Resource Conservation and Recovery Act (RCRA), Groundwater Protection Standards and Maximum Concentration Limits (40 CFR 264, Subpart F).

Clean Water Act, Water Quality Criteria (Section 304) (May 1, 1987 - Gold Book).

Safe Drinking Water Act, Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16).

Safe Drinking Water Act National Primary Drinking Water Regulations, Maximum Contaminant Level Goals (MCLGs) (40 CFR 141.50-141.51).

New York State:

New York State Codes, Rules and Regulations (NYCRR) Title 6, Chapter X.

New York Groundwater Quality Standards (6 NYCRR 703).

New York Safe Drinking Water Act, Maximum Contaminant Levels (MCLs) (10 NYCRR 5).

New York Surface Water Quality Standards (6 NYCRR 702).

New York State Raw Water Quality Standards (10 NYCRR 170.4).

New York RCRA Groundwater Protection Standards (6 NYCRR 373-2.6 (e)).

New York State Department of Environmental Conservation, Division of Water, Technical and Operational Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, November 15, 1990, updated October 1993, June 1998, and April 2000.

Surface Water and Groundwater Classifications and Standards (6 NYCRR 700-705).

Declaration of Policy, Article 1 Environmental Conservation Law (ECL), Department of Environmental Conservation.

General Functions, Powers, Duties and Jurisdiction, Article 3 Environmental Conservation Law, Department of Environmental Conservation.

ECL, Protection of Water, Article 15, Title 5, Department of Environmental Conservation.

Use and Protection of Waters, (6 NYCRR, Part 608).

2.4.3 Sources of Location-Specific ARARs

Federal:

Executive Orders on Floodplain Management and Wetlands Protection (CERCLA Floodplain and Wetlands Assessments) #11988 and 11990.

National Historic Preservation Act (16 USC 470) Section 106 et seq. (36 CFR 800) (Requires Federal agencies to identify all affected properties on or eligible for the National Register of Historic Places and consult with the State Historic Preservation Office and Advisory Council on Historic Presentation).

RCRA Location Requirements for 100-year Floodplains (40 CFR 264.18(b)).

Clean Water Act, Section 404, and Rivers and Harbor Act, Section 10, Requirements for Dredge and Fill Activities (40 CFR 230).

National Environmental Policy Act (NEPA), Statement of Procedures on Floodplain Management and Wetlands Protection (40 CFR 6, Appendix A).

USDA/SCS - Farmland Protection Policy (7 CFR 658).

USDA Secretary's Memorandum No. 1827, Supplement 1, Statement of Prime Farmland, and Forest Land - June 21, 1976.

EPA Statement of Policy to Protect Environmentally Significant Agricultural Lands - September 8, 1978.

Farmland Protection Policy Act of 1981 (FPPA)(7 USC 4201 *et seq*).

Endangered Species Act (16 USC 1531).

Wilderness Act (16 USC 1131).

National Environmental Policy Act (NEPA), Wetlands, Floodplains, Important Farmland, Coastal Zones, Wild and Scenic Rivers, Fish and Wildlife and Endangered Species (40 CFR 6.302).

New York State:

New York State Freshwater Wetlands Law (ECL Article 24, 71 in Title 23).

New York State Freshwater Wetlands Permit Requirements and Classification (6 NYCRR 663 and 664).

New York State Floodplain Management Act and Regulations (ECL Article 36 and 6 NYCRR 500).

Endangered and Threatened Species of Fish and Wildlife Requirements (6 NYCRR 182).

New York State Flood Hazard Area Construction Standards.

2.4.4 Sources of Action-Specific ARARs

Federal:

RCRA Subtitle C Hazardous Waste Treatment Facility Design and Operating Standards for Treatment and Disposal systems, (i.e., landfill, incinerators, tanks, containers, etc.) (40 CFR 264 and 265); Minimum Technology Requirements.

RCRA, Subtitle C, Closure and Post-Closure Standards (40 CFR 264, Subpart G).

RCRA Groundwater Monitoring and Protection Standards (40 CFR, Subpart F).

RCRA Generator Requirements for Manifesting Waste for Offsite Disposal (40 CFR 262).

RCRA Transporter Requirements for Off-Site Disposal (40 CFR 263).

RCRA, Subtitle D, Non-Hazardous Waste Management Standards (40 CFR 257).

Safe Drinking Water Act, Underground Injection Control Requirements (40 CFR 144 and 146).

RCRA Land Disposal Restrictions (40 CFR 268) (On and off-site disposal of excavated soil).

Clean Water Act, - NPDES Permitting Requirements for Discharge of Treatment System Effluent (40 CFR 122-125).

Effluent Guidelines for Organic Chemicals, Plastics and Resins (Discharge Limits) (40 CFR 414).

Clean Water Act Discharge to Publicly - Owned Treatment Works (POTW) (40 CFR 403).

DOT Rules for Hazardous Materials Transport (49 CFR 107, 171.1-171.500).

Occupational Safety and Health Standards for Hazardous Responses and General Construction Activities (29 CFR 1904, 1910, 1926).

Federal Ambient Water Quality Standards (AWQCs) (33 USC 1314(a), 40 CFR 122.44).

RCRA Identification and Listing of Hazardous Wastes, Toxicity Characteristic (40 CFR 261.24).
SARA (42 USC 9601).

OSHA (29 CFR 1910.120).

Clean Air Act (40 CFR 50.61).

New York State:

New York State Pollutant Discharge Elimination System (SPDES) Requirements (Standards for Storm Water Runoff, Surface Water, and Groundwater discharges (6 NYCRR 750-757).

New York State RCRA Standards for the Design and Operation of Hazardous Waste Treatment Facilities (i.e., landfills, incinerators, tanks, containers, etc.); Minimum Technology Requirements (6 NYCRR 370-373).

New York State RCRA Closure and Post-Closure Standards (Clean Closure and Waste-in-Place Closures) (6 NYCRR 372).

New York State Solid Waste Management Requirements and Siting Restrictions (6 NYCRR 360-361), and revisions/enhancements effective October 9, 1993.

New York State RCRA Generator and Transporter Requirements for Manifesting Waste for Off-Site Disposal (6 NYCRR 364 and 372).

2.4.5 Sources of TBC Criteria

Federal:

Proposed Maximum Contaminant Levels (50 Federal Register 46936-47022, November 13, 1985).

Proposed Maximum Contaminant Levels Goals (50 Federal Register 46936-47022, November 13, 1985).

Proposed Requirements for Hybrid Closures (combined waste-in-place and clean closures) (52 Federal Register 8711).

USEPA, 1989. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A). EPA/540/1-89/002.

USEPA, 1997. Exposure Factors Handbook. Volumes 1 – III. Update to Exposure Factors Handbook (EPA/600/8-89/043 – May 1989). EPA/600/P-95/002Fa.

USEPA, Integrated Risk Information System (IRIS), electronic database.

USEPA Drinking Water Health Advisories, long-term only.

USEPA Health Effect Assessment (HEAs).

TSCA Health Data.

Toxicological Profiles, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service.

Policy for the Development of Water-Quality-Based Permit Limitations for Toxic Pollutants (49 Federal Register 9016).

Cancer Assessment Group (National Academy of Science) Guidance.

Groundwater Classification Guidelines.

Groundwater Protection Strategy.

Waste Load Allocation Procedures.

Fish and Wildlife Coordination Act Advisories.

Federal Guidelines for Specification of Disposal Site for Dredged or Fill Material.

USEPA Interim Guidance for Establishing Soil Lead Clean Up Levels.

RCRA Clean-Up Criteria for Soils/Groundwater (RFI Guidance), EPA 530-SW-89-031.

USEPA OSWER Publication 9345.3-03 FS, Management of Investigation-Derived Waste, January 1992.

New York State:

New York State Proposed Safe Drinking Water Standards Maximum Contaminant Levels for VOCs (10 NYCRR 5).

New York State Underground Injection/Recirculation at Groundwater Remediation Sites (Technical Operating Guidance (TOG) Series 7.1.2).

New York State Analytical Detectability for Toxic Pollutants (85-W-40 TOG).

New York State Toxicity Testing for the SPDES Permit Program (TOG 1.3.2).

New York State Regional Authorization for Temporary Discharges (TOG Series 1.6.1).

Sediment Criteria - December, 1989 - Used as Guidance by the Bureau of Environmental Protection, Division of Fish and Wildlife, New York State Department of Environmental Conservation.

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites; October 1994.

New York State Department of Environmental Conservation, Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels, TAGM 4046, January 24, 1994 (revised).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Use of Inactive Hazardous Waste Disposal Site Numbers, February 1987, (HWR-4001).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Preparation

of Annual "Short List" of Prequalified Consultants, January 1993, (HWR-4002).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Guidelines for Entries to the Quarterly Status Report of Inactive Hazardous Waste Disposal Sites, May 1987, (HWR-4003).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Guidelines for Classifying Inactive Hazardous Waste Disposal Sites, June 1987, (HWR-4004).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Insurance Requirements for Consultant and Construction Contracts and Title 3 Projects, September 1989, (HWR-4005).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Consultant Contract Overhead Rates and Multipliers, April 1988, (HWR-4006).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Phase II Investigation Generic Work Plan, May 1988, (HWR-4007).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Phase II Investigation Oversight Guidance, November 1990, (HWR-4008).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Team Submissions in Responding to Requests for Proposals and Title 3 Projects, June 1992, (HWR-4009).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Roles and Responsibilities of the NYSDEC Regional Offices, January 1992, (HWR-4010).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Contractor/Consultant Oversight Guidance - O&D Memo #88-26, July 1988, (HWR-4011).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Inactive Hazardous Waste Disposal Site Registry Petitions - O&D Memo #88-33, August 1988, (HWR-4012).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Emergency Hazardous Waste Drum Removal/Surficial Cleanup Procedures, January 1995, (HWR-4013).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Protocol Between Division of Hazardous Waste Remediation and Division of Environmental Enforcement, September 1988, (HWR-4014).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Policy Regarding Alteration of Groundwater Samples Collected for Metal Analysis, September 1988,

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Health and Safety Training and Equipment, October 1988, (HWR-4016).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Protocol Between DHWR and DHSR for Determining Lead Program for RCRA/CERCLA Title 13 Sites, November 1988, (HWR-4017).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Phase I Investigations, November 1988, (HWR-4018).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Phase II Investigation Oversight Note-Taking, November 1990, (HWR-4019).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Guidelines for Responding to Freedom of Information Law (FOIL) Requests, December 1988, (HWR-4020).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Start/End Definitions for Program Elements Within Funding Sources, March 1991, (HWR-4021).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Records of Decision for Remediation of Class 2 Inactive Hazardous Waste Disposal Sites - O&D Memo #89-05, February 1989, (HWR-4022).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Citizen Participation Plan, February 1989, (HWR-4023).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): NYSDOH Hazardous Waste Site Notification, March 1989, (HWR-4024).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Guidelines for Remedial Investigation/Feasibility Studies, March 1989, (HWR-4025).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Assistance for Contaminated Private and Public Water Supplies, April 1994, (HWR-4027).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Subcontracting under Hazardous Waste Remediation Contracts, April 1989, (HWR-4028).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Roles and Responsibilities of the Technology Section - Site-Specific Projects, April 1990, (HWR-4029).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Selection of Remedial Actions at Inactive Hazardous Waste Sites, May 1990, (HWR-4030).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites, October 1989, (HWR-4031).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Disposal of Drill Cuttings, November 1989, (HWR-4032).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Inactive Sites Interface with Sanitary Landfills, December 1989, (HWR-4033).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Guidelines for Eligibility Determination for Work Performed Under the EQBA Title 3 Provisions, January 1900, (HWR-4034).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Project Manager and Contract Manager Responsibilities Under Standby Contract, March 1990, (HWR-4034).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Landfill Regulatory Responsibility, March 1990, (HWR-4036).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Major Milestone Dates for Tracking Remedial Projects, April 1990, (HWR-4037).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Remediation of Inactive Hazardous Waste Disposal Sites, April 1990, (HWR-4038).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Contract Appeals, October 1990, (HWR-4039).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Permitting Jurisdiction Over Inactive Hazardous Waste Site Remediation - O&D Memo #94-04, March 1994, (HWR-4040).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Releasing Sampling Data, Findings and Recommendations, February 1991, (HWR-4041).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Interim Remedial Measures, June 1992, (HWR-4042).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Procedures for Handling RPP-Funded PSAs, February 1992, (HWR-4043).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Accelerated Remedial Actions at Class 2, Non-RCRA Regulated Landfills, March 1992, (HWR-4044).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Enforcement Referrals, July 1992, (HWR-4045).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives and Cleanup Levels, January 1994, (HWR-4046).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Priority Ranking System for Class 2 Inactive Hazardous Waste Sites, December 1992, (HWR-4047).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Interim Remedial Measures-Procedures, December 1992, (HWR-4048).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Referral of Sites to the Division of Water, December 1992, (HWR-4049).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Payment Review Process, April 1993, (HWR-4050).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Early Design Strategy, August 1993, (HWR-4051).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Administrative Records and Administrative Record File, August 1993, (HWR-4052).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Obtaining Property Access for Investigation, Design, Remediation and Monitoring/Maintenance, September 1993, (HWR-4053).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Contract Conceptual Approval Process, November 1994, (HWR-4054).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Contract Final Approval Process, November 1994, (HWR-4055).

New York State, Division Technical and Administrative Guidance Memorandum (TAGM): Remedial Action by PRPs, April 1995, (HWR-4056).

2.5 DATA QUALITY OBJECTIVES (DQOs)

The RI process requires decisions regarding future site remedial actions, including whether or not any actions are required. The RI serves as the mechanism for collecting and assessing data that will be used in the decision making process. During this portion of the overall process, data will be collected and assembled to:

- characterize site conditions;
- determine the nature of the waste(s) or contaminant(s) present;
- assess the risk posed to human health and the environment by the identified waste(s) or contaminant(s); and
- perform testing to evaluate the potential performance and cost of treatment technologies that are being considered for use.

The FS provides the mechanism within which the alternative remedial actions are developed, scoped, assessed and evaluated. Ultimately, the output of the RI process is a recommended alternative for remedial actions needed at the site that is based on the data that is developed during the RI. Consequently, the collected data must be of sufficient quantity and quality to support defensible decision making.

The U.S. Environmental Protection Agency's Quality Assurance Management Staff (QAMS) developed the Data Quality Objectives (DQO) Process (USEPA, 1996) as a systematic planning tool for developing data collection designs that support defensible decision making in a resource-effective manner. Proper application and use of the EPA's recommended DQO Process can improve the effectiveness, efficiency and defensibility of data collection efforts used in the development and recommendation of potential remedial actions.

The DQO Process is an iterative process that consists of seven steps, as is shown in **Figure 2-10**. The output from each step influences the choices that may be made later in the Process, and may lead to reconsideration of prior decisions due to the development or discovery of new data that does not support prior decisions. The first six steps focus on the development and specification of decision performance criteria or the DQOs that will be used to develop the data collection design. Key components of each of these steps are highlighted below:

- State the Problem – Concisely describe the problem to be studied. Review existing information and data to serve as the basis of the problem definition.
- Identify the Decision – Identify what questions the investigation/study will attempt to resolve, and the actions that may result.
- Identify the Inputs to the Decision – What information/data needs to be obtained and collected to resolve the problem identified?
- Define the Study Boundaries – Specify the time periods and spatial area to which the decisions will apply. Determine where and when data should be collected.
- Develop a Decision Rule – Define the statistical parameter of interest, specify the action level, and integrate the previous DQO inputs into a single statement that describes the logical basis for choosing among the alternatives.
- Specify Tolerable Limits on Decision Errors – Define decision error rates based on the consideration of making an incorrect decision.

The last step of the DQO Process is the development and specification of the data collection design based on the DQOs. During this step, all of the data and information developed and collected during the prior steps of the process are evaluated and used to generate alternative data collection designs that could be applied to resolving the identified problem. Once the alternative data collection strategies are identified, the most resource-effective design that meets all the DQOs may be selected and implemented.

Each of the first six steps of the DQO has been incorporated into the development and presentation of this work plan for the proposed environmental baseline survey for the Non-Evaluated Sites at the Planned Industrial Development Area. This work plan presents the Army's recommended approach to conducting an investigation that will be used to prepare a Decision Document that will intern be used to justify the future disposition of the site.

2.6 DATA NEEDS

2.6.1 Site Visit

A preliminary site visit will be made to the sites to mark and verify the suitability of the proposed sampling locations. The sampling locations tentatively identified in this sampling plan are based on observations made at the time of the preparation of the work plan, and site conditions may change prior to the approval of the proposed work that will necessitate the repositioning of one or more sampling points.

2.6.2 Soil Data

Soil samples will be collected at each of the two sites and analyzed to provide the following information:

- Catalogue and verify the stratigraphic composition of soils found in the area of the two sites.
- Collect analytical data to identify if contaminants have been released to the soil and if contaminants are found, to document to what extent the surficial and deeper soil has been impacted by site activities.
- Identify the potential for contaminants found in soil to infiltrate to the groundwater.
- Assess the adsorptive potential of the soil by performing TOC analyses on soil samples.
- Assess the potential severity of identified contaminant concentrations by comparing measured concentrations with ARARs.

2.6.3 Groundwater Data

It is currently expected that three wells will be installed at SEAD-121C. No wells are currently anticipated for SEAD-121I because available information for this site has not indicated that a shallow, overburden groundwater aquifer is present in the areas. If preliminary soil borings indicate that a shallow groundwater aquifer may be present at the time of the investigation, additional monitoring wells will be installed and samples will be collected and analyzed as part of the proposed investigation at these sites.

Two rounds of groundwater samples will be collected from the three proposed wells at SEAD-121C and the samples will be analyzed to quantify the level of contaminants that are present.

Groundwater evaluations will be conducted to provide the following information and data:

- Aquifer characteristics, including groundwater elevation, flow direction and hydraulic conductivity to assess potential migration pathways for chemical constituents.

- Collect and analyze groundwater samples to determine if the local groundwater has been affected by releases from the site, and if it is affected, to what extent the groundwater has been impacted by site activities.
- Assess the potential severity of identified contaminant concentrations by comparing measured concentrations with ARARs.

2.6.4 Surface Water Data

There are no natural and permanent surface watercourses or bodies present at SEAD-121I. Surface water flow in this area results from storm event run-off that flows over the surface towards engineered drainage swales, culverts or catch basins and buried storm water sewers. The drainage culverts and storm water sewers subsequently transport storm water flow out of the PID and into the central portion of the Depot where it empties into Kendaia Creek.

An ephemeral stream, creek bed, or drainage culvert forms the northwestern boundary of SEAD-121C. This stream, creek, drainage culvert is fed primarily by storm event run-off from the northern portion of the planned industrial development area, and this watercourse forms part of the headwaters of Kendaia Creek, which subsequently transects the central portion of the Depot before discharging into Lake Seneca to the west.

Surface water evaluations will be collected to provide the following information and data:

- Preliminary site inspections of the engineered drainage swales, culverts, ephemeral watercourses, catch basins and buried storm water sewer lines to document how surface water flow at each of the SEADs moves away from the site.
- If possible, samples of surface water will be collected from locations within, upgradient, and downgradient of each site, and the samples will be analyzed to determine if the surface water is being affected by releases from the sites, and if it is affected, to what extent the surface water has been impacted by site activities.
- Collected surface water data will be compared to ARARs to estimate the potential severity of identified contaminant concentrations measured at each site.

2.6.5 Transported Soil and Debris resident in Man-Made and Natural Watercourses

As is discussed above, there is no natural and permanent surface watercourse or body present at SEAD-121I. Additionally, although a watercourse forms the northwestern boundary of SEAD-121C it is ephemeral in nature, and generally inadequate to support aquatic or wetland life. Therefore, material found in the man-made and naturally occurring watercourses at these sites is classified as transported soil or surface debris.

Samples of the transported soil or surface debris found in the identified ephemeral stream/creek beds, drainage culverts, swales, storm sewer lines, and catch basins will be collected from both SEADs and analyzed to provide the following information:

- Determine to what extent the collected material has been impacted by site activities.
- Establish the potential for constituents in the debris to become suspended in storm water run-off from the site and migrate downgradient of the Depot where it may enter receiving water bodies.
- Assess the adsorptive potential of the transported soil and debris by performing TOC analyses on the collected samples.
- Assess the potential severity of the contaminants found in the debris by comparing the data with soil and sediment ARARs.

Definition of Data Qualifiers (Q) Used in Appendix Tables

Qualifier Code (Q)		**Definition**
Blank cell	=	Compound was detected at listed concentration.
J	=	Reported concentration is an estimate
R	=	The reported value was rejected during data validation.
U	=	Compound was not detected at the identified concentration.
UJ	=	The compound was not detected and the associated detection limit is estimated.

Table 2-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

SEAD ID								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
Loc. ID								SB121C-1	SB121C-1	SB121C-1	SB121C-2	SB121C-2
Matrix								SOIL	SOIL	SOIL	SOIL	SOIL
Lab ID								EB226	EB231	EB232	EB014	EB228
Upper Limit								0	0	2.5	0	2
Depth (feet)								0.2	0.2	3	0.2	2.5
Sample Date								3/9/98	3/9/98	3/9/98	3/9/98	3/9/98
Sample Type								SA	SA	SA	DU	SA
Program								EBS	EBS	EBS	EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value (^{a})	Number of Exceedences	Number of Detections	Number of Analyses	Value (Q^{b})	Value (Q^{b})	Value (Q^{b})	Value (Q^{b})	Value (Q^{b})
Volatile Organic Compounds												
Acetone	UG/KG	28	42.9%	200	0	6	14	12 UJ	12 U	14	12 J	11 UJ
Benzene	UG/KG	2	7.1%	60	0	1	14	12 UJ	12 U	12 U	12 U	2 J
Chloroform	UG/KG	4	28.6%	300	0	4	14	12 UJ	12 U	12 U	12 U	4 J
Toluene	UG/KG	28	92.9%	1500	0	13	14	3 J	2 J	7 J	5 J	5 UJ
Semivolatile Organic Compounds												
2,4-Dinitrotoluene	UG/KG	45	7.1%		0	1	14	45 J	78 U	77 U	73 U	75 U
2-Methylnaphthalene	UG/KG	18	50.0%	36400	0	7	14	8.6 J	78 U	77 U	4.3 J	7 J
Acenaphthene	UG/KG	52	50.0%	50000	0	7	14	32 J	78 U	77 U	6.8 J	20 J
Anthracene	UG/KG	96	50.0%	50000	0	7	14	52 J	78 U	77 U	15 J	41 J
Benzo(a)anthracene	UG/KG	420	85.7%	224	2	12	14	180	78 U	4.6 J	76	140
Benzo(a)pyrene	UG/KG	370	71.4%	61	4	10	14	**150**	78 U	6.3 J	57 J	**100**
Benzo(b)fluoranthene	UG/KG	530	78.6%	1100	0	11	14	200	78 U	6.6 J	95	110
Benzo(ghi)perylene	UG/KG	380	71.4%	50000	0	10	14	98	78 U	12 J	42 J	65 J
Benzo(k)fluoranthene	UG/KG	390	71.4%	1100	0	10	14	150	78 U	5.7 J	67 J	120
Bis(2-Ethylhexyl)phthalate	UG/KG	200	85.7%	50000	0	12	14	73 U	13 J	10 J	73 U	21 J
Butylbenzylphthalate	UG/KG	24	28.6%	50000	0	4	14	73 U	78 U	77 U	73 U	6.4 J
Carbazole	UG/KG	130	50.0%		0	7	14	73 J	78 U	77 U	17 J	56 J
Chrysene	UG/KG	510	85.7%	400	1	12	14	210	78 U	5.5 J	90	160
Di-n-butylphthalate	UG/KG	50	42.9%	8100	0	6	14	73 U	78 U	77 U	73 U	19 J
Di-n-octylphthalate	UG/KG	17	35.7%	50000	0	5	14	73 U	9.9 J	9.8 J	73 U	17 J
Dibenz(a,h)anthracene	UG/KG	150	57.1%	14	6	8	14	**43** J	78 U	9.7 J	**21** J	**33** J
Dibenzofuran	UG/KG	22	42.9%	6200	0	6	14	19 J	78 U	77 U	5.1 J	13 J
Diethyl phthalate	UG/KG	18	78.6%	7100	0	11	14	73 U	5.8 J	8.9 J	73 U	6.8 J
Fluoranthene	UG/KG	820	85.7%	50000	0	12	14	520	78 U	4.8 J	180	390
Fluorene	UG/KG	43	50.0%	50000	0	7	14	32 J	78 U	77 U	8 J	22 J
Hexachlorobenzene	UG/KG	8.5	7.1%	410	0	1	14	8.5 J	78 U	77 U	73 U	75 U
Indeno(1,2,3-cd)pyrene	UG/KG	350	71.4%	3200	0	10	14	94	78 U	8.6 J	41 J	58 J
N-Nitrosodiphenylamine	UG/KG	4.8	7.1%		0	1	14	4.8 J	78 U	77 U	73 U	75 U
Naphthalene	UG/KG	14	42.9%	13000	0	6	14	11 J	78 U	77 U	73 U	12 J
Phenanthrene	UG/KG	520	78.6%	50000	0	11	14	360	78 U	77 U	96	280
Pyrene	UG/KG	820	85.7%	50000	0	12	14	380	78 U	4.7 J	170	290
Pesticides												
4,4'-DDD	UG/KG	7.4	7.1%	2900	0	1	14	3.7 U	3.9 U	3.8 U	3.7 U	3.8 U
4,4'-DDE	UG/KG	69	64.3%	2100	0	9	14	13	3.9 U	3.8 U	29	13
4,4'-DDT	UG/KG	100	57.1%	2100	0	8	14	18	3.9 U	3.8 U	35	9.8
Alpha-Chlordane	UG/KG	1	7.1%		0	1	14	1.8 U	2 U	2 U	1.8 U	1.9 U
Aroclor-1242	UG/KG	58	7.1%		0	1	14	37 U	39 U	38 U	37 UJ	38 U

Table 2-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value (a)	Number of Exceedences	Number of Detections	Number of Analyses	Value (Q(b))	Value (Q(b))	Value (Q(b))	Value (Q(b))	Value (Q(b))
	SEAD ID							SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
	Loc. ID							SB121C-1	SB121C-1	SB121C-1	SB121C-2	SB121C-2
	Matrix							SOIL	SOIL	SOIL	SOIL	SOIL
	Lab ID							EB226	EB231	EB232	EB014	EB228
	Upper Limit							0	0	2.5	0	2
	Depth (feet)							0.2	0.2	3	0.2	2.5
	Sample Date							3/9/98	3/9/98	3/9/98	3/9/98	3/9/98
	Sample Type							SA	SA	SA	DU	SA
	Program							EBS	EBS	EBS	EBS	EBS
Pesticides												
Aroclor-1254	UG/KG	79	14.3%	10000	0	2	14	37 U	39 U	38 U	37 UJ	38 U
Aroclor-1260	UG/KG	200	35.7%	10000	0	5	14	37 U	39 U	38 U	30 J	200
Delta-BHC	UG/KG	2	28.6%	300	0	4	14	1.8 U	2 U	2 U	0.95 J	1.3 J
Endrin ketone	UG/KG	3.8	7.1%		0	1	14	3.7 U	3.9 U	3.8 U	3.7 UJ	3.8 U
Gamma-Chlordane	UG/KG	1.2	7.1%	540	0	1	14	1.8 U	2 U	2 U	1.8 UJ	1.9 U
Heptachlor	UG/KG	2.1	7.1%	100	0	1	14	1.8 U	2 U	2 U	1.8 UJ	1.9 U
Heptachlor epoxide	UG/KG	2.8	21.4%	20	0	3	14	1.8 U	2 U	2 U	1.8 UJ	1.1 J
Metals												
Aluminum	MG/KG	16200	100.0%	19300	0	14	14	15100	12800	13400	14500	16200
Antimony	MG/KG	19.3	92.9%	5.9	3	13	14	**17.3** J	1.1 J	1.4 J	**19.3** J	**11.5** J
Arsenic	MG/KG	8.1	100.0%	8.2	0	14	14	6.5	5.5	4.4	6.1	8.1
Barium	MG/KG	1600	100.0%	300	4	14	14	**1420**	64.9	64.2	**1600**	**1050**
Beryllium	MG/KG	0.72	100.0%	1.1	0	14	14	0.47	0.52	0.72	0.4	0.43
Cadmium	MG/KG	21.1	50.0%	2.3	6	7	14	2.3	0.07 U	0.07 U	**2.7**	**8.1**
Calcium	MG/KG	296000	100.0%	121000	3	14	14	23400	2580	2280	31300	31600
Chromium	MG/KG	49.2	100.0%	29.6	7	14	14	**35.2**	20.9	21	**32.9**	**37**
Cobalt	MG/KG	19.7	100.0%	30	0	14	14	15.7	12.8	9.4	16.5	16
Copper	MG/KG	9750	100.0%	33	9	14	14	**9750**	19.7 J	18.7 J	**7690**	**2440** J
Iron	MG/KG	54100	100.0%	36500	5	14	14	**41500**	25700	23800	**41100**	**54100**
Lead	MG/KG	5280	100.0%	24.8	10	14	14	**5080**	11.8 J	14.1 J	**5280**	**1780**
Magnesium	MG/KG	15400	100.0%	21500	0	14	14	6810	4590	4040	6820	6480
Manganese	MG/KG	752	100.0%	1060	0	14	14	525	598	299	612	752
Mercury	MG/KG	0.15	50.0%	0.1	2	7	14	0.07	0.06 U	0.05	0.05 U	0.07
Nickel	MG/KG	224	100.0%	49	9	14	14	**58.5** J	40.5	35.8	**54.2** J	**56.6**
Potassium	MG/KG	1990	100.0%	2380	0	14	14	1990	1600	1670	1840	1220
Silver	MG/KG	21.8	28.6%	0.75	4	4	14	0.46 U	0.48 U	0.48 U	0.41 U	0.43 U
Sodium	MG/KG	606	57.1%	172	6	8	14	**392**	139 U	138 U	**606**	**214**
Thallium	MG/KG	1.4	7.1%	0.7	1	1	14	1.4 U	1.4 UJ	1.4 UJ	1.2 U	1.3 UJ
Vanadium	MG/KG	21.8	100.0%	150	0	14	14	20.9 J	20.8	21.8	19.5 J	19.3
Zinc	MG/KG	1350	100.0%	110	10	14	14	**1350**	80.3	70.5	**1280**	**691**
Total Petroleum Hydrocarbons												
TPH	MG/KG	482				12	14	23.4	16.7 U	90.4	28.3	18.5

Notes:

(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(b) See preceding flysheet for definition of Qualifier Codes (Q).

Table 2-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

	SEAD ID							SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
	Loc. ID							SB121C-3	SB121C-3	SB121C-4	SB121C-4	SB121C-4
	Matrix							SOIL	SOIL	SOIL	SOIL	SOIL
	Lab ID							EB233	EB234	EB020	EB229	EB230
	Upper Limit							0	2.5	0	0	2.5
	Depth (feet)							0.2	3	0.2	0.2	3
	Sample Date							3/9/98	3/9/98	3/9/98	3/9/98	3/9/98
	Sample Type							SA	SA	DU	SA	SA
	Program							EBS	EBS	EBS	EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value (^{a})	Number of Exceedences	Number of Detections	Number of Analyses	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)
Volatile Organic Compounds												
Acetone	UG/KG	28	42.9%	200	0	6	14	11 U	16	10 J	11 UJ	28 J
Benzene	UG/KG	2	7.1%	60	0	1	14	11 U	11 U	11 UJ	11 UJ	11 UJ
Chloroform	UG/KG	4	28.6%	300	0	4	14	11 U	11 U	11 UJ	4 J	2 J
Toluene	UG/KG	28	92.9%	1500	0	13	14	2 J	9 J	12 J	10 J	4 J
Semivolatile Organic Compounds												
2,4-Dinitrotoluene	UG/KG	45	7.1%		0	1	14	72 U	77 U	72 U	71 U	76 U
2-Methylnaphthalene	UG/KG	18	50.0%	36400	0	7	14	5.5 J	8.3 J	72 U	71 U	76 U
Acenaphthene	UG/KG	52	50.0%	50000	0	7	14	72 U	13 J	72 U	71 U	76 U
Anthracene	UG/KG	96	50.0%	50000	0	7	14	72 U	19 J	72 U	71 U	76 U
Benzo(a)anthracene	UG/KG	420	85.7%	224	2	12	14	8.2 J	68 J	3.9 J	7 J	4.6 J
Benzo(a)pyrene	UG/KG	370	71.4%	61	4	10	14	8.1 J	58 J	72 U	71 U	6 J
Benzo(b)fluoranthene	UG/KG	530	78.6%	1100	0	11	14	13 J	74 J	13 J	71 U	5.8 J
Benzo(ghi)perylene	UG/KG	380	71.4%	50000	0	10	14	11 J	54 J	72 U	71 U	6.2 J
Benzo(k)fluoranthene	UG/KG	390	71.4%	1100	0	10	14	7 J	70 J	72 U	71 U	6.7 J
Bis(2-Ethylhexyl)phthalate	UG/KG	200	85.7%	50000	0	12	14	9.2 J	39 J	9.3 J	13 J	14 J
Butylbenzylphthalate	UG/KG	24	28.6%	50000	0	4	14	72 U	77 U	72 U	71 U	76 U
Carbazole	UG/KG	130	50.0%		0	7	14	72 U	34 J	72 U	71 U	76 U
Chrysene	UG/KG	510	85.7%	400	1	12	14	11 J	82	8.8 J	12 J	7.8 J
Di-n-butylphthalate	UG/KG	50	42.9%	8100	0	6	14	72 U	5.3 J	72 U	3.7 J	76 U
Di-n-octylphthalate	UG/KG	17	35.7%	50000	0	5	14	72 U	77 U	72 U	71 U	3.9 J
Dibenz(a,h)anthracene	UG/KG	150	57.1%	14	6	8	14	72 U	**26** J	72 U	71 U	76 U
Dibenzofuran	UG/KG	22	42.9%	6200	0	6	14	72 U	8 J	72 U	71 U	76 U
Diethyl phthalate	UG/KG	18	78.6%	7100	0	11	14	8.5 J	18 J	8.1 J	10 J	4.7 J
Fluoranthene	UG/KG	820	85.7%	50000	0	12	14	13 J	160	7.4 J	10 J	9.6 J
Fluorene	UG/KG	43	50.0%	50000	0	7	14	72 U	12 J	72 U	71 U	76 U
Hexachlorobenzene	UG/KG	8.5	7.1%	410	0	1	14	72 U	77 U	72 U	71 U	76 U
Indeno(1,2,3-cd)pyrene	UG/KG	350	71.4%	3200	0	10	14	8.6 J	48 J	72 U	71 U	5.9 J
N-Nitrosodiphenylamine	UG/KG	4.8	7.1%		0	1	14	72 U	77 U	72 U	71 U	76 U
Naphthalene	UG/KG	14	42.9%	13000	0	6	14	72 U	6.9 J	72 U	71 U	76 U
Phenanthrene	UG/KG	520	78.6%	50000	0	11	14	8.8 J	110	8.8 J	7.6 J	5.9 J
Pyrene	UG/KG	820	85.7%	50000	0	12	14	13 J	130	8.3 J	14 J	8.1 J
Pesticides												
4,4'-DDD	UG/KG	7.4	7.1%	2900	0	1	14	3.6 U	3.8 U	3.6 U	3.5 U	3.8 U
4,4'-DDE	UG/KG	69	64.3%	2100	0	9	14	3.6 U	17	3.8	4.5	2.5 J
4,4'-DDT	UG/KG	100	57.1%	2100	0	8	14	3.6 U	16	1.9 J	2.3 J	3.8 U
Alpha-Chlordane	UG/KG	1	7.1%		0	1	14	1.9 U	2 U	1.8 U	1.8 U	2 U
Aroclor-1242	UG/KG	58	7.1%		0	1	14	36 U	38 U	36 U	35 U	38 U

Table 2-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

	SEAD ID							SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
	Loc. ID							SB121C-3	SB121C-3	SB121C-4	SB121C-4	SB121C-4
	Matrix							SOIL	SOIL	SOIL	SOIL	SOIL
	Lab ID							EB233	EB234	EB020	EB229	EB230
	Upper Limit							0	2.5	0	0	2.5
	Depth (feet)							0.2	3	0.2	0.2	3
	Sample Date							3/9/98	3/9/98	3/9/98	3/9/98	3/9/98
	Sample Type							SA	SA	DU	SA	SA
	Program							EBS	EBS	EBS	EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value (^{a})	Number of Exceedences	Number of Detections	Number of Analyses	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)
Pesticides												
Aroclor-1254	UG/KG	79	14.3%	10000	0	2	14	36 U	38 U	36 U	35 U	38 U
Aroclor-1260	UG/KG	200	35.7%	10000	0	5	14	36 U	21 J	36 U	35 U	38 U
Delta-BHC	UG/KG	2	28.6%	300	0	4	14	1.9 U	2 U	1.8 U	1.8 U	2 U
Endrin ketone	UG/KG	3.8	7.1%		0	1	14	3.6 U	3.8 U	3.6 U	3.5 U	3.8 U
Gamma-Chlordane	UG/KG	1.2	7.1%	540	0	1	14	1.9 U	2 U	1.8 U	1.8 U	2 U
Heptachlor	UG/KG	2.1	7.1%	100	0	1	14	1.9 U	2 U	1.8 U	1.8 U	2 U
Heptachlor epoxide	UG/KG	2.8	21.4%	20	0	3	14	1.9 U	2 U	1.8 U	1.8 U	2 U
Metals												
Aluminum	MG/KG	16200	100.0%	19300	0	14	14	1730	8880	14400	13000	15700
Antimony	MG/KG	19.3	92.9%	5.9	3	13	14	0.93 J	0.98 J	1.7 J	0.81 J	0.69 UJ
Arsenic	MG/KG	8.1	100.0%	8.2	0	14	14	3.8	4.6	5	3.7	6.4
Barium	MG/KG	1600	100.0%	300	4	14	14	18.1	46.3	86.6	69.6	72.4
Beryllium	MG/KG	0.72	100.0%	1.1	0	14	14	0.25	0.32	0.57	0.49	0.63
Cadmium	MG/KG	21.1	50.0%	2.3	6	7	14	0.07 U	0.07 U	0.07 U	0.05 U	0.06 U
Calcium	MG/KG	296000	100.0%	121000	3	14	14	**283000**	97200	17200	25500	13000
Chromium	MG/KG	49.2	100.0%	29.6	7	14	14	3.8	13.1	27.8	22.6	**30**
Cobalt	MG/KG	19.7	100.0%	30	0	14	14	3.5	7.7	17.6	12.5	19.7
Copper	MG/KG	9750	100.0%	33	9	14	14	8.8 J	20.6 J	**39.1** J	33 J	**39.1** J
Iron	MG/KG	54100	100.0%	36500	5	14	14	4230	16500	32000	25900	35600
Lead	MG/KG	5280	100.0%	24.8	10	14	14	11.7 J	**39.9** J	**27.1**	23.5 J	**26** J
Magnesium	MG/KG	15400	100.0%	21500	0	14	14	10200	8000	6980	5630	7500
Manganese	MG/KG	752	100.0%	1060	0	14	14	213	473	413	359	394
Mercury	MG/KG	0.15	50.0%	0.1	2	7	14	0.04 U	0.06 U	0.04 U	0.04 U	0.06
Nickel	MG/KG	224	100.0%	49	9	14	14	11.6	22.3	**61.8**	**49.3**	**69.7**
Potassium	MG/KG	1990	100.0%	2380	0	14	14	1150	1500	1980	1450	1870
Silver	MG/KG	21.8	28.6%	0.75	4	4	14	0.46 U	0.49 U	0.46 U	0.36 U	0.41 U
Sodium	MG/KG	606	57.1%	172	6	8	14	132 U	141 U	132 U	110	119 U
Thallium	MG/KG	1.4	7.1%	0.7	1	1	14	1.4 UJ	1.5 UJ	**1.4** J	1.1 UJ	1.2 UJ
Vanadium	MG/KG	21.8	100.0%	150	0	14	14	5.1	14.4	21	17	21.7
Zinc	MG/KG	1350	100.0%	110	10	14	14	29.8	77.6	**153**	**196**	**158**
Total Petroleum Hydrocarbons												
TPH	MG/KG	482				12	14	19	213	413	303	38.4

Notes:

(^{a}) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(^{b}) See preceding flysheet for definition of Qualifier Codes (Q).

Table 2-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

	SEAD ID							SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
	Loc. ID							SS121C-1	SS121C-2	SS121C-3	SS121C-4
	Matrix							SOIL	SOIL	SOIL	SOIL
	Lab ID							EB235	EB236	EB237	EB241
	Upper Limit							0	0	0	0
	Depth (feet)							0.2	0.2	0.2	0.2
	Sample Date							3/9/98	3/9/98	3/9/98	3/10/98
	Sample Type							SA	SA	SA	SA
	Program							EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value (^{a})**	**Number of Exceedences**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Volatile Organic Compounds											
Acetone	UG/KG	28	42.9%	200	0	6	14	10 J	11 UJ	11 U	11 U
Benzene	UG/KG	2	7.1%	60	0	1	14	11 UJ	11 UJ	11 U	11 U
Chloroform	UG/KG	4	28.6%	300	0	4	14	11 UJ	11 UJ	11 U	4 J
Toluene	UG/KG	28	92.9%	1500	0	13	14	9 J	28 J	4 J	16
Semivolatile Organic Compounds											
2,4-Dinitrotoluene	UG/KG	45	7.1%		0	1	14	72 U	69 U	180 U	170 U
2-Methylnaphthalene	UG/KG	18	50.0%	36400	0	7	14	72 U	69 U	18 J	9.9 J
Acenaphthene	UG/KG	52	50.0%	50000	0	7	14	72 U	6.5 J	50 J	52 J
Anthracene	UG/KG	96	50.0%	50000	0	7	14	72 U	6.5 J	96 J	70 J
Benzo(a)anthracene	UG/KG	420	85.7%	224	2	12	14	72 U	30 J	420	320
Benzo(a)pyrene	UG/KG	370	71.4%	61	4	10	14	72 U	28 J	370	260
Benzo(b)fluoranthene	UG/KG	530	78.6%	1100	0	11	14	72 U	40 J	530	310
Benzo(ghi)perylene	UG/KG	380	71.4%	50000	0	10	14	72 U	15 J	380	190
Benzo(k)fluoranthene	UG/KG	390	71.4%	1100	0	10	14	72 U	29 J	340	390
Bis(2-Ethylhexyl)phthalate	UG/KG	200	85.7%	50000	0	12	14	7.2 J	9.2 J	200	52 J
Butylbenzylphthalate	UG/KG	24	28.6%	50000	0	4	14	72 U	7.8 J	24 J	10 J
Carbazole	UG/KG	130	50.0%		0	7	14	72 U	14 J	130 J	100 J
Chrysene	UG/KG	510	85.7%	400	1	12	14	72 U	35 J	510	360
Di-n-butylphthalate	UG/KG	50	42.9%	8100	0	6	14	8.2 J	69 U	50 J	20 J
Di-n-octylphthalate	UG/KG	17	35.7%	50000	0	5	14	72 U	3.8 J	180 U	170 U
Dibenz(a,h)anthracene	UG/KG	150	57.1%	14	6	8	14	72 U	7.6 J	150 J	79 J
Dibenzofuran	UG/KG	22	42.9%	6200	0	6	14	72 U	69 U	22 J	22 J
Diethyl phthalate	UG/KG	18	78.6%	7100	0	11	14	11 J	9.4 J	11 J	170 U
Fluoranthene	UG/KG	820	85.7%	50000	0	12	14	72 U	65 J	820	760
Fluorene	UG/KG	43	50.0%	50000	0	7	14	72 U	5 J	41 J	43 J
Hexachlorobenzene	UG/KG	8.5	7.1%	410	0	1	14	72 U	69 U	180 U	170 U
Indeno(1,2,3-cd)pyrene	UG/KG	350	71.4%	3200	0	10	14	72 U	17 J	350	180
N-Nitrosodiphenylamine	UG/KG	4.8	7.1%		0	1	14	72 U	69 U	180 U	170 U
Naphthalene	UG/KG	14	42.9%	13000	0	6	14	72 U	4 J	14 J	12 J
Phenanthrene	UG/KG	520	78.6%	50000	0	11	14	72 U	38 J	520	440
Pyrene	UG/KG	820	85.7%	50000	0	12	14	72 U	53 J	820	580
Pesticides											
4,4'-DDD	UG/KG	7.4	7.1%	2900	0	1	14	3.6 U	3.5 U	7.4	3.5 U
4,4'-DDE	UG/KG	69	64.3%	2100	0	9	14	3.6 U	3.5 U	69 J	50
4,4'-DDT	UG/KG	100	57.1%	2100	0	8	14	3.6 U	3.5 U	100 J	37
Alpha-Chlordane	UG/KG	1	7.1%		0	1	14	1.9 U	1.8 U	1.9 U	1 J
Aroclor-1242	UG/KG	58	7.1%		0	1	14	36 U	35 U	36 U	58 J

Table 2-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

	SEAD ID							SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
	Loc. ID							SS121C-1	SS121C-2	SS121C-3	SS121C-4
	Matrix							SOIL	SOIL	SOIL	SOIL
	Lab ID							EB235	EB236	EB237	EB241
	Upper Limit							0	0	0	0
	Depth (feet)							0.2	0.2	0.2	0.2
	Sample Date							3/9/98	3/9/98	3/9/98	3/10/98
	Sample Type							SA	SA	SA	SA
	Program							EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value (^{a})**	**Number of Exceedences**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Pesticides											
Aroclor-1254	UG/KG	79	14.3%	10000	0	2	14	36 U	35 U	72	79
Aroclor-1260	UG/KG	200	35.7%	10000	0	5	14	36 U	35 U	85 J	36 J
Delta-BHC	UG/KG	2	28.6%	300	0	4	14	1.9 U	1.8 U	1.2 J	2 J
Endrin ketone	UG/KG	3.8	7.1%		0	1	14	3.6 U	3.5 U	3.8 J	3.5 U
Gamma-Chlordane	UG/KG	1.2	7.1%	540	0	1	14	1.9 U	1.8 U	1.9 U	1.2 J
Heptachlor	UG/KG	2.1	7.1%	100	0	1	14	1.9 U	1.8 U	2.1 J	1.8 U
Heptachlor epoxide	UG/KG	2.8	21.4%	20	0	3	14	1.9 U	1.8 U	2.8 J	1.4 J
Metals											
Aluminum	MG/KG	16200	100.0%	19300	0	14	14	12800	12600	7650	2700
Antimony	MG/KG	19.3	92.9%	5.9	3	13	14	2.5 J	2.2 J	3.4 J	2.9 J
Arsenic	MG/KG	8.1	100.0%	8.2	0	14	14	5.2	6.3	6.4	5.4
Barium	MG/KG	1600	100.0%	300	4	14	14	57.7	252	394	90.6
Beryllium	MG/KG	0.72	100.0%	1.1	0	14	14	0.56	0.48	0.3	0.21
Cadmium	MG/KG	21.1	50.0%	2.3	6	7	14	21.1	7.1	18.5	12.6
Calcium	MG/KG	296000	100.0%	121000	3	14	14	11800	53100	129000	296000
Chromium	MG/KG	49.2	100.0%	29.6	7	14	14	32.9	45.7	49.2	9.2
Cobalt	MG/KG	19.7	100.0%	30	0	14	14	14	15.5	11.3	9.6
Copper	MG/KG	9750	100.0%	33	9	14	14	139 J	324 J	383 J	532 J
Iron	MG/KG	54100	100.0%	36500	5	14	14	41300	43600	35000	8050
Lead	MG/KG	5280	100.0%	24.8	10	14	14	78.2 J	251	577 J	171 J
Magnesium	MG/KG	15400	100.0%	21500	0	14	14	6220	12800	8770	15400
Manganese	MG/KG	752	100.0%	1060	0	14	14	364	403	494	407
Mercury	MG/KG	0.15	50.0%	0.1	2	7	14	0.05 U	0.1	0.15	0.13
Nickel	MG/KG	224	100.0%	49	9	14	14	58.6	224	62.5	19.5
Potassium	MG/KG	1990	100.0%	2380	0	14	14	1480	1890	1600	1290
Silver	MG/KG	21.8	28.6%	0.75	4	4	14	21.8	1.3	4.7	2.1
Sodium	MG/KG	606	57.1%	172	6	8	14	223	196	255	147
Thallium	MG/KG	1.4	7.1%	0.7	1	1	14	1.4 UJ	1.3 UJ	1.4 UJ	1.3 UJ
Vanadium	MG/KG	21.8	100.0%	150	0	14	14	18.6	20.1	21.5	8.5
Zinc	MG/KG	1350	100.0%	110	10	14	14	585	431	525	250
Total Petroleum Hydrocarbons											
TPH	MG/KG	482				12	14	19.3 U	109	482	66.3

Notes:

(^{a}) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(^{b}) See preceding flysheet for definition of Qualifier Codes (Q).

Table 2-2
March 1998 Groundwater Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value Type (^{a})	Criteria Value	Number of Exceedences	Number of Detections	Number of Analysis	Value (Q^b)	Value (Q^b)	Value (Q^b)
SEAD ID									SEAD-121C	SEAD-121C	SEAD-121C
Loc. ID									MW121C-1	MW121C-1	MW121C-2
Matrix									GROUNDWATER	GROUNDWATER	GROUNDWATER
Lab ID									EB023	EB153	EB154
Screen Top									0	2.1	1.6
Screen Bottom									0	9.6	5.1
Sample Date									3/17/98	3/17/98	3/17/98
Sample Type									DU	SA	SA
Program									EBS	EBS	EBS
Volatile Organic Compounds											
1,4-Dichlorobenzene	ug/L	36	33.3%	GA	3	1	1	3	1 U	1 U	**36**
Acetone	ug/L	61	66.7%			0	2	3	52	61	1 U
Bromochloromethane	ug/L	1	33.3%	GA	5	0	1	3	1 U	1 U	1
Bromoform	ug/L	4	33.3%	MCL	80	0	1	3	1 U	1 U	4
Carbon disulfide	ug/L	2	66.7%			0	2	3	2	2	1 U
Chlorobenzene	ug/L	2	33.3%	GA	5	0	1	3	1 U	1 U	2
Vinyl chloride	ug/L	1	33.3%	GA	2	0	1	3	1 U	1 U	1
Semivolatile Organic Compounds											
Bis(2-Ethylhexyl)phthalate	ug/L	0.4	100.0%	GA	5	0	2	2		0.23 J	0.4 J
Butylbenzylphthalate	ug/L	0.12	50.0%			0	1	2		0.12 J	1.1 U
Di-n-butylphthalate	ug/L	1.7	100.0%	GA	50	0	2	2		1.7	0.79 J
Diethyl phthalate	ug/L	0.057	50.0%			0	1	2		0.057 J	1.1 U
Fluorene	ug/L	0.48	50.0%			0	1	2		1.1 U	0.48 J
Hexachlorobutadiene	ug/L	0.4	100.0%	GA	0.5	0	2	2		0.061 J	0.4 J
Phenanthrene	ug/L	0.24	50.0%			0	1	2		1.1 U	0.24 J
Pyrene	ug/L	0.13	50.0%			0	1	2		1.1 U	0.13 J
Pesticides and PCBs											
4,4'-DDD	ug/L	0.9	66.7%	GA	0.3	2	2	3	**0.9**	0.11 U	**0.81** J
4,4'-DDE	ug/L	0.3	100.0%	GA	0.2	2	3	3	**0.27** J	0.093 J	**0.3** J
4,4'-DDT	ug/L	0.56	100.0%	GA	0.2	3	3	3	**0.29** J	**0.28**	**0.56** J
Alpha-BHC	ug/L	0.059	66.7%	GA	0.01	2	2	3	0.057 U	**0.036** J	**0.059** J
Alpha-Chlordane	ug/L	0.096	66.7%			0	2	3	0.096	0.068	0.054 U
Beta-BHC	ug/L	0.56	100.0%	GA	0.04	3	3	3	**0.56** J	**0.096** J	**0.061** J
Delta-BHC	ug/L	0.23	100.0%	GA	0.04	3	3	3	**0.23** J	**0.094**	**0.16** J
Dieldrin	ug/L	0.2	66.7%	GA	0.004	2	2	3	0.11 U	**0.052** J	**0.2** J
Endosulfan I	ug/L	0.11	66.7%			0	2	3	0.11 J	0.08 J	0.054 U
Endosulfan II	ug/L	0.28	66.7%			0	2	3	0.28 J	0.11 U	0.28
Endosulfan sulfate	ug/L	0.69	100.0%			0	3	3	0.28 J	0.14 J	0.69 J
Endrin	ug/L	0.71	33.3%	GA	0	0	1	3	0.11 U	0.11 U	0.71 J
Endrin aldehyde	ug/L	0.97	100.0%	GA	5	0	3	3	0.22 J	0.073 J	0.97 J
Endrin ketone	ug/L	0.2	33.3%	GA	5	0	1	3	0.11 U	0.11 U	0.2
Gamma-BHC/Lindane	ug/L	0.038	33.3%	GA	0.05	0	1	3	0.057 U	0.057 U	0.038 J
Gamma-Chlordane	ug/L	0.47	100.0%			0	3	3	0.47	0.086 J	0.17 J
Heptachlor	ug/L	0.23	66.7%	GA	0.04	2	2	3	**0.23** J	**0.058** J	0.054 U
Heptachlor epoxide	ug/L	0.11	66.7%	GA	0.03	2	2	3	0.057 U	**0.072** J	**0.11** J
Methoxychlor	ug/L	0.62	66.7%	GA	35	0	2	3	0.57	0.57 U	0.62 J

Table 2-2
March 1998 Groundwater Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

		SEAD ID							SEAD-121C	SEAD-121C	SEAD-121C
		Loc. ID							MW121C-1	MW121C-1	MW121C-2
		Matrix							GROUNDWATER	GROUNDWATER	GROUNDWATER
		Lab ID							EB023	EB153	EB154
		Screen Top							0	2.1	1.6
		Screen Bottom							0	9.6	5.1
		Sample Date							3/17/98	3/17/98	3/17/98
		Sample Type							DU	SA	SA
		Program							EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Type (^{a})**	**Criteria Value**	**Number of Exceedences**	**Number of Detections**	**Number of Analysis**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Metals											
Aluminum	ug/L	5350	100.0%	SEC	50	3	3	3	**133**	**738** J	**5350** J
Arsenic	ug/L	3.8	33.3%	MCL	10	0	1	3	3.7 U	3.8	3.7 U
Barium	ug/L	106	100.0%	GA	1000	0	3	3	39.5	38	106
Beryllium	ug/L	0.1	33.3%	MCL	4	0	1	3	0.1 U	0.1 U	0.1
Cadmium	ug/L	0.39	33.3%	GA	5	0	1	3	0.39	0.3 U	0.3 U
Calcium	ug/L	172000	100.0%			0	3	3	172000 J	163000	162000 J
Chromium	ug/L	6.5	100.0%	GA	50	0	3	3	1.2	2.4	6.5
Cobalt	ug/L	3.6	66.7%			0	2	3	1.4 U	1.6	3.6
Copper	ug/L	5.2	66.7%	GA	200	0	2	3	1.2 U	2	5.2
Iron	ug/L	5620	100.0%	GA	300	3	3	3	**346**	**1430**	**5620**
Magnesium	ug/L	24100	100.0%			0	3	3	23800	24100	23200
Manganese	ug/L	1590	100.0%	SEC	50	3	3	3	**1590**	**1140**	**1100**
Nickel	ug/L	10.6	100.0%	GA	100	0	3	3	2.8	4.2	10.6
Potassium	ug/L	21400	100.0%			0	3	3	7610	10900	21400
Selenium	ug/L	5.6	100.0%	GA	10	0	3	3	3.7 J	5.6 J	4.3
Sodium	ug/L	95200	100.0%	GA	20000	1	3	3	8920	11200	**95200**
Vanadium	ug/L	6.5	66.7%			0	2	3	1.5 U	2.4	6.5 J
Zinc	ug/L	16.4	100.0%	SEC	5000	0	3	3	2.4	9.3	16.4

Notes:

NA = Not Available

(a) GA = NYSDEC Ambient Water Quality Standards for a source of Drinking Water from Groundwater (TOGS 1.1.1)

MCL = Maximum Contaminant Level - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)

SEC = Secondary Drinking Water Regulations - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)

Table 2-3
March 1998 Soil Sample Results, SEAD 121I Rumored Cosmoline Oil Disposal Area
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value (a)	Number of Exceedences	Number of Detections	Number of Analysis	Value (Q[b])	Value (Q)	Value (Q)	Value (Q)
	SEAD ID							SEAD-121I	SEAD-121I	SEAD-121I	SEAD-121I
	Loc. ID							SS121I-1	SS121I-2	SS121I-3	SS121I-4
	Matrix							SOIL	SOIL	SOIL	SOIL
	Lab ID							EB147	EB150	EB149	EB148
	Upper Limit							0	0	0	0
	Depth (feet)							0.2	0.2	0.2	0.2
	Sample Date							3/10/98	3/10/98	3/10/98	3/10/98
	Sample Type							SA	SA	SA	SA
	Program							EBS	EBS	EBS	EBS
Semi-Vloatile Organics											
2-Methylnaphthalene	UG/KG	54	25.0%	36400	0	1	4	470 U	7400 UJ	54 J	550 U
Acenaphthene	UG/KG	1900	100.0%	50000	0	4	4	170 J	1900 J	140 J	320 J
Anthracene	UG/KG	2600	100.0%	50000	0	4	4	170 J	2600 J	220 J	230 J
Benzo(a)anthracene	UG/KG	13000	100.0%	224	4	4	4	1400	13000 J	1600	1700
Benzo(a)pyrene	UG/KG	13000	100.0%	61	4	4	4	1300	13000 J	1800	1600
Benzo(b)fluoranthene	UG/KG	12000	100.0%	1100	4	4	4	1500	12000 J	2100	1700
Benzo(ghi)perylene	UG/KG	8100	100.0%	50000	0	4	4	820	8100 J	1600	940
Benzo(k)fluoranthene	UG/KG	15000	100.0%	1100	4	4	4	1500	15000 J	2500	1800
Bis(2-Ethylhexyl)phthalate	UG/KG	230	75.0%	50000	0	3	4	51 J	7400 UJ	230 J	47 J
Carbazole	UG/KG	3100	100.0%		0	4	4	230 J	3100 J	320 J	380 J
Chrysene	UG/KG	16000	100.0%	400	4	4	4	1700	16000 J	2000	1900
Di-n-butylphthalate	UG/KG	45	25.0%	8100	0	1	4	45 J	7400 UJ	770 U	550 U
Dibenz(a,h)anthracene	UG/KG	4600	100.0%	14	4	4	4	350 J	4600 J	720 J	420 J
Dibenzofuran	UG/KG	440	100.0%	6200	0	4	4	29 J	440 J	42 J	63 J
Fluoranthene	UG/KG	35000	100.0%	50000	0	4	4	3200	35000 J	4000	4100
Fluorene	UG/KG	1100	100.0%	50000	0	4	4	83 J	1100 J	98 J	160 J
Indeno(1,2,3-cd)pyrene	UG/KG	8000	100.0%	3200	1	4	4	760	8000 J	1600	950
Naphthalene	UG/KG	51	25.0%	13000	0	1	4	470 U	7400 UJ	770 U	51 J
Phenanthrene	UG/KG	15000	100.0%	50000	0	4	4	1200	15000 J	1400	1800
Pyrene	UG/KG	23000	100.0%	50000	0	4	4	2700	23000	3000	3200
Total PetroleumHydrocarbon											
TPH	MG/KG	452				3	4	43.9	108	452	20.3 U

Notes:

(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(b) See preceding flysheet for definition of Qualifier Codes (Q)

Table 2-4
March 1998, Debris Sample Results, SEAD 121I Rumored Cosmoline Oil Disposal Area
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121I	SEAD-121I
								SS121I-1	SS121I-2
								SEDIMENT	SEDIMENT
								EB151	EB152
								0	0
								0.2	0.2
								3/10/98	3/10/98
								SA	SA
								EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value ([a])	Number of Exceedances	Number of Detections	Number of Analysis	Value (Q[b])	Value (Q[b])
Semivolatile Organic Compounds									
2-Methylnaphthalene	UG/KG	33	50.0%	36400	0	1	2	33 J	4400 U
Acenaphthene	UG/KG	390	100.0%	50000	0	2	2	140 J	390 J
Acenaphthylene	UG/KG	420	50.0%	41000	0	1	2	480 U	420 J
Anthracene	UG/KG	1800	100.0%	50000	0	2	2	260 J	1800 J
Benzo(a)anthracene	UG/KG	14000	100.0%	224	2	2	2	**1300**	**14000**
Benzo(a)pyrene	UG/KG	16000	100.0%	61	2	2	2	**1300**	**16000**
Benzo(b)fluoranthene	UG/KG	22000	100.0%	1100	2	2	2	**2100**	**22000**
Benzo(ghi)perylene	UG/KG	12000	100.0%	50000	0	2	2	840	12000
Benzo(k)fluoranthene	UG/KG	23000	100.0%	1100	2	2	2	**1600**	**23000**
Bis(2-Ethylhexyl)phthalate	UG/KG	25	50.0%	50000	0	1	2	25 J	4400 U
Carbazole	UG/KG	1600	100.0%		0	2	2	410 J	1600 J
Chrysene	UG/KG	25000	100.0%	400	2	2	2	**1700**	**25000**
Dibenz(a,h)anthracene	UG/KG	5000	100.0%	14	2	2	2	**400** J	**5000** J
Dibenzofuran	UG/KG	58	50.0%	6200	0	1	2	58 J	4400 U
Fluoranthene	UG/KG	24000	100.0%	50000	0	2	2	3400	24000
Fluorene	UG/KG	360	100.0%	50000	0	2	2	130 J	360 J
Indeno(1,2,3-cd)pyrene	UG/KG	12000	100.0%	3200	1	2	2	850 J	**12000** J
Phenanthrene	UG/KG	4400	100.0%	50000	0	2	2	1600	4400 J
Pyrene	UG/KG	17000	100.0%	50000	0	2	2	2700	17000
Other Analyses									
TPH	MG/KG	370	100.0%		0	2	2	136	370

Notes:

([a]) New York State Department of Environmental Conservation, Technical and Administrative Guidance Memeorandum # 4046.

([b]) See preceding flysheet for definition of Qualifier Codes (Q).

TABLE 2-5
SUMMARY OF FATE AND TRANSPORT PARAMETERS FOR SELECTED ORGANIC COMPOUNDS OF CONCERN

WORK PLAN, REMEDIAL INVESTIGATION AT EBS SITES IN PID AREA
SENECA ARMY DEPOT ACTIVITY, ROMULUS NEW YORK

COMPOUND	SOLUBILITY (mg/l)	VAPOR PRESSURE (mmHg)	HENRY'S LAW CONSTANT (atm-m³/mol)	Koc (ml/g)	Kow	HALF - LIFE (days)	BCF
Volatile Organic Compounds							
Methylene Chloride	20000	438	2.03E-03	8.80E+00	2.00E+01	1-3	0.8
Acetone	infinite	288	2.06E-05	2.80E-01	5.75E-01		0.03
1,1,1-Trichloroethane	1500	123	1.44E-02	1.52E+02	3.16E+02	300	5.6-15
1,1,-Dichloroethane	5500	182	4.31E-03	3.00E+01	6.17E+01		2.9
1,1,2,2-Tetrachloroethane	2900	5	3.81E-04	1.18E+02	2.45E+02		
1,2-Dichloroethene (total)	6300	5.3	6.60E-03	5.90E+01	1.23E+02		4.5
2-Hexanone	14000	11.6	2.82E-05				6
4-Methyl-2-Pentanone	17000	20	1.55E-04				
Benzene	1750	95.2	5.59E-03	8.30E+01	1.32E+02	110	6.5
Carbon Disulfide	2940	366	1.32E-02	5.40E+01	1.00E+02		7.9
Chloroform	8200	208	2.87E-03	4.70E+01	9.33E+01		4.5-6
Chloromethane	6500	4310	4.40E-02	3.50E+01	9.50E-01		
Ethylbenzene	152	7	6.43E-03	1.10E+03	1.41E+03	37	68-95
2-Butanone	353000	70.6	4.35E-05	9.40E-01	1.95E+00		0.09-1.86
1,2-Dichloroethane	8520	80	9.78E-04	1.40E+01	3.02E+01	2-18	1.4-2
MTBE	43000						
Trichloroethene	1100	75	9.10E-03	1.26E+02	2.40E+02	3-300	13-39
Vinyl chloride	2670	2300	8.19E-02	5.70E+01	2.40E+01		
Stryene	300	4.5	2.05E-03				
1,1-Dichloroethene	2250	500	3.40E-02	6.50E+01	5.30E+01		
Tetrachloroethene	150	19	2.59E-02	3.64E+02	3.98E+02	1-13	49-66
Toluene	535	30	6.37E-03	3.00E+02	5.37E+02	3-39	2.6-27.1
Chlorobenzene	490	8.8	3.46E-03	3.33E+02	6.92E+02		10-33
Xylene (total)	0.3	9	6.91E-03	6.91E+02	1.45E+03		70
Semivolatile Organic Compounds							
Phenol	93000	0.341	4.54E-07	1.42E+01	2.88E+01	3-5	1.4-2
1,4-dichlorobenzene	79	1.18	2.89E-03	1.70E+03	3.98E+03		60-117
2-Methylphenol	25000	0.24	1.50E-06	2.74E+02	8.91E+01	1-3	
4-Methylphenol		0.11	4.43E-07	2.67E+02	8.51E+01	1-3	
2,4-Dimethylphenol	4200	0.0573	2.38E-06	2.22E+02	2.63E+02	1-3	9.5-150
Benzoic Acid	2700			2.48E+02	7.41E+01		
Naphthalene	31.7	0.23	1.15E-03	1.30E+03	2.76E+03	1-110	44-95
2-Methylnaphthalene	25.4	0.0083	5.80E-05	8.50E+03	1.30E+04	1-3	
2-Chloronaphthalene	6.74	0.017	4.27E-04	4.16E+03	1.32E+04		
2,6-Dinitrotoluene	1320	0.018	3.27E-06	9.20E+01	1.00E+02	4	4.6
4-Chloroaniline	3900	0.025	1.07E-05				
Acenaphthylene	3.93	0.029	1.48E-03	2.50E+03	5.01E+03		
Acenaphthene	3.42	0.00155	9.20E-05	4.60E+03	1.00E+04		
Dibenzofuran				4.16E+03	1.32E+04		
2,4-Dinitrotoluene	240	0.0051	5.09E-06	4.50E+01	1.00E+02	5	
Diethylphthalate	896	0.0035	1.14E-06	1.42E+02	3.16E+02	1-3	14-117
Carbazole							
Fluorene	1.69	0.00071	6.42E-05	7.30E+03	1.58E+04	32-60	
N-Nitrosodiphenylamine	113		1.40E-06	6.50E+02	1.35E+03	4	65-217
N-Nitroso-di-n-propylamine							
Hexachlorobenzene	0.006	0.000019	6.81E-04	3.90E+03	1.70E+05		
Pentachlorophenol	14	0.00011	2.75E-06	5.30E+04	1.00E+05		13-6300
Phenanthrene	1	0.00021	1.59E-04	1.40E+04	2.88E+04	1-200	
Anthracene	0.045	0.000195	1.02E-03	1.40E+04	2.82E+04	200-460	
Di-n-butylphthalate	13	0.00001	2.82E-07	1.70E+05	3.98E+05	1-3	89-1800
Fluoranthene	0.206	0.0177	6.46E-06	3.80E+04	7.94E+04	140-440	

TABLE 2-5
SUMMARY OF FATE AND TRANSPORT PARAMETERS FOR SELECTED ORGANIC COMPOUNDS OF CONCERN

WORK PLAN, REMEDIAL INVESTIGATION AT EBS SITES IN PID AREA
SENECA ARMY DEPOT ACTIVITY, ROMULUS NEW YORK

COMPOUND	SOLUBILITY (mg/l)	VAPOR PRESSURE (mmHg)	HENRY'S LAW CONSTANT (atm-m³/mol)	Koc (ml/g)	Kow	HALF - LIFE (days)	BCF
Semivolatile Organic Compounds							
Pyrene	0.132	2.50E-06	5.04E-06	3.80E+04	7.59E+04	9-1900	
Butylbenzylphthalate	2.9	8.60E-06	1.20E-06	2.84E+04	5.89E+04		663
Benzo(a)anthracene	0.0057	1.50E-07	1.16E-06	1.38E+06	3.98E+05	240-680	
Chrysene	0.0018	6.30E-09	1.05E-06	2.00E+05	4.07E+05	160-1900	
Bis(2-Ethylhexyl)phthalate	0.285	2.00E-07	3.61E-07	5.90E+03	9.50E+03	Neg. Deg.	
Di-ni-octylphthalate	3			2.40E+06	1.58E+09		
Benzo(b)fluoranthene	0.014	5.00E-07	1.19E-05	5.50E+05	1.15E+06	360-610	
Benzo(k)fluoranthene	0.0043	5.10E-07	3.94E-05	5.50E+05	1.15E+06	910-1400	
Benzo(a)pyrene	0.0012	0.000568	1.55E-06	5.50E+06	1.15E+06	220-530	
Indeno(1,2,3-cd)pyrene	0.00053	1.00E-10	6.86E-08	1.60E+06	3.16E+06	600-730	
Dibenz(a,h)anthracene	0.0005	5.20E-11	7.33E-08	3.30E+06	6.31E+06	750-940	
Benzo(g,h,i)perylene	0.0007	1.03E-10	5.34E-08	1.60E+06	3.24E+06	590-650	
Pesticides/PCBs							
alpha-BHC							
beta-BHC	0.24	2.80E-07	4.47E-07	3.80E+03	7.94E+03	Neg. Deg.	
delta-BHC	31.4	1.70E-05	2.07E-07	6.60E+03	1.26E+04	Neg. Deg.	
gamma-BHC (Lindane)	7.8	0.00016	7.85E-06	1.08E+03	7.94E+03	Neg. Deg.	250
gamma-Chlordane							
Heptachlor	0.18	0.0003	8.19E-04	1.20E-04	2.51E+04	Neg. Deg.	3600-37000
Aldrin	0.18	6.00E-06	1.60E-05	9.60E+04	2.00E+05	Neg. Deg.	3890-12260
Endosulfan I	0.16	0.00001	3.35E-05	2.03E+03	3.55E+03		
Heptachlor epoxide	0.35	0.0003	4.39E-04	2.20E+02	5.01E+02	Neg. Deg.	851-66000
Dieldrin	0.195	1.78E-07	4.58E-07	1.70E+03	3.16E+03	Neg. Deg.	3-10000
4,4'-DDE	0.04	6.50E-06	6.80E-05	4.40E+06	1.00E+07	Neg. Deg.	110000
Endrin	0.024	2.00E-07	4.17E-06	1.91E+04	2.18E+05	Neg. Deg.	1335-49000
Endosulfan II	0.07	0.00001	7.65E-05	2.22E+03	4.17E+03		
4,4'-DDD	0.16	2.00E-09	3.10E-05	2.40E+05	3.60E+05	Neg. Deg.	
Endosulfan sulfate	0.16			2.33E+03	4.57E+03		
4,4'-DDT	0.005	5.50E-06	5.13E-04	2.43E+05	1.55E+06	Neg. Deg.	38642-110000
Endrin aldehyde							
Endrin ketone							
alpha-Chlordane	0.56	0.00001	9.63E-06	1.40E+05	2.09E+03	Neg. Deg.	400-38000
Aroclor-1242	0.24	0.00041	5.60E-04		1.29E+04		
Aroclor-1248	0.054	0.00049	3.50E-03		5.62E+05	Neg. Deg.	
Aroclor-1254	0.012	0.00008	2.70E-03	4.25E+04	1.07E+06	42	10E4-10E6
Aroclor-1260	0.0027	0.000041	7.10E-03	1.30E+06	1.38E+07	Neg. Deg.	10E4-10E6
Herbicides							
2,4-D	620	0.04	1.88E-04	1.96E+01	6.46E+02	208	31
2,4-DB							
Dalapon	502000	0.12	6.43E-08		5.70E+00		
Dicamba	4500	2.0E-05	1.30E-09	2.20E+00	3.00E+00		
Dichloroprop							
MCPA							
MCPP							
2,4,5-T	278	7.5E-07	8.68E-09	6.50E+02			65
2,4,5-TP (Silvex)	238	5.2E-06	1.31E-08	8.01E+01	4.00E+00		170

TABLE 2-5
SUMMARY OF FATE AND TRANSPORT PARAMETERS FOR SELECTED ORGANIC COMPOUNDS OF CONCERN

WORK PLAN, REMEDIAL INVESTIGATION AT EBS SITES IN PID AREA
SENECA ARMY DEPOT ACTIVITY, ROMULUS NEW YORK

COMPOUND	SOLUBILITY (mg/l)	VAPOR PRESSURE (mmHg)	HENRY'S LAW CONSTANT (atm-m³/mol)	Koc (ml/g)	Kow	HALF - LIFE (days)	BCF
Explosives							
HMX	66	3.90E-09		5.08E+02	1.30E-01		
RDX	50	4.10E-09	2.00E-05	5.38E+02	7.80E-01		
1,3,5-Trinitrobenzene	35	2.20E-04	1.30E+00	5.20E+02			
1,3-Dinitrobenzene	470			1.50E+02	4.17E+01		
Tetryl							
2,4,6-Trinitrotoluene	130	0.0001	1.37E-06	5.34E+02	1.90E+00		
4-amino-2,6-Dinitrotoluene							
2-amino-4,6-Dinitrotoluene							
2,6-Dinitrotoluene	182	0.018	3.27E-06	2.49E+02	1.00E+02	4	4.6
2,4-Dinitrotoluene	270	0.0051	5.09E-06	2.01E+02	1.00E+02	5	

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).

Notes:
Koc = organic carbon partition coefficient
Kow = octanol-water partition coefficient
BCF = bioconcentration factor
Neg. Deg. = Negligible Biodegradation

TABLE 2-6
RELATIVE RELATIONSHIPS BETWEEN K_{oc} AND MOBILITY

RI WORK PLAN FOR EBS SITES AT PID AREA
SENECA ARMY DEPOT ACTIVITY, ROMULUS, NY

K_{oc}	Mobility Class
>2000	I - Immobile
500-2000	II - Low Mobility
150-500	III - Intermediate Mobility
50-150	IV - Mobile
<50	V - Very Mobile

K_{oc} - Organic carbon partition coefficient

Source: The Soil Chemistry of Hazardous Materials; James Dragun, Ph.D; The Hazardous Materials Control Research Institute; 1988.

TABLE 2-7
SUMMARY OF FUGACITY CALCULATIONS FOR ASH LANDFILL

RI WORKPLAN FOR EBS SITES IN PID AREA
SENECA ARMY DEPOT ACTIVITY - ROMULUS NY

VADOSE ZONE - WET SEASON

1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**	**Vinyl chloride**
	Assumptions:			
2)	% soil	62.7%	62.7%	62.7%
3)	% water	23.3%	23.3%	23.3%
4)	%air	14.0%	14.0%	14.0%
5)	oc=% organic carbon in soil	0.10	0.10	0.10
6)	bulk density (g/m³)	1.80E+06	1.80E+06	1.80E+06
7)	Koc	126	59	57
8)	Henry's Law Constant	9.10E-03	6.56E-03	8.19E-02
9)	Temperature (°K)	293	293	293
	Calculations:			
	Z(soil)	24.92	16.19	1.25
	Z(water)	109.89	152.44	12.21
	Z(air)	41.62	41.62	41.62
	Estimated % of Total Mass Of Chemical in Each Compartment			
	Results:			
	F(soil)	33.2%	19.7%	8.3%
	F(water)	54.4%	69.0%	30.1%
	F(air)	12.4%	11.3%	61.6%

TABLE 2-7
SUMMARY OF FUGACITY CALCULATIONS FOR ASH LANDFILL

RI WORKPLAN FOR EBS SITES IN PID AREA
SENECA ARMY DEPOT ACTIVITY - ROMULUS NY

SATURATED WET SOIL - WET SEASON

		Trichloroethene	trans-1,2-dichloroethene	Vinyl chloride
1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**	**Vinyl chloride**
	Assumptions:			
2)	% soil	62.7%	62.7%	62.7%
3)	% water	37.3%	37.3%	37.3%
5)	oc=% organic carbon in soil	0.10	0.10	0.10
6)	bulk density (g/m³)	1.80E+06	1.80E+06	1.80E+06
7)	Koc	126	59	57
8)	Henry's Law Constant	9.10E-03	6.56E-03	8.19E-02
9)	Temperature (°K)	293	293	293
	Calculations:			
	Z(soil)	24.92	16.19	1.25
	Z(water)	109.89	152.44	12.21
	Estimated % of Total Mass Of Chemical in Each Compartment			
	Results:			
	F(soil)	27.6%	15.1%	14.7%
	F(water)	72.4%	84.9%	85.3%

TABLE 2-7
SUMMARY OF FUGACITY CALCULATIONS FOR ASH LANDFILL

RI WORKPLAN FOR EBS SITES IN PID AREA
SENECA ARMY DEPOT ACTIVITY - ROMULUS NY

VADOSE ZONE - DRY SEASON

1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**	**Vinyl chloride**
	Assumptions:			
2)	% soil	62.7%	62.7%	62.7%
3)	% water	9.4%	9.4%	9.4%
4)	%air	27.9%	27.9%	27.9%
5)	oc=% organic carbon in soil	0.10	0.10	0.10
6)	bulk density (g/m³)	1.80E+06	1.80E+06	1.80E+06
7)	Koc	126	59	57
8)	Henry's Law Constant	9.10E-03	6.56E-03	8.19E-02
9)	Temperature (°K)	293	293	293
	Calculations:			
	Z(soil)	24.92	16.19	1.25
	Z(water)	109.89	152.44	12.21
	Z(air)	41.62	41.62	41.62
	Estimated % of Total Mass Of Chemical in Each Compartment			
	Results:			
	F(soil)	41.6%	28.1%	5.8%
	F(water)	27.5%	39.7%	8.5%
	F(air)	30.9%	32.2%	85.7%

TABLE 2-7
SUMMARY OF FUGACITY CALCULATIONS FOR ASH LANDFILL

RI WORKPLAN FOR EBS SITES IN PID AREA
SENECA ARMY DEPOT ACTIVITY - ROMULUS NY

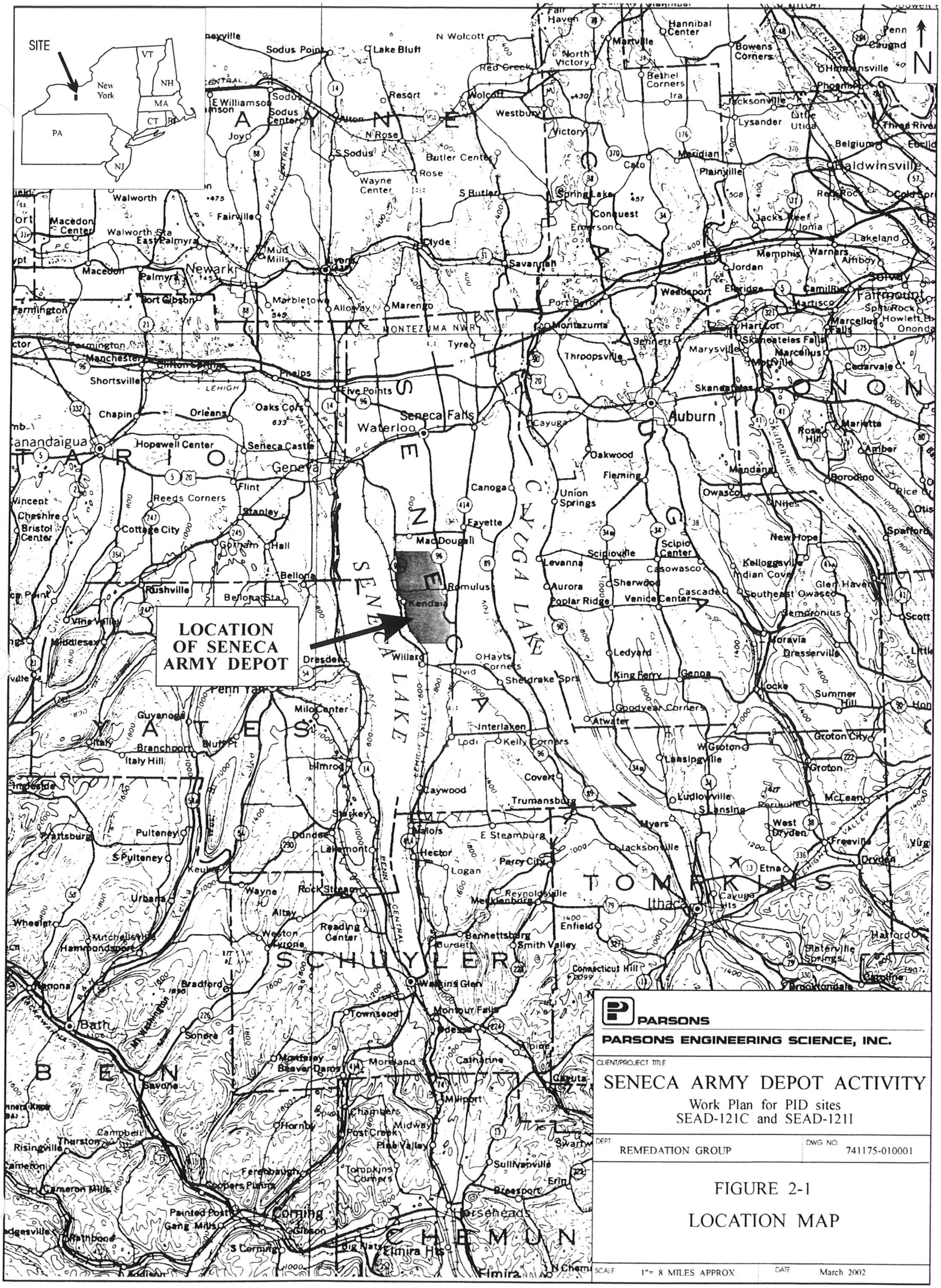
SATURATED DEEP SOIL - DRY SEASON

1)	Chemical Name	**Trichloroethene**	**trans-1,2-dichloroethene**	**Vinyl chloride**
	Assumptions:			
2)	% soil	62.7%	62.7%	62.7%
3)	% water	37.3%	37.3%	37.3%
5)	oc=% organic carbon in soil	0.10	0.10	0.10
6)	bulk density (g/m^3)	1.80E+06	1.80E+06	1.80E+06
7)	Koc	126	59	57
8)	Henry's Law Constant	9.10E-03	6.56E-03	8.19E-02
9)	Temperature (°K)	293	293	293
	Calculations:			
	Z(soil)	24.92	16.19	1.25
	Z(water)	109.89	152.44	12.21
	Estimated % of Total Mass Of Chemical in Each Compartment			
	Results:			
	F(soil)	27.6%	15.1%	14.7%
	F(water)	72.4%	84.9%	85.3%

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).



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PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

Work Plan for PID sites
SEAD-121C and SEAD-121I

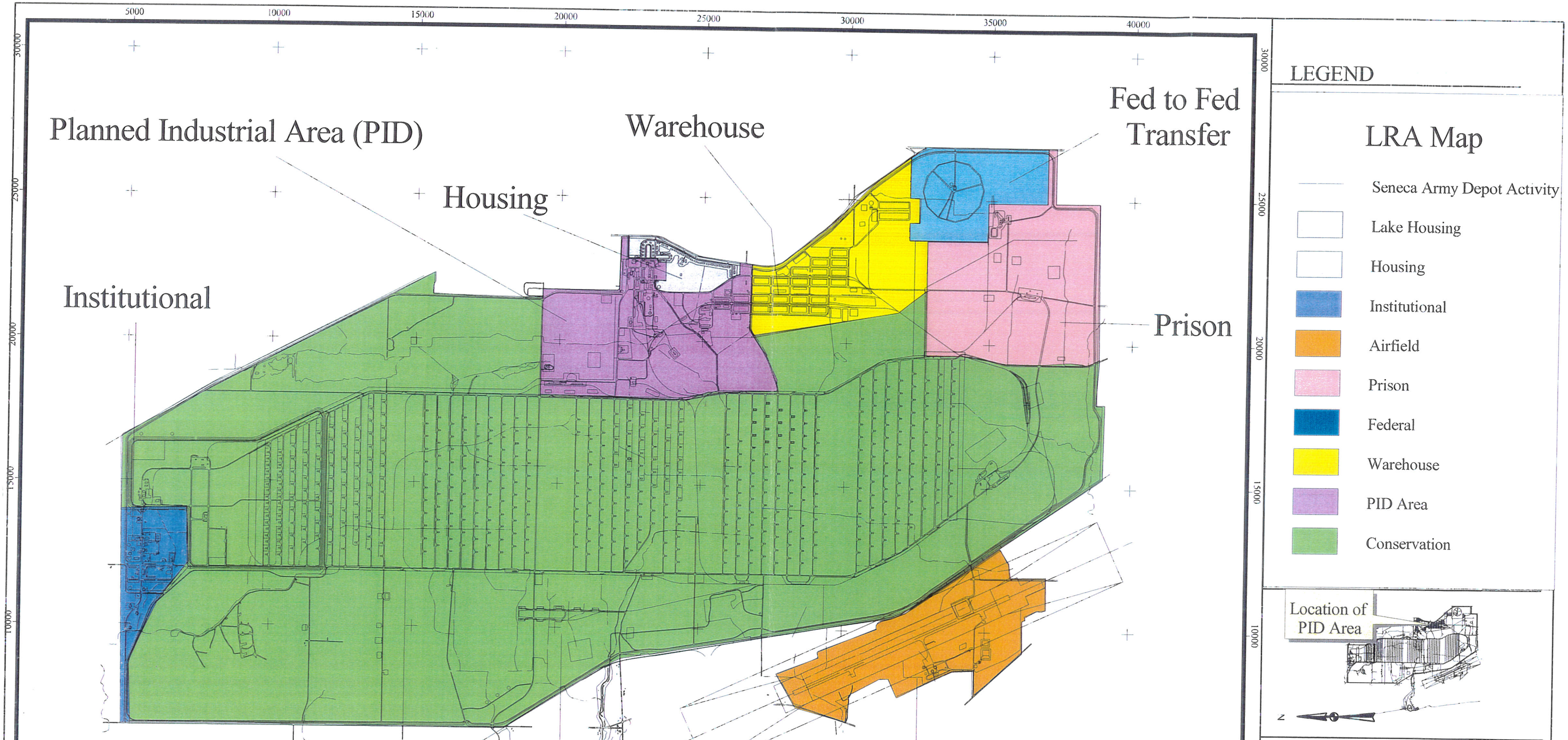
DEPT.	DWG NO.
REMEDATION GROUP	741175-010001

FIGURE 2-1

LOCATION MAP

SCALE	DATE
1"= 8 MILES APPROX.	March 2002

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



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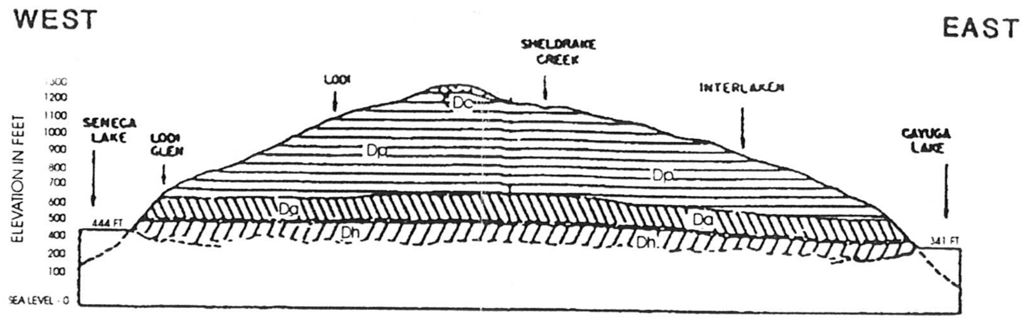
PARSONS ENGINEERING SCIENCE, INC.

SENECA ARMY DEPOT ACTIVITY
RI\FS Workplan for EBS Sites
at the Planned Industrial Development Area

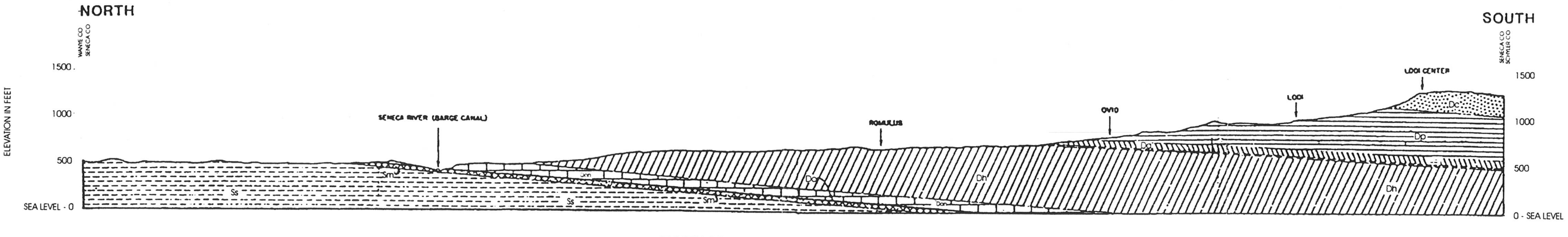
FIGURE 2-2
LAND REUSE AUTHORITY MAP

JOB NUMBER: 741175-01000 DATE: MARCH 2002

o:\seneca\pidai mp\B&Wsead68.apr



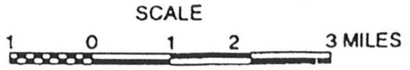
EAST-WEST SECTION ALONG A- A'



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

LEGEND

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



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

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PARSONS ENGINEERING SCIENCE, INC.

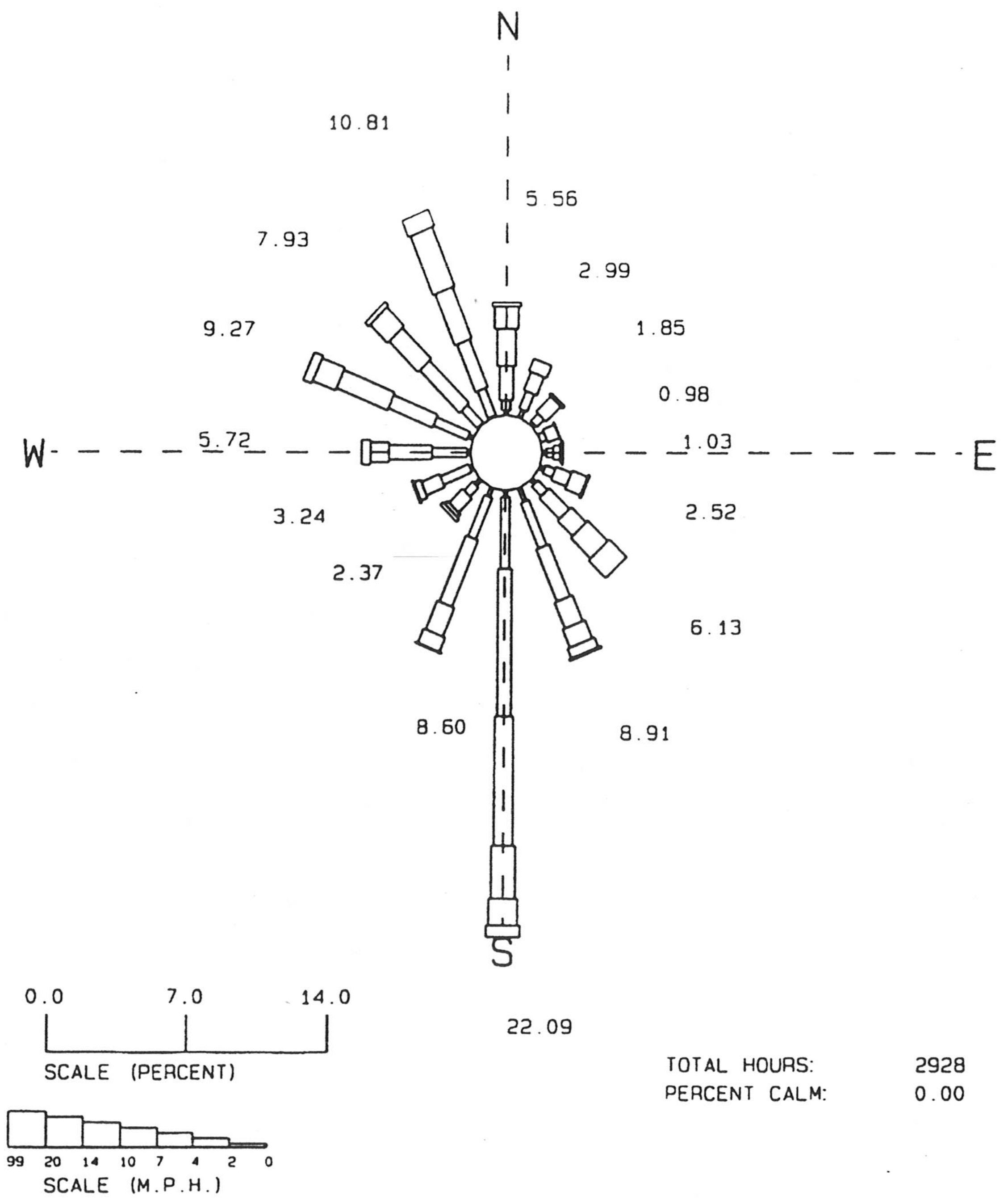
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS Work Plan for
EBS Sites in PID Area

DEPT
ENVIRONMENTAL ENGINEERING
DWG NO
736676-01001

FIGURE 2-3

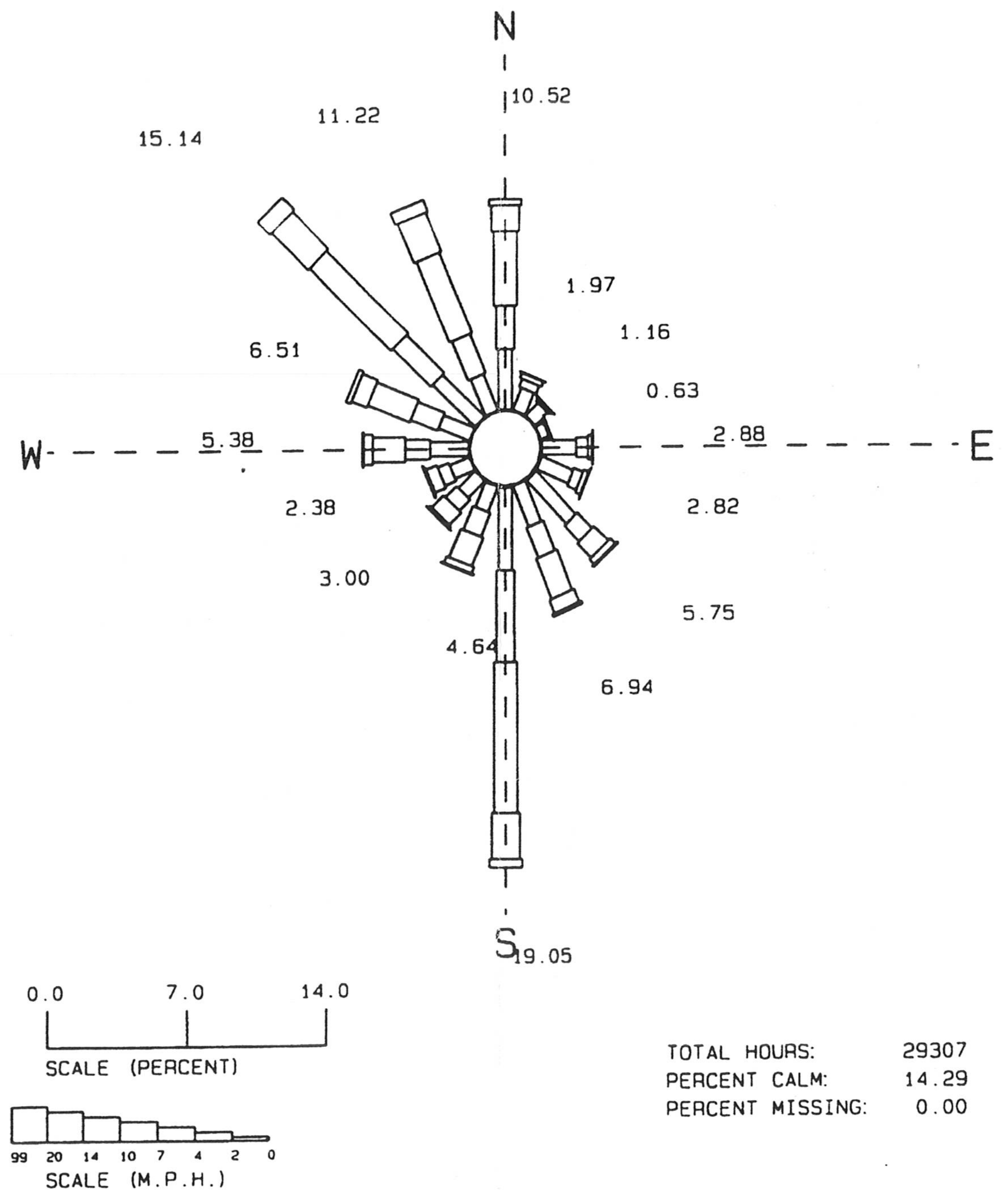
REGIONAL GEOLOGIC
Cross Sections

SCALE
AS NOTED
DATE
MARCH 2002



TOTAL HOURS: 2928
PERCENT CALM: 0.00

SENECA ARMY DEPOT
SENECA 10-M MET. TOWER
SEASONAL WIND ROSE
10 METER LEVEL APRIL 24 - JULY 14 1995



TOTAL HOURS: 29307
PERCENT CALM: 14.29
PERCENT MISSING: 0.00

SENECA ARMY DEPOT
ITHACA AIRPORT
ANNUAL WIND ROSE
20 FOOT LEVEL FOR: 1989-1993

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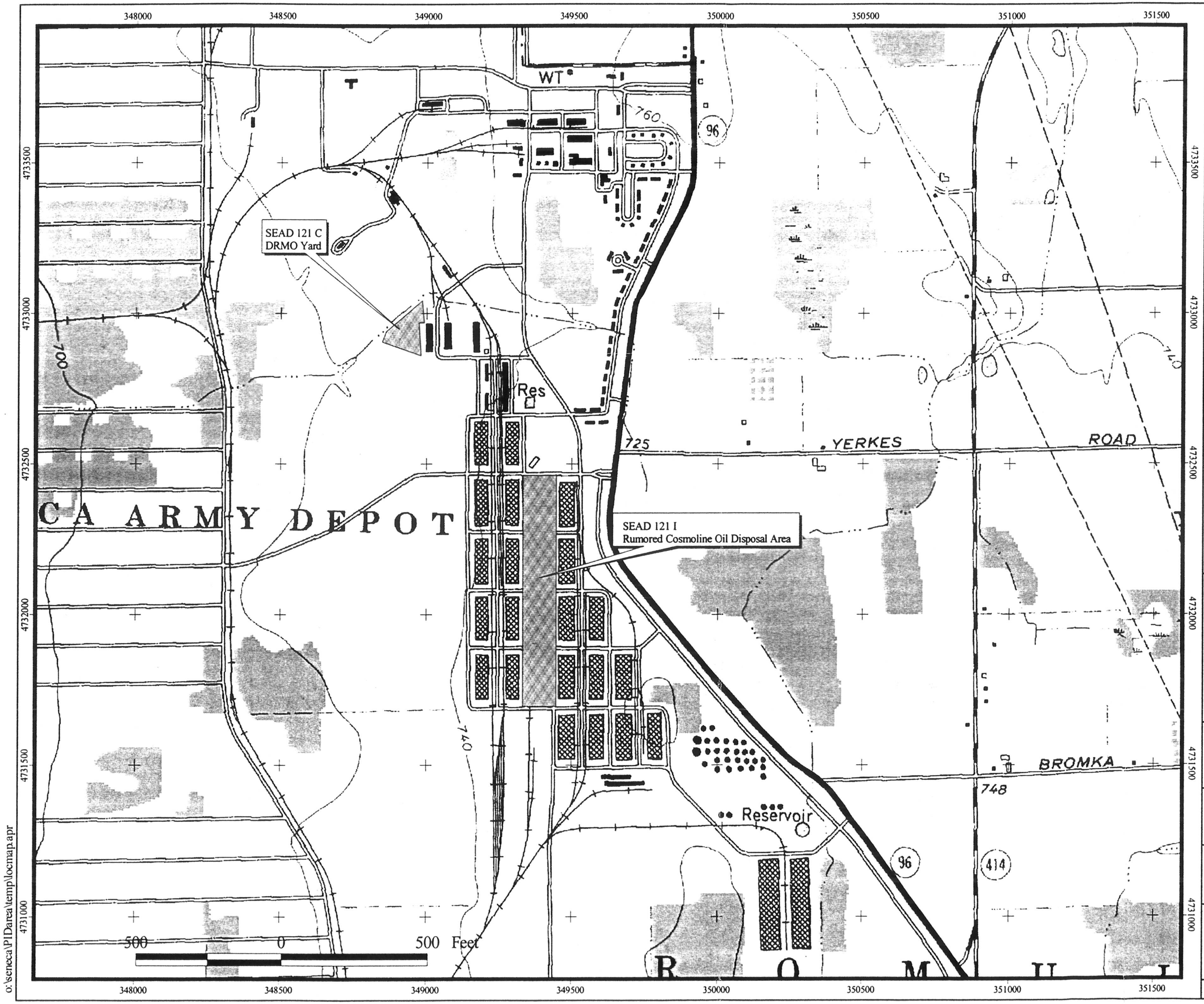
CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
RI/FS Work Plan for
EBS Sites in PID Area

DEPT ENVIRONMENTAL ENGINEERING
DWG NO.

FIGURE 2-4
WIND ROSES

SCALE NA
DATE MARCH 2002

R:\PROJECT-GRAPHICS\SENECA\PID AREA\2WROSES.CDR



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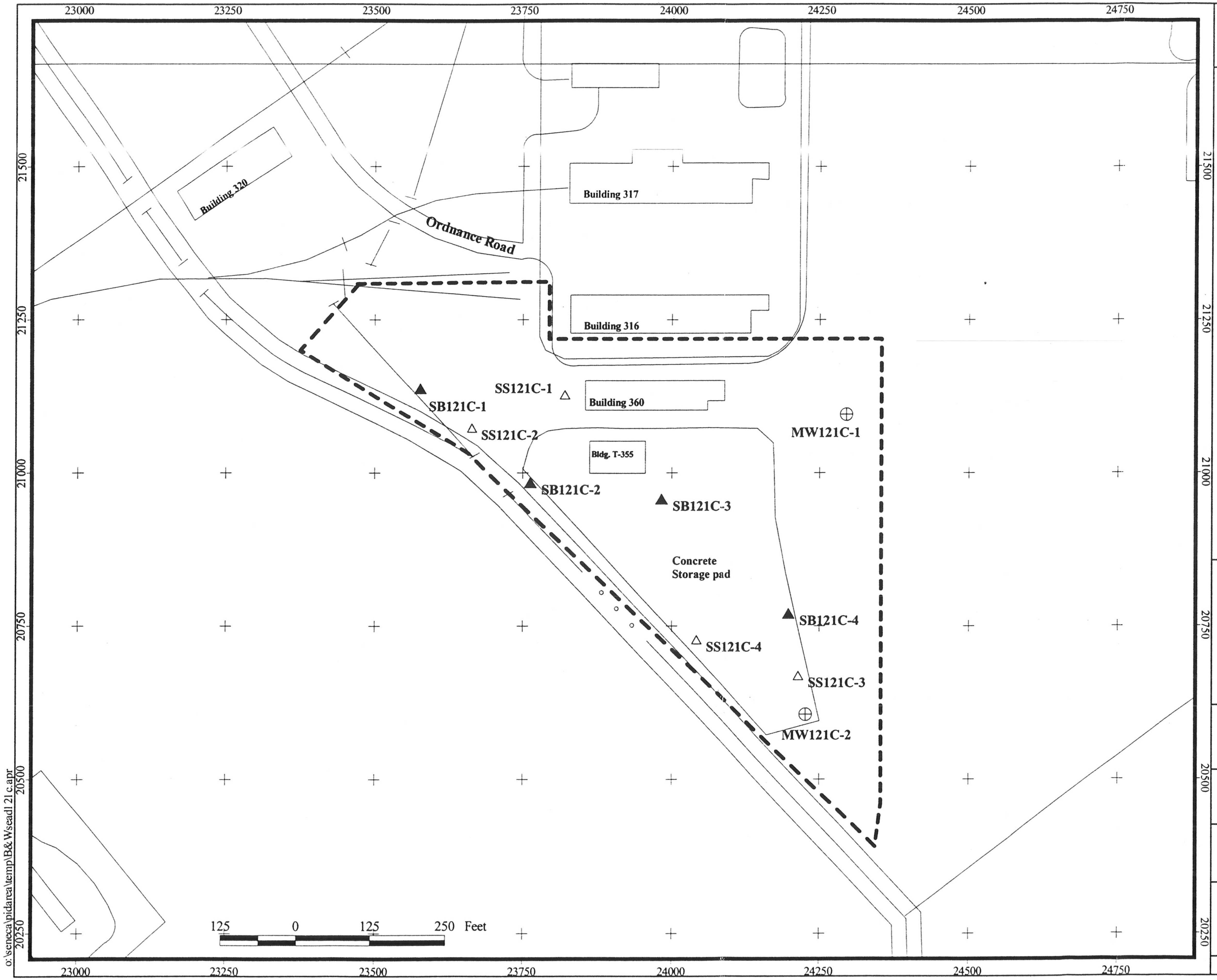
SENECA ARMY DEPOT ACTIVITY
RI/FS Workplan for the EBS Sites
at the Planned Industrial Development Area

FIGURE 2-5

LOCATION OF PLANNED INDUSTRIAL DEVELOPMENT AREA

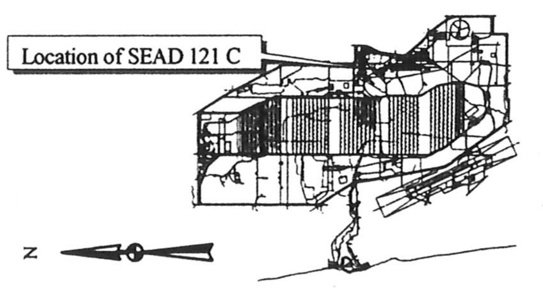
JOB NUMBER: 741174-01000

DATE: March 2002



LEGEND

PAVED ROAD
WETLAND
BRUSH
CHAIN LINK FENCE
UTILITY POLE
APPROXIMATE LOCATION OF FIRE HYDRANT
RAILROAD
OPEN DRAINAGE CULVERT
▲ Sub Surface Soil Samples
△ Surface Soil Samples
■ Surface Water/ Sediment Samples
□ Surface Water Samples
⊡ Sediment Samples
⊕ Ground Water Sample
Area Of Intrest



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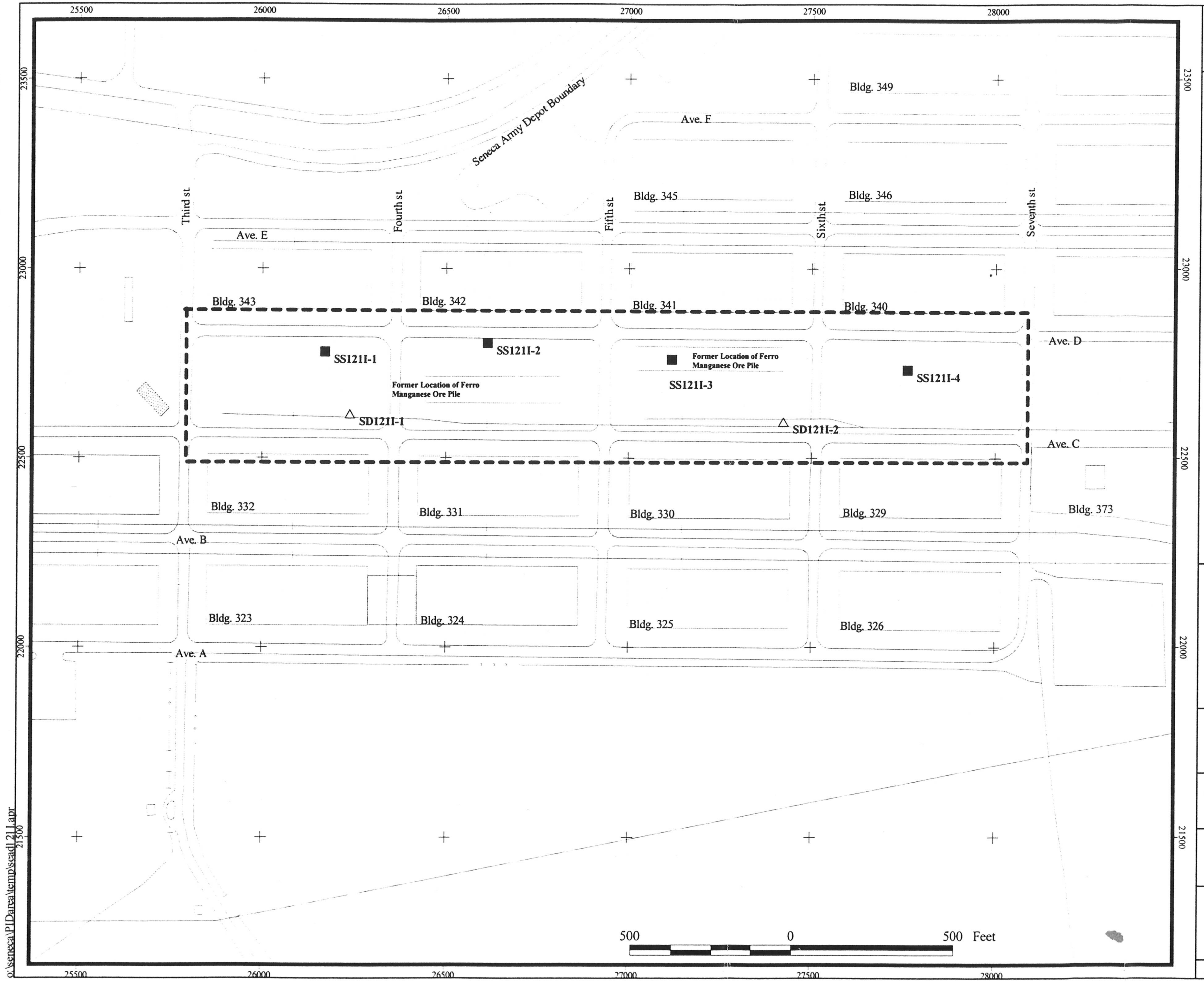
SENECA ARMY DEPOT ACTIVITY
RI\FS Workplan for EBS Sites
at the Planned Industrial Development Area

FIGURE 2-6
SEAD-121C DRMO YARD
Location of March 1998 EBS Samples

JOB NUMBER: 741175-01000

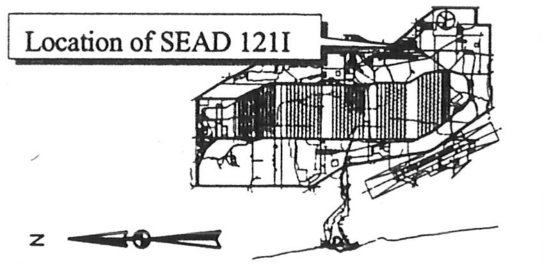
DATE: MARCH 2002



LEGEND

⚌	PAVED ROAD
	WETLAND
○	BRUSH
	CHAIN LINK FENCE
⌽	UTILITY POLE
◆	APPROXIMATE LOCATION OF FIRE HYDRANT
	RAILROAD
	OPEN DRAINAGE CULVERT
▲	Sub Surface Soil Samples
△	Surface Soil Samples
■	Surface Water/ Sediment Samples
□	Surface Water Samples
▣	Sediment Samples
⊕	Ground Water Sample
- - -	Area of Intrest

Location of SEAD 121I



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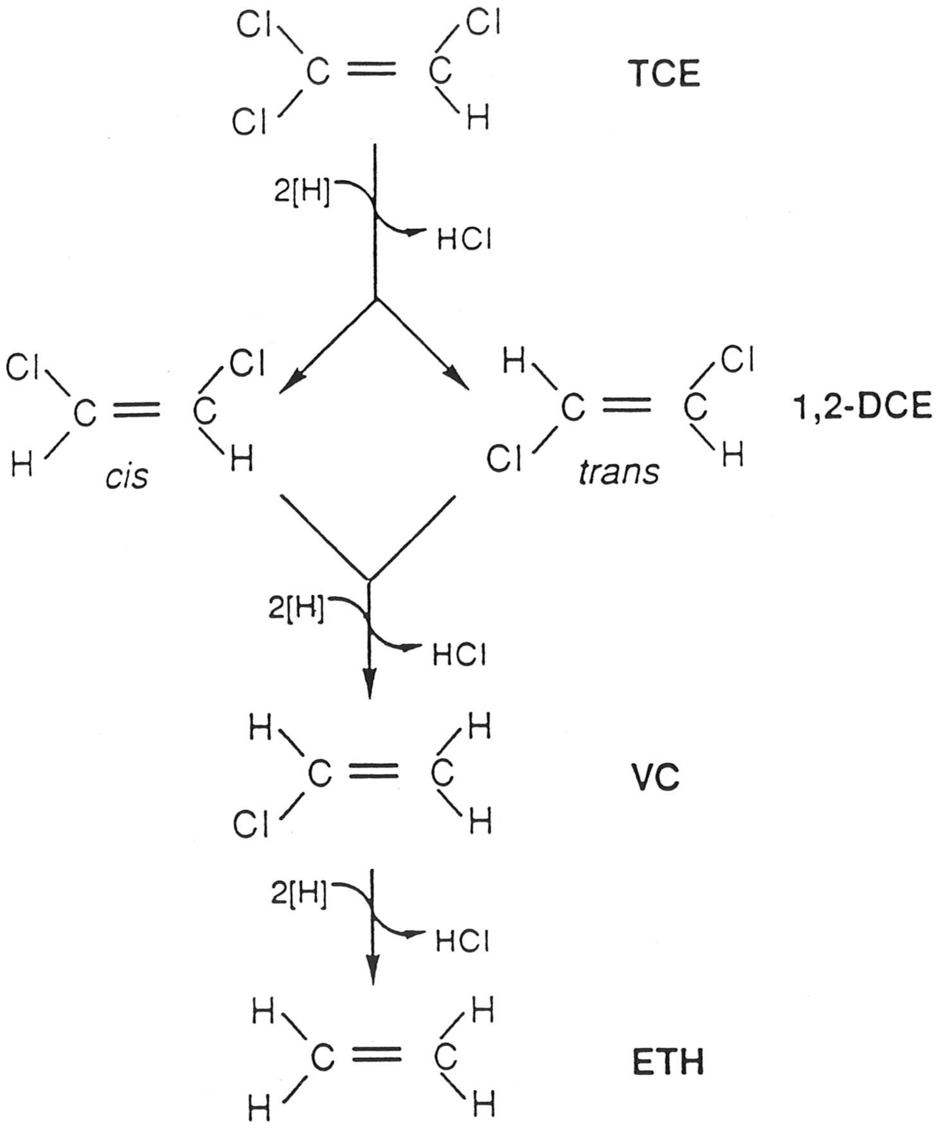
SENECA ARMY DEPOT ACTIVITY
Non-Evaluated EBS Sites at the Planned
Industrial Development Area

FIGURE2-7
SEAD 121I RUMORED
COSMOLINE OIL DISPOSAL AREA
Location Of March 1998 EBS Samples

JOB NUMBER: 741175-01000
DATE: MARCH 2002



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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY

RI/FS Work Plan for EBS Sites
at the Planned Industrial Development Area

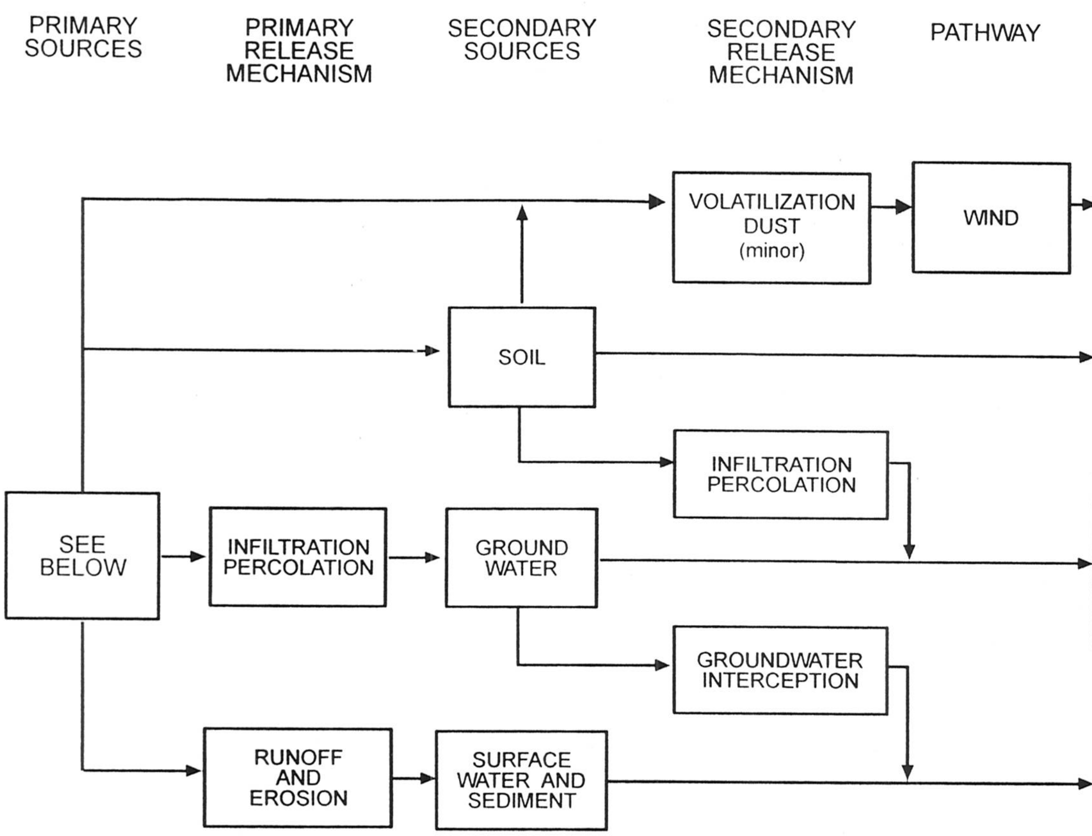
DEPT ENVIRONMENTAL ENGINEERING	DWG NO 726518-01002

FIGURE 2-8

BIODEGRADATION PATHWAY of TCE by Reductive Dechlorination

SCALE	DATE March 2002

R \PROJECT_GRAPHICS\SENECA\PID AREA\biodegradation CDR(CLD)



EXPOSURE ROUTE	RECEPTOR					
	HUMAN					
	CURRENT SITE WORKER	FUTURE SITE WORKER	CONSTRUCTION WORKER	DAYCARE CENTER WORKER	DAYCARE CENTER STUDENT	CHILD TRESPASSER
INHALATION	●	●	●	●	●	●
INGESTION	●	●	●	●	●	●
DERMAL CONTACT	●	●	●	●	●	●
INGESTION	NA	NA	●	NA	NA	●
INHALATION	NA	NA	●	NA	NA	●
DERMAL CONTACT	NA	NA	●	NA	NA	●
INGESTION	●	●	●	X	X	●
DERMAL CONTACT	●	●	●	X	X	●

NOTE:

EXPOSURE ROUTES APPLICABLE BASED ON PRESENCE OF MEDIA AT SITE AS SHOWN BELOW.

SEAD	PRIMARY SOURCE	SOIL	GW
121C	DRMO YARD	✓	✓
121I	RUMORED COSMOLINE OIL DISPOSAL AREA	✓	NA

● PATHWAY CONSIDERED TO POSE POTENTIAL RISK
X PATHWAY NOT CONSIDERED
NA NOT APPLICABLE TO RECEPTOR

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT
RI WORK PLAN FOR
EBS SITES IN PID AREA

DEPT ENVIRONMENTAL ENGINEERING
DWG NO 741175-01000

FIGURE 2-9

EXPOSURE PATHWAY SUMMARY FOR PLANNED INDUSTRIAL DEVELOPMENT SCENARIO

SCALE N/A
DATE MARCH 2002

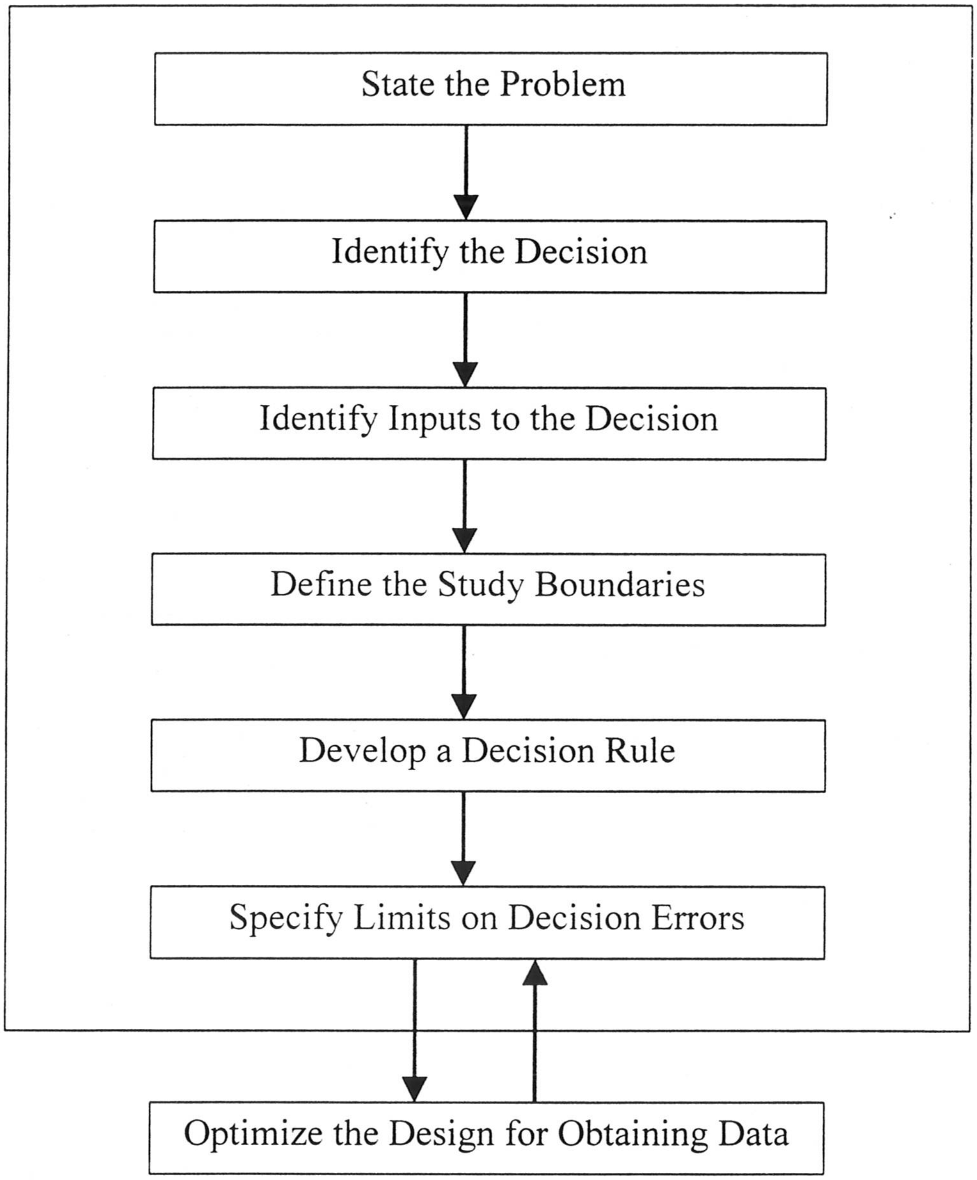


Figure 2-10

US EPA Quality Assurance Management Staff's

Data Quality Objectives Process

(Guidance for the Data Quality Objectives Process, EPA/600/R-96/055, Sept 1994)

3 TASK PLAN FOR THE INVESTIGATIONS

3.1 INFORMATION REVIEW

A review of information from previous investigations will be conducted prior to field mobilization to determine the location of previous sampling points and to establish whether there are site specific features that may influence the upcoming sampling event. Additionally, a review of the existing analytical data will be made to ensure that the sampling personnel are aware of the locations of high concentrations of contamination so appropriate field determinations can be made pertinent to appropriate levels of personal protective equipment and decontamination procedures.

All of the proposed sampling locations will be transcribed onto site maps. The field maps will then be used by sampling personnel to locate and mark the proposed sampling locations in the field. If at the time of field marking, or at any time up to and through the completion of the sampling operations, conditions are noted (e.g., obvious staining of soil or vegetation kill) or encountered (e.g., drilling into cobble) in the field that alter the location of selected sampling points, the field crew will be allowed discretion to relocate sample collection points. If proposed sampling locations are relocated, notes pertinent to the sampler's rationale will be provided in the field notes kept to document the sampling event.

3.2 SOIL INVESTIGATION

3.2.1 Sampling Objectives

The objective of the soil sampling program proposed for the PID Area covered by this work plan is to determine to what extent past use of the sites has impacted the surficial and subsurface soil within, and around, both of the identified sites (i.e., SEAD-121C and SEAD-121I). Further, the goal of this investigation is to fully characterize the extent and distribution of potential site contaminants that are present at the site. These goals will be accomplished by collecting surface soil samples and by advancing soil borings at a number of designated locations. During sample collection activity, the composition of the soil found at each sampling site will be catalogued and recorded, and field and necessary quality control and quality assurance samples will be collected for subsequent transport to contract laboratories for physical and chemical analyses.

3.2.2 Sampling Locations

Soil samples from both surface and subsurface locations will be collected to determine whether chemical materials previously used or stored at each of the sites have been released to the ground and have impacted the site. Site-tailored chemical evaluations will be completed on the collected soil samples to provide data defining where, and at what concentrations, contaminants may have been released to the surface and have migrated. Chemical analyses of the samples may include determinations of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), organo-chlorine and organo-phosphorous pesticides (OCPs and OPPs), herbicides, polychlorinated biphenyls (PCBs) and metals content that is present at the site.

Proposed surface and subsurface soil sampling locations are identified in **Figure 3-1** for SEAD-121C, and **Figures 3-2** and **3-3** for SEAD-121I.

3.2.3 Surface Soil Samples

Surface soil samples will be collected from the near-surface interval (i.e., 0 to 2-inch depth) beneath resident site vegetation. At the time of sampling, personnel will mark a 1-foot by 1-foot square area on the surface of the proposed sample collection zone and remove any obvious, loose accumulations of vegetation, debris, rocks or stones. A decontaminated split-spoon will then be driven into the ground in the approximate center of the area to a final depth of roughly six 6 to 8 inches below grade using a sledge-hammer or equivalent device. The spoon will then be recovered and opened, and necessary volumes needed for VOC determinations will be collected immediately from that soil that is found in the split-spoon's barrel at depths of 0 to 2 inches below any vegetative cover or root ball. Samples for VOC determinations will be collected from the split-spoon's barrel using either a syringe-barrel or Encore® samplers in accordance with procedures described in US EPA's SW-846 Method 5035. Sample volumes recovered for VOC determinations will immediately be sealed and placed into iced and darkened transport containers to minimize potential sample quality deterioration due to volatilization and degradation.

Once needed sample aliquots are recovered for the VOC determinations, decontaminated trowels or spoons and stainless steel bowls will be used to collect sufficient volume to fill all of the remaining sample bottles. All sample volume will be recovered from the remaining area of the 1-foot by 1-foot square, at depths not to exceed 2 inches below resident vegetative and root ball materials. The collected soil will be manually homogenized, and the site inspector/field geologist will classify the soil according to the Unified Soil Classification System as presented in the American Society for Testing and Materials' (ASTM's) Method D 2488, Standard Practice for the Description and Identification of Soils (Visual-Manual Procedure), as modified by the Burmeister Procedure. A complete description of the soil type will be recorded in the field logbook.

It is currently anticipated that 20 shallow soil samples will be collected from SEAD-121C, the DRMO Yard; while approximately 30 will be collected from SEAD-121I, the Rumored Cosmoline Oil Disposal Area. The proposed location of the surface soil samples are displayed on **Figures 3-1**, **3-2**, and **3-3** respectively, for 121C and 121I. Additional shallow soils will be collected if field conditions encountered at the time of sampling dictate that more are warranted.

Soil sampling procedures are specified in Section 3.4.4 and Section 4.1 of the Field Sampling and Analysis Plan (Parsons, 1995, Appendix A).

3.2.4 Subsurface Soil Samples

Subsurface samples will be collected continuously at two-foot intervals from the ground's surface to a final depth that is consistent with auger refusal in an effort to detect and document the extent of site contamination both laterally and vertically throughout the overburden.

Soil borings will be performed using a drilling rig or similar equipment, equipped with 4.25-inch I.D. hollow stem augers. All borings will be advanced to "auger refusal" which will be represented as the depth of the competent bedrock. The determination of "auger refusal" in competent shale is somewhat subjective as the hollow stem augers can generally penetrate through the shale at a very slow rate. For the purposes of these site investigations, "auger refusal" in "competent" shale will be defined as the depth, after penetrating the weathered shale, where auguring becomes significantly more difficult and auger advancement slows substantially.

During drilling, soil samples will be collected continuously using a decontaminated, standard two-inch diameter, two-foot long, carbon steel split-spoon sampler in accordance with procedures identified by ASTM Method D:1586-84. This technique involves driving a decontaminated split-spoon sampler into the ground, recovering the split-spoon, collecting and packaging any sample aliquot needed for VOC determinations from specific horizons, followed by compositing the remainder of the soil found in the split-spoon within a decontaminated sample bowl and dividing it up into other necessary sample jars.

The surface soil sample collected at each of the proposed soil boring locations will be collected in a manner similar to that which is described above in **Section 3.2.3**. A decontaminated split-spoon will be driven into the ground to a final depth of 6 to 8 inches below grade using a 140-pound hammer. The spoon will immediately be recovered, opened, scanned with a hand-held VOC detector, and then sample aliquots needed for VOC determinations will be collected directly from the spoon's barrel from the area that is 0 to 2 inches below any vegetative or root ball material using either syringe-barrel or Encore® type samples. Sample volumes recovered for VOC determinations will immediately be sealed and placed into ice and darkened transport containers to minimize potential sample quality deterioration due to volatilization and degradation. Once required aliquots for VOC determinations are collected, the site inspector or field geologist will describe and document the quantity and description of the recovered soil in field notes. Soil descriptions will be described according to the USCS as presented in ASTM Method D 2488, Standard Practice for the Description and Identification of Soils

(Visual-Manual Procedure), as modified by the Burmeister Procedure.

Once the recovered soil is catalogued, the remaining soil will be transferred to a decontaminated stainless steel bowl and homogenized. Obvious pieces of shale or rock will be removed, and then the recovered soil volume will be used to fill needed bottles for other analytical determinations.

Once the surface sample is recovered from each soil boring location, attempts will be made to collect subsurface soil samples continuously from the ground's surface to a depth where spoon refusal is encountered. All recovered soil volume will be catalogued, and all soil descriptions will be recorded in field notes maintained by the site inspector or the field geologist.

Typically, three soil samples will be collected from each soil boring location. The first sample will generally be collected from the top two inches of soil that underlies any vegetative covering encountered at the site. A second sample will typically be collected from the immediate vicinity of the water table, or from the greatest depth where sufficient sample recovery is achieved. The third sample will be collected either from a location that is roughly midway between the upper and lower sample, or from any location that is found to contain elevated levels of VOCs during field screening or show evidence of staining during sample recovery.

It is currently anticipated that 20 soil borings will be advanced and sampled in SEAD-121C, the DRMO Yard; while 5 soil borings are proposed for the area of SEAD-121I, the Rumored Cosmoline Oil Disposal Area. The proposed locations of the soil boring samples are displayed on **Figures 3-1**, **3-2**, and **3-3** respectively for SEAD-121C and -121I. Additional soil boring locations will be sampled if field conditions encountered at the time of sampling dictate that more are warranted.

3.2.5 Sample Analysis

A summary listing of the analyses that are proposed on the samples recovered from the two sites under this program is provided in **Table 3-1**. The analytical suite proposed for each site has been tailored based on information that known about historic site practices and operations. Organic compounds characterized during this investigation will focus on compounds that are listed on the US EPA's Target Compound List. Additionally, attempts will be made to quantify the next 10 volatile and 20 semivolatile tentatively identified compounds (TICs), in accordance with standard USEPA and NYSDEC Contract Laboratory Program (CLP) protocols. USEPA SW-846 Method 8260B will be used for VOC determinations; Method 8270C will be used for SVOC determinations; Method 8081A will be used for organochlorine pesticides; and Method 8082 will be used for PCB determinations.

Analyses proposed for metals will be limited to those elements/compounds that appear on the US EPA's Target Analyte List. In addition, analyses will include total organic carbon determinations in accordance with the modified Lloyd Kahn Method and total recoverable petroleum hydrocarbons (TRPH) via US EPA.

A summary of the number of samples and analyses to be performed on these soil samples is shown in **Table 3-1**. Detailed descriptions of these methods, as well as lists of reported analytes, are presented in Appendix C, Chemical Data Acquisition Plan, of the Generic Installation RI/FS Work Plan (Parsons, 1995).

3.2.6 Quality Assurance/Quality Control

Field quality assurance and quality control (QA/QC) samples will consist of the collection and analysis of one equipment blank sample, matrix spike, matrix spike duplicate, and one duplicate sample for every batch of twenty samples or less that is submitted to the laboratory for analyses. A breakdown of samples collected for QA/QC purposes is shown on **Table 3-1**.

Field QA/QC samples will be identified using standard sample identifiers, which will provide no indication of their QC role. QA/QC sampling requirements are described in Section 5.4 of Appendix C of the Generic Installation RI/FS Work Plan (Parsons, 1995). Required sample containers, preservation techniques, and holding times are also specified in the Generic Installation RI/FS Work Plan.

3.3 GROUNDWATER INVESTIGATION

3.3.1 Sampling Objectives

It is currently expected that groundwater samples will only be collected from the area of SEAD-121C, the DRMO Yard as part of the proposed investigations. Information collected as part of the prior investigation of the Rumored Cosmoline Oil Disposal Area (SEAD-121I) indicates that a shallow overburden aquifer was not encountered in this area above auger refusal. If results of the soil boring program indicate that a shallow overburden aquifer is present in the area SEAD-121I, additional groundwater wells will be installed and the groundwater samples will be collected and analyzed.

The objective of the groundwater sampling investigation proposed for SEAD-121C is to determine whether past use of the site has impacted the groundwater underlying and migrating away from the site. This objective will be accomplished by the advancement of borings that are subsequently converted to monitoring wells. Each well will be developed, tested to document the local hydraulic conductivity and to provide groundwater flow direction information and then, groundwater samples will be collected and analyzed for a directed list of analytes.

3.3.2 Sampling Locations

Three monitoring wells will be installed and sampled at the SEAD-121C. All wells will be screened across the water table within the glacial till and weathered shale aquifer. MW121C-3 will be installed in the northwestern edge of the site to assess background groundwater chemistry. A second well (MW121C-4) will be installed south of Building 360 northeast of the former location of temporary well MW121C-2 to assess the potential impact on the groundwater quality. A third well (MW121C-5) will be placed between the former DRMO Storage Pad and Kendaia Creek to the north. This well will measure the effect of the creek on the local groundwater flow. The wells will be installed in a triangular pattern, rather than a linear arrangement, to provide the best configuration for determining the groundwater flow direction beneath the site. The locations of the proposed monitoring wells in SEAD-121C are shown on **Figure 3-1**.

3.3.3 Sampling Procedures

Monitoring well installation, development, and sampling procedures for overburden monitoring wells are described in Appendix A, Field Sampling and Analysis Plan (FSAP), of the Generic Installation RI/FS Work Plan (Parsons, 1995). In particular, the installation of monitoring wells is described in Section 3.5 of the FSAP, and the development and sampling of wells is described in Section 3.6.

After well installation, the horizontal location and the elevation of the top of the PVC riser will be surveyed. The requirements of field surveying are described in Section 3.13.1 of the FSAP. Groundwater levels will be measured in each of the monitoring wells in accordance with Section 3.11.1 of the FSAP. A slug test will be performed on each monitoring well to measure in-situ hydraulic conductivity in the screened interval within the overburden (FSAP, Section 3.11.3.1).

3.3.4 Sample Analysis

Two rounds of groundwater sampling and analyses will be performed on each well installed in SEAD-121C. The two sampling rounds will be scheduled no closer that three months apart, and the resulting data will be used to assess groundwater quality under varying seasonal conditions.

Analyses conducted on the recovered groundwater samples will include VOC determinations via USEPA SW-846 Method 8260C (one time) and USEPA Method 524.2 (one time); SVOCs by Method 8270C; Pesticides by Method 8081A; PCBs by Method 8082; Metals by Method 6010; Cyanide by Method 9012A; and TRHP by Method 418.1 as shown in **Table 3-2**. Appendix C, Chemical Data Acquisition Plan, of the Generic Installation RI/FS Work Plan (Parsons, 1995) describes in detail the quality assurance objectives and quality control procedures to be followed by the field sampling teams and the analytical laboratories.

A summary of the number of samples and analyses to be performed on the groundwater samples is shown in **Table 3-2**. Detailed descriptions of these methods, as well as lists of reported analytes, are presented in Appendix C, Chemical Data Acquisition Plan, of the Generic Installation RI/FS Work Plan (Parsons, 1995).

3.3.5 Quality Assurance/Quality Control

Field QA/QC samples will consist of the collection and analysis of one equipment blank sample, matrix spike, matrix spike duplicate, and one duplicate sample for every batch of twenty samples or less that is submitted to the laboratory for analyses. A breakdown of samples collected for QA/QC purposes is shown on **Table 3-2**.

Field QA/QC samples will be identified using standard sample identifiers, which will provide no indication of their QC role. QA/QC sampling requirements are described in Section 5.4 of Appendix C of the Generic Installation RI/FS Work Plan (Parsons, 1995). Required sample containers, preservation techniques, and holding times are also specified in the Generic Installation RI/FS Work Plan.

3.4 SURFACE WATER INVESTIGATION

3.4.1 Sampling Objectives

As has been discussed earlier, there is no permanent surface water body (i.e., pond, creeks, streams, etc.) located at SEAD-121I. The only surface water that is typically expected to occur at this area results from storm water run-off or snowmelt that flows across the site and is captured in man-made collection system that is installed throughout the PID Area. Therefore, the purpose of the proposed surface water sampling in SEAD-121I is to determine if contaminants released from the past operations and activities conducted in this SEAD, if any exist, continue to be mobilized by surface water run-off and migrate away from the site.

An ephemeral drainage culvert/creek runs along the northwestern boundary of SEAD-121C, the DRMO Yard. This drainage channel/creek bed is heavily fed by surface water run-off that falls in the northern portion of the PID Area and in the area of housing to the east of the PID Area and south of the main Depot gate. Therefore, the purpose of the proposed surface water sampling in the area of SEAD-121C is to determine if contaminants from other sources upgradient of SEAD-121C are present in the ephemeral drainage channel that abuts the site and to determine if contaminants released from the past storage and staging operations and activities conducted in SEAD-121C, if any exist, continue to be mobilized by surface water run-off and migrate away from the site and enter into the surface water that is moving away from the site.

3.4.2 Sampling Locations

The location of surface water (SW) sample collection will be heavily influenced by individual site features found at the time of the implementation of the proposed sampling. Specific locations anticipated for use in SEAD-121C, the DRMO Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area, are shown on **Figures 3-1**, and **3-3**, respectively and include locations upgradient and immediately adjacent to catch basins that are located within the area of the former operations. Additionally, locations where the flow captured in the storm water collection system is discharged into Depot streams and creeks will also be sampled to document the extent of contaminant transport and migration, as well as the composition of run-off that may be originating from other portions of the Depot.

3.4.3 Sampling Procedures

Surface water sampling will be scheduled for a day when a significant rain event (rainfall greater than 0.25 inches within an eight hour period) occurs or when there is evidence that snow-melt is providing surface flow to the local catch basin collection system or to man-made drainage swales and culverts that are located at each site. The surface water sampling will be completed before the collection of ditch soil and debris (i.e., "sediment") from a location underlying the surface water. If possible, surface water samples will preferentially be comprised of flowing water, although if flow is not obvious, water contained in standing pools may be collected.

Surface water samples will be collected in an order that moves from the most downgradient location towards the most upgradient location for each stream, culvert or pipeline, respectively, to minimize the likelihood that debris or sediment dislodged during the sampling of one location will effect subsequent samples collected along the same channel. Surface water samples will be collected by immersing the bottle into the water while holding the bottle at a forty-five degree angle, The bottle will be allowed to slowly fill, but not overfill. In the event that the flowing or standing water is not deep enough to fill the sample bottle to the required level, an intermediate, cleaned, sampling device, such as a stainless steel beaker or another clean, and unpreserved sample bottle, will be used to repeatedly dip and transfer additional surface water into the sample bottle.

Once the appropriate sample bottles are filled, water quality parameters for will be measured by directly immersing field instrumentation sensors into the water to obtain readings. All surface water sampling will comply with the guidelines and procedures set forth in the RI\FS generic sampling plan (Parsons 1995).

3.4.4 Sample Analysis

Analyses conducted on the recovered surface water samples will include VOC determinations via USEPA SW-846 Method 8260C; SVOCs by Method 8270C; Pesticides by Method 8081A; PCBs by Method 8082; Metals by Method 6010; Cyanide by Method 9012A; and TRHP by Method 418.1 as shown in **Table 3-3**. Appendix C, Chemical Data Acquisition Plan, of the Generic Installation RI/FS Work Plan (Parsons, 1995) describes in detail the quality assurance objectives and quality control procedures to be followed by the field sampling teams and the analytical laboratories.

A summary of the number of samples and analyses to be performed on the surface water samples is shown in **Table 3-3**. Detailed descriptions of these methods, as well as lists of reported analytes, are presented in Appendix C, Chemical Data Acquisition Plan, of the Generic Installation RI/FS Work Plan (Parsons, 1995).

3.4.5 Quality Assurance/Quality Control

Field QA/QC samples will consist of the collection and analysis of one equipment blank sample, matrix spike, matrix spike duplicate, and one duplicate sample for every batch of twenty samples or less that is submitted to the laboratory for analyses. A breakdown of samples collected for QA/QC purposes is shown on **Table 3-3**.

Field QA/QC samples will be identified using standard sample identifiers, which will provide no indication of their QC role. QA/QC sampling requirements are described in Section 5.4 of Appendix C of the Generic Installation RI/FS Work Plan (Parsons, 1995). Required sample containers, preservation techniques, and holding times are also specified in the Generic Installation RI/FS Work Plan.

3.5 "SEDIMENT" INVESTIGATIONS

3.5.1 Sampling Objectives

As has been discussed earlier, there are no permanent surface water bodies (i.e., pond, creeks, streams, etc.) located at either of the PID Area sites (i.e., SEAD-121C or SEAD-121I) under investigation under this program. Therefore, the proposed "sediment" investigation conducted under this investigation will focus on the collection of surface soil and other forms of naturally-occurring debris (i.e., decomposing vegetation and not trash such as paper, cigarette butts, etc.) that is found in drainage culverts, swales, or ephemeral stream or creek beds, underling locations where surface water samples (see **Section 3.4**, above) are collected. The purpose of the proposed "sediment" sampling and analysis program is to determine if there is evidence that contamination originating from the sites is being mobilized, transported and re-deposited at locations away from the original sites by the action of storm-water run-off.

3.5.2 Sampling Locations

The location of "sediment" (SD) sample collection will underlie the location where surface water samples are collected. If a significant rain or snowmelt event is not encountered during the proposed site investigation, "sediment" samples will be in collected areas immediately next to, or within the collection sumps underlying, catch basins located at the sites. Additionally, "sediment" samples will also be collected beneath or immediately downgradient of outfalls from the PID area's surface water collection system to drainage culverts and Depot creeks/streams. Finally, in the case of SEAD-121C, "sediment" samples will be collected from the northwestern edge of the site where there is evidence that historic surface water flows may have traveled and have most probably deposited suspended solids. Specific locations where "sediment" samples are expected to be collected are shown on **Figures 3-1** and **3-3**, respectively, for SEAD-121C, the DRMO Yard, and SEAD-121I, the Rumored Cosmoline Oil Disposal Area sites.

3.5.3 Sampling Procedures

"Sediment" samples will be collected from locations that are beneath the location of surface water samples, assuming that appropriate field conditions are encountered during the course of the sampling event. If surface water samples can not be collected during the proposed RI, "sediment" samples will be collected from locations where suspended materials from each of the sites is most likely to have flowed.

"Sediment" samples will be collected using a decontaminated, stainless steel spade, spoon, or similar device, in conjunction with a decontaminated, and inert sampling bowl that will be used for compositing. Upon sampling, obvious quantities of living vegetation, rocks and trash will be removed, and a sample of the "sediment" will be collected. Samples collected for VOC determinations will be collected first either using a syringe-barrel sampler or an Encore® sampler. These sample volumes will be immediately transferred into pre-cleaned, labeled, and preserved sample containers. Sample volumes recovered for other evaluations will be placed in a decontaminated stainless steel bowl. After removing large stones and pieces of vegetation, the composited sample will be homogenized and placed in the appropriate container sealed and labeled properly. For each discrete sample location a wooden stake will be labeled with the Loc. ID and Sample ID of the sample and driven into the ground at the location. Sediment sampling procedures are specified in Section 3.4.4 and Section 4.1 of the Field Sampling and Analysis Plan (Parsons, 1995, Appendix A).

3.5.4 "Sediment" Analyses

Analyses conducted on the recovered sediment samples will include VOC determinations via USEPA SW-846 Method 5035 and 8260C; SVOCs by Method 8270C; Pesticides by Method 8081A; PCBs by Method 8082; Metals by Method 6010; Cyanide by Method 9012A; total organic carbon by the modified Lloyd Kahn Method; and TRHP by Method 418.1 as shown in **Table 3-4**. Appendix C, Chemical Data Acquisition Plan, of the Generic Installation RI/FS Work Plan (Parsons, 1995) describes in detail the quality assurance objectives and quality control procedures to be followed by the field sampling teams and the analytical laboratories.

A summary of the number of samples and analyses to be performed on the "sediment" samples is shown in **Table 3-4**. Detailed descriptions of these methods, as well as lists of reported analytes, are presented in Appendix C, Chemical Data Acquisition Plan, of the Generic Installation RI/FS Work Plan (Parsons, 1995).

3.5.5 Quality Assurance/Quality Control

Field QA/QC samples will consist of the collection and analysis of one equipment blank sample, matrix spike, matrix spike duplicate, and one duplicate sample for every batch of twenty samples or less that is submitted to the laboratory for analyses. A breakdown of samples collected for QA/QC purposes is shown on **Table 3-4**.

Field QA/QC samples will be identified using standard sample identifiers, which will provide no indication of their QC role. QA/QC sampling requirements are described in Section 5.4 of Appendix C of the Generic Installation RI/FS Work Plan (Parsons, 1995). Required sample containers, preservation techniques, and holding times are also specified in the Generic Installation RI/FS Work Plan.

3.6 DATA VALIDATION

Analytical data developed during this remedial investigation will be used to support final decisions relative to the final disposition of SEADs -121C and -121I within the PID Area. Analyses proposed as part of the investigation of the PID Area include directed analysis of VOCs, SVOCs, pesticides, herbicides, PCBs, metals, cyanide, and TRPH in soil, "sediment", surface water and groundwater, and total organic carbon analysis in soil and sediment. Sample analysis for each contaminant class will be will be performed in accordance with the USEPA recommended procedures listed below:

- Volatile organic compounds by USEPA SW-846 Method 8260B and 5035 (for soils and "sediment") or USEPA 524.2 (groundwater only, one round);
- Semivolatile organic compounds by USEPA SW-846 Method 8270C;
- Organochlorine pesticides by USEPA Method 8081A;

- Polychlorinated Bibhenyls by USEPA Method 8082;
- TAL Metals by USEPA Method 6010;
- Cyanide by USEPA Method 9012A; and
- Total Recoverable Petroleum Hydrocarbons by USEPA Method 418.1.

In order to meet the requirements of New York State, environmental samples will be collected and analyzed according to US EPA and NYSDEC CLP protocols. Determinations of total organic carbon levels will be completed using the Lloyd Kahn protocol.

Validation of analytical data resulting from analytical determinations in soil, "sediment," surface water, and groundwater will be performed in a manner that is generally consistent with procedures defined in the US EPA's "National Functional Guidelines for Organic Data Review" and consistent with US EPA Region 2's Standard Operating Procedures. Specific data validation procedures that will be followed include:

- HW-24, Validating Volatile Organic Compounds by SW-846 Method 8260B, Revision 1 June 1999;
- HW-22, Validating Semivolatile Organic Compounds by SW-846 Method 8270, Revision 2, June 2001;
- HW-23, Validating Pesticides/PCB Compounds by SW-846 Method 8080A, Revision 0, April 1995; and
- HW-2, Evaluation of Metals Data for the CLP Program, Revision 11, January 1992.

The data package submittal requested from the laboratory for the analytical determinations in soil, "sediment," surface water, and groundwater will contain all data generated during the analyses, including mass spectral identification charts, mass spectral tuning data, spike recoveries laboratory duplicate results, method blank results, instrument calibration, and holding times documentation. All sample data and laboratory quality control results will be requested for soil analyses completed for TOC and TRPH.

Commensurate levels of data validation will be performed on the results and the data packages reported for the proposed analyses. A *qualitative* review will be completed for the TOC and TRPH data. A qualitative review includes and analysis of the following items as they are applicable to the Lloyd Kahn and TRPH procedures: data completeness, custody documentation, holding times, laboratory and field QC blanks, instrument calibrations, laboratory control sample recoveries, matrix spike/matrix spike duplicate (MS/MSD) precision and accuracy, laboratory duplicate precision, instrument performance, surrogate recoveries for organic analyses, field duplicate precision, internal standard responses for organic analyses, instrument run logs, and all other laboratory QC samples.

Other analyses will be subjected to full data validation. Full data validation is a *qualitative* and *quantitative* review of those items evaluated during a qualitative assessment in addition to calculating sample and laboratory QC results with the instrument raw data. This level of data quality provides assurance that all sample results reported by the laboratory were transcribed, calculated, and reported correctly. Therefore, this level of data review requires laboratories to submit all environmental sample results, laboratory QC results, and instrument raw data (i.e., a full data package or "CLP-type" data deliverable).

Table 3-1
Proposed Soil Sample Analyses

RI Work Plan for EBS Sites in PID Area
Seneca Army Depot Activity - Romulus New York

	SEAD-121C		SEAD-121I		Summary			
	Surface Soil Samples (0 to 2 in)	Number of Soil Boring Samples (including 1 surface per location)	Surface Soil Samples (0 to 2 in)	Number of Soil Boring Samples (including 1 surface per location)	Subtotal	QA/QC Samples (1 dup, 1 ms, 1 msd, 1fb per 20 samples)	Trip Blanks	Total Soil Samples
Number of Surface Soil / Soil Borings Samples per Location	1 x 20	3 x 20	1 x 30	3 x 5				
Target Compound List (TCL) Volatile Organic Compounds (VOCs) by SW846 Method 8260B	20	60	30	15	125	28	13	166
TCL Semivolatile Organic Compounds (SVOCs) by SW846 Method 8270C	20	60	30	15	125	28		153
TCL Organochlorine Pesticides (Pests) by SW-846 Method 8081A	20	60			80	16		96
Polychlorinated Biphenyls by SW-846 Method 8082	20	60	30	15	125	28		153
Target Analyte List (TAL) Total Metals by SW-846 Method 6010	20	60	30	15	125	28		153
Total and Amenable Cyanide by SW-846 Method 9012A	20	60			80	16		96
Total Organic Carbon by Lloyd Kahn	20	60	30	15	125			125
Total Recoverable Petroleum Hydrocarbons by USEPA Method 418.1	20	60	30	15	125			125

Notes:
ms = matrix spike; msd = matrix spike duplicate; dup = duplicate; fb = field blank.

Table 3-2
Proposed Groundwater Sample Analyses

RI Work Plan for EBS Sites in PID Area
Seneca Army Depot Activity - Romulus New York

	SEAD-121C	SEAD-121I	Summary			
	Groundwater Samples (1)	**Groundwater Samples**	**Subtotal**	**QA/QC Samples (1 dup, 1 ms, 1 msd, 1fb per 20 samples)**	**Trip Blanks**	**Total Samples**
Number of Monitoring Wells	3	None				
Target Compound List (TCL) Volatile Organic Compounds (VOCs) by SW846 Method 8260B or US EPA 524.2 (1 round each) (1)	6	0	6	8	4	18
TCL Semivolatile Organic Compounds (SVOCs) by SW846 Method 8270C	6	0	6	8		14
TCL Organochlorine Pesticides (Pests) by SW-846 Method 8081A	6	0	6	8		14
Polychlorinated Biphenyls (PCBs) by SW-846 Method 8082	6	0	6	8		14
Target Analyte List (TAL) Total Metals by SW-846 Method 6010	6	0	6	8		14
Total and Amenable Cyanide by SW-846 Method 9012A	6	0	6	8		14
Total Recoverable Petroleum Hydrocarbons by USEPA Method 418.1	6	0	6			6

Notes:
(1) Two sampling rounds will be completed
ms = matrix spike; msd = matrix spike duplicate; dup = duplicate; fb = field blank.

Table 3-3
Proposed Surface Water Sample Analyses

RI Work Plan for EBS Sites in PID Area
Seneca Army Depot Activity - Romulus New York

	SEAD-121C	**SEAD-121I**	**Summary**			
	Sediment Samples	**Sediment Samples**	**Subtotal**	**QA/QC Samples (1 dup, 1 ms, 1 msd, 1fb per 20 samples)**	**Trip Blanks**	**Total Samples**
Number of Surface Water Samples	10	10				
Target Compound List (TCL) Volatile Organic Compounds (VOCs) by SW846 Method 8260B	10	10	20	4	5	29
TCL Semivolatile Organic Compounds (SVOCs) by SW846 Method 8270C	10	10	20	4		24
TCL Organochlorine Pesticides (Pests) by SW-846 Method 8081A	10		10	4		14
Polychlorinated Biphenyls (PCBs) by SW-846 Method 8082	10	10	20	4		24
Target Analyte List (TAL) Total Metals by SW-846 Method 6010	10	10	20	4		24
Total and Amenable Cyanide by SW-846 Method 9012A	10		10	4		14
Total Recoverable Petroleum Hydrocarbons by USEPA Method 418.1	10	10	20			20

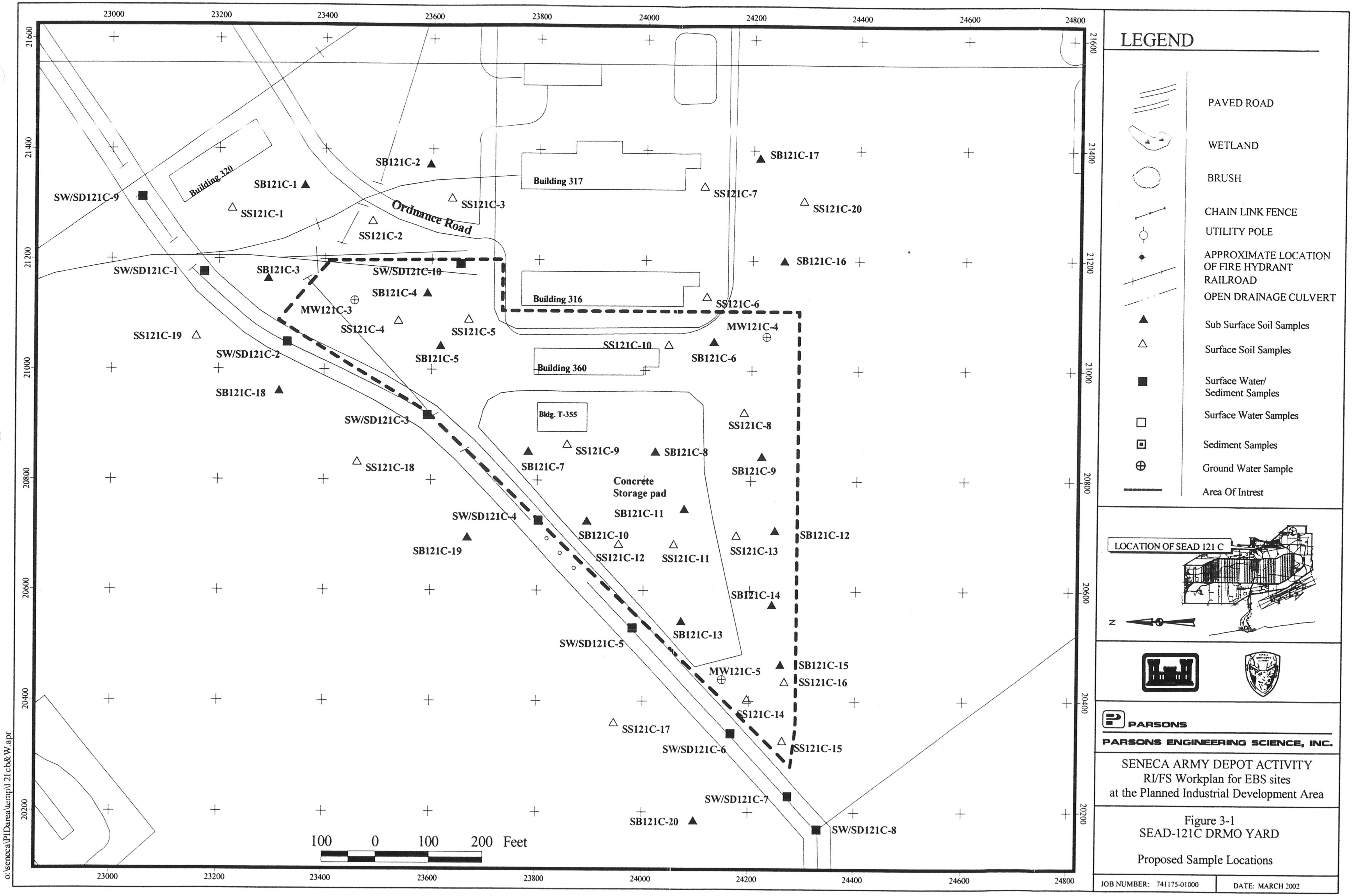
Notes:
ms = matrix spike; msd = matrix spike duplicate; dup = duplicate; fb = field blank.

Table 3-4
Proposed "Sediment" Sample Analyses

RI Work Plan for EBS Sites in PID Area
Seneca Army Depot Activity - Romulus New York

	SEAD-121C	SEAD-121I	Summary			
	Sediment Samples	Sediment Samples	Subtotal	QA/QC Samples (1 dup, 1 ms, 1 msd, 1fb per 20 samples)	Trip Blanks	Total Samples
Number of "Sediment" Samples	10	10				
Target Compound List (TCL) Volatile Organic Compounds (VOCs) by SW846 Method 5035/8260B	10	10	20	4	5	29
TCL Semivolatile Organic Compounds (SVOCs) by SW846 Method 8270C	10	10	20	4		24
TCL Organochlorine Pesticides (Pests) by SW-846 Method 8081A	10		10	4		14
Polychlorinated Biphenyls (PCBs) by SW-846 Method 8082	10	10	20	4		24
Target Analyte List (TAL) Total Metals by SW-846 Method 6010	10	10	20	4		24
Total and Amenable Cyanide by SW-846 Method 9012A	10		10	4		14
Total Organic Carbon by Lloyd Kahn	10	10	20			20
Total Recoverable Petroleum Hydrocarbons by USEPA Method 418.1	10	10	20			20

Notes:
ms = matrix spike; msd = matrix spike duplicate; dup = duplicate; fb = field blank.



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SENECA ARMY DEPOT ACTIVITY
RI/FS Workplan for EBS sites
at the Planned Industrial Development Area

Figure 3-1
SEAD-121C DRMO YARD

Proposed Sample Locations

JOB NUMBER: 741175-01000
DATE: MARCH 2002

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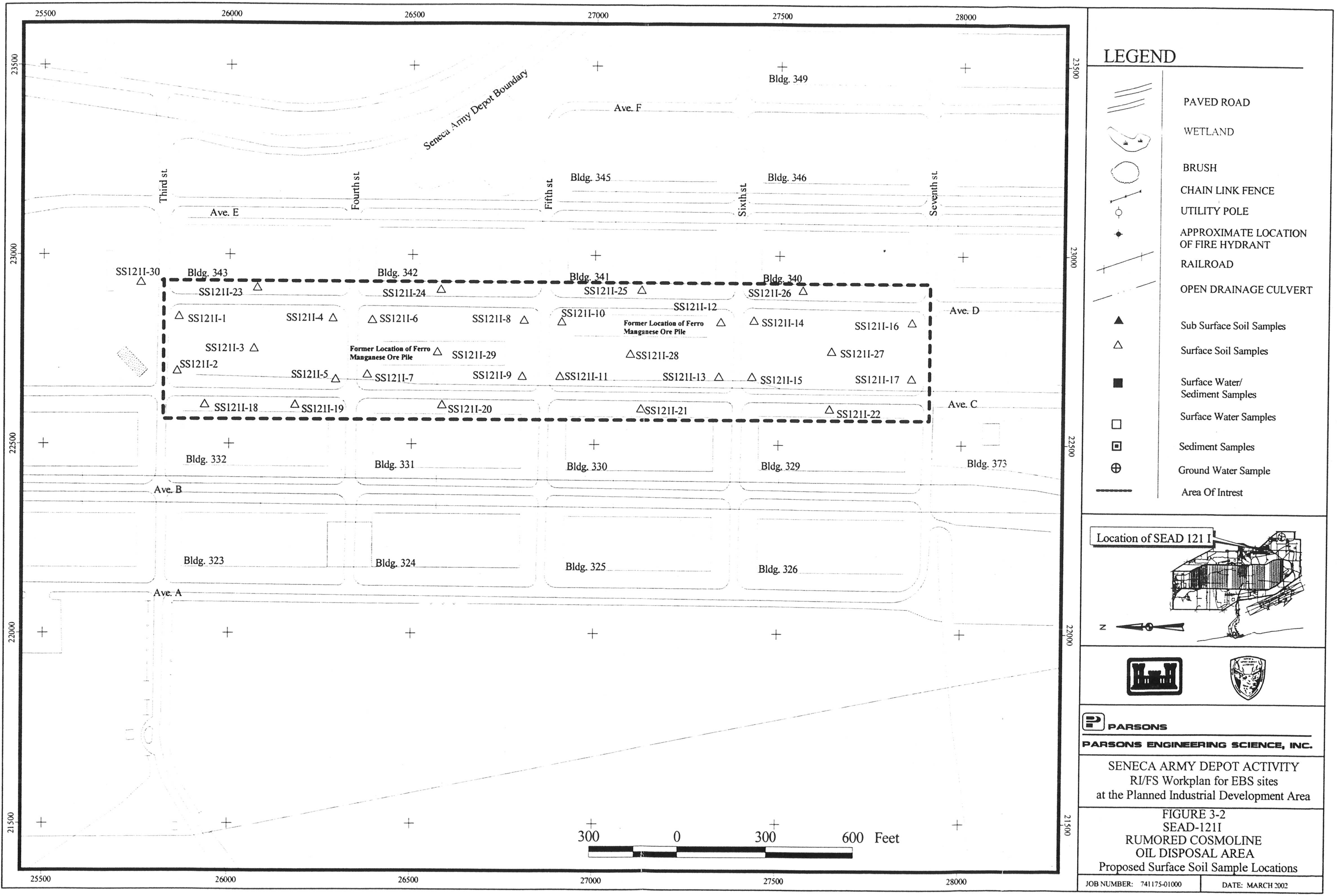

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SENECA ARMY DEPOT ACTIVITY
RI/FS Workplan for EBS sites
at the Planned Industrial Development Area

FIGURE 3-2
SEAD-121I
RUMORED COSMOLINE
OIL DISPOSAL AREA
Proposed Surface Soil Sample Locations

JOB NUMBER: 741175-01000
DATE: MARCH 2002

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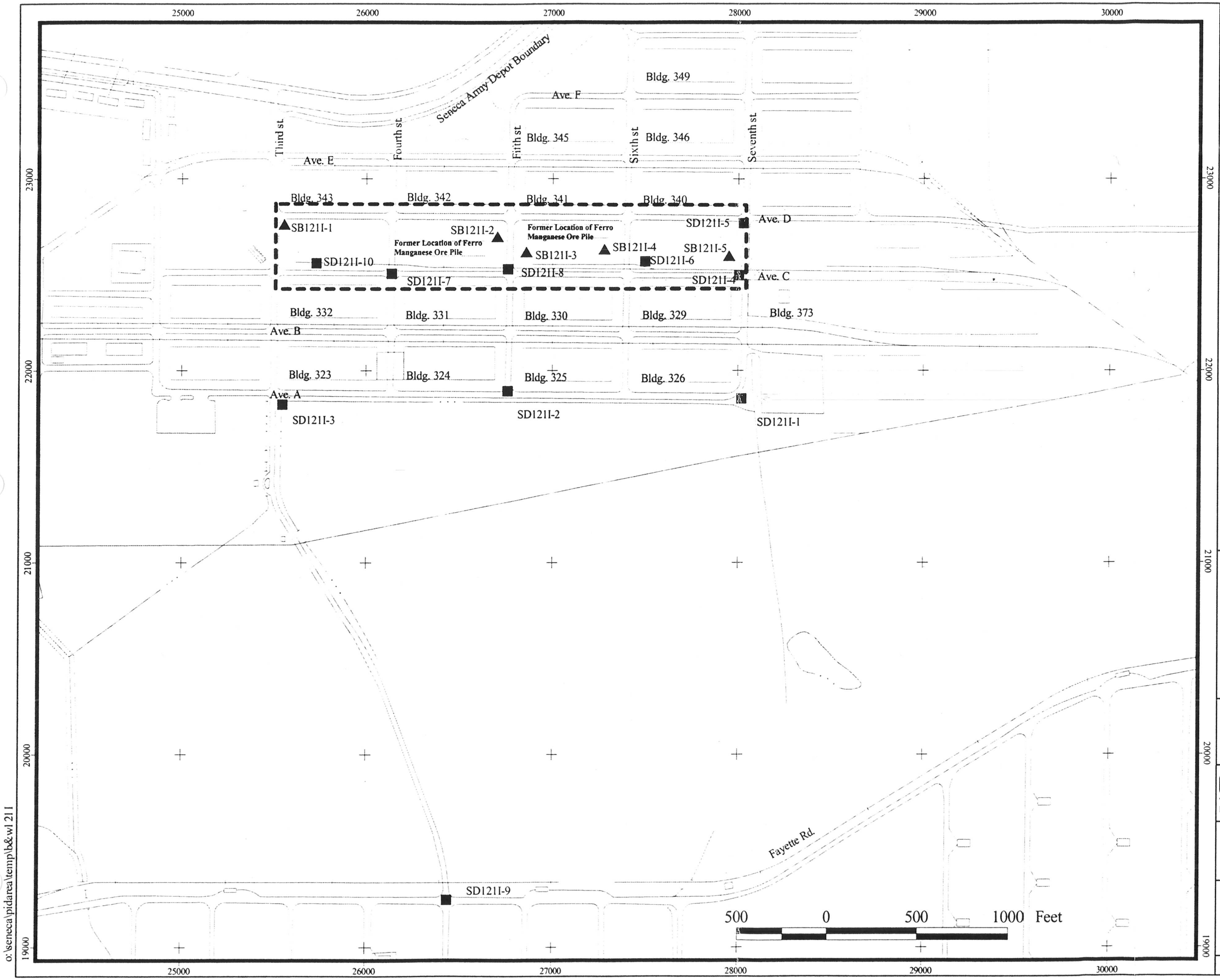

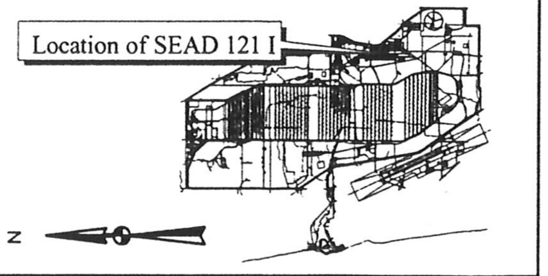

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SENECA ARMY DEPOT ACTIVITY
RI/FS Workplan for EBS Sites at the Planned Industrial Development Area

FIGURE 3-3
SEAD 121I RUMORED COSMOLINE OIL DISPOSAL AREA

Proposed Sample Locations

JOB NUMBER: 741175-01000

DATE: MARCH 2002

4 PLANS AND MANAGEMENT

4.1 REFERENCED PLANS

The following plans from the Generic Installation RI/FS Work Plan for Seneca Army Depot Activity (Parsons, 1995) are incorporated by reference into this document:

- Appendix A. Field Sampling and Analysis Plan
- Appendix B. Site-Specific Safety and Health Plan (SSHP)
- Appendix C. Chemical Data Acquisition Plan

4.2 SCHEDULING

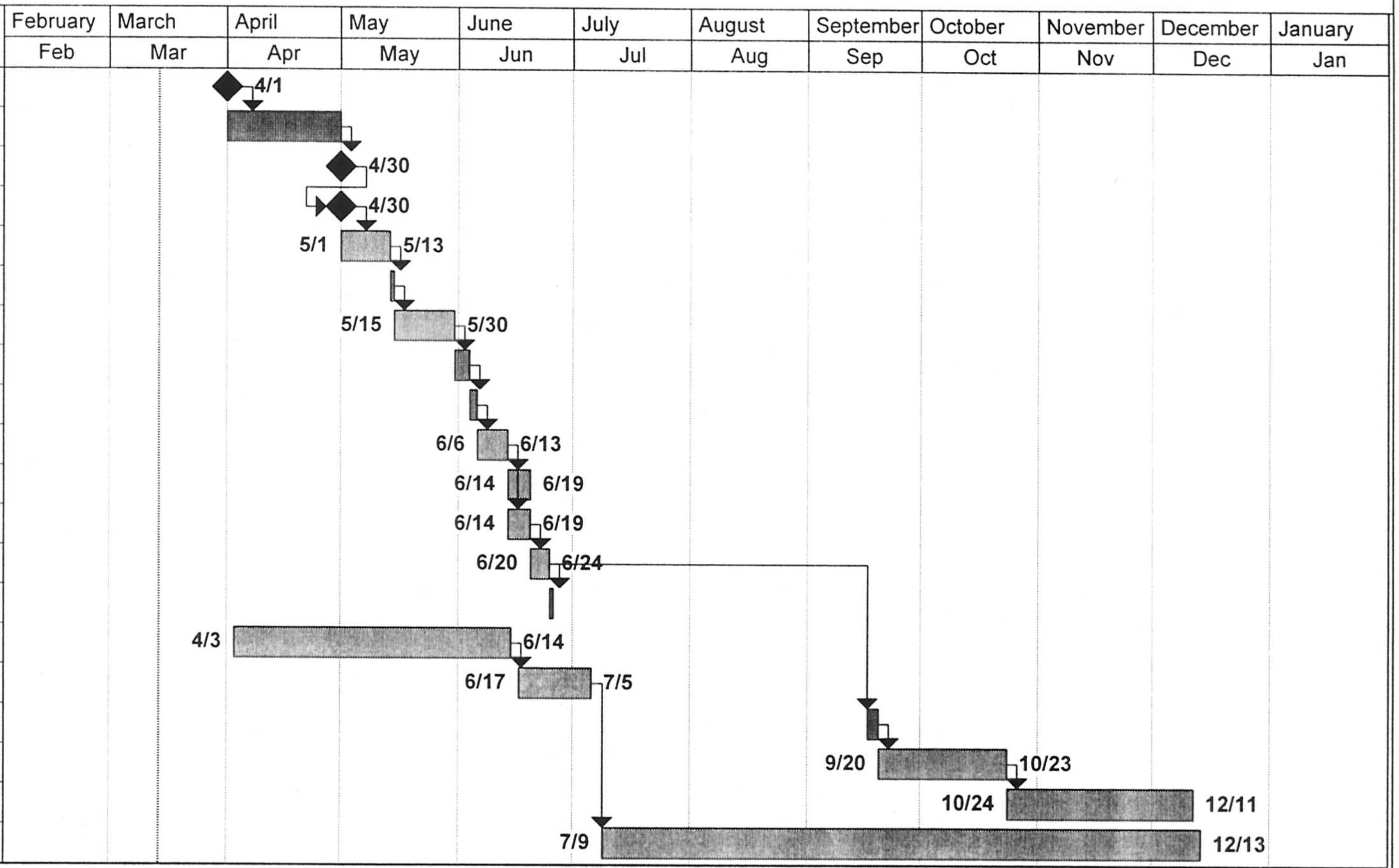
The proposed schedule for performing the work at the Planned Industrial Development Area is presented in **Figure 4-1**.

4.3 STAFFING

The project team organization for performing the work described in this Work Plan is presented in **Figure 4-2.**

FIGURE 4-1.
SCHEDULE FOR FIELD INVESTIGATION OF THREE EBS SITES IN PID AREA, SENECA ARMY DEPOT ACTIVITY

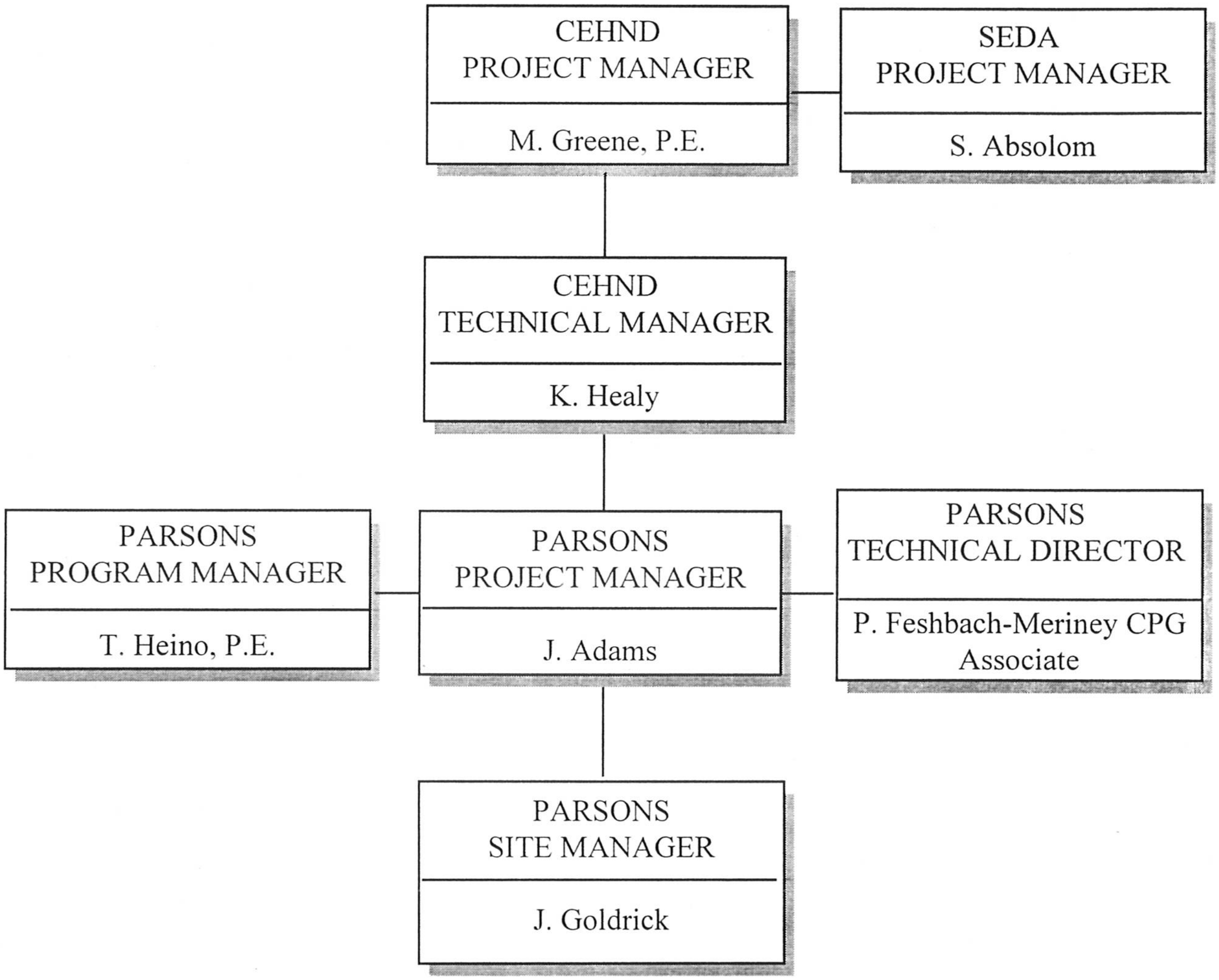
ID	Task Name
1	Submit Workplan
2	Agency Review
3	Agency Approval
4	Notice to Proceed
5	Mobilization
6	Site Visit (Mark Sites)
7	Advance / Sample Soil Borings
8	Install Monitoring Wells
9	Development of Monitoring Wells
10	Surface Soil Sampling
11	Surface Water Sampling
12	Sediment Sampling
13	Sampling of Monitoring Wells - Round 1
14	Slug Testing of Monitoring Wells
15	Chemical Analyses
16	Data Validation
17	Sampling of Monitoring Wells - Round 2
18	Chemical Analyses
19	Data Validation
20	Preparation of Report



Project: schedule
Date: Thu 3/14/02

Task	▨	Rolled Up Task	▨	Project Summary	▬
Split	┈	Rolled Up Split	┈	External Milestone	◆
Progress	▬	Rolled Up Milestone	◇	Deadline	⇩
Milestone	◆	Rolled Up Progress	▬		
Summary	▬	External Tasks	▨		

FIGURE 4-2.
PROJECT TEAM ORGANIZATION FOR THE REMEDIAL INVESTIGATION AT THREE EBS SITES IN PID AREA, SENECA ARMY DEPOT ACTIVITY



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Definition of Data Qualifiers (Q) Used in Appendix Tables

Qualifier Code (Q) **Definition**

Blank cell = Compound was detected at listed concentration.
J = Reported concentration is an estimate
R = The reported value was rejected during data validation.
U = Compound was not detected at the identified concentration.
UJ = The compound was not detected and the associated detection limit is estimated.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-1	SB121C-1	SB121C-1	SB121C-2
								SOIL	SOIL	SOIL	SOIL
								EB226	EB231	EB232	EB014
								0	0	2.5	0
								0.2	0.2	3	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	DU
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^{b})**	**Value (Q^{b})**	**Value (Q^{b})**	**Value (Q^{b})**
Volatiles											
1,1,1-Trichloroethane	UG/KG	0	0.0%	800	0	0	14	12 UJ	12 U	12 U	12 U
1,1,2,2-Tetrachloroethane	UG/KG	0	0.0%	600	0	0	14	12 UJ	12 U	12 U	12 U
1,1,2-Trichloroethane	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
1,1-Dichloroethane	UG/KG	0	0.0%	200	0	0	14	12 UJ	12 U	12 U	12 U
1,1-Dichloroethene	UG/KG	0	0.0%	400	0	0	14	12 UJ	12 U	12 U	12 U
1,2-Dichloroethane	UG/KG	0	0.0%	100	0	0	14	12 UJ	12 U	12 U	12 U
1,2-Dichloroethene (total)	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
1,2-Dichloropropane	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Acetone	UG/KG	28	42.9%	200	0	6	14	12 UJ	12 U	12 U	12 U
Benzene	UG/KG	2	7.1%	60	0	1	14	12 UJ	12 U	14	12 J
Bromodichloromethane	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Bromoform	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Carbon disulfide	UG/KG	0	0.0%	2700	0	0	14	12 UJ	12 U	12 U	12 U
Carbon tetrachloride	UG/KG	0	0.0%	600	0	0	14	12 UJ	12 U	12 U	12 U
Chlorobenzene	UG/KG	0	0.0%	1700	0	0	14	12 UJ	12 U	12 U	12 U
Chlorodibromomethane	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Chloroethane	UG/KG	0	0.0%	1900	0	0	14	12 UJ	12 U	12 U	12 U
Chloroform	UG/KG	4	28.6%	300	0	4	14	12 UJ	12 U	12 U	12 U
Cis-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Ethyl benzene	UG/KG	0	0.0%	5500	0	0	14	12 UJ	12 U	12 U	12 U
Methyl bromide	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Methyl butyl ketone	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Methyl chloride	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Methyl ethyl ketone	UG/KG	0	0.0%	300	0	0	14	12 UJ	12 U	12 U	12 U
Methyl isobutyl ketone	UG/KG	0	0.0%	1000	0	0	14	12 UJ	12 U	12 U	12 U
Methylene chloride	UG/KG	0	0.0%	100	0	0	14	12 UJ	12 U	12 U	12 U
Styrene	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Tetrachloroethene	UG/KG	0	0.0%	1400	0	0	14	12 UJ	12 U	12 U	12 U
Toluene	UG/KG	28	92.9%	1500	0	13	14	3 J	2 J	7 J	5 J
Total Xylenes	UG/KG	0	0.0%	1200	0	0	14	12 UJ	12 U	12 U	12 U
Trans-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	12 UJ	12 U	12 U	12 U
Trichloroethene	UG/KG	0	0.0%	700	0	0	14	12 UJ	12 U	12 U	12 U
Vinyl chloride	UG/KG	0	0.0%	200	0	0	14	12 UJ	12 U	12 U	12 U

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C SB121C-1 SOIL EB226 0 0.2 3/9/98 SA EBS	SEAD-121C SB121C-1 SOIL EB231 0 0.2 3/9/98 SA EBS	SEAD-121C SB121C-1 SOIL EB232 2.5 3 3/9/98 SA EBS	SEAD-121C SB121C-2 SOIL EB014 0 0.2 3/9/98 DU EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value Number (^{a})	Number of Exceedances	Number of Detections	Number of Analyses	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)
Semi-Volatiles											
1,2,4-Trichlorobenzene	UG/KG	0	0.0%	3400	0	0	14	73 U	78 U	77 U	73 U
1,2-Dichlorobenzene	UG/KG	0	0.0%	7900	0	0	14	73 U	78 U	77 U	73 U
1,3-Dichlorobenzene	UG/KG	0	0.0%	1600	0	0	14	73 U	78 U	77 U	73 U
1,4-Dichlorobenzene	UG/KG	0	0.0%	8500	0	0	14	73 U	78 U	77 U	73 U
2,4,5-Trichlorophenol	UG/KG	0	0.0%	100	0	0	14	180 U	190 U	190 U	180 U
2,4,6-Trichlorophenol	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
2,4-Dichlorophenol	UG/KG	0	0.0%	400	0	0	14	73 U	78 U	77 U	73 U
2,4-Dimethylphenol	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
2,4-Dinitrophenol	UG/KG	0	0.0%	200	0	0	14	180 U	190 U	190 U	180 U
2,4-Dinitrotoluene	UG/KG	45	7.1%		0	1	14	45 J	78 U	77 U	73 U
2,6-Dinitrotoluene	UG/KG	0	0.0%	1000	0	0	14	73 U	78 U	77 U	73 U
2-Chloronaphthalene	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
2-Chlorophenol	UG/KG	0	0.0%	800	0	0	14	73 U	78 U	77 U	73 U
2-Methylnaphthalene	UG/KG	18	50.0%	36400	0	7	14	8.6 J	78 U	77 U	4.3 J
2-Methylphenol	UG/KG	0	0.0%	100	0	0	14	73 U	78 U	77 U	73 U
2-Nitroaniline	UG/KG	0	0.0%	430	0	0	14	180 U	190 U	190 U	180 U
2-Nitrophenol	UG/KG	0	0.0%	330	0	0	14	73 U	78 U	77 U	73 U
3,3'-Dichlorobenzidine	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
3-Nitroaniline	UG/KG	0	0.0%	500	0	0	14	180 U	190 U	190 U	180 U
4,6-Dinitro-2-methylphenol	UG/KG	0	0.0%		0	0	14	180 U	190 U	190 U	180 U
4-Bromophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
4-Chloro-3-methylphenol	UG/KG	0	0.0%	240	0	0	14	73 U	78 U	77 U	73 U
4-Chloroaniline	UG/KG	0	0.0%	220	0	0	14	73 U	78 U	77 U	73 U
4-Chlorophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
4-Methylphenol	UG/KG	0	0.0%	900	0	0	14	73 U	78 U	77 U	73 U
4-Nitroaniline	UG/KG	0	0.0%		0	0	14	180 U	190 U	190 U	180 U
4-Nitrophenol	UG/KG	0	0.0%	100	0	0	14	180 U	190 U	190 U	180 U
Acenaphthene	UG/KG	52	50.0%	50000	0	7	14	32 J	78 U	77 U	6.8 J
Acenaphthylene	UG/KG	0	0.0%	41000	0	0	14	73 U	78 U	77 U	73 U
Anthracene	UG/KG	96	50.0%	50000	0	7	14	52 J	78 U	77 U	15 J

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-1	SB121C-1	SB121C-1	SB121C-2
								SOIL	SOIL	SOIL	SOIL
								EB226	EB231	EB232	EB014
								0	0	2.5	0
								0.2	0.2	3	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	DU
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Semi-Volatiles											
Benzo(a)anthracene	UG/KG	420	85.7%	224	2	12	14	180	78 U	4.6 J	76
Benzo(a)pyrene	UG/KG	370	71.4%	61	4	10	14	150	78 U	6.3 J	57 J
Benzo(b)fluoranthene	UG/KG	530	78.6%	1100	0	11	14	200	78 U	6.6 J	95
Benzo(ghi)perylene	UG/KG	380	71.4%	50000	0	10	14	98	78 U	12 J	42 J
Benzo(k)fluoranthene	UG/KG	390	71.4%	1100	0	10	14	150	78 U	5.7 J	67 J
Bis(2-Chloroethoxy)methane	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
Bis(2-Chloroethyl)ether	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
Bis(2-Chloroisopropyl)ether	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
Bis(2-Ethylhexyl)phthalate	UG/KG	200	85.7%	50000	0	12	14	73 U	13 J	10 J	73 U
Butylbenzylphthalate	UG/KG	24	28.6%	50000	0	4	14	73 U	78 U	77 U	73 U
Carbazole	UG/KG	130	50.0%		0	7	14	73 J	78 U	77 U	17 J
Chrysene	UG/KG	510	85.7%	400	1	12	14	210	78 U	5.5 J	90
Di-n-butylphthalate	UG/KG	50	42.9%	8100	0	6	14	73 U	78 U	77 U	73 U
Di-n-octylphthalate	UG/KG	17	35.7%	50000	0	5	14	73 U	9.9 J	9.8 J	73 U
Dibenz(a,h)anthracene	UG/KG	150	57.1%	14	6	8	14	43 J	78 U	9.7 J	21 J
Dibenzofuran	UG/KG	22	42.9%	6200	0	6	14	19 J	78 U	77 U	5.1 J
Diethyl phthalate	UG/KG	18	78.6%	7100	0	11	14	73 U	5.8 J	8.9 J	73 U
Dimethylphthalate	UG/KG	0	0.0%	2000	0	0	14	73 U	78 U	77 U	73 U
Fluoranthene	UG/KG	820	85.7%	50000	0	12	14	520	78 U	4.8 J	180
Fluorene	UG/KG	43	50.0%	50000	0	7	14	32 J	78 U	77 U	8 J
Hexachlorobenzene	UG/KG	8.5	7.1%	410	0	1	14	8.5 J	78 U	77 U	73 U
Hexachlorobutadiene	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
Hexachlorocyclopentadiene	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
Hexachloroethane	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
Indeno(1,2,3-cd)pyrene	UG/KG	350	71.4%	3200	0	10	14	94	78 U	8.6 J	41 J
Isophorone	UG/KG	0	0.0%	4400	0	0	14	73 U	78 U	77 U	73 U
N-Nitrosodiphenylamine	UG/KG	4.8	7.1%		0	1	14	4.8 J	78 U	77 U	73 U
N-Nitrosodipropylamine	UG/KG	0	0.0%		0	0	14	73 U	78 U	77 U	73 U
Naphthalene	UG/KG	14	42.9%	13000	0	6	14	11 J	78 U	77 U	73 U
Nitrobenzene	UG/KG	0	0.0%	200	0	0	14	73 U	78 U	77 U	73 U
Pentachlorophenol	UG/KG	0	0.0%	1000	0	0	14	180 U	190 UJ	190 U	180 U
Phenanthrene	UG/KG	520	78.6%	50000	0	11	14	360	78 U	77 U	96
Phenol	UG/KG	0	0.0%	30	0	0	14	73 U	78 U	77 U	73 U
Pyrene	UG/KG	820	85.7%	50000	0	12	14	380	78 U	4.7 J	170

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-1	SB121C-1	SB121C-1	SB121C-2
								SOIL	SOIL	SOIL	SOIL
								EB226	EB231	EB232	EB014
								0	0	2.5	0
								0.2	0.2	3	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	DU
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (a)**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q[b])**	**Value (Q[b])**	**Value (Q[b])**	**Value (Q[b])**
Pesticides											
4,4'-DDD	UG/KG	7.4	7.1%	2900	0	1	14	3.7 U	3.9 U	3.8 U	3.7 U
4,4'-DDE	UG/KG	69	64.3%	2100	0	9	14	13	3.9 U	3.8 U	29
4,4'-DDT	UG/KG	100	57.1%	2100	0	8	14	18	3.9 U	3.8 U	35
Aldrin	UG/KG	0	0.0%	41	0	0	14	1.8 U	2 U	2 U	1.8 U
Alpha-BHC	UG/KG	0	0.0%	110	0	0	14	1.8 U	2 U	2 U	2 R
Alpha-Chlordane	UG/KG	1	7.1%		0	1	14	1.8 U	2 U	2 U	1.8 U
Aroclor-1016	UG/KG	0	0.0%		0	0	14	37 U	39 U	38 U	37 UJ
Aroclor-1221	UG/KG	0	0.0%		0	0	14	74 U	79 U	78 U	74 UJ
Aroclor-1232	UG/KG	0	0.0%		0	0	14	37 U	39 U	38 U	37 UJ
Aroclor-1242	UG/KG	58	7.1%		0	1	14	37 U	39 U	38 U	37 UJ
Aroclor-1248	UG/KG	0	0.0%		0	0	14	37 U	39 U	38 U	37 UJ
Aroclor-1254	UG/KG	79	14.3%	10000	0	2	14	37 U	39 U	38 U	37 UJ
Aroclor-1260	UG/KG	200	35.7%	10000	0	5	14	37 U	39 U	38 U	30 J
Beta-BHC	UG/KG	0	0.0%	200	0	0	14	1.8 U	2 U	2 U	1.8 UJ
Delta-BHC	UG/KG	2	28.6%	300	0	4	14	1.8 U	2 U	2 U	0.95 J
Dieldrin	UG/KG	0	0.0%	44	0	0	14	3.7 U	3.9 U	3.8 U	3.7 UJ
Endosulfan I	UG/KG	0	0.0%	900	0	0	14	1.8 U	2 U	2 U	1.8 UJ
Endosulfan II	UG/KG	0	0.0%	900	0	0	14	3.7 U	3.9 U	3.8 U	3.7 UJ
Endosulfan sulfate	UG/KG	0	0.0%	1000	0	0	14	3.7 U	3.9 U	3.8 U	3.7 UJ
Endrin	UG/KG	0	0.0%	100	0	0	14	3.7 U	3.9 U	3.8 U	3.7 UJ
Endrin aldehyde	UG/KG	0	0.0%		0	0	14	3.7 U	3.9 U	3.8 U	3.7 UJ
Endrin ketone	UG/KG	3.8	7.1%		0	1	14	3.7 U	3.9 U	3.8 U	3.7 UJ
Gamma-BHC/Lindane	UG/KG	0	0.0%	60	0	0	14	1.8 U	2 U	2 U	1.8 UJ
Gamma-Chlordane	UG/KG	1.2	7.1%	540	0	1	14	1.8 U	2 U	2 U	1.8 UJ
Heptachlor	UG/KG	2.1	7.1%	100	0	1	14	1.8 U	2 U	2 U	1.8 UJ
Heptachlor epoxide	UG/KG	2.8	21.4%	20	0	3	14	1.8 U	2 U	2 U	1.8 UJ
Methoxychlor	UG/KG	0	0.0%		0	0	14	18 U	20 U	20 U	18 UJ
Toxaphene	UG/KG	0	0.0%		0	0	14	180 U	200 U	200 U	180 UJ

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-1	SB121C-1	SB121C-1	SB121C-2
								SOIL	SOIL	SOIL	SOIL
								EB226	EB231	EB232	EB014
								0	0	2.5	0
								0.2	0.2	3	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	DU
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^{b})**	**Value (Q^{b})**	**Value (Q^{b})**	**Value (Q^{b})**
Metals											
Aluminum	MG/KG	16200	100.0%	19300	0	14	14	15100	12800	13400	14500
Antimony	MG/KG	19.3	92.9%	5.9	3	13	14	17.3 J	1.1 J	1.4 J	19.3 J
Arsenic	MG/KG	8.1	100.0%	8.2	0	14	14	6.5	5.5	4.4	6.1
Barium	MG/KG	1600	100.0%	300	4	14	14	1420	64.9	64.2	1600
Beryllium	MG/KG	0.72	100.0%	1.1	0	14	14	0.47	0.52	0.72	0.4
Cadmium	MG/KG	21.1	50.0%	2.3	6	7	14	2.3	0.07 U	0.07 U	2.7
Calcium	MG/KG	296000	100.0%	121000	3	14	14	23400	2580	2280	31300
Chromium	MG/KG	49.2	100.0%	29.6	7	14	14	35.2	20.9	21	32.9
Cobalt	MG/KG	19.7	100.0%	30	0	14	14	15.7	12.8	9.4	16.5
Copper	MG/KG	9750	100.0%	33	9	14	14	9750	19.7 J	18.7 J	7690
Cyanide	MG/KG	0	0.0%	0.35	0	0	14	0.56 U	0.63 U	0.65 U	0.59 U
Iron	MG/KG	54100	100.0%	36500	5	14	14	41500	25700	23800	41100
Lead	MG/KG	5280	100.0%	24.8	10	14	14	5080	11.8 J	14.1 J	5280
Magnesium	MG/KG	15400	100.0%	21500	0	14	14	6810	4590	4040	6820
Manganese	MG/KG	752	100.0%	1060	0	14	14	525	598	299	612
Mercury	MG/KG	0.15	50.0%	0.1	2	7	14	0.07	0.06 U	0.05	0.05 U
Nickel	MG/KG	224	100.0%	49	9	14	14	58.5 J	40.5	35.8	54.2 J
Potassium	MG/KG	1990	100.0%	2380	0	14	14	1990	1600	1670	1840
Selenium	MG/KG	0	0.0%	2	0	0	14	1 UJ	1.1 U	1.1 U	0.92 UJ
Silver	MG/KG	21.8	28.6%	0.75	4	4	14	0.46 U	0.48 U	0.48 U	0.41 U
Sodium	MG/KG	606	57.1%	172	6	8	14	392	139 U	138 U	606
Thallium	MG/KG	1.4	7.1%	0.7	1	1	14	1.4 U	1.4 UJ	1.4 UJ	1.2 U
Vanadium	MG/KG	21.8	100.0%	150	0	14	14	20.9 J	20.8	21.8	19.5 J
Zinc	MG/KG	1350	100.0%	110	10	14	14	1350	80.3	70.5	1280
Total Percent Hydrocarbons											
TPH	MG/KG	482				12	14	23.4	16.7 U	90.4	28.3

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C SB121C-2 SOIL EB228 2 2.5 3/9/98 SA EBS	SEAD-121C SB121C-3 SOIL EB233 0 0.2 3/9/98 SA EBS	SEAD-121C SB121C-3 SOIL EB234 2.5 3 3/9/98 SA EBS	SEAD-121C SB121C-4 SOIL EB020 0 0.2 3/9/98 DU EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value Number (^{a})	Number of Exceedances	Number of Detections	Number of Analyses	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)
Volatiles											
1,1,1-Trichloroethane	UG/KG	0	0.0%	800	0	0	14	11 UJ	11 U	11 U	11 UJ
1,1,2,2-Tetrachloroethane	UG/KG	0	0.0%	600	0	0	14	11 UJ	11 U	11 U	11 UJ
1,1,2-Trichloroethane	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
1,1-Dichloroethane	UG/KG	0	0.0%	200	0	0	14	11 UJ	11 U	11 U	11 UJ
1,1-Dichloroethene	UG/KG	0	0.0%	400	0	0	14	11 UJ	11 U	11 U	11 UJ
1,2-Dichloroethane	UG/KG	0	0.0%	100	0	0	14	11 UJ	11 U	11 U	11 UJ
1,2-Dichloroethene (total)	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
1,2-Dichloropropane	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Acetone	UG/KG	28	42.9%	200	0	6	14	11 UJ	11 U	16	10 J
Benzene	UG/KG	2	7.1%	60	0	1	14	2 J	11 U	11 U	11 UJ
Bromodichloromethane	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Bromoform	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Carbon disulfide	UG/KG	0	0.0%	2700	0	0	14	11 UJ	11 U	11 U	11 UJ
Carbon tetrachloride	UG/KG	0	0.0%	600	0	0	14	11 UJ	11 U	11 U	11 UJ
Chlorobenzene	UG/KG	0	0.0%	1700	0	0	14	11 UJ	11 U	11 U	11 UJ
Chlorodibromomethane	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Chloroethane	UG/KG	0	0.0%	1900	0	0	14	11 UJ	11 U	11 U	11 UJ
Chloroform	UG/KG	4	28.6%	300	0	4	14	4 J	11 U	11 U	11 UJ
Cis-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Ethyl benzene	UG/KG	0	0.0%	5500	0	0	14	11 UJ	11 U	11 U	11 UJ
Methyl bromide	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Methyl butyl ketone	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Methyl chloride	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Methyl ethyl ketone	UG/KG	0	0.0%	300	0	0	14	11 UJ	11 U	11 U	11 UJ
Methyl isobutyl ketone	UG/KG	0	0.0%	1000	0	0	14	11 UJ	11 U	11 U	11 UJ
Methylene chloride	UG/KG	0	0.0%	100	0	0	14	11 UJ	11 U	11 U	11 UJ
Styrene	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Tetrachloroethene	UG/KG	0	0.0%	1400	0	0	14	11 UJ	11 U	11 U	11 UJ
Toluene	UG/KG	28	92.9%	1500	0	13	14	5 UJ	2 J	9 J	12 J
Total Xylenes	UG/KG	0	0.0%	1200	0	0	14	11 UJ	11 U	11 U	11 UJ
Trans-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 U	11 UJ
Trichloroethene	UG/KG	0	0.0%	700	0	0	14	11 UJ	11 U	11 U	11 UJ
Vinyl chloride	UG/KG	0	0.0%	200	0	0	14	11 UJ	11 U	11 U	11 UJ

Notes:

(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C SB121C-2 SOIL EB228 2 2.5 3/9/98 SA EBS	SEAD-121C SB121C-3 SOIL EB233 0 0.2 3/9/98 SA EBS	SEAD-121C SB121C-3 SOIL EB234 2.5 3 3/9/98 SA EBS	SEAD-121C SB121C-4 SOIL EB020 0 0.2 3/9/98 DU EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Semi-Volatiles											
1,2,4-Trichlorobenzene	UG/KG	0	0.0%	3400	0	0	14	75 U	72 U	77 U	72 U
1,2-Dichlorobenzene	UG/KG	0	0.0%	7900	0	0	14	75 U	72 U	77 U	72 U
1,3-Dichlorobenzene	UG/KG	0	0.0%	1600	0	0	14	75 U	72 U	77 U	72 U
1,4-Dichlorobenzene	UG/KG	0	0.0%	8500	0	0	14	75 U	72 U	77 U	72 U
2,4,5-Trichlorophenol	UG/KG	0	0.0%	100	0	0	14	180 U	180 U	190 U	170 U
2,4,6-Trichlorophenol	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
2,4-Dichlorophenol	UG/KG	0	0.0%	400	0	0	14	75 U	72 U	77 U	72 U
2,4-Dimethylphenol	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
2,4-Dinitrophenol	UG/KG	0	0.0%	200	0	0	14	180 U	180 U	190 U	170 U
2,4-Dinitrotoluene	UG/KG	45	7.1%		0	1	14	75 U	72 U	77 U	72 U
2,6-Dinitrotoluene	UG/KG	0	0.0%	1000	0	0	14	75 U	72 U	77 U	72 U
2-Chloronaphthalene	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
2-Chlorophenol	UG/KG	0	0.0%	800	0	0	14	75 U	72 U	77 U	72 U
2-Methylnaphthalene	UG/KG	18	50.0%	36400	0	7	14	7 J	5.5 J	8.3 J	72 U
2-Methylphenol	UG/KG	0	0.0%	100	0	0	14	75 U	72 U	77 U	72 U
2-Nitroaniline	UG/KG	0	0.0%	430	0	0	14	180 U	180 U	190 U	170 U
2-Nitrophenol	UG/KG	0	0.0%	330	0	0	14	75 U	72 U	77 U	72 U
3,3'-Dichlorobenzidine	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
3-Nitroaniline	UG/KG	0	0.0%	500	0	0	14	180 U	180 U	190 U	170 U
4,6-Dinitro-2-methylphenol	UG/KG	0	0.0%		0	0	14	180 U	180 U	190 U	170 U
4-Bromophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
4-Chloro-3-methylphenol	UG/KG	0	0.0%	240	0	0	14	75 U	72 U	77 U	72 U
4-Chloroaniline	UG/KG	0	0.0%	220	0	0	14	75 U	72 U	77 U	72 U
4-Chlorophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
4-Methylphenol	UG/KG	0	0.0%	900	0	0	14	75 U	72 U	77 U	72 U
4-Nitroaniline	UG/KG	0	0.0%		0	0	14	180 U	180 U	190 U	170 U
4-Nitrophenol	UG/KG	0	0.0%	100	0	0	14	180 U	180 U	190 U	170 U
Acenaphthene	UG/KG	52	50.0%	50000	0	7	14	20 J	72 U	13 J	72 U
Acenaphthylene	UG/KG	0	0.0%	41000	0	0	14	75 U	72 U	77 U	72 U
Anthracene	UG/KG	96	50.0%	50000	0	7	14	41 J	72 U	19 J	72 U

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-2	SB121C-3	SB121C-3	SB121C-4
								SOIL	SOIL	SOIL	SOIL
								EB228	EB233	EB234	EB020
								2	0	2.5	0
								2.5	0.2	3	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	DU
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Semi-Volatiles											
Benzo(a)anthracene	UG/KG	420	85.7%	224	2	12	14	140	8.2 J	68 J	3.9 J
Benzo(a)pyrene	UG/KG	370	71.4%	61	4	10	14	100	8.1 J	58 J	72 U
Benzo(b)fluoranthene	UG/KG	530	78.6%	1100	0	11	14	110	13 J	74 J	13 J
Benzo(ghi)perylene	UG/KG	380	71.4%	50000	0	10	14	65 J	11 J	54 J	72 U
Benzo(k)fluoranthene	UG/KG	390	71.4%	1100	0	10	14	120	7 J	70 J	72 U
Bis(2-Chloroethoxy)methane	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
Bis(2-Chloroethyl)ether	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
Bis(2-Chloroisopropyl)ether	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
Bis(2-Ethylhexyl)phthalate	UG/KG	200	85.7%	50000	0	12	14	21 J	9.2 J	39 J	9.3 J
Butylbenzylphthalate	UG/KG	24	28.6%	50000	0	4	14	6.4 J	72 U	77 U	72 U
Carbazole	UG/KG	130	50.0%		0	7	14	56 J	72 U	34 J	72 U
Chrysene	UG/KG	510	85.7%	400	1	12	14	160	11 J	82	8.8 J
Di-n-butylphthalate	UG/KG	50	42.9%	8100	0	6	14	19 J	72 U	5.3 J	72 U
Di-n-octylphthalate	UG/KG	17	35.7%	50000	0	5	14	17 J	72 U	77 U	72 U
Dibenz(a,h)anthracene	UG/KG	150	57.1%	14	6	8	14	33 J	72 U	26 J	72 U
Dibenzofuran	UG/KG	22	42.9%	6200	0	6	14	13 J	72 U	8 J	72 U
Diethyl phthalate	UG/KG	18	78.6%	7100	0	11	14	6.8 J	8.5 J	18 J	8.1 J
Dimethylphthalate	UG/KG	0	0.0%	2000	0	0	14	75 U	72 U	77 U	72 U
Fluoranthene	UG/KG	820	85.7%	50000	0	12	14	390	13 J	160	7.4 J
Fluorene	UG/KG	43	50.0%	50000	0	7	14	22 J	72 U	12 J	72 U
Hexachlorobenzene	UG/KG	8.5	7.1%	410	0	1	14	75 U	72 U	77 U	72 U
Hexachlorobutadiene	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
Hexachlorocyclopentadiene	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
Hexachloroethane	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
Indeno(1,2,3-cd)pyrene	UG/KG	350	71.4%	3200	0	10	14	58 J	8.6 J	48 J	72 U
Isophorone	UG/KG	0	0.0%	4400	0	0	14	75 U	72 U	77 U	72 U
N-Nitrosodiphenylamine	UG/KG	4.8	7.1%		0	1	14	75 U	72 U	77 U	72 U
N-Nitrosodipropylamine	UG/KG	0	0.0%		0	0	14	75 U	72 U	77 U	72 U
Naphthalene	UG/KG	14	42.9%	13000	0	6	14	12 J	72 U	6.9 J	72 U
Nitrobenzene	UG/KG	0	0.0%	200	0	0	14	75 U	72 U	77 U	72 U
Pentachlorophenol	UG/KG	0	0.0%	1000	0	0	14	180 UJ	180 U	190 U	170 U
Phenanthrene	UG/KG	520	78.6%	50000	0	11	14	280	8.8 J	110	8.8 J
Phenol	UG/KG	0	0.0%	30	0	0	14	75 U	72 U	77 U	72 U
Pyrene	UG/KG	820	85.7%	50000	0	12	14	290	13 J	130	8.3 J

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-2	SB121C-3	SB121C-3	SB121C-4
								SOIL	SOIL	SOIL	SOIL
								EB228	EB233	EB234	EB020
								2	0	2.5	0
								2.5	0.2	3	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	DU
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Pesticides											
4,4'-DDD	UG/KG	7.4	7.1%	2900	0	1	14	3.8 U	3.6 U	3.8 U	3.6 U
4,4'-DDE	UG/KG	69	64.3%	2100	0	9	14	13	3.6 U	17	3.8
4,4'-DDT	UG/KG	100	57.1%	2100	0	8	14	9.8	3.6 U	16	1.9 J
Aldrin	UG/KG	0	0.0%	41	0	0	14	1.9 U	1.9 U	2 U	1.8 U
Alpha-BHC	UG/KG	0	0.0%	110	0	0	14	1.9 U	1.9 U	2 U	1.8 U
Alpha-Chlordane	UG/KG	1	7.1%		0	1	14	1.9 U	1.9 U	2 U	1.8 U
Aroclor-1016	UG/KG	0	0.0%		0	0	14	38 U	36 U	38 U	36 U
Aroclor-1221	UG/KG	0	0.0%		0	0	14	76 U	74 U	78 U	73 U
Aroclor-1232	UG/KG	0	0.0%		0	0	14	38 U	36 U	38 U	36 U
Aroclor-1242	UG/KG	58	7.1%		0	1	14	38 U	36 U	38 U	36 U
Aroclor-1248	UG/KG	0	0.0%		0	0	14	38 U	36 U	38 U	36 U
Aroclor-1254	UG/KG	79	14.3%	10000	0	2	14	38 U	36 U	38 U	36 U
Aroclor-1260	UG/KG	200	35.7%	10000	0	5	14	200	36 U	21 J	36 U
Beta-BHC	UG/KG	0	0.0%	200	0	0	14	1.9 U	1.9 U	2 U	1.8 U
Delta-BHC	UG/KG	2	28.6%	300	0	4	14	1.3 J	1.9 U	2 U	1.8 U
Dieldrin	UG/KG	0	0.0%	44	0	0	14	3.8 U	3.6 U	3.8 U	3.6 U
Endosulfan I	UG/KG	0	0.0%	900	0	0	14	1.9 U	1.9 U	2 U	1.8 U
Endosulfan II	UG/KG	0	0.0%	900	0	0	14	3.8 U	3.6 U	3.8 U	3.6 U
Endosulfan sulfate	UG/KG	0	0.0%	1000	0	0	14	3.8 U	3.6 U	3.8 U	3.6 U
Endrin	UG/KG	0	0.0%	100	0	0	14	3.8 U	3.6 U	3.8 U	3.6 U
Endrin aldehyde	UG/KG	0	0.0%		0	0	14	3.8 U	3.6 U	3.8 U	3.6 U
Endrin ketone	UG/KG	3.8	7.1%		0	1	14	3.8 U	3.6 U	3.8 U	3.6 U
Gamma-BHC/Lindane	UG/KG	0	0.0%	60	0	0	14	1.9 U	1.9 U	2 U	1.8 U
Gamma-Chlordane	UG/KG	1.2	7.1%	540	0	1	14	1.9 U	1.9 U	2 U	1.8 U
Heptachlor	UG/KG	2.1	7.1%	100	0	1	14	1.9 U	1.9 U	2 U	1.8 U
Heptachlor epoxide	UG/KG	2.8	21.4%	20	0	3	14	1.1 J	1.9 U	2 U	1.8 U
Methoxychlor	UG/KG	0	0.0%		0	0	14	19 U	19 U	20 U	18 U
Toxaphene	UG/KG	0	0.0%		0	0	14	190 U	190 U	200 U	180 U

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-2	SB121C-3	SB121C-3	SB121C-4
								SOIL	SOIL	SOIL	SOIL
								EB228	EB233	EB234	EB020
								2	0	2.5	0
								2.5	0.2	3	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	DU
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Metals											
Aluminum	MG/KG	16200	100.0%	19300	0	14	14	16200	1730	8880	14400
Antimony	MG/KG	19.3	92.9%	5.9	3	13	14	**11.5** J	0.93 J	0.98 J	1.7 J
Arsenic	MG/KG	8.1	100.0%	8.2	0	14	14	8.1	3.8	4.6	5
Barium	MG/KG	1600	100.0%	300	4	14	14	**1050**	18.1	46.3	86.6
Beryllium	MG/KG	0.72	100.0%	1.1	0	14	14	0.43	0.25	0.32	0.57
Cadmium	MG/KG	21.1	50.0%	2.3	6	7	14	**8.1**	0.07 U	0.07 U	0.07 U
Calcium	MG/KG	296000	100.0%	121000	3	14	14	31600	**283000**	97200	17200
Chromium	MG/KG	49.2	100.0%	29.6	7	14	14	**37**	3.8	13.1	27.8
Cobalt	MG/KG	19.7	100.0%	30	0	14	14	16	3.5	7.7	17.6
Copper	MG/KG	9750	100.0%	33	9	14	14	**2440** J	8.8 J	20.6 J	**39.1** J
Cyanide	MG/KG	0	0.0%	0.35	0	0	14	0.63 U	0.58 U	0.58 U	0.56 U
Iron	MG/KG	54100	100.0%	36500	5	14	14	**54100**	4230	16500	32000
Lead	MG/KG	5280	100.0%	24.8	10	14	14	**1780**	11.7 J	**39.9** J	**27.1**
Magnesium	MG/KG	15400	100.0%	21500	0	14	14	6480	10200	8000	6980
Manganese	MG/KG	752	100.0%	1060	0	14	14	752	213	473	413
Mercury	MG/KG	0.15	50.0%	0.1	2	7	14	0.07	0.04 U	0.06 U	0.04 U
Nickel	MG/KG	224	100.0%	49	9	14	14	**56.6**	11.6	22.3	**61.8**
Potassium	MG/KG	1990	100.0%	2380	0	14	14	1220	1150	1500	1980
Selenium	MG/KG	0	0.0%	2	0	0	14	0.97 U	1 U	1.1 U	1 U
Silver	MG/KG	21.8	28.6%	0.75	4	4	14	0.43 U	0.46 U	0.49 U	0.46 U
Sodium	MG/KG	606	57.1%	172	6	8	14	**214**	132 U	141 U	132 U
Thallium	MG/KG	1.4	7.1%	0.7	1	1	14	1.3 UJ	1.4 UJ	1.5 UJ	**1.4** J
Vanadium	MG/KG	21.8	100.0%	150	0	14	14	19.3	5.1	14.4	21
Zinc	MG/KG	1350	100.0%	110	10	14	14	**691**	29.8	77.6	**153**
Total Percent Hydrocarbons											
TPH	MG/KG	482				12	14	18.5	19	213	413

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-4	SB121C-4	SS121C-1	SS121C-2
								SOIL	SOIL	SOIL	SOIL
								EB229	EB230	EB235	EB236
								0	2.5	0	0
								0.2	3	0.2	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	SA
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Volatiles											
1,1,1-Trichloroethane	UG/KG	0	0.0%	800	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
1,1,2,2-Tetrachloroethane	UG/KG	0	0.0%	600	0	0	14	11 UJ	11 U	11 UJ	11 UJ
1,1,2-Trichloroethane	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 UJ	11 UJ
1,1-Dichloroethane	UG/KG	0	0.0%	200	0	0	14	11 UJ	11 U	11 UJ	11 UJ
1,1-Dichloroethene	UG/KG	0	0.0%	400	0	0	14	11 UJ	11 U	11 UJ	11 UJ
1,2-Dichloroethane	UG/KG	0	0.0%	100	0	0	14	11 UJ	11 U	11 UJ	11 UJ
1,2-Dichloroethene (total)	UG/KG	0	0.0%		0	0	14	11 UJ	11 U	11 UJ	11 UJ
1,2-Dichloropropane	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Acetone	UG/KG	28	42.9%	200	0	6	14	11 UJ	28 J	10 J	11 UJ
Benzene	UG/KG	2	7.1%	60	0	1	14	11 UJ	11 UJ	11 UJ	11 UJ
Bromodichloromethane	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Bromoform	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Carbon disulfide	UG/KG	0	0.0%	2700	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Carbon tetrachloride	UG/KG	0	0.0%	600	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Chlorobenzene	UG/KG	0	0.0%	1700	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Chlorodibromomethane	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Chloroethane	UG/KG	0	0.0%	1900	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Chloroform	UG/KG	4	28.6%	300	0	4	14	4 J	2 J	11 UJ	11 UJ
Cis-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Ethyl benzene	UG/KG	0	0.0%	5500	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Methyl bromide	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Methyl butyl ketone	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Methyl chloride	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Methyl ethyl ketone	UG/KG	0	0.0%	300	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Methyl isobutyl ketone	UG/KG	0	0.0%	1000	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Methylene chloride	UG/KG	0	0.0%	100	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Styrene	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Tetrachloroethene	UG/KG	0	0.0%	1400	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Toluene	UG/KG	28	92.9%	1500	0	13	14	10 J	4 J	9 J	28 J
Total Xylenes	UG/KG	0	0.0%	1200	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Trans-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Trichloroethene	UG/KG	0	0.0%	700	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ
Vinyl chloride	UG/KG	0	0.0%	200	0	0	14	11 UJ	11 UJ	11 UJ	11 UJ

Notes:

(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-4	SB121C-4	SS121C-1	SS121C-2
								SOIL	SOIL	SOIL	SOIL
								EB229	EB230	EB235	EB236
								0	2.5	0	0
								0.2	3	0.2	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	SA
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Semi-Volatiles											
1,2,4-Trichlorobenzene	UG/KG	0	0.0%	3400	0	0	14	71 U	76 U	72 U	69 U
1,2-Dichlorobenzene	UG/KG	0	0.0%	7900	0	0	14	71 U	76 U	72 U	69 U
1,3-Dichlorobenzene	UG/KG	0	0.0%	1600	0	0	14	71 U	76 U	72 U	69 U
1,4-Dichlorobenzene	UG/KG	0	0.0%	8500	0	0	14	71 U	76 U	72 U	69 U
2,4,5-Trichlorophenol	UG/KG	0	0.0%	100	0	0	14	170 U	180 U	180 U	170 U
2,4,6-Trichlorophenol	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
2,4-Dichlorophenol	UG/KG	0	0.0%	400	0	0	14	71 U	76 U	72 U	69 U
2,4-Dimethylphenol	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
2,4-Dinitrophenol	UG/KG	0	0.0%	200	0	0	14	170 U	180 U	180 U	170 U
2,4-Dinitrotoluene	UG/KG	45	7.1%		0	1	14	71 U	76 U	72 U	69 U
2,6-Dinitrotoluene	UG/KG	0	0.0%	1000	0	0	14	71 U	76 U	72 U	69 U
2-Chloronaphthalene	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
2-Chlorophenol	UG/KG	0	0.0%	800	0	0	14	71 U	76 U	72 U	69 U
2-Methylnaphthalene	UG/KG	18	50.0%	36400	0	7	14	71 U	76 U	72 U	69 U
2-Methylphenol	UG/KG	0	0.0%	100	0	0	14	71 U	76 U	72 U	69 U
2-Nitroaniline	UG/KG	0	0.0%	430	0	0	14	170 U	180 U	180 U	170 U
2-Nitrophenol	UG/KG	0	0.0%	330	0	0	14	71 U	76 U	72 U	69 U
3,3'-Dichlorobenzidine	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
3-Nitroaniline	UG/KG	0	0.0%	500	0	0	14	170 U	180 U	180 U	170 U
4,6-Dinitro-2-methylphenol	UG/KG	0	0.0%		0	0	14	170 U	180 U	180 U	170 U
4-Bromophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
4-Chloro-3-methylphenol	UG/KG	0	0.0%	240	0	0	14	71 U	76 U	72 U	69 U
4-Chloroaniline	UG/KG	0	0.0%	220	0	0	14	71 U	76 U	72 U	69 U
4-Chlorophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
4-Methylphenol	UG/KG	0	0.0%	900	0	0	14	71 U	76 U	72 U	69 U
4-Nitroaniline	UG/KG	0	0.0%		0	0	14	170 U	180 U	180 U	170 U
4-Nitrophenol	UG/KG	0	0.0%	100	0	0	14	170 U	180 U	180 U	170 U
Acenaphthene	UG/KG	52	50.0%	50000	0	7	14	71 U	76 U	72 U	6.5 J
Acenaphthylene	UG/KG	0	0.0%	41000	0	0	14	71 U	76 U	72 U	69 U
Anthracene	UG/KG	96	50.0%	50000	0	7	14	71 U	76 U	72 U	6.5 J

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1

March 1998 Soil Sample Results, SEAD 121C DRMO Yard

Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area

Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-4	SB121C-4	SS121C-1	SS121C-2
								SOIL	SOIL	SOIL	SOIL
								EB229	EB230	EB235	EB236
								0	2.5	0	0
								0.2	3	0.2	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	SA
								EBS	EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Semi-Volatiles											
Benzo(a)anthracene	UG/KG	420	85.7%	224	2	12	14	7 J	4.6 J	72 U	30 J
Benzo(a)pyrene	UG/KG	370	71.4%	61	4	10	14	71 U	6 J	72 U	28 J
Benzo(b)fluoranthene	UG/KG	530	78.6%	1100	0	11	14	71 U	5.8 J	72 U	40 J
Benzo(ghi)perylene	UG/KG	380	71.4%	50000	0	10	14	71 U	6.2 J	72 U	15 J
Benzo(k)fluoranthene	UG/KG	390	71.4%	1100	0	10	14	71 U	6.7 J	72 U	29 J
Bis(2-Chloroethoxy)methane	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
Bis(2-Chloroethyl)ether	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
Bis(2-Chloroisopropyl)ether	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
Bis(2-Ethylhexyl)phthalate	UG/KG	200	85.7%	50000	0	12	14	13 J	14 J	7.2 J	9.2 J
Butylbenzylphthalate	UG/KG	24	28.6%	50000	0	4	14	71 U	76 U	72 U	7.8 J
Carbazole	UG/KG	130	50.0%		0	7	14	71 U	76 U	72 U	14 J
Chrysene	UG/KG	510	85.7%	400	1	12	14	12 J	7.8 J	72 U	35 J
Di-n-butylphthalate	UG/KG	50	42.9%	8100	0	6	14	3.7 J	76 U	8.2 J	69 U
Di-n-octylphthalate	UG/KG	17	35.7%	50000	0	5	14	71 U	3.9 J	72 U	3.8 J
Dibenz(a,h)anthracene	UG/KG	150	57.1%	14	6	8	14	71 U	76 U	72 U	7.6 J
Dibenzofuran	UG/KG	22	42.9%	6200	0	6	14	71 U	76 U	72 U	69 U
Diethyl phthalate	UG/KG	18	78.6%	7100	0	11	14	10 J	4.7 J	11 J	9.4 J
Dimethylphthalate	UG/KG	0	0.0%	2000	0	0	14	71 U	76 U	72 U	69 U
Fluoranthene	UG/KG	820	85.7%	50000	0	12	14	10 J	9.6 J	72 U	65 J
Fluorene	UG/KG	43	50.0%	50000	0	7	14	71 U	76 U	72 U	5 J
Hexachlorobenzene	UG/KG	8.5	7.1%	410	0	1	14	71 U	76 U	72 U	69 U
Hexachlorobutadiene	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
Hexachlorocyclopentadiene	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
Hexachloroethane	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
Indeno(1,2,3-cd)pyrene	UG/KG	350	71.4%	3200	0	10	14	71 U	5.9 J	72 U	17 J
Isophorone	UG/KG	0	0.0%	4400	0	0	14	71 U	76 U	72 U	69 U
N-Nitrosodiphenylamine	UG/KG	4.8	7.1%		0	1	14	71 U	76 U	72 U	69 U
N-Nitrosodipropylamine	UG/KG	0	0.0%		0	0	14	71 U	76 U	72 U	69 U
Naphthalene	UG/KG	14	42.9%	13000	0	6	14	71 U	76 U	72 U	4 J
Nitrobenzene	UG/KG	0	0.0%	200	0	0	14	71 U	76 U	72 U	69 U
Pentachlorophenol	UG/KG	0	0.0%	1000	0	0	14	170 U	180 UJ	180 U	170 UJ
Phenanthrene	UG/KG	520	78.6%	50000	0	11	14	7.6 J	5.9 J	72 U	38 J
Phenol	UG/KG	0	0.0%	30	0	0	14	71 U	76 U	72 U	69 U
Pyrene	UG/KG	820	85.7%	50000	0	12	14	14 J	8.1 J	72 U	53 J

Notes:

(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-4	SB121C-4	SS121C-1	SS121C-2
								SOIL	SOIL	SOIL	SOIL
								EB229	EB230	EB235	EB236
								0	2.5	0	0
								0.2	3	0.2	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	SA
								EBS	EBS	EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value Number (^{a})	Number of Exceedances	Number of Detections	Number of Analyses	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)
Pesticides											
4,4'-DDD	UG/KG	7.4	7.1%	2900	0	1	14	3.5 U	3.8 U	3.6 U	3.5 U
4,4'-DDE	UG/KG	69	64.3%	2100	0	9	14	4.5	2.5 J	3.6 U	3.5 U
4,4'-DDT	UG/KG	100	57.1%	2100	0	8	14	2.3 J	3.8 U	3.6 U	3.5 U
Aldrin	UG/KG	0	0.0%	41	0	0	14	1.8 U	2 U	1.9 U	1.8 U
Alpha-BHC	UG/KG	0	0.0%	110	0	0	14	1.8 U	2 U	1.9 U	1.8 U
Alpha-Chlordane	UG/KG	1	7.1%		0	1	14	1.8 U	2 U	1.9 U	1.8 U
Aroclor-1016	UG/KG	0	0.0%		0	0	14	35 U	38 U	36 U	35 U
Aroclor-1221	UG/KG	0	0.0%		0	0	14	72 U	77 U	74 U	70 U
Aroclor-1232	UG/KG	0	0.0%		0	0	14	35 U	38 U	36 U	35 U
Aroclor-1242	UG/KG	58	7.1%		0	1	14	35 U	38 U	36 U	35 U
Aroclor-1248	UG/KG	0	0.0%		0	0	14	35 U	38 U	36 U	35 U
Aroclor-1254	UG/KG	79	14.3%	10000	0	2	14	35 U	38 U	36 U	35 U
Aroclor-1260	UG/KG	200	35.7%	10000	0	5	14	35 U	38 U	36 U	35 U
Beta-BHC	UG/KG	0	0.0%	200	0	0	14	1.8 U	2 U	1.9 U	1.8 U
Delta-BHC	UG/KG	2	28.6%	300	0	4	14	1.8 U	2 U	1.9 U	1.8 U
Dieldrin	UG/KG	0	0.0%	44	0	0	14	3.5 U	3.8 U	3.6 U	3.5 U
Endosulfan I	UG/KG	0	0.0%	900	0	0	14	1.8 U	2 U	1.9 U	1.8 U
Endosulfan II	UG/KG	0	0.0%	900	0	0	14	3.5 U	3.8 U	3.6 U	3.5 U
Endosulfan sulfate	UG/KG	0	0.0%	1000	0	0	14	3.5 U	3.8 U	3.6 U	3.5 U
Endrin	UG/KG	0	0.0%	100	0	0	14	3.5 U	3.8 U	3.6 U	3.5 U
Endrin aldehyde	UG/KG	0	0.0%		0	0	14	3.5 U	3.8 U	3.6 U	3.5 U
Endrin ketone	UG/KG	3.8	7.1%		0	1	14	3.5 U	3.8 U	3.6 U	3.5 U
Gamma-BHC/Lindane	UG/KG	0	0.0%	60	0	0	14	1.8 U	2 U	1.9 U	1.8 U
Gamma-Chlordane	UG/KG	1.2	7.1%	540	0	1	14	1.8 U	2 U	1.9 U	1.8 U
Heptachlor	UG/KG	2.1	7.1%	100	0	1	14	1.8 U	2 U	1.9 U	1.8 U
Heptachlor epoxide	UG/KG	2.8	21.4%	20	0	3	14	1.8 U	2 U	1.9 U	1.8 U
Methoxychlor	UG/KG	0	0.0%		0	0	14	18 U	20 U	19 U	18 U
Toxaphene	UG/KG	0	0.0%		0	0	14	180 U	200 U	190 U	180 U

Notes:

(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.

(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C	SEAD-121C	SEAD-121C
								SB121C-4	SB121C-4	SS121C-1	SS121C-2
								SOIL	SOIL	SOIL	SOIL
								EB229	EB230	EB235	EB236
								0	2.5	0	0
								0.2	3	0.2	0.2
								3/9/98	3/9/98	3/9/98	3/9/98
								SA	SA	SA	SA
								EBS	EBS	EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value Number (^{a})	Number of Exceedances	Number of Detections	Number of Analyses	Value (Q^b)	Value (Q^b)	Value (Q^b)	Value (Q^b)
Metals											
Aluminum	MG/KG	16200	100.0%	19300	0	14	14	13000	15700	12800	12600
Antimony	MG/KG	19.3	92.9%	5.9	3	13	14	0.81 J	0.69 UJ	2.5 J	2.2 J
Arsenic	MG/KG	8.1	100.0%	8.2	0	14	14	3.7	6.4	5.2	6.3
Barium	MG/KG	1600	100.0%	300	4	14	14	69.6	72.4	57.7	252
Beryllium	MG/KG	0.72	100.0%	1.1	0	14	14	0.49	0.63	0.56	0.48
Cadmium	MG/KG	21.1	50.0%	2.3	6	7	14	0.05 U	0.06 U	21.1	7.1
Calcium	MG/KG	296000	100.0%	121000	3	14	14	25500	13000	11800	53100
Chromium	MG/KG	49.2	100.0%	29.6	7	14	14	22.6	30	32.9	45.7
Cobalt	MG/KG	19.7	100.0%	30	0	14	14	12.5	19.7	14	15.5
Copper	MG/KG	9750	100.0%	33	9	14	14	33 J	39.1 J	139 J	324 J
Cyanide	MG/KG	0	0.0%	0.35	0	0	14	0.61 U	0.63 U	0.62 U	0.53 U
Iron	MG/KG	54100	100.0%	36500	5	14	14	25900	35600	41300	43600
Lead	MG/KG	5280	100.0%	24.8	10	14	14	23.5 J	26 J	78.2 J	251
Magnesium	MG/KG	15400	100.0%	21500	0	14	14	5630	7500	6220	12800
Manganese	MG/KG	752	100.0%	1060	0	14	14	359	394	364	403
Mercury	MG/KG	0.15	50.0%	0.1	2	7	14	0.04 U	0.06	0.05 U	0.1
Nickel	MG/KG	224	100.0%	49	9	14	14	49.3	69.7	58.6	224
Potassium	MG/KG	1990	100.0%	2380	0	14	14	1450	1870	1480	1890
Selenium	MG/KG	0	0.0%	2	0	0	14	0.8 U	0.92 U	1 U	0.99 U
Silver	MG/KG	21.8	28.6%	0.75	4	4	14	0.36 U	0.41 U	21.8	1.3
Sodium	MG/KG	606	57.1%	172	6	8	14	110	119 U	223	196
Thallium	MG/KG	1.4	7.1%	0.7	1	1	14	1.1 UJ	1.2 UJ	1.4 UJ	1.3 UJ
Vanadium	MG/KG	21.8	100.0%	150	0	14	14	17	21.7	18.6	20.1
Zinc	MG/KG	1350	100.0%	110	10	14	14	196	158	585	431
Total Percent Hydrocarbons											
TPH	MG/KG	482				12	14	303	38.4	19.3 U	109

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C
								SS121C-3	SS121C-4
								SOIL	SOIL
								EB237	EB241
								0	0
								0.2	0.2
								3/9/98	3/10/98
								SA	SA
								EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**
Volatiles									
1,1,1-Trichloroethane	UG/KG	0	0.0%	800	0	0	14	11 U	11 U
1,1,2,2-Tetrachloroethane	UG/KG	0	0.0%	600	0	0	14	11 U	11 U
1,1,2-Trichloroethane	UG/KG	0	0.0%		0	0	14	11 U	11 U
1,1-Dichloroethane	UG/KG	0	0.0%	200	0	0	14	11 U	11 U
1,1-Dichloroethene	UG/KG	0	0.0%	400	0	0	14	11 U	11 U
1,2-Dichloroethane	UG/KG	0	0.0%	100	0	0	14	11 U	11 U
1,2-Dichloroethene (total)	UG/KG	0	0.0%		0	0	14	11 U	11 U
1,2-Dichloropropane	UG/KG	0	0.0%		0	0	14	11 U	11 U
Acetone	UG/KG	28	42.9%	200	0	6	14	11 U	11 U
Benzene	UG/KG	2	7.1%	60	0	1	14	11 U	11 U
Bromodichloromethane	UG/KG	0	0.0%		0	0	14	11 U	11 U
Bromoform	UG/KG	0	0.0%		0	0	14	11 U	11 U
Carbon disulfide	UG/KG	0	0.0%	2700	0	0	14	11 U	11 U
Carbon tetrachloride	UG/KG	0	0.0%	600	0	0	14	11 U	11 U
Chlorobenzene	UG/KG	0	0.0%	1700	0	0	14	11 U	11 U
Chlorodibromomethane	UG/KG	0	0.0%		0	0	14	11 U	11 U
Chloroethane	UG/KG	0	0.0%	1900	0	0	14	11 U	11 U
Chloroform	UG/KG	4	28.6%	300	0	4	14	11 U	4 J
Cis-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	11 U	11 U
Ethyl benzene	UG/KG	0	0.0%	5500	0	0	14	11 U	11 U
Methyl bromide	UG/KG	0	0.0%		0	0	14	11 U	11 U
Methyl butyl ketone	UG/KG	0	0.0%		0	0	14	11 U	11 U
Methyl chloride	UG/KG	0	0.0%		0	0	14	11 U	11 U
Methyl ethyl ketone	UG/KG	0	0.0%	300	0	0	14	11 U	11 U
Methyl isobutyl ketone	UG/KG	0	0.0%	1000	0	0	14	11 U	11 U
Methylene chloride	UG/KG	0	0.0%	100	0	0	14	11 U	11 U
Styrene	UG/KG	0	0.0%		0	0	14	11 U	11 U
Tetrachloroethene	UG/KG	0	0.0%	1400	0	0	14	11 U	11 U
Toluene	UG/KG	28	92.9%	1500	0	13	14	4 J	16
Total Xylenes	UG/KG	0	0.0%	1200	0	0	14	11 U	11 U
Trans-1,3-Dichloropropene	UG/KG	0	0.0%		0	0	14	11 U	11 U
Trichloroethene	UG/KG	0	0.0%	700	0	0	14	11 U	11 U
Vinyl chloride	UG/KG	0	0.0%	200	0	0	14	11 U	11 U

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C SS121C-3 SOIL EB237 0 0.2 3/9/98 SA EBS	SEAD-121C SS121C-4 SOIL EB241 0 0.2 3/10/98 SA EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**
Semi-Volatiles									
1,2,4-Trichlorobenzene	UG/KG	0	0.0%	3400	0	0	14	180 U	170 U
1,2-Dichlorobenzene	UG/KG	0	0.0%	7900	0	0	14	180 U	170 U
1,3-Dichlorobenzene	UG/KG	0	0.0%	1600	0	0	14	180 U	170 U
1,4-Dichlorobenzene	UG/KG	0	0.0%	8500	0	0	14	180 U	170 U
2,4,5-Trichlorophenol	UG/KG	0	0.0%	100	0	0	14	440 U	420 U
2,4,6-Trichlorophenol	UG/KG	0	0.0%		0	0	14	180 U	170 U
2,4-Dichlorophenol	UG/KG	0	0.0%	400	0	0	14	180 U	170 U
2,4-Dimethylphenol	UG/KG	0	0.0%		0	0	14	180 U	170 U
2,4-Dinitrophenol	UG/KG	0	0.0%	200	0	0	14	440 U	420 U
2,4-Dinitrotoluene	UG/KG	45	7.1%		0	1	14	180 U	170 U
2,6-Dinitrotoluene	UG/KG	0	0.0%	1000	0	0	14	180 U	170 U
2-Chloronaphthalene	UG/KG	0	0.0%		0	0	14	180 U	170 U
2-Chlorophenol	UG/KG	0	0.0%	800	0	0	14	180 U	170 U
2-Methylnaphthalene	UG/KG	18	50.0%	36400	0	7	14	18 J	9.9 J
2-Methylphenol	UG/KG	0	0.0%	100	0	0	14	180 U	170 U
2-Nitroaniline	UG/KG	0	0.0%	430	0	0	14	440 U	420 U
2-Nitrophenol	UG/KG	0	0.0%	330	0	0	14	180 U	170 U
3,3'-Dichlorobenzidine	UG/KG	0	0.0%		0	0	14	180 U	170 U
3-Nitroaniline	UG/KG	0	0.0%	500	0	0	14	440 U	420 U
4,6-Dinitro-2-methylphenol	UG/KG	0	0.0%		0	0	14	440 U	420 U
4-Bromophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	180 U	170 U
4-Chloro-3-methylphenol	UG/KG	0	0.0%	240	0	0	14	180 U	170 U
4-Chloroaniline	UG/KG	0	0.0%	220	0	0	14	180 U	170 U
4-Chlorophenyl phenyl ether	UG/KG	0	0.0%		0	0	14	180 U	170 U
4-Methylphenol	UG/KG	0	0.0%	900	0	0	14	180 U	170 U
4-Nitroaniline	UG/KG	0	0.0%		0	0	14	440 U	420 U
4-Nitrophenol	UG/KG	0	0.0%	100	0	0	14	440 U	420 U
Acenaphthene	UG/KG	52	50.0%	50000	0	7	14	50 J	52 J
Acenaphthylene	UG/KG	0	0.0%	41000	0	0	14	180 U	170 U
Anthracene	UG/KG	96	50.0%	50000	0	7	14	96 J	70 J

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C
								SS121C-3	SS121C-4
								SOIL	SOIL
								EB237	EB241
								0	0
								0.2	0.2
								3/9/98	3/10/98
								SA	SA
								EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**
Semi-Volatiles									
Benzo(a)anthracene	UG/KG	420	85.7%	224	2	12	14	420	320
Benzo(a)pyrene	UG/KG	370	71.4%	61	4	10	14	370	260
Benzo(b)fluoranthene	UG/KG	530	78.6%	1100	0	11	14	530	310
Benzo(ghi)perylene	UG/KG	380	71.4%	50000	0	10	14	380	190
Benzo(k)fluoranthene	UG/KG	390	71.4%	1100	0	10	14	340	390
Bis(2-Chloroethoxy)methane	UG/KG	0	0.0%		0	0	14	180 U	170 U
Bis(2-Chloroethyl)ether	UG/KG	0	0.0%		0	0	14	180 U	170 U
Bis(2-Chloroisopropyl)ether	UG/KG	0	0.0%		0	0	14	180 U	170 U
Bis(2-Ethylhexyl)phthalate	UG/KG	200	85.7%	50000	0	12	14	200	52 J
Butylbenzylphthalate	UG/KG	24	28.6%	50000	0	4	14	24 J	10 J
Carbazole	UG/KG	130	50.0%		0	7	14	130 J	100 J
Chrysene	UG/KG	510	85.7%	400	1	12	14	510	360
Di-n-butylphthalate	UG/KG	50	42.9%	8100	0	6	14	50 J	20 J
Di-n-octylphthalate	UG/KG	17	35.7%	50000	0	5	14	180 U	170 U
Dibenz(a,h)anthracene	UG/KG	150	57.1%	14	6	8	14	150 J	79 J
Dibenzofuran	UG/KG	22	42.9%	6200	0	6	14	22 J	22 J
Diethyl phthalate	UG/KG	18	78.6%	7100	0	11	14	11 J	170 U
Dimethylphthalate	UG/KG	0	0.0%	2000	0	0	14	180 U	170 U
Fluoranthene	UG/KG	820	85.7%	50000	0	12	14	820	760
Fluorene	UG/KG	43	50.0%	50000	0	7	14	41 J	43 J
Hexachlorobenzene	UG/KG	8.5	7.1%	410	0	1	14	180 U	170 U
Hexachlorobutadiene	UG/KG	0	0.0%		0	0	14	180 U	170 U
Hexachlorocyclopentadiene	UG/KG	0	0.0%		0	0	14	180 U	170 U
Hexachloroethane	UG/KG	0	0.0%		0	0	14	180 U	170 U
Indeno(1,2,3-cd)pyrene	UG/KG	350	71.4%	3200	0	10	14	350	180
Isophorone	UG/KG	0	0.0%	4400	0	0	14	180 U	170 U
N-Nitrosodiphenylamine	UG/KG	4.8	7.1%		0	1	14	180 U	170 U
N-Nitrosodipropylamine	UG/KG	0	0.0%		0	0	14	180 U	170 U
Naphthalene	UG/KG	14	42.9%	13000	0	6	14	14 J	12 J
Nitrobenzene	UG/KG	0	0.0%	200	0	0	14	180 U	170 U
Pentachlorophenol	UG/KG	0	0.0%	1000	0	0	14	440 U	420 U
Phenanthrene	UG/KG	520	78.6%	50000	0	11	14	520	440
Phenol	UG/KG	0	0.0%	30	0	0	14	180 U	170 U
Pyrene	UG/KG	820	85.7%	50000	0	12	14	820	580

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C
								SS121C-3	SS121C-4
								SOIL	SOIL
								EB237	EB241
								0	0
								0.2	0.2
								3/9/98	3/10/98
								SA	SA
								EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**
Pesticides									
4,4'-DDD	UG/KG	7.4	7.1%	2900	0	1	14	7.4	3.5 U
4,4'-DDE	UG/KG	69	64.3%	2100	0	9	14	69 J	50
4,4'-DDT	UG/KG	100	57.1%	2100	0	8	14	100 J	37
Aldrin	UG/KG	0	0.0%	41	0	0	14	1.9 U	1.8 U
Alpha-BHC	UG/KG	0	0.0%	110	0	0	14	1.9 U	1.8 U
Alpha-Chlordane	UG/KG	1	7.1%		0	1	14	1.9 U	1 J
Aroclor-1016	UG/KG	0	0.0%		0	0	14	36 U	35 U
Aroclor-1221	UG/KG	0	0.0%		0	0	14	74 U	71 U
Aroclor-1232	UG/KG	0	0.0%		0	0	14	36 U	35 U
Aroclor-1242	UG/KG	58	7.1%		0	1	14	36 U	58 J
Aroclor-1248	UG/KG	0	0.0%		0	0	14	36 U	35 U
Aroclor-1254	UG/KG	79	14.3%	10000	0	2	14	72	79
Aroclor-1260	UG/KG	200	35.7%	10000	0	5	14	85 J	36 J
Beta-BHC	UG/KG	0	0.0%	200	0	0	14	1.9 U	1.8 U
Delta-BHC	UG/KG	2	28.6%	300	0	4	14	1.2 J	2 J
Dieldrin	UG/KG	0	0.0%	44	0	0	14	3.6 U	3.5 U
Endosulfan I	UG/KG	0	0.0%	900	0	0	14	1.9 U	1.8 U
Endosulfan II	UG/KG	0	0.0%	900	0	0	14	3.6 U	3.5 U
Endosulfan sulfate	UG/KG	0	0.0%	1000	0	0	14	3.6 U	3.5 U
Endrin	UG/KG	0	0.0%	100	0	0	14	3.6 U	3.5 U
Endrin aldehyde	UG/KG	0	0.0%		0	0	14	3.6 U	3.5 U
Endrin ketone	UG/KG	3.8	7.1%		0	1	14	3.8 J	3.5 U
Gamma-BHC/Lindane	UG/KG	0	0.0%	60	0	0	14	1.9 U	1.8 U
Gamma-Chlordane	UG/KG	1.2	7.1%	540	0	1	14	1.9 U	1.2 J
Heptachlor	UG/KG	2.1	7.1%	100	0	1	14	2.1 J	1.8 U
Heptachlor epoxide	UG/KG	2.8	21.4%	20	0	3	14	2.8 J	1.4 J
Methoxychlor	UG/KG	0	0.0%		0	0	14	19 U	18 U
Toxaphene	UG/KG	0	0.0%		0	0	14	190 U	180 U

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

Table A-1
March 1998 Soil Sample Results, SEAD 121C DRMO Yard
Work Plan, Proposed RI at EBS Sites at the Proposed Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121C	SEAD-121C
								SS121C-3	SS121C-4
								SOIL	SOIL
								EB237	EB241
								0	0
								0.2	0.2
								3/9/98	3/10/98
								SA	SA
								EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value Number (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analyses**	**Value (Q^b)**	**Value (Q^b)**
Metals									
Aluminum	MG/KG	16200	100.0%	19300	0	14	14	7650	2700
Antimony	MG/KG	19.3	92.9%	5.9	3	13	14	3.4 J	2.9 J
Arsenic	MG/KG	8.1	100.0%	8.2	0	14	14	6.4	5.4
Barium	MG/KG	1600	100.0%	300	4	14	14	394	90.6
Beryllium	MG/KG	0.72	100.0%	1.1	0	14	14	0.3	0.21
Cadmium	MG/KG	21.1	50.0%	2.3	6	7	14	18.5	12.6
Calcium	MG/KG	296000	100.0%	121000	3	14	14	129000	296000
Chromium	MG/KG	49.2	100.0%	29.6	7	14	14	49.2	9.2
Cobalt	MG/KG	19.7	100.0%	30	0	14	14	11.3	9.6
Copper	MG/KG	9750	100.0%	33	9	14	14	383 J	532 J
Cyanide	MG/KG	0	0.0%	0.35	0	0	14	0.59 U	0.54 U
Iron	MG/KG	54100	100.0%	36500	5	14	14	35000	8050
Lead	MG/KG	5280	100.0%	24.8	10	14	14	577 J	171 J
Magnesium	MG/KG	15400	100.0%	21500	0	14	14	8770	15400
Manganese	MG/KG	752	100.0%	1060	0	14	14	494	407
Mercury	MG/KG	0.15	50.0%	0.1	2	7	14	0.15	0.13
Nickel	MG/KG	224	100.0%	49	9	14	14	62.5	19.5
Potassium	MG/KG	1990	100.0%	2380	0	14	14	1600	1290
Selenium	MG/KG	0	0.0%	2	0	0	14	1 U	1 U
Silver	MG/KG	21.8	28.6%	0.75	4	4	14	4.7	2.1
Sodium	MG/KG	606	57.1%	172	6	8	14	255	147
Thallium	MG/KG	1.4	7.1%	0.7	1	1	14	1.4 UJ	1.3 UJ
Vanadium	MG/KG	21.8	100.0%	150	0	14	14	21.5	8.5
Zinc	MG/KG	1350	100.0%	110	10	14	14	525	250
Total Percent Hydrocarbons									
TPH	MG/KG	482				12	14	482	66.3

Notes:
(a) NYSDEC Technical and Administrative Guidance Memorandum # 4046.
(b) See Definition of Data Qualifiers on preceding flysheet.

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Table A-2
March 1998 Groundwater Sample Results, SEAD 121C, DRMO Yard
Work Plan, Proposed RI at the EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

									SEAD-121C	SEAD-121C	SEAD-121C
									MW121C-1	MW121C-1	MW121C-2
									GRNDWTR	GRNDWTR	GRNDWTR
									EB023	EB153	EB154
									0	2.1	1.6
									0	9.7	5.1
									3/17/98	3/17/98	3/17/98
									DU	SA	SA
									EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value**	**Criteria Value Source (a)**	**Number of Exceedances**	**Number of Detections**	**Number of Analysis**	**Value (Q[b])**	**Value (Q[b])**	**Value (Q[b])**
Volatile Organic Compounds											
1,1,1-Trichloroethane	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
1,1,2,2-Tetrachloroethane	UG/L	0	0.0%			0	0	3	1 U	1 U	1 U
1,1,2-Trichloroethane	UG/L	0	0.0%	1	GA	0	0	3	1 U	1 U	1 U
1,1-Dichloroethane	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
1,1-Dichloroethene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
1,2-Dibromo-3-chloropropane	UG/L	0	0.0%	0.04	GA	0	0	3	1 U	1 U	1 U
1,2-Dibromoethane	UG/L	0	0.0%	0.0006	GA	0	0	3	1 U	1 U	1 U
1,2-Dichlorobenzene	UG/L	0	0.0%	3	GA	0	0	3	1 U	1 U	1 U
1,2-Dichloroethane	UG/L	0	0.0%	0.6	GA	0	0	3	1 U	1 U	1 U
1,2-Dichloropropane	UG/L	0	0.0%	1	GA	0	0	3	1 U	1 U	1 U
1,3-Dichlorobenzene	UG/L	0	0.0%	3	GA	0	0	3	1 U	1 U	1 U
1,4-Dichlorobenzene	UG/L	36	33.3%	3	GA	1	1	3	1 U	1 U	**36**
Acetone	UG/L	61	66.7%			0	2	3	52	61	1 U
Benzene	UG/L	0	0.0%	1	GA	0	0	3	1 U	1 U	1 U
Bromochloromethane	UG/L	1	33.3%	5	GA	0	1	3	1 U	1 U	1
Bromodichloromethane	UG/L	0	0.0%	80	MCL	0	0	3	1 U	1 U	1 U
Bromoform	UG/L	4	33.3%	80	MCL	0	1	3	1 U	1 U	4
Carbon disulfide	UG/L	2	66.7%			0	2	3	2	2	1 U
Carbon tetrachloride	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Chlorobenzene	UG/L	2	33.3%	5	GA	0	1	3	1 U	1 U	2
Chlorodibromomethane	UG/L	0	0.0%	80	MCL	0	0	3	1 U	1 U	1 U
Chloroethane	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Chloroform	UG/L	0	0.0%	7	GA	0	0	3	1 U	1 U	1 U
Cis-1,2-Dichloroethene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Cis-1,3-Dichloropropene	UG/L	0	0.0%	0.4	GA	0	0	3	1 U	1 U	1 U
Ethyl benzene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Methyl bromide	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	5 U
Methyl butyl ketone	UG/L	0	0.0%			0	0	3	5 U	5 U	1 U
Methyl chloride	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	5 U
Methyl ethyl ketone	UG/L	0	0.0%			0	0	3	5 U	5 U	5 U
Methyl isobutyl ketone	UG/L	0	0.0%			0	0	3	5 U	5 U	2 U
Methylene chloride	UG/L	0	0.0%	5	GA	0	0	3	2 U	2 U	1 U
Styrene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U

Table A-2
March 1998 Groundwater Sample Results, SEAD 121C, DRMO Yard
Work Plan, Proposed RI at the EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value	Criteria Value Source (^{a})	Number of Exceedances	Number of Detections	Number of Analysis	SEAD-121C MW121C-1 GRNDWTR EB023 0 0 3/17/98 DU EBS Value (Q^b)	SEAD-121C MW121C-1 GRNDWTR EB153 2.1 9.7 3/17/98 SA EBS Value (Q^b)	SEAD-121C MW121C-2 GRNDWTR EB154 1.6 5.1 3/17/98 SA EBS Value (Q^b)
Volatile Organic Compounds											
Tetrachloroethene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Toluene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Total Xylenes	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Trans-1,2-Dichloroethene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Trans-1,3-Dichloropropene	UG/L	0	0.0%	0.4	GA	0	0	3	1 U	1 U	1 U
Trichloroethene	UG/L	0	0.0%	5	GA	0	0	3	1 U	1 U	1 U
Vinyl chloride	UG/L	1	33.3%	2	GA	0	1	3	1 U	1 U	1
Semivolatile Organic Compounds											
1,2,4-Trichlorobenzene	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
1,2-Dichlorobenzene	UG/L	0	0.0%	3	GA	0	0	2		1.1 U	1.1 U
1,3-Dichlorobenzene	UG/L	0	0.0%	3	GA	0	0	2		1.1 U	1.1 U
1,4-Dichlorobenzene	UG/L	0	0.0%	3	GA	0	0	2		1.1 U	1.1 U
2,4,5-Trichlorophenol	UG/L	0	0.0%			0	0	2		2.7 U	2.8 U
2,4,6-Trichlorophenol	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
2,4-Dichlorophenol	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
2,4-Dimethylphenol	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
2,4-Dinitrophenol	UG/L	0	0.0%			0	0	2		2.7 U	2.8 U
2,4-Dinitrotoluene	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
2,6-Dinitrotoluene	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
2-Chloronaphthalene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
2-Chlorophenol	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
2-Methylnaphthalene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
2-Methylphenol	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
2-Nitroaniline	UG/L	0	0.0%	5	GA	0	0	2		2.7 U	2.8 U
2-Nitrophenol	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
3,3'-Dichlorobenzidine	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
3-Nitroaniline	UG/L	0	0.0%	5	GA	0	0	2		2.7 U	2.8 U
4,6-Dinitro-2-methylphenol	UG/L	0	0.0%			0	0	2		2.7 U	2.8 U
4-Bromophenyl phenyl ether	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
4-Chloro-3-methylphenol	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
4-Chloroaniline	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
4-Chlorophenyl phenyl ether	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U

Table A-2
March 1998 Groundwater Sample Results, SEAD 121C, DRMO Yard
Work Plan, Proposed RI at the EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

									SEAD-121C	SEAD-121C	SEAD-121C
									MW121C-1	MW121C-1	MW121C-2
									GRNDWTR	GRNDWTR	GRNDWTR
									EB023	EB153	EB154
									0	2.1	1.6
									0	9.7	5.1
									3/17/98	3/17/98	3/17/98
									DU	SA	SA
									EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value**	**Criteria Value Source (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analysis**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Semivolatile Organic Compounds											
4-Methylphenol	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
4-Nitroaniline	UG/L	0	0.0%	5	GA	0	0	2		2.7 U	2.8 U
4-Nitrophenol	UG/L	0	0.0%			0	0	2		2.7 U	2.8 U
Acenaphthene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Acenaphthylene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Anthracene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Benzo(a)anthracene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Benzo(a)pyrene	UG/L	0	0.0%	0	GA	0	0	2		1.1 U	1.1 U
Benzo(b)fluoranthene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Benzo(ghi)perylene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Benzo(k)fluoranthene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Bis(2-Chloroethoxy)methane	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
Bis(2-Chloroethyl)ether	UG/L	0	0.0%	1	GA	0	0	2		1.1 U	1.1 U
Bis(2-Chloroisopropyl)ether	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
Bis(2-Ethylhexyl)phthalate	UG/L	0.4	100.0%	5	GA	0	2	2		0.23 J	0.4 J
Butylbenzylphthalate	UG/L	0.12	50.0%			0	1	2		0.12 J	1.1 U
Carbazole	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Chrysene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Di-n-butylphthalate	UG/L	1.7	100.0%	50	GA	0	2	2		1.7	0.79 J
Di-n-octylphthalate	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Dibenz(a,h)anthracene	UG/L	0	0.0%			0	0	2		1.1 UJ	1.1 U
Dibenzofuran	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Diethyl phthalate	UG/L	0.057	50.0%			0	1	2		0.057 J	1.1 U
Dimethylphthalate	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Fluoranthene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Fluorene	UG/L	0.48	50.0%			0	1	2		1.1 U	0.48 J
Hexachlorobenzene	UG/L	0	0.0%	0.04	GA	0	0	2		1.1 U	1.1 U
Hexachlorobutadiene	UG/L	0.4	100.0%	0.5	GA	0	2	2		0.061 J	0.4 J
Hexachlorocyclopentadiene	UG/L	0	0.0%	5	GA	0	0	2		1.1 UJ	1.1 U
Hexachloroethane	UG/L	0	0.0%	5	GA	0	0	2		1.1 U	1.1 U
Indeno(1,2,3-cd)pyrene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Isophorone	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
N-Nitrosodiphenylamine	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U

Table A-2
March 1998 Groundwater Sample Results, SEAD 121C, DRMO Yard
Work Plan, Proposed RI at the EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

									SEAD-121C	SEAD-121C	SEAD-121C
									MW121C-1	MW121C-1	MW121C-2
									GRNDWTR	GRNDWTR	GRNDWTR
									EB023	EB153	EB154
									0	2.1	1.6
									0	9.7	5.1
									3/17/98	3/17/98	3/17/98
									DU	SA	SA
									EBS	EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value**	**Criteria Value Source (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analysis**	**Value (Q^b)**	**Value (Q^b)**	**Value (Q^b)**
Semivolatile Organic Compounds											
N-Nitrosodipropylamine	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Naphthalene	UG/L	0	0.0%			0	0	2		1.1 U	1.1 U
Nitrobenzene	UG/L	0	0.0%	0.4	GA	0	0	2		1.1 U	1.1 U
Pentachlorophenol	UG/L	0	0.0%	1	GA	0	0	2		2.7 U	2.8 U
Phenanthrene	UG/L	0.24	50.0%			0	1	2		1.1 U	0.24 J
Phenol	UG/L	0	0.0%	1	GA	0	0	2		1.1 U	1.1 U
Pyrene	UG/L	0.13	50.0%			0	1	2		1.1 U	0.13 J
Pesticides and PCBs											
4,4'-DDD	UG/L	0.9	66.7%	0.3	GA	2	2	3	**0.9**	0.11 U	**0.81** J
4,4'-DDE	UG/L	0.3	100.0%	0.2	GA	2	3	3	**0.27** J	0.093 J	**0.3** J
4,4'-DDT	UG/L	0.56	100.0%	0.2	GA	3	3	3	**0.29** J	**0.28**	**0.56** J
Aldrin	UG/L	0	0.0%	0	GA	0	0	3	0.057 U	0.057 U	0.054 U
Alpha-BHC	UG/L	0.059	66.7%	0.01	GA	2	2	3	0.057 U	**0.036** J	**0.059** J
Alpha-Chlordane	UG/L	0.096	66.7%			0	2	3	0.096	0.068	0.054 U
Aroclor-1016	UG/L	0	0.0%	0.09	GA	0	0	3	1.1 U	1.1 U	1.1 U
Aroclor-1221	UG/L	0	0.0%	0.09	GA	0	0	3	2.3 U	2.3 U	2.2 U
Aroclor-1232	UG/L	0	0.0%	0.09	GA	0	0	3	1.1 U	1.1 U	1.1 U
Aroclor-1242	UG/L	0	0.0%	0.09	GA	0	0	3	1.1 U	1.1 U	1.1 U
Aroclor-1248	UG/L	0	0.0%	0.09	GA	0	0	3	1.1 U	1.1 U	1.1 U
Aroclor-1254	UG/L	0	0.0%	0.09	GA	0	0	3	1.1 U	1.1 U	1.1 U
Aroclor-1260	UG/L	0	0.0%	0.09	GA	0	0	3	1.1 U	1.1 U	1.1 U
Beta-BHC	UG/L	0.56	100.0%	0.04	GA	3	3	3	**0.56** J	**0.096** J	**0.061** J
Delta-BHC	UG/L	0.23	100.0%	0.04	GA	3	3	3	**0.23** J	**0.094**	**0.16** J
Dieldrin	UG/L	0.2	66.7%	0.004	GA	2	2	3	0.11 U	**0.052** J	**0.2** J
Endosulfan I	UG/L	0.11	66.7%			0	2	3	0.11 J	0.08 J	0.054 U
Endosulfan II	UG/L	0.28	66.7%			0	2	3	0.28 J	0.11 U	0.28
Endosulfan sulfate	UG/L	0.69	100.0%			0	3	3	0.28 J	0.14 J	0.69 J
Endrin	UG/L	0.71	33.3%	0	GA	0	1	3	0.11 U	0.11 U	0.71 J
Endrin aldehyde	UG/L	0.97	100.0%	5	GA	0	3	3	0.22 J	0.073 J	0.97 J
Endrin ketone	UG/L	0.2	33.3%	5	GA	0	1	3	0.11 U	0.11 U	0.2
Gamma-BHC/Lindane	UG/L	0.038	33.3%	0.05	GA	0	1	3	0.057 U	0.057 U	0.038 J
Gamma-Chlordane	UG/L	0.47	100.0%			0	3	3	0.47	0.086 J	0.17 J

Table A-2
March 1998 Groundwater Sample Results, SEAD 121C, DRMO Yard
Work Plan, Proposed RI at the EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value	Criteria Value Source (^{a})	Number of Exceedances	Number of Detections	Number of Analysis	SEAD-121C	SEAD-121C	SEAD-121C
									MW121C-1	MW121C-1	MW121C-2
									GRNDWTR	GRNDWTR	GRNDWTR
									EB023	EB153	EB154
									0	2.1	1.6
									0	9.7	5.1
									3/17/98	3/17/98	3/17/98
									DU	SA	SA
									EBS	EBS	EBS
									Value (Q^b)	Value (Q^b)	Value (Q^b)
Pesticides and PCBs											
Heptachlor	UG/L	0.23	66.7%	0.04	GA	2	2	3	0.23 J	0.058 J	0.054 U
Heptachlor epoxide	UG/L	0.11	66.7%	0.03	GA	2	2	3	0.057 U	0.072 J	0.11 J
Methoxychlor	UG/L	0.62	66.7%	35	GA	0	2	3	0.57	0.57 U	0.62 J
Toxaphene	UG/L	0	0.0%	0.06	GA	0	0	3	5.7 U	5.7 U	5.4 U
Metals											
Aluminum	UG/L	5350	100.0%	50	SEC	3	3	3	133	738 J	5350 J
Antimony	UG/L	0	0.0%	3	GA	0	0	3	5.1 U	5.1 U	5.1 U
Arsenic	UG/L	3.8	33.3%	10	MCL	0	1	3	3.7 U	3.8	3.7 U
Barium	UG/L	106	100.0%	1000	GA	0	3	3	39.5	38	106
Beryllium	UG/L	0.1	33.3%	4	MCL	0	1	3	0.1 U	0.1 U	0.1
Cadmium	UG/L	0.39	33.3%	5	GA	0	1	3	0.39	0.3 U	0.3 U
Calcium	UG/L	172000	100.0%			0	3	3	172000 J	163000	162000 J
Chromium	UG/L	6.5	100.0%	50	GA	0	3	3	1.2	2.4	6.5
Cobalt	UG/L	3.6	66.7%			0	2	3	1.4 U	1.6	3.6
Copper	UG/L	5.2	66.7%	200	GA	0	2	3	1.2 U	2	5.2
Cyanide	UG/L	0	0.0%			0	0	3	5 U	5 U	5 U
Iron	UG/L	5620	100.0%	300	GA	3	3	3	346	1430	5620
Lead	UG/L	0	0.0%	15	MCL	0	0	3	1.8 U	1.8 U	1.8 U
Magnesium	UG/L	24100	100.0%			0	3	3	23800	24100	23200
Manganese	UG/L	1590	100.0%	50	SEC	3	3	3	1590	1140	1100
Mercury	UG/L	0	0.0%	0.7	GA	0	0	3	0.1 U	0.1 U	0.1 U
Nickel	UG/L	10.6	100.0%	100	GA	0	3	3	2.8	4.2	10.6
Potassium	UG/L	21400	100.0%			0	3	3	7610	10900	21400
Selenium	UG/L	5.6	100.0%	10	GA	0	3	3	3.7 J	5.6 J	4.3
Silver	UG/L	0	0.0%	50	GA	0	0	3	1.3 U	1.3 U	1.3 U
Sodium	UG/L	95200	100.0%	20000	GA	1	3	3	8920	11200	95200
Thallium	UG/L	0	0.0%	2	MCL	0	0	3	6.7 U	6.7 U	6.7 U
Vanadium	UG/L	6.5	66.7%			0	2	3	1.5 U	2.4	6.5 J
Zinc	UG/L	16.4	100.0%	5000	SEC	0	3	3	2.4	9.3	16.4

Notes:

NA = Not Available

(^{a}) GA = NYSDEC Ambient Water Quality Standards for a source of Drinking Water from Groundwater (TOGS 1.1.1)

MCL = Maximum Contaminant Level - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)

SEC = Secondary Drinking Water Regulations - Drinking Water Standards and Health Advisory (EPA 822-B-00-001)

(^{b}) See preceding flysheet for definition of data qualifiers (Q).

Table A-3
March 1998 Sample Results, SEAD-121I Rumored Cosmoline Oil Disposal Area
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121I	SEAD-121I	SEAD-121I	SEAD-121I
								SS121I-1	SS121I-2	SS121I-3	SS121I-4
								SOIL	SOIL	SOIL	SOIL
								EB147	EB150	EB149	EB148
								0	0	0	0
								0.2	0.2	0.2	0.2
								3/10/98	3/10/98	3/10/98	3/10/98
								SA	SA	SA	SA
								EBS	EBS	EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value (^{a})	Number of Exceedances	Number of Detections	Number of Analysis	Value (Q^b)	Value (Q)	Value (Q)	Value (Q)
Semi-Vloatile Organics											
1,2-Dichlorobenzene	UG/KG	0	0.0%	7900	0	0	4	470 U	7400 UJ	770 U	550 U
1,3-Dichlorobenzene	UG/KG	0	0.0%	1600	0	0	4	470 U	7400 UJ	770 U	550 U
1,4-Dichlorobenzene	UG/KG	0	0.0%	8500	0	0	4	470 U	7400 UJ	770 U	550 U
2,4,5-Trichlorophenol	UG/KG	0	0.0%	100	0	0	4	1100 U	18000 UJ	1900 U	1300 U
2,4,6-Trichlorophenol	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
2,4-Dichlorophenol	UG/KG	0	0.0%	400	0	0	4	470 U	7400 UJ	770 U	550 U
2,4-Dimethylphenol	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
2,4-Dinitrophenol	UG/KG	0	0.0%	200	0	0	4	1100 UJ	18000 UJ	1900 U	1300 UJ
2,4-Dinitrotoluene	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
2,6-Dinitrotoluene	UG/KG	0	0.0%	1000	0	0	4	470 U	7400 UJ	770 U	550 U
2-Chloronaphthalene	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
2-Chlorophenol	UG/KG	0	0.0%	800	0	0	4	470 U	7400 UJ	770 U	550 U
2-Methylnaphthalene	UG/KG	54	25.0%	36400	0	1	4	470 U	7400 UJ	54 J	550 U
2-Methylphenol	UG/KG	0	0.0%	100	0	0	4	470 U	7400 UJ	770 U	550 U
2-Nitroaniline	UG/KG	0	0.0%	430	0	0	4	1100 U	18000 UJ	1900 U	1300 U
2-Nitrophenol	UG/KG	0	0.0%	330	0	0	4	470 U	7400 UJ	770 U	550 U
3,3'-Dichlorobenzidine	UG/KG	0	0.0%		0	0	4	470 U	7400 U	770 U	550 U
3-Nitroaniline	UG/KG	0	0.0%	500	0	0	4	1100 U	18000 UJ	1900 U	1300 U
4,6-Dinitro-2-methylphenol	UG/KG	0	0.0%		0	0	4	1100 UJ	18000 UJ	1900 U	1300 U
4-Bromophenyl phenyl ether	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
4-Chloro-3-methylphenol	UG/KG	0	0.0%	240	0	0	4	470 U	7400 UJ	770 U	550 U
4-Chloroaniline	UG/KG	0	0.0%	220	0	0	4	470 U	7400 UJ	770 U	550 U
4-Chlorophenyl phenyl ether	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
4-Methylphenol	UG/KG	0	0.0%	900	0	0	4	470 U	7400 UJ	770 U	550 U
4-Nitroaniline	UG/KG	0	0.0%		0	0	4	1100 UJ	18000 U	1900 U	1300 UJ
4-Nitrophenol	UG/KG	0	0.0%	100	0	0	4	1100 U	18000 UJ	1900 U	1300 U
Acenaphthene	UG/KG	1900	100.0%	50000	0	4	4	170 J	1900 J	140 J	320 J
Acenaphthylene	UG/KG	0	0.0%	41000	0	0	4	470 U	7400 U	770 U	550 U
Anthracene	UG/KG	2600	100.0%	50000	0	4	4	170 J	2600 J	220 J	230 J
Benzo(a)anthracene	UG/KG	13000	100.0%	224	4	4	4	1400	13000 J	1600	1700
Benzo(a)pyrene	UG/KG	13000	100.0%	61	4	4	4	1300	13000 J	1800	1600
Benzo(b)fluoranthene	UG/KG	12000	100.0%	1100	4	4	4	1500	12000 J	2100	1700
Benzo(ghi)perylene	UG/KG	8100	100.0%	50000	0	4	4	820	8100 J	1600	940

Table A-3
March 1998 Sample Results, SEAD-121I Rumored Cosmoline Oil Disposal Area
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121I	SEAD-121I	SEAD-121I	SEAD-121I
								SS121I-1	SS121I-2	SS121I-3	SS121I-4
								SOIL	SOIL	SOIL	SOIL
								EB147	EB150	EB149	EB148
								0	0	0	0
								0.2	0.2	0.2	0.2
								3/10/98	3/10/98	3/10/98	3/10/98
								SA	SA	SA	SA
								EBS	EBS	EBS	EBS
Parameter	Units	Maximum Concentration	Frequency of Detection	Criteria Value (a)	Number of Exceedances	Number of Detections	Number of Analysis	Value (Q[b])	Value (Q)	Value (Q)	Value (Q)
Semi-Vloatile Organics											
Benzo(k)fluoranthene	UG/KG	15000	100.0%	1100	4	4	4	1500	15000 J	2500	1800
Bis(2-Chloroethoxy)methane	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
Bis(2-Chloroethyl)ether	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
Bis(2-Chloroisopropyl)ether	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
Bis(2-Ethylhexyl)phthalate	UG/KG	230	75.0%	50000	0	3	4	51 J	7400 UJ	230 J	47 J
Butylbenzylphthalate	UG/KG	0	0.0%	50000	0	0	4	470 U	7400 UJ	770 U	550 U
Carbazole	UG/KG	3100	100.0%		0	4	4	230 J	3100 J	320 J	380 J
Chrysene	UG/KG	16000	100.0%	400	4	4	4	1700	16000 J	2000	1900
Di-n-butylphthalate	UG/KG	45	25.0%	8100	0	1	4	45 J	7400 UJ	770 U	550 U
Di-n-octylphthalate	UG/KG	0	0.0%	50000	0	0	4	470 UJ	7400 UJ	770 U	550 UJ
Dibenz(a,h)anthracene	UG/KG	4600	100.0%	14	4	4	4	350 J	4600 J	720 J	420 J
Dibenzofuran	UG/KG	440	100.0%	6200	0	4	4	29 J	440 J	42 J	63 J
Diethyl phthalate	UG/KG	0	0.0%	7100	0	0	4	470 U	7400 UJ	770 U	550 U
Dimethylphthalate	UG/KG	0	0.0%	2000	0	0	4	470 U	7400 UJ	770 U	550 U
Fluoranthene	UG/KG	35000	100.0%	50000	0	4	4	3200	35000 J	4000	4100
Fluorene	UG/KG	1100	100.0%	50000	0	4	4	83 J	1100 J	98 J	160 J
Hexachlorobenzene	UG/KG	0	0.0%	410	0	0	4	470 U	7400 UJ	770 U	550 U
Hexachlorobutadiene	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
Hexachlorocyclopentadiene	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
Hexachloroethane	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
Indeno(1,2,3-cd)pyrene	UG/KG	8000	100.0%	3200	1	4	4	760	8000 J	1600	950
Isophorone	UG/KG	0	0.0%	4400	0	0	4	470 U	7400 UJ	770 U	550 U
N-Nitrosodiphenylamine	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
N-Nitrosodipropylamine	UG/KG	0	0.0%		0	0	4	470 U	7400 UJ	770 U	550 U
Naphthalene	UG/KG	51	25.0%	13000	0	1	4	470 U	7400 UJ	770 U	51 J
Nitrobenzene	UG/KG	0	0.0%	200	0	0	4	470 U	7400 UJ	770 U	550 U
Pentachlorophenol	UG/KG	0	0.0%	1000	0	0	4	1100 U	18000 UJ	1900 U	1300 U
Phenanthrene	UG/KG	15000	100.0%	50000	0	4	4	1200	15000 J	1400	1800
Phenol	UG/KG	0	0.0%	30	0	0	4	470 U	7400 UJ	770 U	550 U
Pyrene	UG/KG	23000	100.0%	50000	0	4	4	2700	23000	3000	3200
Total Percent Hydrocarbon											
TPH	MG/KG	452				3	4	43.9	108	452	20.3 U

Notes:

(a) New York State Department of Environmental Conservation, Technical and Administrative Guidance Memorandum # 4046.

(b0 See preceding flysheet for definition of Qualifier Codes (Q)

Table A-4
March 1998, Debris Sample Results, SEAD 121I Rumored Cosmoline Oil Disposal Area
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121I	SEAD-121I
								SS121I-1	SS121I-2
								SEDIMENT	SEDIMENT
								EB151	EB152
								0	0
								0.2	0.2
								3/10/98	3/10/98
								SA	SA
								EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value (^{a})**	**Number of Exceedances**	**Number of Detections**	**Number of Analysis**	**Value (Q^b)**	**Value (Q^b)**
Semivolatile Organic Compounds									
1,2-Dichlorobenzene	UG/KG	0	0.0%	7900	0	0	2	480 U	4400 U
1,3-Dichlorobenzene	UG/KG	0	0.0%	1600	0	0	2	480 U	4400 U
1,4-Dichlorobenzene	UG/KG	0	0.0%	8500	0	0	2	480 U	4400 U
2,4,5-Trichlorophenol	UG/KG	0	0.0%	100	0	0	2	1200 U	11000 U
2,4,6-Trichlorophenol	UG/KG	0	0.0%		0	0	2	480 U	4400 U
2,4-Dichlorophenol	UG/KG	0	0.0%	400	0	0	2	480 U	4400 U
2,4-Dimethylphenol	UG/KG	0	0.0%		0	0	2	480 U	4400 U
2,4-Dinitrophenol	UG/KG	0	0.0%	200	0	0	2	1200 U	11000 U
2,4-Dinitrotoluene	UG/KG	0	0.0%		0	0	2	480 U	4400 U
2,6-Dinitrotoluene	UG/KG	0	0.0%	1000	0	0	2	480 U	4400 U
2-Chloronaphthalene	UG/KG	0	0.0%		0	0	2	480 U	4400 U
2-Chlorophenol	UG/KG	0	0.0%	800	0	0	2	480 U	4400 U
2-Methylnaphthalene	UG/KG	33	50.0%	36400	0	1	2	33 J	4400 U
2-Methylphenol	UG/KG	0	0.0%	100	0	0	2	480 U	4400 U
2-Nitroaniline	UG/KG	0	0.0%	430	0	0	2	1200 U	11000 U
2-Nitrophenol	UG/KG	0	0.0%	330	0	0	2	480 U	4400 U
3,3'-Dichlorobenzidine	UG/KG	0	0.0%		0	0	2	480 U	4400 U
3-Nitroaniline	UG/KG	0	0.0%	500	0	0	2	1200 U	11000 U
4,6-Dinitro-2-methylphenol	UG/KG	0	0.0%		0	0	2	1200 U	11000 U
4-Bromophenyl phenyl ether	UG/KG	0	0.0%		0	0	2	480 U	4400 U
4-Chloro-3-methylphenol	UG/KG	0	0.0%	240	0	0	2	480 U	4400 U
4-Chloroaniline	UG/KG	0	0.0%	220	0	0	2	480 U	4400 U
4-Chlorophenyl phenyl ether	UG/KG	0	0.0%		0	0	2	480 U	4400 U
4-Methylphenol	UG/KG	0	0.0%	900	0	0	2	480 U	4400 U
4-Nitroaniline	UG/KG	0	0.0%		0	0	2	1200 U	11000 U
4-Nitrophenol	UG/KG	0	0.0%	100	0	0	2	1200 U	11000 U
Acenaphthene	UG/KG	390	100.0%	50000	0	2	2	140 J	390 J
Acenaphthylene	UG/KG	420	50.0%	41000	0	1	2	480 U	420 J
Anthracene	UG/KG	1800	100.0%	50000	0	2	2	260 J	1800 J
Benzo(a)anthracene	UG/KG	14000	100.0%	224	2	2	2	1300	14000
Benzo(a)pyrene	UG/KG	16000	100.0%	61	2	2	2	1300	16000
Benzo(b)fluoranthene	UG/KG	22000	100.0%	1100	2	2	2	2100	22000
Benzo(ghi)perylene	UG/KG	12000	100.0%	50000	0	2	2	840	12000
Benzo(k)fluoranthene	UG/KG	23000	100.0%	1100	2	2	2	1600	23000
Bis(2-Chloroethoxy)methane	UG/KG	0	0.0%		0	0	2	480 U	4400 U

Table A-4
March 1998, Debris Sample Results, SEAD 121I Rumored Cosmoline Oil Disposal Area
Work Plan, Proposed RI at EBS Sites at the Planned Industrial Development Area
Seneca Army Depot Activity, Romulus NY

								SEAD-121I	SEAD-121I
								SS121I-1	SS121I-2
								SEDIMENT	SEDIMENT
								EB151	EB152
								0	0
								0.2	0.2
								3/10/98	3/10/98
								SA	SA
								EBS	EBS
Parameter	**Units**	**Maximum Concentration**	**Frequency of Detection**	**Criteria Value ([a])**	**Number of Exceedances**	**Number of Detections**	**Number of Analysis**	**Value (Q^b)**	**Value (Q^b)**
Bis(2-Chloroethyl)ether	UG/KG	0	0.0%		0	0	2	480 U	4400 U
Bis(2-Chloroisopropyl)ether	UG/KG	0	0.0%		0	0	2	480 U	4400 U
Bis(2-Ethylhexyl)phthalate	UG/KG	25	50.0%	50000	0	1	2	25 J	4400 U
Butylbenzylphthalate	UG/KG	0	0.0%	50000	0	0	2	480 U	4400 U
Carbazole	UG/KG	1600	100.0%		0	2	2	410 J	1600 J
Chrysene	UG/KG	25000	100.0%	400	2	2	2	1700	25000
Di-n-butylphthalate	UG/KG	0	0.0%	8100	0	0	2	480 U	4400 U
Di-n-octylphthalate	UG/KG	0	0.0%	50000	0	0	2	480 U	4400 U
Dibenz(a,h)anthracene	UG/KG	5000	100.0%	14	2	2	2	400 J	5000 J
Dibenzofuran	UG/KG	58	50.0%	6200	0	1	2	58 J	4400 U
Diethyl phthalate	UG/KG	0	0.0%	7100	0	0	2	480 U	4400 U
Dimethylphthalate	UG/KG	0	0.0%	2000	0	0	2	480 U	4400 U
Fluoranthene	UG/KG	24000	100.0%	50000	0	2	2	3400	24000
Fluorene	UG/KG	360	100.0%	50000	0	2	2	130 J	360 J
Hexachlorobenzene	UG/KG	0	0.0%	410	0	0	2	480 U	4400 U
Hexachlorobutadiene	UG/KG	0	0.0%		0	0	2	480 U	4400 U
Hexachlorocyclopentadiene	UG/KG	0	0.0%		0	0	2	480 U	4400 U
Hexachloroethane	UG/KG	0	0.0%		0	0	2	480 U	4400 U
Indeno(1,2,3-cd)pyrene	UG/KG	12000	100.0%	3200	1	2	2	850 J	12000 J
Isophorone	UG/KG	0	0.0%	4400	0	0	2	480 U	4400 U
N-Nitrosodiphenylamine	UG/KG	0	0.0%		0	0	2	480 U	4400 U
N-Nitrosodipropylamine	UG/KG	0	0.0%		0	0	2	480 U	4400 U
Naphthalene	UG/KG	0	0.0%	13000	0	0	2	480 U	4400 U
Nitrobenzene	UG/KG	0	0.0%	200	0	0	2	480 U	4400 U
Pentachlorophenol	UG/KG	0	0.0%	1000	0	0	2	1200 U	11000 U
Phenanthrene	UG/KG	4400	100.0%	50000	0	2	2	1600	4400 J
Phenol	UG/KG	0	0.0%	30	0	0	2	480 U	4400 U
Pyrene	UG/KG	17000	100.0%	50000	0	2	2	2700	17000
Other Analyses									
TPH	MG/KG	370	100.0%		0	2	2	136	370

Notes:

([a]) New York State Department of Environmental Conservation, Technical and Administrative Guidance Memorandum # 4046

([b]) See preceding flysheet for definition of Qualifier Codes (Q)