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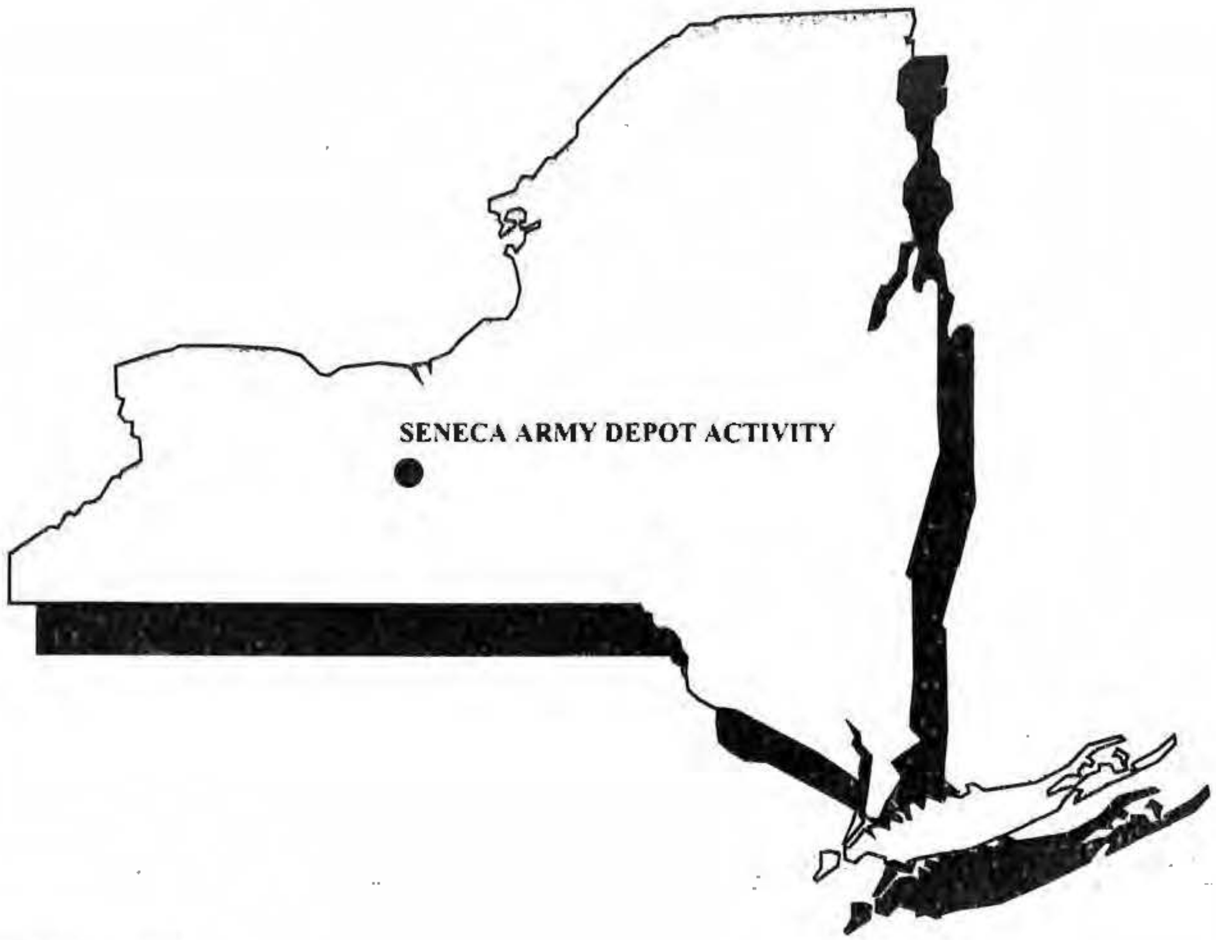
U.S. ARMY ENGINEER DIVISION
HUNTSVILLE, ALABAMA



DRAFT

ACTION MEMORANDUM FOR REMOVAL ACTIONS AT SWMUs SEAD-59 AND SEAD-71 SENECA ARMY DEPOT ACTIVITY

CONTRACT NO. DACA87-95-D-0031
TASK ORDER R OF DELIVERY ORDER 17

JUNE 2001

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ACTION MEMORANDUM FOR
REMOVAL ACTIONS AT
SEAD-59 and SEAD-71
SENECA ARMY DEPOT ACTIVITY

Prepared for:

Seneca Army Depot Activity
Romulus, New York

Prepared by:

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Contract No. DACA87-95-D-0031
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LIST OF ACRONYMS

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
B	Boring
bls	below land surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CY	Cubic yards
DOD	Department of Defense
DOT	Department of Transportation
EE/CA	Engineering Evaluation/Cost Analysis
EM	Electromagnetic
EPA	Environmental Protection Agency
ES	Engineering-Science, Inc.
ESI	Expanded Site Inspection
ft	Feet
ft/sec	Feet per second
GC	Gas chromatograph
GPR	Ground penetrating radar
IAG	Interagency Agreement
m	meter
MCACES	Micro Computer Aided Cost Engineering System
MCL	Maximum Contaminant Levels
mg/kg	Milligrams per kilogram

LIST OF ACRONYMS

mg/L	Milligrams per liter
MSL	Mean sea level
MW	Monitoring Well
NAVA	North American Vertical Datum
NBS	National Bureau of Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic Atmospheric Administration
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Safety and Health Administration
OV	Specific Ovid Quadrangle
OVM	Organic Vapor Meter
PAH	Polynuclear aromatic hydrocarbons
PID	Photoionization detector
ppm	parts per million
ppmv	Part Per Million Per Volume
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SB	Soil Boring
SCG	Site Cleanup Goals
SEAD	Seneca Army Depot (*archaic*)
SEDA	Seneca Army Depot
Sec	Seconds
SOP	Standard Operating Procedures

LIST OF ACRONYMS

SVOCs	Semi-Volatile Organic Compounds
SWMU	Solid Waste Management Unit
TAGM	New York State Chemical And Administrative Guidance Memorandum
TP	Test Pit
TPH	Total Petroleum Hydrocarbons
TRACES	Tri-Service Automated Cost Engineering System
ug/g	Micrograms per gram
ug/kg	Micrograms per kilogram
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
USAEHA	United States Army Environmental Hygiene Agency
USATHAMA	United States Army Toxic and Hazardous Materials Agency
USCS	Unified Soil Classification System
VOA	Volatile organic analyte
VOC	Volatile Organic Compound

1.0 INTRODUCTION

1.1 EXECUTIVE SUMMARY

An Expanded Site Inspection (ESI) and Phase I Remedial Investigation (RI) have been performed at SEAD-59, the Fill Area West of Building 135, and at SEAD-71, the Alleged Paint Disposal Area, at the Seneca Army Depot Activity (SEDA) in Romulus, NY. This Action Memorandum presents the proposed plan for conducting a time-critical removal action at SEADs-59 and 71 to eliminate contaminants that have been identified in the soil that represent a potential threat to the environment and neighboring populations. This removal action is considered time-critical because of the increased potential for exposure of workers and other re-users now present at the depot. The presence of drums and other containers and the uncertainty of their contents is also justification for a removal action at both sites.

Since the historic military mission of the depot has been terminated, the depot has officially been closed by the Department of the Defense (DoD) and the US Army. In accordance with provisions of the DoD's Base Realignment and Closure (BRAC) process, the land and the facilities of the former depot have been surveyed and evaluated, and prospective beneficial uses of the facility have been identified. Portions of the depot are now being released to the public and private sectors for reuse under the BRAC process. As portions of the former depot are released for other beneficial uses, increased access is afforded to all portions of the former depot, resulting in an increased potential for exposure to any residual chemicals that are present at former solid waste management units (SWMUs) remaining at the depot pending clean-up. Therefore, the goal of the proposed time-critical removal action at SEADs-59 and 71 is to eliminate and contain an identified source of residual chemical materials in the soil to remove or at least lessen the magnitude of the potential threat that it represents to surrounding populations and the environment.

The test pitting investigations at SEADs-59 and 71 have confirmed the presence of 55-gallon drums and other containers at both sites. The presence of such buried objects is of concern since the nature of the contents is unknown. The uncertainty of the contents of the buried items that may remain in the disposal area and at geophysical anomalies and the contamination in soils and groundwater are considered justification for performing removal actions at SEADs-59 and 71. While removal of drums, paint cans, and other containers is the focus of the planned removal actions for both sites, the potential for contamination to be present in the soils and groundwater that surround these items will also be addressed by this action.

This Action Memorandum presents the selected removal action that was developed in accordance with the Federal Facility Agreement and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Contingency Plan. Based upon the results of these investigations, it is recommended that the soil and debris at both sites be selectively removed, contained, and disposed of at an off site permitted waste landfill. Groundwater will be pumped out of the excavation area and treated as part of the removal action. This removal action is intended to be the final remedy for both sites.

For SEAD-59, it is recommended that 23,085 cubic yards of soil and geophysical anomalies be removed from the fill area and selected areas south of the access road. For SEAD-71, it is recommended that 871 cubic yards of geophysical anomalies and soils exceeding the soil clean up goals be removed from the site. The excavated materials exceeding the soil cleanup goals would be transported to, and disposed of at an off-site facility. The extent of the area requiring excavation will be confirmed via sampling and analysis, and once completed, the excavations will be refilled with excavated soil with concentrations less than the soil clean up goals and re-contoured to match the existing terrain characteristics.

1.2 PURPOSE, SCOPE, AND OBJECTIVES

This Action Memorandum has been prepared for the Fill Area West of Building 135 (SEAD-59) and the Alleged Paint Disposal Area (SEAD-71) at the Seneca Army Depot (SEDA) by Parsons Engineering Science (Parsons ES) in support of the proposed time-critical removal action at SEADs-59 and 71. Parsons ES has been retained by the United States Army Corps of Engineers (USACE) Huntsville Division as part of their remedial response activities under the Comprehensive Environmental Responsibility, Compensation, and Liability Act (CERCLA) to perform these activities.

The purpose of this action memorandum is to describe the need for and the decision process leading to the proposed time critical removal action at SEADs-59 and 71. The primary objective of the removal action is to eliminate or significantly reduce the potential for human or environmental exposure to contamination through uncontrolled releases of benzene, toluene, ethylbenzene, and xylenes (BTEX), total petroleum hydrocarbons (TPH), polyaromatic hydrocarbons (PAHs), and metals to groundwater from contaminated soils. A Decision Document was prepared to evaluate the various remedial options for the site, and to select the best option. The Decision Document is included as Appendix A.

This work is based primarily upon the data collected during the Expanded Site Inspection (ESI) and Remedial Investigation (RI) conducted at SEADs-59 and 71 and is supported by the following documents: *Draft Phase I Remedial Investigation (RI) at SEAD-59 and SEAD-71* (Parsons ES, 1998) and the *Project Scoping Plan for Performing a CERCLA Remedial Investigation / Feasibility Study at SEAD-59 and 71* (Parsons ES, 1997) which is based on the findings in the *Expanded Site Inspection Report for Seven Low Priority AOCs - SEADs 60, 62, 63, 64 (A, B, C, and D), 67, 70, and 71* (Parsons ES, 1995a) and the *Expanded Site Inspection Report for Eight Moderately Low Priority AOCs – SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59* (Parsons ES, 1995b). Activities conducted as part of the ESI and RI included: (1) seismic, electromagnetic, and ground penetrating radar (GPR) surveys, as well as test pits, to determine groundwater flow direction and the exact location of the miscellaneous burial pits, (2) soil borings to gather stratigraphic information, (3) soil samples from borings and test pits for analytical testing, (4) soil gas surveys, (5) construction and sampling of overburden groundwater monitoring wells, (6) groundwater sampling for analytical testing.

The time-critical removal action, which will be completed as a result of this Action Memorandum, is intended to incorporate the necessary measures for removal site closeout. The outcome of this action will then be incorporated into the final Record of Decision (ROD) document. If following an evaluation of risk, unacceptable risk remains, additional remedial actions may be considered.

1.3 STATUTORY AUTHORITY

Authority for responding to releases or threats of releases from a hazardous waste site is addressed in section 104 of CERCLA, as amended. The Army has been delegated the response authority for Army sites, whether or not the sites are on the National Priorities List of the U.S. Environmental Protection Agency (EPA). Under CERCLA Section 104(b), the Army is authorized to investigate, survey, test, or gather other data required to identify the existence, extent, and nature of contaminants, including the extent of danger to human health or welfare and the environment. In addition, the Army is authorized to undertake planning, engineering, and other studies or investigations appropriate to directing response actions that prevent, limit, or mitigate the risk to human health or welfare and the environment.

1.4 SITE CONTACTS

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2.0 SITE CHARACTERIZATION

2.1 BASE DESCRIPTION AND HISTORY

This section provides a brief overview of SEDA and the conditions at Fill Area West of Building 135 (SEAD-59) and the Alleged Paint Disposal Area (SEAD-71). The site was evaluated in 1994 as part of an Army effort to determine the conditions at several SWMUs that were considered to potentially pose a threat to human health and the environment. A more detailed discussion can be found in the Draft Final *Project Scoping Plan for Performing a CERCLA Remedial Investigation / Feasibility Study (RI/FS) at the Fill Area West of Building 135 (SEAD-59), and the Alleged Paint Disposal Area (SEAD-71)*, February 1997, as well as the *Expanded Site Inspection - Seven Low Priority AOCs SEADs 60, 62, 63, 64 (A,B,C, and D), 67, 70, and 71*, April 1995, and *Expanded Site Inspection - Eight Moderately Low Priority AOCs SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59*, December 1995, and *Draft Phase I Remedial Investigation (RI) at the Fill Area West of Building 135 (SEAD-59), and the Alleged Paint Disposal Area (SEAD-71)*, July 1998.

The SEDA facility is situated on the western flank of a topographic high between Cayuga and Seneca lakes in the Finger Lakes region of central New York (**Figure 2-1**). The SEDA was constructed in 1941 and has been owned by the United States Government and operated by the Department of the Army since this time. The post generally consists of an elongated central area for storage of ammunitions and weaponry in Quonset-style buildings, an operations and administration area in the eastern portion, and an army barracks area at the north end of the depot. The base was expanded to encompass a 1,524-meter airstrip, formerly the Sampson Air Force Base.

Update, no military personnel

The mission of the SEDA has been primarily the management of munitions. Currently, SEDA is used for the following purposes: (1) receiving, storing, and distributing ammunition and explosives, (2) providing receipt, storage, and distribution of items that support special weapons, and (3) performing depot-level maintenance, demilitarization, and surveillance on conventional ammunition and special weapons. The depot formerly employed approximately 1,000 civilian and military personnel. Within the last year, the facility has undergone a downsizing and no longer houses a large contingent of military personnel.

SEAD-59 (Fill Area West of Building 135) is located in the east-central portion of SEDA. The site encompasses an area along both sides of an unnamed dirt road which is the access road to

Building 311 and runs perpendicular to the south side of Administration Avenue terminating at Building 311 (**Figures 2-2 and 2-3**). SEAD-59 is comprised of two areas, one area located north of the access road to Building 311 and one area located to the south of the road. Each area is characterized by different topography with the area to south of the road being relatively flat and sloping gently to the west and the area to the north of the road containing a fill area with approximately 10 feet of relief.

The entire western border of the site is defined by a north-south trending drainage ditch. A drainage swale that flows east to west parallels the railroad tracks that form the northern boundary of SEAD-59. At the northwestern corner of the site, the drainage swale turns to the north and flows under the railroad tracks. Drainage ditches are also located on each side of the access road to Building 311 and flow from east to west into the drainage ditch in the western portion of the site.

SEAD-59 was used for the disposal of construction debris and oily sludges. SEDA personnel have indicated that there may be a large quantity of miscellaneous "roads and grounds" waste buried at the site. It is not known when the disposal took place.

SEAD-71 (Alleged Paint Disposal Area) is located in the east-central portion of SEDA. The site is located approximately 200 feet west of 4th Avenue near Buildings 127 and 114 (**Figures 2-2 and 2-4**). The entire site is approximately 350 feet by 100 feet and bounded on the north and south by railroad tracks serving Buildings 114 and 127. A chain-link fence borders the east side of the site. The topography is relatively flat with a gentle slope to the southwest.

It is rumored that paints and/or solvents were disposed of in burial pits at SEAD-71. It is not known what other activities occurred here. No dates of disposal are available nor is there any information on the number of suspected disposal pits.

2.2 SITE-SPECIFIC GEOLOGY

2.2.1 SEAD-59

Based on the results of the drilling program conducted for the ESI at SEAD-59, fill material, till, weathered dark gray shale, and competent gray-black shale are the four major geologic units present on-site. At most of the boring locations very little topsoil was present. Several of the borings were drilled on a gravel surface, and no topsoil was encountered at these locations.

Fill material was encountered in the borings located within the fill area north of the access road. The fill was lithologically similar to the till in that it was characterized as silt with minor components of sand and shale fragments, but was different from the till in color, which tended to be gray brown or tan, and by the presence of gravel, asphalt, wood and other organic material. The fill was found up to a depth of 10.5 feet.

The till was characterized as light brown in color and composed of silt, very fine sand, and clay, with minor components of gray-black shale fragments. Larger shale fragments (rip-up clasts) were observed at some locations at the top of the weathered shale. The thickness of the till ranged from 3.1 to 8.6 feet.

The weathered shale that forms the transition between till and competent shale was encountered at five of the nine boring locations. Competent gray-black shale was observed at two spots at 8.0 and 10.5 feet below grade, respectively. At the remaining boring locations bedrock was inferred from the point of auger or spoon refusal at depths ranging from 9.5 to 20.5 feet below grade.

2.2.2 SEAD-71

Based on the results of the subsurface exploration conducted for the ESI at SEAD-71, till, calcareous weathered shale, and competent shale are the three major types of geologic materials present on-site. The till in the storage area was characterized as olive gray clay with little silt, very fine sand, and shale fragments (up to 1 inch in diameter) and ranged in thickness between 4.7 and 7.8 feet. In the southern section of the storage area, the till consisted of light brown silt with little clay and trace amounts of shale fragments (up to 1 inch in diameter). Large shale fragments (rip-up clasts) were observed at or near the till/weathered shale contact at all soil boring locations. In the western half of the site, the till consisted of olive gray silt and was found to be approximately 4 feet thick.

The weathered shale that forms the transition between the till and competent shale was encountered at all soil boring and test pit locations. The depth of the weathered shale ranged from 4.7 to 8.3 feet below ground surface. Competent, calcareous gray shale was encountered at depths between 5.2 and 9.4 feet below ground surface.

2.3 SITE-SPECIFIC HYDROLOGY AND HYDROGEOLOGY

2.3.1 SEAD-59

Surface water flow from precipitation events is controlled by local topography. The area to the south of the access road slopes gently to the west. Surface water flow in this area is to the west and it is likely to be captured by the north-south trending drainage swale located in the western portion of the site and by the drainage ditch which parallels the south side of the access road.

In the area north of the access road, a hill composed of fill material has approximately 10 feet of vertical relief. To the west, the hill slopes steeply to the north-south trending drainage swale, which flows north and eventually flows under the railroad tracks north of the site. To the north, the hill slopes to a sustained drainage ditch approximately two feet deep. This ditch originates east of the site near Building 128 and flows west paralleling the railroad tracks and the northern boundary of SEAD-59. At the northwestern corner of the site, the drainage swale flows north under the railroad tracks. To the east, the hill slopes downward to a graded gravel surface used for storing large equipment. Surface water from this area also drains into the northern drainage swale, flowing along the northern boundary of the site, as described above. To the south, the hill slopes to the access road that runs through the site. Surface water from this southern portion of the hill drains into the drainage ditch that parallels the access road on the north side. This drainage ditch flows west and intersects the north flowing drainage ditch in the western portion of SEAD-59.

Based on the data collected during the ESI, the groundwater flow direction is primarily southwest across SEAD-59.

2.3.2 SEAD-71

Surface water flow from precipitation events is controlled by local topography, although there is little topographic relief on the site. There are no sustained surface water bodies on-site. In the fenced storage area located in the eastern half of the site, the area is covered with asphalt, which provides an impermeable surface resulting in an increased amount of surface water runoff from the site. Based on topographic relief, surface water flow is to the southwest toward the SEDA railroad tracks (to the south), which are topographically lower than the site.

Based on the data collected during the ESI, the groundwater flow direction in the till/weathered shale aquifer on the site is to the west-southwest.

2.4 LAND USE

The SEDA is situated between Seneca Lake and Cayuga Lake and encompasses portions of Romulus and Varick Townships. Land use in this region of New York is largely agricultural, with some forestry and public land (school, recreational and state parks). The most recent land use report is that issued by Cornell University (Cornell 1967). This report classifies in further detail land uses and environments of this region. Agricultural land use is categorized as inactive and active use. Inactive agricultural land consists of land committed to eventual forest regeneration, land waiting to be developed, or land presently under construction. Active agricultural land surrounding SEDA consists largely of cropland and cropland pasture.

Forest land adjacent to SEDA is primarily under regeneration with sporadic occurrence of mature forestry. Public and semi-public land use surrounding and within the vicinity of SEDA includes Sampson State Park, Willard Psychiatric Center, and Central School (at the Town of Romulus). Sampson State Park entails approximately 1,853 acres of land and includes a boat ramp on Seneca Lake. Historically, Varick and Romulus Townships within Seneca County developed as an agricultural center supporting a rural population. However, increased population occurred in 1941 due to the opening of SEDA. Population has progressed since then largely due to the increased emphasis on promoting tourism and recreation in this area.

Depot already closed

The 10,587-acre SEDA facility was constructed in 1941 and has been owned by the United States Government and operated by the Department of the Army (DOA) since that date. From its inception in 1941 until 1995, SEDA's primary mission was the receipt, storage, maintenance, and supply of military items, including munitions and equipment. The Depot's mission changed in early 1995 when the Department of Defense (DOD) recommended closure of the SEDA under its Base Realignment and Closure (BRAC) process. This recommendation was approved by Congress on September 28, 1995 and the Depot is scheduled for closure by July 2001.

In accordance with the requirements of the BRAC process, the Seneca County Board of Supervisors established the Seneca Army Depot Local Redevelopment Authority (LRA) in October 1995. 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 as to their most likely future use. These areas included: housing, institutional, industrial, an area for the existing navigational LORAN transmitter, recreational/conservation and an area designated for a future prison. The LRA has established that the area including SEAD-59 and SEAD-71 will be used for Planned Industrial Development. At the time when the SEDA facility is relinquished by the Army, the Army will ensure that both sites can be used for the intended purpose.

2.5 CONTAMINATION ASSESSMENT

Geophysical surveys and test pits were performed during the ESI and RI to identify burial sites at SEAD-59 and 71. Soil (surface, subsurface), soil gas, and groundwater were collected and analyzed as part of the investigations (**Appendix A**). The results are presented in the *Draft Phase I Remedial Investigation (RI) SEAD-59 and SEAD-71*, *the ESI Report for Seven Low Priority AOCs - SEADs 60, 62, 63, 64 (A, B, C, and D), 67, 70, and 71* (Parsons ES, 1995a) and the *Expanded Site Inspection - Eight Moderately Low Priority AOCs SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59*, December 1995. The following sections summarize the nature and extent of contamination identified at these sites.

2.5.1 Soil Gas Survey

2.5.1.1 SEAD-59

A total of 241 soil gas points were sampled and analyzed during the Phase I RI investigation at SEAD-59. This sampling effort revealed one large area and four smaller areas of elevated total volatile organic compounds (VOCs) (**Appendix A**). The larger area of elevated soil gas encompasses most of SEAD-59, extending from north of the unnamed dirt road to the west of the 60,000 gallon oil storage tank, including the mounded fill area. The highest soil gas hits were within the boundaries of the fill area. Maximum total VOC hits of greater than 10 ppmv were observed at three separate locations within the fill area. The four smaller areas of elevated soil gas containing VOCs were detected in an area southeast of the fill area, an area directly southwest of the fill area, another area south of the fill area, and an additional area northwest of the fill area.

2.5.1.2 SEAD-71

A soil gas survey has not been performed at SEAD-71.

2.5.2 Geophysics

2.5.2.1 SEAD-59

Four seismic refraction profiles were performed, during the ESI, on 4 lines positioned along each boundary line of SEAD-59. The seismic refraction profiles detected 5 to 10 feet of unconsolidated overburden (1,050 to 1,730 ft/sec) overlying bedrock (10,500 to 15,500 ft/sec). Saturated overburden was not detected by the seismic survey due to limited thickness of the saturated overburden. The elevations of the bedrock surface indicated that the bedrock sloped to the west, generally following the surface topography. Based upon the results of the seismic survey, the groundwater flow direction was also expected to be to the west, following the slope of the bedrock surface.

Electromagnetic (EM-31, EM-61) surveys were performed for the ESI and the Phase I RI at SEAD-59 to delineate the limits of the landfill and to identify locations where metallic objects were buried (**Appendix A**). The ESI EM-31 survey detected eight anomalies of unknown origin, though no clearly defined boundaries of the large fill area in the northeastern portion of the EM grid could be determined based upon the geophysical results. The electromagnetic (EM-61) survey performed for the Phase I RI at SEAD-59 detected 39 localized anomalies which could not be attributed to surface features and are due to unknown buried sources.

Ground penetrating radar (GPR) data were acquired for the ESI at SEAD-59. A small disposal pit was detected in the southeastern portion of the area investigated. Twelve of the 17 suspected buried metallic object locations revealed by the GPR survey were situated within the suspected disposal area in the northeastern quadrant of SEAD-59. Ten of the GPR anomaly locations were either situated over a localized EM anomaly or within 15 feet of a localized EM anomaly.

GPR data were also acquired for the Phase I RI at SEAD-59 over each distinct EM-61 anomaly to provide better characterization of the suspected metallic sources. Test pit locations were selected based on GPR data indicating the strongest presence of disposal pits or debris.

2.5.2.2 SEAD-71

Four seismic refraction profiles were performed as part of the geophysical investigations for the ESI on four lines positioned along each boundary line of the storage area in the eastern half of SEAD-71. The seismic refraction profiles detected 6 to 9 feet of unconsolidated overburden (1,125 to 1,500 ft/sec) overlying bedrock (12,800 to 16,200 ft/sec). Saturated overburden was not detected by the seismic survey due to limited thickness of the saturated overburden. The elevations of the bedrock surface indicated that the bedrock slopes to the west, generally following the surface topography. Based on the results of the seismic survey, the groundwater flow direction is also expected to be to the west, following the slope of the bedrock surface.

An EM-31 survey was performed for the ESI at SEAD-71 in the western half of the site to help locate the burial pits (**Appendix A**). Interferences from many cultural effects along the perimeter of the surveyed area complicated the interpretation of the data. A review of the EM-31 data from SEAD-71 revealed one area, in the south central portion of the grid, where both the apparent conductivity and the in-phase response decreased noticeably. One other area of increased apparent ground conductivity measurements was detected along the west-central portion of the grid, however, an associated in-phase response was not observed.

GPR data was acquired for the ESI at SEAD-71. The data from these surveys revealed an underground utility line or conduit running northwest - southeast across the northeastern corner of the storage compound. One area of anomalous subsurface reflections, typical of reflections from metallic objects, was detected in the south-central portion of the storage compound. The GPR survey conducted in the area west of the storage compound revealed five localized anomalies and three zones with multiple anomalies. The source of these EM-31 and the GPR anomalies was identified during test pit excavations as construction debris composed of chain link fencing, sheet metal, asphalt, and a crushed, yellow, twenty gallon drum. Weathered shale, encountered at a depth of 5.5 feet, limited any further advancement of the excavation. There were no readings above background levels (0 ppm of organic vapors and 10-15 micro rems per hour of radiation) during the excavations.

GPR data were also acquired for the Phase I RI at SEAD-71. Test pit locations were selected based on GPR data indicating the strongest presence of disposal pits or debris.

2.5.3 Test Pitting Program

2.5.3.1 SEAD-59

A total of 24 test pits were excavated at SEAD-59 to investigate the nature of the geophysical and soil gas anomalies and to collect chemical data to identify the presence of constituents of concern. The excavated debris consisted of concrete, asphalt, metal, wood, chain link fencing, 55-gallon drums, and paint cans. Areas of petroleum hydrocarbon stained and paint stained soils were also detected.

2.5.3.2 SEAD-71

A total of six test pits were excavated at SEAD-71 to characterize the source of the geophysical anomalies. One test pit revealed oil stained soils. The excavated debris consisted of construction debris composed of chain link fencing, sheet metal, asphalt, stone slabs, bricks and piping. A crushed, yellow, twenty gallon drum and railroad ties were also found.

2.5.4 Summary of Affected Media

SEAD 59 - VOCS, SVOCS, TPH, metals

2.5.4.1 SEAD-59

The ESI and Phase I RI conducted at SEAD-59 identified several areas which have been impacted by releases of volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons, and to a lesser extent, heavy metals.

Soil Data

Sampling conducted in SEAD-59 indicated impacts to soils from volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons, and to a lesser extent, metals. A total of 20 soil samples were collected from soil borings and test pits as part of the ESI for SEAD-59. A total of 105 samples were collected during the Phase I RI for field screening and 34 of those samples were sent to the laboratory for confirmatory analysis.

In the fill area, polyaromatic hydrocarbon (PAH) compounds were found in surface soil and subsurface soil samples at concentrations exceeding the criteria specified in the Technical and

Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives. Total petroleum hydrocarbons were detected in the majority of the soil samples collected from the fill area. In the area directly southwest of the fill area, there is both physical and chemical evidence of the presence of hydrocarbons. In the area south of the fill area, several paint cans containing paint were found. BTEX constituents were detected in the sample from this location at concentrations exceeding the associated TAGM criteria and Cleanup Levels (NYSDEC, 1992). **Figure 2-5** presents the distribution of total xylenes detected at the site. Xylene was selected as an indicator of BTEX since it was found at the majority of locations where BTEX compounds were detected. **Figure 2-6** presents the distribution of benzo[a]pyrene, chosen as an indicator chemical for PAHs.

<u>Groundwater Data</u>

The analytical results of the groundwater analyses (**Appendix A**) indicate that the groundwater at SEAD-59 has been moderately impacted by total petroleum hydrocarbons and, to a lesser extent, by metals and semivolatile organic compounds. Total petroleum hydrocarbons were detected at low concentrations in each of the downgradient groundwater samples, and were undetected in the upgradient groundwater samples. Iron and sodium were detected at concentrations above their associated groundwater criteria in both the upgradient and the downgradient groundwater samples. Thallium was found in the upgradient and one downgradient groundwater sample at concentrations above the federal MCL. Manganese was found in one downgradient sample at a concentration above the state groundwater criteria. One SVOC was reported at estimated concentrations above groundwater TAGM.

The results of the ESI have identified significant releases of BTEX and PAH compounds in the materials comprising the fill area and disposal pits at SEAD-59. It is important to note that trace quantities of total petroleum hydrocarbons detected in the fill materials are presumably being leached into the groundwater beneath the site. Therefore, the data suggest that affected media at SEAD-59 may have the potential to impact the modeled receptors.

2.5.4.2 SEAD-71

Soil and groundwater were sampled as part of the ESI conducted at SEAD-71 in 1994. Soils were also sampled as part of the Phase I RI conducted in 1998. Sampling and analyses were based upon historical usage of the area for the disposal of paint and solvents. The results of this investigation were detailed in the ESI and Phase I RI reports (Parsons ES, April 1995, July 1998). To evaluate whether each media (soil and groundwater) is being impacted, the chemical analysis data were compared to available New York State and Federal standards, guidelines, and criteria. Only those state standards which are more stringent than federal requirements were used as criteria.

Soil Data

A total of 21 surface soil samples were obtained for chemical analysis as part of the Phase I RI for SEAD-71. Nine soil samples were collected from 4 test pits and screened for BTEX compounds using immunoassay field screening tests. Five test pit soil samples from the 4 test pits were sent to the laboratory for chemical analysis.

The Phase I RI confirmed the findings of the ESI conducted at SEAD-71. No burial pit for paint and solvents was uncovered during either investigation, although the investigations did indicate the soils at SEAD-71 have been impacted by the waste materials which have been disposed of in at least one disposal pit on site. At three test pit locations, polynuclear aromatic hydrocarbons (PAHs) were present at concentrations exceeding the criteria specified in the Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives and Cleanup Levels (NYSDEC 1992). Heavy metals concentrations above the associated criteria values were also present in these three test pits. There is clear evidence that surface soils at SEAD-71 have been impacted by waste materials disposed in the area. Both PAHs and heavy metals were detected above their associated criteria in every surface soil sample collected during the Phase I RI. **Figure 2-7** presents the benzo[a]pyrene concentrations detected at SEAD-71. Benzo[a]pyrene was selected as the indicator chemical for PAHs.

Groundwater Data

Groundwater at the site has not been significantly impacted. Metals were the only constituents detected, with a total 20 for SEAD-71. Out of the 20 metals found, five (aluminum, iron, lead, manganese, and thallium) were detected at concentrations above the lowest associated state or federal criteria (**Appendix A**).

2.6 STATE AND LOCAL ACTIONS TO DATE

There have been no related state or local actions to date at the SEAD-59 and 71. However, state and local authorities have been active in reviewing the ESI work plans and reports, and have provided oversight for the field work.

2.7 POTENTIAL FOR CONTINUED STATE/LOCAL RESPONSE

There are no known plans for state or local response at the site. The removal action proposed in this action memorandum will be conducted by the Army. State authorities will continue to be given the opportunity to review and comment on site documents.

3.0 THREATS TO PUBLIC HEALTH, WELFARE OR THE ENVIRONMENT; STATUTORY AND REGULATORY AUTHORITIES

The removal action program discussed in this action memorandum is proposed to address the potential threats discussed below.

3.1 THREATS TO PUBLIC HEALTH OR WELFARE

A streamlined risk assessment (or mini-risk assessment) was conducted to determine the extent of human risk posed by the contaminants present at SEAD-59 and SEAD-71 (see **Section 3 of Appendix** A). Likely future receptors included an industrial worker, construction worker, trespasser (child), and on-site day care worker and child. A residential receptor was also considered for comparative purposes only. Future residential use of the land is highly unlikely.

For SEAD-59, the total cancer risk from all exposure routes is within the EPA target range for all receptors (less than 1×10^{-4}). Likewise, the total non-cancer hazard index from all exposure routes is less than one for all receptors.

For SEAD-71, the total cancer risk from all exposure routes is within the EPA target range for all receptors except for the future day care center worker, future day care center child, and the future resident. The cancer risk of the day care center worker, based on RME, is 5×10^{-4}. The value based on CT drops to 6×10^{-5}, which is within the target range for cancer risk. The cancer risk of the day care center child based on RME is 1×10^{-3} and based on CT is 2×10^{-4}. The elevated risk for both receptors is primarily due to the ingestion of onsite soils with benzo[a]pyrene and dibenz[a,h]anthracene being the most significant risk contributors. For the resident, the total lifetime cancer risk based on RME is 2×10^{-3}. The total lifetime cancer risk CT value of 2×10^{-4} also exceeds the EPA target range. Both of the elevated cancer risk values are primarily due to the childhood ingestion of soil. The adult ingestion of soil is also a significant contributor to the elevated RME risk value. Benzo[a]anthracene, benzo[a]pyrene, and dibenz[a,h]anthracene are the compounds which most contribute to the elevated risk. The total non-cancer hazard index (HI) based on the RME exceeds one for the industrial worker (HI=4), day care center worker (HI=4) the day care center child (HI=9), the adult resident (HI=5), and the child resident (HI=13). These values decrease based on the CT but still exceed one for all of the previously mentioned receptors (industrial worker (HI=3), day care center worker (HI=3), day care center child (HI=8), adult resident (HI=2), and child resident (HI=6)). The elevated hazard index for all receptors is due solely to ingestion of groundwater, with iron, manganese, and aluminum being the most significant risk contributors.

3.2 THREATS TO THE ENVIRONMENT

An ecological mini-risk assessment was performed for SEAD-59 and SEAD-71 (see **Section 3 of Appendix A**). The deer mouse, short-tailed shrew, and American robin were considered as receptors. Only terrestrial receptors were considered in the ecological mini-risk assessment since there is no evidence of aquatic receptors at both sites. Exposure to terrestrial receptors is from surface soils at the sites.

SEAD-59

For SEAD-59, the potential effects of the exposure of deer mice, short-tailed shrews, or American robins to the COPCs detected in surface soils (0 to 2 feet bgs) were estimated by computing hazard quotients for each species and chemical pair. EPCs used in the HQ calculations are equal to the maximum and mean concentrations. Inorganic analytes present at background levels were eliminated from the risk assessment. Background samples were excluded from the calculation of EPCs. The NOAEL HQs for all constituents found in shallow soil were less than one, with the exception of those listed below:

	Hazard Quotients for SEAD-59					
Compound	**Deer Mouse**		**Short-Tailed Shrew**		**American Robin**	
	Max	**Mean**	**Max**	**Mean**	**Max**	**Mean**
Benzene	<1	<1	3.1	<1	-	-
Ethyl benzene	<1	<1	3.2	<1	-	-
Toluene	**255**	**13**	**1300**	**66**	-	-
Total Xylenes	**340**	**17**	**1600**	**82**	7.7	<1
2-Methylnaphthalene	<1	<1	1.9	<1	<1	<1
Benzo(a)pyrene	3.5	3.7	**15**	**16**	<1	<1
Benzo(b)fluoranthene	<1	<1	1.1	1.2	<1	<1
Bis(2-Ethylhexyl)phthalate	1.1	<1	5.6	<1	**59**	**4.2**

Di-n-octylphthalate	<1	6.6	1.7	**35**	**17**	**360**
Diethylphthalate	<1	<1	<1	<1	**45**	**840**
Fluoranthene	<1	<1	3.6	2.6	<1	<1
Fluorene	1.0	<1	3.5	<1	<1	<1
Indeno(1,2,3-cd)pyrene	<1	<1	1.3	1.4	<1	<1
Phenanthrene	1.3	<1	3.3	<1	<1	<1
Pyrene	<1	<1	<1	<1	<1	<1
Delta-BHC	<1	<1	<1	<1	1.5	<1
Antimony	2.4	1.3	13	6.6	-	-
Mercury	<1	<1	<1	<1	**15**	2.4

Note: HQ values for some compounds are greater for the mean than the maximum concentrations. This is because the calculated mean is greater than the maximum due to high detection limits.

SEAD-59 is located in a portion of the Depot where the future land use is classified as a planned industrial development. As such, this area will probably not represent a preferred habitat for any of the three identified ecological receptors, and the estimated ecological risk will be reduced accordingly.

SEAD-71

For SEAD-71, the potential effects of the exposure of deer mice, short-tailed shrews, or American robins to the COPCs detected in surface soils (0 to 2 feet bgs) were estimated by computing hazard quotients for each species and chemical pair. EPCs used in the HQ calculations are equal to the maximum and mean concentrations. Inorganic analytes present at background levels were eliminated from the risk assessment. Background samples were excluded from the calculation of EPCs. The NOAEL HQs for all constituents found in shallow soil were less than one, with the exception of those listed below:

	Hazard Quotients for SEAD-71					
Compound	**Deer Mouse**		**Short-Tailed Shrew**		**American Robin**	
	Max	**Mean**	**Max**	**Mean**	**Max**	**Mean**
Acenaphthene	1.5	<1	4	2.8	<1	<1
Benzo(a)anthracene	2.9	<1	8.9	1.5	<1	<1
Benzo(a)pyrene	**72**	**12**	**260**	**44**	4.3	<1
Benzo(b)fluoranthene	3.5	<1	**13**	2.8	<1	<1
Benzo(ghi)perylene	1.9	<1	**7**	1.3	<1	<
Benzo(k)fluoranthene	4.2	<1	**16**	2.5	<1	<1
Chrysene	3.9	<1	**12**	2.1	<1	<1
Dibenzofuran	<1	<1	<1	<1	**60**	6.2
Dibenz(a,h)anthracene	<1	<1	2.1	<1	<1	<1
Fluoranthene	**33**	4.7	**130**	**19**	2.9	<1
Fluorene	2.8	<1	8.2	<1	<1	<1
Indeno(1,2,3-cd)pyrene	3.2	<1	**13**	2.1	<1	<1
Naphthalene	<1	<1	1.1	<1	<1	<1
Phenanthrene	8.3	1.3	**17**	2.8	1.1	<1
Pyrene	5.4	<1	**12**	2.2	<1	<1
4,4'-DDT	<1	<1	<1	<1	1.9	<1
Lead	**100**	7.3	**430**	**31**	**540**	**39**
Mercury	<1	<1	2.2	<1	**36**	2.3
Selenium	6.1	3.1	**22**	**11**	7.2	3.6
Zinc	**25**	3.5	**110**	**15**	**680**	**93**

SEAD-71 is located in a portion of the Depot where the future land use is classified as a planned industrial development. As such, this area will probably not represent a preferred habitat for any of the three identified ecological receptors, and the estimated ecological risk will be reduced accordingly.

3.3 STATUTORY AUTHORITY

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) states that a removal action may be conducted at a site when there is a potential threat to public health, public welfare, or the environment. An appropriate removal action is undertaken to abate, minimize, stabilize, mitigate, or eliminate the release or the threat of release at a site. Section 300.415(b)(2) of the NCP outlines factors to be considered when determining the appropriateness of a removal action, such as high levels of hazardous substances, pollutants, or contaminants in soils, largely at or near the surface, that may migrate; or the threat of fire or explosion.

Once it is determined that a removal action is appropriate, the removal is designated an emergency, time-critical, or non-time-critical removal. Emergencies are those situations in which response actions must begin within hours or days after the completion of the site evaluation. Time-critical removals are those in which, based on a site evaluation, it is determined that less than 6 months remains before response actions must begin. Non-time-critical removals are those in which it is determined that more than 6 months may pass before response actions must begin. Since less than 6 months may pass before this removal action begins, this removal action is considered a voluntary, time-critical removal action.

3.4 ADDITIONAL JUSTIFICATION FOR REMOVAL ACTION

The results of the test pitting investigation have confirmed the presence of 55-gallon drums, paint cans, and other containers at SEADs-59 and 71. The presence of such buried objects is of concern since the nature of the contents is unknown. The uncertainty of the contents of the buried items that may remain in the disposal area and at geophysical anomalies and the contamination in soils and groundwater are considered justification for performing a removal action at both sites.. While removal of drums and paint cans is the focus of the planned removal action, the potential for contamination to be present in the soil that surrounds these items will also be addressed by this action. Goals for allowable soil concentrations will be developed, based upon existing conditions, and will be used as the basis for returning soil, segregated from the buried items, to the fill area and areas south of the road.

4.0 ENDANGERMENT DETERMINATION

Actual or threatened releases of pollutants and contaminants from this site, if not addressed by implementing the response action selected in this action memorandum, may present an endangerment to public health, welfare, or the environment.

5.0 PROPOSED ACTION AND ESTIMATED COSTS

5.1 PROPOSED ACTION

5.1.1 General Statement of the Removal Action Objectives

The establishment of action objectives and site-specific considerations forms a basis for identifying and selecting appropriate action alternatives. Action objectives must:

- Protect human health and the environment, and
- Address contaminants of concern, exposure routes, and receptors.

Applicable or relevant and appropriate requirements (ARARs) establish cleanup standards that can be used to define action objectives.

Several general objectives can be defined for the proposed action at SEAD-59 and 71. The primary objective is to eliminate the threat of continued groundwater contamination by removing the source of the contamination. Secondary objectives include completing all remedial activities on site, and in a manner which minimizes exposure to workers and the general public during the remedial activities.

5.1.2 Proposed Action Description

Once the work plans have been approved, site preparation and mobilization will begin. The contractor will bring all the necessary equipment to the site, arrange for all required utilities, and obtain all necessary permits. If necessary, pads will be constructed for the equipment, and run on and run off controls will be constructed.

SEAD-59

SEAD-59 consists of two areas that are located north and south of an access road that bisects the site from east to west. The area north of the road is a fill area and the area south of the road was used as a staging area for heavy equipment and construction materials.

As part of the removal action at SEAD-59, approximately 23,085 cy of soil will be excavated

(**Figure 5-1**). The fill area (Area 1) will be excavated. Geophysical anomalies located south of the road will be excavated. Drums, paint cans, and construction debris will be screened out and disposed off-site.

Following excavation, soils will be placed in 150cy piles for testing to ensure that they comply with the clean up goals developed for the site. Soils with concentration of metals, pesticides, and SVOCs exceeding the clean up goals will be disposed of at an offsite facility. These soils will also be analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) limits required for landfill disposal. Soils from SEAD-59 are not expected to exceed TCLP limits and will be disposed of at an off-site, Subtitle D, solid waste industrial landfill.

Soils with concentrations of metals, pesticides, and SVOCs below the cleanup goals will be backfilled into the former fill area and the area south of the road. The sites will be regraded. A two-foot thick vegetative cover will be placed over the former fill area. It is assumed that NYCRR Part 360 will no longer apply because the fill area is being removed. The remaining areas will be covered with crushed stone.

The excavations at SEAD-59 will be dewatered and the water placed in holding tanks. Any groundwater collected will be treated and disposed in accordance with all state and federal regulations. During the excavation process, the sides of the excavation may be sloped to the levels required by OSHA. Shoring or bracing may also be used.

Site groundwater will be monitored on a semi-annual basis and analyzed for SVOCs, Total Petroleum Hydrocarbons, and metals at SEAD-59. Four additional monitoring wells will be installed at the site as required. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years.

Deed restrictions will be applied to SEAD-59 in order that the future land use remains as Planned Industrial Development.

SEAD-71

At SEAD-71, geophysical anomalies and soils with concentrations exceeding the soil cleanup goals for the site will be excavated (**Figure 5-2**). Paint cans and debris will be screened out and disposed off site.

Following excavation, soils will be placed in 150cy piles for testing to ensure that they comply with the clean up goals developed for the site. Soils with concentration of metals, pesticides, and SVOCs exceeding the clean up goals will be disposed of at an offsite facility. These soils will also be analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) limits required for landfill disposal. About 3% (275cy) of SEAD-71 soils are expected to exceed TCLP limits due to elevated levels of lead. These soils will be treated off site. Once treatment of necessary soils has occurred, these contaminated soils would be transported to an off-site, Subtitle D, solid waste industrial landfill for disposal.

Soils with concentrations below the cleanup goals will be backfilled into SEAD-71. The area will be covered with crushed stone.

Site groundwater will be monitored on a semi-annual basis and analyzed for metals at SEAD-71. Additional monitoring wells will be installed at each site as required. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years.

Deed restrictions will be applied to SEAD-71 in order that the future land use remains as Planned Industrial Development.

5.1.3 Contribution to Remedial Performance

The purpose of this action is to remove the source of semivolatile organic compounds, pesticides, PCBs, and metal contamination at the sites and thereby reduce the potential for further contamination of soils and groundwater. This work should eliminate the potential for future remedial actions.

Because the impetus for the removal action at both sites is the presence of drums and paint cans, and due to the uncertain nature of the contents, excavation and disposal, rather than any sort of in-situ treatment of these items is logical. For this reason, no alternative technologies were evaluated as part of this analysis.

5.1.4 Engineering Evaluation/Cost Analysis

Because this removal action is considered time-critical, only one alternative, excavation and disposal, rather than any sort of in-situ treatment of these materials was considered. A Decision Document, which contains a brief summary of the site history and the results of previous investigations, was prepared and is included as **Appendix A** of this report.

5.1.5 Description of Alternative Technologies

The main focus of the Decision Document is an evaluation of the different remedial technologies. Because the impetus for the removal action at these sites is the presence of debris, and due to the uncertain nature of this debris, only one alternative, excavation and disposal, rather than any sort of in-situ treatment of these items is logical. For this reason, no alternative technologies were evaluated as part of this evaluation.

5.1.6 Institutional Controls

There are no institutional controls required for this action. The requirement for institutional controls will be addressed as part of the overall remedial action.

5.1.7 Off-Site Disposal Policy

It is anticipated that soil generated during the removal action at SEAD-71 may be classified as hazardous waste. These soils will be treated off site. Once treatment of necessary soils has occurred, these contaminated soils would be transported to an off-site, Subtitle D, solid waste industrial landfill for disposal. All non-hazardous waste (construction debris, soils) will be disposed in an approved non-hazardous waste landfill (if necessary).

5.1.8 Post-Removal Site Control Activities

The depot is fenced to limit access.

5.1.9 QA/QC Plan

The remedial contractor will be required to develop a QA/QC plan which will be submitted to the appropriate agencies for approval. This plan will address both detailed and broad QA/QC issues. Detailed requirements include sampling and analytical protocols. The broader aspects will address the procedures necessary to ensure that the excavation, sizing, stabilization procedures, and stabilization procedures are conducted for accordance with the specifications.

Additional QA/QC will be provided by a 3rd party oversite contractor. The oversight contractor will be responsible for monitoring the removal action activities, including taking confirmation soil samples. The QA/QC plan will be provided as part of the Removal Action Work Plan.

5.2 ARARS STANDARDS, CRITERIA AND GUIDELINES (SCGS)

Pursuant to Section 300.415(i) of the NCP, the removal action for the site "shall, to the extent practicable considering the exigencies of the situation, attain applicable or relevant and appropriate requirements under federal environmental or state environmental or facility siting laws." ARARs are used to identify removal action objectives, formulate removal action alternatives, govern the implementation and operation of a selected removal action, and evaluate the appropriate extent of site cleanup.

In 40 CFR 300.5, EPA defines applicable requirements as those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable. Relevant and appropriate requirements are defined as those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

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

Three categories of ARARs have been analyzed: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs address certain chemicals or a class of chemicals and relate to the level of contamination allowed for a specific pollutant in various environmental media (water, soil, air). Location-specific ARARs are based on the specific setting and nature of the site. Action-specific ARARs relate to specific actions proposed for implementation at a site.

5.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are usually health or risk-based standards limiting the concentration of a chemical found in or discharged to the environment. They govern the extent of site remediation by providing actual cleanup levels, or the basis for calculating such levels for specific media. These requirements may apply to air emissions during the removal action. A number of federal and state regulations may be used for this site. These include the following:

Federal:

- Resource Conservation and Recovery Act (RCRA), Groundwater Protection Standards and Maximum Concentration Limits (40 CFR 264, Subpart F)
- Atomic Energy Act, Standards for Protection Against Radiation (10 CFR 20 subpart D)
- Clean Water Act, Water Quality Criteria (Section 304) (May 1, 1987 - Gold Book)
- Clean Air Act, Standards for Radionuclides (40 CFR 61.22 and .102)

- Safe Drinking Water Act, Maximum Contaminant Levels (MCLs) (40 CFR 141.11-.16)

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, November 15, 1990
- New York State Department of Environment Conservation, Division of Fish and Wildlife, Division of Marine Resources, Technical Guidance for Screening Contaminated Sediments, July 1994.
- Surface Water and Groundwater Classifications and Standards (6 NYCRR 700-705)
- Declaration of Policy, Article 1 Environmental Conservation Law (ECL)
- General Functions, Powers, Duties and Jurisdiction, Article 3 Environmental Conservation Law, Department of Environmental Conservation
- ECL, Protection of Water, Article 15, Title 5.
- Use and Protection of Waters, (6 NYCRR, Part 608)

Water Quality

There are a number of water quality standards which are potential ARARs for this removal action.

- 40 CFR Part 131 (applicable): Water Quality Standards. This part implements Section 101 of the Clean Water Act (CWA), which specifies the national goals of eliminating the discharge of pollutants, prohibiting the discharge of toxic pollutants in toxic amounts, and implementing programs for control of non-point sources.

- 40 CFR Part 131.12 (applicable): Antidegradation Policy. Establishes standards to prevent a body of water which has an existing high standard from degrading to a lower standard.

- 40 CFR Part 141 (applicable): National Primary Drinking Water Regulations. This part establishes primary drinking water regulators pursuant to Section 1412 of the Public Health Service Act as amended by the Safe Drinking Water Act.

- 40 CFR Part 141.11 (applicable): Maximum Inorganic Chemical Contaminant Levels. This section establishes maximum contaminant levels (MCLs) for inorganic chemicals.

- 40 CFR Part 141.12 (applicable): Maximum Organic Chemical Contaminant Levels. This section establishes MCLs for organic chemicals.

- 40 CFR Part 264 Subpart F (relevant and appropriate): Releases from Solid Waste Management Units. Standards for protection of groundwater are established under this citation.

- 40 CFR Part 403 (applicable): Pretreatment Standards for the Discharge of Treated Site Water to a Publicly Owned Treatment Works (POTW). This part establishes pretreatment standards for the discharge of wastewater to POTWs.

- 6 NYCRR Chapter X (relevant and appropriate): This chapter establishes the requirements of the State Pollutant Discharge Elimination System.

- 6 NYCRR subparts 701 and 702 (applicable): These subparts establish surface water standards for protection of drinking water and aquatic life.

- 6 NYCRR subpart 703 (applicable): This subpart establishes groundwater standards specified to protect groundwater for drinking water purposes.

- 6 NYCRR subpart 375 (relevant and appropriate): This subpart contains the New York State rules for inactive hazardous waste disposal sites.

- 6 NYCRR subpart 373-2.6 and 373-2.11 (applicable): This regulation requires groundwater monitoring for releases from solid waste management units.

- 6 NYCRR subpart 373-2 (relevant and appropriate): This regulation establishes postclosure care and groundwater monitoring requirements.

- 10 NYCRR Part 5 (relevant and appropriate): This regulation establishes criteria for drinking water supplies. Specifically, NYSDOH has established MCLs for water.

- NYSDEC TOGS 1.1.1 (relevant and appropriate): This document compiles water quality standards and guidance values for use in NYSDEC programs.

Soil Quality

- 40 CFR Part 268 (relevant and appropriate): Land Disposal Restrictions. Restricts the disposal of listed and characteristic hazardous waste which contain hazardous constituents exceeding designated levels. Applies when the waste is "placed" on the land.

- 40 CFR subpart S parts 264.552 and 264.533 (relevant and applicable): Corrective Action for Solid Waste Management Action for Solid Waste Management Units. Allows for the consolidation of wastes, or the replacement of remediated wastes in land based units without invoking the RCRA land-disposal requirement of 40 CFR 268.

- 6 NYCRR subpart 375 (relevant and appropriate): This subpart contains the New York State rules for inactive hazardous waste disposal sites. Specifically, cleanup levels for hazardous constituents in soil have been proposed by the State of New York through Technical and Administrative Guidance Manuals (TAGMs). The NYSDEC TAGM manual for cleanup levels for soils is #HWR-92-4046 and has been used as guidance for this remedial action. The final management of these materials will be the focus of the ultimate Record of Decision (ROD) and are not the focus of this action.

Site Cleanup Goals (SCG) for semivolatile organic compounds, pesticides, PCBs, and metals have been determined as the maximum concentration to be protective of human health from ingestion of soils under the Industrial Use Scenario.

5.2.2 Location-Specific ARARs

Location-specific ARARs govern natural site features such as wetlands, floodplains, and sensitive ecosystems, and manmade features such as landfills, disposal areas, and places of historic or archaeological significance. These ARARs generally restrict the concentration of hazardous substances or the conduct of activities based solely on the particular characteristics or location of the site. Federal and State regulations which may apply to this removal action include the following:

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)

- Wetlands Construction and Management Procedures (40 CFR 6, Appendix A).

- USDA/SCS - Farmland Protection Policy (7CFR 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 se q).
- Endangered Species Act (16 USC 1531).
- Fish and Wildlife Coordination Act (16 USC 661)
- Wilderness Act (16 USC 1131).

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.

Endangered Species

- 40 CFR Part 257.3-2 (relevant and appropriate): Facilities or practices shall not cause or contribute to the taking of any endangered or threatened species.

Location Standards

- 40 CFR Part 264.18 (relevant and appropriate): Location Standards for Hazardous Waste Facilities. The general requirements for locating a hazardous treatment, storage, or disposal facility are found in this section. They include provisions for seismic considerations and floodplains.

- 40 CFR Part 241.202 (applicable): Site selection shall be consistent with public health and welfare. It shall also be consistent with land-use plans and air and water quality standards.

Antiquities

- 16 USC Part 469a-1 (applicable): The Archaeological and Historic Preservation Act requires that action be taken to recover and preserve artifacts.

- 36 CFR Part 800 (relevant and appropriate): Action must be taken to preserve historic properties. Actions must be planned to minimize harm to national historic landmarks.

5.2.3 Action-Specific ARARs

Action-specific ARARs are usually technology- or activity-based- limitations that control actions at hazardous waste sites. Action-specific ARARs generally set performance or design standards, controls, or restrictions on particular types of activities. To develop technically feasible alternatives, applicable performance or design standards must be considered during the development of all removal alternatives. Action-specific ARARs are applicable to this site. The action-specific ARARs to be used will be determined by the Army based upon the technology chosen. Federal and State regulations which may apply include the following:

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 Publically - 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).
- SARA (42 USC 9601)
- OSHA (29 CFR 1910.120)
- Clean Air Act (40 CFR 50.61)

New York State:

- New York State Pollution Discharge Elimination System (SPDES) Requirements (Standards for Stormwater Runoff, Surfacewater, 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).

Solid Waste Management

- 40 part CFR 241.100 (relevant and appropriate): Guidelines for the Land Disposal of Solid Wastes. These regulations are geared specifically toward sanitary landfills; however, they are applicable to all forms of land disposal and land-based treatment.

- 40 CFR Part 241.204 (applicable): Water Quality. The location, design, construction, and operation of land disposal facilities shall protect water quality.

- 40 CFR Part 241.205 (applicable): The design, construction, and operation of land disposal facilities shall conform to air quality and source control standards.

- 40 CFR Part 257.1 (relevant and appropriate): This part establishes the scope and purpose of criteria for use in assessing the possibility of adverse effects on health or the environment from solid waste disposal operations.

- 40 CFR Part 257.3 (relevant and appropriate): This part establishes criteria to assess the impact of disposal operations, including such considerations as floodplains, endangered species, air, surface water, groundwater, and land used for food-chain crops.

- 40 CFR Part 243.202 (relevant and appropriate): This part specifies the requirements for transporting solid waste, including provisions to prevent spillage.

Hazardous Waste Management

- 40 CFR 262.11 (applicable): This regulation requires a person who generates a solid waste to determine if that waste is a hazardous waste.

- 40 CFR Part 263.30 and 263.31 (relevant and appropriate): These regulations set forth the standards and requirements for action in the event of a release during transport.

- 40 CFR Part 264 (relevant and appropriate): This part establishes hazardous waste management facility standards and requirements. The onsite disposal areas used for stockpiling, mixing, and extended bioremediation of wastes must meet the substantive requirements of 40 CFR subparts B (general facility standards), E (manifest system, record keeping, and reporting), F (releases from solid waste management units), G (closure and postclosure), L (waste piles), M (land treatment), and N (landfills). These regulations are applicable for hazardous wastes and are also relevant and appropriate for certain wastes which are not hazardous wastes.

- 40 CFR Part 270 subpart C (relevant and appropriate): This regulation establishes permit conditions, including monitoring, recordkeeping requirements, operation and maintenance requirements, sampling, and monitoring requirements. Although no permit is required for activities conducted entirely on site, the substantive requirements of these provisions are relevant and appropriate.

- 40 CFR Part 270 subpart B (relevant and appropriate): This part defines the required contents of a hazardous waste management permit application. The substantive requirements of these provisions are relevant and appropriate.

Occupational Health and Safety Administration

- 29 CFR Part 1910.50 (applicable): Occupational Noise. No worker shall be exposed to noise levels in excess of the levels specified in this regulation.

- 29 CFR Part 1910.1000 (applicable): Occupational Air Contaminants. The purpose of this rule is to establish maximum threshold limit values for air contaminants to which it is believed nearly all workers may be repeatedly exposed day after day without adverse health effects. No worker shall be exposed to air contaminant levels in excess of the threshold limit values listed in the regulation.

- 29 CFR Part 1910.1200 (applicable): This part requires that each employer compile and maintain a workplace chemical list which contains the chemical name of each hazardous chemical in the workplace, cross-referenced to generally used common names. This list must indicate the work area in which each such hazardous chemical is stored or used. Employees must be provided with information and training regarding the hazardous chemicals.

- 29 CFR Part 120 (applicable): This part applies to employers and employees engaged in sites that have been designated for cleanup, and other work related to RCRA and CERCLA. The regulation establishes proceedings for site characterization and control, and requirements for employee training and medical monitoring.

Transportation of Hazardous Waste

- 49 CFR Part 171 (applicable): General information, regulations, and definitions. This regulation prescribes the requirements of the DOT governing the transportation of hazardous material.

- 40 CFR Part 172 (applicable): Hazardous materials table, special provisions, Hazardous Materials Communications, Emergency Response Information, and Training requirements. This regulation lists and classifies those materials which the DOT has designated to be hazardous materials for the purpose of transportation and prescribes the requirements for shipping papers, package marking, labeling and transport vehicle placarding applicable to the shipment and transportation of those hazardous materials.

- 49 CFR Part 177 (applicable): Carriage by Public Highway. This regulation prescribes requirements that are applicable to the acceptance and transportation of hazardous materials by private, common, or contract carriers by motor vehicle.

- 6 NYCRR Chapter 364 (applicable): New York Waste Transport Permit Regulation. This regulation governs the collection, transport, and delivery of regulated waste originating on terminating within the state of New York.

- EPA/DOT Guidance Manual on hazardous waste transportation (TBC)

5.3 SITE-SPECIFIC CLEAN-UP GOALS

5.3.1 Clean-Up Goals for Soil

Clean-up goals for both sites have been established such that human health risk will be reduced to within EPA criteria values for the future land use. Concentrations of SVOCs, pesticides, and metals that would yield a hazard index of 1 or a cancer risk of 1×10^{-4} were calculated based on the reasonable maximum exposure (REM) for the future industrial land use scenario. **Table 5.3-1** presents the clean-up goals for each site.

5.3.2 Discharge Criteria for Groundwater

Discharge criteria for constituents in groundwater will be adopted based on values as reported in the Division of Water Technical and Operational Guidance Series (1.1.1 and 1.1.2) (TOGS) for Ambient Water Quality Standards And Guidance Values And Groundwater Effluent Limitations. This document includes the groundwater standards (6 NYCRR 703.5) and regulatory effluent limitations (6 NYCRR 703.6).

5.4 PROJECT SCHEDULE

The total duration for the removal action after regulatory approval is 3 months.

5.5 ESTIMATED COSTS

The estimated total project cost of $3.5 million is based upon a preliminary estimate provided by Parsons Engineering Science, using the TRACES/MCACES for Windows v1.2 software (**Table 5.5-1**).

TABLE 5.3-1
MAXIMUM CONCENTRATIONS TO BE PROTECTIVE OF HUMAN HEALTH FROM INGESTION OF SOILS UNDER THE INDUSTRIAL USE SCENERIO
Decision Document- SEADs- 59 and 71
Seneca Army Depot Activity

	SEAD-59	SEAD-71
Semivolatile Organics	**(ug/kg)**	**(ug/kg)**
2-Methylnaphthalene	65,471	114,546
Acenaphthene		147,273
Anthracene		373,092
Benzo(a)anthracene	13,208	14,966
Benzo(a)pyrene	12,107	11,980
Benzo(b)fluoranthene	15,409	8,784
Bis(2-Ethylhexyl)phthalate	65,471	
Dibenz(a,h)anthracene	2,531	2,497
Fluoranthene	851,121	1,636,368
Fluorene		120,273
Indeno(1,2,3-cd)pyrene		6,479
Naphthalene		146,455
Pyrene	834,753	1,045,639
Pesticides/PCBs		
4,4-DDT		2,045
alpha-Chlordane		25
Aroclor-1254	327	
Endrin		121
gamma-Chlordane		49
Heptaclor epoxide	21	88
Metals	**(mg/kg)**	**(mg/kg)**
Antimony	13	
Mercury	1.4	0.4
Selenium		4
Zinc		1792

Table 5.5-1
Cost Estimate for Excavation and Off-site Disposal
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SEAD-59	**Recommended Removal Action Excavation/Off-site Disposal**
Cost to Prime	$1,957,768
Cost to Owner	$2,702,220
Annual O&M Costs	$0
Annual Post Remediation Monitoring Costs	$52,450
Present Worth O&M and Monitoring Costs (5 years)	$233,497
Total Evaluated Price	$2,935,717

SEAD-71	**Recommended Removal Action Excavation/Off-site Disposal**
Cost to Prime	$348,864
Cost to Owner	$467,630
Annual O&M Costs	$0
Annual Post Remediation Monitoring Costs	$32,920
Present Worth O&M and Monitoring Costs (5 years)	$146,553
Total Evaluated Price	$614,183

SEADs-59 and 71	**Recommended Removal Action Excavation/Off-site Disposal**
Cost to Prime	$2,306,632
Cost to Owner	$3,169,850
Annual O&M Costs	$0
Annual Post Remediation Monitoring Costs	$85,370
Present Worth O&M and Monitoring Costs (5 years)	$380,050
Total Evaluated Price	$3,549,900

NOTES:

1. Cost to Prime (Contractor) is the sum of the direct costs plus any sales tax, subcontractor markups, and adjust pricing that have been applied in the project.
2. Cost to Owner is the sum of the Cost to Prime plus prime contractor Indirect Cost. Also known as the bid amount or construction contract cost.
3. Annual Costs are costs that will occur yearly due to activities such as maintenance or monitoring.
4. Post Remediation Monitoring consists of semi-annual groundwater monitoring.
5. Present Worth Cost is based on a 4% interest rate over the number of years specified above.
6. Total Evaluated Price is the sum of the Project Cost and Present Worth Cost.

6.0 EXPECTED CHANGE IN SITE CONDITIONS SHOULD ACTION BE DELAYED OR NOT TAKEN

If this removal action is delayed or not taken, several changes in site conditions would occur:

- Some lateral and vertical migration of the contaminants can be expected. The migration could occur through several mechanisms, including transport of water-soluble constituents through infiltration or runoff.

- The contamination in the soil is likely to migrate slowly over time. Contaminants that are near or at the water table may be transported via leaching and groundwater flow.

7.0 OUTSTANDING POLICY ISSUES

This section is not applicable to this removal action since the lead agency for this site is the Army, and not the EPA, NYSDEC, or NYSDOH.

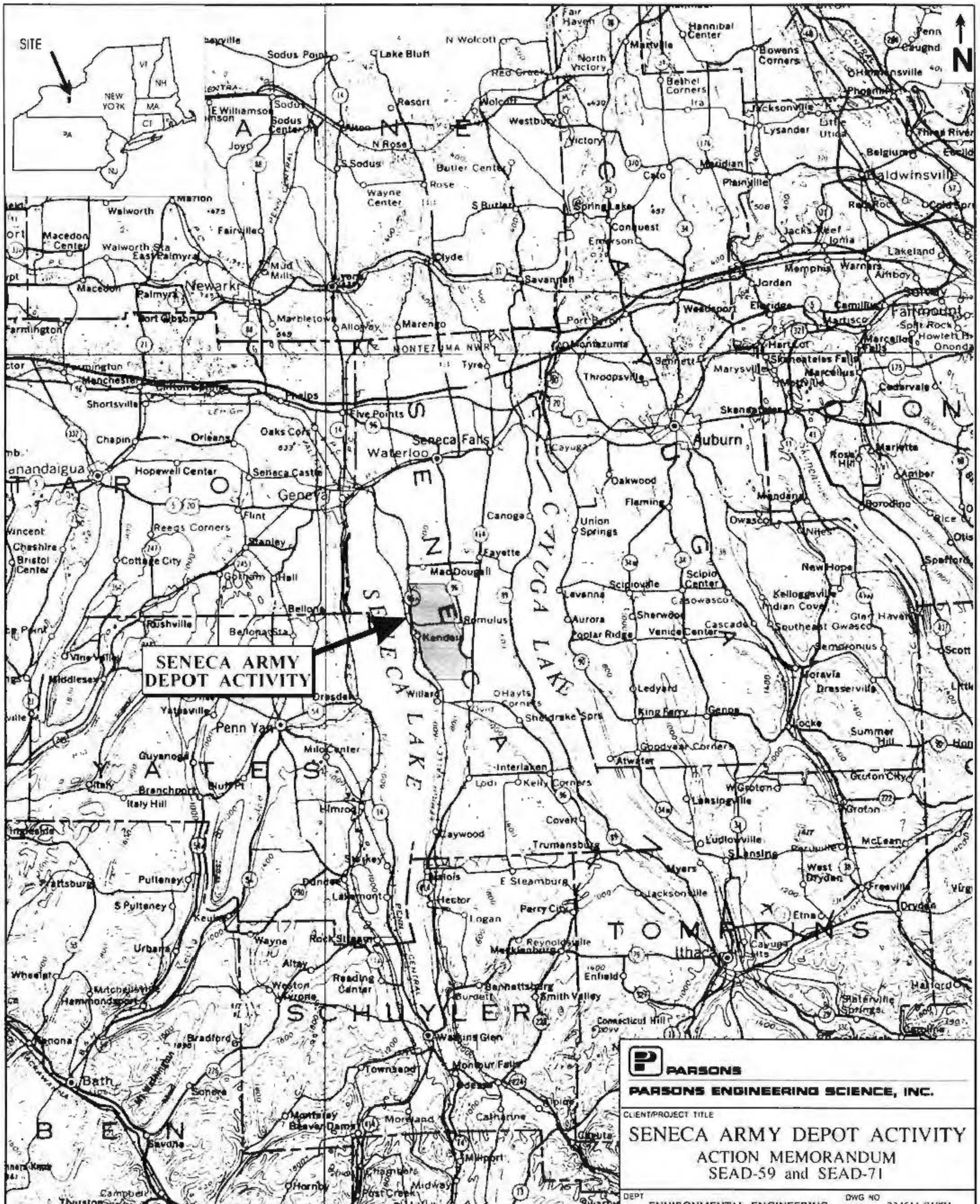
8.0 ENFORCEMENT

This section is not applicable to this removal action since the lead agency, the Army is the Principle Responsible Party for this site, and is taking responsibility for the removal action.

9.0 RECOMMENDATION

The time-critical removal action recommended for SEADs-59 and 71 is excavation of the debris and soil that exceeds the site-specific clean-up goals, off-site disposal, and backfilling of the excavated soils if constituents present are below the clean-up criteria. Additionally, new groundwater monitoring wells will be installed near SEADs-59 and 71 for use in the characterization of underlying groundwater. The new monitoring wells and the existing wells will be sampled using low-flow purge-and-pump techniques to minimize trubidity levels.

This Action Memorandum represents the selected removal action for SEAD-59 and SEAD-71 at the Seneca Army Depot Activity located in Romulus, New York. This proposal was developed in accordance with CERCLA as amended, and consistent with the NCP. This decision is based on the administrative record for the site.



PARSONS

PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
ACTION MEMORANDUM
SEAD-59 and SEAD-71

DEPT	DWG NO
ENVIRONMENTAL ENGINEERING	734516-01001

FIGURE 2-1
LOCATION MAP

SCALE	DATE
1" = 8 MILES APPROX.	JULY 2000

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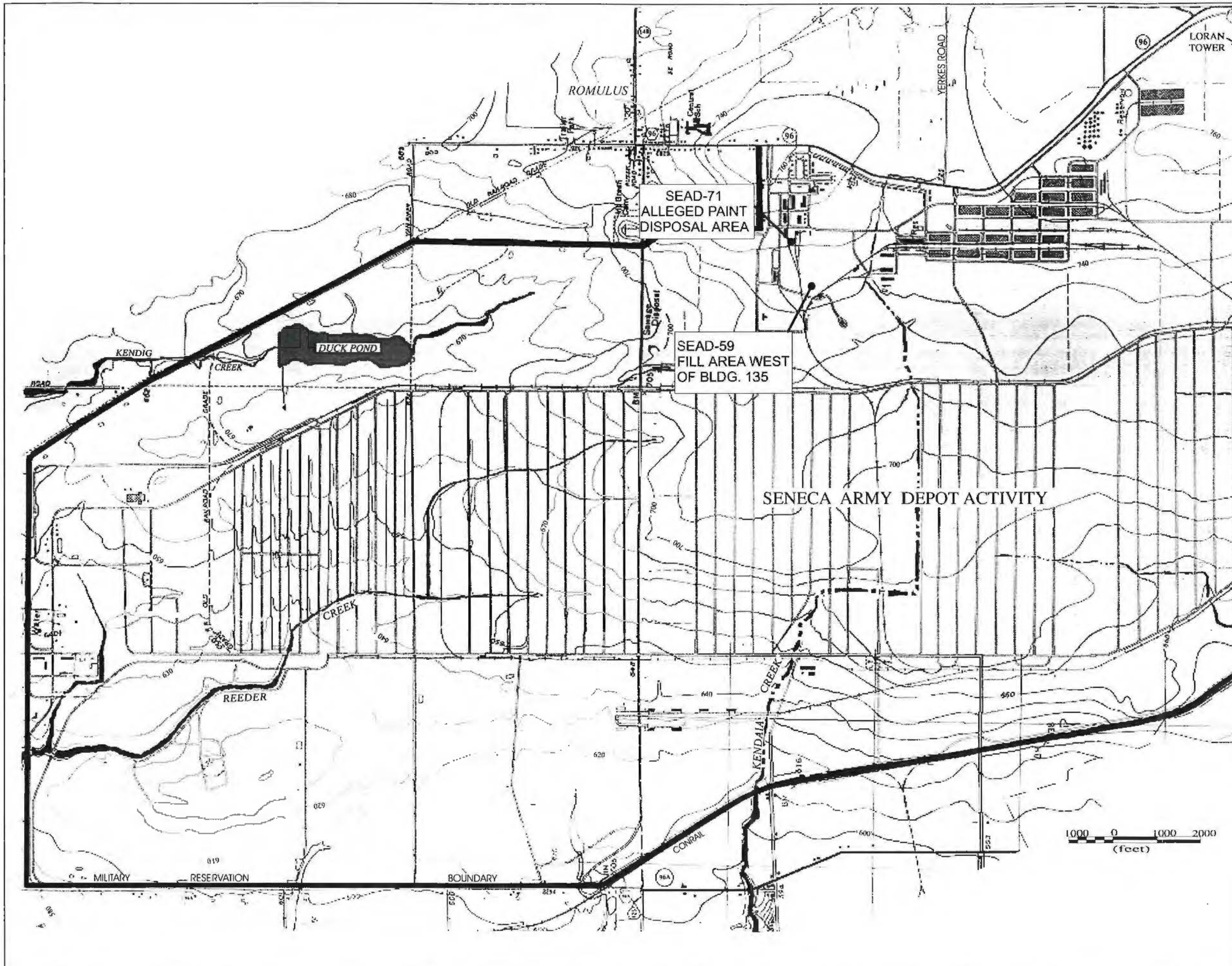

PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
ACTION MEMORANDUM
SEAD 59 AND SEAD 71

DEPT ENVIRONMENTAL ENGINEERING | DWG NO 734516-01001

FIGURE 2-2

SENECA ARMY DEPOT ACTIVITY MAP

SCALE NA | DATE JULY 2000

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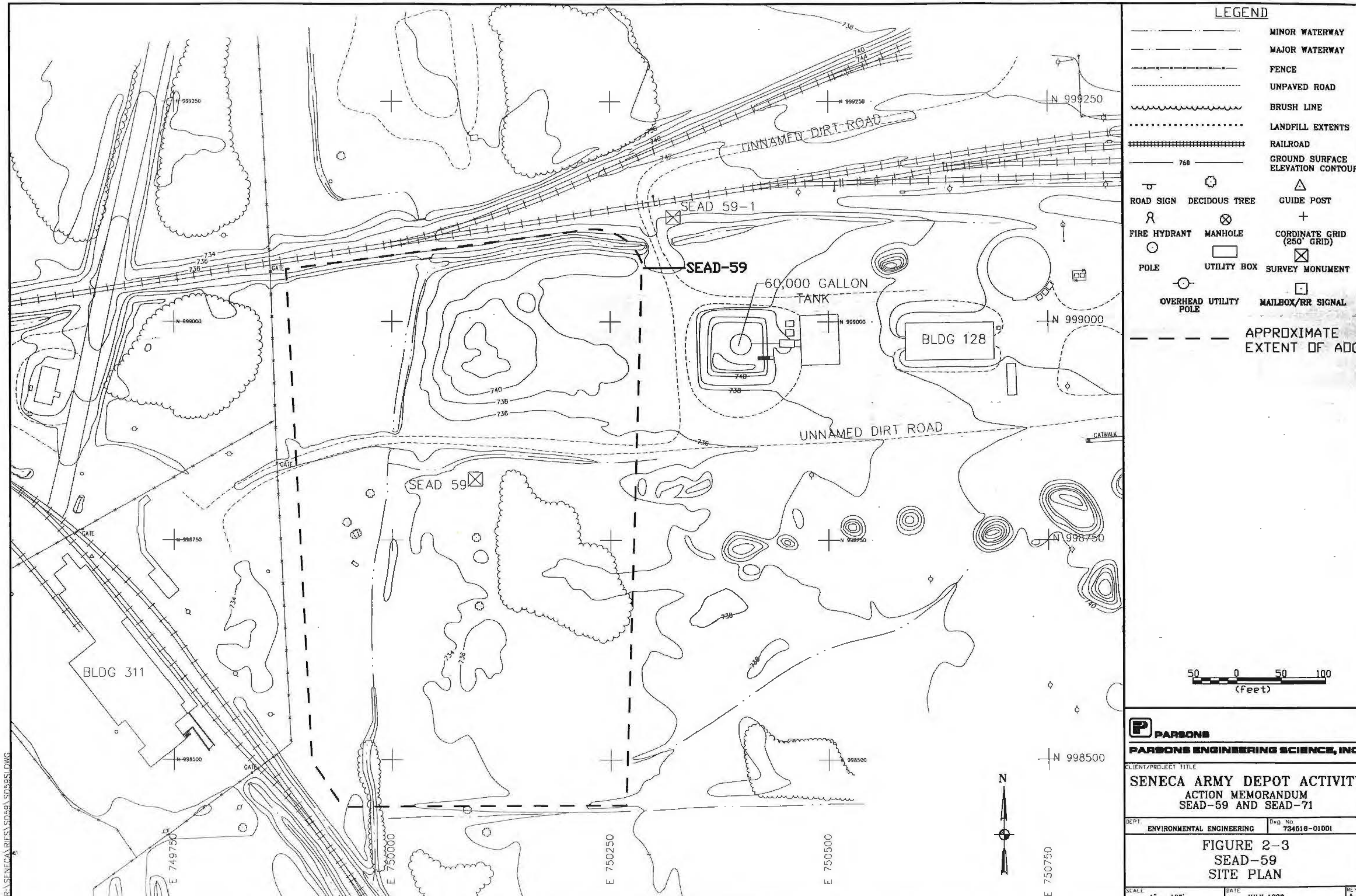


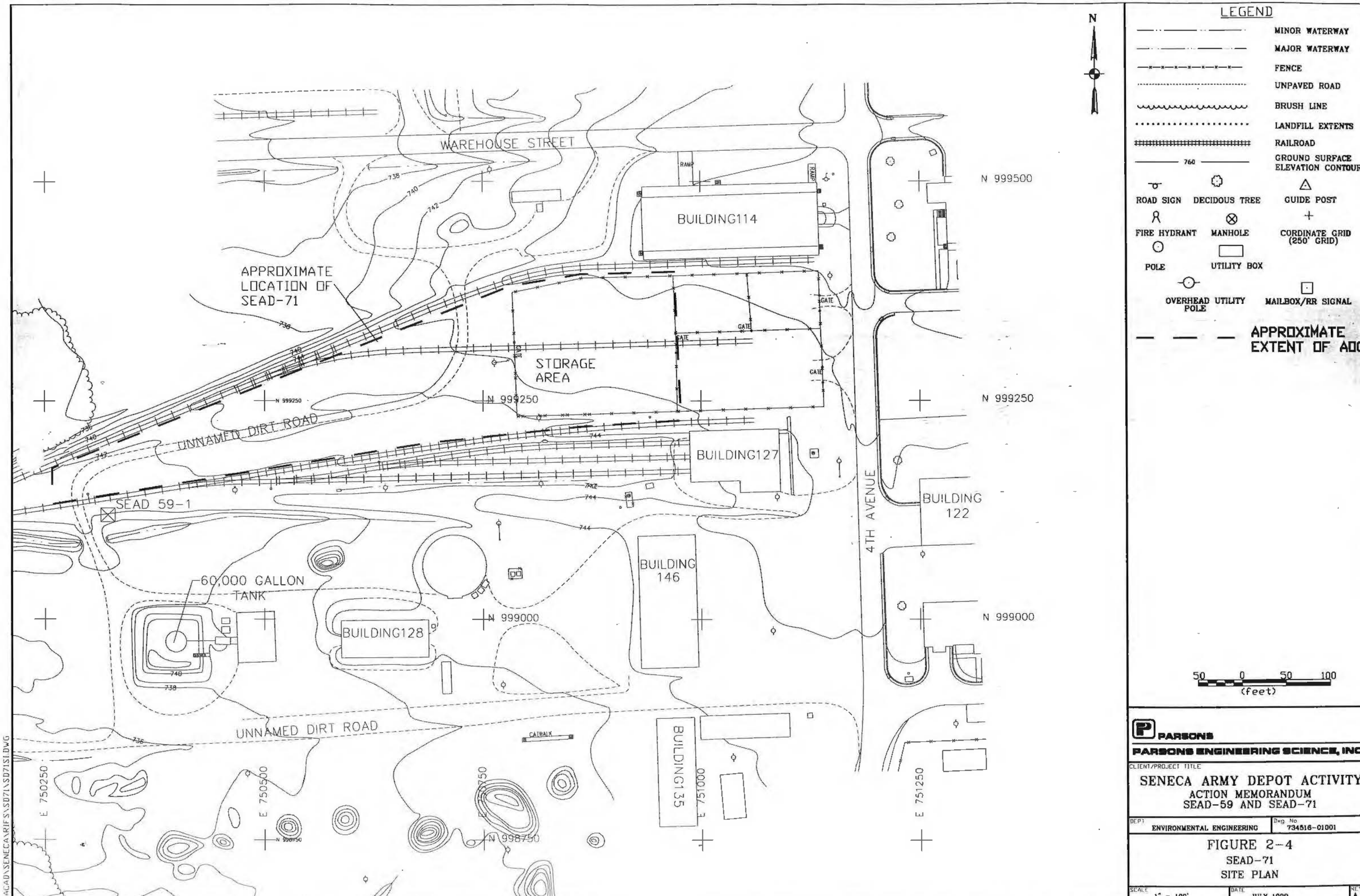
PARSONS
PARSONS ENGINEERING SCIENCE, INC.

CLIENT/PROJECT TITLE
SENECA ARMY DEPOT ACTIVITY
ACTION MEMORANDUM
SEAD-59 AND SEAD-71

DEPT.	Dwg. No.
ENVIRONMENTAL ENGINEERING	734518-01001

FIGURE 2-3
SEAD-59
SITE PLAN

SCALE	DATE	REV
1" = 100'	JULY 1999	A



PARSONS

PARSONS ENGINEERING SCIENCE, INC.

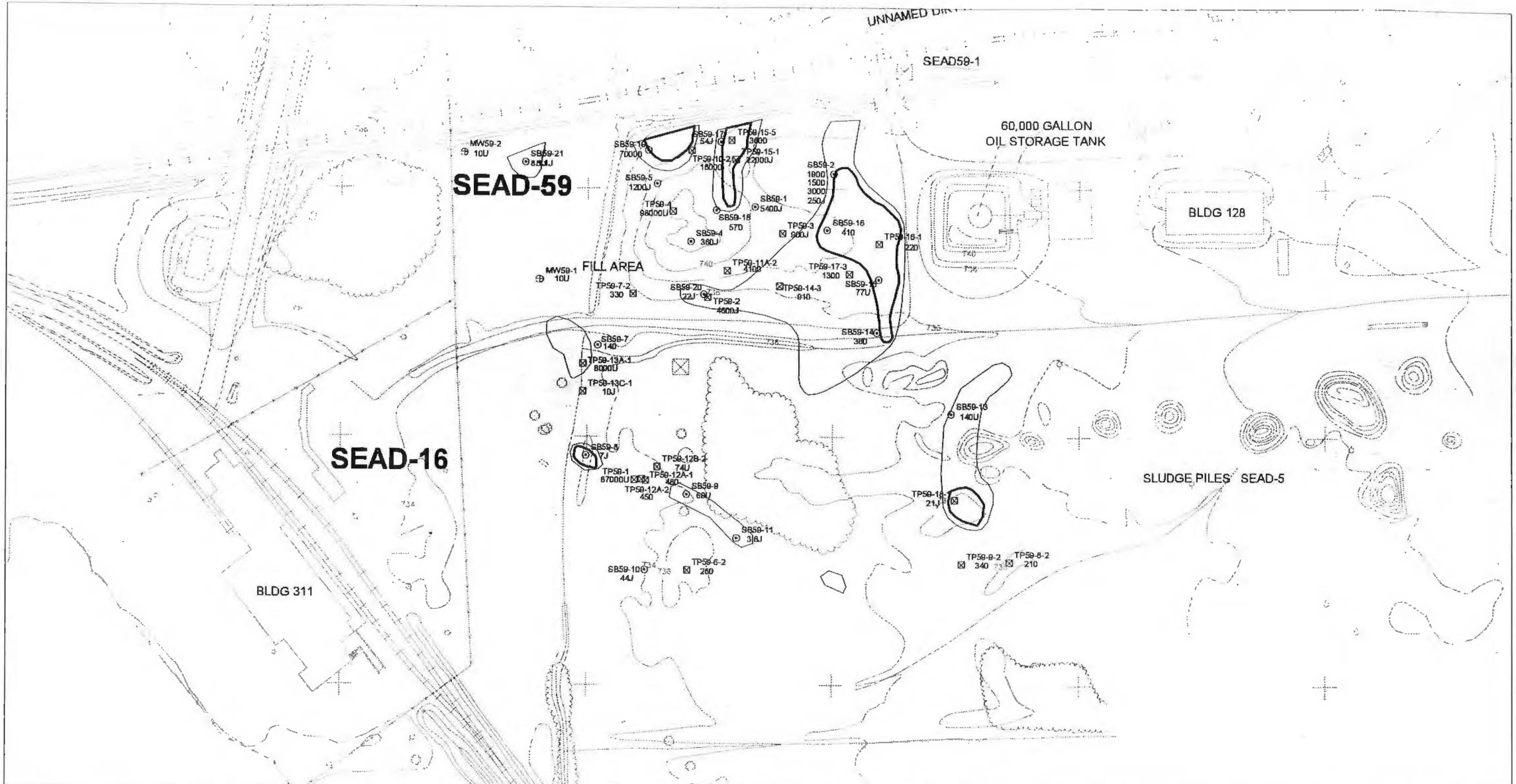
CLIENT/PROJECT TITLE

SENECA ARMY DEPOT ACTIVITY
ACTION MEMORANDUM
SEAD-59 AND SEAD-71

DEPT: ENVIRONMENTAL ENGINEERING | Dwg No: 734516-01001

FIGURE 2-4
SEAD-71
SITE PLAN

SCALE: 1" = 100' | DATE: JULY 1999 | REV: A



Base Map Features

Soil Gas

- 20 ppm or greater
- 10 ppm - 20 ppm

- ESI Test Pit Locations
- Monitoring Well Location
- ▲ Soil Boring Location

70 0 70 140 Feet

Concentration of Benzo[a]pyrene in Soil (ug/Kg)

SB71-16
12U

N

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SENECA ARMY DEPOT ACTIVITY
ACTION MEMORANDUM – SEADs-59 and 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-5

TOTAL BENZO[A]PYRENE CONCENTRATIONS IN SOIL AT SEAD-59

JOB NUMBER	DATE	SHEET No
734516-01001	APRIL 2001	1 OF 1

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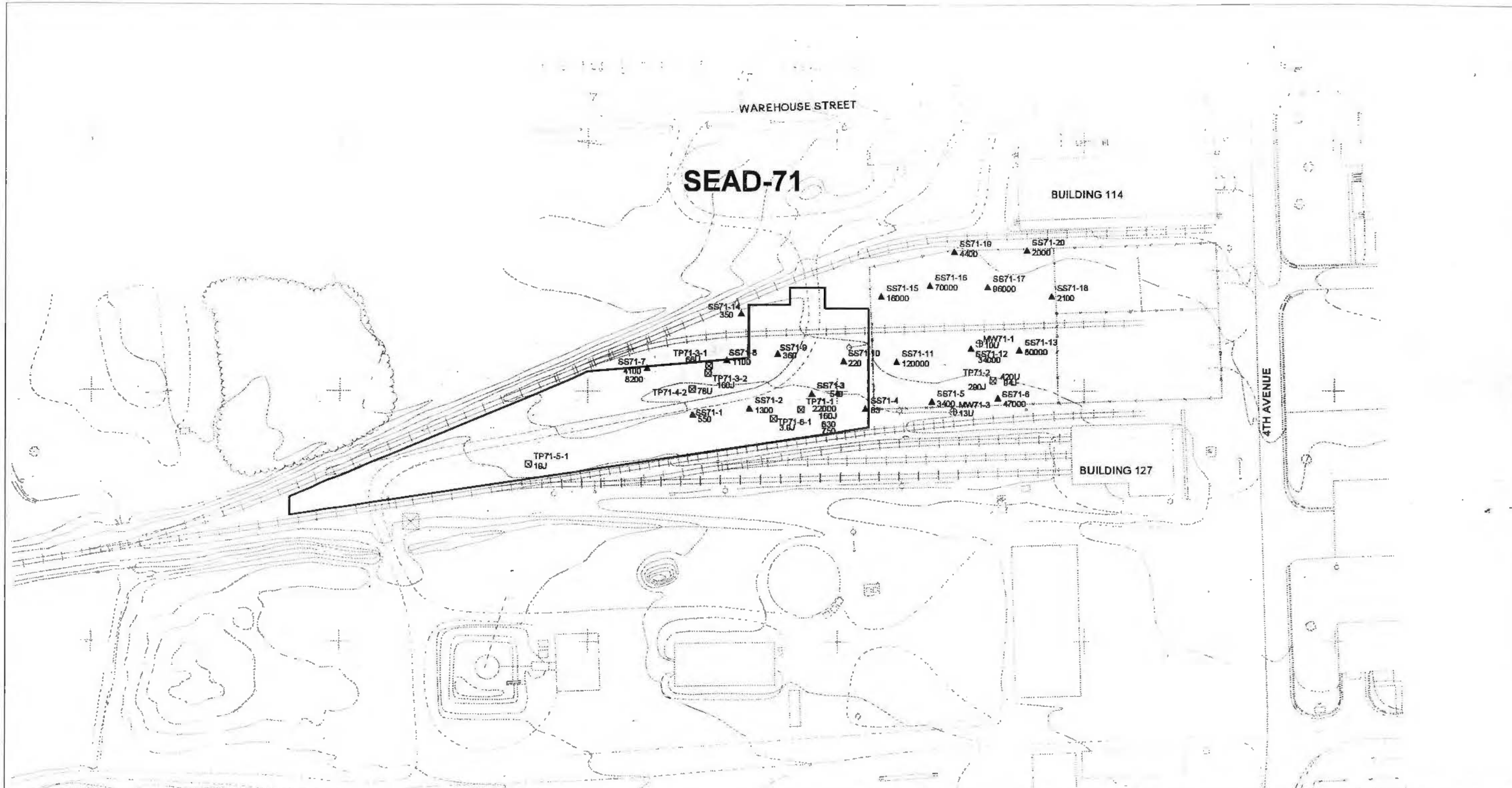

Base Map Features

Approximate Extent of 1997 GPR Survey

ESI Test Pit Locations

Monitoring Well Location

Soil Boring/Soil Sample Location

100 0 100 Feet

N

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SENECA ARMY DEPOT ACTIVITY

ACTION MEMORANDUM – SEADs-59 and 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-6

BENZO(A)PYRENE CONCENTRATIONS
IN SOIL AT SEAD-71

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	

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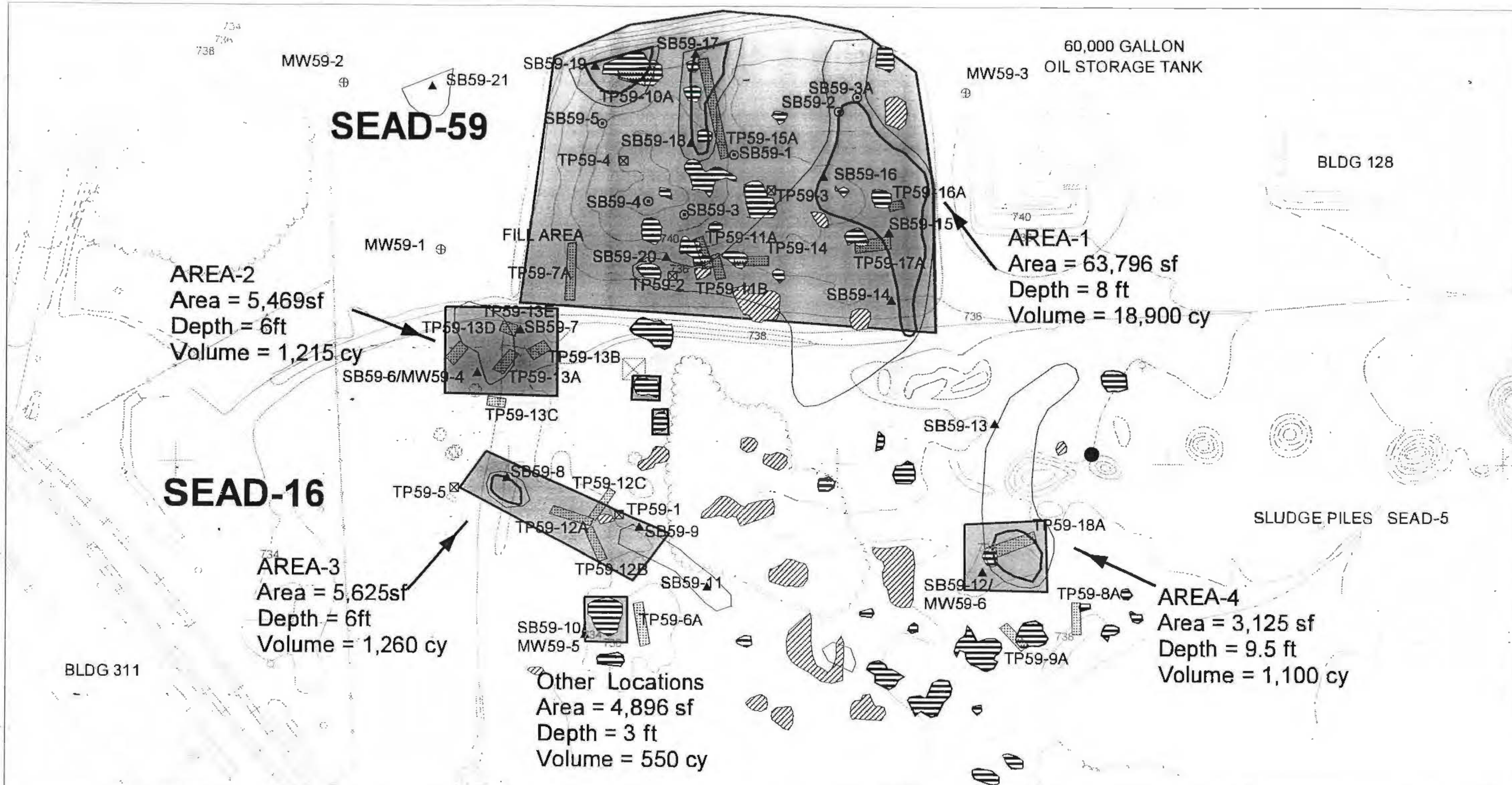

Base Map Features

Suspected Source of Geophysical Anomalies

- Known Surface Debris
- Unknown Surface Debris
- Phase I RI Test Pit Location
- ESI Test Pit Location
- Monitoring Well Location
- Soil Boring Location
- Area to be Remediated

Soil Gas

- 20 ppm or greater
- 10 ppm - 20 ppm

Note: Areas described as "others" in the text are the Unknown Surface Debris Areas

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SENECA ARMY DEPOT ACTIVITY

ACTION MEMORANDUM – SEADs 59 and 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 5-1

SOIL AREAS TO BE REMEDIATED

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	

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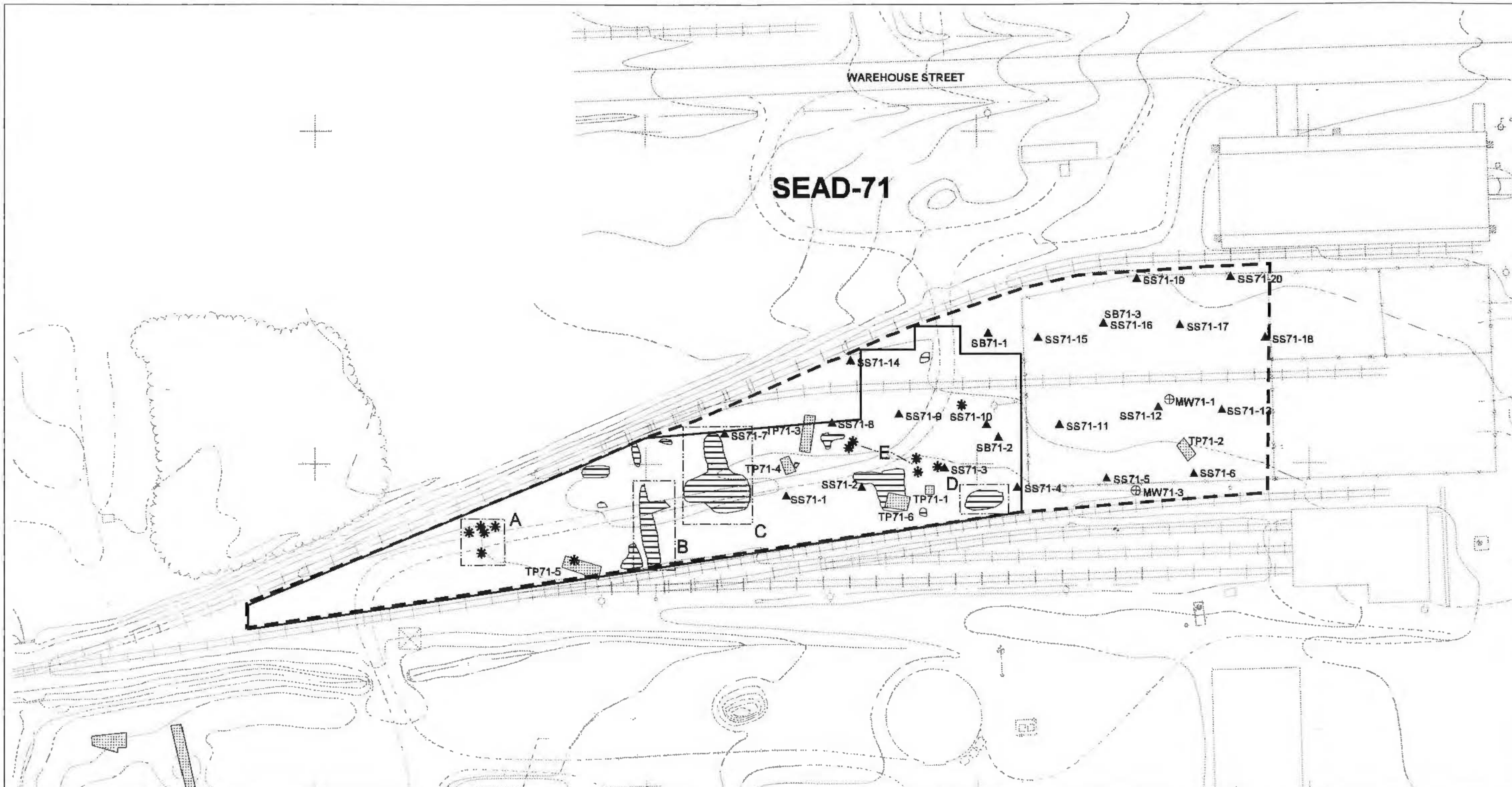

Base Map Features

Approximate Extent of 1997 GPR Survey

Suspected Locations of GPR Anomalies

ESI Test Pit Locations

Monitoring Well Location

Soil Boring/Soil Sample Location

A Soil to be Removed

Areas identified as A, B, C, D, and E are geophysical anomalies to be removed. (volume = 871 cubic yards)

100 0 100 Feet

N

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SENECA ARMY DEPOT ACTIVITY

ACTION MEMORANDUM - SEADs 59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 5-2

SOIL AREAS TO BE REMEDIATED AT SEAD-71

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	

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DECISION DOCUMENT FOR
REMOVAL ACTIONS AT
SEAD-59 and SEAD-71
SENECA ARMY DEPOT ACTIVITY

Prepared for:

Seneca Army Depot Activity
Romulus, New York

Prepared by:

Parsons Engineering Science, Inc.
Canton, Massachusetts

Contract No. DACA87-95-D-0031
Task Order R of Delivery Order 17
734516

JUNE 2001

Decision Document – SEADs-59 and 71
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APPENDICES

FIGURES

TABLES

ABBREVIATIONS AND ACRONYMS

AM	Action memorandum
AOC	Area of Concern
ARAR	Applicable or relevant and appropriate requirements
AQCR	Air Quality Control Region
B	Soil Boring Designation
bgl	Below ground level
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cm/sec	Centimeter per second
CWA	Clean Water Act
DCE	Dichloroethene
DOD	Department of Defense
DOT	Department of Transportation
ECL	Environmental Conservation Law
EE/CA	Engineering evaluation/cost analysis
EM	Electromagnetic
EPA	United States Environmental Protection Agency
ES	Engineering-Science, Inc
ESI	Expanded Site Inspection
FPPA	Farmland Protection Policy Act
FS	Feasibility Study
ft/day	Feet per day
ft/sec	Feet per second
GC	Gas chromatograph
gpm	Gallons per minute
GPR	Ground Penetrating Radar
IRP	Installation restoration program
m	meter
m/s	meter per second
MAIN	Parsons-Main, Inc.
MCL	Maximum Contaminant Level
MCPP	(±)-2-(4-chloro-2-methylphenoxy)-propanoic acid
?g/kg	micrograms per kilogram
?g/L	micrograms per liter

ABBREVIATIONS AND ACRONYMS - Continued

mg/kg	milligrams per kilogram
mg/L	milligrams per liter
ML	Non Plastic or Low Plasticity Fines Low Liquid Limit
MW	Monitoring well
MSL	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and maintenance
OSHA	Occupational Safety and Health Administration
OVM	Organic Vapor Meter
PA	Preliminary assessment
PAH	Polynuclear aromatic hydrocarbon
PA/SI	Preliminary assessment/site investigation
PCB	Polychlorinated biphenyl
PID	Photo Ionization Detector
PM	Particulate Matter
ppm	Part Per Million
ppmv	Part Per Million by Volume
ppmw	Part Per Million by Weight
POTW	Publicly-Owned Treatment Works
PSCR	Preliminary Site Characterization Report
PT	Monitoring well designation
RCRA	Resource Conservation and Recovery Act
RETEC	Remediation Technologies Incorporated
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
ROD	Record of Decision
RQD	Rock quality designation
SB	Soil boring
SCG	Standards, Criteria, or Guidelines
SCS	Soil Conservation Service
SDWA	Safe Drinking Water Act
SEDA	Seneca Army Depot

ABBREVIATIONS AND ACRONYMS - Continued

SEAD	Seneca Army Depot
SCG	New York State Standards, Criteria, and Guidelines
SG	Soil gas survey designation
SI	Site investigation
SIP	State Implementation Plan
SOV	Soil organic vapor
SPDES	State Pollutant Discharge Elimination System
SVE	Soil vapor extraction
SVOC	Semi-volatile Organic Compounds
SWMU	Solid Waste Management Unit
TAGM	Technical and Guidance Memorandum
TARGET	Target Environmental, Inc.
TBC	To be considered
TCE	Trichloroethene
TP	Test pit
TPH	Total petroleum hydrocarbons
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USDA	U.S. Department of Agriculture
USGS	U.S. Geologic Survey
UST	Underground storage tank
VOA	Volatile organic analysis
VOC	Volatile organic compounds
Vs	Volt-second

1.0 INTRODUCTION

1.1 EXECUTIVE SUMMARY

An Expanded Site Inspection (ESI) and Phase I Remedial Investigation (RI) have been performed at SEAD-59, the Fill Area West of Building 135, and at SEAD-71, the Alleged Paint Disposal Area, at the Seneca Army Depot Activity (SEDA) in Romulus, NY. This Decision Document presents the proposed plan for conducting a time-critical removal action at SEADs-59 and 71 to eliminate contaminants that have been identified in the soil that represent a potential threat to the environment and neighboring populations. This removal action is considered time-critical because of the increased potential for exposure of workers and other re-users now present at the depot. The presence of drums and other containers and the uncertainty of their contents is also justification for a removal action at both sites.

Since the historic military mission of the depot has been terminated, the depot has officially been closed by the Department of the Defense (DoD) and the US Army. In accordance with provisions of the DoD's Base Realignment and Closure (BRAC) process, the land and the facilities of the former depot have been surveyed and evaluated, and prospective beneficial uses of the facility have been identified. Portions of the depot are now being released to the public and private sectors for reuse under the BRAC process. As portions of the former depot are released for other beneficial uses, increased access is afforded to all portions of the former depot, resulting in an increased potential for exposure to any residual chemicals that are present at former solid waste management units (SWMUs) remaining at the depot pending clean-up. Therefore, the goal of the proposed time-critical removal action at SEADs-59 and 71 is to eliminate and contain an identified source of residual chemical materials in the soil to remove or at least lessen the magnitude of the potential threat that it represents to surrounding populations and the environment.

The test pitting investigations at SEADs-59 and 71 have confirmed the presence of 55-gallon drums and other containers at both sites. The presence of such buried objects is of concern since the nature of the contents is unknown. The uncertainty of the contents of the buried items that may remain in the disposal area and at geophysical anomalies and the contamination in soils and groundwater are considered justification for performing removal actions at SEADs-59 and 71. While removal of drums, paint cans, and other containers is the focus of the planned removal actions for both sites, the potential for contamination to be present in the soils and groundwater that surround these items will also be addressed by this action.

This Decision Document presents the selected removal action that was developed in accordance with the Federal Facility Agreement and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Contingency Plan. Based upon the results of these investigations, it is recommended that the soil and debris at both sites be selectively removed, contained, and disposed of at an off site permitted waste landfill. Groundwater will be pumped out of the excavation area and treated as part of the removal action. This removal action is intended to be the final remedy for both sites.

For SEAD-59, it is recommended that 23,085 cubic yards of soil and geophysical anomalies be removed from the fill area and selected areas south of the access road. For SEAD-71, it is recommended that 871 cubic yards of geophysical anomalies and soils exceeding the soil clean up goals be removed from the site. The excavated materials exceeding the soil cleanup goals would be transported to, and disposed of at an off-site facility. The extent of the area requiring excavation will be confirmed via sampling and analysis, and once completed, the excavations will be refilled with excavated soil with concentrations less than the soil clean up goals and re-contoured to match the existing terrain characteristics.

1.2 OBJECTIVE OF THIS DOCUMENT

Since its inception in 1941, the mission of the Seneca Army Depot Activity (SEDA) has been the management of various military items, including munitions. Management of these items required areas and facilities for storage, quality assurance testing, range testing, munitions washout, deactivation furnaces and other support areas such as ordnance detonation. In addition, administrative and plant operational facilities were also established in support of the depot mission. Waste management was integrated with the SEDA management mission.

Management waste materials produced from these operations has been in accordance with the requirements of the Resource Conservation Recovery Act (RCRA). As part of the requirements of RCRA, the Depot identified a total of 72 Solid Waste Management Units (SWMUs). In 1990, the Depot was included in the federal section of the National Priority List (NPL). As a federal facility listed on the NPL, provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA - 42 USC § 9620e) required that the US Army investigate the sites known to exist at the Depot and complete all necessary remedial investigations and actions at the facility.

In accordance with this stipulation, the US Army, the US Environmental Protection Agency (EPA), and the New York State Department of Environmental Conservation (NYSDEC) negotiated and finalized a Federal Facility Agreement (FFA) that outlines the administrative process and the procedures that will be followed to comply with CERCLA.

The US Army identified all of the SWMUs at the Depot as those sites that would potentially need to be investigated and provided this list to USEPA and NYSDEC. Following the initial identification of sites, the Army ranked each site for investigation based upon that site's projected risk. The goal of the initial categorization of SWMUs was to prioritize the pending investigations and remedial actions so that those sites with the greatest risk would be addressed first. The assigned rankings divided the 72 identified SWMUs into 5 groups (i.e., No Further Action, High Priority, Moderate Priority, Moderately Low Priority, and Low Priority SWMUs). Subsequent to the US Army's proposal of the priority rankings, all parties met to review and discuss the available information for the identified SWMUs, and to finalize priority-ranking assignments. The consensus of all parties was to mount necessary investigations and possible actions at those SWMUs that are considered as "Areas of concern" (AOC) and identify the SWMUs for which no investigations would be required ("No Action" SWMUs).

In 1995, the SEDA was designated for closure under the Department of Defense's Base Realignment and Closure (BRAC) process. With SEDA's inclusion on the BRAC list, the US Army's emphasis expanded from expediting necessary investigations and remedial actions at the High and Moderately High Priority sites. It was changed to include the release and reuse of non-affected portions of the depot to the surrounding community for non-military (i.e., industrial, municipal and residential) purposes. Thus, BRAC has required the US Army to finalize decisions and actions for SWMUs, regardless of ranking, so that these sites may be released for non-military use.

Parsons Engineering Science has been retained by the U.S. Army Corps of Engineers (USACOE) to conduct Expanded site Inspections (ESI) at SWMUs that have been designated as AOC within the SEDA. The work has been performed according to the requirements of the New York State Department of Environmental Conservation (NYSDEC), the U.S. Environmental Protection Agency, Region II (EPA), and the IAG.

This document focuses on two of the SWMUs, the Fill Area West of Building 135 (SEAD-59) and the Alleged Paint Disposal Area (SEAD-71). SEAD-59 was classified as Moderately Low Priority and SEAD-71 was classified as Low Priority. SEADs-59 and 71 were evaluated in this document in order present the selected time-critical removal action that was developed in accordance with the FFA, CERCLA as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The data used for the evaluation was obtained through sampling performed through an Expanded Site Inspection (ESI) and a Phase I Remedial Investigation (RI). Based upon the results of the Expanded Site Inspection and Phase I Remedial Investigation, it is recommended that the soils and debris at both sites be selectively removed, contained, and disposed of at an off-site permitted waste landfill. This removal action is intended to be the final remedy for these sites, which have been designated for Planned Industrial Development.

The NCP states that a removal action may be conducted at a site when there is a potential threat to public health, public welfare, or the environment. An appropriate removal action is undertaken to abate, minimize, stabilize, mitigate, or eliminate the release or the threat of release at a site. Section 300.415(b)(2) of the NCP outlines factors to be considered when determining the appropriateness of a removal action, such as high levels of hazardous substances, pollutants, or contaminants in soils, largely at or near the surface, that may migrate; or the threat of fire or explosion.

Once it is determined that a removal action is appropriate, the removal is designated an emergency, time-critical, or non-time-critical removal. Emergencies are those situations in which response actions must begin within hours or days after the completion of the site evaluation. Time-critical removals are those in which, based on a site evaluation, it is determined that less than 6 months remains before response actions must begin. Non-time-critical removals are those in which it is determined that more than 6 months may pass before response actions must begin. Since less than 6 months remains before this removal action begins, this removal action is considered a time-critical removal action.

This removal action is considered time-critical because the historic military mission of the depot has been terminated and the depot has officially been closed by the Department of the Defense (DoD) and the US Army. In accordance with provisions of the DoD's Base Realignment and Closure (BRAC) process, the land and the facilities of the former depot have been surveyed and evaluated, and prospective beneficial uses of the facility have been identified. Portions of the depot are now being released to the public and private sectors for reuse under the BRAC process. As portions of the former depot are released for other beneficial uses, increased access is afforded to all portions of the former depot, resulting in an increased potential for exposure to any residual chemicals that are present at former solid waste management units (SWMUs) remaining at the depot pending clean-up. Furthermore, although a security fence surround the former depot, there are no longer 24-hour security guards at the site. Access to the sites is now unrestricted. Therefore, the goal of the proposed time-critical removal action at SEADs-59 and 71 is to eliminate and contain an identified source of residual chemical materials in the soil to remove or at least lessen the magnitude of the potential threat that it represents to surrounding populations and the environment.

The goal of this document with respect to SEADs-59 and 71 is to:

1. Assemble and summarize all of the currently known information about the site;
2. Compare the available data and information with applicable guidance levels and standards and conduct a risk assessment in order to determine if there is an indication of potential threats to human health and the environment at the sites;
3. Provide a recommendation and a justification to substantiate the proposed time-critical removal for the sites.

Additional information clarifying and substantiating recommendations pertinent to SEADs-59 and 71 is provided in the following sections of this Report.

Cleanup goals for both sites have been established such that human health risk will be reduced to within EPA criteria values for the future land use. Concentrations of metals, SVOCs, and pesticides that would yield a hazard index of 1 or a cancer risk of 1×10^{-4} will be calculated based on the reasonable maximum exposure (RME) for the future industrial land use scenario.

1.3 HISTORIC OVERVIEW

The Seneca Army Depot Activity (SEDA) lies between Cayuga and Seneca Lakes in New York's Finger Lake Region, near the communities of Romulus and Varick, NY (**Figure 1-1**). SEDA encompasses approximately 10,600 acres of land 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 developed and opened in 1941. The depot has been subject to closure and its operation ceased in September 2000. The mission of the facility throughout its history has included receipt, storage, distribution, maintenance, and demilitarization of conventional ammunition, explosives and special weapons.

Activities conducted at SEDA use chemical materials, and generate wastes that contain hazardous materials. The generation, storage, treatment, shipment, and disposal of hazardous wastes are regulated under the Resource Conservation and Recovery Act – RCRA [42 USC §§ 6901 – 6991, as amended by the Hazardous and Solid Waste Amendments of 1984, Public Law 98-616]. Activities conducted at SEDA were approved for Part A, interim status in 1980. SEDA submitted a federal Part B permit application for activities and operations in 1986, and a NYSDEC Part 373 permit application for hazardous waste management facilities in 1991.

Since 1978, the potential environmental impacts of operations and activities conducted at SEDA have been subject to review by the US Army, the New York State Department of Environmental Conservation (NYSDEC), and the US Environmental Protections Agency (US EPA). Initially, environmental investigations were conducted under the Department of Defense's (DoD's) Installation Restoration Program (IRP) but subsequently these programs were performed under the Comprehensive Environmental Response, Compensation, and Liability Act – CERCLA [42 U.S.C. §§ 9601 – 9675, as amended by the Superfund Amendments and Reauthorization Act of 1986, Public Law 99 – 499] and RCRA. As a result of these investigations, evidence of hazardous chemical and radioactive constituents and compounds used, stored, and demilitarized at the depot was found in samples of ground water, soil, sediment and surface water collected and characterized. On July 14, 1989, the US EPA proposed SEDA for inclusion on the National Priority List (NPL) based on a hazard ranking score of 37.3. Supporting its recommendation for listing, the US EPA stated "the Army identified a number of potentially contaminated areas, including an unlined 13-acre landfill in the west-central portion of the depot, where solid waste and incinerator ash were disposed of intermittently for 30 years during 1941-79; two incinerator pits adjacent to the landfill, where refuse was burned at least once a week during 1941-74; a 90-acre open burning/detonation area in the northwest portion of the depot, where explosives and related wastes have been burned and detonated during the past 30 years; and the APE-11236 Deactivation Furnace in the east-central portion of the depot, where small arms are destroyed." The US EPA's recommendation was approved on August 30, 1990, and SEDA was listed in Group 14 on the Federal Section of the NPL.

1.4 BASE REALIGNMENT AND CLOSURE (BRAC)

The major portion of SEDA was approved for the 1995 Base Realignment and Closure (BRAC) list in October of 1995. The mission closure date for the facility was scheduled for September 30, 1999, with an installation closure date of September 30, 2000. A small enclave at SEDA has remained open after 2000, and is being used to store hazardous materials and ores.

Woodward-Clyde Federal Services was retained to prepare an Environmental Baseline Survey for SEDA. Under this process, Woodward-Clyde was charged with the initial classification of discrete areas of the depot into one of seven standard environmental condition of property area types 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 U.S. 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.

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 is 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. These areas currently 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).

The currently recommended future land use for SEADs-59 and 71 is Planned Industrial Development.

1.5 SOLID WASTE MANAGEMENT UNIT CLASSIFICATION

As mandated by the EPA Region II and by NYSDEC, the U.S. Army Corps of Engineers commissioned the "Solid Waste Management Unit Classification Report" at SEDA (ERCE 1991). This report was finalized by Parsons on June 10, 1994. The goals of this work was to evaluate the effects of past solid waste management practices at identified SWMUs and to classify each SWMU as an area where "No Action is Required" or as an "Area of Concern" where additional investigations and studies were required. Areas of Concern include both (a) SWMUs where releases of hazardous substances may have occurred and (b) locations where there has been a threat of a release into the environment of a hazardous substance or constituent (including radionuclides). AOCs included former spill areas, landfills, surface impoundments, waste piles, land treatment units, transfer stations, wastewater treatment units, incinerators, container storage areas, scrap yards, cesspools and tanks with associated piping that are known to have caused a release into the environment or whose integrity has not been verified.

A total of 69 SWMUs and AOCs were originally identified in the ERCE SWMU Classification Report. Following the completion of the ERCE report, three additional SWMUs were added by the Army, bringing the total number of SWMUs listed at SEDA to 72.

A recommended classification for all SWMUs was presented in the final SWMU Classification Report (Parsons, 1994). At this time, the Army identified 24 of the original SWMUs as sites that required "no further action" based on existing information. Furthermore, 13 other SWMUs were designated as High Priority sites; 3 were designated as Moderate Priority sites; 11 were designated as Moderately Low Priority sites; and 21 were designated as Low Priority sites.

The Army identified additional sites, unknown at the time of the SWMU Classification Report, as part of the Environmental Baseline Survey conducted in 1998. These sites have not received a SWMU classification.

In response to the BRAC closure process, the Army has refocused its efforts and is investigating and evaluating sites that are located within parcels that have the greatest reuse potential under the BRAC future land use designation. This effort encourages the reuse of the facility through land transfer or lease prior to the end of the military mission at the Depot. The Army will still continue to close sites after the military mission is complete.

2.0 SITE CHARACTERIZATION

2.1 BASE DESCRIPTION AND HISTORY

This section provides a brief overview of SEDA and the conditions at the Fill Area West of Building 135 (SEAD-59) and the Alleged Paint Disposal Area (SEAD-71). The sites were evaluated in 1994 as part of an Army effort to determine the conditions at several SWMUs that were considered to potentially pose a threat to human health and the environment. A more detailed discussion can be found in the Draft Final *Project Scoping Plan for Performing a CERCLA Remedial Investigation / Feasibility Study (RI/FS) at the Fill Area West of Building 135 (SEAD-59), and the Alleged Paint Disposal Area (SEAD-71)*, February 1997, as well as the *Expanded Site Inspection - Seven Low Priority AOCs SEADs 60, 62, 63, 64 (A,B,C, and D), 67, 70, and 71*, April 1995, and *Expanded Site Inspection - Eight Moderately Low Priority AOCs SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59*, December 1995, and *Draft Phase I Remedial Investigation (RI) at the Fill Area West of Building 135 (SEAD-59), and the Alleged Paint Disposal Area (SEAD-71)*, July 1998.

SEAD-59 (Fill Area West of Building 135) is located in the east-central portion of SEDA (**Figure 2-1**). The site encompasses an area along both sides of an unnamed dirt road which is the access road to Building 311 and runs perpendicular to the south side of Administration Avenue terminating at Building 311 (**Figure 2-2**). SEAD-59 is comprised of two areas, one area located north of the access road to Building 311 and one area located to the south of the road. Each area is characterized by different topography with the area to south of the road being relatively flat and sloping gently to the west and the area to the north of the road containing a fill area with approximately 10 feet of relief.

The entire western border of the site is defined by a north-south trending drainage ditch. A drainage swale which flows east to west, parallels the railroad tracks which form the northern boundary of SEAD-59. At the northwestern corner of the site, the drainage swale turns to the north and flows under the railroad tracks. Drainage ditches are also located on each side of the access road to Building 311 and flow from east to west into the drainage ditch in the western portion of the site.

Surface water flow from precipitation events is controlled by local topography. Surface water flow in this area is to the west and it is likely to be captured by the north-south trending drainage swale located in the western portion of the site and by the drainage ditch which parallels the south side of the access road. This ditch also drains SEAD-5, which is located just to the east of SEAD-59. The groundwater flow direction is primarily southwest across SEAD-59.

SEAD-59 was used for the disposal of construction debris and oily sludges. SEDA personnel have indicated that there may be a large quantity of miscellaneous "roads and grounds" waste buried at the site. It is not known when the disposal took place.

SEAD-71 (Alleged Paint Disposal Area) is located in the east-central portion of SEDA (**Figure 2-1**). The site is located approximately 200 feet west of 4th Avenue near Buildings 127 and 114 (**Figure 2-3**). The entire site is approximately 350 feet by 100 feet and bounded on the north and south by railroad tracks serving Buildings 114 and 127. A chain-link fence borders the east side of the site.

Surface water flow from precipitation events is controlled by local topography, although the topography is relatively flat, gently sloping to the southwest. There are no sustained surface water bodies on-site. In the fenced storage area located in the eastern half of the site, the area is covered with asphalt, which provides an impermeable surface resulting in an increased amount of surface water runoff from the site. The groundwater flow direction in the till/weathered shale aquifer on the site is to the west-southwest.

It is rumored that paints and/or solvents were disposed of in burial pits at SEAD-71. It is not known what other activities occurred here. No dates of disposal are available nor is there any information on the number of suspected disposal pits.

2.2 GEOLOGIC / HYDROGEOLOGICAL SETTING

Regional Geology

The Finger Lakes uplands area is underlain by a broad north-to-south trending series of rock terraces mantled by glacial till. As part of the Appalachian Plateau, the region is underlain by a tectonically undisturbed sequence of Paleozoic rocks consisting of shales, sandstones, conglomerates, limestones and dolostones. **Figure 2-4** shows the regional geology of Seneca County. In the vicinity of SEDA, Devonian age (385 million years bp) rocks of the Hamilton group are monoclinally folded and dip gently to the south. No evidence of faulting or folding is present.

The Hamilton Group is Figure2-5a sequence of limestones, calcareous shales, siltstones, and sandstones.

These rocks were deposited in a shallow inland sea at the north end of the Appalachian Basin (Gray, 1991). Terrigenous sediments from topographic highs associated with the Arcadian landmass of Western New England, eastern New York and Pennsylvania were transported to the west across a marine shelf (Gray, 1991). These sediments were deposited in a northeast-southwest trending trough whose central axis was near what is now the Finger Lakes (Gray, 1991).

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. The Ludlowville and Moscow formations are characterized by gray, calcareous shales and mudstones and thin limestones with numerous zones of abundant invertebrate fossils that form geographically widespread encrinites, coral-rich layers, and complex shell beds. The Ludlowville Formation is known to contain brachiopods, bivalves, trilobites, corals and bryozoans (Gray, 1991). In contrast, the lower two formations (Skaneateles and Marcellus) consist largely of black and dark gray sparsely fossiliferous shales (Brett et al., 1991). Locally, the shale is soft, gray, and fissile. **Figure 2-5** displays the stratigraphic section of Paleozoic rocks of Central New York. The shale is extensively jointed and weathered at the contact with overlying tills. Joint spacings are 1 inch to 4 feet in surface exposures. Prominent joint directions are N 60^{o} E, N 30^{o} W, and N 20^{o} E, with the joints being primarily vertical. Corings performed on the upper 5 to 8 feet of the bedrock revealed low Rock Quality Designations (RQD's), i.e., less than 5 percent with almost 100 percent recovery (Metcalf & Eddy, 1989), suggesting a high degree of weathering.

Pleistocene age (Wisconsin event, 20,000 bp) glacial till deposits overlie the shales. **Figure 2-6**, the physiography of Seneca County, presents an overview of the subsurface sediments present in the area. The site is shown on as lying on the western edge of a large glacial till plain between Seneca Lake and Cayuga Lake. The till matrix, the result of glaciation, varies locally but generally consists of horizons of unsorted silt, clay, sand, and gravel. The soils at the site contain varying amounts of inorganic clays, inorganic silts, and silty sands. In the central and eastern portions of SEDA, the till is thin and bedrock is exposed or within 3 feet of the surface. The thickness of the glacial till deposits at SEDA generally ranges from 1 to 15 feet.

Darien silt-loam soils, 0 to 18 inches thick, have developed over Wisconsin age glacial tills. These soils are developed on glacial till where they overlie the shale. In general, the topographic relief associated with these soils is from 3 to 8 percent. **Figure 2-7** presents the U.S. Department of Agriculture (USDA) General Soil map for Seneca County.

Regional background elemental concentrations for soils from the Finger Lakes area of New York State are not available. However, elemental concentrations for soils from the eastern United States and in particular, New York State are available. **Table 2.2-1** cites data on the eastern United States from a United States Geological Survey (USGS) professional paper (Shacklette and Boerngen, 1984) and data on the New York State soils from a NYSDEC report.

Regional Hydrology/Hydrogeology

Regionally, four distinct hydrologic units have been identified within Seneca County (Mozola A.J., 1951). These include two distinct shale formations, a series of limestone units, and unconsolidated beds of Pleistocene glacial drift. Overall, the groundwater in the county is very hard, and therefore, the quality is minimally acceptable for use as potable water.

Approximately 95 percent of the wells in the county are used for domestic or farm supply and the average daily withdrawal is approximately 500 gallons, an average rate of 0.35 gallons per minute (gpm). About five percent of the wells in the county are used for commercial, industrial, or municipal purposes. Seneca Falls and Waterloo, the two largest communities in the county, are in the hydrogeologic region which is most favorable for the development of a groundwater supply. However, because the hardness of the groundwater is objectionable to the industrial and commercial establishments operating within the villages, both villages utilize surface water (Cayuga Lake and Seneca River, respectively) as their municipal supplies. The villages of Ovid and Interlaken, both of which are without substantial industrial establishments, utilize groundwater as their public water supplies. Ovid obtains its supply from two shallow gravel-packed wells, and Interlaken is served by a developed seepage-spring area.

Regionally, the water table aquifer of the unconsolidated surficial glacial deposits of the region would be expected to flow in a direction consistent with the ground surface elevations. 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 exists

Table 2.2-1

Background Concentrations of Elements in Soils of the Eastern United States with Specific Data for New York State

SEAD-4 Remedial Investigation
Seneca Army Depot Activity

Element	Concentration Range (mg/kg)	Geographic Location
Aluminum	7,000 - 100,000	Eastern U.S. (2)
	1,000 - 25,000	Albany Area (1)
Arsenic	< 0.1 - 73	Eastern U.S. (2)
	3 - 12	New York State (1)
	< 0.1 - 6.5	Albany Area (1)
Barium	10 - 1,500	Eastern U.S. (2)
	15 - 600	New York State (1)
	250 -350	Albany Area (1)
Beryllium	1 - 7	Eastern U.S. (2)
	0 - 1.75	New York State (1)
	0 - 0.9	Albany Area (1)
Cadmium	Not Available	Eastern U.S. (2)
	0.0001 - 1.0	No Region Specified (1)
Calcium	100 - 280,000	Eastern U.S. (2)
	130 - 35,000	New York State (1)
	150 - 5,000	Albany Area (1)
	2,900 - 6,500	Albany Area (1)
Chromium	1 - 1,000	Eastern U.S. (2)
	1.5 - 40	New York State (1)
	1.5 - 25	Albany Area (1)
Cobalt	< 0.3 - 70	Eastern U.S. (2)
	2.5 - 60	New York State (1)
	2.5 - 6	Albany Area (1)
Copper	< 1 - 700	Eastern U.S. (2)
	< 1 - 15	Albany Area (1)
Iron	100 - 100,000	Eastern U.S. (2)
	17,000 - 25,000	Albany Area (1)
Lead	> 10 - 300	Eastern U.S. (2)
	1 - 12.5	Albany Area (1)

Table 2.2-1

Background Concentrations of Elements in Soils of the Eastern United States with Specific Data for New York State

SEAD-4 Remedial Investigation
Seneca Army Depot Activity

Element	Concentration Range (mg/kg)	Geographic Location
Magnesium	50 - 50,000	Eastern U.S. (2)
	2,500 - 6,000	New York State (1)
	1,700 - 4,000	Albany Area (1)
Manganese	> 2 - 7,000	Eastern U.S. (2)
	50 - 5,000	New York State (1)
	400 - 600	Albany Area (1)
Mercury	0.01 - 3.4	Eastern U.S. (2)
	0.042 - 0.066	Albany Area (1)
Nickel	< 5 - 700	Eastern U.S. (2)
	19.5 (mean)	New York State (1) (no range available)
Potassium	50 - 37,000	Eastern U.S. (2)
	47.5 - 117.5	New York State (1)
Selenium	> 0.1 - 3.9	Eastern U.S. (2)
	Not Available	
Sodium	500 - 50,000	Eastern U.S. (2)
	Not Available	
Vanadium	> 7 - 300	Eastern U.S. (2)
	Not Available	
Zinc	> 5 - 2,900	Eastern U.S. (2)
	37 - 60	Albany Area (1)

Notes:

1. (1) Source: McGovern, Carol E., Background Concentrations of 20 Elements in Soils with Special Regard for New York State. Wildlife Resources Center, New York Department of Environmental Conservation, Delmar, New York 12054, No Date.
2. (2) Source: Shacklette, H.T. and Boerngen, J.G., 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S.G.S. Prof Paper 1270, Washington.
3. The data are for areas where surficial materials are thought to be uncontaminated, undisturbed, or areas far from pollution sources.

approximately half way between the two finger lakes. SEDA is located on the western slope of this divide and therefore regional groundwater flow is expected to be primarily westward toward Seneca Lake.

A substantial amount of information concerning the hydrogeology of the area has been compiled by the State of New York, (Mozola, 1951). No other recent state sponsored hydrogeological report is available for review. This report has been reviewed in order to better understand the hydrogeology of the area surrounding SEDA. The data indicates that within a four-mile radius of the site a number of wells exist from which geologic and hydrogeologic information has been obtained. This information includes: (1) the depth; (2) the yield; and (3) the geological strata the wells were drilled through. Although the information was compiled in the 1950s, these data are useful in providing an understanding and characterization of the aquifers present within the area surrounding SEDA. A review of this information suggests that three geologic units have been used to produce water for both domestic and agricultural purposes. These units include: (1) a bedrock aquifer, which in this area is predominantly shale; (2) an overburden aquifer, which includes Pleistocene deposits (glacial till); and (3) a deep aquifer present within beds of limestone in the underlying shale. The occurrence of water derived from limestone is considered to be unusual for this area and is more commonplace to the north of SEDA. The limestone aquifer in this area is between 100 and 700 feet deep. As of 1957, twenty-five wells utilized water from the shale aquifer, six wells tapped the overburden aquifer, and one used the deep limestone as a source of water.

For the six wells that utilized groundwater extracted from the overburden, the average yield was approximately 7.5 gpm. The average depth of these wells were 36 feet. The geologic material which comprises this aquifer is generally Pleistocene till, with the exception of one well located northeast of the site. This well penetrates an outwash sand and gravel deposit. The yields from the five overburden wells ranged from 4 to 15 gpm. The well located in the outwash sand and gravel deposit, drilled to 60 feet, yielded only 5 gpm. A 20-foot hand dug well, located southeasterly of the outwash well, yielded 10 gpm.

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

Local Geology

The site geology is characterized by gray Devonian shale with a thin weathered zone where it contacts the overlying mantle of Pleistocene glacial till. This stratigraphy is consistent over the entire site. The predominant surficial geologic unit present at the site is dense glacial till. The till is distributed across the entire site and ranges in thickness from less than 2 feet to as much as 15 feet although it is generally only a few feet thick. The 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 ripped-up clasts removed by the active glacier.

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 have a high percentage of silt and clay with trace amounts of fine gravel. Another study, conducted at the same site by the United States Army Environmental Hygiene Agency (USAEHA) determined the porosities of 5 gray-brown silty clay (i.e., till) samples. These ranged from 34.0 percent to 44.2 percent with an average of 37.3 percent (USAEHA Hazardous Waste Study No. 37-26-0479-85).

Darian silt-loam soils, 0 to 18 inches thick, have developed over the till, however, in some locations, the agricultural soils have been eroded away and the till is exposed at the surface. The surficial soils are poorly drained and have a silt clay loam and clay subsoil. In general, the topographic relief associated with these soils is from 3 to 8%. A zone of gray weathered shale of variable thickness is present below the till in almost all locations drilled at SEDA. This zone is characterized by fissile shale with a large amount of brown interstitial silt and clay.

The bedrock underlying the site is composed of the Ludlowville Formation of the Devonian age Hamilton Group. Merin (1992) also cites three prominent vertical joint directions of northeast, north-northwest, and east-northeast in outcrops of the Genesse Formation 30 miles southeast of SEDA near Ithaca, New York. Three predominant joint directions, N60°E, N30°W, and N20°E are present within this unit (Mozola, 1952). These joints are primarily vertical. The Hamilton Group is a gray-black, calcareous shale that is fissile and exhibits parting (or separation) along bedding planes.

Table C-1 in Appendix C presents the local background metal concentrations for soils in the SEDA area.

Local Hydrology/Hydrogeology

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

Characterization of the local hydrogeology is based upon hydrogeological information obtained from previous site investigations. USATHAMA (1989) conducted single-well aquifer tests (slug tests) in the Ash Landfill area to estimate the hydraulic conductivity of the water-bearing materials underlying the site. The slug tests were performed on five shallow groundwater monitor wells (PT-11, PT-12, PT-15, PT-21 and PT-23) screened in the overburden and upper (weathered) portion of the bedrock. Slug test data were analyzed according to the method developed by Bouwer and Rice (1976). The hydraulic conductivity values generated from the slug test analysis were used in conjunction with an estimate of soil porosity and the calculated groundwater flow gradient to develop an estimate for the average groundwater flow rate at the Ash Landfill site. Excluding PT-21, which had an unusually low hydraulic conductivity value of 5.87×10^{-11} centimeters per second (cm/sec) (1.66×10^{-7} ft/day), the average hydraulic conductivity, as determined by the slug test analysis, was 2.06×10^{-4} cm/sec (0.587 ft/day). Typical tight clay soils have hydraulic conductivity values that range from 3.53×10^{-5} to 3.53×10^{-8} cm/sec (Davis, 1969).

The effective porosity of the aquifer at the Ash Landfill site was estimated by ICF to be 11 percent. The average linear velocity of groundwater flow, calculated by ICF, Inc. using Darcy's law, between PT-17 and PT-18 is 2.2×10^{-7} ft/sec, 1.9×10^{-2} ft/day or, 6.9 feet per year (ft/yr) based on a hydraulic conductivity of 3.3×10^{-5} cm/sec (9.33×10^{-2} ft/day).

Data from the Ash Landfill site quarterly groundwater monitoring program and previous field investigations indicate that the saturated thickness of the till/weathered shale overburden aquifer is variable, generally ranging between 1 and 8.5 feet. However, the aquifer 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. This cycle of variations in the aquifer thickness appears to be consistent with what would be expected based upon an understanding of the hydrologic cycle. Although rainfall is fairly consistent at SEDA, averaging approximately 3 inches per month, evapotranspiration is a likely reason for the large fluctuations observed in the saturated thickness of the over-burden aquifer.

On-site hydraulic conductivity determinations were performed by M&E (1989) on monitoring wells MW-8 through MW-17 at the Open Burning Grounds. These wells are all screened within the glacial till unit. The data were analyzed according to a procedure described by Hvorslev (1951). The average hydraulic conductivity measured for the ten monitoring wells was 5.0×10^{-1} ft/day (1.8×10^{-4} cm/sec). The hydraulic conductivities ranged from 2.02×10^{-2} ft/day (7.06×10^{-6} cm/sec) to 1.47 ft/day (5.19×10^{-4} cm/sec). These hydraulic conductivity measurements were within an order of magnitude agreement with previous results reported by O'Brien and Gere (1984). O'Brien and Gere determined the average hydraulic conductivity of the till material to be approximately 2.8×10^{-1} ft/day (9.9×10^{-5}cm/sec). A comparison of the measured values with the typical range of hydraulic conductivities for glacial tills indicates that the glacial till at the site is at the more permeable end of typical glacial till values.

Soils samples were collected during the 1984 U.S. Army Environmental Hygiene Agency (USAEHA) Phase IV investigation of the Open Burning Grounds to characterize the permeability of the burning pad soils. Soil permeabilities were measured by recompacting the soil in a mold to 95% standard proctor density. The average permeability for 5 measurements was 1.01×10^{-3} ft/day

(3.56×10^{-7} cm/sec). The typical range for glacial tills, described by Freeze and Cherry (1979), is between 3×10^{-1} ft/day (1×10^{-4} cm/sec) and 3×10^{-7} ft/day (1×10^{-10} cm/sec).

2.3 AREA METEOROLOGY

Table 2.3-1 summarizes climatological data for the SEDA area. The nearest source of climatological data is the Aurora Research Farm located approximately 10 miles east of the site which provided precipitation and temperature measurements. Meteorological data collected from 1965 to 1974 at Hancock International Airport in Syracuse, New York, were used in preparation of the wind rose. The airport is located approximately 60 miles northeast of SEDA, and is representative of wind patterns at SEDA. The wind rose is presented in **Figure 2-8**.

A cool climate exists at SEDA with temperatures ranging from an average of 23°F in January to 69°F in July. Marked temperature differences are found between daytime highs and nighttime lows during the summer and portions of the transitional seasons. Precipitation is well-distributed, averaging approximately 3 inches per month (**Figure 2-9**). This precipitation is derived principally from cyclonic storms which pass from the interior of the county through the St. Lawrence Valley. Lakes Seneca, Cayuga and Ontario provide a significant amount of the winter precipitation and moderate the local climate. The annual average snowfall is 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 westerly and west-southwesterly.

As **Table 2.3-1** shows, temperature tends to be highest from June through September. Precipitation and relative humidity tend to be rather high throughout the year. The months with the most amount of sunshine are June through September. Mixing heights tend to be lowest in the summer and during the morning hours. Wind speeds also tend to be lower during the morning, which suggests that dispersion will often be reduced at those times, particularly during the summer. No episode-days are expected to occur with low mixing heights (less than 500 m) and light wind speeds (less than or equal to 2 m/s).

Daily precipitation data measured at the Aurora Research Farm in Aurora, New York (approximately 10 miles east of the site) for the period (1957-1991) were obtained from the Northeast Regional Climate Center at Cornell University. The maximum 24-hour precipitation measured at this station during this period was 3.91 inches on September 26, 1975. The reported

Table 2.3-1

Climatological Data for Seneca Army Depot Activity

SEAD-4 Remedial Investigation
Seneca Army Depot Activity

Month	Temperature (1),°F			Mean Precip-itation (1), in.	Mean Relative Humidity (%)	Percent Sunshine	Mean Number of Days (4)		
	Maximum	Minimum	Mean				Clear	Partly Cloudy	Cloudy
January	30.9	14.0	22.5	1.88	70	35	3	7	21
February	32.4	14.1	23.3	2.16	70	50	3	6	19
March	40.6	23.4	32.0	2.45	70	50	4	7	20
April	54.9	34.7	44.8	2.86	70	50	6	7	17
May	66.1	42.9	54.5	3.17	70	50	6	10	15
June	76.1	53.1	64.6	3.70	70	60	8	10	12
July	80.7	57.2	69.0	3.46	70	60	8	13	10
August	78.8	55.2	67.0	3.18	70	60	8	11	12
September	72.1	49.1	60.7	2.95	70	60	7	11	12
October	61.2	39.5	50.3	2.80	70	50	7	8	16
November	47.1	31.4	39.3	3.15	70	30	2	6	22
December	35.1	20.4	27.8	2.57	70	30	2	5	24
Annual	56.3	36.3	46.3	34.33	70	50	64	101	200

Period	Mixing Height (2), m	Wind Speed (2), m/s
Morning (Winter)	900	8
Morning (Spring)	700	6
Morning (Summer)	500	5
Morning (Autumn)	600	5
Morning (Annual)	650	6
Afternoon (Winter)	900	8
Afternoon (Spring)	1600	8
Afternoon (Summer)	1800	7
Afternoon (Autumn)	1300	7
Afternoon (Annual)	1400	7

Mean Annual Pan Evaporation (3), inches : 35
Mean Annual Lake Evaporation (3), inches : 28

Number of episodes lasting more than 2 days (2), (No. of episode-days) :
Mixing Height < 500 m, wind speed < 2 m/s : 0 (0)
Mixing Height < 1000 m, wind speed < 2 m/s : 0 (0)
Number of episodes lasting more than 5 days (2), (No. of episode-days) :
Mixing Height < 500 m, wind speed < 4 m/s : 0 (0)

Notes:
1) Climate of New York Climatography of the United States No. 60, National Oceanic and Atmospheric Administration, June 1982. Data for Ithaca Cornell University, NY.
2) Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution throughout the Contiguous United States, George C. Holzworth, Jan. 1972.
3) Climate Atlas of the United States, U.S. Department of Commerce, 1983.
4) Climate of New York Climatography of the United States No. 60, National Oceanic and Atmospheric Administration, June 1982. Data for Syracuse, NY.

mean annual pan evaporation was 35 inches, and annual lake evaporation was a reported 28 inches. An independent value of 27 inches for mean annual evaporation from open water surfaces was estimated from an isopleth presented in *Water Atlas of the United States* (Water Information Center, 1973).

Information on the frequency of inversion episodes for a number of National Weather Service stations is summarized in *Mixing Heights, Wind Speeds, and Potential for Urban Air Pollution Throughout the Contiguous United States* (George C. Holzworth, US EPA, 1972). The closest stations for which inversion information is available are in Albany, New York, and Buffalo, New York. The Buffalo station is nearer to SEDA but almost certainly exhibits influences from Lake Erie. These influences would not be expected to be as noticeable at SEDA.

SEDA is located in the Genesse-Finger Lakes Air Quality Control Region (AQCR). The AQCR is designated as non-attainment for ozone and attainment or unclassified for all other criteria pollutants. Data for the existing air quality in the area which surrounds the SEDA, cannot be obtained since the nearest state air quality stations are 40 to 50 miles away from the army depot, (Rochester of Monroe County or Syracuse of Onondaga County), and is not representative of the conditions at SEDA. A review of the data for Rochester, which is in the same AQCR as the SEDA, indicates that all monitored pollutants (sulfur dioxide, particulates, carbon monoxide, lead, and ozone) are below state and federal limits, with the exception of ozone. In 1987, the maximum ozone concentration observed in Rochester was 0.127 ppm; however, this value is not representative of the SEDA area which is a more rural environment.

2.4 LAND USE

The SEDA is situated between Seneca Lake and Cayuga Lake and encompasses portions of Romulus and Varick Townships. Land use in this region of New York is largely agricultural, with some forestry and public land (school, recreational and state parks). The most recent land use report is that issued by Cornell University (Cornell 1967). This report classifies in further detail land uses and environments of this region. Agricultural land use is categorized as inactive and active use. Inactive agricultural land consists of land committed to eventual forest regeneration, land waiting to be developed, or land presently under construction. Active agricultural land surrounding SEDA consists largely of cropland and cropland pasture.

Forest land adjacent to SEDA is primarily under regeneration with sporadic occurrence of mature forestry. Public and semi-public land use surrounding and within the vicinity of SEDA is Sampson State Park, Willard Psychiatric Center, and Central School (at the Town of Romulus). Sampson State Park entails approximately 1,853 acres of land and includes a boat ramp on Seneca Lake. Historically, Varick and Romulus Townships within Seneca County developed as an agricultural center supporting a rural population. However, increased population occurred in 1941 due to the opening of SEDA. Population has progressed since then largely due to the increased emphasis on promoting tourism and recreation in this area.

The total area of SEDA is 10,587 acres, of which 8,382 are designated storage areas for ammunition, storage and warehouse, and open storage and warehouse. Land use at the depot is controlled by the facility mission. The entire facility has restricted access and is surrounded by chain-link fencing topped with barbed wire. The depot has a roadway network consisting of paved macadam, concrete, and gravel roads totaling approximately 141 miles.

Land use is divided into three categories at the depot. The Main Post accounts for 9,832 acres and consists of an exclusion area containing partially buried, reinforced concrete igloos, general storage magazines, and warehouses. The cantonment areas of the facility consist of the North and South Posts. The North Post, at the north end of the Main Post, includes troop housing, troop support, and community services. The South Post is located in the southeast portion of the facility near Route 96 and is a developed area containing warehouses, administration buildings, quarters, and community services.

The intended land use plan for SEAD-59 and 71 is represented in **Figure 2-10**. A property transfer by the Army, according to CERCLA, Sections 120 (h)(1),(2), and (3), requires that the prospective owner must be notified that hazardous substances were possibly stored on the parcel, including the quantity and type of the substances that were stored. Under CERCLA, the content of the deed must include a covenant warranting that all remedial actions necessary to protect human health and the environment with respect to any such hazardous substances remaining on the property have been taken before the date of the transfer. In addition, Section 30 of the IAG requires that the Army notify the EPA and NYSDEC at least 90 days prior to any transfer. The Army shall ensure that all response actions undertaken will not be impeded or impaired by the transfer of the property.

2.5 SITE-SPECIFIC GEOLOGY

2.5.1 SEAD-59

Determination of the site geology was based on the drilling program conducted for the ESI at SEAD-59. This program included 5 soil borings and 3 monitoring wells which were drilled to a maximum depth of 20 feet below ground surface. Based on the results of the drilling program, fill material, till, weathered dark gray shale, and competent gray-black shale are the four major geologic units present on-site. At most of the boring locations very little topsoil was present. Several of the borings were drilled on a gravel surface, and no topsoil was encountered at these locations.

Fill material was encountered in the seven borings located within the fill area north of the access road. The borings in which fill was not encountered were the two downgradient monitoring well locations, MW59-1 and MW59-2. The fill was lithologically similar to the till in that it was characterized as silt with minor components of sand and shale fragments, but was different from the till in color, which tended to be gray brown or tan, and by the presence of gravel, asphalt, wood and other organic material. The fill was fond up to a depth of 10.5 feet.

The till was characterized as light brown in color and composed of silt, very fine sand, and clay, with minor components of gray-black shale fragments. Larger shale fragments (rip-up clasts) were observed at some locations at the top of the weathered shale. The thickness of the till ranged from 3.1 to 8.6 feet.

The weathered shale that forms the transition between till and competent shale was encountered at five of the nine boring locations. At boring locations MW59-3 and SB59-2, the contact between till and weathered shale was distinct. At the remaining three boring locations the weathered shale interval was comprised of weathered shale interbedded with till. Competent gray-black shale was observed at MW59-3 and SB59-1 at 8.0 and 10.5 feet below grade, respectively. At the remainder of the boring locations (SB59-3A and SB59-5 excepted), bedrock was inferred from the point of auger or spoon refusal at depths ranging from 9.5 to 20.5 feet below grade.

2.5.2 SEAD-71

Determination of the site geology was based on the results of the subsurface exploration program conducted for the ESI at SEAD-71. This program included three soil borings, which were completed as monitoring wells, and two test pits. The soil borings were drilled to a maximum depth of 9.4 feet below ground surface and the test pits were excavated to a maximum depth of 5.7 feet.

Based on the results of the subsurface exploration program, till, calcareous weathered shale, and competent shale are the three major types of geologic materials present on-site. The till in the storage area was characterized as olive gray clay with little silt, very fine sand, and shale fragments (up to 1 inch in diameter) and ranged in thickness between 4.7 and 7.8 feet. In the southern section of the storage area, the till consisted of light brown silt with little clay and trace amounts of shale fragments (up to 1 inch in diameter). Large shale fragments (rip-up clasts) were observed at or near the till/weathered shale contact at all soil boring locations. In the western half of the site, the till consisted of olive gray silt and was found to be approximately 4 feet thick.

The weathered shale that forms the transition between the till and competent shale was encountered at all soil boring and test pit locations. The depth of the weathered shale ranged from 4.7 to 8.3 feet below ground surface. Competent, calcareous gray shale was encountered at depths between 5.2 and 9.4 feet below ground surface.

2.6 SITE-SPECIFIC HYDROLOGY AND HYDROGEOLOGY

2.6.1 SEAD-59

SEAD-59 is comprised of two areas, one area located north of the access road to Building 311 and one area located to the south of the road. Each area is characterized by different topography with the area to south of the road being relatively flat and sloping gently to the west and the area to the north of the road containing a fill area with approximately 10 feet of relief.

Surface water flow from precipitation events is controlled by local topography. The area to the south of the access road slopes gently to the west. Surface water flow in this area is to the west and it is likely to be captured by the north-south trending drainage swale located in the western portion of the site and by the drainage ditch which parallels the south side of the access road. This ditch also drains SEAD-5, which is located adjacent to SEAD-59 and to the east.

In the area north of the access road, a hill composed of fill material has approximately 10 feet of vertical relief. To the west, the hill slopes steeply to the north-south trending drainage swale which flows north and eventually flows under the railroad tracks north of the site. To the north, the hill slopes to a sustained drainage ditch approximately two feet deep. This ditch originates east of the site near Building 128 and flows west paralleling the railroad tracks and the northern boundary of SEAD-59. At the northwestern corner of the site, the drainage swale flows north under the railroad tracks. To the east, the hill slopes downward to a graded gravel surface used for storing large equipment. Surface water from this area also drains into the northern drainage swale, flowing along the northern boundary of the site, as described above. To the south, the hill slopes to the access road which runs through the site. Surface water from this southern portion of the hill drains into the drainage ditch which parallels the access road on the north side. This drainage ditch flows west and intersects the north flowing drainage ditch in the western portion of SEAD-59.

As part of the ESI program, three monitoring wells were installed at SEAD-59 and three wells were installed at SEAD-5. SEAD-5 is located adjacent to SEAD-59 just east of the area south of the access road. Based on the data collected during the ESI, the groundwater flow direction is primarily southwest across SEAD-59.

2.6.2 SEAD-71

Surface water flow from precipitation events is controlled by local topography, although there is little topographic relief on the site. There are no sustained surface water bodies on-site. In the fenced storage area located in the eastern half of the site, the area is covered with asphalt, which provides an impermeable surface resulting in an increased amount of surface water runoff from the site. Based on topographic relief, surface water flow is to the southwest toward the SEDA railroad tracks (to the south), which are topographically lower than the site.

As part of the ESI program, three monitoring wells were installed at SEAD-71. Based on the data collected during the ESI, the groundwater flow direction in the till/weathered shale aquifer on the site is to the west-southwest.

2.7 CONTAMINATION ASSESSMENT

Geophysical surveys and test pits were performed during the ESI and RI to identify burial sites at SEAD-59 and 71. Soil (surface, subsurface), soil gas, and groundwater were collected and analyzed as part of the investigations (**Figures 2-11 and 2-12**). The results are presented in the *Draft Phase I Remedial Investigation (RI) SEAD-59 and SEAD-71, the ESI Report for Seven Low Priority AOCs - SEADs 60, 62, 63, 64 (A, B, C, and D), 67, 70, and 71* (Parsons ES, 1995a) and the *Expanded Site Inspection - Eight Moderately Low Priority AOCs SEADs 5, 9, 12 (A and B), 43, 56, 69, 44 (A and B), 50, 58, and 59*, December 1995. The following sections summarize the nature and extent of contamination identified at these sites.

2.7.1 Soil Gas Survey

2.7.1.1 SEAD-59

A total of 241 soil gas points were sampled and analyzed during the Phase I RI investigation at SEAD-59. This sampling effort revealed one large area and four smaller areas of elevated total volatile organic compounds (VOCs), as shown in **Figures 2-11 and 2-13**. The larger area of elevated soil gas encompasses most of SEAD-59, extending from north of the unnamed dirt road to the west of the 60,000 gallon oil storage tank, including the mounded fill area. The highest soil gas hits were within the boundaries of the fill area. Maximum total VOC hits of greater than 10 ppmv were observed at three separate locations within the fill area. The four smaller areas of elevated soil gas containing VOCs were detected in an area southeast of the fill area, an area directly southwest of the fill area, another area south of the fill area, and an additional area northwest of the fill area.

2.7.1.2 SEAD-71

A soil gas survey has not been performed at SEAD-71.

2.7.2 Geophysics: Seismic Survey

2.7.2.1 SEAD-59

Four seismic refraction profiles were performed, during the ESI, on 4 lines positioned along each boundary line of SEAD-59. The seismic refraction profiles detected 5 to 10 feet of unconsolidated overburden (1,050 to 1,730 ft/sec) overlying bedrock (10,500 to 15,500 ft/sec). Saturated overburden was not detected by the seismic survey due to limited thickness of the saturated overburden. The elevations of the bedrock surface indicated that the bedrock sloped to the west, generally following the surface topography. Based upon the results of the seismic survey, the groundwater flow direction was also expected to be to the west, following the slope of the bedrock surface.

2.7.2.2 SEAD-71

Four seismic refraction profiles were performed as part of the geophysical investigations for the ESI on four lines positioned along each boundary line of the storage area in the eastern half of SEAD-71. The seismic refraction profiles detected 6 to 9 feet of unconsolidated overburden (1,125 to 1,500 ft./sec.) overlying bedrock (12,800 to 16,200 ft./sec.). Saturated overburden was not detected by the seismic survey due to limited thickness of the saturated overburden. The elevations of the bedrock surface indicated that the bedrock slopes to the west, generally following the surface topography. Based on the results of the seismic survey, the groundwater flow direction is also expected to be to the west, following the slope of the bedrock surface.

2.7.3 Geophysics: EM-31 Survey

2.7.3.1 SEAD-59

Electromagnetic (EM-31, EM-61) surveys were performed for the ESI and the Phase I RI at SEAD-59 to delineate the limits of the landfill and to identify locations where metallic objects were buried. Fill areas can generally be delineated since these areas contain metallic objects which can be easily detected using electromagnetic techniques. Areas within the fill where magnetic anomalies are prevalent also serve as a basis for performing test pit exploration, especially when these areas coincide with elevated soil gas anomalies.

Figure 2-14 shows the EM-31 quadrature responses from the ESI, which is proportional to the apparent ground conductivity. Several apparent ground conductivity anomalies were observed in the northeastern portion of the EM grid which coincided with areas used for site access and equipment storage. A large area of elevated ground conductivity, also located in the northeastern portion of the EM grid, could be attributed to an increase in the clay content of the fill material, to the presence of dissolved solids in the groundwater, or to soil moisture. A north-south trending lineament was detected near the western boundary of the EM grid and was correlated to a drainage swale having a large quantity of clay sediment along its length.

Ten localized anomalies were identified as a result of the EM-31 survey completed at SEAD-59. Two of the 10 localized anomalies were correlated to surface features: one was attributed to a drainage culvert located under the railroad track along the northern boundary of the EM grid, and the second was correlated to an area of surface debris located in the southwestern portion of the EM grid. The sources of the remaining 8 localized anomalies could not be attributed to surface features.

The results of the in-phase response, which reflect the presence of buried ferrous objects, are shown in **Figure 2-15**. Eight of the localized in-phase response anomalies are associated with the eight apparent ground conductivity anomalies of unknown origin previously mentioned. Several larger anomalies were identified in the northeastern quadrant of the EM grid and were associated to cultural features. Although many anomalies were observed in both the apparent ground conductivity and in-phase data, no clearly defined boundaries of the large fill area in the northeastern portion of the EM grid could be determined based upon the geophysical results.

The results of the electromagnetic (EM-61) survey performed for the Phase I RI at SEAD-59 are shown in **Figures 2-11 and 2-13**. Fifty-seven localized anomalies were identified as a result of the EM-61 survey completed at SEAD-59. Eighteen of the 57 localized anomalies were correlated to known surface features such as the drainage culvert located under the railroad track along the northern boundary of the EM grid, and the area of surface debris located in the southwestern portion of the EM grid. The sources of the remaining 39 localized anomalies could not be attributed to surface features and are due to unknown buried sources.

2.7.3.2 SEAD-71

The EM-31 survey was performed for the ESI at SEAD-71 in the western half of the site to help locate the burial pits. **Figure 2-16** shows the EM-31 quadrature response, which is proportional to the apparent ground conductivity survey. **Figure 2-17** shows the results of the in-phase response, which reflects the presence of buried ferrous objects.

Interferences from many cultural effects along the perimeter of the surveyed area complicated the interpretation of the data. A review of the EM-31 data from SEAD-71 revealed one area, in the south central portion of the grid, where both the apparent conductivity and the in-phase response decreased noticeably. One other area of increased apparent ground conductivity measurements was detected along the west-central portion of the grid, however, an associated in-phase response was not observed.

2.7.4 Geophysics: GPR Survey

2.7.4.1 SEAD-59

Ground penetrating radar (GPR) data were acquired for the ESI at SEAD-59 along profiles spaced at 50-foot intervals. In addition, GPR data from two profiles were also collected over distinct EM-31 anomalies to provide better characterization of the suspected metallic sources. The GPR profiles revealed 17 locations where buried metallic objects were suspected. A small disposal pit was also detected in the southeastern portion of the area investigated. Twelve of the buried metallic object locations were situated within the suspected disposal area in the northeastern quadrant of SEAD-59. Ten of the GPR anomaly locations were either situated over a localized EM anomaly or within 15 feet of a localized EM anomaly.

GPR data were also acquired for the Phase I RI at SEAD-59 over each distinct EM-61 anomaly to provide better characterization of the suspected metallic sources. Test pit locations were selected based on GPR data indicating the strongest presence of disposal pits or debris.

2.7.4.2 SEAD-71

GPR data was acquired for the ESI at SEAD-71. The data from these surveys revealed an underground utility line or conduit running northwest - southeast across the northeastern corner of the storage compound. One area of anomalous subsurface reflections, typical of reflections from metallic objects, was detected in the south-central portion of the storage compound. The GPR survey conducted in the area west of the storage compound revealed five localized anomalies and three zones with multiple anomalies. The source of these EM-31 and the GPR anomalies was identified during test pit excavations as construction debris composed of chain link fencing, sheet metal, asphalt, and a crushed, yellow, twenty gallon drum. Weathered shale, encountered at a depth of 5.5 feet, limited any further advancement of the excavation. There were no readings above background levels (0 ppm of organic vapors and 10-15 micro rems per hour of radiation) during the excavations.

GPR data were also acquired for the Phase I RI at SEAD-71 in the area depicted in **Figure 2-12** to provide better characterization of the suspected metallic sources. Test pit locations were selected based on GPR data indicating the strongest presence of disposal pits or debris.

2.7.5 Test Pitting Program

2.7.5.1 SEAD-59

Test pits were excavated during both the ESI and Phase I RI in areas identified by geophysics and soil gas as anomalies. Test pit excavations were performed to investigate the nature of the anomaly and collect chemical data to identify the presence of constituents of concern. The excavated material from all the test pits during the Phase I RI was continuously screened for organic vapors with a Thermo Environmental Organic Vapor Meter (OVM) 580 PID. With the exception of the OVM readings cited below, no other readings above background levels (0 ppm of organic vapors) were observed during the excavations.

Five test pits were excavated during the ESI and nineteen test pits were excavated during the Phase I RI at SEAD-59. Their locations are shown on **Figure 2-11**. Test pit logs can be found in the appendices of the ESI and Phase I RI reports. Test pit locations were selected based on the results of the EM31, EM-61, GPR and soil gas anomalies located throughout the site. Geophysical anomalies that coincided with the presence of soil gas anomalies were considered to represent the greatest potential for contamination.

Test pits (TP59-2, TP59-3, TP59-4, TP59-7, TP59-10, TP59-11, TP59-14, TP59-15, TP59-16 and TP59-17) were excavated within the fill area during the ESI and Phase I RI. Debris consisting of concrete, asphalt, metal and wood were found in this area. A layer of petroleum hydrocarbon stained silt (having a petroleum odor) was observed in the 1.4 to 1.8 feet depth interval of test pit TP59-4. A maximum reading of 132 ppmv of organic vapors was recorded from this depth interval with a hand held Organic vapor meter (OVM). Soil sample TP59-4-1 was collected from this depth interval to confirm the presence of contamination.

Three 55-gallon drums were found at approximately 3 feet below grade at the TP59-3 location. One drum had been buried in an upright position and the two others were found in a horizontal position. The excavation was halted when these drums were unearthed, therefore, the existence of additional drums at greater depths is unknown. Soils from the spaces between the drums were collected and identified as soil sample TP59-3. One end of one of the horizontally positioned drums was separated from the body of the drum, revealing a white, flexible, plastic-like substance. Some areas of this white substance showed a dark-yellow staining. A small amount of this substance was collected in a VOC vial and submitted for VOC analysis as sample number TP59-3X.

Drums were also found in test pits TP59-15 and TP59-16. A crushed 15-gallon drum containing black oily stains was located six feet below ground surface in TP59-15. An OVM reading of 16 ppmv was recorded at this location. Sample TP59-15-1 was collected from the exterior of the drum. Another drum was found in TP59-16. This drum did not appear to be leaking and no OVM reading was recorded. Sample TP59-16-1 was collected from beneath this drum. Corroded drum fragments having no contents were found in TP59-10.

In the area directly southwest of the fill area, test pits TP59-13A, TP59-13B, and TP59-13C were excavated. Little debris was encountered in these pits. However, a petroleum-type odor was noted between 3.5 and 4 feet in TP59-13A and an OVM reading of 7.4 ppmv was recorded. In addition, a sheen was observed on the water which was encountered at the top of the shale bedrock at four feet below ground surface. A silty sheen having no odor was also observed in water encountered at approximately the same depth in TP59-13C. Samples TP59-13A-1 and TP59-13C-1 were collected from the intervals above the bedrock where the water was encountered (between 3 to 4 feet below ground surface).

In the area south of the fill area, test pits TP59-1, TP59-5, TP59-6, TP59-12A, TP59-12B and TP59-12C were excavated. The excavation at TP59-1 revealed a large quantity of filled 2-gallon paint cans approximately 1 foot below the ground surface. Several zones of paint stained soil were observed and screened with an OVM. Soil and paint residues from the zone with the highest organic vapor reading (560 ppmv) were collected and submitted for chemical analysis as soil sample TP59-1. A 0.6-foot thick layer of construction debris had been disposed of over the paint cans. This debris included a crushed, yellow, 20-gallon waste can and chain-link fencing. A 5-inch thick layer of crushed shale gravel overlaid the construction debris. A 5-gallon paint can was observed one foot below the surface at TP59-12A as well as a paint globule and a crushed 1-gallon paint can. No organic vapors were detected and sample TP59-12A-1 was collected from between 1 and 1.5 feet below ground surface. At test pit TP59-12B, a 5-gallon paint can was also uncovered one foot below the surface leaking a brown grease-like substance. White solidified paint was also observed in this interval. An OVM reading of 274 ppmv was recorded. Construction debris was encountered in TP59-5, the westernmost test pit at SEAD 59, and TP59-6, one of the southernmost test pits at SEAD 59.

Construction debris was encountered in the test pits excavated in the area southeast of the fill area (TP59-8, TP59-9 and TP59-18). Some iron-stained soil was noted between 1.5 and 2 feet below ground surface at TP59-18.

2.7.5.2 SEAD-71

Four test pits were excavated during the Phase I RI at SEAD-71 to characterize the source of the geophysical anomalies. Two test pits were excavated during the ESI as well. The locations of the test pits are shown on **Figure 2-12**. The test pit logs are presented in the appendices of the ESI and RI reports. The excavated material from the test pits was continuously screened for organic vapors during the Phase I RI with a Thermo OVM 580 PID. Except for the OVM readings cited below, no readings above background levels (0 ppm of organic vapors) were observed during the excavations.

The source of the EM-31 and the GPR anomalies identified during the ESI at the TP71-1 location was identified as construction debris composed of chain link fencing, sheet metal, asphalt, and a crushed, yellow, twenty gallon drum. This debris was situated 0.75 to 1.3 feet below the ground surface. A 0.75 foot thick layer of fine angular black debris (resembling creosote or soot) was observed immediately below the construction debris layer. A weathered shale layer, encountered at a depth of 5.5 feet, limited any further advancement of the excavation.

Test pit TP71-2 was centered over a GPR anomaly located in the storage area. This location was situated along the southern boundary of compacted roadstone. A dark gray to black, possibly stained, fine shale gravel layer was encountered from 0.25 to 1.0 foot below ground surface. The source of the GPR anomaly was not identified at this test pit location. Changes in the electrical properties of the soils within a layer may give rise to spurious radar wave reflections resembling GPR signatures observed over metallic objects.

Test pit TP71-3 was located over a GPR anomaly located north of the road and near the steel garage. Sand and stone slabs were encountered between 0.5 and 2 feet. At 8 feet below ground surface, a slight hydrocarbon odor was noticed and an OVM reading of 4 to 6 ppm was recorded. Sample TP71-3-1 was collected from between 8.5 and 9 feet below the ground surface. The soil at this depth was stained with a gray-brown color. A trace of an oily sheen was noted on the clay soil at ten feet and stones at 10.5 to 11 feet were covered with a brown oily liquid. Sample TP71-3-2 was collected from between 10.5 and 11 feet below ground surface.

Test pit TP71-4 was located over a GPR anomaly located north of the road. A stone slab layer was encountered at 1 foot below the surface and other slabs mixed with lumber sand and stone were located between 3 and 7 feet below the surface. At ten feet below ground surface, some iron staining was noted on the soil and an OVM reading of 6 ppm was recorded.

Test pit TP71-5 was located over a GPR anomaly located between the south edge of the road and the southern railroad tracks. Railroad ties were encountered at 3 to 7 feet below ground surface which matched the GPR anomaly. Sample TP71-5-1 was collected from between 7 and 7.5 feet below ground surface. At 12.5 feet below ground surface, an OVM reading of 8 ppm was recorded and sample TP71-5-2 was collected from between 12.5 and 13 feet below ground surface for on-site screening.

Test pit TP71-6 was located south of the road and north of the railroad and salt shed. Fill within this test pit consisted of black cinders, wood, asphalt bricks, fencing, piping and railroad ties. Sample TP71-6-3 was collected from beneath the black cinders between 3 and 3.5 feet below ground surface. Two other samples (TP71-6-1 and TP71-6-2) were collected from the native soils beneath this test pit.

2.7.6 Summary of Affected Media

2.7.6.1 SEAD-59

The ESI and Phase I RI conducted at SEAD-59 identified several areas which have been impacted by releases of volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons, and to a lesser extent, heavy metals.

Soil Data

Sampling conducted in SEAD-59 indicated impacts to soils from volatile organic compounds, semivolatile organic compounds, total petroleum hydrocarbons, and to a lesser extent, metals. A total of 20 soil samples were collected from soil borings and test pits as part of the ESI for SEAD-59. A total of 105 samples were collected during the Phase I RI for field screening and 34 of those samples were sent to the laboratory for confirmatory analysis. **Table 2.7-1** presents a summary of the compounds detected during these investigations. **Table A-1** in Appendix A presents all validated data for soil from SEAD-59.

In the fill area, polyaromatic hydrocarbon (PAH) compounds were found in surface soil and subsurface soil samples at concentrations exceeding the criteria specified in the Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives. Total petroleum hydrocarbons were detected in the majority of the soil samples collected from the fill area. In the area directly southwest of the fill area, there is both physical and chemical evidence of the presence of hydrocarbons. In the area south of the fill area, several paint cans containing paint were found. BTEX constituents were detected in the sample from this location at concentrations exceeding the associated TAGM criteria and Cleanup Levels (NYSDEC, 1992). **Figure 2-18** presents the distribution of benzo[a]pyrene, chosen as an indicator chemical for PAHs.

Groundwater Data

The analytical results of the groundwater analyses (**Table A-2** in Appendix A) indicate that the groundwater at SEAD-59 has been moderately impacted by total petroleum hydrocarbons and, to a lesser extent, by metals and semivolatile organic compounds. Total petroleum hydrocarbons were detected at low concentrations in each of the downgradient groundwater samples, and were undetected in the upgradient groundwater samples. Iron and sodium were detected at concentrations above their associated groundwater criteria in both the upgradient and the downgradient groundwater samples. Thallium was found in the upgradient and one downgradient groundwater sample at concentrations above the federal MCL. Manganese was found in one downgradient sample at a concentration above the state groundwater criteria. One SVOC was reported at estimated concentrations above groundwater TAGM.

The results of the ESI have identified significant releases of BTEX and PAH compounds in the materials comprising the fill area and disposal pits at SEAD-59. It is important to note that trace

Table 2.7-1
SUMMARY OF COMPOUNDS DETECTED IN SOIL DURING
SEAD-59 ESI and Phase I RI
Decision Document - SEADs- 59 and 71
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COMPOUND	UNIT	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	FREQUENCY OF DETECTION	MAXIMUM VALUE	NUMBER ABOVE TAGM	TAGM
VOLATILE ORGANICS							
1,1,1-Trichloroethane	UG/KG	55	0	0.00%	0	0	800.
1,1,2,2-Tetrachloroethane	UG/KG	55	0	0.00%	0	0	600.
1,1,2-Trichloroethane	UG/KG	55	0	0.00%	0	0	
1,1-Dichloroethane	UG/KG	55	0	0.00%	0	0	200.
1,1-Dichloroethene	UG/KG	55	0	0.00%	0	0	400.
1,2-Dichloroethane	UG/KG	55	0	0.00%	0	0	100.
1,2-Dichloroethene (total)	UG/KG	55	0	0.00%	0	0	
1,2-Dichloropropane	UG/KG	55	0	0.00%	0	0	
Acetone	UG/KG	55	1	1.82%	150	0	200.
Benzene	UG/KG	55	3	5.45%	5900	2	60.
Bromodichloromethane	UG/KG	55	0	0.00%	0	0	
Bromoform	UG/KG	55	0	0.00%	0	0	
Carbon disulfide	UG/KG	55	1	1.82%	4	0	2,700.
Carbon tetrachloride	UG/KG	55	0	0.00%	0	0	600.
Chlorobenzene	UG/KG	55	0	0.00%	0	0	1,700.
Chlorodibromomethane	UG/KG	55	0	0.00%	0	0	
Chloroethane	UG/KG	55	0	0.00%	0	0	1,900.
Chloroform	UG/KG	55	0	0.00%	0	0	300.
Cis-1,3-Dichloropropene	UG/KG	55	0	0.00%	0	0	
Ethyl benzene	UG/KG	55	4	7.27%	260000	1	5,500.
Methyl bromide	UG/KG	55	0	0.00%	0	0	
Methyl butyl ketone	UG/KG	55	0	0.00%	0	0	
Methyl chloride	UG/KG	55	1	1.82%	1	0	
Methyl ethyl ketone	UG/KG	55	3	5.45%	36	0	300.
Methyl isobutyl ketone	UG/KG	55	0	0.00%	0	0	1,000.
Methylene chloride	UG/KG	55	2	3.64%	2	0	100.
Styrene	UG/KG	55	0	0.00%	0	0	
Tetrachloroethene	UG/KG	55	0	0.00%	0	0	1,400.
Toluene	UG/KG	55	8	14.55%	830000	1	1,500.
Total Xylenes	UG/KG	55	6	10.91%	1000000	1	1,200.
Trans-1,3-Dichloropropene	UG/KG	55	0	0.00%	0	0	
Trichloroethene	UG/KG	55	2	3.64%	2	0	700.
Vinyl chloride	UG/KG	55	0	0.00%	0	0	200.
SEMIVOLATILE ORGANICS							
1,2,4-Trichlorobenzene	UG/KG	54	1	1.85%	28	0	3,400.
1,2-Dichlorobenzene	UG/KG	54	0	0.00%	0	0	7,900.
1,3-Dichlorobenzene	UG/KG	54	0	0.00%	0	0	1,600.
1,4-Dichlorobenzene	UG/KG	54	0	0.00%	0	0	8,500.
2,2'-oxybis(1-Chloropropane)		21	0	0.00%	0	0	
2,4,5-Trichlorophenol	UG/KG	54	0	0.00%	0	0	100.
2,4,6-Trichlorophenol	UG/KG	54	0	0.00%	0	0	
2,4-Dichlorophenol	UG/KG	54	0	0.00%	0	0	400.
2,4-Dimethylphenol	UG/KG	54	0	0.00%	0	0	
2,4-Dinitrophenol	UG/KG	54	0	0.00%	0	0	200.
2,4-Dinitrotoluene	UG/KG	54	0	0.00%	0	0	
2,6-Dinitrotoluene	UG/KG	54	0	0.00%	0	0	1,000.

Table 2.7-1
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SEAD-59 ESI and Phase I RI
Decision Document - SEADs- 59 and 71
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COMPOUND	UNIT	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	FREQUENCY OF DETECTION	MAXIMUM VALUE	NUMBER ABOVE TAGM	TAGM
2-Chloronaphthalene	UG/KG	54	0	0.00%	0	0	
2-Chlorophenol	UG/KG	54	0	0.00%	0	0	800.
2-Methylnaphthalene	UG/KG	54	37	68.52%	67000	2	36,400.
2-Methylphenol	UG/KG	54	0	0.00%	0	0	100.
2-Nitroaniline	UG/KG	54	0	0.00%	0	0	430.
2-Nitrophenol	UG/KG	54	0	0.00%	0	0	330.
3,3'-Dichlorobenzidine	UG/KG	54	0	0.00%	0	0	
3-Nitroaniline	UG/KG	54	0	0.00%	0	0	500.
4,6-Dinitro-2-methylphenol	UG/KG	54	0	0.00%	0	0	
4-Bromophenyl phenyl ether	UG/KG	54	0	0.00%	0	0	
4-Chloro-3-methylphenol	UG/KG	54	0	0.00%	0	0	240.
4-Chloroaniline	UG/KG	54	0	0.00%	0	0	220.
4-Chlorophenyl phenyl ether	UG/KG	54	0	0.00%	0	0	
4-Methylphenol	UG/KG	54	2	3.70%	83	0	900.
4-Nitroaniline	UG/KG	54	0	0.00%	0	0	
4-Nitrophenol	UG/KG	54	0	0.00%	0	0	100.
Acenaphthene	UG/KG	54	39	72.22%	20000	0	50,000.
Acenaphthylene	UG/KG	54	29	53.70%	5700	0	41,000.
Anthracene	UG/KG	54	36	66.67%	38000	0	50,000.
Benzo[a]anthracene	UG/KG	54	44	81.48%	67000	31	224.
Benzo[a]pyrene	UG/KG	54	43	79.63%	70000	33	61.
Benzo[b]fluoranthene	UG/KG	54	46	85.19%	58000	13	1,100.
Benzo[ghi]perylene	UG/KG	54	39	72.22%	35000	0	50,000.
Benzo[k]fluoranthene	UG/KG	54	41	75.93%	48000	12	1,100.
Bis(2-Chloroethoxy)methane	UG/KG	54	0	0.00%	0	0	
Bis(2-Chloroethyl)ether	UG/KG	54	0	0.00%	0	0	
Bis(2-Chloroisopropyl)ether	UG/KG	34	0	0.00%	0	0	
Bis(2-Ethylhexyl)phthalate	UG/KG	54	33	61.11%	15000	0	50,000.
Butylbenzylphthalate	UG/KG	54	4	7.41%	1000	0	50,000.
Carbazole	UG/KG	54	36	66.67%	33000	0	
Chrysene	UG/KG	54	45	83.33%	63000	26	400.
Di-n-butylphthalate	UG/KG	54	22	40.74%	250	0	8,100.
Di-n-octylphthalate	UG/KG	54	5	9.26%	11	0	50,000.
Dibenz[a,h]anthracene	UG/KG	54	34	62.96%	17000	29	14.
Dibenzofuran	UG/KG	54	34	62.96%	18000	1	6,200.
Diethyl phthalate	UG/KG	54	15	27.78%	12	0	7,100.
Dimethylphthalate	UG/KG	54	0	0.00%	0	0	2,000.
Fluoranthene	UG/KG	54	46	85.19%	160000	1	50,000.
Fluorene	UG/KG	54	38	70.37%	38000	0	50,000.
Hexachlorobenzene	UG/KG	54	0	0.00%	0	0	410.
Hexachlorobutadiene	UG/KG	54	0	0.00%	0	0	
Hexachlorocyclopentadiene	UG/KG	54	0	0.00%	0	0	
Hexachloroethane	UG/KG	54	0	0.00%	0	0	
Indeno[1,2,3-cd]pyrene	UG/KG	54	42	77.78%	34000	4	3,200.
Isophorone	UG/KG	54	0	0.00%	0	0	4,400.
N-Nitrosodiphenylamine	UG/KG	54	0	0.00%	0	0	
N-Nitrosodipropylamine	UG/KG	54	0	0.00%	0	0	
Naphthalene	UG/KG	54	35	64.81%	29000	2	13,000.

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COMPOUND	UNIT	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	FREQUENCY OF DETECTION	MAXIMUM VALUE	NUMBER ABOVE TAGM	TAGM
Nitrobenzene	UG/KG	54	0	0.00%	0	0	200.
Pentachlorophenol	UG/KG	54	0	0.00%	0	0	1,000.
Phenenthrene	UG/KG	54	46	85.19%	140000	2	50,000.
Phenol	UG/KG	54	2	3.70%	17	0	30.
Pyrene	UG/KG	54	47	87.04%	120000	1	50,000.
PESTICIDES/PCBS							
4,4`-DDD	UG/KG	54	31	57.41%	450	0	2,900.
4,4`-DDE	UG/KG	54	34	62.96%	150	0	2,100.
4,4`-DDT	UG/KG	54	31	57.41%	350	0	2,100.
Aldrin	UG/KG	54	2	3.70%	1.2	0	41.
Alpha-BHC	UG/KG	54	4	7.41%	14	0	110.
Alpha-Chlordane	UG/KG	54	13	24.07%	81	0	
Aroclor-1016	UG/KG	54	0	0.00%	0	0	1000/10000(a)
Aroclor-1221	UG/KG	54	0	0.00%	0	0	1000/10000(a)
Aroclor-1232	UG/KG	54	0	0.00%	0	0	1000/10000(a)
Aroclor-1242	UG/KG	54	0	0.00%	0	0	1000/10000(e)
Aroclor-1248	UG/KG	54	0	0.00%	0	0	1000/10000(a)
Aroclor-1254	UG/KG	54	2	3.70%	63	0	1000/10000(a)
Aroclor-1260	UG/KG	54	0	0.00%	0	0	1000/10000(a)
Beta-BHC	UG/KG	54	7	12.96%	4.7	0	200.
Delta-BHC	UG/KG	54	7	12.96%	8.5	0	300.
Dieldrin	UG/KG	54	4	7.41%	4.9	0	44.
Endosulfan I	UG/KG	54	8	14.81%	26	0	900.
Endosulfan II	UG/KG	54	5	9.26%	7.1	0	900.
Endosulfan sulfate	UG/KG	54	5	9.26%	20	0	1,000.
Endrin	UG/KG	54	9	16.67%	46	0	100.
Endrin aldehyde	UG/KG	54	12	22.22%	17	0	
Endrin ketone	UG/KG	54	9	16.67%	77	0	
Gamma-BHC/Lindane	UG/KG	54	0	0.00%	0	0	60.
Gamma-Chlordane	UG/KG	54	11	20.37%	100	0	540.
Heptachlor	UG/KG	54	0	0.00%	0	0	100.
Heptachlor epoxide	UG/KG	54	14	25.93%	10	0	20.
Methoxychlor	UG/KG	54	2	3.70%	110	0	
Toxaphene	UG/KG	54	0	0.00%	0	0	
METALS							
Aluminum	MG/KG	54	54	100.00%	20600	1	19,300.
Antimony	MG/KG	54	12	22.22%	424	1	5.9
Arsenic	MG/KG	54	54	100.00%	6.1	0	8.2
Barium	MG/KG	54	54	100.00%	304	1	300.
Beryllium	MG/KG	54	54	100.00%	0.91	0	1.1
Cadmium	MG/KG	54	20	37.04%	3.2	1	2.3
Calcium	MG/KG	54	54	100.00%	214000	5	121,000.
Chromium	MG/KG	54	54	100.00%	25.5	0	29.6
Cobalt	MG/KG	54	54	100.00%	14.7	0	30.
Copper	MG/KG	54	54	100.00%	36.1	1	33.
Cyanide	MG/KG	54	0	0.00%	0	0	.35

Table 2.7-1
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SEAD-59 ESI and Phase I RI
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COMPOUND	UNIT	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	FREQUENCY OF DETECTION	MAXIMUM VALUE	NUMBER ABOVE TAGM	TAGM
Iron	MG/KG	54	54	100.00%	33300	0	36,500.
Lead	MG/KG	54	54	100.00%	139	29	24.8
Magnesium	MG/KG	54	54	100.00%	34400	1	21,500.
Manganese	MG/KG	54	54	100.00%	1150	1	1,060.
Mercury	MG/KG	54	34	62.96%	1.6	11	.1
Nickel	MG/KG	54	54	100.00%	41.4	0	49.
Potassium	MG/KG	54	54	100.00%	2520	1	2,380.
Selenium	MG/KG	54	18	33.33%	2.2	1	2.
Silver	MG/KG	54	4	7.41%	4.1	1	.75
Sodium	MG/KG	54	43	79.63%	2310	18	172.
Thallium	MG/KG	54	0	0.00%	0	0	.7
Vanadium	MG/KG	54	54	100.00%	41.9	0	150.
Zinc	MG/KG	54	54	100.00%	1550	8	110.
OTHER ANALYSES							
Total Petroleum Hydrocarbons	MG/KG	55	35	63.64%	19700	NA	
Nitrate/Nitrite Nitrogen	MG/KG	34	34	100.00%	9.9	NA	

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

quantities of total petroleum hydrocarbons detected in the fill materials are presumably being leached into the groundwater beneath the site. Therefore, the data suggest that affected media at SEAD-59 may have the potential to impact the modeled receptors.

2.7.6.2 SEAD-71

Soil and groundwater were sampled as part of the ESI conducted at SEAD-71 in 1994. Soils were also sampled as part of the Phase I RI conducted in 1998. Sampling and analyses were based upon historical usage of the area for the disposal of paint and solvents. The results of these investigations were detailed in the ESI and Phase I RI reports (Parsons ES, April 1995, July 1998). To evaluate whether each media (soil and groundwater) is being impacted, the chemical analysis data from both investigations were compared to available New York State and Federal standards, guidelines, and criteria. Only those state standards which are more stringent than federal requirements were used as criteria.

<u>Soil Data</u>

A total of 21 surface soil samples were obtained for chemical analysis as part of the Phase I RI for SEAD-71. Nine soil samples were collected from 4 test pits and screened for BTEX compounds using immunoassay field screening tests. Five test pit soil samples from the 4 test pits were sent to the laboratory for chemical analysis. The chemical data for these surface soil and test pit soil samples in addition to the eight soil samples collected from two test pits during the ESI are summarized in **Table 2.7-2**. **Table B-1** in Appendix B presents all validated data from the two investigations at SEAD-71. The following sections describe the nature and extent of contamination identified at SEAD-71.

The Phase I RI confirmed the findings of the ESI conducted at SEAD-71. No burial pit for paint and solvents was uncovered during either investigation, although the investigations did indicate the soils at SEAD-71 have been impacted by the waste materials which have been disposed of in at least one disposal pit on site. At three test pit locations, polynuclear aromatic hydrocarbons (PAHs) were present at concentrations exceeding the criteria specified in the Technical and Administrative Guidance Memorandum (TAGM): Determination of Soil Cleanup Objectives and Cleanup Levels (NYSDEC 1992). Heavy metals concentrations above the associated criteria values were also present in these three test pits. There is clear evidence that surface soils at SEAD-71 have been impacted by waste materials disposed in the area. Both PAHs and heavy

Table 2.7-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL DURING
SEAD-71 ESI and Phase I RI
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COMPOUND	UNIT	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	FREQUENCY OF DETECTION	MAXIMUM VALUE	NUMBER ABOVE TAGM	TAGM
VOLATILE ORGANICS							
1,1,1-Trichloroethane	UG/KG	34	6	17.65%	23	0	800.
1,1,2,2-Tetrachloroethane	UG/KG	34	0	0.00%	0	0	600.
1,1,2-Trichloroethane	UG/KG	34	0	0.00%	0	0	
1,1-Dichloroethane	UG/KG	34	0	0.00%	0	0	200.
1,1-Dichloroethene	UG/KG	34	0	0.00%	0	0	400.
1,2-Dichloroethane	UG/KG	34	0	0.00%	0	0	100.
1,2-Dichloroethene (total)	UG/KG	34	0	0.00%	0	0	
1,2-Dichloropropane	UG/KG	34	0	0.00%	0	0	
Acetone	UG/KG	34	2	5.88%	74	0	200.
Benzene	UG/KG	34	1	2.94%	2	0	60.
Bromodichloromethane	UG/KG	34	0	0.00%	0	0	
Bromoform	UG/KG	34	0	0.00%	0	0	
Carbon disulfide	UG/KG	34	0	0.00%	0	0	2,700.
Carbon tetrachloride	UG/KG	34	0	0.00%	0	0	600.
Chlorobenzene	UG/KG	34	0	0.00%	0	0	1,700.
Chlorodibromomethane	UG/KG	34	0	0.00%	0	0	
Chloroethane	UG/KG	34	0	0.00%	0	0	1,900.
Chloroform	UG/KG	34	0	0.00%	0	0	300.
Cis-1,3-Dichloropropene	UG/KG	34	0	0.00%	0	0	
Ethyl benzene	UG/KG	34	2	5.88%	4	0	5,500.
Methyl bromide	UG/KG	34	0	0.00%	0	0	
Methyl butyl ketone	UG/KG	34	0	0.00%	0	0	
Methyl chloride	UG/KG	34	0	0.00%	0	0	
Methyl ethyl ketone	UG/KG	34	0	0.00%	0	0	300.
Methyl isobutyl ketone	UG/KG	34	0	0.00%	0	0	1,000.
Methylene chloride	UG/KG	34	9	26.47%	11	0	100.
Styrene	UG/KG	34	1	2.94%	1	0	
Tetrachloroethene	UG/KG	34	4	11.76%	33	0	1,400.
Toluene	UG/KG	34	8	23.53%	16	0	1,500.
Total Xylenes	UG/KG	34	4	11.76%	96	0	1,200.
Trans-1,3-Dichloropropene	UG/KG	34	0	0.00%	0	0	
Trichloroethene	UG/KG	34	0	0.00%	0	0	700.
Vinyl chloride	UG/KG	34	0	0.00%	0	0	200.
SEMIVOLATILE ORGANICS							
1,2,4-Trichlorobenzene	UG/KG	34	0	0.00%	0	0	3,400.
1,2-Dichlorobenzene	UG/KG	34	0	0.00%	0	0	7,900.
1,3-Dichlorobenzene	UG/KG	34	0	0.00%	0	0	1,600.
1,4-Dichlorobenzene	UG/KG	34	0	0.00%	0	0	8,500.
2,2'-oxybis(1-Chloropropane)	UG/KG	8	0	0.00%	0	0	
2,4,5-Trichlorophenol	UG/KG	34	0	0.00%	0	0	100.
2,4,6-Trichlorophenol	UG/KG	34	0	0.00%	0	0	
2,4-Dichlorophenol	UG/KG	34	0	0.00%	0	0	400.
2,4-Dimethylphenol	UG/KG	34	0	0.00%	0	0	
2,4-Dinitrophenol	UG/KG	34	0	0.00%	0	0	200.
2,4-Dinitrotoluene	UG/KG	34	0	0.00%	0	0	
2,6-Dinitrotoluene	UG/KG	34	0	0.00%	0	0	1,000.
2-Chloronaphthalene	UG/KG	34	0	0.00%	0	0	
2-Chlorophenol	UG/KG	34	0	0.00%	0	0	800.
2-Methylnaphthalene	UG/KG	34	14	41.18%	31000	0	36,400.
2-Methylphenol	UG/KG	34	0	0.00%	0	0	100.
2-Nitroaniline	UG/KG	34	0	0.00%	0	0	430.
2-Nitrophenol	UG/KG	34	0	0.00%	0	0	330.
3,3'-Dichlorobenzidine	UG/KG	34	0	0.00%	0	0	
3-Nitroaniline	UG/KG	34	0	0.00%	0	0	500.
4,6-Dinitro-2-methylphenol	UG/KG	34	0	0.00%	0	0	

Table 2.7-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL DURING
SEAD-71 ESI and Phase I RI
Decision Document - SEADs-59 and 71
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COMPOUND	UNIT	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	FREQUENCY OF DETECTION	MAXIMUM VALUE	NUMBER ABOVE TAGM	TAGM
4-Bromophenyl phenyl ether	UG/KG	34	0	0.00%	0	0	
4-Chloro-3-methylphenol	UG/KG	34	0	0.00%	0	0	240.
4-Chloroaniline	UG/KG	34	0	0.00%	0	0	220.
4-Chlorophenyl phenyl ether	UG/KG	34	0	0.00%	0	0	
4-Methylphenol	UG/KG	34	0	0.00%	0	0	900.
4-Nitroaniline	UG/KG	34	0	0.00%	0	0	
4-Nitrophenol	UG/KG	34	0	0.00%	0	0	100.
Acenaphthene	UG/KG	34	24	70.59%	42000	0	50.000.
Acenaphthylene	UG/KG	34	5	14.71%	340	0	41.000.
Anthracene	UG/KG	34	27	79.41%	100000	3	50.000.
Benzo[a]anthracene	UG/KG	34	32	94.12%	150000	25	224
Benzo[a]pyrene	UG/KG	34	31	91.18%	120000	29	61.
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	88000	16	1.100.
Benzo[ghi]perylene	UG/KG	34	30	88.24%	62000	1	50,000
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	13	1.100.
Bis(2-Chloroethoxy)methane	UG/KG	34	0	0.00%	0	0	
Bis(2-Chloroethyl)ether	UG/KG	34	0	0.00%	0	0	
Bis(2-Chloroisopropyl)ether	UG/KG	34	0	0.00%	0	0	
Bis(2-Ethylhexyl)phthalate	UG/KG	34	3	8.82%	15	0	50.000.
Butylbenzylphthalate	UG/KG	34	0	0.00%	0	0	50.000.
Carbazole	UG/KG	34	28	82.35%	77000	0	
Chrysene	UG/KG	34	32	94.12%	150000	23	400.
Di-n-butylphthalate	UG/KG	34	2	5.88%	140	0	8.100.
Di-n-octylphthalate	UG/KG	34	0	0.00%	0	0	50,000.
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	27	14.
Dibenzofuran	UG/KG	34	22	64.71%	38000	5	6.200
Diethyl phthalate	UG/KG	34	0	0.00%	0	0	7.100.
Dimethylphthalate	UG/KG	34	0	0.00%	0	0	2.000
Fluoranthene	UG/KG	34	33	97.06%	440000	7	50.000.
Fluorene	UG/KG	34	25	73.53%	62000	1	50.000
Hexachlorobenzene	UG/KG	34	0	0.00%	0	0	410
Hexachlorobutadiene	UG/KG	34	0	0.00%	0	0	
Hexachlorocyclopentadiene	UG/KG	34	0	0.00%	0	0	
Hexachloroethane	UG/KG	34	0	0.00%	0	0	
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	9	3.200
Isophorone	UG/KG	34	0	0.00%	0	0	4.400.
N-Nitrosodiphenylamine	UG/KG	34	0	0.00%	0	0	
N-Nitrosodipropylamine	UG/KG	34	0	0.00%	0	0	
Naphthalene	UG/KG	34	15	44.12%	46000	2	13.000.
Nitrobenzene	UG/KG	34	0	0.00%	0	0	200.
Pentachlorophenol	UG/KG	34	0	0.00%	0	0	1.000.
Phenanthrene	UG/KG	34	32	94.12%	290000	6	50.000.
Phenol	UG/KG	34	1	2.94%	4.5	0	30.
Pyrene	UG/KG	34	33	97.06%	280000	7	50.000.
PESTICIDES/PCBS							
4,4'-DDD	UG/KG	34	11	32.35%	240	0	2.900.
4,4'-DDE	UG/KG	34	21	61.76%	810	0	2,100
4,4'-DDT	UG/KG	34	22	64.71%	1300	0	2.100.
Aldrin	UG/KG	34	0	0.00%	0	0	41
Alpha-BHC	UG/KG	34	8	23.53%	18	0	110.
Alpha-Chlordane	UG/KG	34	2	5.88%	74	0	
Aroclor-1016	UG/KG	34	0	0.00%	0	0	
Aroclor-1221	UG/KG	34	0	0.00%	0	0	
Aroclor-1232	UG/KG	34	0	0.00%	0	0	
Aroclor-1242	UG/KG	34	0	0.00%	0	0	
Aroclor-1248	UG/KG	34	0	0.00%	0	0	

Table 2.7-2
SUMMARY OF COMPOUNDS DETECTED IN SOIL DURING
SEAD-71 ESI and Phase I RI
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	FREQUENCY OF DETECTION	MAXIMUM VALUE	NUMBER ABOVE TAGM	TAGM
Aroclor-1254	UG/KG	34	0	0.00%	0	0	10,000.
Aroclor-1260	UG/KG	34	0	0.00%	0	0	10,000.
Beta-BHC	UG/KG	34	7	20.59%	32	0	200.
Delta-BHC	UG/KG	34	1	2.94%	1.8	0	300.
Dieldrin	UG/KG	34	3	8.82%	3.5	0	44.
Endosulfan I	UG/KG	34	11	32.35%	200	0	900.
Endosulfan II	UG/KG	34	6	17.65%	52	0	900.
Endosulfan sulfate	UG/KG	34	12	35.29%	110	0	1,000.
Endrin	UG/KG	34	11	32.35%	120	1	100.
Endrin aldehyde	UG/KG	34	19	55.88%	120	0	
Endrin ketone	UG/KG	34	18	52.94%	160	0	
Gamma-BHC/Lindane	UG/KG	34	1	2.94%	4	0	60.
Gamma-Chlordane	UG/KG	34	4	11.76%	22	0	540.
Heptachlor	UG/KG	34	1	2.94%	1.2	0	100.
Heptachlor epoxide	UG/KG	34	14	41.18%	180	4	20.
Methoxychlor	UG/KG	34	12	35.29%	520	0	
Toxaphene	UG/KG	34	0	0.00%	0	0	
METALS							
Aluminum	MG/KG	34	34	100.00%	18000	0	19,520.
Antimony	MG/KG	34	12	35.29%	19.3	1	6.
Arsenic	MG/KG	34	34	100.00%	14.6	4	8.9
Barium	MG/KG	34	34	100.00%	179	0	300.
Beryllium	MG/KG	34	33	97.06%	0.88	0	1.13
Cadmium	MG/KG	34	15	44.12%	12.1	4	2.46
Calcium	MG/KG	34	34	100.00%	295000	11	125,300.
Chromium	MG/KG	34	34	100.00%	80.3	4	30.
Cobalt	MG/KG	34	34	100.00%	14.6	0	30.
Copper	MG/KG	34	34	100.00%	134	12	33.
Cyanide	MG/KG	34	0	0.00%	0	0	.35
Iron	MG/KG	34	34	100.00%	65100	2	37,410.
Lead	MG/KG	34	34	100.00%	3470	22	24.4
Magnesium	MG/KG	34	34	100.00%	59300	6	21,700.
Manganese	MG/KG	34	34	100.00%	853	0	1,100.
Mercury	MG/KG	34	16	47.06%	2.7	4	.1
Nickel	MG/KG	34	34	100.00%	110	2	50.
Potassium	MG/KG	34	34	100.00%	2940	1	2,623.
Selenium	MG/KG	34	15	44.12%	1.8	0	2.
Silver	MG/KG	34	5	14.71%	0.69	0	.8
Sodium	MG/KG	34	30	88.24%	1040	19	188.
Thallium	MG/KG	34	1	2.94%	2.3	1	.855
Vanadium	MG/KG	34	34	100.00%	29.2	0	150.
Zinc	MG/KG	34	33	97.06%	3660	13	115.
		34	34	100.00%	0	0	
OTHER ANALYSES	MG/KG						
Total Petroleum Hydrocarbons	MG/KG	26	22	84.62%	9060		
Nitrate/Nitrite Nitrogen		26	26	100.00%	30.2		

metals were detected above their associated criteria in every surface soil sample collected during the Phase I RI. **Figure 2-19** presents the benzo[a]pyrene concentrations detected at SEAD-71. Benzo[a]pyrene was selected as the indicator chemical for PAHs.

<u>Groundwater Data</u>

Groundwater at the site has not been significantly impacted. Metals were the only constituents detected. Out of the 20 metals found, five (aluminum, iron, lead,
manganese, and thallium) were detected at concentrations above the lowest associated state or federal criteria (**Table B-2** in Appendix B).

3.0 RISK ASSESSMENT

The threat from a site can be quantified using risk assessment techniques. Risk assessments have been performed at several of the higher priority sites and have been a useful tool in evaluating site conditions. Since future land use scenarios have been described as part of the Base Realignment Plan these scenarios have been incorporated into the risk assessment. Risk assessments are appropriate for developing and supporting planning decisions regarding the disposition of the remaining sites that exist at the Seneca Army Depot Activity.

This section of the Decision Document presents the risk assessments that have been performed for SEADs-59 and 71. These risk assessments provide an understanding of the potential threats that these sites may pose. The results of these evaluations are used to support decisions regarding site disposition. A site that is above the EPA target risk level will be considered further, while a site that is below these criteria may be eliminated from further consideration.

The methods used to conduct the risk assessment are the same as those used in prior baseline risk assessments at several of the other sites. Biased sampling has been performed, and the data represent "worst case" conditions.

The objectives of the screening risk assessment are to:

- quantify the threat that a site may pose;
- help determine whether a remedial investigation is necessary;
- provide a basis for determining if a removal action will eliminate the threat;
- help support selection of the "No Action" remedial alternative, where appropriate.

To meet these objectives, the *Risk Assessment Guidance for Superfund* (RAGS) (USEPA, 1989a) was followed when possible and applicable. Technical judgment, consultation with USEPA staff, and recent publications were used in the development of the risk assessment.

The future land use of both SEAD-59 and 71 is Planned Industrial Development. The sites are shown in **Figure 1-2.**

3.1 METHODOLOGY AND ORGANIZATION OF DOCUMENT

The methodology employed for this risk assessment follows USEPA guidance. This section contains four major subsections, as follows:

1. Identification of Chemicals of Concern (**Section 3.2**)

This section provides site-related data along with background chemical data. Detailed summaries and statistical analyses of these data are provided in this section. All chemicals with validated detections in the applicable environmental media were evaluated in the risk assessment. The relevant exposure pathway risks were calculated for each detected chemical. Also included in the Data Evaluation section is an evaluation of site background data. Relevant background data are presented and, where appropriate, statistical analyses were performed to compare on-site chemical concentrations with background concentrations. Based on these analyses, chemicals whose presence at a site is attributable to background were not further evaluated in the screening risk assessments.

2. Exposure Assessment (**Section 3.3**)

This section includes derivation and presentation of the applicable exposure point concentrations (EPCs) used in the human health risk assessment. Exposure point concentrations for the baseline risk assessment are based on analytical data and modeling results. The EPCs provided are used for future onsite land-use scenarios, and correspond to the applicable exposure pathways for the risk assessment.

The future land-use scenarios for both sites are Planned Industrial Development. Associated with each land use scenario is a specific set of plausible receptors and exposure pathways. In all scenarios, the calculated risk values apply to a hypothetical reasonable maximum exposure (RME) and a central tendency (CT) exposure (more typical) for an individual working on or visiting the site. The risk values are dictated by the environmental sampling data used as exposure point concentrations for the applicable media.

The three primary exposure routes considered in these risk assessments are ingestion, inhalation, and dermal contact. Chemical intake values for future land use are calculated based on exposure pathways, specific exposure values, and assumptions. Equations used to calculate intakes for all applicable exposure pathways are presented in this section.

3. Toxicity Assessment (**Section 3.4**)

This section presents oral, inhalation, and dermal toxicity values used in the human health risk calculations. Appropriate data sources (i.e. IRIS, HEAST and EPA Risk Assessment Issue papers) are provided to support the toxicity values.

4. Risk Characterization (**Section 3.5**)

This section presents the risk calculations for all human health exposure pathways for the expected future land use. Non-carcinogenic and carcinogenic risk estimates are summarized for each receptor and exposure pathway.

3.2 IDENTIFICATION OF CHEMICALS OF CONCERN

Data collected were evaluated for suitability of use in the risk assessment as discussed in RAGS (EPA, 1989a). These decisions were based on analytical methods, quantitation limits, qualifiers, and blank contamination.

The data usability criteria for documentation, analytical methods, data validation, precision, accuracy, representativeness, comparability, and completeness are discussed in past reports which document the field investigations at SEADs-59 and 71. Such discussions may be found in the *SWMU Classification Report*, *ESI for Eight Moderately Low Priority Sites*, the *ESI for Seven Low Priority Sites*, and the *Phase I Remedial Investigation at SEAD-59 and SEAD-71*.

The data used in the screening risk assessments were collected during the four investigations documented in the reports cited above. Data collected for the SWMU Classification Report was collected during December 1993. Data for the ESI for Eight Moderately Low Priority Sites was collected between March - July, 1994. Data for the ESI for Seven Low Priority Sites was collected between June - July, 1994. Data for the Phase I Remedial Investigation was collected between September – November, 1997.

Table 3.2-1 summarizes the number of samples from each media collected at each of these areas of concern. Three separate sample counts are provided for soil samples: all soils, shallow soils from 0ft to 2ft, and shallow soils from 0ft to 0.5 ft. Shallow soil samples from 0ft to 2ft provide the basis for the evaluation of ecological risks in **Section 3.6**, while the shallow soil samples

Table 3.2-1
SUMMARY OF SAMPLES COLLECTED
Decision Document - Mini Risk Assessment
Seneca Army Depot Activity

Number of Samples Collected				
Site	**Total Soil**	**Surface Soil (0ft-2ft)**	**Surface Soil (0ft-0.5ft)**	**Groundwater**
SEAD-59	57	20	6	3
SEAD-71	34	24	21	2

from 0 to 0.5ft provide the basis for the risk evaluation of many of the human health receptors. The figures showing these sample locations are found in **Section 2**.

The following sections describe the processes by which the data were analyzed, examined, and reduced to arrive at a list of analytes, for each exposure pathway, that were quantified for use in the human health risk assessment.

3.2.1 Site-Specific Data Evaluation Considerations

NYSDEC CLP Statement of Work methods were used for the analysis of organic and inorganic constituents in soil and groundwater. Herbicides were analyzed using EPA Methods 8150. These methods provide data suitable for the risk assessment.

For inorganics, each site dataset was compared against the SEDA background dataset to determine if the site dataset is statistically different from the background dataset. This background comparison was performed for both soil and groundwater.

The analysis, recommended by USEPA Region 2, is as follows. For each inorganic constituent, the average concentration for the site was compared to 2 times the average background concentration. If the site average concentration for a constituent was less than 2 times the background average concentration, the constituent is considered to be present due to background conditions, and it was eliminated from further consideration in the risk assessment. Removing analytes from further consideration is consistent with RAGS (EPA 1989a).

Only inorganic constituents were compared to background. Anthropogenic organic constituents have not been considered. Organic compounds were eliminated from further consideration only if they were not detected at a particular site. This has produced a more conservative risk assessment since all organic constituents have been assumed to be present due to previous site activities. Background data sets and the locations from which the data were collected are provided in **Appendix C**.

Three inorganic analytes were found to occur in the soil at SEAD-59 at concentrations that tend to be above background soil measurements. They are antimony, mercury, and sodium. Five inorganic analytes were found in SEAD-71 soil at concentrations that tend to be above background soil measurements. They are lead, mercury, selenium, sodium, and zinc. These inorganic constituents in soil were retained for further analysis in the individual risk assessments, as appropriate.

Sodium was the only inorganic analyte that was found to occur in the groundwater at SEAD-59 at higher concentrations than background groundwater concentrations. The following 11 compounds were found in SEAD-71 groundwater at concentrations greater than those detected in background groundwater: aluminum, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, vanadium, and zinc. These inorganic constituents in groundwater were retained for further analysis in the risk assessments performed for each affected site.

3.2.2 Data Quantification for Use in the Risk Assessment

After eliminating inorganic analytes present at background levels from the risk assessment, exposure point concentrations (EPCs) were calculated for each of the remaining detected analytes in each media at the two sites. EPCs for both the reasonable maximum exposure (RME and central tendency (CT) risk calculations are equal to the 95 percent upper confidence limit (UCL) of the arithmetic mean of the concentration (EPA, May 1992). Background samples were excluded from the calculation of EPCs.

The analytical results of each pair of samples and duplicate samples were averaged to produce single sets of results used to calculate EPCs for each detected analyte. The following logic was used to average the results of samples and their duplicate samples:

- If an analyte was detected in both the sample and duplicate sample, then the detected values were averaged.
- If an analyte was not detected in either the sample or duplicate sample, then the sample quantitation limits were averaged.
- If an analyte was detected in only one sample of a sample-duplicate pair and the SQL of the other sample was less than four times the detected value, then the analyte was considered present at a level equal to the average of the detected value and one-half of the SQL.
- If an analyte was detected in only one sample of a sample-duplicate pair and the SQL of the other sample was greater than or equal to four times the detected value, then the analyte was considered present at the detected level.

The EPC, or 95% UCL of the mean concentration, was calculated for each analyte using the following algorithm:

1. A list of concentrations was tabulated for each detected analyte using one-half of the SQL for all negative results.
2. Each analyte distribution was tested for normality by either the Shapiro-Wilk Test for less than or equal to 50 samples, or the D'Agostino Test for more than 50 samples (Gilbert, 1987, pp. 158-162). A normal distribution was assumed if the distribution passed the test at the 0.05 significance level, otherwise the distribution was assumed to be lognormal. (WHICH?)
3. The 95 percent UCL of the mean was calculated using the t-statistic for normal distributions for the H-statistic for lognormal distributions (see Gilbert, 1987). If the 95 percent UCL of the mean exceeded the maximum detected concentration, then the following steps were executed.
4. The set of results was tested for unusually high SQLs. An unusually high SQL was assumed to exceed 1.5 times the average SQL.
5. If an unusually high SQL was present and the 95 percent UCL of the mean exceeded the maximum detected concentration, then the sample with the highest SQL was excluded from the data set and the statistics were re-calculated (1 through 4 above).
6. Analytical results with unusually high SQLs were removed one-by-one until either (a) the 95 percent UCL of the mean no longer exceeded the maximum detected concentration or (b) no more unusually high SQLs were present.
7. In cases where the final 95 percent UCL exceeded the maximum detected concentration. the maximum detected concentration was selected as the EPC. In these cases, the maximum detected concentration is believed to be a better conservative (upper bound) estimate of the mean than the established 95% UCL for various reasons, including small sample populations, small number of detected values, poor knowledge of the underlying statistical distribution based on available data. and variable SQLs.

Tables located in Appendices A and B list the chemicals of potential concern for the baseline human health and ecological risk assessments in all soils, surface soils (0 to 6 inches and 0 to 2 feet), and groundwater of SEADs-59 and 71. For each analyte detected in each sample medium, this table presents the number of analyses performed, the number of times detected, the frequency of detection, the mean and standard deviation of the sampled concentrations, the maximum detected concentrations, the result of the test for normality, the 95 percent UCL of the mean of the sampled concentration (RME and CT concentrations), and the value chosen as the EPC.

Tables 3.2-2 and **3.2-3** provide a summary of all the chemicals quantified in the human health risk assessments. These tables lists the anlalytes found in each sampled medium, less the inorganic analytes found at background levels.

3.3 EXPOSURE ASSESSMENT

3.3.1 Overview and Characterization of Exposure Setting

The objective of the exposure assessment was to estimate the type and magnitude of exposures to the Chemicals of Potential Concern (COPC) that are present at, or migrating from, the site. This component of the risk assessment can be performed either qualitatively or quantitatively. Quantitative assessment is preferred when toxicity factors necessary to characterize a compound of concern are available.

The exposure assessment consists of three steps (EPA, 1989a):

1) **Characterize Exposure Setting:** In this step, information on the physical characteristics of the site that may influence exposure is considered. The physical setting involves climate, vegetation, soil characteristics, surface and groundwater hydrology. All potentially exposed populations and sub-populations therein (receptors) are assessed relative to their potential for exposure. Additionally, locations relative to the site along with the current and potential future land use of the site are considered. This step is a qualitative one aimed at providing a general site perspective and offering insight on the surrounding population.

2) **Identify Exposure Pathways:** All exposure pathways, ways in which receptors can be exposed to contaminants that originate from the source, are reviewed in this step. Chemical sources and mechanisms for release along with subsequent fate and transport are investigated. Exposure points of human contact and exposure routes are discussed before quantifying the exposure pathways in step 3.

3) **Quantify Exposure**: In this final step, the exposure levels (COPC intakes or doses) are calculated for each exposure pathway and receptor. These calculations typically follow EPA guidance for assumptions of intake variables or exposure factors for each exposure pathway and EPA-recommended calculation methods.

TABLE 3.2-2
CHEMICALS OF POTENTIAL CONCERN AT SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Compound	Total Soil	Surface Soil (0ft-2ft)	Surface Soil (0ft-0.5ft)	Groundwater
Volatile Organic Compounds				
Acetone	X			
Benzene	X			
Carbon disulfide	X			
Ethyl benzene	X			
Methyl chloride	X			
Methyl ethyl ketone	X		X	
Methylene chloride	X			
Toluene	X			
Total BTEX				
Total Xylenes	X			
Trichloroethene	X			
Semivolatile Organic Compounds				
1,2,4-Trichlorobenzene	X			
2-Methylnaphthalene	X	X	X	
4-Methylphenol	X			
Acenaphthene	X	X	X	
Acenaphthylene	X	X	X	
Anthracene	X	X	X	
Benzo(a)anthracene	X	X	X	
Benzo(a)pyrene	X	X	X	
Benzo(b)fluoranthene	X	X	X	
Benzo(ghi)perylene	X	X	X	
Benzo(k)fluoranthene	X	X	X	
Bis(2-Ethylhexyl)phthalate	X	X	X	
Butylbenzylphthalate	X	X		
Carbazole	X	X	X	
Chrysene	X	X	X	
Di-n-butylphthalate	X	X	X	
Di-n-octylphthalate	X	X		
Dibenz(a,h)anthracene	X	X	X	
Dibenzofuran	X	X	X	
Diethyl phthalate	X	X		
Fluoranthene	X	X	X	
Fluorene	X	X	X	
Indeno(1,2,3-cd)pyrene	X	X	X	
Naphthalene	X	X	X	
Phenanthrene	X	X	X	
Phenol	X			X
Pyrene	X	X	X	
Total Unknown PAHs as SV		X		
Pesticides/PCB				
4,4'-DDD	X	X	X	
4,4'-DDE	X	X	X	
4,4'-DDT	X	X	X	
Aldrin	X	X	X	
Alpha-BHC	X	X		
Alpha-Chlordane	X	X	X	
Aroclor-1254	X			
Beta-BHC	X	X		
Delta-BHC	X	X		
Dieldrin	X	X		
Endosulfan I	X	X	X	
Endosulfan II	X	X	X	
Endosulfan sulfate	X	X		
Endrin	X	X	X	
Endrin aldehyde	X	X	X	
Endrin ketone	X	X		
Gamma-Chlordane	X	X	X	
Heptachlor epoxide	X	X		
Methoxychlor	X			
Metals				
Antimony	X	X	X	
Mercury	X	X	X	
Sodium	X	X	X	X

Note

Surface soil from 0ft-0.5ft considered in human health risk assessment

Surface Soil from 0ft-2ft considered in ecological risk assessment

TABLE 3.2-3
CHEMICALS OF POTENTIAL CONCERN AT SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Compound	Total Soil	Surface Soil (0ft-2ft)	Surface Soil (0ft-0.5ft)	Groundwater
Volatile Organic Compounds				
1,1,1-Trichloroethane	X			
Acetone	X	X	X	
Benzene	X	X	X	
Ethyl benzene	X	X	X	
Methylene chloride	X	X	X	
Styrene	X	X	X	
Tetrachloroethene	X	X	X	
Toluene	X	X	X	
Total BTEX	X			
Total Xylenes	X	X	X	
Semivolatile Organic Compounds				
2-Methylnaphthalene	X	X	X	
Acenaphthene	X	X	X	
Acenaphthylene	X	X	X	
Anthracene	X	X	X	
Benzo(a)anthracene	X	X	X	
Benzo(a)pyrene	X	X	X	
Benzo(b)fluoranthene	X	X	X	
Benzo(ghi)perylene	X	X	X	
Benzo(k)fluoranthene	X	X	X	
Bis(2-Ethylhexyl)phthalate	X			
Carbazole	X	X	X	
Chrysene	X	X	X	
Di-n-butylphthalate	X	X	X	
Dibenz(a,h)anthracene	X	X	X	
Dibenzofuran	X	X	X	
Fluoranthene	X	X	X	
Fluorene	X	X	X	
Indeno(1,2,3-cd)pyrene	X	X	X	
Naphthalene	X	X	X	
Phenanthrene	X	X	X	
Phenol	X			
Pyrene	X	X	X	
Pesticides				
4,4'-DDD	X	X	X	
4,4'-DDE	X	X	X	
4,4'-DDT	X	X	X	
Alpha-BHC	X	X	X	
Alpha-Chlordane	X	X		
Beta-BHC	X	X	X	
Delta-BHC	X			
Dieldrin	X	X	X	
Endosulfan I	X	X	X	
Endosulfan II	X	X	X	
Endosulfan sulfate	X	X	X	
Endrin	X	X	X	
Endrin aldehyde	X	X	X	
Endrin ketone	X	X	X	
Gamma-BHC/Lindane	X			
Gamma-Chlordane	X	X	X	
Heptachlor	X			
Heptachlor epoxide	X	X	X	
Methoxychlor	X	X	X	
Metals				
Aluminum				X
Beryllium				X
Chromium				X
Cobalt				X
Copper				X
Iron				X
Lead	X	X	X	X
Manganese				X
Mercury	X	X	X	
Nickel				X
Selenium	X	X	X	
Sodium	X	X	X	
Vanadium				X
Zinc	X	X	X	X

Note:
Surface soil from 0ft-0.5ft considered in human health risk assessment
Surface Soil from 0ft-2ft considered in ecological risk assessment

Figure 3-1 illustrates the exposure assessment process.

3.3.2 Physical Setting and Characteristics

The physical setting and characteristics of the site are described in **Section 2** of this document.

3.3.3 Land Use and Potentially Exposed Populations

3.3.3.1 Current Land Use

The sites under consideration are abandoned and are no longer in use. There are no drinking water supply wells at either area. These sites have no actual site workers and are occasionally patrolled by site security personnel.

3.3.3.2 Potential Future Land Use

EPA guidance recommends that, if available, master plans, which include future land uses, Bureau of Census projections and established land use trends in the general area should be utilized to establish future land use trends.

In July 1995, the Base Realignment and Closure Act (BRAC) Commission voted to recommend closure of SEDA. Congress approved the recommendation, which became public law on October 1, 1995. According to BRAC regulations, future uses of the site will be determined by the Army.

In accordance with BRAC regulations, the Army will notify all appropriate regulatory agencies and will perform any additional investigations and remedial actions to assure that any changes in the intended use of the sites is protective of human health and the environment in accordance with CERCLA. Also, Army regulations (Regulation 200-1, paragraph 12-5, Real Property Transactions), require that the Army perform an Environmental Baseline Study (EBS) prior to a transfer of Army property. The EBS is an inventory and a comprehensive evaluation of the existing environmental conditions and consists of scope definition, survey, sampling, investigative and risk assessment.

As part of the 1995 BRAC process, a Land Redevelopment Authority (LRA) comprised of representatives of the local public was established. This group commissioned a study to recommend future uses of the Seneca Army Depot. The Land Reuse Plan produced by the LRA designated various uses for different parcels of SEDA. This Land Reuse Plan is the basis of future land use assumptions for the sites included in this risk assessment. **Figure 1-2** shows the intended future land use of each parcel of SEDA, and shows the location of SEADs-59 and 71 Planned Industrial Development parcel.

NYSDEC has established a goal for site remediation to "restore the site to pre-disposal conditions, to the extent feasible and authorized by law." [6 NYCRR 375-1.10]. The risk assessment includes a residential receptor scenario, as a basis for considering the site conditions in terms of this regulatory "pre-disposal" goal.

3.3.3.3 Potentially Exposed Populations

Potentially exposed populations that are relevant to the future land use are evaluated in this risk assessment. Although current exposure is infrequent and limited, it is also considered in this risk assessment.

The potentially exposed populations for the Planned Industrial Development land use are as follows:

Current Site Worker
Future Industrial Worker
Future Construction Worker
Future Trespasser (Child)
Future Worker at On-Site Day Care Center
Future Child at On-Site Day Care Center
Future Residents (for pre-disposal goal evaluation)

3.3.4 Identification of Exposure Pathways

Exposures are estimated only for plausible completed exposure pathways. A completed exposure pathway has the following four elements:

- a source and mechanism for chemical release,
- an environmental transport medium,
- an exposure point, and
- a human receptor and a feasible route of exposure at the exposure point.

A pathway cannot be completed unless each of these elements is present. **Figure 3-2** illustrates the completed exposure pathways for the Planned Industrial Use scenario.

3.3.4.1 Sources and Receiving Media

The contaminant source areas for each site are summarized below:

SEAD-59

The suspected potential sources are the construction debris and drums comprising the fill area and the debris and paint cans found elsewhere on the site. The primary release mechanisms from the site are surface water runoff collected in the drainage swale located in the western portion of the site, the northern portion of the site, and by the drainage ditch which parallels the south side of the access road. The infiltration of precipitation through the source areas is also a primary release mechanism from the site. If infiltration of precipitation occurs then groundwater would be a secondary source. Soil, surface water, and sediment are also secondary sources.

SEAD-71

The suspected potential sources are waste materials that were disposed of onsite. The primary release mechanisms from the site are surface water runoff, which makes its way onto the sites to the southwest and infiltration of precipitation through the potential source areas. If infiltration of precipitation occurs then groundwater would be a secondary source. Soil, surface water and sediment are also secondary sources.

3.3.4.2 Fate and Transport

The environmental fate associated with the general classes of COPCs found at SEADs-59 and 71 site is discussed briefly below.

3.3.4.2.1 Volatile Organic Compounds

Volatile organic compounds were detected infrequently in soil at SEADs-59 and 71. Of the few samples that did contain BTEX compounds (benzene, toluene, ethylbenzene, xylenes), some were detected at SEAD-59 at levels exceeding state criteria. No VOCs were detected in groundwater at either site. Because of this low prevalence and concentrations, direct volatilization of VOCs was not considered significant in this assessment.

3.3.4.2.2 Semi-Volatile Organic Compounds

The principal semi-volatile compounds found in soil SEADs-59 and 71 are polynuclear aromatic hydrocarbons (PAHs). Generally, these constituents are relatively persistent and immobile in the environment. Pesticides were also found in soil both sites and one PCB compound was detected in SEAD-59 soils. The only semivolatile compound detected in the groundwater at the two sites was phenol at SEAD-59.

3.3.4.2.3 Metals

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 pollutant migration and was not considered. However, leaching and sorption are considered potential mechanisms for transport. Leaching of metals from soil is controlled by numerous factors. Most importantly is its chemical form (base metal or cation) in the soil. The leaching of metals from soils is substantial if the metal exists as a soluble salt. Upon contact with surface water or precipitation, the metals, either as metal oxides or metal salts, can be solubilized, eventually leaching to the groundwater. Multiple metals were found in groundwater at SEAD-71. Only one metal was found in SEAD-59 groundwater.

3.3.4.3 Summary of Exposure Pathways to be Quantified

The pathways presented reflect the projected future onsite use of SEADs-59 and 71. This section presents the rationale for including these exposure pathways in this risk assessment.

Inhalation of Particulate Matter in Ambient Air

Surface soil particles may become airborne via wind erosion, which in turn may be inhaled by individuals at the site. Construction workers may also be exposed to subsurface soil particles. Therefore, inhalation exposure to soil particulates in ambient air was assessed for all receptors except the industrial site worker, who is expected to spend the majority of the day indoors.

Incidental Ingestion and Dermal Contact to On-Site Surface Soils

During the course of daily activities, current site workers, day care workers, residents, and visiting children (trespassing or attending day care) could come into contact with site surface soils and involuntarily ingest and/or have their skin exposed to them. Therefore, exposure via dermal contact and soil ingestion was assessed for all the receptors mentioned above.

Incidental Ingestion and Dermal Contact to On-Site Surface and Subsurface Soils

The laboratory analyses of all surface and subsurface soils show the presence of VOCs, semi-volatile organics, pesticides, and metals. During the course of daily activities, an on-site construction worker will come into contact with these surface and subsurface soils during intrusive activities and may involuntarily ingest and have his/her skin exposed to them. Therefore, exposure via both dermal contact and soil ingestion was assessed for the future construction worker.

Ingestion of Groundwater

There is no current use of groundwater as a potable water source at the Depot. The future plan for all areas of SEDA is to obtain potable water from the existing water supply line. Potable water is supplied to the Depot from a water supply line that passes through the Town of Varick. Varick's water is obtained from the water treatment plant at the Town of Waterloo. The source of this water is Lake Seneca. It is unlikely that a groundwater well would be installed for future drinking water use since a potable water pipeline exists. The shallow groundwater aquifer at the site is inadequate for both yield and quality. Nonetheless, since this use is not prevented via an institutional control such as a deed restriction, it was assumed that wells would be installed on-site for potable water at any site where COPCs were detected at levels exceeding background concentrations. Therefore, this is considered a complete pathway for receptors at the areas of concern.

Inhalation and Dermal Contact with Groundwater while Showering

Residents may be exposed to groundwater while taking daily showers. These receptors may be exposed to all chemicals contained in groundwater during showering by dermal contact and volatile chemicals that partition into the air via inhalation. Therefore, this is considered a complete pathway and data from the on-site wells are used to calculate exposure concentrations.

3.3.5 Quantification of Exposure

In this section, each receptor's potential exposures to chemicals of potential concern (COPCs) is quantified for each of the exposure pathways described above. In each case, the exposures are calculated following methods recommended in EPA guidance documents, such as the Risk Assessment Guidance for Superfund (EPA 1989). These calculations generally involve two steps. First, representative chemical concentrations in the environment, or exposure point concentrations (EPCs), are determined for each pathway and receptor. From these EPC values, the amount of chemical that an exposed person may take into his/her body is then calculated. This value is referred to as either the Human Intake or the Absorbed Dose, depending on the exposure route.

This section describes the exposure scenarios, exposure assumptions and exposure calculation methods used in this risk assessment. All calculations are shown in the tables included in **Appendices A** and **B**.

Risk assessment as a whole, and the exposure assessment step in particular, are designed to be health protective. The exposure calculations require estimates and assumptions about certain human exposure parameters, such as inhalation rates, ingestion rates, etc. Generally, values are selected which tend to overestimate exposure. USEPA (1993) recommends two types of exposure estimates be used for Superfund risk assessments: a reasonable maximum exposure (RME) and central tendency exposure (CT). The RME is defined as the highest exposure that could reasonably be expected to occur for a given exposure pathway at a site, and is intended to account for both uncertainty in the contaminant concentration and variability in the exposure parameters (such as exposure frequency or averaging time). The CT also may be evaluated for comparison purposes and is generally based on mean exposure parameters. Both scenarios have been evaluated in this risk assessment.

Superfund risk assessments consider chronic exposures unless specific conditions warrant a short-term or an acute assessment. In this evaluation, long-term exposure to relatively low chemical concentrations is the greatest concern. Short-term (i.e., subchronic) and acute exposures were evaluated only for the construction worker and day care child who have exposure durations of 1 and 6 years, respectively.

Exposure-point concentrations (EPCs) were estimated for all pathways selected for quantitative evaluation. These concentrations are based on the 95% UCL of the mean (for soil and groundwater) or on calculated estimates (for ambient air). Steady-state conditions were assumed. Therefore, current and future chemical concentrations were assumed identical. This assumption may tend to overestimate long-term exposure concentrations because chemical concentrations are likely to decrease over time from natural processes such as dispersion, attenuation, degradation and dilution.

Estimates of pathway-specific human intakes or absorbed doses for each chemical involve assumptions about patterns of human exposure to contaminated media. These assumptions are integrated with exposure-point concentrations to calculate intakes. Intakes or doses are normally expressed as the amount of chemical at the environment-human receptor exchange boundary in milligrams per kilogram of body weight per day (mg/kg-day), which represents an exposure normalized for body weight over time. The total exposure is divided by the period of interest to obtain an average exposure. The averaging time is a function of the toxic endpoint: for non-carcinogenic effects, it is the exposure time (specific to the scenario being assessed) and for carcinogenic effects, it is lifetime (70 years).

3.3.5.1 Exposure Assumptions

An important aspect of exposure assessment is the determination of assumptions regarding how receptors may be exposed to contaminants. An extensive listing of exposure factors are provided in USEPA guidance, and these were followed throughout this assessment. Standard scenarios and EPA-recommended default assumptions were used where appropriate.

The exposure scenarios in this assessment involve the following receptors, based on the future use of Planned Industrial Development:

- current site worker
- future industrial worker
- future construction worker
- future trespasser (child)
- future worker at on-site day care center
- future child at on-site day care center
- future residents (for pre-disposal goal evaluation)

The exposure assumptions for these scenarios are intended to approximate the frequency, duration, and manner in which receptors are exposed to environmental media. For example, the worker scenarios are intended to approximate the exposure potential of individuals employed at the site.

Details of the exposure assumptions and parameters for each exposure scenario are shown in **Table 3.3-1**.

The primary sources for the RME and CT exposure factors are as follows:

- USEPA, 1988: Superfund Exposure Assessment Manual
- USEPA, 1989a: Risk Assessment Guidance for Superfund, Volume I (RAGS)
- USEPA, 1991a: Supplemental Guidance, Standard Default Exposure Factors
- USEPA, 1992: Dermal Exposure Assessment, Principles and Applications
- USEPA, 1993a: Superfund's Standard Default Exposure for the Central Tendency and Reasonable Maximum Exposure
- USEPA, 1997: Exposure Factors Handbook

In the following sections, the methods used to calculate exposures by each pathway are explained. Tables that show the human intake or absorbed dose values calculated for each exposure scenario at each site are contained in **Appendices A and B**. These intakes and doses are used to assess overall carcinogenic and non-carcinogenic risk, as discussed later in the risk characterization section (**Section 3.5**).

3.3.5.2 Exposure Scenarios

The various receptors evaluated in this assessment, and their respective exposure scenarios are described below.

Construction Worker. Future construction workers are assumed to spend one year working at the site, which is a typical duration for a significant construction project. These workers spend each working day at the site. During this time, this worker inhales the ambient air at the sites and may ingest or dermally contact the soil there. Since the construction worker may be digging onsite, the soil ingestion or dermal contact with both surface and subsurface soils was assumed.

Industrial and Day Care Worker. The future workers at the industrial development and day care center spend each working day at the site (5 days/week for 50 weeks, RME). This exposure

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
CURRENT SITE WORKER	**Inhalation of Dust in Ambient Air**	RME & CT	Inhalation Rate	9.6	m3/day	Average inhalation rate for moderate activity is 1.2 m3/hr, 8 hr work day	USEPA, 1996
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Air EPC Calculated from Surface Soil Only)	RME	Exposure Frequency	20	days/yr	Assumed	BPJ
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Exposure Frequency	10	days/yr	Assumed	BPJ
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Ingestion of Soil	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	100	mg soil/day	Upper bound worker exposure to dirt and dust	USEPA, 1993
			Exposure Frequency	20	days/yr	Assumed	BPJ
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Ingestion Rate	50	mg soil/day	Average worker exposure to dirt and dust	USEPA, 1993
			Exposure Frequency	10	days/yr	Assumed	BPJ
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Dermal Contact - Soil	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Absorption Factor	Compound Specific			USEPA, 1992
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	5800	cm2	Hands, legs, arms, neck and head exposed, 25% of upper bound body skin area of adul	USEPA, 1992
			Soil to Skin Adherence Fac	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	20	days/yr	Assumed	BPJ
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Skin Contact Surface Area	5000	cm2	Hands, legs, arms, neck and head exposed, 25% of average body skin area of adult	USEPA, 1992
			Soil to Skin Adherence Fac	0.2	mg/cm2	Average soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	10	days/yr	Assumed	BPJ
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
FUTURE INDUSTRIAL WORKER	Ingestion of Groundwater	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Ingestion Rate	2	liters/day		USEPA, 1993
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
FUTURE CONSTRUCTION WORKER	Inhalation of Dust in Ambient Air	RME & CT	Inhalation Rate	10.4	m3/day	Average inhalation rate for outdoor worker is 1.3 m3/hr, 8 hr work day	USEPA, 1996
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Exposure Duration	1	year	Upper bound time of employment for constr. worker	USEPA, 1991
	(Air EPC Calculated		Averaging Time - Nc	365	days	1 year	USEPA, 1989
	from Surface and		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	Subsurface Soils)	RME	Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
		CT	Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993
	Ingestion of Soil	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
	(Soil EPC Calculated		Exposure Duration	1	year	Upper bound time of employment for constr. worker	USEPA, 1991
	from Surface and		Averaging Time - Nc	365	days	1 year	USEPA, 1989
	Subsurface Soils)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	480	mg soil/day	Assumed IR for intensive construction work	USEPA, 1991, 1993
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
		CT	Ingestion Rate	100	mg soil/day	Assumed average IR for construction work	USEPA, 1993
			Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993
	Dermal Contact - Soil	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Absorption Factor	Compound Specific			USEPA, 1992
	(Soil EPC Calculated		Exposure Duration	1	year	Upper bound time of employment for constr. worker	USEPA, 1991
	from Surface and		Averaging Time - Nc	365	days	1 year	USEPA, 1989
	Subsurface Soils)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	5800	cm2	Hands, legs, arms, neck and head exposed, 25% of upper bound body skin area of adul	USEPA, 1992
			Soil to Skin Adherence Fac	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
		CT	Skin Contact Surface Area	5000	cm2	Hands, legs, arms, neck and head exposed, 25% of average body skin area of adult	USEPA, 1992
			Soil to Skin Adherence Fac	0.2	mg/cm2	Average soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
FUTURE TRESSPASSER CHILD	**Inhalation of Dust in Ambient Air** (Air EPC Calculated from Surface Soil Only)	RME & CT	Inhalation Rate	1.2	m3/day	Average inhalation rate for moderate activity is 1.2 m3/hr, exposure time of 1 hr/day	USEPA, 1996
			Body Weight	50	kg	mean weight for 13 year old	USEPA, 1996
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Exposure Frequency	50	days/yr	2 days/wk, 25 wk/yr	BPJ
			Exposure Duration	5	years	Assumed	BPJ
			Averaging Time - Nc	1825	days	5 years	USEPA, 1989
		CT	Exposure Frequency	25	days/yr	1 day/wk, 25 wk/yr	BPJ
			Exposure Duration	1	year	Assumed	BPJ
			Averaging Time - Nc	365	days	1 year	USEPA, 1989
	Ingestion of Soil (Soil EPC Calculated from Surface Soil Only)	RME & CT	Body Weight	50	kg	mean weight for 13 year old	USEPA, 1996
			Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	200	mg soil/day	Maximum IR for a child	USEPA, 1993
			Exposure Frequency	50	days/yr	2 days/wk, 25 wk/yr	BPJ
			Exposure Duration	5	years	Assumed	BPJ
			Averaging Time - Nc	1825	days	5 years	USEPA, 1989
		CT	Ingestion Rate	100	mg soil/day	Average IR for a child	USEPA, 1993
			Exposure Frequency	25	days/yr	1 day/wk, 25 wk/yr	BPJ
			Exposure Duration	1	year	Assumed	BPJ
			Averaging Time - Nc	365	days	1 year	USEPA, 1989
	Dermal Contact - Soil (Soil EPC Calculated from Surface Soil Only)	RME & CT	Body Weight	50	kg	mean weight for 13 year old	USEPA, 1996
			Absorption Factor	Compound Specific			USEPA, 1992
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	4625	cm2	Hands, legs, arms, neck and head exposed; 25% of upper bound body skin area of a 12	USEPA, 1992
			Soil to Skin Adherence Fac	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	50	days/yr	2 days/wk, 25 wk/yr	BPJ
			Exposure Duration	5	years	Assumed	BPJ
			Averaging Time - Nc	1825	days	5 years	USEPA, 1989
		CT	Skin Contact Surface Area	3725	cm2	Hands, legs, arms, neck and head exposed; 25% of average body skin area of a 12-15 y	USEPA, 1992
			Soil to Skin Adherence Fac	0.2	mg/cm2	Average soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	25	days/yr	1 day/wk, 25 wk/yr	BPJ
			Exposure Duration	1	year	Assumed	BPJ
			Averaging Time - Nc	365	days	1 year	USEPA, 1989

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
FUTURE DAY CARE CENTER CHILD	**Inhalation of Dust in Ambient Air**		Inhalation Rate	4	m3/day	Average non-sleeping inhalation rate for 3-5 year olds is 0.4 m3/hr, exposure time 10 h	USEPA, 1996
		RME & CT	Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Air EPC Calculated from Surface Soil Only)		Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
		RME	Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
			Exposure Frequency	219	days/yr	Average for occupational workers	USEPA, 1993
		CT	Exposure Duration	3	years		BPJ
			Averaging Time - Nc	1095	days		BPJ
	Ingestion of Soil		Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
		RME & CT	Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Ingestion Rate	200	mg soil/day	Maximum IR for a child	USEPA, 1993
		RME	Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
			Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
			Ingestion Rate	100	mg soil/day	Average IR for a child	USEPA, 1993
		CT	Exposure Frequency	219	days/yr	Average for occupational workers	USEPA, 1993
			Exposure Duration	3	years		BPJ
			Averaging Time - Nc	1095	days		BPJ
	Dermal Contact - Soil		Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
		RME & CT	Absorption Factor	Compound Specific			
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Skin Contact Surface Area	2190	cm2	Hands, legs, arms, neck and head exposed; 25% of upper bound body skin area of a 3-	USEPA, 1992
			Soil to Skin Adherence Fac	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
		RME	Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
			Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
			Skin Contact Surface Area	1820	cm2	Hands, legs, arms, neck and head exposed; 25% of average body skin area of a 3-6 yea	USEPA, 1992
			Soil to Skin Adherence Fac	0.2	mg/cm2	Average soil to skin adherence factor	USEPA, 1992
		CT	Exposure Frequency	219	days/yr	Average occupational workers	USEPA, 1993
			Exposure Duration	3	years		BPJ
			Averaging Time - Nc	1095	days		BPJ
	Ingestion of Groundwater		Body Weight	15	kg	mean weight for 0-6 year olds	USEPA, 1993
		RME & CT	Ingestion Rate	1	liters/day		USEPA, 1996
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
			Exposure Frequency	250	days/yr	Assumes attends 5 days/wk and 10 days vacation	USEPA, 1991
		RME	Exposure Duration	6	years	Assumes attends from 0-6 years old	BPJ
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
			Exposure Frequency	219	days/yr	Average occupational workers	USEPA, 1993
		CT	Exposure Duration	3	years		BPJ
			Averaging Time - Nc	1095	days		BPJ

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
FUTURE DAY CARE CENTER WORKER	**Inhalation of Dust in Ambient Air**	RME & CT	Inhalation Rate	8	m3/day	Average inhalation rate for light activity is 1 m3/hr, 8 hr work day	USEPA, 1996
			Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
	(Air EPC Calculated from Surface Soil Only)	RME	Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Ingestion of Soil	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	100	mg soil/day	Upper bound worker exposure to dirt and dust	USEPA, 1993
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Ingestion Rate	50	mg soil/day	Average worker exposure to dirt and dust	USEPA, 1993
			Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Dermal Contact - Soil	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Absorption Factor	Compound Specific			USEPA, 1992
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	5800	cm2	Hands, legs, arms, neck and head exposed, 25% of upper bound body skin area of adul	USEPA, 1992
			Soil to Skin Adherence Fac	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Skin Contact Surface Area	5000	cm2	Hands, legs, arms, neck and head exposed, 25% of average body skin area of adult	USEPA, 1992
			Soil to Skin Adherence Fac	0.2	mg/cm2	Average soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Ingestion of Groundwater	RME & CT	Body Weight	70	kg	Standard reference weight for adult males	USEPA, 1991
			Ingestion Rate	2	liters/day		USEPA, 1992
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Exposure Frequency	250	days/yr	Assumes works 5 days/wk and 10 days/yr vacation	USEPA, 1991
			Exposure Duration	25	years	Upper bound time for employment at a job	USEPA, 1991, 1993
			Averaging Time - Nc	9125	days	25 years	USEPA, 1989
		CT	Exposure Frequency	219	days/yr	Mean for adult workers	USEPA, 1993
			Exposure Duration	7	years	Mean time for employment at a job	USEPA, 1996
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989

RME = Resonable Maximum Exposure
CT = Central Tendency
Car = Carcinogenic
Nc = Non-carcinogenic

Source References:
USEPA, 1988: Superfund Exposure Assessment Manual
USEPA, 1989: Risk Assessment Guidance for Superfund, Volume I (RAGS)
USEPA, 1991: Supplemental Guidance, Standard Default Exposure Factors
USEPA, 1992: Dermal Exposure Assessment, Principles and Applications
USEPA, 1993: Superfund's Standard Default Exposure for the Central Tendency and Reasonable Maximum Exposure
USEPA, 1996: Exposure Factors Handbook, Draft update to 1990 handbook

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
RESIDENT (ADULT)	**Inhalation of Dust in Ambient Air**	RME & CT	Inhalation Rate	20	m3/day	Assumed inhalation rate for adult receptors.	USEPA, 1991, 1993
	(Air EPC Calculated from Surface Soil Only)		Body Weight	70	kg	Standard reference wieght for adult males.	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	24	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult	USEPA, 1991,1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
		CT	Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	7	year	Average length of residence in same home: 9 years (7 adult, 2 child assu	USEPA, 1993, 1997
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Ingestion of Soil	RME & CT	Body Weight	70	kg	Standard reference wieght for adult males.	USEPA, 1991
			Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	100	mg soil/da	Upper bound residential adult exposure to indoor and outdoor dirt and d	USEPA, 1991
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	24	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult	USEPA, 1991,1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
		CT	Ingestion Rate	50	mg soil/da	Average residential adult exposure to indoor and outdoor dirt and dust.	USEPA, 1993
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	7	year	Average length of residence in same home: 9 years (7 adult, 2 child assu	USEPA, 1993, 1997
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Dermal Contact - Soil	RME & CT	Body Weight	70	kg	Standard reference wieght for adult males.	USEPA, 1991
			Absorption Factor	Compound Specific			
	(Soil EPC Calculated from Surface Soil Only)		Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	5800	cm2	Upper bound adult skin surface exposed to soils.	USEPA, 1992
			Soil to Skin Adherence Fact	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	24	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult	USEPA, 1991,1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
		CT	Skin Contact Surface Area	5000	cm2	Upper bound adult skin surface exposed to soil.	USEPA, 1992
			Soil to Skin Adherence Fact	0.2	mg/cm2	Average soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	7	year	Average length of residence in same home: 9 years (7 adult, 2 child assu	USEPA, 1993, 1997
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
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RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
RESIDENT (ADULT)	**Inhalation of Groundwater**	RME & CT	Inhalation Rate	0.5	m3/hr	Inhalation rate for sedentary adults	USEPA, 1997
			Body Weight	70	kg	Standard reference wieght for adult males.	USEPA, 1991
			Event Frequency	1	shower/da	Typical showering frequency for 90% of American population	USEPA, 1992
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Event Duration	15	min/day	Upper bound shower duration	USEPA, 1992, 1997
			Exposure Duration	24	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult	USEPA, 1991,1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
		CT	Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Event Duration	10	min/day	Average shower duration	USEPA, 1992, 1997
			Exposure Duration	7	years	Average length of residence in same home: 9 years (7 adult, 2 child assu	USEPA, 1993, 1997
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Ingestion of Groundwater	RME & CT	Body Weight	70	kg	Standard reference wieght for adult males.	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	2	liter/day	90th percentile for adult residents.	USEPA, 1989,
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	24	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult	USEPA, 1991,1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
		CT	Ingestion Rate	1.4	liter/day	Average ingestion rate for adults	USEPA, 1993
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	7	years	Average length of residence in same home: 9 years (7 adult, 2 child assu	USEPA, 1993, 1997
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989
	Dermal Contact - Groundwater	RME & CT	Body Weight	70	kg	Standard reference wieght for adult males.	USEPA, 1991
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	23000	cm2	Upper bound total skin surface area for adults.	USEPA, 1992
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Time	0.25	hours/day	Upper bound of time spent in shower (15 minutes).	USEPA, 1992
			Exposure Duration	24	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult	USEPA, 1991,1993
			Averaging Time - Nc	8760	days	24 years	USEPA, 1989
		CT	Skin Contact Surface Area	20000	cm2	Average total skin surface area for adults.	USEPA, 1992
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Time	0.17	hours/day	Average showering duration (10 min).	USEPA, 1992
			Exposure Duration	7	years	Average length of residence in same home: 9 years (7 adult, 2 child assu	USEPA, 1993, 1997
			Averaging Time - Nc	2555	days	7 years	USEPA, 1989

Notes:
RME = Resonable Maximum Exposure
CT = Central Tendency
Car = Carcinogenic
Nc = Non-carcinogenic

Source References:
BPJ: Best Professional Judgement.
USEPA, 1988: Superfund Exposure Assessment Manual
USEPA, 1989: Risk Assessment Guidance for Superfund, Volume I (RAGS)
USEPA, 1991: Supplemental Guidance, Standard Default Exposure Factors
USEPA, 1992: Dermal Exposure Assessment, Principles and Applications
USEPA, 1993: Superfund's Standard Default Exposure for the Central Tendency and Reasonable Maximum Exposure
USEPA, 1997: Exposure Factors Handbook, Draft update to 1990 handbook

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
RESIDENT (CHILD)	**Inhalation of Dust in Ambient Air**	RME & CT	Inhalation Rate	8.7	m3/day	Average inhalation rate for a child 1-12 years old.	USEPA, 1997
	(Air EPC Calculated from Surface Soil Only)		Body Weight	15	kg	Standard reference weight for children less than 6 years old.	USEPA, 1991,1993
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	6	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult.	USEPA, 1991, 1993.
			Averaging Time - Nc	2190	days	6 years.	USEPA, 1989
		CT	Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	2	years	Average length of residence in same home: 9 years (7 adult, 2 child assum	USEPA, 1993, 1997
			Averaging Time - Nc	730	days	2 years	USEPA, 1989
	Ingestion of Soil	RME & CT	Body Weight	15	kg	Standard reference weight for children less than 6 years old.	USEPA, 1991,1993
	(Soil EPC Calculated from Surface Soil Only)		Fraction Ingested	1	(unitless)	100% ingestion, conservative assumption	BPJ
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	200	mg soil/da	Maximum IR for a child	USEPA, 1993
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	6	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult.	USEPA, 1991, 1993.
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
		CT	Ingestion Rate	100	mg soil/da	Average IR for a child	USEPA, 1993
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	2	years	Average length of residence in same home: 9 years (7 adult, 2 child assum	USEPA, 1993, 1997
			Averaging Time - Nc	730	days	2 years	USEPA, 1989
	Dermal Contact - Soil	RME & CT	Body Weight	15	kg	Standard reference weight for children less than 6 years old.	USEPA, 1991,1993
	(Soil EPC Calculated from Surface Soil Only)		Absorption Factor	Compound Specific			USEPA, 1992
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	2300	cm2	Upper bound skin surface exposed to soil for child age 5-6.	USEPA, 1992
			Soil to Skin Adherence Fact	1	mg/cm2	Upper bound soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	6	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult.	USEPA, 1991, 1993.
			Averaging Time - Nc	2190	days	6 years.	USEPA, 1989
		CT	Skin Contact Surface Area	1980	cm2	Average skin surface exposed to soil for child age 5-6.	USEPA, 1992
			Soil to Skin Adherence Fact	0.2	mg/cm2	Average soil to skin adherence factor	USEPA, 1992
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	2	years	Average length of residence in same home: 9 years (7 adult, 2 child assum	USEPA, 1993, 1997
			Averaging Time - Nc	730	days	2 years	USEPA, 1989

Table 3.3-1
EXPOSURE FACTOR ASSUMPTIONS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	RME/CT	PARAMETER	VALUE	UNITS	BASIS	SOURCE
RESIDENT (CHILD)	**Inhalation of Groundwater**	RME & CT	Inhalation Rate	0.3	m3/hr	Inhalation rate for sedentary children ages 3-10	USEPA, 1997
			Body Weight	15	kg	Standard reference weight for children less than 6 years old.	USEPA, 1991,1993
			Event Frequency	1	shower/da	Typical showering frequency for 90% of American population	USEPA, 1992
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Event Duration	15	min/day	Upper bound shower duration	USEPA, 1992, 1997
			Exposure Duration	6	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult.	USEPA, 1991, 1993,
			Averaging Time - Nc	2190	days	6 years	USEPA, 1989
		CT	Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Event Duration	10	min/day	Average shower duration	USEPA, 1992, 1997
			Exposure Duration	2	years	Average length of residence in same home: 9 years (7 adult, 2 child assum	USEPA, 1993, 1997
			Averaging Time - Nc	730	days	2 years	USEPA, 1989
	Ingestion of Groundwater	RME & CT	Body Weight	15	kg	Standard reference weight for children less than 6 years old.	USEPA, 1991,1993
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Ingestion Rate	1	liter/day	Approximate 90th percentile value for children 1-11 years old.	USEPA, 1997
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Duration	6	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult.	USEPA, 1991, 1993,
			Averaging Time - Nc	2190	days	6 years.	USEPA, 1989
		CT	Ingestion Rate	0.74	liters/day	Average IR for a child 1-10 years old	USEPA, 1997
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Duration	2	years	Average length of residence in same home: 9 years (7 adult, 2 child assum	USEPA, 1993, 1997
			Averaging Time - Nc	730	days	2 years	USEPA, 1989
	Dermal Contact - Groundwater	RME & CT	Body Weight	15	kg	Standard reference weight for children less than 6 years old.	USEPA, 1991,1993
			Averaging Time - Car	25550	days	70 years, conventional human life span	USEPA, 1989
		RME	Skin Contact Surface Area	9180	cm2	Upper bound skin surface area for children.	USEPA, 1992
			Exposure Frequency	350	days/yr	Standard upper bound residential default	USEPA, 1993
			Exposure Time	0.25	hours/day	Upper bound showering duration. (15 min)	USEPA, 1992
			Exposure Duration	6	years	Upper bound time in 1 residence: 6 years as a child, 24 years as an adult.	USEPA, 1991, 1993,
			Averaging Time - Nc	2190	days	6 years.	USEPA, 1989
		CT	Skin Contact Surface Area	7930	cm2	Average skin surface area for children.	USEPA, 1992
			Exposure Frequency	234	days/yr	Standard residential CT (average) default.	USEPA, 1993
			Exposure Time	0.17	hours/day	Average showering duration (10 min).	USEPA, 1992
			Exposure Duration	2	years	Average length of residence in same home: 9 years (7 adult, 2 child assum	USEPA, 1993, 1997
			Averaging Time - Nc	730	days	2 years	USEPA, 1989

Notes:
RME = Resonable Maximum Exposure
CT = Central Tendency
Car = Carcinogenic
Nc = Non-carcinogenic

Source References:
BPJ: Best Professional Judgement.
USEPA, 1988: Superfund Exposure Assessment Manual
USEPA, 1989: Risk Assessment Guidance for Superfund, Volume I (RAGS)
USEPA, 1991: Supplemental Guidance, Standard Default Exposure Factors
USEPA, 1992: Dermal Exposure Assessment, Principles and Applications
USEPA, 1993: Superfund's Standard Default Exposure for the Central Tendency and Reasonable Maximum Exposure
USEPA, 1997: Exposure Factors Handbook, Update to 1990 handbook

period lasts for an entire 25-year career. During this time, these workers inhale the ambient air, ingest groundwater, and ingest and dermally contact surface soil.

Trespasser (Child). The adolescent trespasser is assumed to visit the industrial area 50 days per year (twice a week during warm months) for 5 years (RME). During each visit, the trespasser inhales the ambient air and ingests and dermally contacts surface soil.

Day Care Center Child. It is possible that a day care center could be established onsite as an adjunct to the industrial development. Future day care children are assumed to attend the center 5 days/week, 12 hours/day, 50 weeks/year for 6 years (RME). During this time, the child inhales the ambient air, ingests groundwater, and ingests and dermally contacts surface soil.

Future Resident. The resident is assumed to reside continuously at the site for 30 years (RME) or 9 years (CT). The resident is assumed to be a child for a portion of this duration: 6 years (RME) and 2 years (CT). The resident inhales the ambient air, ingests groundwater, inhales and dermally contacts groundwater during showering, and ingests and dermally contacts surface soil.

Complete exposure assumptions (exposure factors) for all receptors and exposure scenarios are summarized in **Table 3.3-1**. Most exposure factors used in the exposure assessment were obtained from EPA guidance documents. Other exposure factors were based on conservative professional judgment where no data are available from EPA or other sources.

3.3.5.3 Inhalation of Particulate Matter in Ambient Air

This pathway consists of particulate matter (PM) being released from soils to the air and then being inhaled by future receptors. Ambient PM concentrations for a construction worker were estimated using an emission and dispersion model. PM concentrations for the other workers, trespassers, and day care receptors were based on existing site air measurements shown in **Table 3.3-2.**

TABLE 3.3-2
SUSPENDED PARTICULATE CONCENTRATIONS MEASURED AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

PARTICULATE DATA	SITE #1 PM 10	SITE #2 PM 10	SITE #3 PM 10	SITE #4 PM 10
Peak Concentration (ug/m3)	37 on 23 July 95	37 on 23 July 95	37 on 5 July 95	37 on 5 July 95
Arithmetic Mean (ug/m3)	16.9	16.6	16.4	15.8
Standard Deviation	21.4	21.1	23.0	23.0
Geometric Mean (ug/m3)	15.1	14.8	14.8	14.2
No. of 24-hr. Avgs. Above 150 ug/m3	0	0	0	0
Number of Valid Samples	29	32	29	31
Percent Data Recovery	90.6	100.0	90.6	96.9

ulative Summary for April 1, 1995 through July 31, 1995

Construction Worker

During construction activities, construction workers may be exposed to chemicals in site soils via inhalation. Construction activities, such as excavation, have the potential to create dust, or suspended particulate matter (PM), originating from the soils being removed. This dust would contain the chemicals present in the soil. Construction workers in the construction area would breathe this PM in the ambient air.

Air concentrations of site chemicals of concern were estimated for this exposure pathway using excavation models recommended in the USEPA's "Models for Estimating Air Emission Rates from Superfund Remedial Actions" (EPA 451/R-93-001). Particulate emissions from soil excavation and loading into trucks are estimated with the following equation:

$$\mathbf{E} = \frac{\mathbf{k\,(0.0016)\,(M)\,[\,U/2.2\,]^{1.3}}}{\mathbf{[\,X/2\,]^{1.4}}}$$

where:
E = emissions (g)
k = particle size multiplier (unitless)
0.0016 = empirical constant (g/kg)
M = mass of soil handled (kg)
U = mean wind speed (m/sec)
2.2 = empirical constant (m/sec)
X = percent moisture content (%)

The construction worker receptor is assumed to work at a site for a one-year period. To conservatively estimate potential particulate emissions from construction activities during this period, it was assumed that an area equivalent to the area of the contaminated portions of SEADs-59 and 71 (an approximate 5,110 square meter area at SEAD-59 and 3,252 square meter area at SEAD-71)) is excavated to a depth of two meters over the course of one year.

This results in the following mass of soil removed at each site:

Mass = Area x Depth x Soil Bulk Density

SEAD-59

= 5,110 square meters x 2 meters x 1.5 g/cm^3 x 10^6 cm^3/m^3

= 1.53 x 10^{10} grams

= 1.53 x 10^7 kg

SEAD-71

= 3,252 square meters x 2 meters x 1.5 g/cm^3 x 10^6 cm^3/m^3

= 9.75 x 10^9 grams

= 9.75 x 10^6 kg

Other parameter values for the model are as follows:

k = 0.35 for PM_{10} (EPA 1993)
U = 4.4 m/sec, average wind speed for Syracuse, NY (EPA 1985)
X = 10%, recommended default (EPA 1993)

With these values for M, k, U and X, the emission rate (E) from excavation activities is calculated 2,220 grams of PM_{10} over the course of a year for SEAD-59 and 1,410 grams/year for SEAD-71. This emission rate would be representative if all soil excavated at the SWMUs were contaminated, and if local climatic factors did not suppress emissions. For example, precipitation, snow cover and frozen soil in the winter will minimize emissions. To account for these climatic/seasonal factors, it was assumed that emissions occur only half of the construction time. This results in a representative emission rate (E) of 1,110 grams/year (707 grams/year for SEAD-71). This is equivalent to an average emission rate of 0.15 mg/sec (0.10 mg/sec for SEAD-71), assuming emission occur only during work days: 250 days/yr, 8 hr/day.

Much greater short-term emissions are estimated for site grading with a bulldozer or tractor. This type of activity is assumed to occur for 90 work days (8-hour day) over the course of a year. The model equation for grading emissions is:

$$E = \frac{0.094\,(s)^{1.5}}{X^{1.4}}$$

where:

E = emission rate (g/sec)
0.094 = empirical constant (g/sec)
s = percent silt content (%)
X = percent moisture content (%)

Assuming the EPA-recommended default values of 8% for s, and 10% for X, the emission rate (E) from grading is calculated as 0.085 g/sec. Averaged over the course of a year with 90 8-hour days of grading emissions, this is 38.1 g/hr or 10.6 mg/sec of PM_{10} emissions, assuming all emissions occur during working hours.

Total annual average emissions from excavation and grading are estimated as 0.15 mg/sec + 10.6 mg/sec = 10.73 mg/sec (or 0.10mg/sec + 10.6 mg/sec = 10.68 mg/sec for SEAD-71).

Localized exposure concentrations for construction workers are estimated with a simple box model. The model treats a defined surface area as a uniform emission source over the time period of interest. The box, or mixing volume, is defined by this surface area and an assumed mixing height. The emitted PM_{10} is assumed to mix uniformly throughout the box, with dilution from surface winds.

The general model equation is:

$$C = \frac{E}{(U)(W)(H)}$$

where:

E = emission rate, mg/sec
U = wind speed, m/sec
W = crosswind width of the area source, m
H = mixing height, m

E and U are the same as defined or calculated above. The mixing area is based upon the assumption that the construction activity causing worker exposure is being performed within a 100 square meter area. This area is assumed square in shape, and W is the square root of 100 m^2, or 10 meters. H is assumed to equal the height of the breathing zone, or 1.75 meters.

With these values, the PM_{10} exposure concentration for a construction worker is calculated as 0.139 mg/m^3 for both SEADs-59 and 71. All of this PM_{10} was assumed to be airborne soil released from each site as represented by total soils (surface and subsurface).

The concentration of particulate-associated chemicals in ambient air, then, is:

$$\mathbf{CA = CS \times PM_{10} \times CF}$$

where:

CA = chemical concentration in air (mg/m^3)
CS = chemical concentration in soil (mg/kg soil)
PM_{10} = PM_{10} concentration (ug/m^3)
CF = conversion factor (10^{-9} kg/ug)

These calculated CA values are the inhalation EPCs for the dust inhalation scenarios. Tables in **Appendices A and B** show the inhalation EPCs for the future construction workers.

All Other Receptors (All Workers and All Child Receptors)

Ambient air normally contains particulate matter derived from various natural and anthropogenic sources, including soil erosion, fuel burning, automobiles, etc. The concentrations of airborne particulate matter were measured at SEDA over a four-month period (April-July) in 1995. A summary of the data collected in this air sampling program is shown in **Table 3.3-2**. Both Total Suspended Particulate Matter (TSP) and particulate matter less than 10μm aerodynamic diameter (PM_{10}) were measured. TSP includes all particles which can remain suspended in air, while PM_{10} includes only smaller particles which can be inhaled (particles larger than 10μm diameter typically cannot enter the narrow airways in the lung).

For this assessment, the highest 4-month average PM_{10} concentration measured at any of the four monitoring stations was assumed to represent ambient air at SEADs-59 and 71. The entire particulate loading was assumed to be airborne soil released from the site as represented by the surface soil EPCs for each site.

The concentration of particulate-associated chemicals in ambient air, (CA) was calculated with the same equation [CA = CS x PM_{10} x CF] used for the construction worker, above.

The ambient air exposure point concentrations used in the intake calculations are shown in Tables in **Appendices A** and **B**.

The equation for intake is as follows (EPA, 1989a):

$$\textbf{Intake (mg/kg/day)} = \frac{\textbf{CA x IR x EF x ED}}{\textbf{BW x AT}}$$

where:

CA = Chemical concentration in air (mg/m^3)
IR = Inhalation Rate (m^3/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Bodyweight (kg)
AT = Averaging Time (days)

The results of these calculations are shown in Tables in **Appendices A** and **B.**

3.3.5.4 Incidental Ingestion of Soil

The soil data collected from each site were compiled and the EPCs were selected for each compound. For the all receptors except the construction worker, only surface soil data collected from the 0 to 0.5 foot interval were used in this analysis. For the construction worker exposure, all soil data were used as it is assumed that the construction worker will engage in intrusive activities.

The equation for intake is as follows (EPA 1989a):

$$\textbf{Intake (mg/kg-day)} = \frac{\textbf{CS x IR x CF x FI x EF x ED}}{\textbf{BW x AT}}$$

where:

CS = Chemical Concentration in Soil (mg/kg soil)
IR = Ingestion Rate (mg soil/day)
CF = Conversion Factor (1 Kg/10^6 mg)
FI = Fraction Ingested from Contaminated Source (unitless)
EF = Exposure Frequency (days/years)
ED = Exposure Duration (years)
BW = Body Weight (kg)
AT= Averaging Time (period over which exposure is averaged -- days)

The results of these calculations are shown in Tables presented in **Appendices A** and **B.**

3.3.5.5 Dermal Contact with Soils

The same receptors considered to have the potential to ingest soil may also contact the same soils dermally.

As with the soil ingestion scenarios, the chemical concentration of the soils taken from the 0 to 0.5 foot depth were used as the exposure point concentrations for all receptors except the construction worker. The chemical concentration of all soils was used as the exposure point concentration for the construction worker scenario.

The equation for the absorbed dose from dermal exposure is as follows, based on guidance in EPA 1992:

$$\textbf{Absorbed Dose (mg/kg-day)} = \frac{\textbf{CS x CF x AF x ABS x SA x EF x ED}}{\textbf{BW x AT}}$$

where:

CS = Chemical Concentration in Soil (mg/kg soil)
CF = Conversion Factor (10^{-6} kg/mg)
AF = Soil to Skin Adherence Factor (mg/cm^2)
ABS = Absorption Factor (unitless)
SA = Skin Surface Area Available for Contact (cm^2)
EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)

BW = Body Weight (kg)

AT = Averaging Time (period over which exposure is averaged -- days)

The product of the terms CS, AF, and ABS represents the absorbed dose per event as defined in the EPA 1992 guidance.

The exposure calculations are summarized in Tables presented in **Appendices A** and **B.**

Dermal exposure involves several unique exposure factors discussed briefly here. Specifically, the dermal exposure calculation considers the amount of exposed skin, the amount of soil that adheres to the skin and the degree to which a chemical may be adsorbed through the skin.

The surface area of exposed skin depends on the size of an individual (especially adult vs. child), clothing worn, and the specific parts of the body which may directly contact the medium of concern (e.g., soil or groundwater during showering). USEPA recommendations were followed to select exposed skin surface areas for each scenario in this assessment.

The following assumptions were made regarding skin surface areas for dermal exposure, according to EPA 1992:

All Workers and Future Adult Resident (Soil): The hands, legs, arms, neck and head may be exposed. These comprise approximately 25% of the total body surface area. EPA 1992 recommends a surface area value of 5800 cm^2 RME and 5000 cm2 for the CT for the RME as representative of these exposed body parts.

All Child Receptors (Soil): 25% of total body area was assumed for children age 5-6. This results in surface area exposure values of 2300 cm^2 for the RME and 1980 cm^2 for the CT.

Future Child Resident (Groundwater) The entire body surface may be exposed during showering. EPA 1992 recommends a surface area value of 9,180 cm^2 for the RME, and 7930 cm^2 for the CT, as representative of the entire body of a child.

Future Adult Resident (Groundwater) The entire body surface may be exposed during showering. EPA 1992 recommends a surface area value of 23,000 cm^2 for the RME, and 20,000 cm^2 for the CT, as representative of the entire body of an adult.

The potential magnitude of exposure depends on the amount of soil that adheres to the exposed skin. Again, USEPA recommended soil-to-skin adherence factors were used in this assessment.

Certain chemicals may be readily absorbed through the skin while others penetrate much more slowly or not at all. In the case of soil, some chemicals may be strongly bound to the matrix, which reduces their ability to absorb through the skin. Chemical-specific absorption factors as provided by USEPA were used in this assessment. USEPA Region II recommends quantifying dermal exposure for only cadmium, arsenic, PCBs, dioxins/furans and pentachorophenol (others are under development), since credible values are not available for other chemicals of concern. Of these compounds, only arsenic and PCBs (aroclor 1254) were detected in any soil at levels above background. Absorption factors (ABS) of 1% (0.01) and 6%(0.06) were used for arsenic and aroclor-1254, respectively, as recommended by EPA (EPA, 1992).

No other compounds were considered quantitatively for dermal exposure from soil in this risk assessment.

The reader should note that in the guidance document Dermal Exposure Assessment: Principles and Applications (EPA 1992), EPA cautions that "dermal exposure is the least well understood of the major exposure routes. Very little chemical-specific data are available, especially for soils, and the predictive techniques have not been well validated." EPA further states that dermal exposure/risk estimates have considerable uncertainty, and in some cases may be overly conservative.

3.3.5.6 Groundwater Ingestion

All future workers, residents, and children in day care may drink groundwater. The groundwater data collected from each site were compiled and the EPCs were selected for each compound.

The equation for intake is as follows (EPA, 1989a):

$$\textbf{Intake (mg/kg-day)} = \frac{\textbf{CW x IR x EF x ED}}{\textbf{BW x AT}}$$

where:

CW = Chemical Concentration in Water (mg/liter)
IR = Ingestion Rate (liters/day)

EF = Exposure Frequency (days/year)
ED = Exposure Duration (years)
BW = Bodyweight (kg)
AT = Averaging time (days)

The results of these calculations are shown in Tables in **Appendices A** and **B**.

3.3.5.7 Dermal Contact to Groundwater while Showering/Bathing

The resident may be exposed to groundwater while showering. The EPCs developed for ingestion of groundwater are also used for this exposure route. The equation for the absorbed dose, taken from RAGS (EPA, 1989a) is as follows:

$$\textbf{Absorbed Dose (mg/kg-day)} = \frac{\mathbf{DA \times SA \times EF \times ED}}{\mathbf{BW \times AT}}$$

Where:

DA	=	Absorbed Dose per event (mg/cm^2 - event)
SA	=	Skin Surface Area Available for Contact (cm^2)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged (days)

The absorbed dose per event (DA) was calculated as described in EPAs "Dermal Exposure Assessment: Principles and Applications," (EPA, 1992).

For organics, a parameter, B is first calculated. The B value was adopted from the Bunge Model (Cleek and Bunge, 1992). This value attempts to characterize the relative contribution of each compounds specific permeability coefficient (Kp value) in the stratum corneum and the viable epidermis. The B-values for certain compounds are listed in Table 5-8 of the Dermal Exposure Assessment Manual, EPA, 1992. For any compounds not listed in this table, B-values are derived using the following equation:

$$\mathbf{B \approx \frac{Kow}{10{,}000}}$$

where Kow is the octanol-water partitioning coefficient (dimensionless).

Once calculated, the B value is used to calculate time conditions associated with estimates of compound breakthrough time. In accordance with the work of Cleek and Bunge, if the exposure time per event (ET) is less than the breakthrough time (t*) of steady-state conditions specific to each compound, then the absorbed dose is calculated as follows:

$$\mathbf{DA = 2\ K_p\ x\ CW\ x\ CF}\ \sqrt{\frac{6 \times \tau \times ET}{\pi}}$$

If the exposure time is longer than t*, then the absorbed dose is calculated using:

$$\mathbf{DA_{event} = K_p\ x\ CW\ x\ CF}\left[\frac{ET + 2(1+3B)\tau}{1+B}\right]$$

where for both equations:

K_p = Dermal permeability coefficient (cm/hr)
CW = Chemical Concentration in Water (mg/l)
ET = Exposure Time (hours)
B = Bunge Model Value (unitless)
τ = Lag time (hours)
CF = Volume Conversion Factor = 0.001L/cm^3

The exposure times for showering are assumed to be 15 minutes/day (0.25 hr/day) for the RME, and 10 minutes/day for CT, as recommended in the Dermal Exposure Assessment Manual, EPA, 1992.

The lag time (τ), is defined as the time it takes a chemical to penetrate to reach a steady-state condition during a dermal exposure in aqueous media. By properly defining the lag time, the permeability coefficient (K_p) can be more properly used in the risk calculation further reducing uncertainty. Lag times and breakthrough times (t*) for each organic compound were taken from a list in Table 5-8 of the Dermal Exposure Assessment Manual, EPA, 1992, or calculated. All chemicals not having lag times were derived using the following equation:

$$\tau = \frac{\int_{sc}^{2}}{6D_{sc}}$$

where:

$\int_{sc}$ = thickness of the stratum corneum, assume (0.001) (cm)

D_{sc} = Stratum corneum diffusion coefficient (cm^2/hr)

The t* value for each organic compound found in ground water is shown below.

Compound	t* (hours)
Phenol	0.79

The exposure time, 0.25 hour for RME and 0.17 for CT, is less than t* in all cases. Therefore, the first equation for DA, above, was used for all organic compounds.

In the Dermal Exposure Assessment Manual (EPA 1992), EPA cautions that the above approach for calculating dermal exposures to organic chemicals in water may be overly conservative. EPA expressed concern that preliminary testing of this model indicated that for some compounds the absorbed dose from dermal exposure during showering was much greater than the dose from ingestion of 2 L/day of water. EPA further states that model validation is difficult due to a lack of data.

For inorganics, DA was calculated by:

$$\mathbf{DA = K_p \times CW \times ET \times CF}$$

USEPA in the Dermal Exposure Assessment & Guidelines (EPA, 1992) recommends Dermal Permeability Coefficients (K_p) for a number of organic and inorganic chemicals. These recommended values were used in these exposure calculations. When no organic K_p value was available, a value was calculated using the following equation:

$$\text{Log } K_p = -2.72 + 0.71 (\log K_{o/w}) - 0.0061 (MW)$$

Many inorganic compounds do not have specified recommended K_p values. In this case, K_p was assumed to be 1×10^{-3} as the default value recommended by EPA (EPA, 1992).

Exposure to chemicals in groundwater during showering occurs via two routes: inhalation of volatile chemicals that partition into the air from the hot shower water, and dermal contact. The analyses of these two exposure routes assume that release of volatile chemicals to the air occurs quickly, and that only the quantities which remain in the water stream are available for dermal contact. The calculations of exposure from inhalation assume that the water from the shower nozzle has the same concentration as groundwater, and the groundwater EPC is used. However, for dermal contact, the EPCs are first adjusted to subtract the amount of each chemical which partitions into the air. This adjusted EPC, referred to as C_{derm} , is calculated as:

$$C_{derm} = EPC_{gw} (1-f_e)$$

where: EPC_{gw} = groundwater exposure point concentration (at the shower nozzle), mg/L
f_e = fraction of chemical emitted to the air in the shower, dimensionless

The fraction emitted (f_e) is calculated as:

$$f_e = (EPC_{air} \times F_a) / (EPC_{gw} \times F_w)$$

where: EPC_{air} = air exposure point concentration in the shower (mg/m^3)
F_a = air flow rate (ventilation rate) in the shower (m^3/min)
F_w = water flow rate in the shower (L/min)

This C_{derm} value is used as CW in the calculations of absorbed dose per event (DA) in the assessment of dermal exposure during showering.

The dermal exposure calculations are summarized in **Appendices A and B**.

3.3.5.8 Inhalation of Groundwater while Showering/Bathing

The same groundwater concentrations that were used in the groundwater ingestion scenario were used in this scenario. These groundwater concentrations were converted to air concentrations inside the shower using a model developed by Andelman (Andelman, J.B. 1984, Andelman, J.B., 1985a, Andelman, J.B., 1985b). This model assumes that the concentration of the air inside the shower is in equilibrium between the rate of release from the shower water and the rate of air exchange between the shower and the bathroom. The empirical constants in the model were obtained from the observed efficiency of volatilization for TCE in model showers and from several homes with contaminated water where measurements have been made. The efficiency of release for chemicals other than TCE is obtained as the product of the ratio of the Henry's Law constant for that compound to the Henry's Law constant for TCE and the efficiency factor for TCE.

The average concentration of a volatile organic in the shower air over a period of t_S minutes is:

$$\mathbf{C_S} = C_{inf}\left[1 + \left(\frac{1}{kt_s}\right) \times \left(e^{(-kt_s)^{-1}}\right)\right]$$

for $t_S > 0$

where:

C_S = average concentration of a volatile compound in the shower air over a duration of t_S minutes (mg/m^3)

C_{inf} = asymptotic concentration in air if shower ran for a long time (much longer than 15 minutes), calculated below (mg/m^3)

t_S = time in shower, RME value for an adult is 15 minutes (min)

k = rate constant for exponential function, defined below (1/min)

C_{inf} = $[(E)(F_w)(C_t)]/F_a$

k = F_a/V_b

F_w = flow rate of water in shower, RME value is 19 L/min; CT value is 8 L/min (L/min)

C_t = concentration in shower water, determined case by case; C_t is the concentration of contaminant in groundwater where domestic water is provided by a well (mg/L or ppm)

F_a = flow rate of air in shower, typical value is 2.4 m^3/min

V_b = volume of bathroom, typical value is 12 m^3 (m^3)

E = $(E_{TCE})(H)/(H_{TCE})$

E = efficiency of release of a compound from water to air; $0 \leq E \leq 1$; if E has a calculated value greater than 1, then E must be set equal to 1 (unitless)

E_{TCE}= efficiency of release of TCE from water to air, $E_{TCE} = 0.6$ is a typical value (unitless)

H = Henry's law constant for an organic compound, (m^3-atm/mol)

H_{TCE} = Henry's law constant for TCE, typical value is $H_{TCE} = 9.10E^{-3}$ (m^3- atm/mol)

The calculated average concentrations in the air in the shower are presented in the Appendix tables.

The equation for the intake, taken from RAGS (EPA, 1989a) is as follows:

$$\textbf{Intake (mg/kg-day)} = \frac{\textbf{CA x IR x EF x ED}}{\textbf{BW x AT}}$$

Where:

CA	=	Chemical Concentration in Air (mg/m^3)
IR	=	Inhalation Rate (m^3/hr)
EF	=	Exposure Frequency (hrs/yr)
ED	=	Exposure Duration (years)
BW	=	Body Weight (kg)
AT	=	Averaging Time (period over which exposure is averaged -- days)

The exposure calculations are summarized in the Appendix tables.

The Chemical Concentrations in the air were developed using the model described previously. The inhalation rate of 0.3 m^3/hr was used as the RME value, recommended in the Exposure Factors Handbook (EPA 1997) as representative of sedentary children.

3.4 TOXICITY ASSESSMENT

The objective of the toxicity assessment is to weigh available evidence regarding the potential of the chemicals to cause adverse effects in exposed individuals, and to provide, where possible, an estimate of the relationship between the extent of exposure to a chemical and the increased likelihood and/or severity of adverse effects. The types of toxicity information considered in this assessment include the reference dose (RfD) and reference concentration (RfC) used to evaluate non-carcinogenic effects, and the slope factor and unit risk to evaluate carcinogenic potential. Most toxicity information used in this evaluation was obtained from the Integrated Risk

Information System (IRIS). If values were not available from IRIS, the *Health Effects Assessment Summary Tables* (HEAST) (EPA, 1993b) were consulted. Finally, the USEPA Region II was consulted to provide any additional values not included in these two sources. The toxicity factors used in this evaluation are summarized in **Table 3.4-1** for both non-carcinogenic and carcinogenic effects.

3.4.1 Non-carcinogenic Effects

For chemicals that exhibit non-carcinogenic (i.e., systemic) effects, authorities consider organisms to have repair and detoxification capabilities that must be exceeded by some critical concentration (threshold) before the health effect is manifested. For example, an organ can have a large number of cells performing the same or similar functions that must be significantly depleted before the effect on the organ is seen. This threshold view holds that a range of exposures from just above zero to some finite value can be tolerated by the organism without an appreciable risk of adverse effects.

Health criteria for chemicals exhibiting non-carcinogenic effects for use in risk assessment are generally developed using USEPA RfDs and RfCs developed by the RfD/RfC Work Group and included in the IRIS. In general, the RfD/RfC is an estimate of an average daily exposure to an individual (including sensitive individuals) below which there will not be an appreciable risk of adverse health effects. The RfD/RfC is derived using uncertainty factors (e.g., to adjust from animals to humans and to protect sensitive subpopulations) to ensure that it is unlikely to underestimate the potential for adverse non-carcinogenic effects to occur. The purpose of the RfD/RfC is to provide a benchmark against which an intake (or an absorbed dose in the case of dermal contact) from human exposure to various environmental conditions might be compared.

Intakes of doses that are significantly higher than the RfD/RfC may indicate that an inadequate margin of safety could exist for exposure to that substance and that an adverse health effect could occur.

3.4.1.1 References Doses for Oral and Inhalation Exposure

The types of toxicity values used to evaluate the non-carcinogenic effects of chemicals include RfDs for oral exposure, and RfCs for inhalation exposure. RfDs and RfCs represent thresholds for toxicity. They are derived such that human lifetime exposure to a given chemical via a given

TABLE 3.4-1
TOXICITY VALUES
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	Oral RfD (mg/kg-day)		Inhalation RfD (mg/kg-day)		Carc. Slope Oral (mg/kg-day)-1		Rank Wt. of Evidence	Carc. Slope Inhalation (mg/kg-day)-1		Dermal RfD (mg/kg-day)		Carc. Slope Dermal (mg/kg-day)-1		Oral Absorption Factor	
Volatile Organics															
Trichloroethane, 1,1,1-	2.00E-002	i	2.86E-001	i	NA	e	D	NA	e	2.00E-002	f	NA	g	1	j
Acetone	1.00E-001	a	NA	e	NA	e	D	NA	e	1.00E-001	f	NA	g	1	j
Benzene	3.00E-003	i	1.71E-003	i	2.90E-002	a	A	2.91E-002	a	2.85E-003	f	3.05E-002	g	0.95	k
Carbon disulfide	1.00E-001	a	2.00E-001	b	NA	e	NA	NA	e	6.30E-002	f	NA	g	0.63	k
Ethyl benzene	1.00E-001	a	2.86E-001	a	NA	a	D	NA	a	NA		NA		1	
Methyl chloride	NA	a	NA	a	1.30E-002	a	C	6.33E-003	a	NA	f	1.30E-002	g	1	k
Methylene chloride	6.00E-002	a	8.57E-001	b	7.50E-003	a	B2	1.65E-003	a	5.88E-002	f	7.65E-003	g	0.98	k
Methyl ethyl ketone	6.00E-001	a	2.86E-001	a	NA	e	D	NA	e	6.00E-001	f	NA	g	1	j
Styrene	2.00E-001	a	2.86E-001	a	NA	a	NA	NA	a	2.00E-001	f	NA	g	1	j
Tetrachloroethene	1.00E-002	a	NA	e	5.2E-002	e	NR	2.00E-003	e	1.00E-002	f	5.2E-002	g	1	j
Toluene	2.00E-001	a	1.14E-001	a	NA	e	D	NA	e	2.00E-001	f	NA	g	1	j
Trichloroethene	NA	e	NA	e	1.10E-002	e	NA	6.00E-003	e	NA	f	1.22E-002	g	0.9	k
Total Xylenes	2.00E+000	a	NA	e	NA	e	D	NA	e	1.80E+000	f	NA	g	0.9	k
Semivolatiles*															
1,2,4-Trichlorobenzene	1.00E-002	a	NA	a	NA	a	D	NA	a	1.00E-002	f	NA	g	1	j
2-Methylnaphthalene	4.00E-002	i	NA	e	NA	e	NA	NA	e	4.00E-002	f	NA	g	1	j
4-Methylphenol	5.00E-003	b	NA	a	NA	a	C	NA	a	NA		NA		1	
Acenaphthene	6.00E-002	a	NA	e	NA	e	NA	NA	e	6.00E-002	f	NA	g	1	j
Acenaphthylene	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Anthracene	3.00E-001	a	NA	e	NA	e	D	NA	e	3.00E-001	f	NA	g	1	j
Benzo(a)anthracene	NA	e	NA	e	7.30E-001	c	B2	NA	e	NA	f	7.30E-001	g	1	j
Benzo(a)pyrene	NA	e	NA	e	7.30E+000	a	B2	NA	e	NA	f	1.83E+001	g	0.4	k
Benzo(b)fluoranthene	NA	e	NA	e	7.30E-001	c	B2	NA	e	NA	f	7.30E-001	g	1	j
Benzo(ghi)perylene	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Benzo(k)fluoranthene	NA	e	NA	e	7.30E-002	c	B2	NA	e	NA	f	7.30E-002	g	1	j
Butylbenzylphthalate	2.00E-001	b	NA	e	NA	e	C	NA	e	2.00E-001	f	NA	g	1	j
Carbazole	NA	e	NA	e	2.00E-002	b	B2	NA	e	NA	f	2.00E-002	g	1	j
Chrysene	NA	e	NA	e	7.30E-003	c	B2	NA	e	NA	f	7.30E-003	g	1	j
Di-n-butylphthalate	1.00E-001	a	NA	e	NA	e	D	NA	e	9.00E-002	f	NA	g	0.9	k
Di-n-octylphthalate	2.00E-002	b	NA	a	NA	a	NA	NA	a	NA		NA		1.00	j
Dibenz(a,h)anthracene	NA	e	NA	e	7.30E+000	c	B2	NA	e	NA	f	7.30E+000	g	1	j
Dibenzofuran	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Diethyl phthalate	8.00E-001	b	NA	e	NA	e	D	NA	e	8.00E-001	f	NA	g	1	j
Fluoranthene	4.00E-002	a	NA	e	NA	e	D	NA	e	4.00E-002	f	NA	g	1	j
Fluorene	4.00E-002	a	NA	e	NA	e	D	NA	e	4.00E-002	f	NA	g	1	j
Indeno(1,2,3-cd)pyrene	NA	e	NA	e	7.30E-001	c	B2	NA	e	NA	f	7.30E-001	g	1	j
Naphthalene	4.00E-002	e	NA	e	NA	e	D	NA	e	4.00E-002	f	NA	g	1	j
Phenanthrene	NA	e	NA	e	NA	e	D	NA	e	NA	f	NA	g	1	j
Phenol	6.00E-001	a	NA	e	NA	e	D	NA	e	5.40E-001	f	NA	g	0.9	k
Pyrene	3.00E-002	a	NA	e	NA	e	NA	NA	e	3.00E-002	f	NA	g	1	k
bis(2-Ethylhexyl)phthalate	2.00E-002	a	NA	e	1.40E-002	a	B2	NA	e	1.00E-002	f	2.80E-002	g	0.5	k
Pesticides/PCBs															
4,4'-DDD	NA	a	NA	e	2.40E-001	a	B2	NA	e	NA	f	1.20E+000	g	0.2	k
4,4'-DDE	NA	e	NA	e	3.40E-001	e	B2	NA	e	NA	f	1.70E+000	g	0.2	k
4,4'-DDT	5.00E-004	a	NA	e	3.40E-001	a	B2	3.40E-001	a	1.00E-004	f	1.70E+000	g	0.2	k
Aldrin	3.00E-005	a	NA	b	1.70E+001	a	B2	1.72E+001	a	1.50E-005	f	3.40E+001	g	0.5	k
Aroclor-1254	2.00E-005	a	NA	a	2.00E+000	a	B2	4.00E-001	a	1.80E-005	f	2.22E+000	g	0.9	k
Dieldrin	5.00E-005	a	NA	e	1.60E+001	a	B2	1.61E+001	a	2.50E-005	f	3.20E+001	g	0.5	k
Endosulfan I	6.00E-003	b	NA	e	NA	e	NA	NA	e	6.00E-003	f	NA	g	1	j
Endosulfan II	6.00E-003	e	NA	e	NA	e	NA	NA	e	6.00E-003	f	NA	g	1	j
Endosulfan sulfate	6.00E-003	b	NA	e	NA	e	NA	NA	e	6.00E-003	f	NA	g	1	j
Endrin	3.00E-004	a	NA	e	NA	e	D	NA	e	3.00E-004	f	NA	g	1	j
Endrin aldehyde	NA	e	NA	e	NA	e	NA	NA	e	NA	f	NA	g	1	j

TABLE 3.4-1
TOXICITY VALUES
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	Oral RfD (mg/kg-day)		Inhalation RfD (mg/kg-day)		Carc. Slope Oral (mg/kg-day)-1		Rank Wt. of Evidence	Carc. Slope Inhalation (mg/kg-day)-1		Dermal RfD (mg/kg-day)		Carc. Slope Dermal (mg/kg-day)-1		Oral Absorption Factor	
Endrin ketone	NA	e	NA	e	NA	e	NA	NA	e	NA	f	NA	g	1	j
Heptachlor	5.00E-004	a	NA	e	4.50E+000	a	B2	4.55E+000	a	5.00E-004	f	4.50E+000	g	1	j
Heptachlor epoxide	1.30E-005	a	NA	e	9.10E+000	a	B2	9.10E+000	a	1.30E-005	f	9.10E+000	g	1	j
alpha-BHC	NA	e	NA	e	6.30E+000	a	B2	6.30E+000	a	NA	f	NA	g	1	j
alpha-Chlordane	6.00E-005	b	NA	e	1.30E+000	a	B2	1.30E+000	e	6.00E-005	f	1.30E+000	g	1	j
beta-BHC	NA	e	NA	e	1.80E+000	a	C	1.86E+000	a	NA	f	1.80E+000	g	1	j
gamma-BHC (Lindane)	3.00E-004	a	NA	e	1.30E+000	e	NA	NA	e	3.00E-004	f	NA	g	1	j
gamma-Chlordane	6.00E-005	e	NA	e	1.30E+000	e	NA	1.30E+000	e	6.00E-005	f	1.30E+000	g	1	j
delta-BHC	NA	e	NA	e	NA	e	NA	NA	e	NA	f	NA	g	1	j
Methoxychlor	5.00E-003	a	NA	e	NA	e	D	NA	e	5.00E-003	f	NA	g	1	j
Metals															
Aluminum	1.00E+000	m	1.43E-003	m	NA	m	D	NA	m	NA	m	NA	m	0.04	k
Antimony	4.00E-004	b	NA	e	NA	m	D	NA	e	4.00E-004	f	NA	g	0.01	k
Beryllium	5.00E-003	a	NA	e	4.30E+000	a	B2	8.40E+000	a	5.00E-005	f	4.30E+002	g	0.01	k
Chromium	5.00E-003	a	NA	e	NA	e	A	4.20E+001	a	1.00E-004	f	NA	g	0.02	k
Cobalt	6.00E-002	m	NA	a	NA	a	NA	NA	a	NA		NA		0.05	k
Copper	4.00E-002	b	NA	e	NA	e	D	NA	e	2.40E-002	f	NA	g	0.6	k
Iron	3.00E-001	e	NA	e	NA	e	D	NA	e	3.00E-001	f	NA	g	1	j
Lead	NA	e	NA	e	NA	e	B2	NA	e	NA	f	NA	g	0.15	k
Manganese	5.00E-002	a	1.40E-005	a	NA	e	D	NA	e	1.50E-003	f	NA	g	0.03	k
Mercury	3.00E-004	b	8.57E-005	b	NA	e	D	NA	e	3.00E-006	f	NA	g	0.01	k
Nickel	2.00E-002	a	NA	e	NA	e	A	NA	b	8.00E-004	f	NA	g	0.04	k
Selenium	5.00E-003	b	NA	e	NA	e	NA	NA	e	4.50E-003	f	NA	g	0.9	k
Sodium	NA	e	NA	e	NA	e	NA	NA	e	NA	f	NA	g	1	j
Vanadium	7.00E-003	b	NA	e	NA	e	D	NA	e	7.00E-005	f	NA	g	0.01	k
Zinc	3.00E-001	a	NA	e	NA	e	D	NA	e	7.50E-002	f	NA	g	0.25	k

a = Taken from the Integrated Risk Information System (IRIS) (Online December 1997)
b = Taken from HEAST 1995
c = Calculated using TEF
d = Calculated from proposed oral unit risk value
e = Provided by USEPA - October 1993
f = Calculated from oral RFD value
g = Calculated from oral slope factor
i = Provisional health guideline from EPA Risk Assessment Issue Papers (1995-1996) provided by EPA Technical Support Center.
(Inhalation RfD's were derived from EPA RfC's based on the assumption of 20 m3/day inhalation rate and 70 kg body weight.)
j = Where no oral absorption efficiency data are available, EPA Region 2 recommends that no adjustment be made for relative absorption (i.e. assume oral absorption factor = 1.0)
k = Taken from ATSDR Toxicity Profiles (1989 - 1995)
l = EPA Region 2 accepted oral absorption factor for cadmium (personal communication between A. Schatz of Parsons and M. Maddaloni of EPA)
m = Provisional health guideline from EPA Risk Assessment Issue Papers (1997) provided by EPA Technical Support Center.
(Inhalation RfD's were derived from EPA RfC's based on the assumption of 20 m3/day inhalation rate and 70 kg body weight.)
NA = Not Available

route at levels at or below the RfD or RfC, as appropriate, should not result in adverse health effects, even for the most sensitive members of the population. The chronic RfD or RfC for a chemical is ideally based on studies where either animal or human populations are exposed to a given chemical by a given route of exposure for the major portion of the life span (referred to as a chronic study). Various effect levels may be determined in a study; however, the preferred effect level for calculating non-carcinogenic toxicity values is the no-observed-adverse-effect level, or NOAEL. Second to the NOAEL is the lowest-observed-adverse-effect level, or LOAEL.

The oral RfD is derived by determining dose-specific effect levels from all the available quantitative studies, and applying uncertainty factors and/or a modifying factor to the most appropriate effect level. Uncertainty factors are intended to account for: 1) the variation in sensitivity among members of the human population; 2) the uncertainty in extrapolating animal data to humans; 3) the uncertainty in extrapolating from data obtained in a study that is less than lifetime exposure; 4) the uncertainty in using LOAEL data rather than NOAEL data; and 5) the uncertainty resulting from inadequacies in the data base. The modifying factor may be used to account for other uncertainties such as inadequacy of the number of animals in the critical study. Usually each of these uncertainty factors is set equal to 10, while the modifying factor varies between one and 10. RfDs are reported as doses in milligrams of chemical per kilogram body weight per day (mg/kg-day).

The inhalation RfC is derived by determining concentration-specific effect levels from all of the available literature and transforming the most appropriate concentration to a human RfC. Transformation usually entails converting the concentration and exposure duration used in the study to an equivalent continuous 24-hour exposure, transforming the exposure-adjusted value to account for differences in animal and human inhalation, and then applying uncertainty factors and/or a modifying factor to the adjusted human exposure concentration to arrive at an RfC. The uncertainty factors potentially used are the same ones used to arrive at an RfD (see above). RfCs are reported as concentrations in milligrams of chemical per cubic meter of air (mg/m^3). To use the RfCs in calculating risks, they were converted to inhalation reference doses in units of milligrams of chemical per kilogram of body weight per day (mg/kg/day). This conversion was made by assuming an inhalation rate of 20 m^3/day and an adult body weight of 70 kg. Thus:

$$\textbf{Inhalation Reference Dose (mg/kg/day)} = RfC\left(\frac{mg}{m^3}\right)x\left(\frac{20m^3}{day}\right)x\left(\frac{1}{70kg}\right)$$

3.4.1.2 Reference Doses for Dermal Exposure

USEPA has not derived toxicity values for all routes of exposure. Most of the available toxicity values are for oral exposure. Many inhalation values are also available. No values are currently available for dermal exposure. This is due to the lack of scientific studies available to quantify dermal toxicity and carcinogenic potential for the vast majority of priority pollutants. In addition, until recently, scientists have assumed that the hazards due to dermal exposures were minimal in comparison with those due to oral exposure. However, it appears that in many instances the hazards due to dermal exposure may be as great or greater.

In the absence of dermal reference toxicity values, USEPA has suggested (EPA, 1989a) that in some cases it is appropriate to modify an oral RfD so it can be used to estimate the hazard incurred by dermal exposure. This requires that the toxic endpoints observed are the same for both oral and dermal exposure, and that one has quantitative estimates of both dermal and oral absorption of the chemical. This information is not available for most priority pollutants, and oral toxicity values are nevertheless often used to quantify risks associated with dermal exposure. Consequently, any valuation of the contribution of dermal exposure to the overall hazard needs to be viewed as highly tentative at best.

USEPA RAGS (1989a) provides guidance for use of oral toxicity values in determining dermal toxicity. RfDs are expressed as the amount of substance administered per unit time and unit body weight (administered-dose), whereas exposure estimates for the dermal route of exposure are expressed as the amount of substance absorbed into the body per unit time and unit body weight (absorbed-dose). Thus, for dermal exposure to contaminants in water or in soil, it is necessary to adjust an oral toxicity value from an administered to an absorbed dose. Where oral absorption efficiencies were available, the oral RfD was converted to a dermal RfD by multiplying by oral absorption efficiency. Oral absorption factors and the calculated dermal RfDs are shown in **Table 3.4-1**.

In the absence of any information on absorption for the substance or chemically related substances, an oral absorption efficiency of 100 percent was assumed in accordance with USEPA Region 2 guidance (personal communication between A. Schatz of Parsons and M. Maddeloni of EPA Region 2).

3.4.1.3 Exposure Periods

As mentioned earlier, chronic RfDs and RfCs are set at levels such that human lifetime exposure at or below these levels should not result in adverse health effects, even for the most sensitive members of the population. These values are ideally based on chronic exposure studies in humans or animals. Chronic exposure for humans is considered to be exposure of roughly seven years or more, based on exposure of rodents for one year or more in animal toxicity studies. For institution students, recreational visitors, trespassers, day care children and construction workers, chronic RfDs and RfCs were used to conservatively assess risks for shorter exposure periods.

3.4.2 Carcinogenic Effects

For chemicals that exhibit carcinogenic effects, most authorities recognize that one or more molecular events can evoke changes in a single cell or a small number of cells that can lead to tumor formation. This is the non-threshold theory of carcinogenesis which purports that any level of exposure to a carcinogen can result in some finite possibility of generating the disease. Generally, regulatory agencies assume the non-threshold hypothesis for carcinogens in the absence of information concerning the mechanisms of action for the chemical of concern.

USEPA's Carcinogen Risk Assessment Verification Endeavor (CRAVE) has developed slope factors and unit risks (i.e., dose-response values) for estimating excess lifetime cancer risks associated with various levels of lifetime exposure to potential human carcinogens. The carcinogenic slope factors can be used to estimate the lifetime excess cancer risk associated with exposure to a potential carcinogen. Risks estimated using slope factors are considered unlikely to underestimate actual risks, but they may overestimate actual risks. Excess lifetime cancer risks are generally expressed in scientific notation. An excess lifetime cancer risk of 1×10^{-6} (one in a million), for example, represents the probability of an individual developing cancer over a lifetime as a result of exposure to the specific carcinogenic chemical. USEPA considers total excess lifetime cancer risks within the range of 10^{-4} (one in ten thousand) to 10^{-6} (EPA, 1989a) to be acceptable when developing remedial alternatives for cleanup of Superfund Sites.

In practice, slope factors are derived from the results of human epidemiology studies or chronic animal bioassays. The data from animal studies are fitted to the linearized, multistage model and a dose-response curve is obtained. The upper limit of the 95th percentile confidence-interval slope of the dose-response curve is subjected to various adjustments, and an interspecies scaling factor is applied to conservatively derive the slope factor for humans. This linearized multistage procedure leads to a plausible upper limit of the risk that is consistent with some proposed mechanisms of carcinogenesis. Thus, the actual risks associated with exposure to a potential carcinogen are not likely to exceed the risks estimated using these slope factors, but they may be much lower. Dose-response data derived from human epidemiological studies are fitted to dose-time-response curves on an ad-hoc basis. These models provide rough but plausible estimates of the upper limits on lifetime risk. Slope factors based on human epidemiological data are also derived using very conservative assumptions and, as such, are considered unlikely to underestimate risks. In summary, while the actual risks associated with exposures to potential carcinogens are unlikely to be higher than the risks calculated using a slope factor, they could be considerably lower.

In addition, there are varying degrees of confidence in the weight of evidence for carcinogenicity of a given chemical. The USEPA system involves characterizing the overall weight of evidence for a chemical's carcinogenicity based on availability of animal, human, and other supportive data. The weight-of-evidence classification is an attempt to determine the likelihood that the agent is a human carcinogen, and thus qualitatively affects the estimation of potential health risks. Three major factors are considered in characterizing the overall weight of evidence for carcinogenicity: (1) the quality of evidence from human studies, (2) the quality of evidence from animal studies, which are combined into a characterization of the overall weight of evidence for human carcinogenicity; and (3) other supportive information which is assessed to determine whether the overall weight of evidence should be modified. USEPA's final classification of the overall weight of evidence includes the following five categories:

Group A - Human Carcinogen – There is sufficient evidence from epidemiological studies to support a causal association between an agent and cancer.

Group B - Probable Human Carcinogen – There is at least limited evidence from epidemiological studies of carcinogenicity to humans (Group B1) or that, in the absence of adequate data on humans, there is sufficient evidence of carcinogenicity in animals (Group B2).

Group C - Possible Human Carcinogen – There is limited evidence of carcinogenicity in animals in the absence of data on humans.

Group D - Not Classified – The evidence for carcinogenicity in animals is inadequate.

Group E - No Evidence of Carcinogenicity to Humans – There is no evidence for carcinogenicity in at least two adequate animal tests in different species, or in both epidemiological and animal studies.

Slope factors and unit risks are developed by the USEPA based on epidemiological or animal bioassay data for a specific route of exposure, either oral or inhalation. For some chemicals, sufficient data are available to develop route-specific slope factors for inhalation and ingestion. For chemicals with only one route-specific slope factor but for which carcinogenic effects may also occur via another route, the available slope factor may be used by the USEPA to evaluate risks associated with several potential routes of exposure (EPA, 1989b).

A number of the chemicals of potential concern have been classified as carcinogens or potential carcinogens by USEPA, and each of these has also been assigned a carcinogenicity weight-of-evidence category, as shown in **Table 3.4-1**. These chemicals are:

Group A - Human Carcinogens

Benzene
Chromium
Nickel

Group B - Probable Human Carcinogens

Methylene Chloride
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Carbazole
Chrysene
Dibenz(a,h)anthracene
Indeno(1,2,3-cd)pyrene
bis(2-Ethylhexyl)phthalate
DDD, 4,4'-
DDE, 4,4'-
DDT, 4,4'-

Aldrin
Aroclor 1254
Dieldrin
Heptachlor
Heptachlor epoxide
alpha-BHC
alpha-Chlordane
Beryllium
Lead

Group C - Possible Human Carcinogens

4-Methylphenol
Butylbenzylphthalate
beta-BHC

All remaining chemicals of concern are either not found to have weight of evidence rankings or are Group D or E. Group D classification means that the data are insufficient to make a determination regarding carcinogenic potential while Group E compounds have been conclusively found to be non-carcinogenic. Chemicals of potential concern found at the SEADs with potential carcinogenic effects are shown in **Table 3.4-1** along with their cancer slope factors.

3.4.2.1 Cancer Slope Factors for Oral and Inhalation Exposure

The types of toxicity values used to evaluate the carcinogenic effects of chemicals include slope factors (SFs) for oral exposure, and unit risk factors (URFs) for inhalation exposure. Oral slope factors are reported as risk per dose $(mg/kg\text{-}day)^{-1}$. Inhalation unit risk factors are reported in units of risk per concentration $(mg/m^3)^{-1}$. To make use of the unit risk factors in calculating risks they first had to be converted to inhalation slope factors in units of $(mg/kg\text{-}day)^{-1}$. This conversion was made by assuming an inhalation rate of 20 m^3/day and an adult bodyweight of 70 kg. Thus:

$$\textbf{Inhalation slope factor (mg/kg-day)}^{-1} = UnitRisk\left(\frac{ug}{m^3}\right)^{-1} \times \frac{day}{20m^3} \times 70kg \times \frac{1000ug}{mg}$$

3.4.2.2 Cancer Slope Factors for Dermal Exposure

As discussed above, USEPA has not derived toxicity values for the dermal route of exposure. In the absence of dermal reference toxicity values, USEPA has suggested (EPA, 1989a) that, in some cases, it is appropriate to modify an oral slope factor so it can be used to estimate the risk incurred by dermal exposure. The oral slope factors were converted to dermal slope factors by dividing by the oral absorption efficiency. The same values presented in **Section 3.4.1.2** were used, however, if chemical specific modification factors were unavailable, oral values are used without adjustment. As discussed previously any valuation of the contribution of dermal exposure to the overall risk needs to be viewed as highly tentative at best. This is particularly true for PAH's which are carcinogens at the point of contact, i.e., to skin.

3.4.2.3 Toxic Equivalency Factors

When slope factors and unit risks were not available for all potentially carcinogenic members of a chemical class, toxicity values were calculated using toxicity equivalency factors (TEFs). TEFs are values that compare the carcinogenic potential of a given chemical in a class to the carcinogenic potential of a chemical in the class that has a verified slope factor and/or unit risk. USEPA has provided TEFs for PAHs (EPA, 1993b). TEF values are as follows:

PAH	TEF
Benzo(a)pyrene	1.0
Benzo(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Dibenzo(a,h)anthracene	1.0
Chrysene	0.001
Indeno(1,2,3-cd)pyrene	0.1

To calculate a slope factor or unit risk for a given PAH the appropriate TEF value is multiplied by the slope factor or unit risk for benzo(a)pyrene.

3.5 RISK CHARACTERIZATION

3.5.1 Introduction

To characterize risk, toxicity and exposure assessments were summarized and integrated into quantitative and qualitative expressions of risk. To characterize potential non-carcinogenic effects, comparisons were made between projected intakes of substances and toxicity values. To characterize potential carcinogenic effects, probabilities that an individual will develop cancer over a lifetime of exposure are estimated from projected intakes and chemical-specific dose-response information. Major assumptions, scientific judgments, and, to the extent possible, estimates of the uncertainties embodied in the assessment are also presented.

3.5.1.1 Non-carcinogenic Effects

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified period with an RfD derived for a similar exposure period. This ratio of exposure to toxicity is called a hazard quotient according to the following equation:

$$\textit{Noncancer Hazard Quotient} = E/RfD$$

where:

E = Exposure level or intake (mg/kg-day), and
RfD = Reference Dose (mg/kg-day)

The noncancer hazard quotient assumes that there is a level of exposure (i.e., an RfD) below which it is unlikely for even sensitive populations to experience adverse health effects. If the exposure level (E) exceeds the threshold (i.e., If E/RfD exceeds unity) there may be concern for potential noncancer effects.

To assess the overall potential for non-carcinogenic effects posed by more than one chemical, a hazard index (HI) approach has been developed by the USEPA. This approach assumes that simultaneous sub-threshold exposures to several chemicals could result in an adverse health effect. It also assumes that the magnitude of the adverse effect will be proportional to the sum of the ratios of the subthreshold exposures to respective acceptable exposures.

This is expressed as:

$$HI = E_1/RfD_1 + E_2/RfD_2 + ... + E_i/RfD_i$$

where:

E_i = the exposure level or intake of the I toxicant, and
RfD_i= reference dose for the i^{th} toxicant.

While any single chemical with an exposure level greater that the toxicity value will cause the HI to exceed unity, for multiple chemical exposures, the HI can also exceed unity even if no single chemical exposure exceeds its RfD. The assumption of dose additivity reflected in the HI is best applied to compounds that induce the same effects by the same mechanisms. Applying the HI to cases where the known compounds do not induce the same effect may overestimate the potential for effects. To assess the overall potential for non-carcinogenic effects posed by several exposure pathways, the total HI for chronic exposure is the sum of the HI's for each pathway, for each receptor.

3.5.1.2 Carcinogenic Effects

For carcinogens, risks are estimated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen (i.e., excess individual lifetime cancer risk). The slope factor converts estimated daily intakes averaged over a lifetime of exposure directly to incremental risk of an individual developing cancer. It can generally be assumed that the dose-response relationship will be linear in the low-dose portion of the multistage model dose-response curve. Under this assumption, the slope factor is a constant, and risk will be directly related to intake. Thus, the following linear low-dose equation was used in this assessment:

$$Risk = CDI \times SF$$

where:

Risk = A unitless probability of an individual developing cancer,
CDI = Chronic Daily Intake over 70 years (mg/kg-day), and
SF = Slope Factor $(mg/kg\text{-}day)^{-1}$

Because the slope factor is often an upper 95th-percentile confidence limit of the probability of a response and is based on animal data used in the multistage model, the carcinogenic risk will generally be an upper-bound estimate. This means that the "true risk" is not likely to exceed the risk estimate derived through this model and is likely to be less than predicted.

For simultaneous exposure to several carcinogens, the USEPA assumes that the risks are additive. That is to say:

$$\mathbf{Risk_T = Risk1 + Risk2 + ... + Risk_i}$$

where:

$Risk_T$ = Total cancer risk, expressed as a unitless probability, and
$Risk_i$ = Risk estimate for the ith substance.

Addition of the carcinogenic risks is valid when the following assumptions are met:

- doses are low,
- no synergistic or antagonistic interactions occur, and
- similar endpoints are evaluated.

According to guidance in the National Contingency Plan, the target overall lifetime carcinogenic risks from exposures for determining clean-up levels should range from 10^{-4} to 10^{-6}.

3.5.2 Risk Summary

Human health risks were calculated for site-specific future exposure scenarios at both SEAD-59 and SEAD-71. The receptors and exposure scenarios were based on the expected future land use for the site. Both sites are located in an area designated Planned Industrial Development.

Cancer and non-cancer risks at each site were calculated for all applicable exposure routes and are presented in **Tables 3.5-1** through **3.5-4**. These tables also serve as a guide to the tables in Appendices A and B which show risk calculations for each exposure route. The following section highlights the exposure scenarios at each site which result in risks that exceed the

USEPA defined targets (lifetime cancer risk range of 10^{-4} to 10^{-6}; non-cancer hazard index less than one).

Human health risks were calculated for the following seven exposure scenarios at each site:

- Current site worker
- Future industrial worker
- Future construction worker
- Future child trespasser
- On-Site day care center worker
- Child attending on-site day care center
- Future Residents (for pre-disposal goal evaluation)

The potential exposure pathways associated with each receptor are summarized in **Figure 3-2**.

The estimated human health risks for each site are discussed below.

3.5.2.1 SEAD-59

Tables 3.5-1 and **3.5-2** summarize the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. Table 3.5-1 displays the results for the reasonable maximum exposure (RME) and Table 3.5-2 for the central tendency (CT). The total cancer risk from all exposure routes is within the EPA target range for all receptors. Likewise, the total non-cancer hazard index from all exposure routes is less than one for all receptors.

3.5.2.2 SEAD-71

Tables 3.5-3 and **3.5-4** summarize the calculated cancer and non-cancer risks for all receptors and exposure routes considered in this risk assessment. Table 3.5-3 displays the results for the reasonable maximum exposure (RME) and Table 3.5-4 for the central tendency (CT). The total cancer risk from all exposure routes is within the EPA target range for all receptor except for the future day care center worker, future day care center child, and the future resident.

The cancer risk of the day care center worker, based on RME, is 5×10^{-4}. The value based on CT drops to 6×10^{-5}, which is within the target range for cancer risk. The cancer risk of the day care center child based on RME is 1×10^{-3} and based on CT is 2×10^{-4}. The elevated risk for both

TABLE 3.5-1
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-59
REASONABLE MAXIMUM EXPOSURE (RME)
PLANNED INDUSTRIAL DEVELOPMENT SCENARIO
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table A-10	1E-006	2E-012
	Ingestion of Onsite Soils	Table A-12	4E-004	1E-006
	Dermal Contact to Onsite Soils	Table A-14	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*4E-004*	*1E-006*
FUTURE INDUSTRIAL WORKER	Ingestion of Groundwater	Table A-18	7E-005	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*7E-005*	*NQ*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table A-10	2E-005	3E-011
	Ingestion of Onsite Soils	Table A-12	4E-002	1E-005
	Dermal Contact to Onsite Soils	Table A-14	5E-003	3E-009
	TOTAL RECEPTOR RISK (Nc & Car)		*4E-002*	*1E-005*
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table A-10	5E-007	2E-013
	Ingestion of Onsite Soils	Table A-12	3E-003	2E-006
	Dermal Contact to Onsite Soils	Table A-14	1E-003	3E-009
	TOTAL RECEPTOR RISK (Nc & Car)		*4E-003*	*2E-006*
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table A-10	3E-005	1E-011
	Ingestion of Onsite Soils	Table A-12	5E-002	4E-005
	Dermal Contact to Onsite Soils	Table A-14	NQ	NQ
	Ingestion of Groundwater	Table A-18	2E-004	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-002*	*4E-005*
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table A-10	1E-005	2E-011
	Ingestion of Onsite Soils	Table A-12	5E-003	2E-005
	Dermal Contact to Onsite Soils	Table A-14	NQ	NQ
	Ingestion of Groundwater	Table A-18	7E-005	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-003*	*2E-005*

NQ = Not Quantified due to lack of toxicity data

TABLE 3.5-1
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-59
REASONABLE MAXIMUM EXPOSURE (RME)
PLANNED RESIDENTIAL DEVELOPMENT SCENARIO
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RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
RESIDENT (ADULT)	Inhalation of Dust in Ambient Air	Table A-10	5E-005	7E-011
	Ingestion of Soil	Table A-12	7E-003	2E-005
	Dermal Contact to Soil	Table A-14	NQ	NQ
	Inhalation of Ground Water	Table A-16	NQ	NQ
	Ingestion of Ground Water	Table A-18	9E-005	NQ
	Dermal Contact to Ground Water	Table A-20	5E-006	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*7E-003*	*2E-005*
RESIDENT (CHILD)	Inhalation of Dust Ambient Air	Table A-10	9E-005	4E-011
	Ingestion of Soil	Table A-12	6E-002	6E-005
	Dermal Contact to Soil	Table A-14	NQ	NQ
	Inhalation of Ground Water	Table A-16	NQ	NQ
	Ingestion of Ground Water	Table A-18	2E-004	NQ
	Dermal Contact to Ground Water	Table A-20	9E-006	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*6E-002*	*6E-005*
TOTAL LIFETIME CANCER RISK	Inhalation of Dust in Ambient Air	Table A-10		1E-010
	Ingestion of Soil	Table A-12		8E-005
	Dermal Contact to Soil	Table A-14		NQ
	Inhalation of Ground Water	Table A-16		NQ
	Ingestion of Ground Water	Table A-18		NQ
	Dermal Contact to Ground Water	Table A-20		NQ
	TOTAL RECEPTOR RISK (Nc & Car)			*8E-005*

TABLE 3.5-2
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-59
CENTRAL TENDENCY (CT)
PLANNED INDUSTRIAL DEVELOPMENT SCENARIO
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RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table A-11	6E-007	3E-013
	Ingestion of Onsite Soils	Table A-13	1E-004	1E-007
	Dermal Contact to Onsite Soils	Table A-15	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-004*	*1E-007*
FUTURE INDUSTRIAL WORKER	Ingestion of Groundwater	Table A-19	6E-005	0E+000
	TOTAL RECEPTOR RISK (Nc & Car)		*6E-005*	*0E+000*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table A-11	1E-005	2E-011
	Ingestion of Onsite Soils	Table A-13	7E-003	3E-006
	Dermal Contact to Onsite Soils	Table A-15	8E-004	5E-010
	TOTAL RECEPTOR RISK (Nc & Car)		*8E-003*	*3E-006*
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table A-11	3E-007	2E-014
	Ingestion of Onsite Soils	Table A-13	7E-004	1E-007
	Dermal Contact to Onsite Soils	Table A-15	1E-004	6E-011
	TOTAL RECEPTOR RISK (Nc & Car)		*8E-004*	*1E-007*
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table A-11	3E-005	5E-012
	Ingestion of Onsite Soils	Table A-13	2E-002	9E-006
	Dermal Contact to Onsite Soils	Table A-15	NQ	NQ
	Ingestion of Groundwater	Table A-19	1E-004	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-002*	*9E-006*
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table A-11	1E-005	5E-012
	Ingestion of Onsite Soils	Table A-13	2E-003	2E-006
	Dermal Contact to Onsite Soils	Table A-15	NQ	NQ
	Ingestion of Groundwater	Table A-19	6E-005	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-003*	*2E-006*

TABLE 3.5-2
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-59
CENTRAL TENDENCY (CT)
PLANNED RESIDENTIAL DEVELOPMENT SCENARIO
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RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
RESIDENT (ADULT)	Inhalation of Dust in Ambient Air	Table A-11	3E-005	1E-011
	Ingestion of Soil	Table A-13	2E-003	2E-006
	Dermal Contact to Soil	Table A-15	NQ	NQ
	Inhalatiou of Ground Water	Table A-17	NQ	NQ
	Iugestion of Ground Water	Table A-19	4E-005	NQ
	Dermal Contact to Ground Water	Table A-21	2E-006	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-003*	*2E-006*
RESIDENT (CHILD)	Inhalation of Dust Ambient Air	Table A-11	6E-005	8E-012
	Ingestion of Soil	Table A-13	2E-002	6E-006
	Dermal Contact to Soil	Table A-15	NQ	NQ
	Inhalation of Ground Water	Table A-17	NQ	NQ
	Ingestion of Ground Water	Table A-19	1E-004	NQ
	Dermal Contact to Ground Water	Table A-21	5E-006	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-002*	*6E-006*
TOTAL LIFETIME CANCER RISK	Inhalation of Dust in Ambient Air	Table A-11		2E-011
	Ingestion of Soil	Table A-13		9E-006
	Dermal Contact to Soil	Table A-15		NQ
	Inhalation of Ground Water	Table A-17		NQ
	Ingestion of Ground Water	Table A-19		NQ
	Dermal Contact to Ground Water	Table A-21		NQ
	TOTAL RECEPTOR RISK (Nc & Car)			*9E-006*

TABLE 3.5-3
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
PLANNED INDUSTRIAL DEVELOPMENT SCENARIO
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RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table B-10	3E-007	5E-011
	Ingestion of Onsite Soils	Table B-12	3E-003	4E-005
	Dermal Contact to Onsite Soils	Table B-14	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-003*	*4E-005*
FUTURE INDUSTRIAL WORKER	Ingestion of Groundwater	Table B-18	4E+000	3E-005
	TOTAL RECEPTOR RISK (Nc & Car)		*4E+000*	*3E-005*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table B-10	2E-005	1E-010
	Ingestion of Onsite Soils	Table B-12	1E-001	9E-005
	Dermal Contact to Onsite Soils	Table B-14	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*1E-001*	*9E-005*
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table B-10	1E-007	4E-012
	Ingestion of Onsite Soils	Table B-12	2E-002	5E-005
	Dermal Contact to Onsite Soils	Table B-14	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*2E-002*	*5E-005*
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table B-10	7E-006	3E-010
	Ingestion of Onsite Soils	Table B-12	3E-001	1E-003
	Dermal Contact to Onsite Soils	Table B-14	NQ	NQ
	Ingestion of Groundwater	Table B-18	8E+000	1E-005
	TOTAL RECEPTOR RISK (Nc & Car)		*9E+000*	*1E-003*
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table B-10	3E-006	5E-010
	Ingestion of Onsite Soils	Table B-12	4E-002	5E-004
	Dermal Contact to Onsite Soils	Table B-14	NQ	NQ
	Ingestion of Groundwater	Table B-18	4E+000	3E-005
	TOTAL RECEPTOR RISK (Nc & Car)		*4E+000*	*5E-004*

NQ = Not Quantified due to lack of toxicity data.

TABLE 3.5-3
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
PLANNED RESIDENTIAL DEVELOPMENT SCENARIO
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Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
RESIDENT (ADULT)	Inhalation of Dust in Ambient Air	Table B-10	1E-005	2E-009
	Ingestion of Soil	Table B-12	5E-002	6E-004
	Dermal Contact to Soil	Table B-14	NQ	NQ
	Inhalation of Ground Water	Table B-16	NQ	NQ
	Ingestion of Ground Water	Table B-18	5E+000	4E-005
	Dermal Contact to Ground Water	Table B-20	2E-001	1E-005
	TOTAL RECEPTOR RISK (Nc & Car)		*5E+000*	*7E-004*
RESIDENT (CHILD)	Inhalation of Dust Ambient Air	Table B-10	2E-005	8E-010
	Ingestion of Soil	Table B-12	5E-001	1E-003
	Dermal Contact to Soil	Table B-14	NQ	NQ
	Inhalation of Ground Water	Table B-16	NQ	NQ
	Ingestion of Ground Water	Table B-18	1E+001	2E-005
	Dermal Contact to Ground Water	Table B-20	3E-001	5E-006
	TOTAL RECEPTOR RISK (Nc & Car)		*1E+001*	*1E-003*
TOTAL LIFETIME CANCER RISK	Inhalation of Dust in Ambient Air	Table B-10		2E-009
	Ingestion of Soil	Table B-12		2E-003
	Dermal Contact to Soil	Table B-14		NQ
	Inhalation of Ground Water	Table B-5		NQ
	Ingestion of Ground Water	Table B-18		6E-005
	Dermal Contact to Ground Water	Table B-20		1E-005
	TOTAL RECEPTOR RISK (Nc & Car)			*2E-003*

TABLE 3.5-4
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-71
CENTRAL TENDENCY (CT)
PLANNED INDUSTRIAL DEVELOPMENT SCENARIO
SEAD-71
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Seneca Army Depot Activity

RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
CURRENT SITE WORKER	Inhalation of Dust in Ambient Air	Table B-11	1E-007	7E-012
	Ingestion of Onsite Soils	Table B-13	7E-004	3E-006
	Dermal Contact to Onsite Soils	Table B-15	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*7E-004*	*3E-006*
FUTURE INDUSTRIAL WORKER	Ingestion of Groundwater	Table B-19	3E+000	6E-006
	TOTAL RECEPTOR RISK (Nc & Car)		*3E+000*	*6E-006*
FUTURE ON-SITE CONSTRUCTION WORKERS	Inhalation of Dust in Ambient Air	Table B-11	1E-005	1E-010
	Ingestion of Onsite Soils	Table B-13	3E-002	2E-005
	Dermal Contact to Onsite Soils	Table B-15	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*3E-002*	*2E-005*
FUTURE TRESSPASSER	Inhalation of Dust in Ambient Air	Table B-11	6E-008	4E-013
	Ingestion of Onsite Soils	Table B-13	5E-003	3E-006
	Dermal Contact to Onsite Soils	Table B-15	NQ	NQ
	TOTAL RECEPTOR RISK (Nc & Car)		*5E-003*	*3E-006*
FUTURE DAY CARE CENTER CHILD	Inhalation of Dust in Ambient Air	Table B-11	6E-006	1E-010
	Ingestion of Onsite Soils	Table B-13	1E-001	2E-004
	Dermal Contact to Onsite Soils	Table B-15	NQ	NQ
	Ingestion of Groundwater	Table B-19	7E+000	6E-006
	TOTAL RECEPTOR RISK (Nc & Car)		*8E+000*	*2E-004*
FUTURE DAY CARE CENTER WORKER	Inhalation of Dust in Ambient Air	Table B-11	3E-006	1E-010
	Ingestion of Onsite Soils	Table B-13	2E-002	6E-005
	Dermal Contact to Onsite Soils	Table B-15	NQ	NQ
	Ingestion of Groundwater	Table B-19	3E+000	6E-006
	TOTAL RECEPTOR RISK (Nc & Car)		*3E+000*	*6E-005*

TABLE 3.5-4
CALCULATION OF TOTAL NONCARCINOGENIC AND CARCINOGENIC RISKS - SEAD-71
CENTRAL TENDENCY (CT)
PLANNED RESIDENTIAL DEVELOPMENT SCENARIO
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RECEPTOR	EXPOSURE ROUTE	EXPOSURE/RISK CALCULATIONS Table Number	HAZARD INDEX	CANCER RISK
RESIDENT (ADULT)	Inhalation of Dust in Ambient Air	Table B-11	7E-006	3E-010
	Ingestion of Soil	Table B-13	2E-002	6E-005
	Dermal Contact to Soil	Table B-15	NQ	NQ
	Inhalation of Ground Water	Table B-17	NQ	NQ
	Ingestion of Ground Water	Table B-19	2E+000	5E-006
	Dermal Contact to Ground Water	Table B-21	7E-002	1E-006
	TOTAL RECEPTOR RISK (Nc & Car)		*2E+000*	*7E-005*
RESIDENT (CHILD)	Inhalation of Dust Ambient Air	Table B-11	1E-005	2E-010
	Ingestion of Soil	Table B-13	2E-001	2E-004
	Dermal Contact to Soil	Table B-15	NQ	NQ
	Inhalation of Ground Water	Table B-17	NQ	NQ
	Ingestion of Ground Water	Table B-19	6E+000	3E-006
	Dermal Contact to Ground Water	Table B-21	1E-001	6E-007
	TOTAL RECEPTOR RISK (Nc & Car)		*6E+000*	*2E-004*
TOTAL LIFETIME CANCER RISK	Inhalation of Dust in Ambient Air	Table B-11		5E-010
	Ingestion of Soil	Table B-13		2E-004
	Dermal Contact to Soil	Table B-15		NQ
	Inhalation of Ground Water	Table B-17		NQ
	Ingestion of Ground Water	Table B-19		8E-006
	Dermal Contact to Ground Water	Table B-21		2E-006
	TOTAL RECEPTOR RISK (Nc & Car)			*2E-004*

receptors is primarily due to the ingestion of onsite soils with benzo[a]pyrene and dibenz[a,h]anthracene being the most significant risk contributors.

For the resident, the total lifetime cancer risk based on RME is $2x10^{-3}$. The total lifetime cancer risk CT value of $2x10^{-4}$ also exceeds the EPA target range. Both of the elevated cancer risk values are primarily due to the childhood ingestion of soil. The adult ingestion of soil is also a significant contributor to the elevated RME risk value. Benzo[a]anthracene, benzo[a]pyrene, and dibenz[a,h]anthracene are the compounds which most contribute to the elevated risk. The total non-cancer hazard index (HI) based on the RME exceeds one for the industrial worker (HI=4), day care center worker (HI=4) the day care center child (HI=9), the adult resident (HI=5), and the child resident (HI=13). These values decrease based on the CT but still exceed one for all of the previously mentioned receptors (industrial worker (HI=3), day care center worker (HI=3), day care center child (HI=8), adult resident (HI=2), and child resident (HI=6)). The elevated hazard index for all receptors is due solely to ingestion of groundwater, with iron, manganese, and aluminum being the most significant risk contributors.

3.5.3 Risk Characterization for Lead

The previous analyses of the current and future land use exposure scenarios do not include any quantification of risk for lead since no approved RfD, RfC, slope factor or inhalation unit risk currently are available. Lead was detected at SEAD-71 in soil and groundwater at the levels indicated below. This section qualitatively addresses the risk from lead exposure at this site.

	No. of Hits	Frequency of detection	Mean mg/kg	Max Hit mg/kg	95% UCL of Mean mg/kg
Total soils	34	100%	185	3470	267
Surface soils	21	100%	284	3470	557

The effects of lead are the same regardless of whether it enters the body through breathing or ingestion. The major health threat from lead arises from the damage it causes to the brain, especially in fetuses, infants and young children, which are not part of the current site users. Young and developing humans are highly sensitive to its effects. Also, young children are prone to ingest more lead as a result of normal mouthing behavior. Decreased IQ and reduced growth may result from childhood exposure. Fetal exposure may result in pre-term birth, reduced birth weight, and decreased IQ. Some of the health effects of lead, particularly changes in the levels of certain blood enzymes and in aspects of children's neurobehavioral development, may occur at blood levels so low as to be essentially without a threshold.

Lead exposures may increase blood pressure in middle-aged men. High-level exposure can severely damage the brain and kidneys in adults or children. In addition, high doses of lead will cause abortion and damage to the male reproductive system. The USEPA currently does not provide any toxicity values for lead. The USEPA has placed lead in weight-of-evidence Group B2, indicating that it is a probable human carcinogen.

USEPA has developed different approaches for assessing risks from adult and child exposure to lead. To address adult exposures, EPA issued "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (USEPA, December 1996c). To address child exposures, the OSWER directive #9355-12 and 40 CFR Part 475, "Lead; Identification of Dangerous Levels of Lead; Final Rule" are recommended. The analysis of potential risk from exposure to lead at SEAD-71 follows these recommendations for adult and child exposures, respectively.

Child Exposure

The EPA has set a soil-lead hazard standard of 400ppm for bare soil in play areas and an average of 1,200 ppm for bare soil in the non-play area portion of the yard (40 CFR 475). The OSWER directive #9355-12 indicates that these screening levels may be used as a tool to determine which sites or portions of sites do not require further study.

The average concentrations of lead, 285mg/kg and 185mg/kg, in surface and total soils respectively, are lower than both of the EPA recommended screening levels discussed above. Only two of the 34 samples exceed the 400mg/kg screening level. The concentrations of these two samples are 3470mg/kg and 572mg/kg.

Adult Occupational Exposure

To qualitatively assess risks from adult occupational lead exposure, the site concentrations are compared with risk-based remediation goals (RBRGs) presented in "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (USEPA, December 1996). In this report, EPA presents a model to calculate target soil concentrations of lead (RBRGs) at which the exposure for a women of child-bearing age would minimize risk to her fetus. Thus, while adult exposure is addressed by EPA's analysis, the most sensitive receptor (i.e., the fetus) is being protected.

EPA has calculated RBRGs for lead in soil using their recommended default parameters as inputs to the model. For a homogeneous, non-urban population exposed for 219 days per year, EPA suggests an RBRG of 1750 mg/kg lead in soil. The EPA RBRG for urban areas is 750 mg/kg. While SEDA is more comparable to the non-urban case, the Army believes a more conservative RBRG of 1250 mg/kg is appropriate for the Seneca Army Depot.

The maximum concentration for lead in surface soil and total soils at SEAD-71 is 3470 mg/kg. This is the only sample, of the 34 samples analyzed, which exceeds the Army target value of 1,250 mg/kg discussed above. The highest outdoor air EPC for lead is 0.0095 ug/m^3. This value is lower than the National Ambient Air Quality Standard for lead, which is 1.5 ug/m^3 (based on a 3-month average).

These results suggest that lead does not pose a health risk upon regular exposure to the site soils for any receptor at the site.

3.5.4 Uncertainty Assessment

All risk assessments involve the use of assumptions, judgements, and imperfect data to varying degrees. This results in uncertainty in the final estimates of risk. There are uncertainties associated with each component of the risk assessment from data collection through risk characterization. For example, there is uncertainty in the initial selection of substances used to characterize exposures and risk on the basis of the sampling data and available toxicity information. Other sources of uncertainty are inherent in the toxicity values for each substance and the exposure assessments used to characterize risk. Finally, additional uncertainties are incorporated into the risk assessment when exposures to several substances across multiple pathways are summed. Areas of uncertainty in each risk assessment step are discussed below.

3.5.4.1 Uncertainty in Data Collection and Evaluation

Uncertainties in the data collection/evaluation step of the risk assessment focus on determining whether enough samples were collected to adequately characterize the risk, and if sample analyses were conducted in a qualified manner to maximize the confidence in the results.

Results of the sample analyses were used to develop a database that includes a complete list of the chemicals by media and their representative concentrations used in the risk assessment. The sampling and analysis addressed various objectives in addition to the risk assessment. Therefore, the samples were not collected randomly but were collected from areas of the site with the greatest likelihood to be contaminated. This type of non-random sampling biases the data collected toward overestimating chemical concentrations from the site.

All chemicals detected that were potentially site-related were retained in this assessment. Chemicals that were never detected were eliminated from the assessment. This practice may slightly underestimate risks due to low levels (i.e., below the sample quantitation limit) of eliminated chemicals. Since samples were collected at areas where concentrations were expected to be high and the maximum concentrations were used for the assessment, it is very unlikely that any chemicals were present at the site at health-significant levels and not detected in at least one sample. However, if this did occur, this assumption will underestimate risk.

The 95% UCL of the mean concentrations were used to calculate site-related risks. Since that assumption implies chronic exposure to the 95% UCL of the mean concentration, this assumption is likely to overestimate risk.

3.5.4.2 Uncertainty in Exposure Assessment

There are inherent uncertainties in predicting future land uses and future chemical concentrations. Future land use scenarios were based on the Land Reuse Plan developed by the Land Redevelopment Authority.

A large part of the risk assessment is the estimation of risks for a broad set of exposure scenarios and pathways. If exposure does not occur, no risks are present. This assessment does not factor in the probability of the exposure occurring. For certain pathways, exposure may be extremely unlikely. For example, the future receptors are assumed to drink groundwater. It is unlikely that this will occur, since there is a current acceptable water supply, and the aquifer beneath the site is not believed to be productive enough to supply the needs of the future land uses. This assumption yields an overestimate of risk for this scenario.

Once pathways are identified, exposure point concentrations must be estimated. There is always some doubt as to how well an exposure model approximates the actual conditions receptors will be exposed to at a given site. Key assumptions in estimating exposure point concentrations and exposure assumptions and their potential impact on the assessment are described in the following paragraphs.

As summarized in **Table 3.3-1**, there are many factors that determine the level of exposure for each exposure pathway. These factors include inhalation rates, ingestion rates, exposure frequencies, exposure duration, body weight, etc. The values for these exposure factors must be selected by the risk assessor to represent each receptor. For the scenarios in this risk assessment, upper bound values were selected for each exposure factor. In the calculations of exposure, these multiple upper-bound exposure factor estimates compound to yield intakes and absorbed doses that overestimate likely exposure levels.

The EPCs (i.e., 95% UCL of the mean) derived from the measured chemical concentrations are assumed to persist without change for the entire duration of each exposure scenario. It is likely that some degradation would occur over time, particularly for some of the organic compounds, that would reduce the current concentrations. Therefore, this steady state assumption tends to overestimate exposure levels.

3.5.4.3 Uncertainty in Toxicity Assessment

Of the chemicals of potential concern, some had no reference dose or slope factors. They are:

- acenaphthylene
- benzo(g,h,i)perylene
- dibenzofuran
- phenanthrene
- delta-BHC
- endrin aldehyde
- endrin keytone
- lead
- sodium

Several of these compounds have toxicity information such as weight of evidence classification indicating a strong potential for adverse health effects, particularly lead. The absence of toxicity values for these chemicals tends to underestimate risks.

There is considerable uncertainty inherent in the toxicity values for both carcinogens and non-carcinogens. Many of the studies are based on animals and extrapolated to humans, and in some cases, subchronic studies must be used to assess chronic effects. Most cancer slope factors are calculated using a model that extrapolates low dose effects from high dose animal studies. Because toxicity constants are generally based on the upper limit of the 95th-percentile confidence interval or incorporate safety factors to compensate for uncertainty, chemical-specific risks may be overestimated.

Toxicity information was not available for dermal exposure; hence, several assumptions had to be made which may tend to over- or underestimate risk. Oral toxicity values were used without adjustment to calculate risks from dermal exposure because the USEPA has not derived toxicity values for this route of exposure. However, values found in the literature (Owen, 1990) indicate that the uncertainty associated with using oral absorption to estimate dermal absorption is likely less than one order of magnitude. This is due to the lack of scientific studies available to quantify dermal toxicity and carcinogenic potential for the vast majority of priority pollutants and because chemical specific information needed to convert ingested dose to absorbed dose is not available.

3.5.4.4 Uncertainty in Risk Characterization

Uncertainties in the toxicity assessment are compounded under the assumption of dose additivity for multiple substance exposure. That assumption ignores possible synergisms and antagonisms among chemicals, and assumes similarity in mechanisms of action and metabolism. Overall, these assumptions would tend to overestimate risk. Similarly, risks summed for chemicals having various weight-of-evidence classifications as well as different target organs may also tend to overestimate risk.

3.6 ECOLOGICAL RISK ASSESSMENT (ERA)

3.6.1 Objectives and Overview

In addition to the evaluation of human health, this risk assessment considers the risk posed by the site to its ecological communities. This ecological risk assessment (ERA) is intended to indicate the potential, if any, of chemicals found at SEADs-59 and 71 to pose a risk or stress to plants or animals which may inhabit or visit any of these sites.

Other areas of SEDA have been studied to characterize the ecological communities at SEDA in general and at specific SEADs (e.g. SEADs 16, 17, 25 and 26). Field surveys during the Remedial Investigations of these SEADs produced an understanding of the habitat, vegetative communities and wildlife species present at the site. Since the land at the sites considered in this risk assessment is environmentally similar to the other areas at SEDA which have been studied in depth, the existing ecological characterizations are considered to apply as well to these sites. Therefore, this ERA is based upon the findings of these prior field surveys. An ecological field survey specific to SEADs-59 and 71 has not been performed.

As preceding sections of this report have indicated, the existing site-specific database of chemical and physical information was developed to characterize the types, locations, and concentrations of chemicals in soil and groundwater. Calculations in this ERA are conservatively based on the maximum concentrations of each chemical detected in the medium of potential concern to ecological receptors (e.g., soil).

The ERA addresses potentially significant risks to the following biological groups and special-interest resources associated with the site: vascular vegetation, wildlife, aquatic life, endangered and threatened species, and wetlands. The focus of the ERA lies in the evaluation of the potential toxicity of each constituent of potential concern (COPC) in soil and defines toxicity benchmark values that will be used to calculate the ecological risk quotient.

The purpose of the ERA is to evaluate the likelihood that adverse ecological effects are occurring or may occur as a result of exposure to chemicals associated with the site based on a weight-of-evidence approach. An ecological risk does not exist unless a given contaminant has the ability to cause one or more adverse effects and it is contacted by, an ecological receptor for a sufficient length of time, or at a sufficient intensity to elicit the identified adverse effect(s) (EPA, 1997a).

In this ERA, ecological receptors were determined based on prior studies at SEDA. Impacts from exposure to these receptors are determined using conservative assumptions to assure that a reasonable degree of protection is maintained. Ecological risk is then presented in terms of a hazard quotient (HQ), which is defined as the ratio of the estimated exposure point concentration to an appropriate toxicity reference value (TRV). Separate HQs are calculated for each contaminant/receptor pair. Uncertainties are the greatest and arise from extrapolation of the available toxicity data and inference regarding exposure. In general, ratios of exposure point concentration to TRV greater than one (1) are considered to indicate a potential risk. Due to the uncertainties associated with using this approach, safety factors are considered in interpreting the findings. HQs between 1 and 10 are interpreted as having some potential for adverse effects; whereas, HQs between 10 and 100 indicate a significant potential for adverse effects. HQs greater than 100 indicate adverse effects can be expected.

3.6.2 Problem Formulation

Problem formulation establishes the goals, breadth, and focus of the ERA through the following:

- Identification of the ecological contaminants of potential concern (COPCs);
- Identification of potential ecological effects;
- Development and review of information about ecosystems potentially at risk, contaminant fate and transport, and complete exposure pathways;
- Selection of assessment endpoints;
- Presentation of an ecological conceptual site model; and
- Selection of an analysis plan (including measures of effects).

Each of these steps is discussed and described in the following sections.

3.6.2.1 Identification of Ecological Constituents of Potential Concern

Chemicals detected in any soil sample were considered constituents of potential concern (COPCs) for this ERA. Screening analyses designed to reduce the list of COPCs were not performed for this ERA. The highest concentration for each COPC measured in samples from each of the sites was used as the exposure point concentration (EPC) in the calculations presented later in this section for the site.

3.6.2.2 Identification of Potential Ecological Effects

Available state and federal databases and literature sources were reviewed to determine if there were any known threatened or endangered plant or animal species present at or near the Depot. Additionally, a literature search was conducted to obtain information on the identified ecological contaminants of potential concern and their potential ecological effects on species of potential concern at the Depot. Topics reviewed during this assessment included information for exposure profiles, bioavailability or bioconcentration factors for various COPCs, life-history information for the species of concern or the surrogate species, and an ecological effects profile.

3.6.2.3 Ecosystems at Risk, Contaminant Fate and Transport, and Complete Exposure Pathways

3.6.2.3.1 Site Habitat Characterization

Detailed site-specific ecological evaluations of the plant and animal habitats and communities found at SEADs-59 and 71 have not been conducted. Characterizations of the site habitat and ecological communities present at the subject sites are based on general observations made during preliminary site investigations and on the results of detailed ecological evaluations and assessment that have been conducted at other SWMUs at the Depot (i.e., for SEADs-16, 17, 25 and 26 and the Open Burning (OB) Grounds) as part of remedial investigations. The results and findings of the detailed ecological characterizations completed at the other four SWMUs are assumed to be representative of the sites included in this ERA. Key aspects of these characterizations relevant to this risk assessment are presented below.

Ecological site characterizations were based on compilation of existing ecological information and on-site reconnaissance activities. The methods used to characterize the ecological resources included site-walkovers for the evaluation of existing wildlife and vegetative communities; interviews with local, state, and SEDA resource personnel; and review of environmental data obtained from previous Army reports. SEDA has a strong wildlife management program that is reviewed and approved by the New York Fish and Game Agency. The Depot manages an annual white-tailed deer (Odocoileus virginiana) harvest and has constructed a large wetland called the "duck pond" in the northeastern portion of the facility to provide a habitat for migrating waterfowl.

The NYSDEC Natural Heritage Program Biological and Conservation Data System identifies no known occurrences of federal- or state-designated threatened or endangered plant or animal species within a 2-mile radius of the site. No species of special concern are documented within the Depot property.

The only significant terrestrial resource known to occur at SEDA is the population of white-pelaged white-tailed deer (Odocoileus virginiana), which inhabits the fenced portion of the Depot. Annual deer counting conducted at the Depot indicates that the size of the deer herd is approximately 600 animals of which approximately one-third (i.e., 200) are white-pelaged. Since the Depot is totally enclosed, the white-pelaged deer is thought to result from inbreeding within the herd. The depot maintains the herd through an annual hunting season to prevent overgrazing and starvation of the deer. The management plan of the herd is conducted by the New York State DFW. The normal brown-pelaged deer are also common. White-tailed deer are not listed as a rare or endangered species.

Agricultural crops and deciduous forests comprise the vegetative resources used by humans near SEDA. Although no crops are grown on the Depot, farmland is the predominant land use of the surrounding private lands. Crops including corn, wheat, oats, beans and hay mixtures, are grown primarily for livestock feed. Deciduous forestland on the Depot and surrounding private lands is under active forest management. Timber and firewood are harvested from private woodlots that surround the Depot, but timber harvesting does not occur on the Depot.

Several wildlife species are hunted and trapped on private lands near SEDA. Game species hunted include the eastern cottontail, white-tailed deer, ruffed grouse, ring-necked pheasant and various waterfowl. Gray squirrel and wild turkey are hunted to a lesser extent. Fur-bearing species trapped in the study area include red and gray fox and raccoon. Muskrat and beaver are trapped to a lesser extent (Woodruff 1992). On the Depot, deer, waterfowl and small game hunting is allowed, although the designated waterfowl hunting area is outside the study area. Trapping is also permitted (SEDA 1992) on the Depot.

Animals that have been identified at the depot during prior ecological surveys include beaver, eastern coyote, deer, red and gray fox, eastern cottontail rabbit, muskrat, raccoon, gray squirrel, striped skunk, and the woodchuck. Birds species that have been identified include the bluejay, black-capped chickadee, American crow, mourning dove, northern flicker, ruffed grouse, ring-billed gull, red-tailed hawk, northern junco, American kestrel, white breasted nuthatch, ring-necked pheasant, American robin, eastern starling, turkey vulture, and pileated woodpecker.

There are no permanent lakes, ponds, streams or wetlands in either SEAD-59 or SEAD-71. Surface water only exists intermittently in drainage ditches; thus, it does not directly support aquatic life.

No signs of stressed or altered terrestrial biota (vegetation and wildlife species) were observed during the surveys in either of the sites considered in this assessment. There were no indications of unnatural die-off or stunted vegetation.

3.6.2.3.2 Contaminant Fate and Transport

The primary sources of contaminants at SEADs- 59 and 71 are the residues of former operations and activities that were conducted in the identified SEADs. These residues reside primarily in the soils that remain at the sites. As is indicated above, permanent ponds, lakes, wetlands, rivers, etc. do not exist on either of the sites covered by this ecological risk assessment.

Contamination, if present, in the soil residues may migrate from the original sites of release due to bioturbation or excavation. Volatile compounds can move through the soils. Infiltrating rainwater can leach contaminants and transport them into groundwater, and surface water runoff may also carry contaminants onto adjacent soils or drainage ditches.

3.6.2.3.3 Complete Exposure Pathways

An exposure point is a location where a receptor could potentially come into contact with a contaminated medium. An exposure route is the means by which a receptor comes into contact with a contaminated medium at an exposure point. Exposure to COPCs may occur through the routes of ingestion, inhalation, and dermal contact.

There are five media through which ecological receptors could potentially be exposed to site-related contaminants: air (dust and vapor), soil, surface water, sediment, and organisms in the food chain. Probable exposure routes (i.e., potentially complete pathways) were identified for each medium based on the physical characteristics of the site and the potential ecological receptors that may occur there.

Exposure to soil contaminants may occur directly through ingestion, inhalation, and/or dermal contact. Chemicals also may migrate further in the environment by a variety of pathways following secondary release from surface soil and deeper soil. The following pathways result from these secondary release mechanisms:

- Suspension and dispersal by the wind of particulate contaminants or contaminants adsorbed to surface soil particles.
- Direct volatilization of volatile organic compounds from surface soil to air.
- Uptake of soil contaminants by terrestrial organisms.
- Transport of chemicals to surface water and sediment by surface runoff of water and soil particles.

Exposure routes were also identified for the potential avian and mammalian ecological receptors. Principal pathways for which analytical data were available for quantitative evaluation of soil COPCs include ingestion of soil and ingestion of other animals and plants that have accumulated contaminants. For sediment and surface water, principal pathways include direct contact with surface water and sediment, ingestion of surface water and sediment, and ingestion of other organisms that have accumulated contaminants. However, since permanent surface water bodies do not exist at any of the sites, exposure via ingestion or dermal contact with surface water was considered incidental and not quantitatively evaluated. Similarly, since sediment does not permanently exist at these sites, exposure via this media is considered equivalent to that represented and quantified for soil.

As is indicated above, permanent lakes, ponds, wetlands, rivers, etc. are not present in sites considered in this risk assessment. Therefore, surface water and sediment do not pose a risk to permanent aquatic life populations (e.g., fish, invertebrates, etc.) since such populations do not exist at any of these sites.

3.6.2.4 Ecological Assessment Endpoint(s)

EPA's interim final Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA, 1997a) states that the selection of assessment endpoints depends on the following:

- The constituents present and their concentrations,
- Mechanisms of toxicity to different groups of organisms,
- Potential species present, and
- Potential complete exposure pathways.

The constituents and concentrations of site COPCs are discussed in detail in Section 2. Species identified at the Depot were identified in Section 3.6.2.3.1 and final receptor selection is described below. Mechanisms of toxicity are evaluated conceptually in the analysis plan in Section 3.6.2.3.2. Complete exposure pathways were discussed in Section 3.6.2.3.3.

To assess whether significant adverse ecological effects have occurred or may occur at the sites because of the ecological receptors' exposure to COPCs, ecological endpoints were selected. An ecological endpoint is a characteristic of an ecological component that may be affected by exposure to a stressor, such as a chemical. Assessment endpoints represent environmental values to be protected and generally refer to characteristics of populations and ecosystems (EPA, 1997a). Unlike the human health risk assessment process, which focuses on individual receptors, the ERA focuses on populations or groups of interbreeding non-human, non-domesticated receptors. In the ERA process, risks to individuals are assessed only if they are protected under the Endangered Species Act, as well as species that are candidates for protection or are considered rare.

Given the diversity of the biological world and the multiple values placed on it by society, there is no universally-applicable list of assessment endpoints. Therefore, EPA, in the Guidelines for Ecological Risk Assessment (EPA, 1998) has suggested three criteria that should be considered in selecting assessment endpoints suitable for a specific ecological risk assessment. These criteria are: ecological relevance, susceptibility to the contaminant(s), and representation of management goals.

- Ecological relevance. The assessment endpoint should have biological/ecological significance to a higher level of the ecological hierarchy. Relevant endpoints help sustain the natural structure, function, and biodiversity of an ecosystem. For example, an increase in mortality or a decrease in fecundity of individuals is ecologically significant if it affects the size or productivity of the population. Likewise, a decrease in the size of a population is ecologically significant if it affects the number of species, the productivity, or some other property of the ecosystem.

- Susceptibility to the contaminant(s). The assessment endpoint should be susceptible to exposure to the contaminant(s) and should be responsive/sensitive to such exposure. That is, assessment endpoints should be chosen that are likely to be exposed to contaminants at the site, either directly or indirectly (e.g., through the food chain), and they should be sensitive enough that such exposure may elicit an adverse response. Ideally, this sensitivity should be at such a level that other site-related receptors of potential concern are adequately protected under the selected endpoint's response threshold.

- Representation of management goals. The value of a risk assessment depends on whether it can support quality management decisions. Therefore, the assessment is based on values and organisms that reflect management goals. The protection of ecological resources (e.g., habitats and species of plants and animals) is a principal motivation for conducting ERAs. Key aspects of ecological protection are presented as policy goals, which are general goals established by legislation or agency policy based on societal concern for the protection of certain environmental resources. For example, environmental protection is mandated by a variety of legislation and government agency policies (e.g., CERCLA, National Environmental Policy Act). Other legislation includes the Endangered Species Act, 16 U.S.C. 1531-1544 (1993, as amended) and the Migratory Bird Treaty Act, 16 U.S.C. 703-711 (1993, as amended). **Table 3.6-1** shows the policy goals established for the site. To determine whether these protection goals are met at the site, assessment and measurement endpoints are formulated that define the specific ecological values to be protected and the degree to which each may be protected.

The Depot does not provide habitat for any threatened or endangered species; therefore, the assessment endpoint of no reduction in numbers of any threatened/endangered species is met. However, the available field surveys indicate that the site is likely to be used by terrestrial mammalian and avian populations. Accordingly, the assessment endpoint that has been selected to represent the policy goal of protection of terrestrial populations and ecosystems is "no substantial adverse effect on survival, growth, and reproduction of resident terrestrial and avian populations."

3.6.2.4.1 Receptor Selection

Site-specific receptors were selected to represent assessment endpoints based principally on their importance in the community food web; their susceptibility (through exposure and sensitivity) to the site-related constituents, the amount of available data describing their potential for exposure and the toxicological effects that may result from exposure; and the extent to which they represent management goals.

TABLE 3.6-1
POLICY GOALS, ECOLOGICAL ASSESSMENT AND MEASUREMENT ENDPOINTS, AND DECISION RULES
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Policy Goals	Assessment Endpoint	Measurement Endpoint	Decision Rule
Policy Goal 1: The conservation of threatened and endangered species (TES) and their critical habitats	**Assessment Endpoint 1:** No reduction in numbers of any state- or federally-designated TES	**Measurement Endpoint 1:** Biosurveys for TES plants and animals; COPC concentration in physical media and predicted concentration in prey species	**Decision Rule for Assessment Endpoint 1:** If TES are not present, or COPC Maximum concentrations in the media do not exceed toxicity screening thresholds or dietary NOAELS (i.e., HO<1), the assessment endpoint is met and TES are not at risk
Policy Goal 2: The protection of terrestrial and avian populations and ecosystems	**Assessment Endpoint 2:** No substantial adverse effect on populations of small mammals (i.e., deer mouse, short-tailed) or foraging bird species (i.e., American robin).	**Measurement Endpoint 2:** Lowest chronic, dietary, non-lethal effect level of COPCs on mice, shrew, and robins.	**Decision Rule for Assessment Endpoint 2:** If ratios of estimated exposure concentrations predicted from COPC maximum/average concentrations in soil to dietary limits corresponding to NOAEL toxicity reference values for adverse effects on receptor species (HQs) are <1, then Assessment endpoint 2 is met and indigenous receptor species populations are not at risk.

COPC = constituent of potential concern.
TES = threatened and endangered species.
NOAEL = no observed adverse effect level.
LOAEL = lowest observed adverse effect level.
HQ = hazard quotient.

The native mouse and short-tailed shrew species inhabiting areas of SEDA are appropriate terrestrial mammalian receptor species for soil, and the relevant assessment endpoint were defined as "no substantial adverse effects on resident mouse or shrew populations." The deer mouse (Peromyscus maniculatus) was selected as the resident species with the niche best met by conditions present at the site. These are one of the vertebrate receptors most likely to be maximally exposed to contaminants in soil at the site. They represent a significant component of the food chain, feeding on seeds and berries and soil invertebrates and providing prey for predators. A second terrestrial receptor, the short-tail shrew (Blarina brevicauda), was also evaluated. The shrew was selected because more of its diet is derived from soil invertebrates and less is derived from seeds and berries than the deer mouse. Therefore, the shrew may be more susceptible than the mouse to the effects of COPCs that bioaccumulate in soil biota.

The American robin (Turdus migratorius) has been identified at SEDA during site reconnaissance visits and has been selected as an appropriate avian receptor species for soil, and the relevant assessment endpoint was defined as "no substantial adverse effects on resident American robin populations." Birds are frequently more sensitive to specific chemicals (e.g., pesticides and phthalates) than terrestrial mammalian species. The American robin was selected because a large portion of its diet is derived from soil invertebrates which would make it more susceptible to the effects of COPCs that bioaccumulate in soil biota. Additionally, its home range is roughly comparable to those of both the deer mouse and shrew.

A raptor, such as a red-tailed hawk (Buteo jamaicensis), was initially considered as a potential receptor for this ERA. However, the home range of a hawk, approximately 1800 acres or more (USEPA 1993, Wildlife Exposure Factors Handbook), is much greater than the area of any of the sites considered in this assessment. The largest site (SEAD-59) is 1.26 acres; the combined area of SEADs-59 and 71 is 2.07 acres. Therefore, it is unlikely that a hawk would derive a significant portion of its diet from prey at any one of the sites evaluated. Consequently, the raptor was not further evaluated in this ERA.

Databases and available literature were searched for toxicity data for deer mice, short-tailed shrews, American robin and other native rodent and bird species. In the absence of site-specific data, laboratory-derived data on mortality or reproductive effects were used as measurement endpoints. In the absence of data on native species, data for other rodents (e.g., laboratory mice and laboratory rats) or birds (e.g., red-winged blackbird, mallard, chicken, Japanese quail, gray partridge, etc.) were used. Measures of effects (measurement endpoints) were selected that could be extrapolated to predict effects on the assessment endpoints.

3.6.2.5 Ecological Conceptual Site Model

The conceptual site model (CSM) presents the ecological receptors at SEADs-59 and 71 that are potentially exposed to hazardous substances in soil across several pathways (**Figure 3-3**). A complete exposure pathway consists of the following four elements:

- A source and mechanism of contaminant release to the environment.
- An environmental transport mechanism for the released contaminants.
- A point of contact with the contaminated medium.
- A route of contaminant entry into the receptor at the exposure point.

If any of these elements is missing, the pathway is incomplete and is not considered further in the ERA. A pathway is complete when all four elements are present and permit potential exposure of a receptor to a source of contamination. Quantification of some potentially complete pathways may not be warranted because of minimal risk contribution relative to other major pathways. The dominant pathways from sources and exposure media through the food web to ecological receptors potentially exposed to ecological COPCs at the site are presented in Figure 3-3.

The CSM will serve as a conceptual hypothesis for the exposure characterization, the objective of which is to gather information from which to determine the pathways and media through which ecological receptors may be exposed to COPCs. The exposure characterization typically involves determining the following (EPA, 1997a):

- The ecological setting of the site
- The inventory of constituents that are or may be present at the site
- The extent and magnitude of the constituent concentrations present, along with spatial and temporal variability of those concentrations
- The environmental fate and transport of the constituents.

The ecological setting was described in Section 3.6.2.3.1 and the extent and magnitude of contaminants is presented in Section 2. Environmental fate of the COPCs and the potential exposure pathways are discussed in the following paragraphs.

Exposure to surface soil contaminants may occur directly through ingestion, inhalation, and/or dermal contact. Chemicals also may migrate further in the environment by a variety of pathways following secondary release from surface soil and deeper soil. The following pathways result from these secondary release mechanisms:

- Suspension and dispersal by the wind of particulate contaminants or contaminants adsorbed to surface soil particles
- Direct volatilization of volatile organic compounds from surface soil to air
- Uptake of soil contaminants by terrestrial organisms
- Transport of chemicals to surface water and sediment by surface runoff of water and soil particles

Terrestrial animal and bird populations could potentially be directly exposed to soil contaminants through ingestion of, dermal contact with, and/or inhalation from site soils. For species such as deer, raccoon, opossum, rabbits, rodents, and birds, such exposures would likely be associated with foraging activities. Burrowing species, such as rabbits, mice, moles, and shrews, would probably receive the greatest exposures among vertebrates. Invertebrates living on and within the soil also may experience significant exposures. Although ingestion is the principal soil exposure route, dermal contact also may be important, particularly for burrowing species. However, the limited dermal permeability database available for ecological receptors and surrogate species precluded quantitative evaluation of the dermal exposure pathway for either mammals or birds.

Ecological receptors could also potentially be exposed to site-related contaminants via the air medium. Contaminants in air may be in the form of vapor from volatile organic compounds, or in particulate form (as dusts or adsorbed to soil particles) suspended by wind. In either form, ecological receptors could be exposed to contaminants through inhalation. However, the lack of applicable inhalation toxicity data for ecological receptors or similar species precluded quantitative evaluation of potential risks.

Plants may be considered ecological receptors as well as a pathway or medium through which wildlife receptors can be exposed to site contaminants. Plants may absorb site-related contaminants from soil through their roots. Contaminants absorbed by plants may then be transferred to wildlife when the plants are ingested for food. This exposure pathway was addressed by use of chemical-specific soil-to-plant uptake factors (obtained from the scientific literature) in the animal receptor exposure calculations.

Under the future land use scenario for SEADs-59 and 71, it is assumed that contaminated soils may be excavated during construction and distributed on the ground surface. As under current conditions, ecological receptors could potentially be exposed to chemicals in soil through ingestion and dermal contact. Other exposure pathways also were assumed to remain essentially the same as under current conditions, except that possible inhalation exposures are likely to be reduced by paving and vegetation (e.g., lawns). The abundance and diversity of some ecological receptors on the site may likely be reduced due to the development.

3.6.2.6 Analysis Plan

The analysis plan is the final stage of problem formulation. In this step, risk hypotheses presented in the CSM are evaluated to determine how these hypotheses will be assessed using site-specific data. The analysis plan includes three categories of measures to evaluate the risk hypotheses identified in the CSM: measures of effect (also termed measurement endpoints), measures of exposure, and measures of ecosystem and receptor characteristics.

3.6.2.6.1 Measures of Effect

Measurement endpoints are measurable responses to a stressor that are related to the valued characteristics chosen as assessment endpoints (EPA, 1992a). Assessment endpoints generally refer to characteristics of populations and ecosystems. It is usually impractical to measure changes in these characteristics as part of an assessment. Consequently, measurement endpoints are selected that can be measured and extrapolated to predict effects on assessment endpoints (EPA, 1992a). The most appropriate measurement endpoint relating to the assessment endpoint is the lowest concentration of the constituent that, in chronic toxicity tests, is associated with non-lethal effects to a deer mouse, a short-tailed shrew, or an American robin. Because the assessment endpoint focuses on maintenance of the population of deer mice, shrews, or robins, a measure of effect equivalent to "no effect" would be overly conservative, in that it would reflect protection of the individual, not the population. A more appropriate measure of effect, reflecting population level response, is the lowest non-lethal effect level. Toxicity data from tests that measure responses that influence reproduction, health, and longevity of the species will conform with the assessment endpoint. Therefore, the lowest concentration of the constituent that produces such effects will be used as a measure of effects.

Reliable measures of effects are not available for each exposure route for each constituent. Effects from exposure through inhalation and dermal contact are not well developed for ecological receptors; consequently, these exposure routes are analyzed qualitatively.

The measures of ecosystem and receptor characteristics include such characteristics as the behavior and location of the receptor and the distribution of a contaminant, both of which may affect the receptor's exposure to the contaminant. The typical foraging area of the receptor as well as the quality of the habitat in the site have been considered in the estimation of exposure, as discussed in Sections 3.6.3.2 and 3.6.3.3.

3.6.2.6.2 Measures of Exposure

Measures of exposure are the amounts, in dosage or concentration, that the receptors are hypothesized to receive. These include concentrations of constituents in the impacted media and concentrations or dosages of the constituents to which the receptor is exposed.

Decision rules are specified for evaluating effects on the assessment endpoints. Table 3.6-1 shows the decision rules that describe the logical basis for choosing among alternative actions for the assessment endpoints based on the results of the measurement endpoints. Together, the assessment endpoint, measurement endpoint, and decision rule define the following:

- An entity (e.g., deer mouse population)
- A characteristic of the entity (e.g., health of the individuals in the population)
- An acceptable amount of change in the entity (e.g., loss of no more than 20 percent of a population)
- A decision whether the protection goal is or is not met.

For soil exposures, the results of the assessment will be presented in terms of hazard quotients (HQs). The HQ is the ratio of the measured or predicted concentration of an ecological COPC to which the receptors are exposed in an environmental medium, and the measured concentration that adversely affects an organism based on a toxicity threshold. If the measured concentration or estimated dose is less than the concentration or dose expected to have the potential to produce an adverse effect (i.e., the ratio of the two is less than 1), the risk is considered acceptable (protective of the ecological receptor). Any quotient greater than or equal to 1 indicates that the ecological COPC warrants further evaluation to determine the actual likelihood of harm. COCs are selected only after an additional weight-of-evidence evaluation of the conservatism of the exposure assumptions, toxicity values, and uncertainties is conducted.

Due to the ephemeral nature of surface water accumulation in the drainage ditches and the limited exposure of valued ecological receptors to surface water or sediment in the ditches, these media are not quantitatively assessed in this ERA.

3.6.2.6.3 Measures of Ecosystem and Receptor Characteristics

Section 3.6.3.4 discusses the toxicity reference values associated with the COPCs. Endpoints stated in terms of specific ecological receptors or exposure classes (groups of species exposed by similar pathways) often require data on the processes that increase or decrease the exposure concentration below or above the measured or predicted environmental concentration. Thus, some quotients incorporate exposure factors (e.g., dietary soil fractions and bioaccumulation factors). Section 3.6.3.3 discusses exposure factors for the site.

3.6.3 Exposure Assessment

The exposure assessment evaluates potential exposure of ecological receptors to site-related constituents through evaluation of the following:

- Description of the spatial distribution of COPCs
- Description of spatial and temporal distribution of ecological receptors
- Quantification of exposure that may result from overlap of these distributions

Each of these components is discussed below.

3.6.3.1 Constituent Distribution

The extent of measured chemical contamination at the site is restricted to the areas sampled within the SEADs-59 and 71. The total combined area of the sites is 2.07 acres, about 0.02 percent of the 10,000-acre Depot property. Soil located outside these sites is presumed to be relatively clean.

The magnitude of constituent exposures that may be experienced by ecological receptors is affected by the degree of their spatial and temporal associations with the site, as discussed in the following sections.

3.6.3.2 Receptor Distribution

A variety of factors may affect the extent and significance of potential exposures. Receptor exposures are affected by the degree of spatial and temporal association with the site. For example, the receptors' mobility may significantly affect their potential exposures to site-related contaminants. Many species may only inhabit the study area during seasonal periods (e.g., breeding season, non-migratory periods). Non-migratory species may remain in the vicinity throughout the year. These species, particularly those with longer life spans (and usually larger home ranges), have the greatest potential duration of exposure. However, species with small home range sizes have the greatest potential frequency of exposure. Other factors affecting exposures include habitat preference, behavior (e.g., burrowing, rooting, foraging), individual home range size (larger home ranges correspond to far less frequent use of study area), and diet. Diet is of particular importance in exposure as related to (1) food source availability (larger amount of preferred food sources equals a greater potential for receptor usage) and (2) bioaccumulative contaminants. Contaminants that bioaccumulate may also tend to biomagnify in the food chain. This discussed in more detail in Section 3.6.3.3. As a result, predatory species at higher trophic levels may receive their most significant exposures through their prey. However, the possibility of a population of an upper trophic-level predator, or even an individual predator, utilizing either SEAD-59 or 71 as a primary source of food is considered extremely remote.

The deer mouse (~ 0.14 acre), short-tailed shrew (~ 0.96 acre), and the American robin (~ 0.4 acre) each have a typical home range that is less than 1 acre (EPA, 1993c). SEADs-59 and 71, both encompassing at approximately 1 acre of land, could constitute 100 percent of the home range of a deer mouse, a shrew, or a robin.

3.6.3.3 Quantification of Exposure

Evaluation of the degree to which contaminant and receptor distributions (described in the previous two sections) coincide at the site indicated that the deer mouse, the short-tailed shrew, and the American robin are each receptors likely to have significant potential exposures to COPCs in soil.

To quantify exposures of target receptors to each COPC, a daily intake of each COPC was calculated. Conversion of the environmental concentration of each COPC to an estimated daily intake for a receptor at the site was necessary prior to evaluation of potentially toxic effects. For terrestrial animal and avian receptors, calculation of exposure intake rates relied upon determination of an organism's exposure to COPCs found in soil. Exposure rates for the target receptors were based upon ingestion of contaminants from this medium and also from consumption of other organisms. The ERA did not attempt to measure potential risk from dermal and/or inhalation exposure pathways given the insignificance of these pathways relative to the major exposure pathways (e.g., ingestion) and due to the scarcity of data available for these pathways.

The first step in measuring exposure rates for wildlife receptors was the calculation of food ingestion rates for the deer mouse, short-tailed shrew, and the robin. The EPA's Wildlife Exposure Factors Handbook (EPA, 1993c) includes a variety of exposure information for a number of avian, herptile, and mammalian species. Data are directly available for body weight, ingestion rate, and dietary composition of the three selected target receptors.

The mean body weight of 0.02 kg for the female deer mouse and the maximum food ingestion rate of 0.22 g/g-day (0.0044 kg/day) for a non-lactating mouse were used (EPA, 1993c) to provide conservative exposure rate calculations for the deer mouse. Similarly, the lowest reported mean body weight of 0.015 kg and the maximum food ingestion rate of 0.6 g/g-day (0.009 kg/day) for a short-tailed shrew were used (EPA, 1993c), to provide conservative exposure rate calculations for the short-tailed shrew. The year round average body weight of 0.077 kg and the average food ingestion rate of 1.205 g/g-day (0.0928 kg/day) for and adult robin (EPA, 1993c) were used to estimate exposure rates for the robin.

The Wildlife Exposure Factors Handbook (EPA, 1993c) also presents average values for intake of animal matter and plant matter for the receptors as well as incidental soil ingestion.

Soil ingestion has been measured at less than 2 percent of diet (Beyer et al., 1994) for mammalian species. As might be expected based on the opportunistic habits of mice, the proportion of animal to plant matter in the diet varies from around 65 percent animal: 35 percent plant to 25 percent animal : 75 percent plant depending on season and region of the country. For this ERA, an approximate average of 50 percent animal: 50 percent plant was used, after subtracting the 2 percent for incidental soil ingestion. The dietary intakes calculated for this assessment are as follows:

Total Dietary Intake	=	0.0044 kg food/day
Plant Matter Intake	=	0.00216 kg plant matter/day
Animal Matter Intake	=	0.00216 kg animal matter/day
Incidental Soil Intake	=	0.000088 kg soil/day

The short-tailed shrew is primarily carnivorous, with its diet consisting largely of insects and other invertebrates found in the soil. Based on information provided in the Wildlife Exposure Factors Handbook (EPA, 1993c), 5.3 percent of the shrew's diet is vegetative, with most of the remainder comprised of soil invertebrates. To be conservative in terms of potential bioaccumulation, it was assumed that 94.7 percent of the shrew's intake is animal matter (small insects, etc.) and none of the intake is soil. Accordingly, the shrew's dietary intakes calculated for this assessment are as follows:

Total Dietary Intake	=	0.009 kg food/day
Plant Matter Intake	=	0.00048 kg plant matter/day
Animal Matter Intake	=	0.00852 kg animal matter/day
Incidental Soil Intake	=	0 kg soil/day

The American robin's diet includes ground dwelling invertebrates, foliage dwelling insects and fruits. The robin's diet varies significantly throughout the year, exhibiting a high insect and invertebrate intake in the spring and a high plant material intake characteristic in the fall. Averaging the dietary characteristics over these three seasons results in an average invertebrate intake of 44 % and an average plant material intake of 56%. Soil ingestion for the American woodcock (surrogate species) has been measured at approximately 10.4 percent of diet (Beyer et al., 1994). For this ERA, an approximate average of 44 percent invertebrate: 56 percent plant was used, after subtracting the 10.4 percent for incidental soil ingestion. The dietary intakes calculated for this assessment are as follows:

Total Dietary Intake	=	0.093 kg food/day
Plant Matter Intake	=	0.0466 kg plant matter/day
Invertebrate Matter Intake	=	0.0366 kg animal matter/day
Incidental Soil Intake	=	0.0096 kg soil/day

A site-specific exposure dose of each COPC was calculated using a food chain uptake model consistent with EPA Region IV guidance (EPA, 1995). This algorithm accounts for exposure via incidental ingestion of contaminated soil, ingestion of plants grown in contaminated soil, and ingestion of lower trophic level animals associated with contamination. The exposure equation for soil is as follows:

EDsoil = [(Cs x SP x CF x Ip) + (Cs x BAF x Ia) + (Cs x Is)] x SFF / BW

where:

EDsoil	=	Soil exposure dose for terrestrial receptor (mg/kg/day)
Cs	=	RME concentration in soil (mg/kg)
SP	=	Soil-to-plant uptake factor (unitless)
CF	=	Plant wet-weight-to-dry-weight conversion factor (unitless) = 0.2 (used for SP values based on plant dry weight)
Ip	=	Receptor-specific ingestion rate of plant material (kg/day)
BAF	=	Constituent-specific bioaccumulation factor (unitless)
Ia	=	Receptor-specific ingestion rate of animal material (kg/day)
Is	=	Receptor-specific ingestion rate of soil (kg/day)
SFF	=	Site foraging factor (unitless) (see explanation below)
BW	=	Body weight (kg)

In evaluating the potential for a contaminant to pose ecological risk, it is important to consider its propensity for bioaccumulation although its concentration in an environmental medium may be below toxic levels. Therefore, all COPCs were evaluated with regard to their ecological persistence and tendency to bioaccumulate.

Bioaccumulation is the process of absorption and retention of a substance by an organism due to both uptake from water (or other surrounding media) and uptake from ingested residues in food, soil, and/or sediment. It is quantified by the calculation of a bioaccumulation factor (BAF). Bioconcentration is a component of bioaccumulation, accounting only for the process of uptake from the surrounding medium (usually water). It is quantified by the calculation of a bioconcentration factor (BCF). Both BAFs and BCFs are proportionality constants relating the concentration of a contaminant in the tissues of an organism to the concentration in the surrounding environment.

Bioaccumulation and bioconcentration may be a significant component of exposure to COPCs for the terrestrial receptors. For the deer mouse, short-tailed shrew, and the robin, bioaccumulation was evaluated by means of contaminant-specific soil-to-plant uptake factors and BAFs. The soil-to-plant uptake factors were obtained from NRC (1992) for metals and for organic compounds by using a regression equation from Travis and Arms (1988). The latter is based on the contaminant-specific octanol/water partition coefficient (log Kow). BAFs were obtained from the scientific literature. Factors reflecting accumulation of COPCs in earthworms were preferentially selected, based on the feeding habits of the deer mouse, shrew, and robin. **Tables 3.6-2 and 3.6-3** show values for soil-to-plant uptake factors and BAFs.

A site foraging factor (SFF) is calculated to account for the reasonably expected use of an exposure group. Because of the small size of their home ranges (i.e., 0.14 acre) and their year-round residence, mice living at most of the sites could potentially use contaminated areas 100 percent of the time. The exposure dose calculations assumed the mouse would be exposed to the contaminants at the site in proportion to the size of the site (0.80 to 1.26 acres) compared to the typical size of a deer mouse foraging area (0.14 acres). Therefore, a SFF of 1 (i.e., all SEADs larger than 0.14 acres in size) was used. Similarly, for the short-tailed shrew whose home range is 0.963 acres and who is also a year- round resident, SFFs of 0.83 (SEAD-71) and 1 (SEAD-59) were used. Finally, Site Foraging Factors of 0.43 (SEAD-71) and 0.583 were used for the robin based on its seasonal residence (7 months out of the year) at the site, and its average territory size (i.e., 0.395 acres).

3.6.3.4 Effects Assessment

The effects assessment defines and evaluates the potential ecological response to ecological COPCs in terms of the selected assessment and measurement endpoints. The effects assessment for soil exposure includes the derivation of toxicity reference values (TRVs) that are the basis of the comparison. Section 3.6.4 uses the results of the toxicity assessment to identify ecological COCs and characterize ecological risk.

For soil, the methodology for assessing the potentially toxic effects of COPCs was based on the derivation of a TRV for each COPC. The TRVs were derived to represent reasonable estimates of the constituent concentrations that, if exceeded, may produce toxicity effects in ecological receptors exposed to soil. Ideally, TRV values would be based on site-specific toxicity data. However, in the absence of site-specific data, toxicity data from the literature were used by establishing data selection criteria such that TRVs would be as relevant as possible to assessment

TABLE 3.6-2
WILDLIFE INTAKE RATES
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Receptor	Body Weight (kg) [1]	Trophic Level[2]	Foraging Factor[3]	Dietary Breakdown		
				Plant (kg/day)	Animal (kg/day)	Soil (kg/day)
Deer Mouse	0.020	3	Variable	0.00216	0.00216	0.000088
Short-tailed Shrew	0.015	3	Variable	0.00048	0.00852	0 [4]
American Robin	0.077	3	Variable	0.03658	0.04656	0.00965

Notes:

(1) Body weight of deer mouse based on mean body weight for female deer mouse.
Body weight of short-tailed shrew based on mean body weight of adult male short-tailed shrew during fall.

(2) Trophic level: organisms are assigned to trophic levels of 1 (producer), 2 (herbivore), 3 (1st order carnivore), and 4 (top carnivore) within the food web.

(3) Foraging factor: adjustment factor (from 0 to 1) based upon an organism's total time of exposure to unit-based contaminants. For this preliminary risk assessment stage, the foraging factor was computed as the ratio of SEAD area to the size of the organism's home range (ratio not to exceed 1) multiplied by the period of the organism's stay in the area.

	Home Range	Occupant		
Robin:	1.1 acre	7 months	=	[site area (acre)/ 1.1] X (7/12)
Deer Mouse	0.147 acre	12 months	=	[site area (acre)/ 0.147] X (12/12)
Short-tailed Shrew	0.964 acre	12 months	=	[site area (acre)/ 0.964] X (12/12)

SEAD-59 is 1.26 acres. Robin SFF = 0.583; Deer Mouse SFF = 1; Short-tailed Shrew SFF = 1
SEAD-71 is 0.80 acres. Robin SFF = 0.43; Deer Mouse SFF = 1; Short-tailed Shrew SFF = 0.83

(4) Short-tailed shrew is primarily carnivorous and soil ingestion is negligible.
*Source: Wildlife Exposure Factors Handbook, USEPA 1993 and USEPA 1997.

TABLE 3.6-3
ENVIRONMENTAL FATE AND TRANSPORT PROPERTIES
FOR CHEMICALS OF POTENTIAL CONCERN
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Soil to Plant Transfer Factors (STP)			Trophic Level 2 BAF (Invertebrates)	
	logKow[1]	STP[2]	Source	BAF	Source
Volatiles					
1,1,1-Trichloroethane	2.47	1.45E+00	Travis & Arms 1988	4.52E-01	Sample et al 1996
Acetone	-0.24	5.33E+01	Travis & Arms 1988	3.90E-01	Sample et al 1996
Benzene	2.13	2.34E+00	Travis & Arms 1988	2.45E-01	Sample et al 1996
Carbon Disulfide	1.84	3.35E+00	Travis & Arms 1988	1.00E+00	Default
Ethylbenzene	3.13	6.01E-01	Travis & Arms 1988	1.00E+00	default
Methylene chloride	1.30	6.86E+00	Travis & Arms 1988	5.25E+00	Sample et al 1996
Tetrachloroethene	2.60	1.22E+00	Travis & Arms 1988	1.00E+00	default
Toluene	2.50	1.39E+00	Travis & Arms 1988	7.24E-01	Sample et al 1996
Total Xylenes	3.18	5.62E-01	Travis & Arms 1988	6.00E+00	ATSDR 1990
Trichloroethene	2.60	1.22E+00	Travis & Arms 1988	6.76E-01	Sample et al 1996
		3.87E+01			
PAHs		3.87E+01			
2-Methylnaphthalene	4.11	1.63E-01	Travis & Arms 1988	3.42E-01	Beyer 1990
Acenaphthene	3.92	2.10E-01	Travis & Arms 1988	3.42E-01	Beyer 1990 (BAP as surrogate)
Acenaphthylene	4.07	1.72E-01	Travis & Arms 1988	1.00E+00	default
Anthracene	4.45	1.04E-01	Travis & Arms 1988	5.10E-02	Beyer 1990
Benzo(a)anthracene	5.90	1.51E-02	Travis & Arms 1988	1.25E-01	Beyer 1990
Benzo(a)pyrene	6.14	1.25E-02	USEPA 1994	4.50E+00	USEPA 1994
Benzo(b)fluoranthene	6.57	6.17E-03	Travis & Arms 1988	3.20E-01	Beyer 1990
Benzo(ghi)perylene	7.10	3.05E-03	Travis & Arms 1988	2.40E-01	Beyer 1990
Benzo(k)fluoranthene	6.85	4.25E-03	Travis & Arms 1988	2.53E-01	Beyer 1990
Chrysene	5.61	2.22E-02	Travis & Arms 1988	1.75E-01	Beyer 1990
Dibenz(a,h)anthracene	6.36	8.16E-03	Travis & Arms 1988	1.75E-01	Beyer 1990
Fluoranthene	5.22	3.72E-02	Travis & Arms 1988	2.92E-01	Beyer 1990
Fluorene	4.18	1.49E-01	Travis & Arms 1988	3.42E-01	Beyer 1990
Indeno(1,2,3-cd)pyrene	7.70	1.37E-03	Travis & Arms 1988	4.19E-01	Beyer 1990
Naphthalene	3.36	4.43E-01	Travis & Arms 1988	3.42E-01	Beyer 1990
Phenanthrene	4.46	1.02E-01	Travis & Arms 1988	1.22E-01	Beyer 1990
Pyrene	5.09	4.43E-02	Travis & Arms 1988	9.20E-02	Beyer 1990
Semivols					
4-Methylphenol	1.94	2.93E+00	Travis & Arms 1988	1.00E+00	default
Bis(2-ethylhexyl)phthalate	4.20	5.16E-03	USEPA 1994	1.20E-01	USEPA 1994
Butylbenzylphthalate	4.78	1.00E+00	default	1.00E+00	default
Carbazole	1.00	1.00E+00	default	1.15E-02	AQUIRE 1997
Dibenzofuran	4.17	1.51E-01	Travis & Arms 1988	1.00E+00	default
Diethylphthalate	3	7.14E-01	Travis & Arms 1988	1.17E+02	AQUIRE 1997
Di-n-butylphthalate	4.57	8.84E-02	Travis & Arms 1988	1.25E-01	USEPA 1994 (BEHP as surrogate)
Di-n-octylphthalate	9.20	1.69E-04	USEPA 1994	4.90E+03	USEPA 1994
Phenol	1.45	5.40E+00	Travis & Arms 1988	1.00E+00	default
Pesticides					
4,4'-DDD	5.99	1.34E-02	Travis & Arms 1988	1.00E-01	USEPA 1994 (DDT as surrogate)
4,4'-DDE	5.77	1.79E-02	Travis & Arms 1988	2.50E-02	Menzie et al 1992
4,4'-DDT	5.90	1.00E-02	USEPA 1994	1.00E-01	USEPA 1994
Aldrin	5.52	1.00E-02	USEPA 1994	3.50E+00	USEPA 1994
alpha-BHC	3.78	3.00E-01	Bell 1992	1.00E+00	default
alpha-Chlordane	5.93	1.45E-02	Travis & Arms 1988	2.40E-01	USEPA 1994 (chlordane as surrogate)
Aroclor-1254	6.47	7.05E-03	Travis & Arms 1988	4.50E+00	USEPA 1994
delta-BHC	4.14	3.00E-01	Bell 1992	2.80E+02	AQUIRE 1997
Dieldrin	4.61	1.20E-01	USEPA 1994	4.70E-02	USEPA 1994
Endosulfan I	3.55	3.44E-01	Travis & Arms 1988	2.50E-01	Menzie et al 1992
Endosulfan II	3.62	3.13E-01	Travis & Arms 1988	2.50E-01	Menzie et al 1992 (endosulfan I as surrogate)
Endosulfan sulfate	3.66	2.97E-01	Travis & Arms 1988	2.50E-01	Menzie et al 1992 (endosulfan I as surrogate)
Endrin	4.56	5.80E-02	USEPA 1994	1.80E-01	USEPA 1994
Endrin ketone	5.06	2.20E-02	USEPA 1995	1.80E-01	USEPA 1994 (endrin as surrogate)
gamma-BHC (Lindane)	3.61	4.00E-01	Bell 1992	4.03E-02	Sample et al 1996
gamma-Chlordane	6.00	2.40E-02	USEPA 1994 (chlordane as surrogate	2.40E-01	USEPA 1994 (chlordane as surrogate)
Heptachlor	5.44	4.90E-02	USEPA 1994	2.40E-01	USEPA 1994
Heptachlor epoxide	5.4	7.00E-02	USEPA 1994	1.30E-01	USEPA 1994
Metals					
Antimony	NA	1.30E-04	NRC 1992	4.30E+00	AQUIRE 1997
Beryllium	NA	1.00E-02	NRC 1992	1.90E+01	AQUIRE 1997
Chromium	NA	7.50E-03	NRC 1992	7.75E-01	Beyer and Cromartie 1987
Copper	NA	4.00E-01	NRC 1992	6.82E-01	MA et al 1983
Iron	NA	4.00E-03	NRC 1992	5.00E-02	Ash and Lee 1980
Lead	NA	5.80E-03	NRC 1992	2.10E+00	MA et al 1983
Manganese	NA	5.60E-01	NRC 1992	1.00E+00	Default
Mercury	NA	9.00E-01	NRC 1992	2.30E-01	USEPA 1994
Nickel	NA	2.80E-01	NRC 1992	3.60E-01	ATSDR 1992
Selenium	NA	6.20E+00	USEPA 1992	5.00E+00	Beyer & Cromartie 1987
Sodium	NA	1.00E+00	Default	1.00E+00	Default
Zinc	NA	1.40E+00	NRC 1992	9.90E+00	Beyer & Cromartie 1987

1 Logarithmic value of octonol-water partition coefficient. Montgomery, J.H. and L.M. Welkom. Groundwater Chemicals Desk Reference. 1989

2 Soil to plant uptake factor

3 Bioaccumulation factor

endpoints for this site. Furthermore, the conservativeness of the TRVs was reinforced by using the lowest available, appropriate toxicity values and modifying them by uncertainty factors when necessary. The derivation of TRVs for mammals and soil is shown in **Table 3.6-4**. The derivation of TRVs for birds and soil is shown in **Table 3.6-5**.

The toxicity benchmarks used as effects thresholds for the evaluation of the assessment endpoint (maintenance of healthy populations of small mammals or birds) are based on NOAELs for test organisms (Sample et al., 1996). The NOAEL (no observed adverse effect level) is the highest exposure concentration at which no harmful effects were observed. Use of the NOAEL as the toxicity benchmark is more conservative than use of the LOAEL (lowest observed adverse effect level). Exposure of receptors to the LOAEL has been predicted to translate into less than 20 percent reduction in population size (Suter et al., 1994) or Lowest Observed Effects Concentrations.

For the selected receptors, the order of taxonomic preference when choosing TRVs was data from studies using: 1) native species potentially present at the site; or 2) proxy species, such as commonly studied laboratory species. The preferred toxicity test endpoint was the NOAEL from an appropriate chronic study for non-lethal or reproductive effects. When NOAEL values were not available, LOAELs for were used, as available. Values based on chronic studies were preferred. Studies were considered to provide chronic toxicity data if conducted for a minimum duration of 1 year. Studies longer than acute but shorter than chronic are considered subchronic. Studies shorter than 90 days were considered acute. Studies on developmental effects were considered chronic if conducted during a critical gestation period.

The toxicity values selected by this approach were modified through the application of uncertainty factors, as applicable, to derive a TRV for each COPC. The TRVs represent NOAELs with uncertainty factors incorporated for toxicity information derived from studies other than chronic studies and studies on species other than the receptors selected for this risk assessment. Where only a LOAEL was available, an uncertainty factor of 10 was applied, as recommended by EPA Region II, to represent a surrogate NOAEL. In addition, where toxicity information for a surrogate contaminant was used, an uncertainty factor of 10 was applied. Uncertainty factors were applied by dividing the initial toxicity value by the product of the necessary uncertainty factors. Uncertainty factors are listed in Tables 3.6-4 and 3.6-5 with the TRVs developed for soil COPCs.

TABLE 3.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF[1]	Study Duration CF[1]	Total CF[1]	TRV[2] (mg/kg/day)
Volatile Organics								
1,1,1-Trichloroethane	mouse	NOAEL, oral in water, 2 gen, crit lifestage, reproduction	Sample et al. 1996	1000.00	1	1	1	1000.00
Acetone	rat	NOAEL, gavage, 90-day, liver and kidney damage	Sample et al. 1996	100.00	1	10	10	10.00
Benzene	mouse	LOAEL, oral gavage, days 6-12 gestation crit. lifestage, reproduction	Sample et al. 1996	263.60	10	1	10	26.36
Carbon disulfide	rat	LOAEL, oral gavage, 1-14 days, hepatic effects	ATSDR 1996	3.00	10	10	100	0.03
Ethylbenzene	rat	LD50, gavage, 1 day, survival	ATSDR 1990	4730.00	10	10	100	47.30
Methyl ethyl ketone	rat	NOAEL, water, 2 generations, reproduction	Sample et al. 1996	1771.000	10	1	10	177.100
Methylene chloride	rat	NOAEL, water, 2 years, liver histology	Sample et al. 1996	5.85	1	1	1	5.85
Tetrachloroethene	mouse	NOAEL, corn oil oral gavage, 6 wks, hepatotoxicity	IRIS, 1988	14.00	10	1	10	1.40
Toluene	mouse	LOAEL, gavage, day 6-12 gestation crit. lifestage, reproduction	Sample et al. 1996	260.00	10	1	10	26.00
Total Xylenes	mouse	NOAEL, gavage, day 6-15 gestation crit. lifestage, reproduction	Sample et al. 1996	2.10	1	1	1	2.10
Trichloroethene	mouse	LOAEL, oral gavage, 6 wks, hepatotoxicity	Sample et al. 1996	70.00	10	1	10	7.00
Semivolatile Organics								
2-Methylnaphthalene	mouse	LOAEL, diet, 81 wks., respitory (naphthalene used as surrogate)	ATSDR 1995	71.60	10	1	10	7.16
4-Methylphenol	mink	NOAEL, diet, 6 mos. crit. lifestage, reproduction (Methylphenol, 2- (o-cresol) as surrogate)	Sample et al. 1996	219.20	1	1	1	219.20
Acenaphthene	mouse	LOAEL, oral gavage, 13wk, hepatic effects	ATSDR 1995	175.00	10	10	100	1.75

TABLE 3.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF[1]	Study Duration CF[1]	Total CF[1]	TRV[2] (mg/kg/day)
Acenaphthylene	mouse	LOAEL, oral intubation, gestation days 7-16 (crit. lifestage), reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Anthracene	mouse	NOAEL, oral gavage, 13 wks., hepatic effects	ATSDR 1995	1000.00	1	10	10	100.00
Benzo(a)anthracene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Benzo(a)pyrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction	Sample et al. 1996	10.00	10	1	10	1.00
Benzo(b)fluoranthene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Benzo(ghi)perylene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Benzo(k)fluoranthene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Benzoic Acid	rat	NOAEL, diet, assume acute	US EPA (IRIS) 1996	80.00	1	10	10	8.00
bis(2-ethylhexyl)phthalate	mouse	NOAEL, diet, 105 days crit. lifestage, reproduction	Sample et al. 1996	18.33	1	1	1	18.33
Butylbenzylphthalate	rat	NOAEL, diet, 6 months, increased liver-to-body-weight and liver-to-brain-weight ratios.	IRIS, 1993	159.00	10	1	10	15.90
Carbazole		No data available						no data
Chrysene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00

TABLE 3.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF(1)	Study Duration CF(1)	Total CF(1)	TRV(2) (mg/kg/day)
Dibenz(a,h)anthracene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Dibenzofuran	mammal	No data available					--	no data
Diethylphthalate	mouse	NOAEL, diet, 105 day crit. lifestage, reproduction	Sample et al. 1996	4583.00	1	1	1	4583.00
Di-n-butylphthalate	mouse	NOAEL, diet, 105 days crit. lifestage, reproduction	Sample et al. 1996	550.00	1	1	1	550.00
Di-n-octylphthalate	mouse	NOAEL, diet, 105 days crit. lifestage, reproduction (BEHP as surrogate)	Sample et al. 1996	18.33	1	1	1	18.33
Fluoranthene	mouse	LOAEL, oral gavage, 13 wks., hepatic effects	ATSDR 1995	125.00	10	10	100	1.25
Fluorene	mouse	LOAEL, oral gavage, 13 wks., hepatic effects	ATSDR 1995	125.00	10	10	100	1.25
Indeno(1,2,3-cd)pyrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Naphthalene	mouse	LOAEL, diet, 81 wks., respitory	ATSDR 1995	71.60	10	1	10	7.16
Phenanthrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Phenol	rat	NOAEL, gavage, gestation days 6-15, reduced fetal body weight	IRIS, 1990	60.00	1	1	1	60.00
Pyrene	mouse	LOAEL, oral intubation, gestation days 7-16 crit. lifestage, reproduction (benzo(a)pyrene used as surrogate)	Sample et al. 1996	10.00	10	1	10	1.00
Pesticides/PCBs								

TABLE 3.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF[1]	Study Duration CF[1]	Total CF[1]	TRV[2] (mg/kg/day)
beta-BHC	rat	NOAEL, diet, 4 generations, reproduction (BHC-mixed isomers)	Sample et al. 1996	1.60	1	1	1	1.60
4,4'-DDD	rat	NOAEL, diet, 2 year crit. lifestage, reproduction (DDT used as surrogate)	Sample et al. 1996	0.800	1	1	1	0.800
4,4'-DDE	rat	NOAEL, diet, 2 year crit. lifestage, reproduction (DDT used as surrogate)	Sample et al. 1996	0.800	1	1	1	0.800
4,4'-DDT	rat	NOAEL, diet, 2 year crit. lifestage, reproduction	Sample et al. 1996	0.800	1	1	1	0.800
Aldrin	rat	NOAEL, diet, 3 generations, reproduction	Sample et al. 1996	0.20	1	1	1	0.20
alpha-BHC	rat	NOAEL, diet, 4 generations, reproduction (BHC-mixed isomers used as surrogate))	Sample et al. 1996	1.60	1	1	1	1.60
alpha-Chlordane	mouse	NOAEL, diet, 6 generations, reproduction (total chlordane used as surrogate)	Sample et al. 1996	4.58	1	1	1	4.58
Aroclor-1254	oldfield mouse	LOAEL, diet, 12 mos. crit. lifestage, reproduction	Sample et al. 1996	0.68	10	1	10	0.07
delta-BHC	rat	NOAEL, diet, 4 generations, reproduction (BHC-mixed isomers)	Sample et al. 1996	1.60	1	1	1	1.60
Dieldrin	rat	LOAEL, diet, 3 yr. crit. lifestage, reproduction.	Sample et al. 1996	0.200	10	1	10	0.020
Endosulfan I	rat	NOAEL, oral intubation, 30 days, reproduction (endosulfan used as surrogate)	Sample et al. 1996	1.50	1	1	1	1.50
Endosulfan II	rat	NOAEL, oral intubation, 30 days, reproduction (endosulfan used as surrogate)	Sample et al. 1996	1.50	1	1	1	1.50
Endosulfan sulfate	rat	NOAEL, oral intubation, 30 days, reproduction (endosulfan used as surrogate)	Sample et al. 1996	1.50	1	1	1	1.50
Endrin	mouse	LOAEL, diet, 120 days crit. lifestage, reproduction	Sample et al. 1996	0.92	10	1	10	0.09
Endrin ketone	mouse	LOAEL, diet, 120 days, crit. lifestage, reproduction (endrin used as surrogate)	Sample et al. 1996	0.92	10	1	10	0.09
gamma-BHC (Lindane)	rat	NOAEL, diet, 3 generations, reproduction.	Sample et al. 1996	8.00	1	1	1	8.00

TABLE 3.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF[1]	Study Duration CF[1]	Total CF[1]	TRV[2] (mg/kg/day)
gamma-Chlordane	mouse	NOAEL, diet, 6 generations, reproduction	Sample et al. 1996	4.58	1	1	1	4.58
Heptachlor	mink	LOAEL, diet, 181 days crit. lifestage, reproduction	Sample et al. 1996	1.00	10	1	10	0.10
Heptachlor epoxide	mink	LOAEL, diet, 181 days crit. lifestage, reproduction (heptachlor as surrogate)	Sample et al. 1996	1.00	10	1	10	0.10
Metals								
Aluminum	mouse	NOAEL, water, 3 generations, reproduction	Sample et al. 1996	1.93	1	1	1	1.93
Antimony	mouse	LOAEL, water, lifetime, longevity	Sample et al. 1996	1.25	10	1	10	0.13
Beryllium	rat	NOAEL, water, lifetime, weight and longevity	Sample et al. 1996	0.66	1	1	1	0.66
Chromium	rat	NOAEL, water, 1 year, physiological	Sample et al. 1996	3.28	1	1	1	3.28
Cobalt	rat	NOAEL, diet, 69 days, behavioral	ATSDR 1992	5.00	1	10	10	0.500
Copper	rat	NOAEL, diet, 13 wks., gastrointestinal effects	ATSDR 1990	14.00	1	10	10	1.40
Iron	rat	LD50, oral, survival	RTECS 1994	2550.00	10	10	100	25.50
Lead	rat	NOAEL, diet, 3 generations, reproduction	Sample et al. 1996	8.00	1	1	1	8.00
Manganese	rat	NOAEL, diet, 244 days crit. lifestage, reproduction	Sample et al. 1996	88.00	1	1	1	88.00
Mercury	mouse	NOAEL, diet, 20 mo., mortality, liver and kidney histology, reproduction	Sample et al. 1996	13.20	1	1	1	13.20
Nickel	rat	NOAEL, diet, 3 generations, reproduction	Sample et al. 1996	40.00	1	1	1	40.00
Selenium	rat	NOAEL, water, 1 yr througth 2 generations, reproduction	Sample et al. 1996	0.20	1	1	1	0.20
Sodium		No data available					--	no data
Zinc	rat	NOAEL, diet, day 1-16 of gestation crit lifestage, reproduction	Sample et al. 1996	160.00	1	1	1	160.00

TABLE 3.6-4
NOAEL TOXICITY REFERENCE VALUES - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF(1)	Study Duration CF(1)	Total CF(1)	TRV(2) (mg/kg/day)

Notes:
(1) CF = conversion factor. Conversion factors - endpoint (non-NOAEL = 10) and study duration (non-chronic = 10)
(2) The toxicity reference value was derived by dividing the effect dose by the total conversion factor.
(3) This table includes TRV factor information available from Parsons ES-Tampa current database (8/99).
(4) V = Volatile (MW<200, H>1E-05); SV = Semi-Volatile; PAH = Polynuclear Aromatic Hydrocarbon; PES = Pesticide; PCB = Polychlorinated Biphenyl; ING = Inorganic
(5) Mammals: acute = <90days, subchronic = 90days - 1yr, chronic = >1yr. Birds: acute = <18days, subchronic = 18days - 10wks, chronic = >10wks. Source: Sample et al. 1996
If the study is during a critical life stage (gestation or development), the study may be considered a chronic exposure.
(6) The product of the appropriate uncertainty factors from each uncertainty category becomes the total uncertainty factor applied to develop the constituent-specific TRV.

TABLE 3.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
Volatiles								
1,1,1-Trichloroethane		No data available						no data
Acetone	Japanese quail	NOAEL, 14-day old, diet, 5 days, survival	Hill and Camardese 1986	6.10E+03	1	10	10	6.10E+02
Benzene		No data available						no data
Carbon Disulfide		No data available						no data
Ethylbenzene		No data available						no data
Methyl ethyl ketone		No data available						no data
Methylene chloride		No data available						no data
Tetrachloroethene		No data available						no data
Toluene		No data available						no data
Total Xylenes	Japanese quail	NOAEL, 14-day old chicks, diet, 5 days, survival	Hill and Camardese 1986	3.06E+03	1	10	10	3.06E+02
Trichloroethene		No data available						no data
Semivolatiles								
2-Methylnaphthalene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
4-Methylphenol	red-winged blackbird	LD50, single gavage, survival	Schafer et al. 1983	2.06E+01	10	10	100	2.06E-01
Acenaphthene	mallard	NOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	1.00E+03	1	1	1	1.00E+03
Acenaphthylene	mallard	NOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	1.00E+03	1	1	1	1.00E+03
Anthracene	mallard	NOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	1.00E+03	1	1	1	1.00E+03
Benzo(a)anthracene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzo(a)pyrene	chicken	Subchronic NOAEL, fertility and malformations	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01

TABLE 3.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
Benzo(b)fluoranthene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzo(ghi)perylene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzo(k)fluoranthene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Benzoic acid	red-winged blackbird	LD50, single gavage, survival	Schafer et al. 1983.	2.14E+01	10	10	100	2.14E-01
Bis(2-ethylhexyl)phthalate	ringed dove	NOAEL, diet, 4 wks. crit. lifestage, reproduction	Sample et al. 1996	1.10E+00	1	1	1	1.10E+00
Butylbenzylphthalate		No data available						no data
Carbazole		No data available						no data
Chrysene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Dibenz(a,h)anthracene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Dibenzofuran	red-winged blackbird	LC50, diet, 18 hours, survival	Schafer et al. 1983.	2.18E+01	10	10	100	2.18E-01
Diethylphthalate	ringed dove	NOAEL, diet, 4 wks. crit. lifestage, reproduction (di-n-butyl-phthalate used as surrogate)	Sample et al. 1996	1.10E-01	1	10	10	1.10E-02
Di-n-butylphthalate	ringed dove	NOAEL, diet, 4 wks. crit. lifestage, reproduction	Sample et al. 1996	1.10E+00	1	10	10	1.10E-01
Di-n-octylphthalate	ringed dove	NOAEL, diet, 4 wks. crit. lifestage, reproduction (BEHPas surrogate)	Sample et al. 1996	1.10E+00	1	1	1	1.10E+00
Fluoranthene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01

TABLE 3.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
Fluorene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
Indeno(1,2,3-cd)pyrene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Naphthalene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
Phenanthrene	mallard	LOAEL, diet, 7 months, physiological (mixed PAHs used as surrogate)	Eisler 1987	2.85E+02	10	1	10	2.85E+01
Phenol		No data available						no data
Pyrene	chicken	Subchronic NOAEL, Fertility and malformations (benzo(a)pyrene used as surrogate)	Rigdon and Neal 1963	4.00E+01	1	1	1	4.00E+01
Pesticides								
4,4'-DDD	Japanese quail	NOAEL, diet, 10 week, reproduction (DDT used as surrogate)	Sample et al. 1996	5.60E-01	1	10	10	5.60E-02
4,4'-DDE	Japanese quail	NOAEL, diet, 12 wks, reproduction, liver effects	Sample et al. 1996	5.60E-01	1	10	10	5.60E-02
4,4'-DDT	Japanese quail	NOAEL, diet, 10 week, reproduction	Sample et al. 1996	5.60E-01	1	10	10	5.60E-02
Aldrin	mallard	LOAEL, diet, 30 days, cumulative toxicity, mortality	Hudson et al. 1984	5.00E+00	10	1	10	5.00E-01
alpha-BHC	Japanese quail	NOAEL, diet, 90 days critical lifestage, reproduction (BHC-mixed isomers used as surrogate)	Sample et al. 1996	5.60E-01	1	1	1	5.60E-01
alpha-Chlordane	red-winged blackbird	NOAEL, diet, 84 days, survival (total chlordane used as surrogate)	Sample et al. 1996	2.14E+00	1	1	1	2.14E+00
alpha-Chlordane	red-winged blackbird	NOAEL, diet, 84 days, survival (total chlordane used as surrogate)	Sample et al. 1996	2.14	1	1	1	2.14
Aroclor-1254	chicken	NOAEL, egg production, hatchability, multi generation	Lillie et al. 1974	0.98	1	1	1	0.98
delta-BHC	Japanese quail	NOAEL, diet, 90 days critical lifestage, reproduction (BHC-mixed isomers used as surrogate)	Sample et al. 1996	0.56	1	1	1	0.56

TABLE 3.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
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Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
delta-BHC	Japanese quail	NOAEL, diet, 90 days critical lifestage, reproduction (BHC-mixed isomers used as surrogate)	Sample et al. 1996	0.56	1	1	1	0.56
Dieldrin	barn owl	NOAEL, diet, 2 yr. crit. lifestage, reproduction.	Sample et al. 1996	0.077	1	1	1	0.077
Endosulfan I	gray partridge	NOAEL, diet, 4 wks crit. lifestage, reproduction (endosulfan as surrogate)	Sample et al. 1996	10	1	10	10	1
Endosulfan II	gray partridge	NOAEL, diet, 4 wks crit. lifestage, reproduction (endosulfan used as surrogate)	Sample et al. 1996	10	1	1	1	10
Endosulfan sulfate	gray partridge	NOAEL, diet, 4 wks crit. lifestage, reproduction (endosulfan as surrogate)	Sample et al. 1996	10	1	10	10	1
Endrin	screech owl	LOAEL, diet, >83 days crit. lifestage, reproduction	Sample et al. 1996	0.1035	10	1	10	0.01035
Endrin ketone	mallard	NOAEL, diet, >200 days, crit. lifestage, reproduction (endrin as surrogate)	Sample et al. 1996	0.3	1	1	1	0.3
gamma-BHC (Lindane)	mallard	LOAEL, diet, 8 wks. crit. lifestage, reproduction.	Sample et al. 1996	20	10	1	10	2
gamma-Chlordane	red-winged blackbird	NOAEL, diet, 84 days, survival (total chlordane used as surrogate)	Sample et al. 1996	2.14	1	1	1	2.14
Heptachlor	mallard	LD50, diet, 8days, mortality	AQUIRE 1997	480	10	10	100	4.8
Heptachlor epoxide	mallard	LD50, diet, 8days, mortality	AQUIRE 1997	480	10	10	100	4.8
Metals								
Antimony		No data available						no data
Beryllium		No data available						no data
Chromium	black duck	NOAEL, diet, 10 mos. crit. lifestage, reproduction (chromium III)	Sample et al. 1996	1	1	1	1	1
Copper	chicken	NOAEL, 1-day old chicks, diet, 10 wks, growth, mortality	Sample et al. 1996	47	1	1	1	47
Iron		No data available						no data
Lead	Am Kestrail	NOAEL, diet, 7 months, reproduction	Sample et al. 1996	3.85	1	1	1	3.85

TABLE 3.6-5
NOAEL TOXICITY REFERENCE VALUES - BIRDS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Test Organism	Endpoint/Duration/Effect	Source	Effect Dose (mg/kg/day)	Endpoint CF1	Study Duration CF1	Total CF1	TRV2 (mg/kg/day)
Manganese	Japanese quail	NOAEL, diet, 75 days, growth & aggressive behavior	Sample et al. 1996	977	1	1	1	977
Mercury	Japanese quail	NOAEL, diet, reproduction	Sample et al. 1996	0.45	1	1	1	0.45
Nickel	mallard	NOAEL, diet, duckling, 90 days, mortality, growth, behavior	Sample et al. 1996	77.4	1	1	1	77.4
Selenium	mallard	NOAEL, diet, 100 days crit. lifestage, reproduction	Sample et al. 1996	0.4	1	1	1	0.4
Sodium		No data available						no data
Zinc	chicken	NOAEL, hens, diet, 44 wks. crit. lifestage, reproduction	Sample et al. 1996	14.5	1	1	1	14.5

3.6.4 Risk Characterization

Risk characterization integrates exposure(s) and effect(s) on receptors using hazard quotients (HQs) (ratios of exposure and effect concentrations). The resulting data are used to define the magnitude of potential risk from COPCs at the site and to assess the risk to ecological receptors. Risk characterization uses the results of the exposure and effects assessments to calculate an HQ for each COPC. The HQs are based on relevant measurement endpoints and are indicative of the COPC's potential to pose ecological risk to receptors. Any COPCs for a given exposure group and medium that were identified as likely to pose significant risk to receptors based on their HQs were classified as ecological chemicals of concern (COCs). Risk assessment related uncertainties are also analyzed and discussed.

Estimation of a COPC's potential to pose significant risk to receptors is based on the magnitude of the HQ value calculated for each constituent, as well as other factors such as the bioaccumulation/biomagnification potential, mechanism of toxicity, physicochemical characteristics, environmental fate, and ecological relevance of each contaminant. The HQ is a ratio of the estimated exposure dose (for receptor species) of a constituent to the TRV. Generally, the greater this ratio or quotient, the greater the likelihood of an effect. Typically, a quotient of 1 is considered the threshold level at which effects may occur. The TRVs on which the HQs were based were derived to be conservative and representative of chronic exposures, as described previously in Section 3.6.3.4.

The calculated HQs were used to assess the potential that toxicological effects will occur among the site's receptors. The HQs were compared to HQ guidelines for assessing the risk posed from contaminants (Menzie et al., 1993). These guidelines suggest that HQs less than or equal to 1 present no probable risk; HQs from 1 up to, but less than, 10 present a small potential for environmental effects; HQs from 10 up to, but less than 100 present a significant potential for ecological effects, and HQs greater than 100 present the highest potential for expected effects. The likelihood that a population of receptor species (i.e., deer mice, short-tailed shrews, American robins) could be significantly impacted by the toxicological effect(s) produced by a given COPC was a major factor in the subsequent determination (see Section 3.6.4.1) of whether that contaminant should be classified as an ecological COC.

Ecological risk from COPCs was characterized for potential future land use at the site. Risks from constituents found in soil available to terrestrial receptors were assessed quantitatively. Complete exposure and hazard quotient calculations for each site are included in Appendices A and B. The hazard quotients calculated for each site are also summarized in **Table 3.6-6**. Significant findings are summarized in the sections below for each site.

3.6.4.1 SEAD-59

The potential effects of the exposure of deer mice, short-tailed shrews, or American robins to the COPCs detected in surface soils (0 to 2 fee) at SEAD-59 were estimated by computing hazard quotients for each species and chemical pair. EPCs used in the HQ calculations are equal to the maximum and mean concentrations. Inorganic analytes present at background levels were eliminated from the risk assessment. Background samples were excluded from the calculation of EPCs. The NOAEL HQs for all constituents found in shallow soil were less than one, with the exception of those listed below:

	Hazard Quotient					
Compound	**Deer Mouse**		**Short-Tailed Shrew**		**American Robin**	
	Max	**Mean**	**Max**	**Mean**	**Max**	**Mean**
Benzene	<1	<1	3.1	<1	-	-
Ethyl benzene	<1	<1	3.2	<1	-	-
Toluene	**255**	**13**	**1300**	**66**	-	-
Total Xylenes	**340**	**17**	**1600**	**82**	7.7	<1
2-Methylnaphthalene	<1	<1	1.9	<1	<1	<1
Benzo(a)pyrene	3.5	3.7	**15**	**16**	<1	<1
Benzo(b)fluoranthene	<1	<1	1.1	1.2	<1	<1
Bis(2-Ethylhexyl)phthalate	1.1	<1	5.6	<1	**59**	**4.2**
Di-n-octylphthalate	<1	6.6	1.7	35	**17**	**360**
Diethylphthalate	<1	<1	<1	<1	**45**	**840**
Fluoranthene	<1	<1	3.6	2.6	<1	<1
Fluorene	1.0	<1	3.5	<1	<1	<1
Indeno(1,2,3-cd)pyrene	<1	<1	1.3	1.4	<1	<1
Phenanthrene	1.3	<1	3.3	<1	<1	<1
Pyrene	<1	<1	<1	<1	<1	<1
Delta-BHC	<1	<1	<1	<1	1.5	<1
Antimony	2.4	1.3	13	6.6	-	-
Mercury	<1	<1	<1	<1	15	2.4

Note: HQ values for some compounds are greater for the mean than the maximum concentrations. This is because the calculated mean is greater than the maximum due to high detection limits.

TABLE 3.6-6a
SUMMARY OF ECOLOGICAL HAZARD QUOTIENTS
Based on Maximum Concentrations
Decision Document- SEADs- 59 and 71
Seneca Army Depot Activity

	SEAD-59			SEAD-71		
	Mouse	Shrew	Robin	Mouse	Shrew	Robin
Volatile Organics						
Acetone	8.70E-02	2.89E-02	3.68E-03	4.29E-02	1.18E-02	1.34E-03
Benzene	6.49E-01	3.13E+00	--	2.20E-04	8.80E-04	--
Ethylbenzene	9.75E-01	3.23E+00	--	1.50E-05	4.12E-05	--
Methyl ethyl ketone	1.52E-04	7.03E-05	--			
Methylene chloride	--	--	--	--	--	--
Styrene				--	--	--
Tetrachloroethene				5.75E-03	1.19E-02	--
Toluene	2.55E-02	1.31E-03	--	4.91E-03	2.10E-02	--
Total Xylenes	3.40E-02	1.63E-03	7.67E+00	3.74E-03	1.49E-02	6.22E-05
Trichloroethene	2.12E-03	1.10E-02	--			
Semivolatile Organics						
2-Methylnaphthalene	5.52E-01	1.87E+00	5.61E-01	1.56E-01	4.39E-01	1.17E-01
Acenaphthene	1.43E-02	4.48E-02	9.82E-05	1.54E+00	4.00E+00	7.80E-03
Acenaphthylene	1.44E-01	6.31E-01	5.21E-04	6.68E-02	2.43E-01	1.78E-04
Anthracene	3.17E-04	4.84E-04	1.80E-04	2.11E-02	2.68E-02	8.83E-03
Benzo(a)anthracene	1.25E-01	4.57E-01	1.94E-02	2.93E+00	8.90E+00	3.36E-01
Benzo(a)pyrene	3.48E+00	1.50E-01	2.82E-01	7.21E-01	2.58E-02	4.30E+00
Benzo(b)fluoranthene	2.50E-01	1.15E+00	2.95E-02	3.49E+00	1.33E-01	3.04E-01
Benzo(ghi)perylene	5.82E-02	2.59E-01	7.53E-03	1.90E+00	7.02E+00	1.81E-01
Benzo(k)fluoranthene	1.87E-01	8.34E-01	2.37E-02	4.18E+00	1.55E-01	3.92E-01
Bis(2-Ethylhexyl)phthalate	1.06E+00	5.58E+00	5.87E-01			
Butylbenzylphthalate	1.33E-04	3.62E-04	--			
Carbazole	--	--	--	--	--	--
Chrysene	1.59E-01	6.21E-01	2.18E-02	3.85E+00	1.25E-01	3.90E-01
Di-n-butylphthalate	1.25E-05	3.36E-05	3.22E-01	6.99E-06	1.56E-05	1.33E-01
Di-n-octylphthalate	3.18E-01	1.67E+00	1.73E-01			
Dibenz(a,h)anthracene	4.59E-02	1.89E-01	6.51E-03	6.05E-01	2.07E+00	6.32E-02
Dibenzofuran	--	--	6.00E-01	--	--	6.01E-01
Diethylphthalate	3.33E-05	1.74E-04	4.53E-01			
Fluoranthene	7.44E-01	3.57E+00	8.97E-02	3.31E-01	1.32E-02	2.94E+00
Fluorene	1.01E+00	3.50E+00	1.81E-01	2.85E+00	8.19E+00	3.77E-01
Indeno(1,2,3-cd)pyrene	2.64E-01	1.26E+00	2.93E-02	3.24E+00	1.28E-01	2.65E-01
Naphthalene	2.99E-03	6.99E-03	2.66E-03	5.73E-01	1.11E+00	3.76E-01
Phenanthrene	1.32E+00	5.34E+00	2.33E-01	8.30E+00	1.75E-01	1.08E+00
Pyrene	2.29E-01	6.44E-01	3.53E-02	5.35E+00	1.25E-01	6.08E-01
Pesticides/PCBs						
4,4'-DDD	8.53E-04	2.93E-03	8.20E-02	4.99E-03	1.42E-02	3.54E-01
4,4'-DDE	4.94E-04	8.08E-04	6.78E-02	9.15E-03	1.24E-02	9.26E-01
4,4'-DDT	1.06E-03	3.71E-03	1.03E-01	2.63E-02	7.70E-02	1.90E+00
Aldrin	2.07E-03	1.07E-02	2.83E-03			
Alpha-BHC	1.27E-03	5.05E-03	1.27E-02	1.27E-03	4.19E-03	9.38E-03
Alpha-Chlordane	3.55E-05	1.52E-04	3.85E-04	1.39E-05	4.96E-05	1.11E-04
Beta-BHC	--	--	--	--	--	--
Delta-BHC	1.61E-01	8.45E-01	1.50E+00			
Dieldrin	4.04E-03	5.50E-03	5.74E-03	3.81E-03	4.31E-03	4.00E-03
Endosulfan I	1.00E-03	2.24E-03	5.64E-03	6.85E-04	1.27E-03	2.84E-03
Endosulfan II	2.22E-04	5.17E-04	1.26E-04	2.26E-03	4.37E-03	9.51E-04
Endosulfan sulfate	4.23E-04	1.01E-03	2.43E-03	4.65E-03	9.22E-03	1.97E-02
Endrin	--	--	8.26E-02	--	--	1.30E+00
Endrin aldehyde	--	--	--			
Endrin ketone	3.13E-03	1.23E-02	5.23E-03	5.13E-02	1.67E-01	6.31E-02
Gamma-Chlordane	5.32E-05	2.21E-04	5.68E-04	3.45E-04	1.19E-03	2.72E-03
Heptachlor epoxide	6.76E-04	1.98E-03	7.49E-05	4.68E-02	1.14E-01	3.82E-03
Methoxychlor				--	--	--
Metals						
Antimony	2.44E+00	1.27E-01	--			
Lead				1.00E-02	4.29E-02	5.41E-02
Mercury	1.60E-01	8.32E-01	1.54E-01	5.13E-01	2.22E+00	3.64E-01
Selenium				6.10E+00	2.15E-01	7.23E+00
Sodium	--	--	--	--	--	--
Zinc				2.53E-01	1.07E-02	6.78E-02

TABLE 3.6-6b
SUMMARY OF ECOLOGICAL HAZARD QUOTIENTS
Based on MeanConcentrations
Decision Document- SEADs- 59 and 71
Seneca Army Depot Activity

	SEAD-59			SEAD-71		
	Mouse	Shrew	Robin	Mouse	Shrew	Robin
Volatile Organics						
Acetone	3.72E-02	1.23E-02	1.57E-03	5.20E-03	1.43E-03	1.62E-04
Benzene	4.90E-02	2.36E-01	--	6.51E-04	2.60E-03	--
Ethylbenzene	4.92E-02	1.63E-01	--	2.17E-05	5.97E-05	--
Methyl ethyl ketone	1.04E-04	4.81E-05	--			
Methylene chloride	--	--	--	--	--	--
Styrene				--	--	--
Tetrachloroethene				1.26E-03	2.60E-03	--
Toluene	1.27E+01	6.58E+01	--	1.88E-03	8.05E-03	--
Total Xylenes	1.70E+01	8.17E+01	3.84E-01	2.14E-03	8.52E-03	3.56E-05
Trichloroethene	5.95E-03	3.07E-02	--			
Semivolatile Organics						
2-Methylnaphthalene	5.13E-02	1.74E-01	5.22E-02	1.63E-02	4.57E-02	1.22E-02
Acenaphthene	1.91E-01	6.00E-01	1.32E-03	1.93E-01	5.03E-01	9.80E-04
Acenaphthylene	7.00E-01	3.06E+00	2.53E-03	7.59E-01	2.76E+00	2.02E-03
Anthracene	1.15E-03	1.76E-03	6.52E-04	3.22E-03	4.08E-03	1.35E-03
Benzo(a)anthracene	1.24E-01	4.53E-01	1.92E-02	4.84E-01	1.47E+00	5.54E-02
Benzo(a)pyrene	3.72E+00	1.60E+01	3.00E-01	1.24E+01	4.43E+01	7.38E-01
Benzo(b)fluoranthene	2.57E-01	1.18E+00	3.05E-02	7.28E-01	2.77E+00	6.35E-02
Benzo(ghi)perylene	1.70E-01	7.58E-01	2.20E-02	3.42E-01	1.26E+00	3.26E-02
Benzo(k)fluoranthene	1.95E-01	8.73E-01	2.48E-02	6.65E-01	2.47E+00	6.23E-02
Bis(2-Ethylhexyl)phthalate	7.67E-02	4.02E-01	4.23E+00			
Butylbenzylphthalate	3.24E-03	8.81E-03	--			
Carbazole	--	--	--	--	--	--
Chrysene	1.62E-01	6.31E-01	2.22E-02	6.53E-01	2.11E+00	6.61E-02
Di-n-butylphthalate	1.04E-05	2.80E-05	2.68E-01	1.54E-05	3.43E-05	2.92E-01
Di-n-octylphthalate	6.62E+00	3.48E+01	3.60E+02			
Dibenz(a,h)anthracene	1.32E-01	5.44E-01	1.87E-02	1.12E-01	3.84E-01	1.17E-02
Dibenzofuran	--	--	1.12E+01	--	--	6.15E+00
Diethylphthalate	6.18E-04	3.23E-03	8.41E+02			
Fluoranthene	5.44E-01	2.61E+00	6.57E-02	4.67E+00	1.86E+01	4.15E-01
Fluorene	1.73E-01	5.98E-01	3.10E-02	3.26E-01	9.39E-01	4.32E-02
Indeno(1,2,3-cd)pyrene	2.91E-01	1.39E+00	3.24E-02	5.42E-01	2.15E+00	4.44E-02
Naphthalene	6.48E-02	1.51E-01	5.77E-02	4.28E-02	8.30E-02	2.81E-02
Phenanthrene	1.74E-01	4.40E-01	3.07E-02	1.32E+00	2.78E+00	1.72E-01
Pyrene	1.38E-01	3.87E-01	2.12E-02	9.36E-01	2.18E+00	1.06E-01
Pesticides/PCBs						
4,4'-DDD	2.39E-04	8.21E-04	2.30E-02	6.11E-04	1.74E-03	4.33E-02
4,4'-DDE	1.79E-04	2.92E-04	2.45E-02	1.23E-03	1.66E-03	1.24E-01
4,4'-DDT	3.15E-04	1.10E-03	3.07E-02	4.85E-03	1.41E-02	3.48E-01
Aldrin	2.18E-03	1.13E-02	2.98E-03			
Alpha-BHC	2.90E-04	1.16E-03	2.91E-03	5.05E-04	1.67E-03	3.74E-03
Alpha-Chlordane	1.68E-05	7.19E-05	1.82E-04	3.72E-05	1.32E-04	2.98E-04
Beta-BHC	--	--	--	--	--	--
Delta-BHC	4.05E-02	2.13E-01	3.78E-01			
Dieldrin	2.56E-03	3.48E-03	3.64E-03	1.16E-02	1.52E-02	1.22E-02
Endosulfan I	1.49E-04	3.33E-04	8.37E-04	2.95E-04	5.46E-04	1.22E-03
Endosulfan II	1.45E-04	3.39E-04	8.29E-05	6.57E-04	1.27E-03	2.76E-04
Endosulfan sulfate	1.50E-04	3.59E-04	8.65E-04	1.02E-03	2.03E-03	4.35E-03
Endrin	--	--	5.20E-02	--	--	2.31E-01
Endrin aldehyde	--	--	--	--	--	--
Endrin ketone	1.08E-03	4.24E-03	1.80E-03	1.31E-02	4.27E-02	1.61E-02
Gamma-Chlordane	1.70E-05	7.10E-05	1.82E-04	5.46E-05	1.89E-04	4.31E-04
Heptachlor epoxide	4.69E-04	1.37E-03	5.20E-05	4.62E-03	1.12E-02	3.77E-04
Methoxychlor				--	--	--
Metals						
Antimony	1.26E+00	6.58E+00	--			
Lead				7.25E+00	3.10E+01	3.91E+01
Mercury	2.46E-02	1.28E-01	2.37E+00	3.20E-02	1.38E-01	2.27E+00
Selenium				3.07E+00	1.08E+01	3.64E+00
Sodium	--	--	--	--	--	--
Zinc				3.46E+00	1.47E+01	9.30E+01

SEAD-59 is located in a portion of the Depot where the future land use is classified as a planned industrial development. As such, this area will probably not represent a preferred habitat for any of the three identified ecological receptors, and the estimated ecological risk will be reduced accordingly.

3.6.4.2 SEAD-71

The potential effects of the exposure of deer mice, short-tailed shrews, or American robins to the COPCs detected in surface soils (0 to 2 feet) at SEAD-71 were estimated by computing hazard quotients for each species and chemical pair. EPCs used in the HQ calculations are equal to the maximum and mean concentrations. Inorganic analytes present at background levels were eliminated from the risk assessment. Background samples were excluded from the calculation of EPCs. The NOAEL HQs for all constituents found in shallow soil were less than one, with the exception of those listed below:

	Hazard Quotient					
Compound	**Deer Mouse**		**Short-Tailed Shrew**		**American Robin**	
	Max	**Mean**	**Max**	**Mean**	**Max**	**Mean**
Acenaphthene	1.5	<1	4	2.8	<1	<1
Benzo(a)anthracene	2.9	<1	8.9	1.5	<1	<1
Benzo(a)pyrene	**72**	**12**	**260**	**44**	4.3	<1
Benzo(b)fluoranthene	3.5	<1	**13**	2.8	<1	<1
Benzo(ghi)perylene	1.9	<1	7	1.3	<1	<
Benzo(k)fluoranthene	4.2	<1	**16**	2.5	<1	<1
Chrysene	3.9	<1	**12**	2.1	<1	<1
Dibenzofuran	<1	<1	<1	<1	**60**	6.2
Dibenz(a,h)anthracene	<1	<1	2.1	<1	<1	<1
Fluoranthene	**33**	4.7	**130**	**19**	2.9	<1
Fluorene	2.8	<1	8.2	<1	<1	<1
Indeno(1,2,3-cd)pyrene	3.2	<1	**13**	2.1	<1	<1
Naphthalene	<1	<1	1.1	<1	<1	<1
Phenanthrene	8.3	1.3	**17**	2.8	1.1	<1
Pyrene	5.4	<1	**12**	2.2	<1	<1
4,4'-DDT	<1	<1	<1	<1	1.9	<1
Lead	**100**	7.3	**430**	**31**	**540**	**39**
Mercury	<1	<1	2.2	<1	**36**	2.3
Selenium	6.1	3.1	**22**	**11**	7.2	3.6
Zinc	**25**	3.5	**110**	**15**	**680**	**93**

SEAD-71 is located in a portion of the Depot where the future land use is classified as a planned industrial development. As such, this area will probably not represent a preferred habitat for any of the three identified ecological receptors, and the estimated ecological risk will be reduced accordingly.

3.6.4.3 Uncertainty

Uncertainty is inherent in each step of the ecological risk assessment process. Major factors contributing to uncertainty in this risk assessment are discussed qualitatively in the following sections.

3.6.4.3.1 Chemicals of Potential Concern

The sampling data may not represent the actual overall distribution of contamination at the site, which could result in underestimation or overestimation of potential risk from identified chemicals. The 95% UCL of the mean concentrations were used to calculate site-related risks. Since that assumption implies chronic exposure to the 95% UCL of the mean concentration, this assumption is likely to overestimate risk.

3.6.4.3.2 Exposure Assessment

While the potential receptor species selected for the site are inevitably a limited subset of the total list of species that may utilize the site, the potential exposure of the species evaluated in this assessment is considered likely to be representative of the nature and magnitude of the exposures experienced by those species not discussed.

Risk associated with intake of contaminants through the food chain was addressed by modeling food chain transfer of chemical residues through plants and earthworms. The degree of uncertainty in the results of the analysis increases with the increasing distance of the receptor from the base of the food chain. Intakes from dermal contact with and inhalation of contaminants were not quantifiable for ecological receptors. However, this does not significantly increase the uncertainty of the estimated intakes because for most receptors, intakes via these routes are likely to be minimal relative to intakes via ingestion.

3.6.4.3.3 Toxicity Assessment

There is uncertainty associated with the TRVs calculated for this risk characterization because the toxicity data were not site-specific. However, the TRVs used were conservative and were modified by uncertainty factors where necessary to increase the applicability of the data to the assessment. The HQs calculated from these conservative TRVs and maximum concentrations provide confidence that the risk assessment yielded reasonably conservative estimates of the potential risk of adverse ecological effects on the assessment endpoint.

Each COPC was assumed highly bioavailable. However, for most chemicals in most media, this is an overestimation (Dixon et. al., 1993) that may result in an overestimation of the potential for ecological risk. Empirical information on bioavailability of the COPCs was not available. No leachability tests in soil or sediment were conducted. No analysis for acid-volatile sulfide/simultaneously extracted metals was conducted as a measure of bioavailability in sediment. It is possible that some of the contaminants, particularly the metals, may be bound to soil or sediment particles and not available for uptake by receptors. This would tend to overestimate risk.

The soil-to-plant uptake equations and the BAFs include a bioavailability factor; however, these data, taken from the scientific literature, are not specific to this site and may under- or overestimate exposure. For several metals, no quantitative bioavailability data could be found, other than an indication from the literature that the constituent does not significantly bioaccumulate. For these metals, a bioaccumulation factor of 1.0 was used in the exposure equation. This is likely to overestimate the actual value.

The potential for toxic effects to be produced in receptor organisms because of exposure to multiple chemicals in a single medium or in multiple media was not evaluated. Therefore, the potential toxic effects in a receptor as a result of exposure to a given medium could be higher or lower than estimated, depending on toxicological interactions. Exposure of a receptor to multiple contaminated media is likely to increase the risk of toxic effects.

3.6.4.3.4 Risk Characterization

The methodology, conservative assumptions, and toxicity benchmarks used in the risk estimation portion of the risk characterization are expected to overestimate, rather than underestimate, the potential for COPCs to pose risk to the ecological assessment endpoint. The 95% UCL of the mean concentrations were used, concentrations were assumed to remain constant over time, and the toxicity benchmarks used were the NOAEL values (levels where no toxic effects are expected) or conservative surrogates based on LOAEL values for non-lethal or reproductive effects appropriate for extrapolation to effects on the assessment endpoint.

4.0 RECOMMENDATIONS

This section presents the recommendation of the Army for SEAD-59 and SEAD-71 located in the area of SEDA designated for Planned Industrial Development. The Army recommends that a time-critical removal action be conducted at both sites. A land use restriction should be placed on both sites. The land use restriction will involve a restriction on the deed in order that the future land use remains as Planned Industrial Development. A groundwater monitoring program is recommended due to the presence of elevated levels of SVOCs, TPH, and metals. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years.

4.1 REMEDIAL ACTION OBJECTIVES

For SEAD-59 and SEAD-71, the remedial objectives are to reduce any non-carcinogenic and carcinogenic risks to acceptable levels considered to be protective of human health and the environment.

The results of the test pitting investigations have confirmed the presence of 55-gallon drums, paint cans, and other containers at SEADs-59 and 71. The presence of such buried objects is of concern since the nature of the contents is unknown. The uncertainty of the contents of the buried items that may remain in the disposal area and at geophysical anomalies and the contamination in soils and groundwater are considered justification for performing removal actions at SEADs-59 and 71. While removal of drums, paint cans, and other containers is the focus of the planned removal actions for both sites, the potential for contamination to be present in the soils and groundwater that surround these items will also be addressed by this action.

4.2 REMEDIATION GOALS

For soils, maximum concentrations of compounds that would be protective of a day-care-child under the industrial use scenario were back-calculated for the compounds listed in **Table 4.3-1.** Calculations are presented in Appendix D. Maximum concentrations of selected SVOCs, Aroclor-1254, heptaclor epoxide, antimony, and mercury were calculated for soils at SEAD-59. Maximum concentrations of selected SVOCs, pesticides, mercury, selenium, and zinc were calculated for soils at SEAD-71. Calculations were done by assigning the total Hazard Index of

TABLE 4.3-1
MAXIMUM CONCENTRATIONS TO BE PROTECTIVE OF HUMAN HEALTH FROM INGESTION OF SOILS UNDER THE INDUSTRIAL USE SCENERIO
Decision Document- SEADs- 59 and 71
Seneca Army Depot Activity

	SEAD-59	SEAD-71
Semivolatile Organics	**(ug/kg)**	**(ug/kg)**
2-Methylnaphthalene	65,471	114,546
Acenaphthene		147,273
Anthracene		373,092
Benzo(a)anthracene	13,208	14,966
Benzo(a)pyrene	12,107	11,980
Benzo(b)fluoranthene	15,409	8,784
Bis(2-Ethylhexyl)phthalate	65,471	
Dibenz(a,h)anthracene	2,531	2,497
Fluoranthene	851,121	1,636,368
Fluorene		120,273
Indeno(1,2,3-cd)pyrene		6,479
Naphthalene		146,455
Pyrene	834,753	1,045,639
Pesticides/PCBs		
4,4-DDT		2,045
alpha-Chlordane		25
Aroclor-1254	327	
Endrin		121
gamma-Chlordane		49
Heptaclor epoxide	21	88
Metals	**(mg/kg)**	**(mg/kg)**
Antimony	13	
Mercury	1.4	0.4
Selenium		4
Zinc		1792

the above compounds as 1 or the cancer risk as 1 x 10^{-4}. The Hazard Quotient and cancer risk was distributed among the compounds according to post-remediation HQ for a day-care-child by ingestion of total soil at both sites.

4.3 RECOMMENDED REMOVAL ACTION

SEAD-59 consists of two areas that are located north and south of an access road that bisects the site from east to west. The area north of the road is a fill area and the area south of the road was used as a staging area for heavy equipment and construction materials.

As part of the removal action at SEAD-59, approximately 23,025 cy of soil will be excavated (**Figure 4-1**). The fill area (Area 1) will be excavated. Geophysical anomalies located south of the road will be excavated. Drums, paint cans, and construction debris will be screened out and disposed off-site.

Following excavation, soils will be placed in 150cy piles for testing to ensure that they comply with the clean up goals developed for the site. Soils with concentration of metals, pesticides, and SVOCs exceeding the clean up goals will be disposed of at an offsite facility. These soils will also be analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) limits required for landfill disposal. Soils from SEAD-59 are not expected to exceed TCLP limits.

Soils with concentrations of metals, pesticides, and SVOCs below the cleanup goals will be backfilled into the former fill area and the area south of the road. The sites will be regraded. A two-foot thick vegetative cover will be placed over the former fill area. It is assumed that NYCRR Part 360 will no longer apply because the fill area is being removed. The remaining areas will be covered with crushed stone.

The excavations at SEAD-59 will be dewatered and the water placed in holding tanks. The water will be treated by air stripping prior to discharge into a storm drain or drainage ditch.

At SEAD-71, approximately 871 cubic yards of geophysical anomalies and soils with concentrations exceeding the soil cleanup goals for the site will be excavated (**Figure 4-2**). Paint cans and debris will be screened out and disposed off site.

Following excavation, soils will be placed in 150cy piles for testing to ensure that they comply with the clean up goals developed for the site. Soils with concentration of metals, pesticides, and SVOCs exceeding the clean up goals will be disposed of at an offsite facility. These soils will also be analyzed for the Toxicity Characteristic Leaching Procedure (TCLP) limits required for landfill disposal. About 3% (275cy) of SEAD-71 soils are expected to exceed TCLP limits due to elevated levels of lead. These soils will be treated off site. Once treatment of necessary soils has occurred, these contaminated soils would be transported to an off-site, Subtitle D, solid waste industrial landfill for disposal.

Soils with concentrations below the cleanup goals will be backfilled into SEAD-71. The area will be covered with crushed stone.

Site groundwater will be monitored on a semi-annual basis and analyzed for SVOCs, Total Petroleum Hydrocarbons, and metals at SEAD-59 and for metals at SEAD-71. Additional monitoring wells will be installed at each site as required. In accordance with the Federal Facility Agreement CERCLA SECTION 120, Docket Number: II-CERCLA-FFA-00202, the monitoring program will be reviewed after five years.

Deed restrictions will be applied to both areas in order that the future land use remains as Planned Industrial Development.

4.4 JUSTIFICATION

A time-critical removal action at both SEAD-59 and SEAD-71 is proposed because of the increased potential for exposure of workers and other re-users now present at the depot. The presence of drums and other containers and the uncertainty of their contents is also justification for a removal action at both sites.

Since the historic military mission of the depot has been terminated, the depot has officially been closed by the Department of the Defense (DoD) and the US Army. This time-critical removal action would eliminate contaminants that have been identified in the soil that represent a potential threat to the environment and neighboring populations. In accordance with provisions of the DoD's Base Realignment and Closure (BRAC) process, the land and the facilities of the former depot have been surveyed and evaluated, and prospective beneficial uses of the facility have been identified.

Portions of the depot are now being released to the public and private sectors for reuse under the BRAC process. As portions of the former depot are released for other beneficial uses, increased access is afforded to all portions of the former depot. This may result in an increased potential for exposure of populations to any residual chemicals that are present at former solid waste management units (SWMUs) remaining at the depot pending clean-up. Therefore, the goal of the proposed time-critical removal action at SEAD-59 and SEAD-71 is to eliminate and contain an identified source of residual chemical materials in the soil. This removal action would remove or at least lessen the magnitude of the potential threat that it represents to surrounding populations and the environment.

4.5 POST-REMOVAL VERIFICATION SAMPLING

Verification of the acceptability of the surrounding soil quality will be demonstrated and documented by collecting and analyzing samples that will be analyzed for SVOCs, pesticides, and metals. Analytical results produced from the analysis of samples will be compared to soil cleanup levels developed for each site. If the results from the confirmatory sampling indicate that all species are below allowable limits, the treatment process will be terminated, and the effected area will be backfilled (as needed if contaminated soil is excavated) and re-contoured; however, if the analytical results indicate that soil contains SVOCs, pesticides, or metals in excess of the site clean up goals, the area of treatment will be expanded to remediate the identified contaminated soil.

At SEAD-59, soil borings will be excavated on a 50-foot interval grid in the area south of the road to determine if the soil in any areas outside of the geophysical anomalies require removal.

4.6 REMEDIAL ACTION COSTS

Preliminary capital costs for excavation, off-site disposal of debris and on-site backfilling of soil were developed using TRACES/MCACES for Windows v1.2 software. The estimated capital cost and present worth cost for this alternative is $3,549,300. Annual costs associated with this removal action include groundwater monitoring for five years. **Table 4.6-1** provides the cost breakdown, with cost backup and assumptions provided in **Appendix E**.

Table 4.6-1
Cost Estimate for Excavation and Off-site Disposal
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

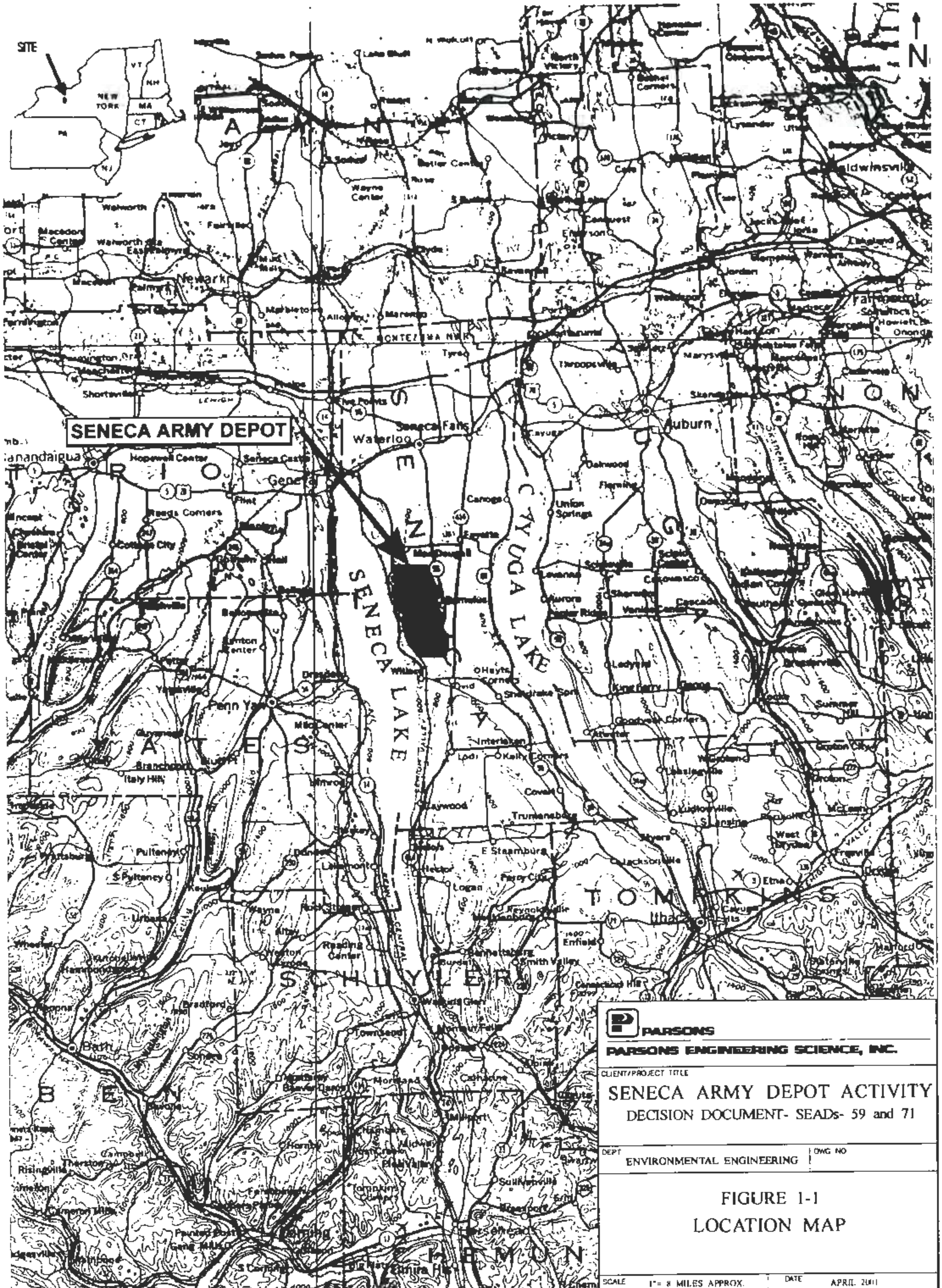
SEAD-59	**Recommended Removal Action Excavation/Off-site Disposal**
Cost to Prime	$1,957,768
Cost to Owner	$2,702,220
Annual O&M Costs	$0
Annual Post Remediation Monitoring Costs	$52,450
Present Worth O&M and Monitoring Costs (5 years)	$233,497
Total Evaluated Price	$2,935,717

SEAD-71	**Recommended Removal Action Excavation/Off-site Disposal**
Cost to Prime	$348,864
Cost to Owner	$467,630
Annual O&M Costs	$0
Annual Post Remediation Monitoring Costs	$32,920
Present Worth O&M and Monitoring Costs (5 years)	$146,553
Total Evaluated Price	$614,183

SEADs-59 and 71	**Recommended Removal Action Excavation/Off-site Disposal**
Cost to Prime	$2,306,632
Cost to Owner	$3,169,850
Annual O&M Costs	$0
Annual Post Remediation Monitoring Costs	$85,370
Present Worth O&M and Monitoring Costs (5 years)	$380,050
Total Evaluated Price	$3,549,900

NOTES

1. Cost to Prime (Contractor) is the sum of the direct costs plus any sales tax, subcontractor markups, and adjust pricing that have been applied in the project.
2. Cost to Owner is the sum of the Cost to Prime plus prime contractor Indirect Cost Also known as the bid amount or construction contract cost
3. Annual Costs are costs that will occur yearly due to activities such as maintenance or monitoring.
4. Post Remediation Monitoring consists of semi-annual groundwater monitoring
5. Present Worth Cost is based on a 4% interest rate over the number of years specified above.
6. Total Evaluated Price is the sum of the Project Cost and Present Worth Cost



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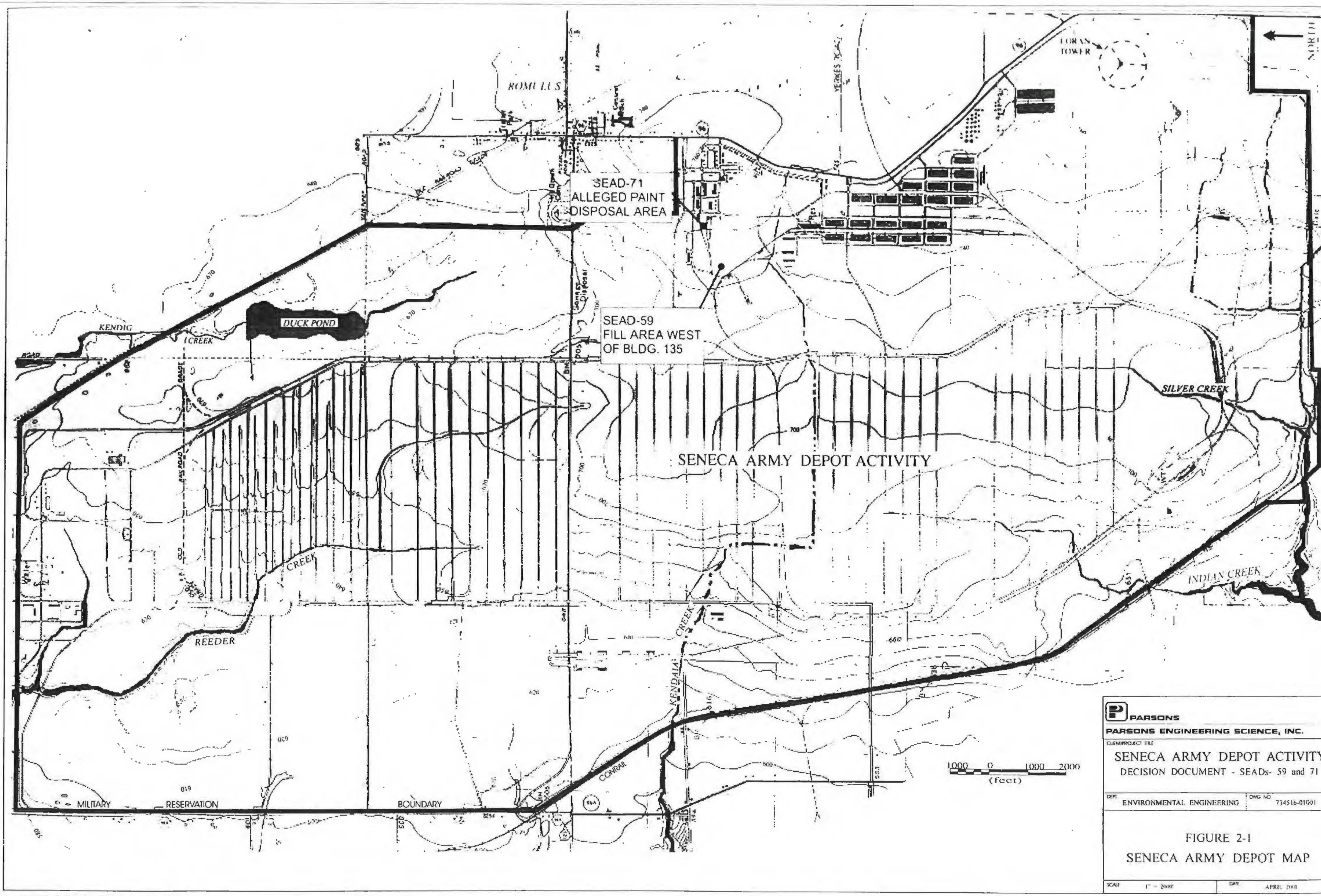
SENECA ARMY DEPOT ACTIVITY
DECISION DOCUMENT- SEADs- 59 and 71

DEPT	DWG NO
ENVIRONMENTAL ENGINEERING	

FIGURE 1-1
LOCATION MAP

SCALE	DATE
1"= 8 MILES APPROX.	APRIL 2011



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SENECA ARMY DEPOT ACTIVITY
DECISION DOCUMENT - SEADs- 59 and 71

ENVIRONMENTAL ENGINEERING | 734516-01001

FIGURE 2-1
SENECA ARMY DEPOT MAP

SCALE 1" = 2000' DATE APRIL 2001

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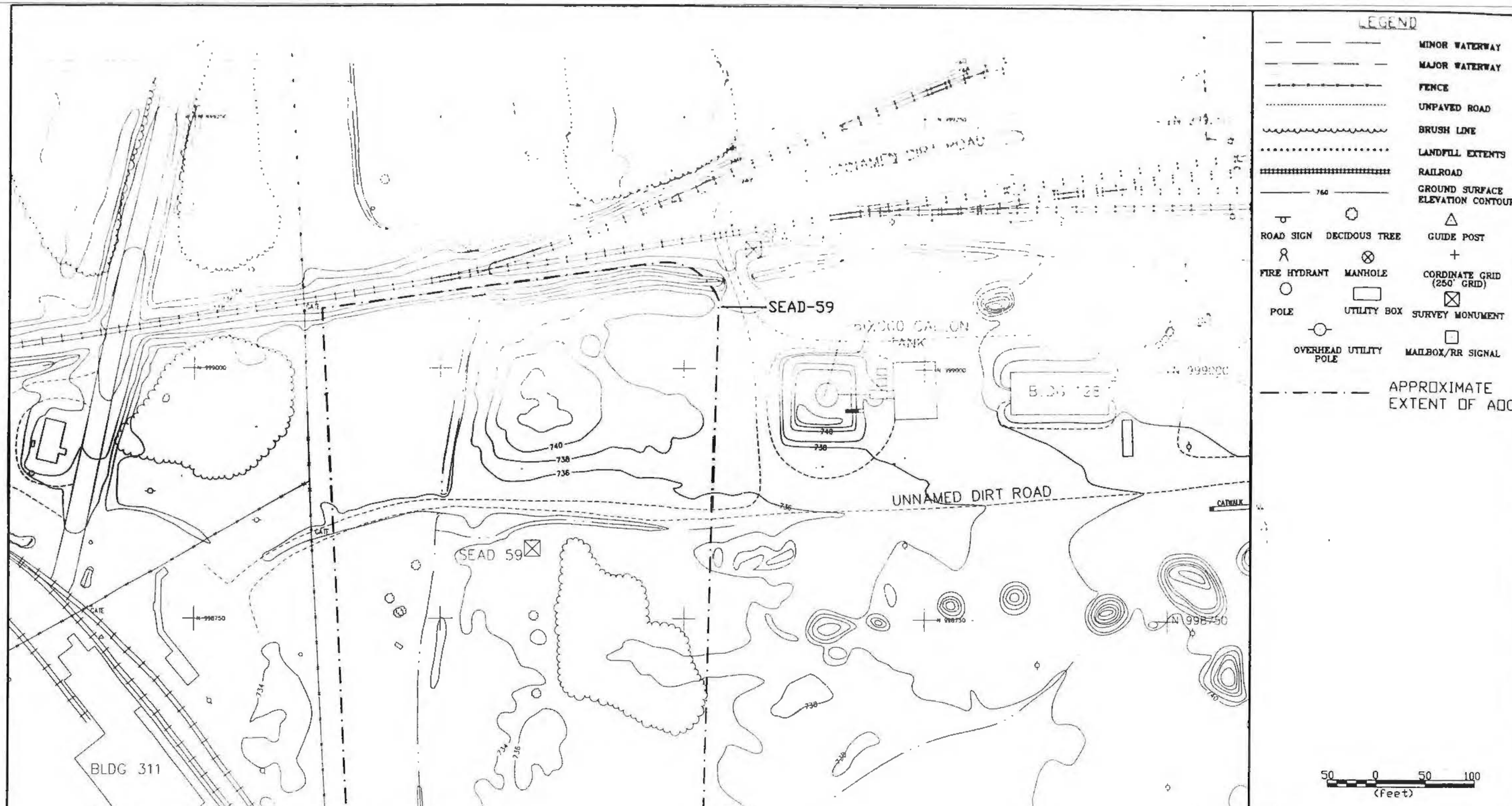

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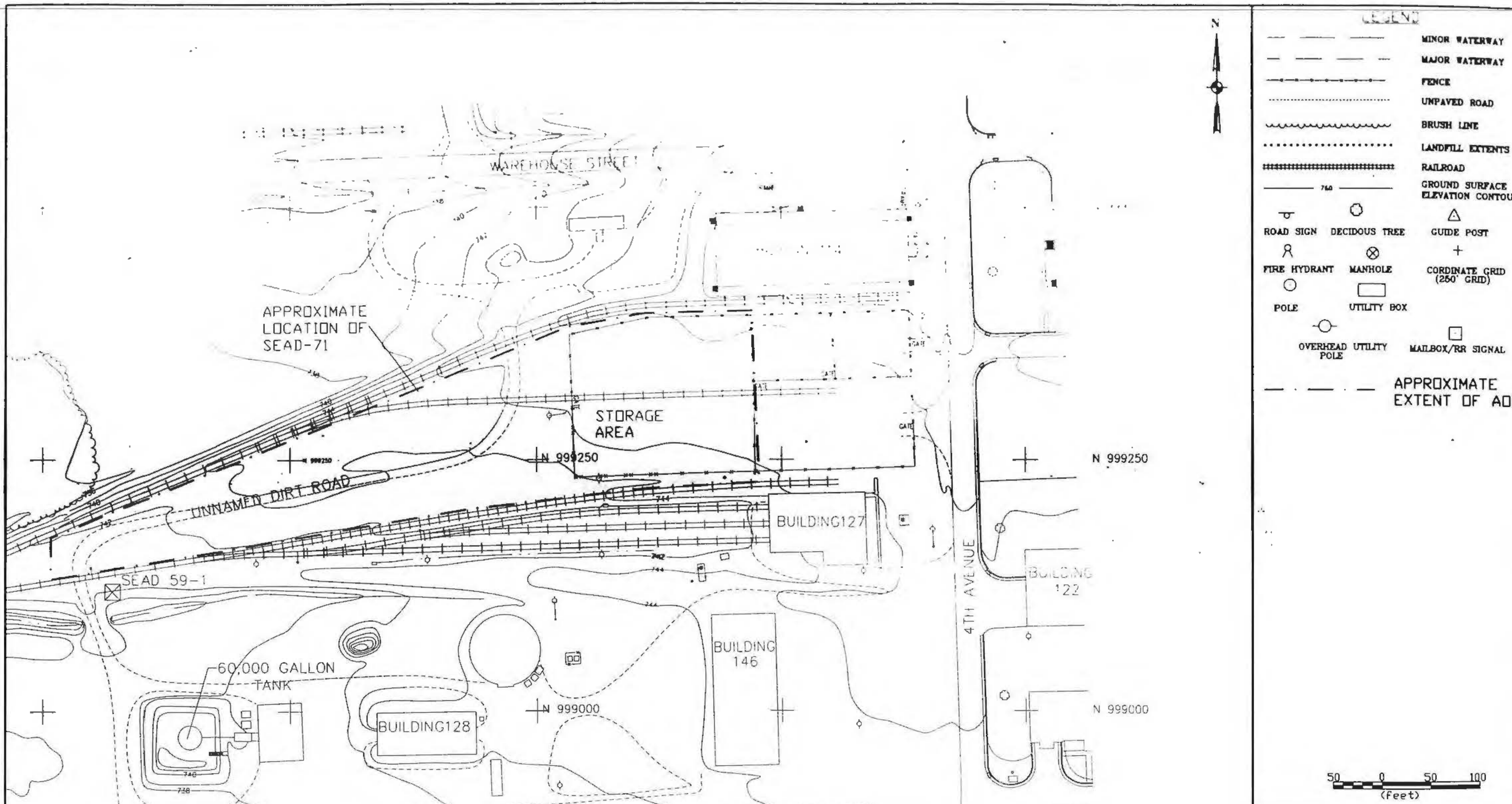
DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-2

SEAD-59
SITE PLAN

JOB NUMBER	DATE	SHEET No
734516-01001	APRIL 2001	1 OF 1



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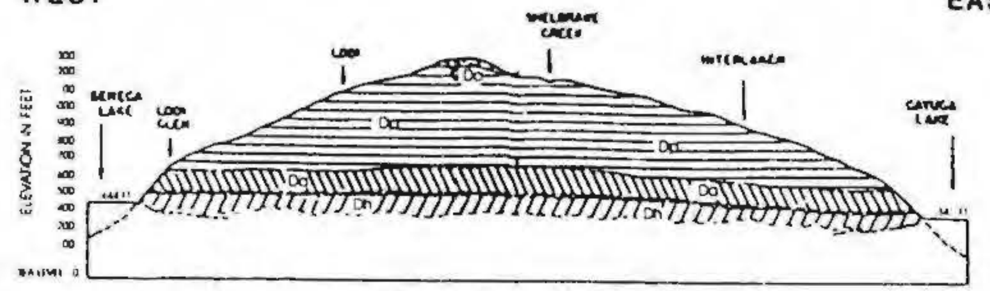
DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-3

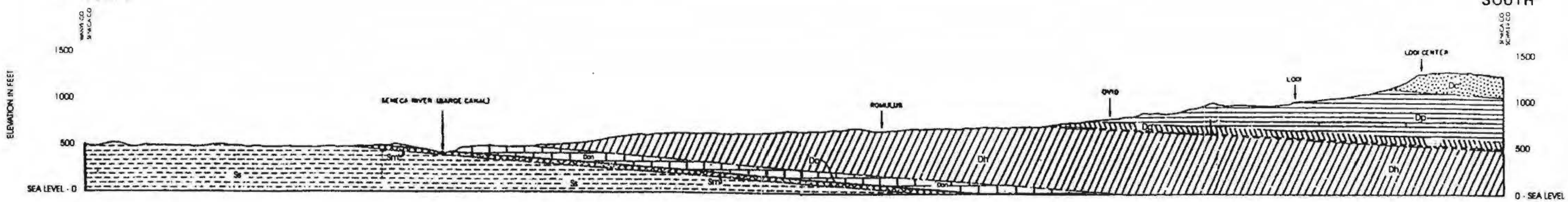
SEAD-71
SITE PLAN

JOB NUMBER	DATE	SHEET No
734516-01001	APRIL 2001	1 OF 1

ACAD\SENECA\RIFS\SD71\SD71SI.DWG



EAST-WEST SECTION ALONG A- A'



NORTH-SOUTH SECTION ALONG 76 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	

SCALE

1 0 1 2 3 MILES

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

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DECISION DOCUMENT - SEADs- 59 and 71

DEPT ENVIRONMENTAL ENGINEERING | DWG NO 734516-01001

FIGURE 2-4

REGIONAL GEOLOGIC CROSS SECTIONS

SCALE AS NOTED | DATE APRIL 2001

R:\PROJECT_GRAPHICS\SENECA\GEOXSEC.CDR(CVM)

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FIGURE 2-5
BEDROCK STRATIGRAPHIC COLUMN

DATE APRIL 2001

MESOZOIC — Lower Cretaceous

MESOZOIC INTRUSIVES

Kimberlite and alnoite dikes and diatremes

PALEOZOIC — Upper Devonian

CONNEAUT GROUP
600-1000 ft. (180-300 m.)

Germania Formation-shale, sandstone; Whiteville Formation-shale, sandstone; Hinsdale Sandstone; Wellsville Formation-shale, sandstone; Cuba Sandstone

CANADAWAY GROUP
800-1200 FT(240-370) m.)

Machias Formation-shale, siltsone; Rushford Sandstone, Caneadea, Canisteo, and Hume Shales, Canaseraga Sandstone; Stone Wales and Dunkirk Shales, in Pennsylvania: Towanda Foramtion-shale, sandstone.

JAVA GROUP
300-700 FT (90-210 m.)

Wiscoy Formation-sandstone, shale; Hanover and pipe creek shales

WEST FALLS GROUP
1100-1600 ft. (340-490 m.)

Nunda Formation-sandstone, shale.
West Hill and fardeau Formations-shale, siltsone; Roncks Glen Shale; upper Beers Hill Shale; Grimes Siltstone
lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales
Nunda Formation-sandstone, shale; West Hill Formation-shale, siltstone; Corning Shale.
"New Milford" Formation-sandstone, shale.
Gardeau formation-shale, siltstone; Roricks Gain Shale
Slide Mountain Formation-sandstone, shale, conglomerate
Beers Hill Shale, Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales

SONYEA GROUP
200-1000 ft. (60-300 m.)

In west: Cashaqua and Middlesex Shales.
In east: Rye Point shale; Rock Stream ("Enfield") Siltstone, Pulteney, Sawmill Creek, John Creek, and Montour Shales

GENESEE GROUP AND TULLY LIMESTONE
200-1000 ft. (60-300 m.)

West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation-shale, siltstone and Sherburne Siltstone.
Oneonta Formation-shale, sandstone.
Unadilla Formation-shale, siltstone.
Tully Limestone

Middle Devonian

HAMILTON GROUP
600-1500 ft. (180-460 m.)

Moscow Foramtion-In west: Windom and Kashong Shales, Menteth Limestone Members; In east: Cooperstown Shale Member, Portland Point Limstone Member.
Ludlowville Formation-In west: Deep Run Shale Tichenor Limestone, Wanakah and Ledyard Shale Members, Centerfield Limestone Member. In east: King Ferry Shale and other members, Stone Mill Sandstone Member.
Skaneateles Formation-In west: Levanna shale and Stafford Limestone Members; In east: Butternut, Pompey, and Delphi Station Shale Members. Mottville Sandstone Member.
Marcellus Fomation-In west: Oakta Creek Shale Member. In east: Cardiff and Chittenango Shale Members, Cherry Valley Linestone and Union Springs Shale Members.
Panther Mountain Formation-shale, siltstone, sandstone

Hamilton group		
MOSCOW SHALE	140±	Lower two-thirds of section is a fossiliferous, soft gray calcareous shale; upper third highly friable but less calcareous and fossiliferous. Staining by iron oxide very common. Concretions present I greater abundance in lower beds, but irregular calcareous masses occur throughout section. Joints
LUDLOWVILLE SHALE	140±	Lower beds are thinly laminated, light-colored, fossiliferous, shaly passage beds; overlain by hard calcareous black shales 5 to 12 inches thick and rich in corals and brachiopods; hard layers responsible for falls and cascades. Middle beds are less fossiliferous, soft gray arenaceous shales, rich in concretions, calcereous lenses, and occasional thin sandstone layers. Upper beds (Tichenor limestone member) are thin, irregularly bedded ray shales becoming light blue gray upon exposure, calcareous, coarsely textured, and fossiliferous. Joint
SKANEATELES SHALE	185±	Basal beds composed of dark fissile shale. Upper shale more calcareous, grayish to bluish impure limestone layers. joint pattern N. 75° E. and N. 30° W.; diagonal joints N. 50° E. Joints sealed, parallel and spaced 6 inches to 4 feet apart.
MARCELLUS SHALE	50	Black, slatelike, bituminous shale with occasional limestone layers in sequence, containing zones rich in iron sulfides or calcareous conretions, often with septarian structures; very fissile, iron-stained and gray when weathered. Joint pattern N. 25° W., N. 65° E., 1 inch

Lower Devonian

ONONDAGA LIMESTONE AND ORISKANY SANDSTONE
75-150 ft. (23-45 m.)

Onondaga Limestone-Seneca, Morehouse (cherty) and Nedrow Limestone Members, Edgecliff cherty Limestone Member, local bioherms.
Oriskany Sandstone.

HELDERBERG GROUP
0-200 ft. (0-60 m.)

Coeymans and Manlius Limestones; Rondout Dolostone

Upper Silurian

AKRON DOLOSTONE, COBLESKILL LIMESTONE,
AND SALINA GROUP
700-1000 FT. (210-200 M.)

Akron Dolostone, Bertie Formation-dolostone , shale. Camillus and Syracuse Formations-shale, dolostone, gypsum, salt.
Cobleskill Limestone; Bertie and camillus Formations-dolostone, shale.

LOCKPORT GROUP
80-175 FT (25-55 m.)

Oak Orchard and Penfield Dolostones, both replaced eastwardly by Sconondoa Formation-limestone, dolostone

CLINTON GROUP
150-325 FT (40-100 m.)

Lower Silurian

Decew Dolostone; Rochester Shale.
Irondequoit Limestone; Williamson Shale; Wolcott Furnace Hematite; Wolcott Limestone; Sodus Shale, Bear Creek Shale; Wallington Limestone; Furnaceville Hematite; Maplewood shale; Kodak Sandstone. Herkimer Sandstone; Kirkland Hematite; Willowvale Shale; Westmoreland Hematite, Sauquoir Formation-sandstone shale; Oneida Conglomerate.

MEDINA GROUP AND QUEENSTON FORMATION
0-900 FT. (0-270 m.)

Upper Ordovician

Medina Group: Grimb
sy Formation-sandstone, shale.
Queenston Formation-shale, siltstone.

LORRAINE GROUP
700-900 FT. (210-270 m.)

Oswego Sandstone
Pulaski and Whetstone Gulf Formations-siltstoen, shale

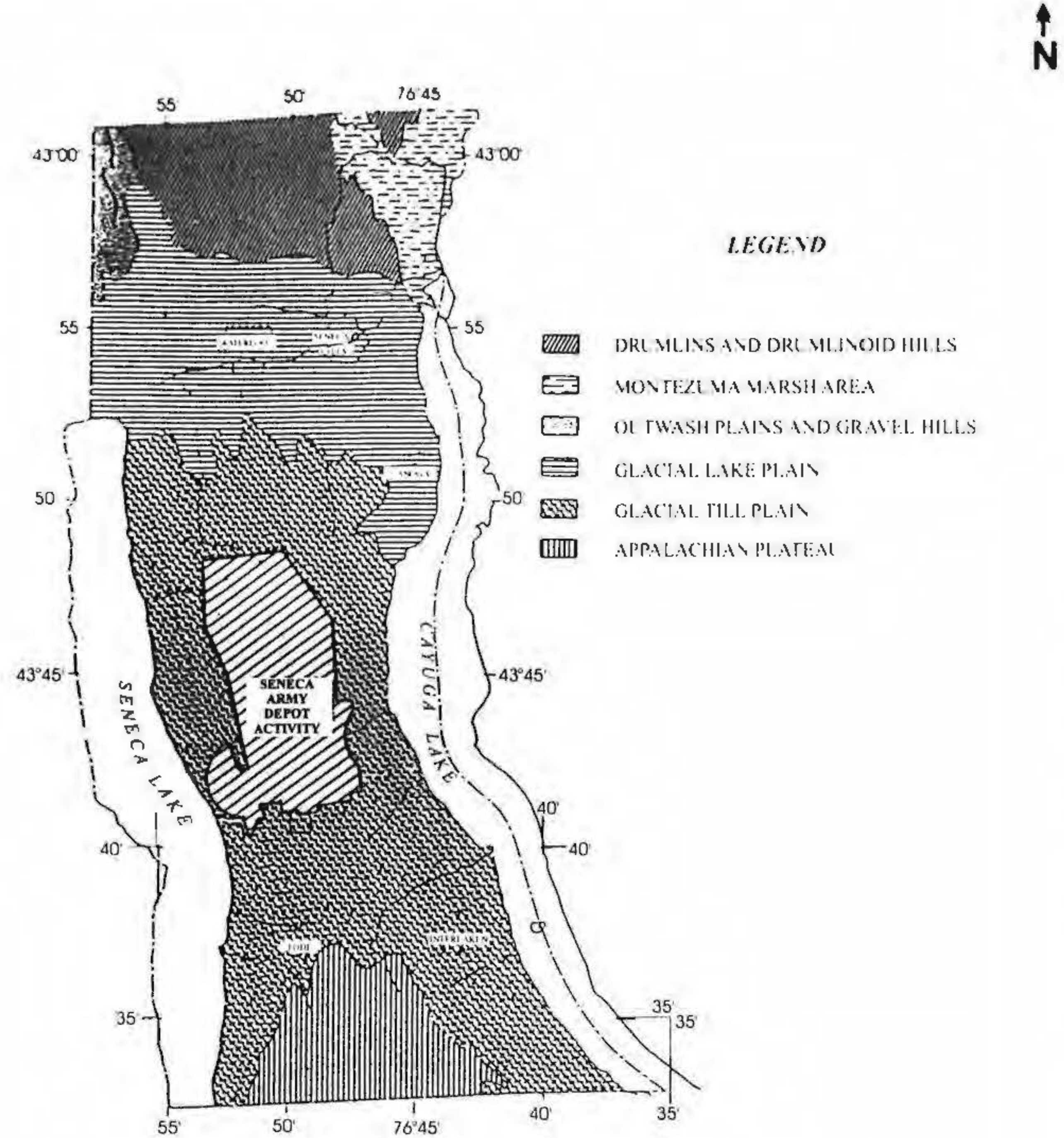
Middle Ordovician

TRENTON GROUP
100-300 ft. (30-90 m.)

Utica Shale

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

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



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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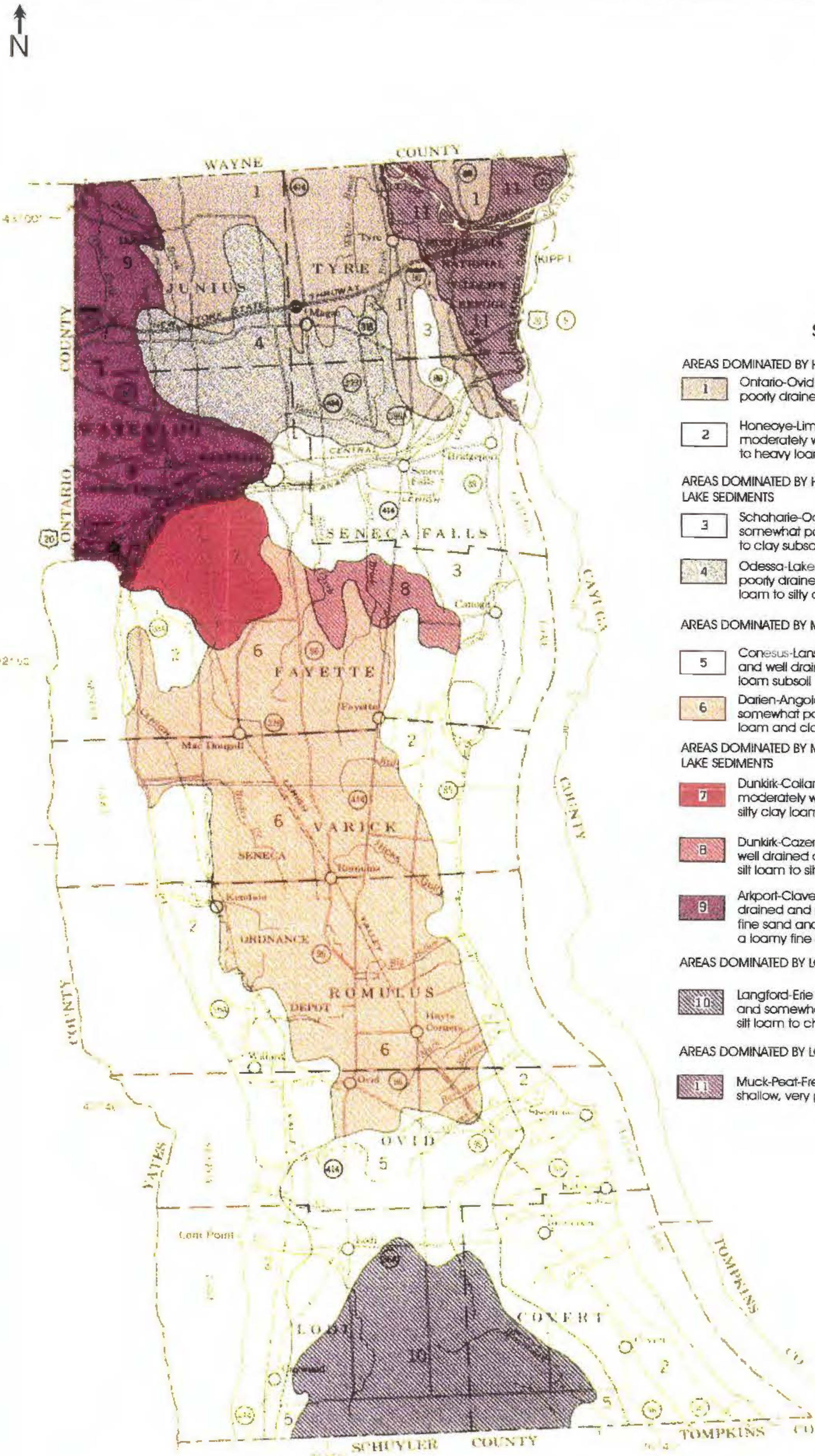
CLIENT/PROJECT TITLE SENECA ARMY DEPOT ACTIVITY DECISION DOCUMENT- SEADs 59 and 71	
DEPT ENVIRONMENTAL ENGINEERING	DWG NO 734516-01001
FIGURE 2-6 PHYSIOGRAPHIC MAP OF SENECA COUNTY	
SCALE 1" = 5 MILES	DATE APRIL 2001

GRAPHICS SENECA PHYSIO CDR(CVM)



1 0 1 2 3 4
SCALE IN MILES
1:190,080

SOIL ASSOCIATIONS

AREAS DOMINATED BY HIGH-LIME SOILS DEVELOPED IN GLACIAL TILL

1 Ontario-Ovid association: Deep, well-drained to somewhat poorly drained soils that have a loam to silty clay loam subsoil

2 Honeoye-Lima association: Deep, well-drained and moderately well drained soils that have a heavy silt loam to heavy loam subsoil

AREAS DOMINATED BY HIGH-LIME SOILS DEVELOPED IN GLACIAL LAKE SEDIMENTS

3 Schoharie-Odessa association: Deep, well-drained to somewhat poorly drained soils that have a silty clay loam to clay subsoil

4 Odessa-Lakemont association: Deep, dominantly somewhat poorly drained and poorly drained soils that have a silty clay loam to silty clay subsoil

AREAS DOMINATED BY MEDIUM-LIME SOILS DEVELOPED IN GLACIAL TILL

5 Conesus-Lansing association: Deep, moderately well drained and well drained soils that have a heavy silt loam to heavy loam subsoil

6 Darien-Angola association: Deep and moderately deep, somewhat poorly drained soils that have a silty clay loam and clay loam subsoil

AREAS DOMINATED BY MEDIUM-LIME SOILS DEVELOPED IN GLACIAL LAKE SEDIMENTS

7 Dunkirk-Collamer association: Deep well drained and moderately well drained soils that have a silt loam to silty clay loam subsoil

8 Dunkirk-Cazenovia association: Moderately deep and deep, well drained and moderately well drained soils that have a silt loam to silty clay loam subsoil that overlies limestone

9 Arkport-Claverack association: Deep, dominantly well drained and moderately well drained soils that are loamy fine sand and fine sandy loam throughout or that have a loamy fine sand subsoil over silty clay or clay

AREAS DOMINATED BY LOW-LIME SOILS DEVELOPED IN GLACIAL TILL

10 Langford-Erie association: Deep, moderately well drained and somewhat poorly drained soils that have a channery silt loam to channery loam fragipan

AREAS DOMINATED BY LOW-LIME SOILS DEVELOPED IN ORGANIC MATERIAL

11 Muck-Peat-Fresh Water Marsh association: Deep to shallow, very poorly drained organic soils

FEBRUARY 1971

SOURCE: U.S. DEPARTMENT OF ARGRICULTURE
SOIL CONSERVATION SERVICE
CORNELL UNIVERSITY AGRICULTURAL EXPERIMENT STATION

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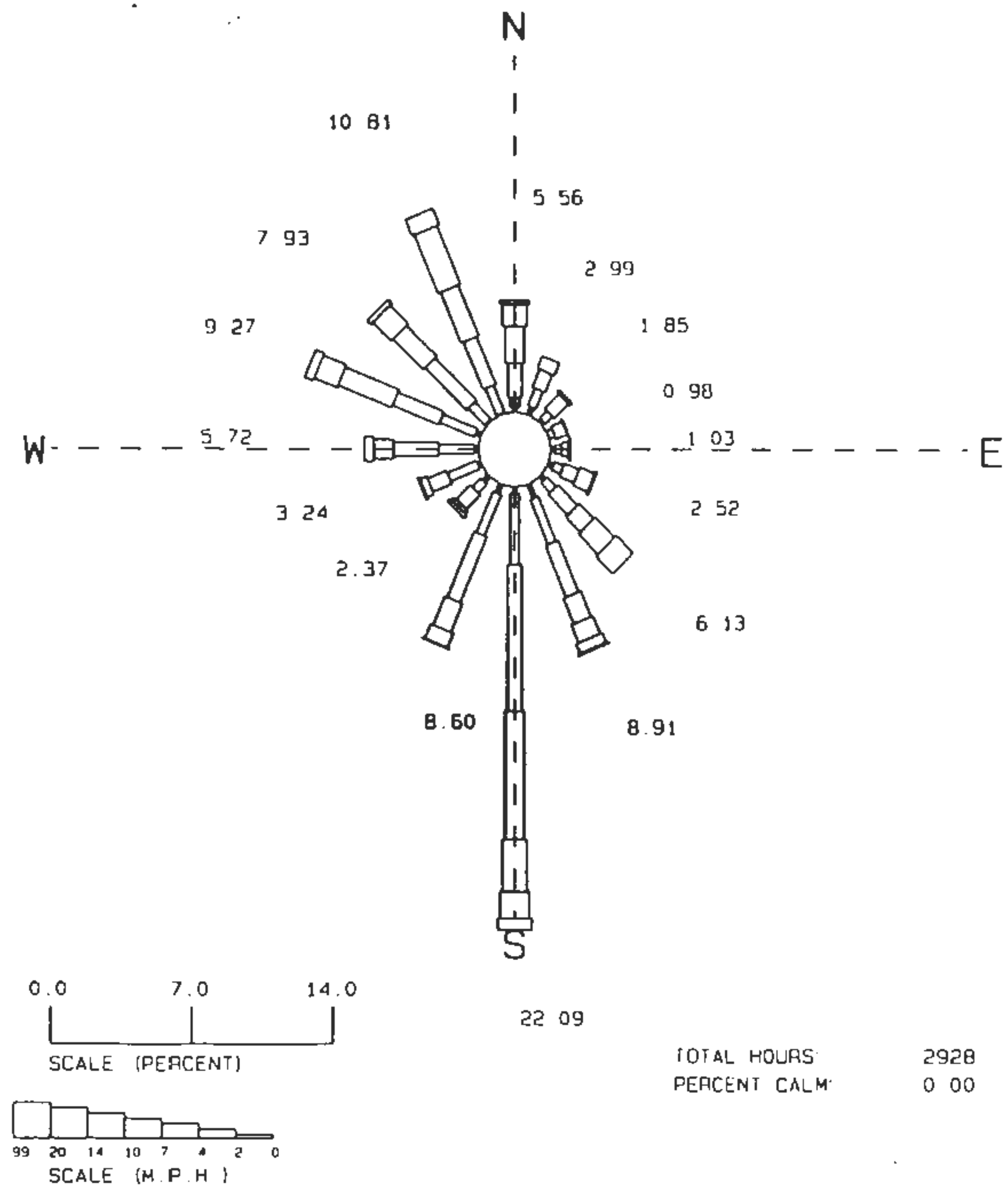
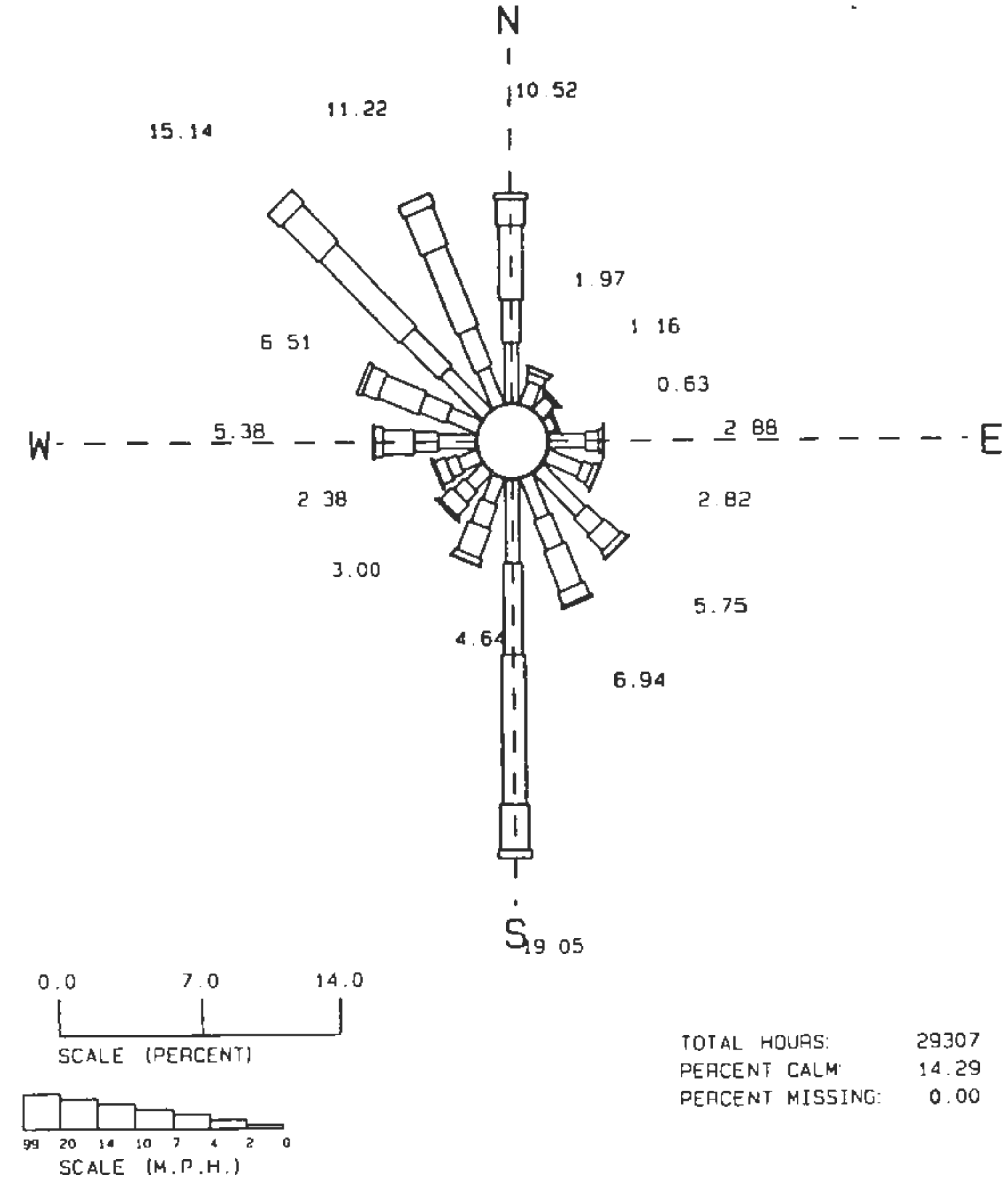
DEPT ENVIRONMENTAL ENGINEERING | DWG NO. 734516-01001

FIGURE 2-7
GENERAL SOIL MAP
SENECA COUNTY, NEW YORK

SCALE 1" = 2000' | DATE APRIL 2001



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



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

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DECISION DOCUMENT- SEADs- 59 and 71

DEPT ENVIRONMENTAL ENGINEERING	DWG NO 734516-01001

FIGURE 2-8
WIND ROSES

SCALE NA	DATE APRIL 2001

GRAPHICS\SENECA\2WROSES.CDR

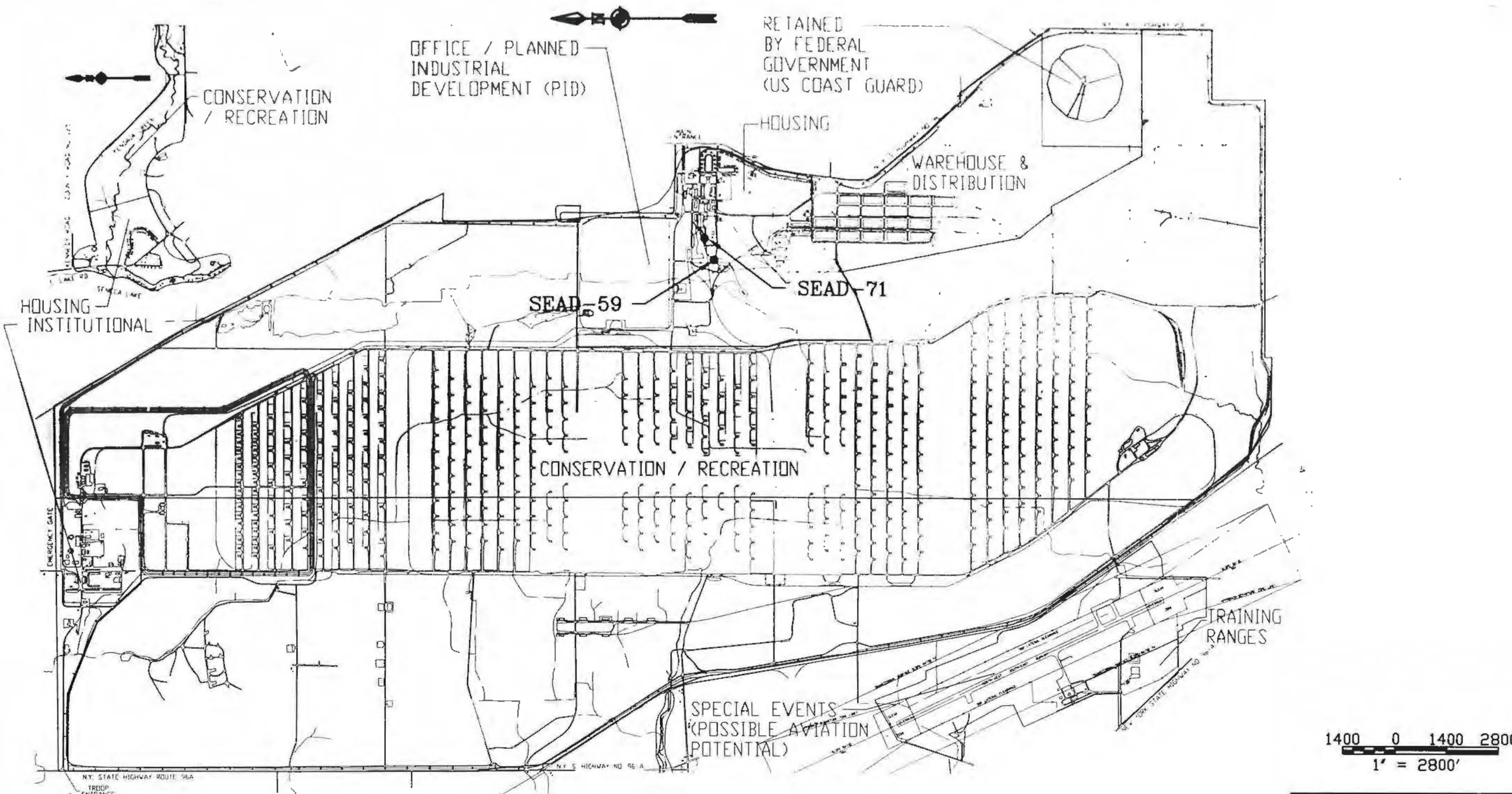

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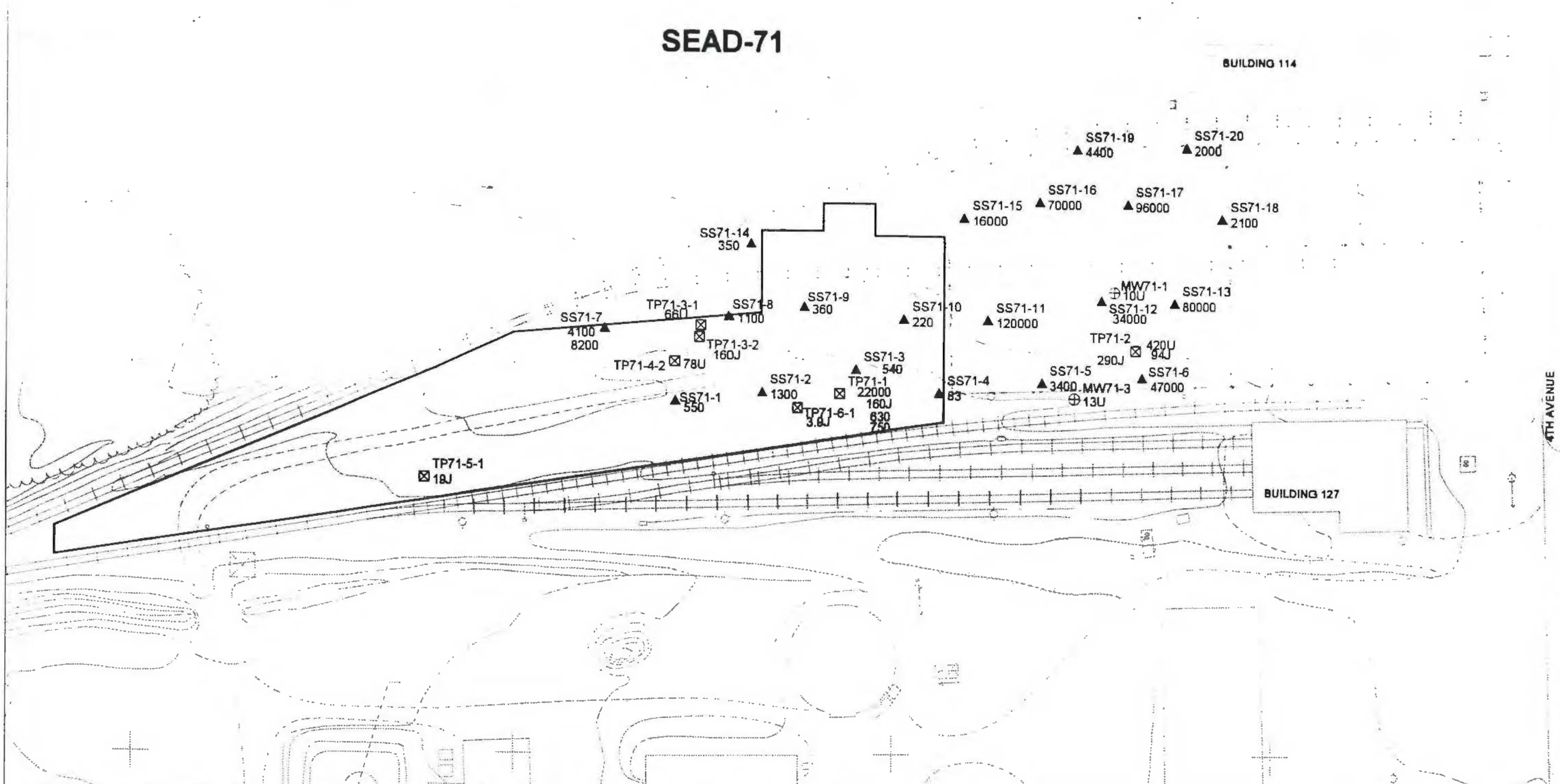
FIGURE 2-10

FINAL LAND USE AND
LOCATION MAP

JOB NUMBER	DATE	SHEET No 1 OF 1
734516-01001	APRIL 2001	



Base Map Features

Approximate Extent of 1997 GPR Survey

Suspected Locations of GPR Anomlies

ESI Test Pit Locations

Monitoring Well Location

Soil Boring/Soil Sample Location

50 0 50 100 150 Feet

N

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FIGURE 2-12

SAMPLING LOCATIONS AND GPR SURVEY RESULTS AT SEAD-71

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	

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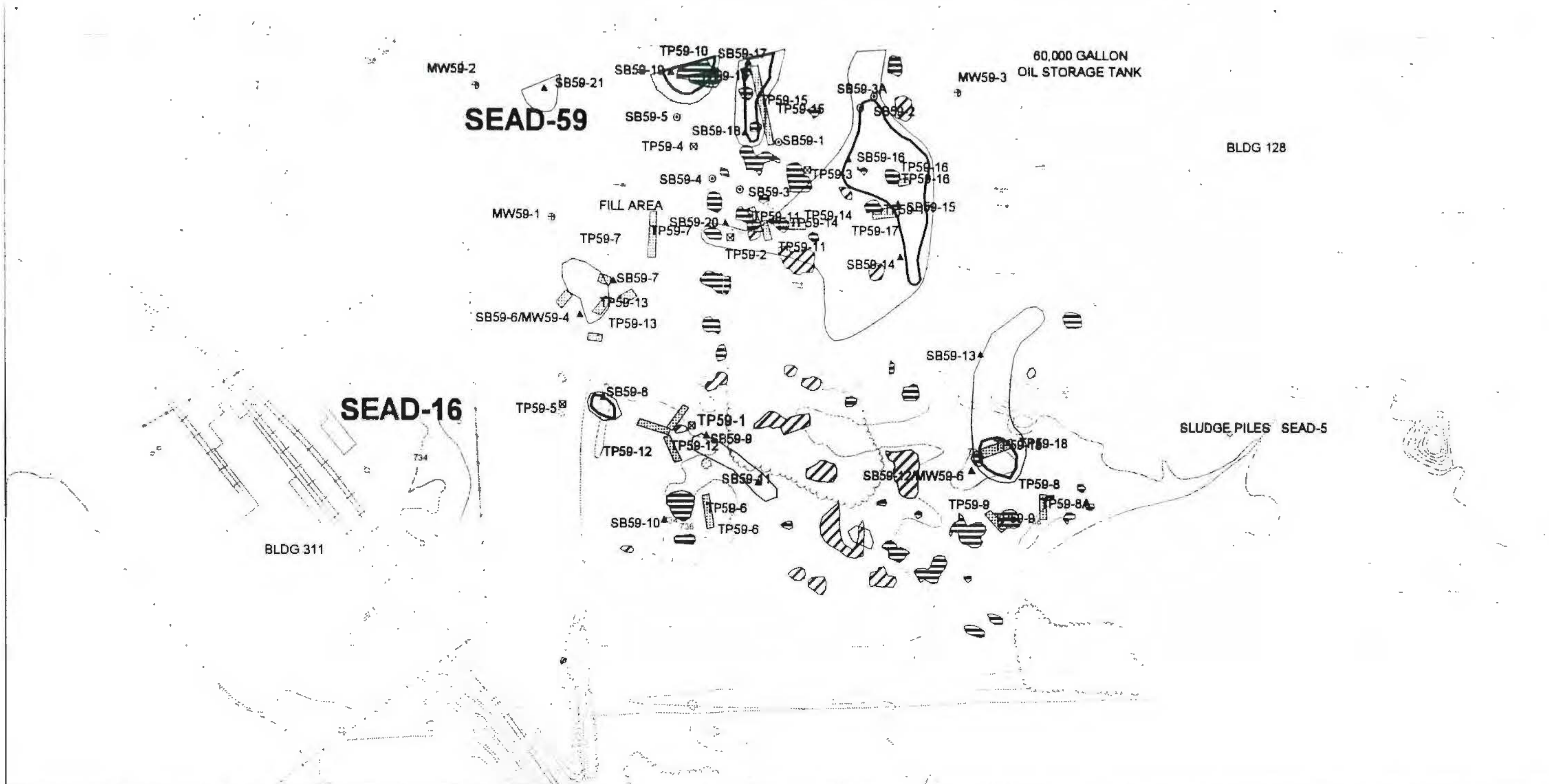

Base Map Features

Suspected Source of Geophysical Anomalies

Known Surface Debris

Unknown

Soil Gas

20 ppm or greater

10 ppm - 20 ppm

Phase I RI Test Pit Locations

ESI Test Pit Locations

Monitoring Well Location

Soil Boring Location

100 0 100 200 Feet

N

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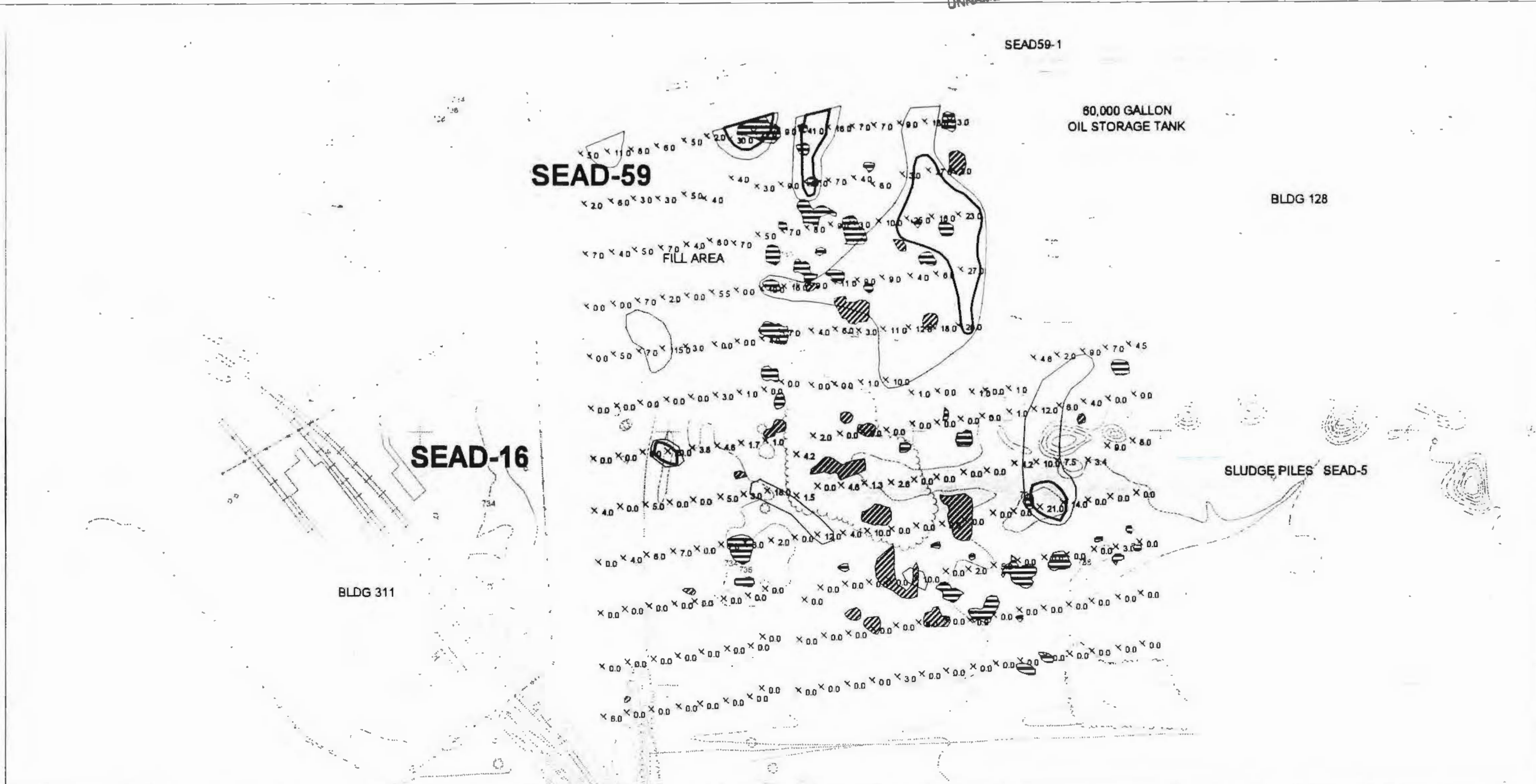
FIGURE 2-11

SEAD-59 SAMPLE LOCATIONS

JOB NUMBER	DATE	SHEET No
734516-01001	APRIL 2001	1 OF 1

o:\seneca\sead5971\sead59.apr



Base Map Features

Suspected Source of Geophysical Anomalies

- Known Surface Debris
- Unknown

Soil Gas

- 20 ppm or greater
- 10 ppm - 20 ppm

100 0 100 200 Feet

N

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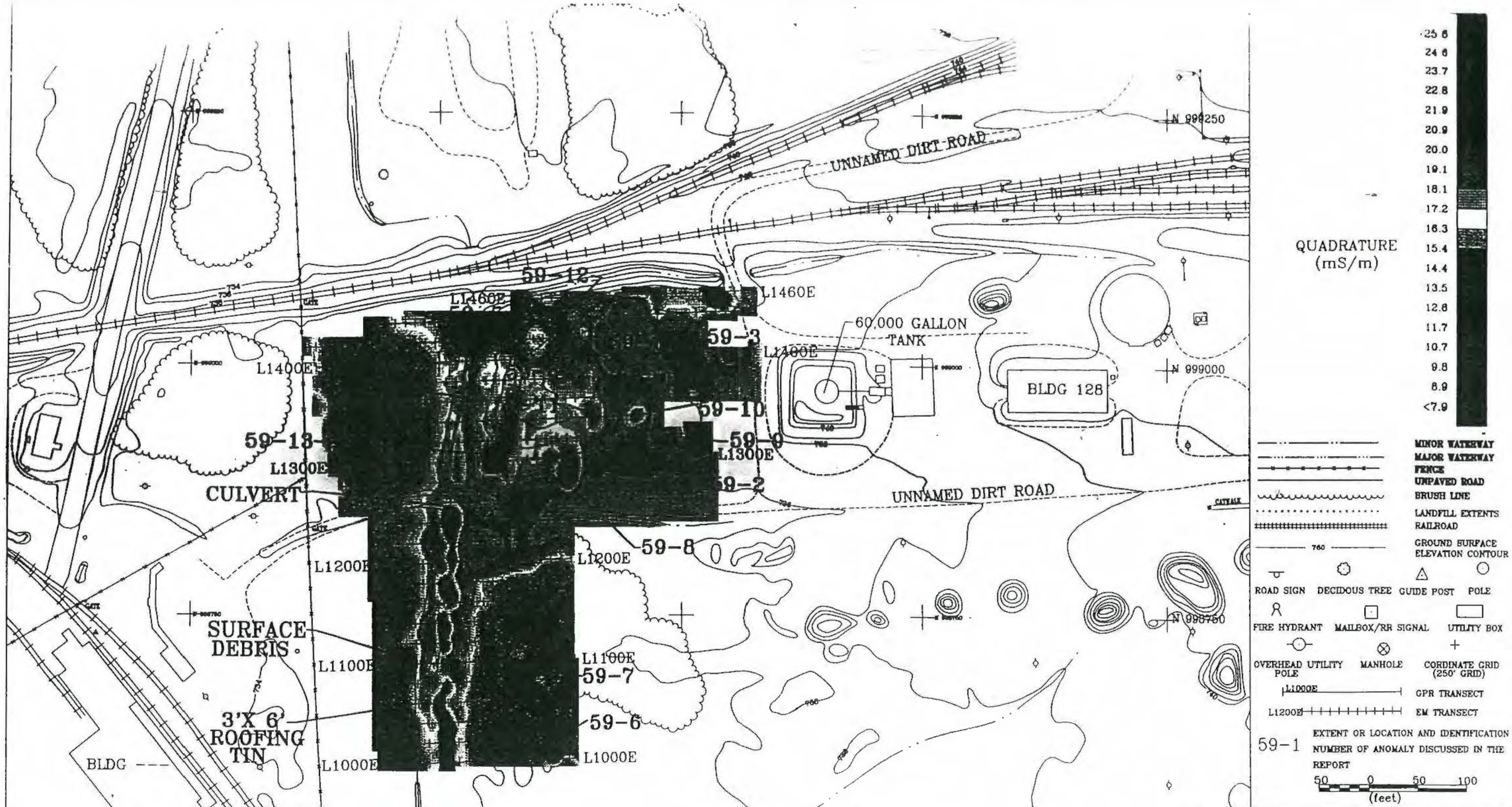
DECISION DOCUMENT-SEADs-59 and 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-13

RESULTS OF SOIL GAS SURVEY AND GEOPHYSICAL INVESTIGATION AT SEAD-59

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	JUNE 2000	

o:\seneca\sead5971\sead59.apr



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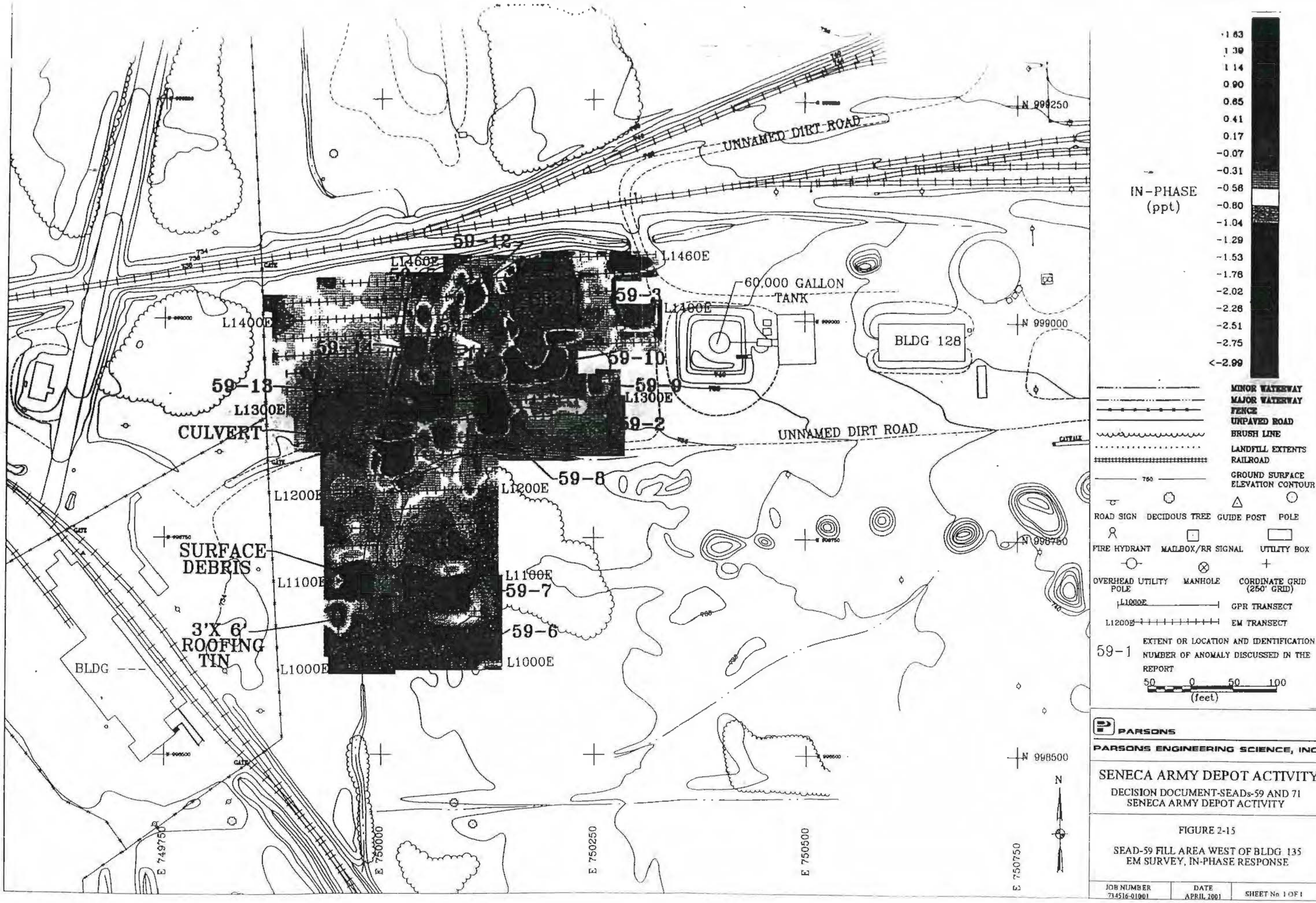
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-14

SEAD-59 FILL AREA WEST OF BLDG. 135
EM SURVEY, QUADRATURE RESPONSE

JOB NUMBER	DATE	SHEET No
734516-01001	APRIL 2001	1 OF 1



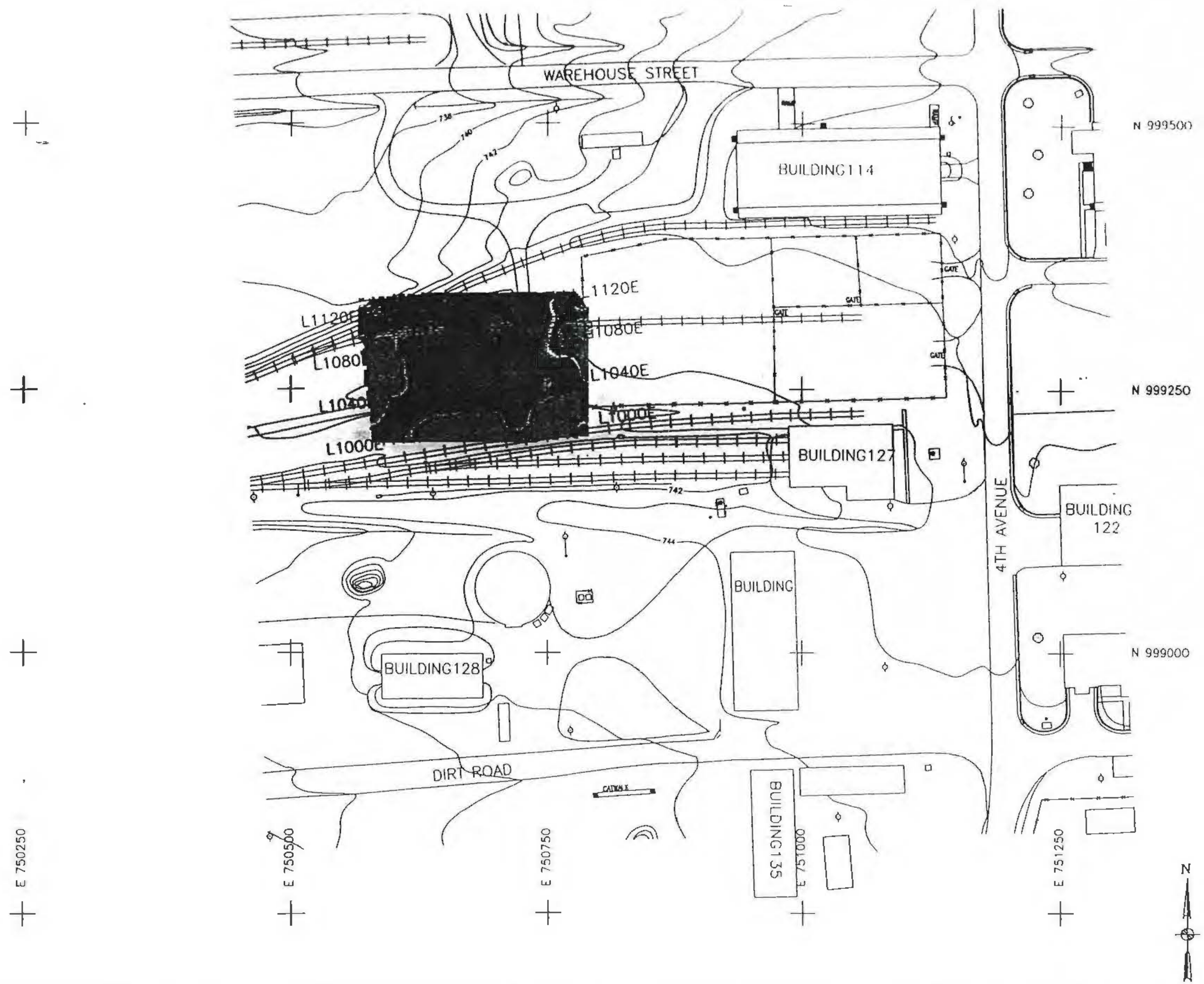
SENECA ARMY DEPOT ACTIVITY

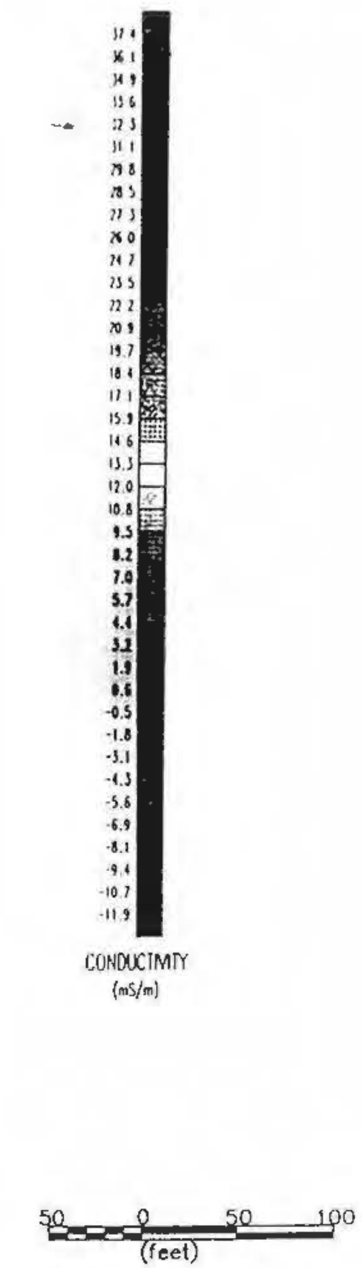
DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-15

SEAD-59 FILL AREA WEST OF BLDG 135
EM SURVEY, IN-PHASE RESPONSE

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	





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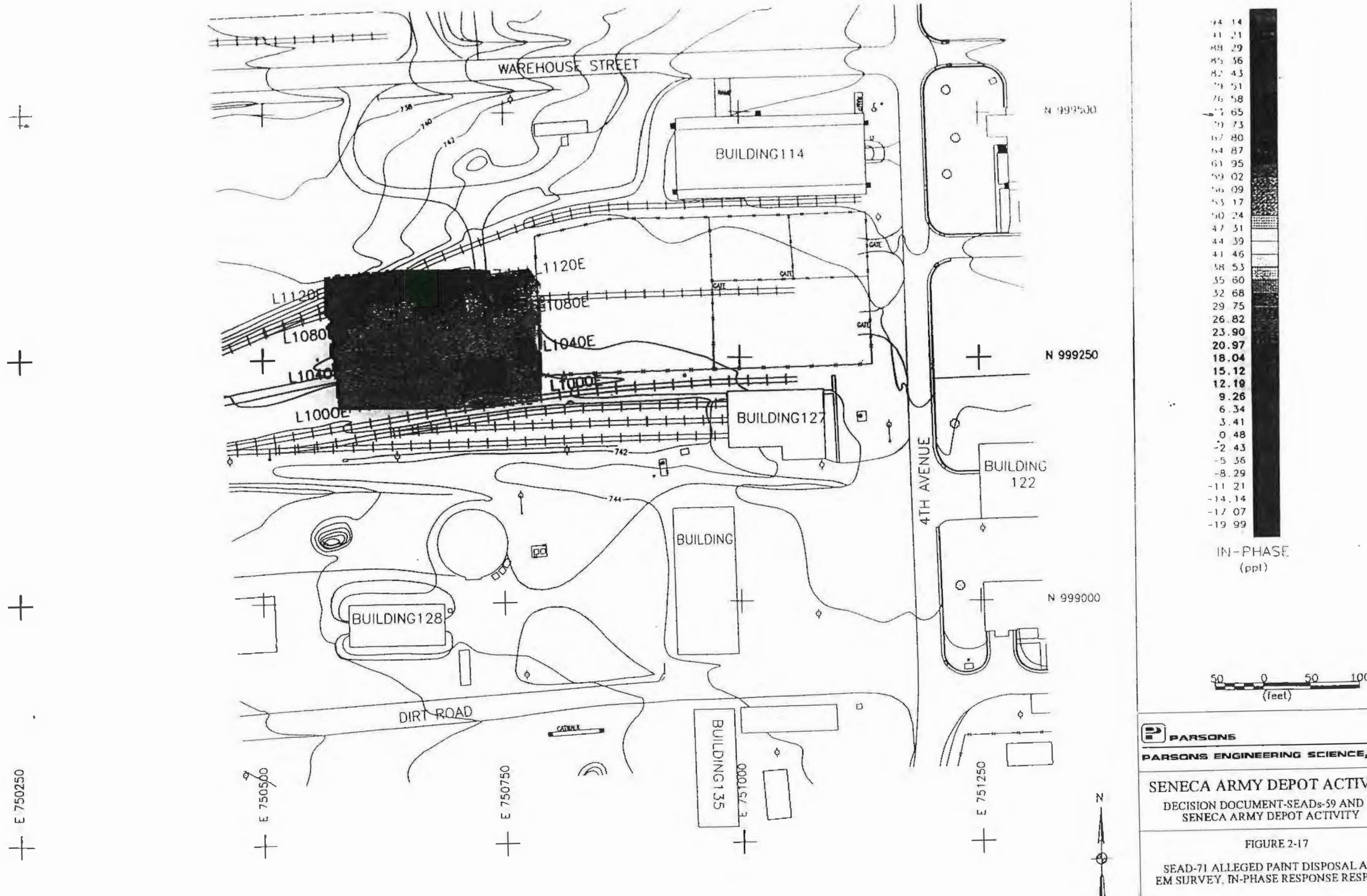
DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-16

SEAD-71 ALLEGED PAINT DISPOSAL AREA
EM SURVEY, QUADRATURE RESPONSE

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	



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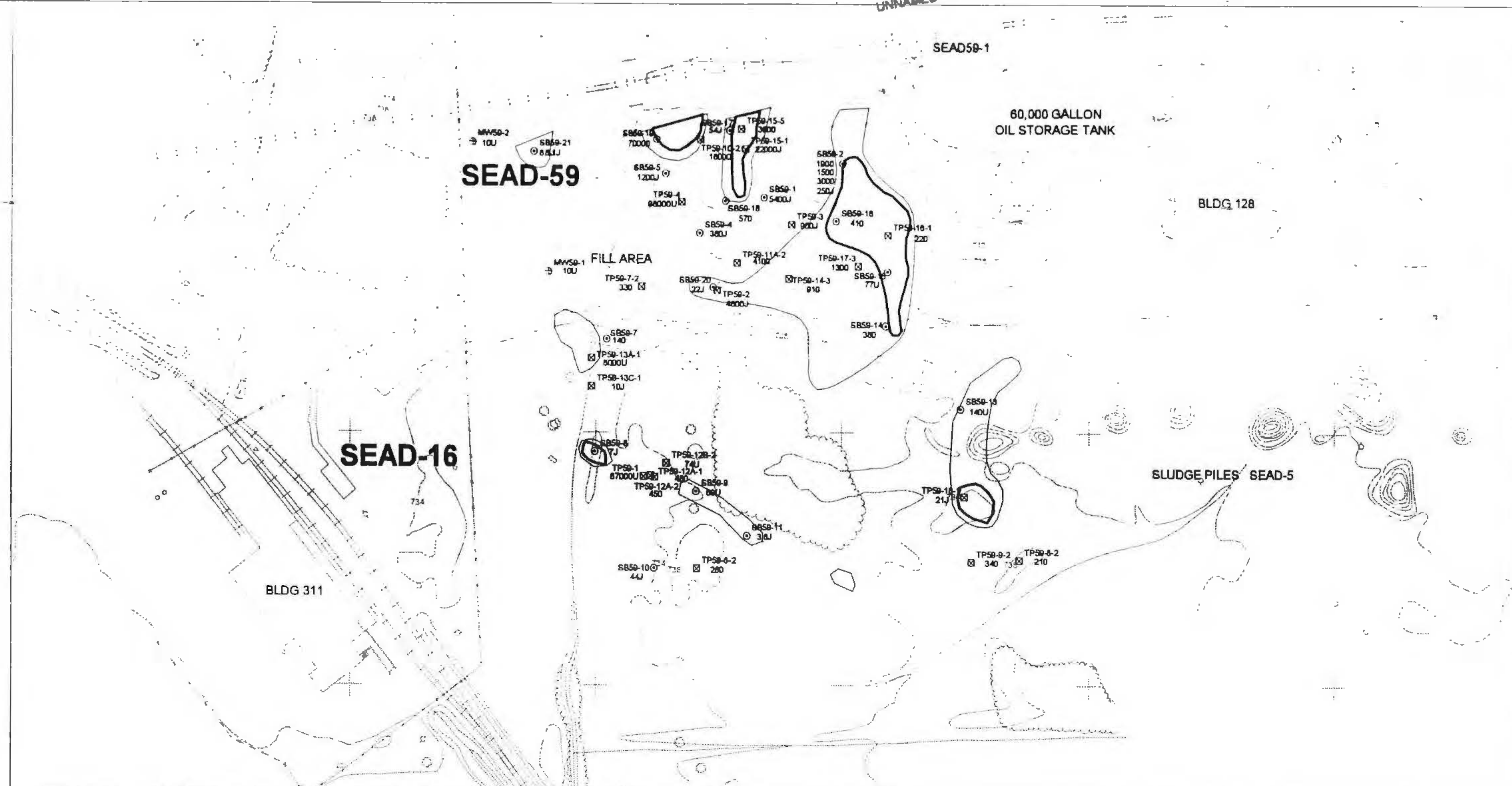
DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-17

SEAD-71 ALLEGED PAINT DISPOSAL AREA
EM SURVEY, IN-PHASE RESPONSE RESPONSE

JOB NUMBER	DATE	SHEET No 1 OF 1
734516-01001	APRIL 2001	



Base Map Features

Soil Gas

20 ppm or greater

10 ppm - 20 ppm

ESI Test Pit Locations

Monitoring Well Location

Soil Boring Location

70 0 70 140 Feet

Concentration of Benzo[a]pyrene in Soil (ug/Kg)

SB71-16
12U

N

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SENECA ARMY DEPOT ACTIVITY

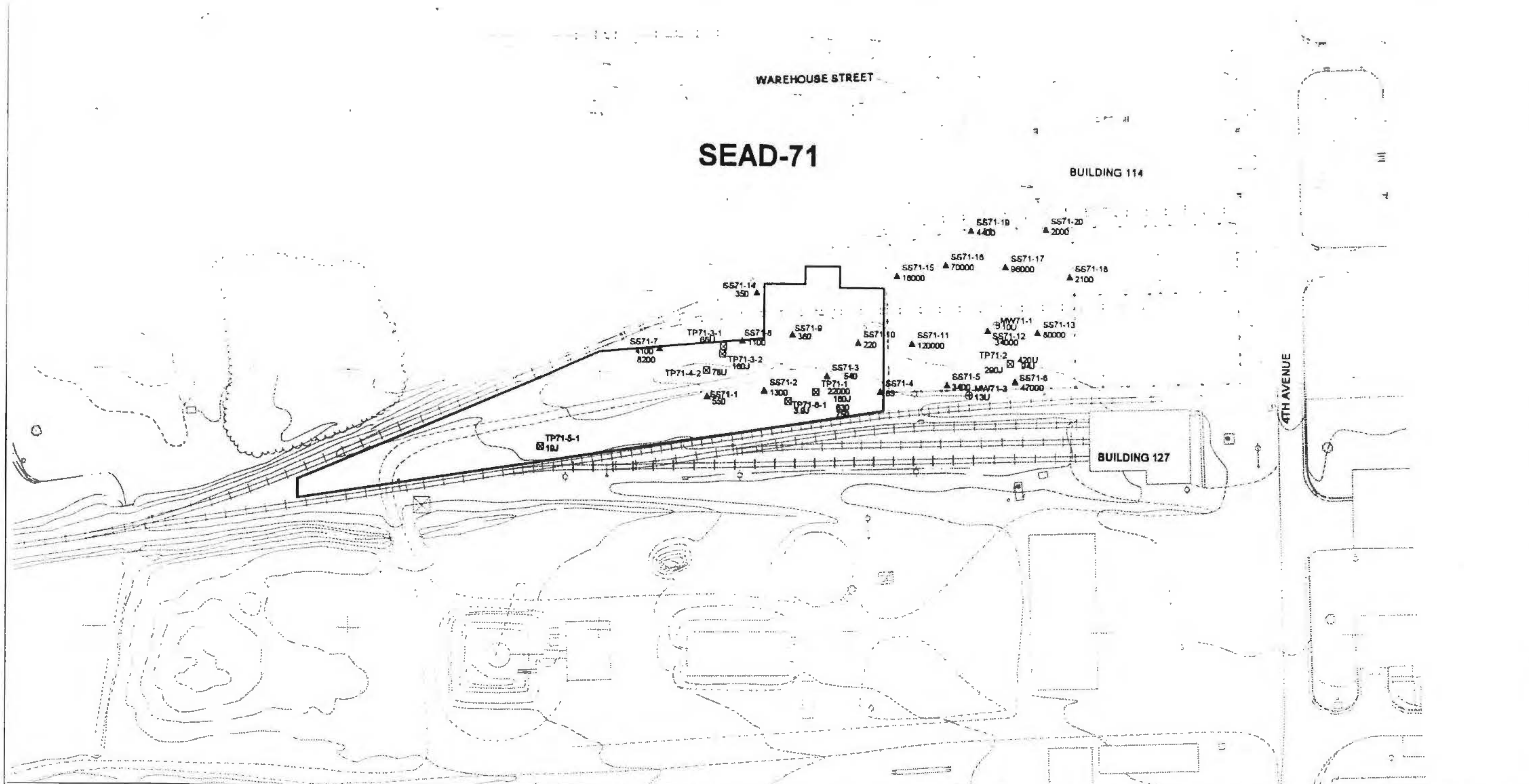
DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-18

TOTAL BENZO[A]PYRENE CONCENTRATIONS IN SOIL AT SEAD-59

JOB NUMBER	DATE	SHEET No
734516-01001	APRIL 2001	1 OF 1

o:\seneca\sead5971\sead59.apr



Base Map Features

Approximate Extent of 1997 GPR Survey

ESI Test Pit Locations

Monitoring Well Location

Soil Boring/Soil Sample Location

100 0 100 Feet

N

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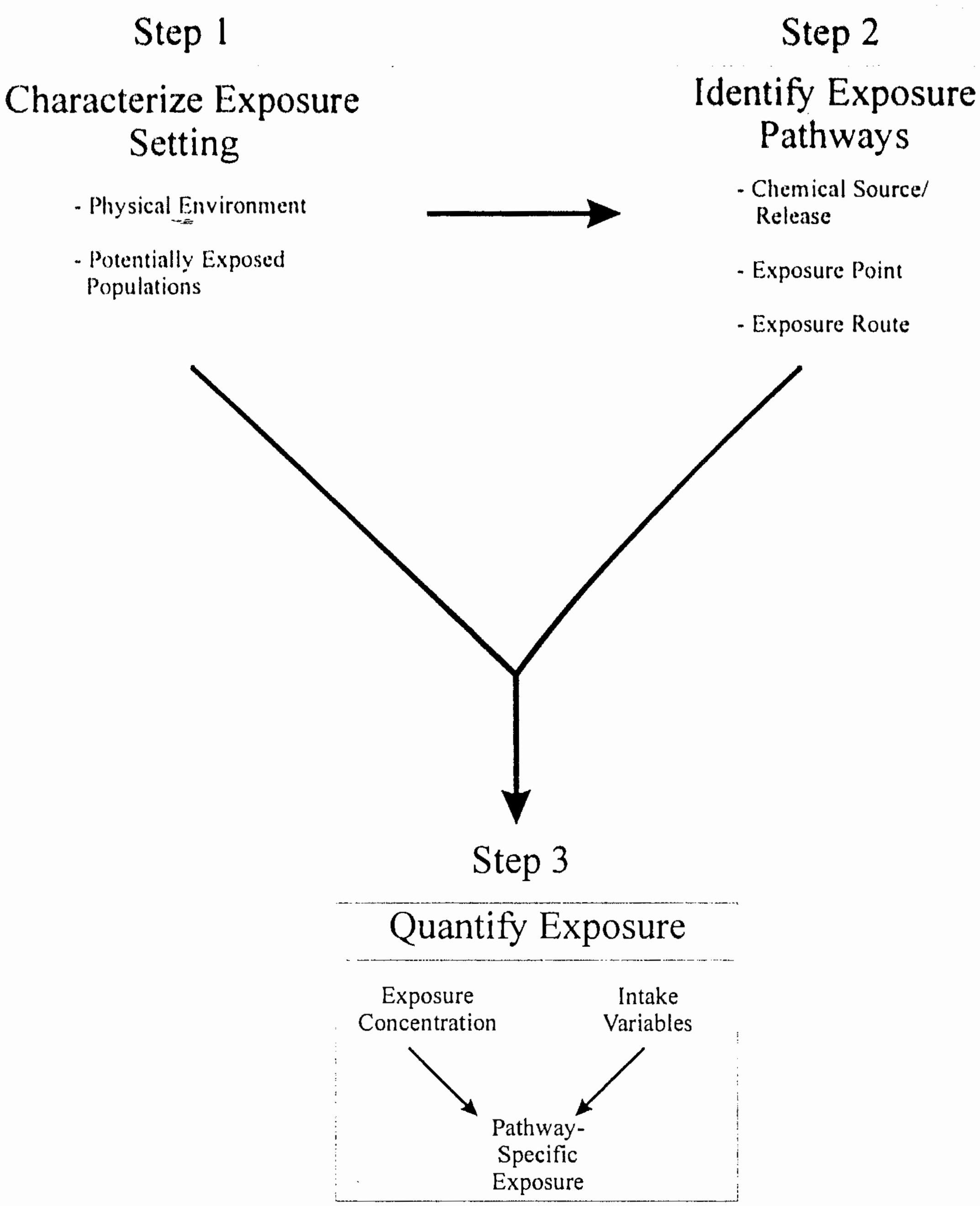
SENECA ARMY DEPOT ACTIVITY

FIGURE 2-19

BENZO(A)PYRENE CONCENTRATIONS
IN SOIL AT SEAD-71

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	

p:\seneca\sead5971\sead59.apr



Source: US EPA 1989a

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CLIENT/PROJECT TITLE

SENECA ARMY DEPOT
DECISION DOCUMENT
SEADs-59 AND 71

ENVIRONMENTAL ENGINEERING | 763026-01001

FIGURE 3-1

EXPOSURE ASSESSMENT PROCESS

SCALE NA | APRIL 2001

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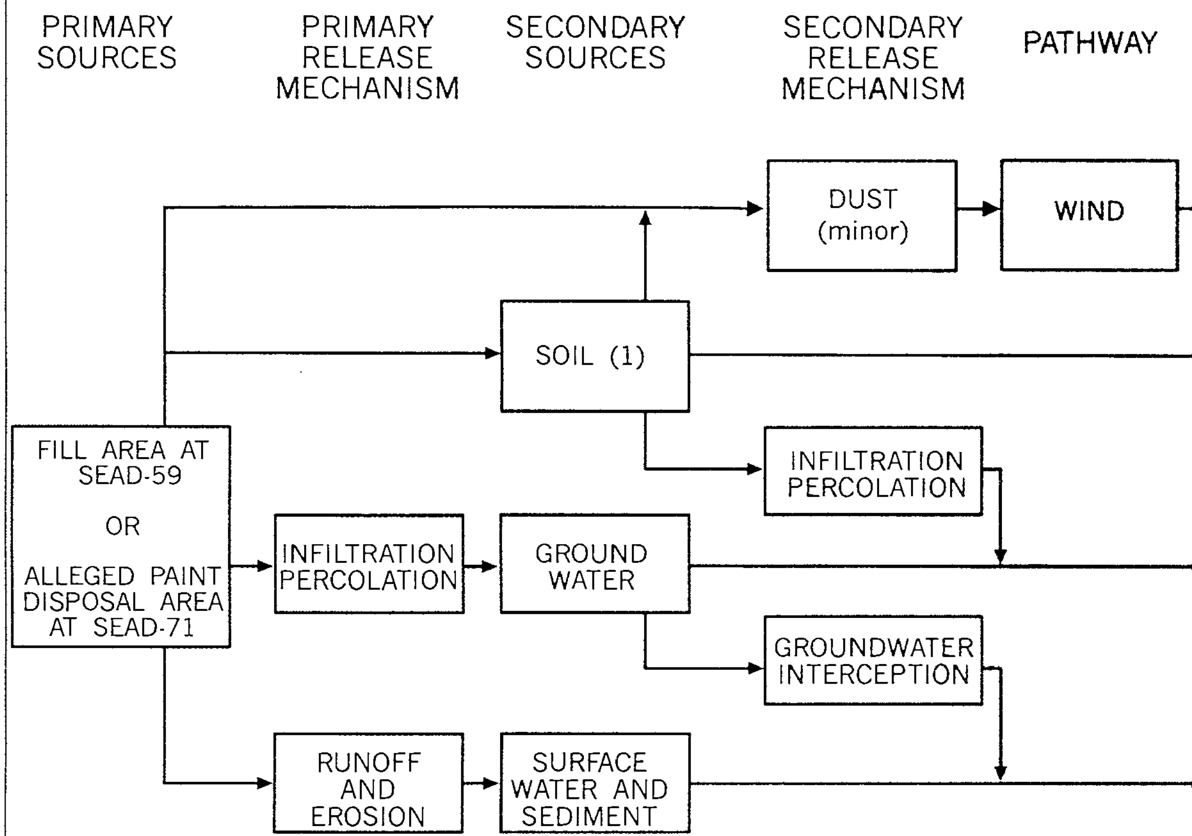

EXPOSURE ROUTE	RECEPTOR: HUMAN						
	CURRENT SITE WORKER	INDUSTRIAL WORKER	CONSTRUCTION WORKER	WORKER AT ON SITE DAY CARE CENTER	CHILD AT ON SITE DAY CARE CENTER	FUTURE RESIDENT	FUTURE TRESPASSER (CHILD)
INHALATION	●	NA	●	●	●	●	●
INGESTION	●	NA	●	●	●	●	●
DERMAL CONTACT	●	NA	●	●	●	●	●
INGESTION	NA	●	NA	●	●	●	NA
INHALATION	NA	NA	NA	NA	NA	●	NA
DERMAL CONTACT	NA	NA	NA	NA	NA	●	NA
INGESTION	X	X	X	X	X	X	X
DERMAL CONTACT	X	X	X	X	X	X	X

● PATHWAY CONSIDERED TO POSE POTENTIAL RISK

X PATHWAY NOT CONSIDERED

NA NOT APPLICABLE TO RECEPTOR

(1) CONSTRUCTION WORKER RECEPTOR CONSIDERS POTENTIAL RISK FROM SURFACE AND SUB-SURFACE SOILS. ALL OTHER RECEPTORS CONSIDER POTENTIAL RISK FROM SURFACE SOILS ONLY.

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CLIENT/PROJECT TITLE
SENECA ARMY DEPOT
DECISION DOCUMENT
SEADs-59 AND 71

DEPT ENVIRONMENTAL ENGINEERING DWG NO 734516-01001

FIGURE 3-2
EXPOSURE PATHWAY SUMMARY FOR PLANNED INDUSTRIAL DEVELOPMENT SCENARIO

SCALE NA DATE APRIL 2004

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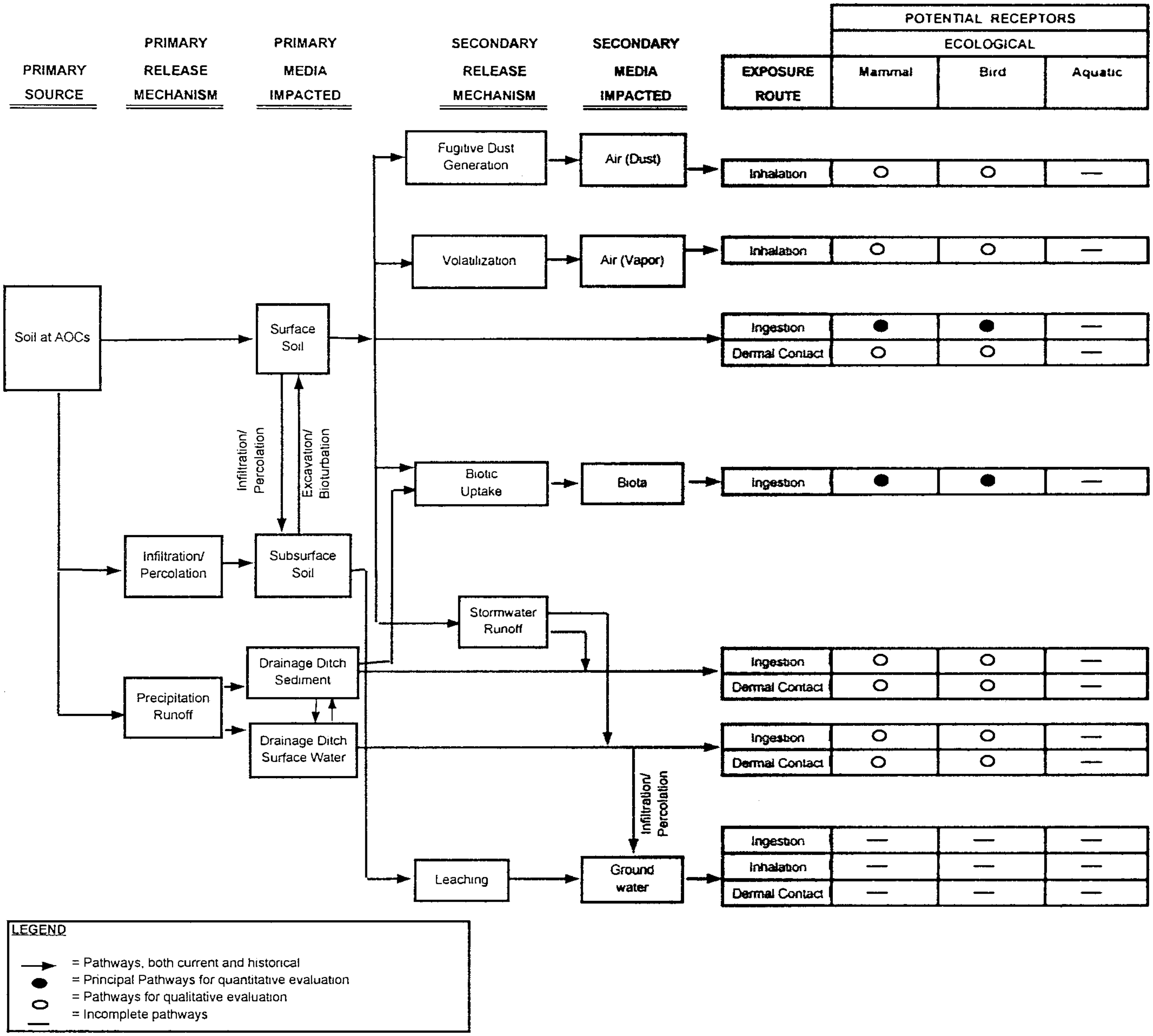
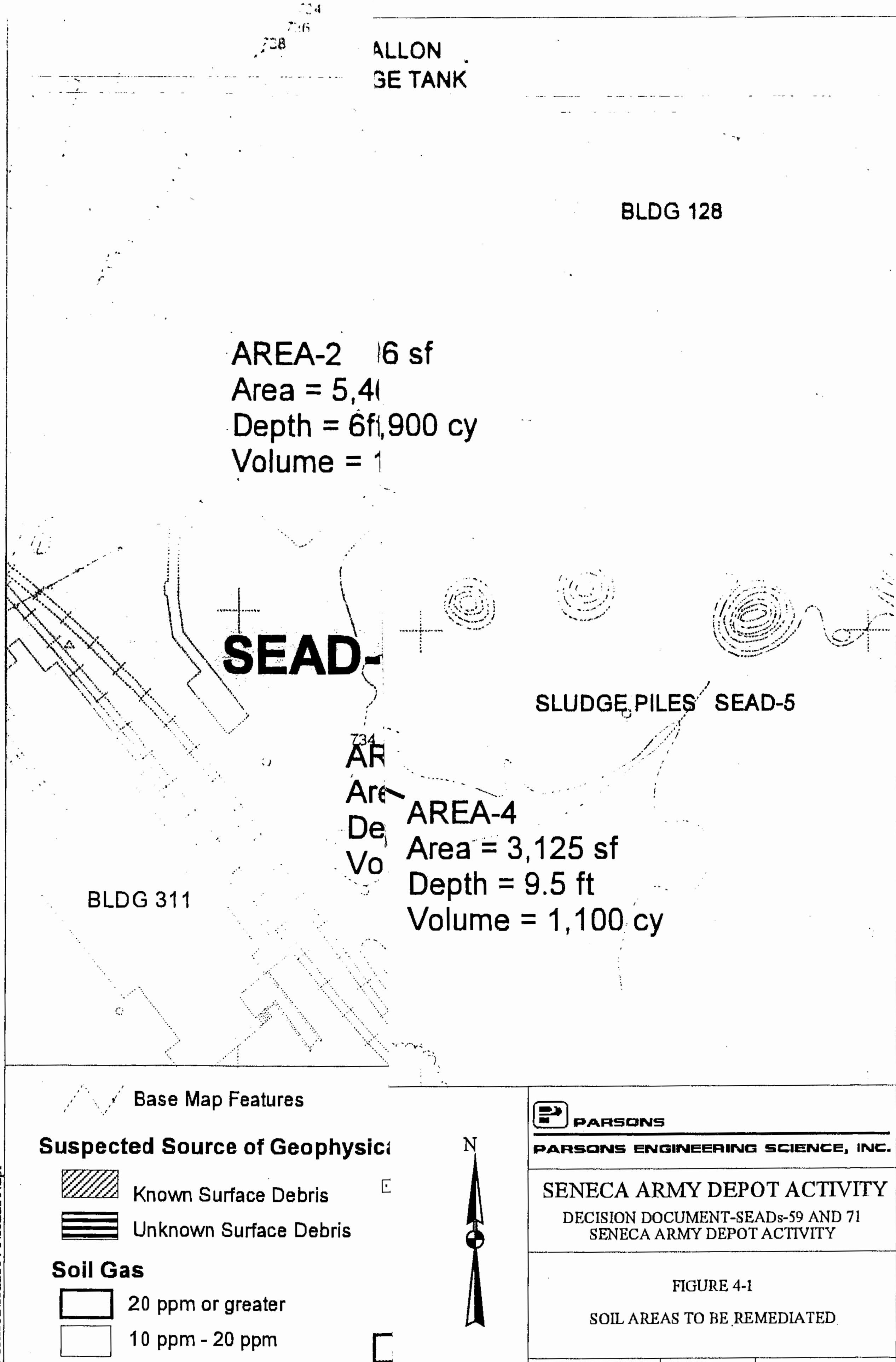
Figure 3-3 Ecological Conceptual Site Model
SENECA ARMY DEPOT ACTIVITY



p:\pit\projects\seneca\s5971ecc\decisoindoc\figures\Ecocsm.xls



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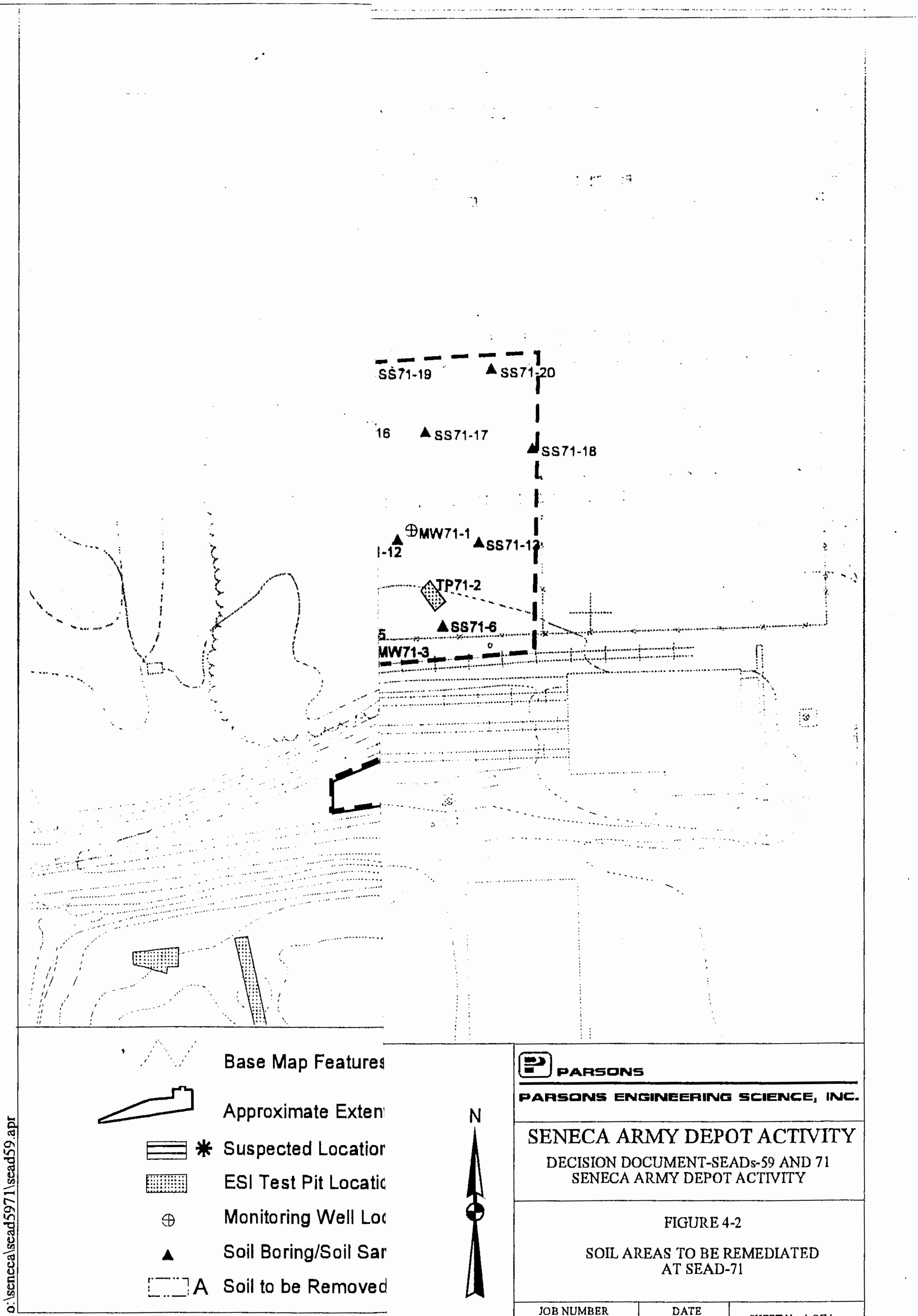
SENECA ARMY DEPOT ACTIVITY
DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 4-1

SOIL AREAS TO BE REMEDIATED

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	

o:\seneca\sead5971\sead59.apr



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PARSONS ENGINEERING SCIENCE, INC.

SENECA ARMY DEPOT ACTIVITY

DECISION DOCUMENT-SEADs-59 AND 71
SENECA ARMY DEPOT ACTIVITY

FIGURE 4-2

SOIL AREAS TO BE REMEDIATED
AT SEAD-71

JOB NUMBER	DATE	SHEET No. 1 OF 1
734516-01001	APRIL 2001	

APPENDIX A

Laboratory Analyses Results – SEAD-59

Risk Calculation Tables for Planned Industrial Land Use

1, _ A-1

SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	ESI	ESI	ESI	ESI	RI Phase 1 Step 1
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							MW59-4	MW59-6	SB59-1	SB59-1	SB59-1	SB59-1	SB59-10
	LAB ID							59055	59129	SB59-1-01	SB59-1-04	SB59-1-06	SB59-1-08	59130
	FIELD QC CODE:							SA	SA	SA	SA	SA	DU	SA
	SAMP. DETH TOP:							4	1	0	6	10	6	0
	SAMP. DEPTH BOT:							6	2.6	0.2	8	12	8	0.8
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							20-Oct-97	24-Oct-97	20-Feb-94	20-Feb-94	20-Feb-94	20-Feb-94	24-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS														
Acetone	UG/KG	150	0	200	0	1	56	12 U	12 U	12 U	47 U	23 U		12 U
Benzene	UG/KG	5900	0	60	2	3	56	12 U	12 U	12 U	13 U	12 U		12 U
Carbon disulfide	UG/KG	4	0	2700	0	1	56	12 U	12 U	12 U	13 U	12 U		12 U
Ethyl benzene	UG/KG	260000	0	5500	1	4	56	12 U	12 U	12 U	13 U	12 U		12 U
Methyl chloride	UG/KG	1	0	0	0	1	56	12 U	12 U	12 U	13 U	12 U		12 U
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56	12 U	12 U	12 U	14 U	12 U		12 U
Methylene chloride	UG/KG	2	0	100	0	2	56	12 U	12 U	12 U	13 U	12 U		12 U
Toluene	UG/KG	830000	0	1500	1	8	56	12 U	12 U	12 U	13 U	12 U		12 U
Total Xylenes	UG/KG	1000000	0	1200	1	6	56	12 U	12 U	12 U	13 U	12 U		12 U
Trichloroethene	UG/KG	2	0	700	0	2	56	12 U	12 U	12 U	13 U	12 U		12 U
SEMIVOLATILE ORGANICS														
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57	78 U	73 U	1500 U	420 U	530 U	1900 U	82 U
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57	78 U	10 J	150 J	110 J	78 J	150 J	82 U
4-Methylphenol	UG/KG	83	0	900	0	2	57	78 U	73 U	1500 U	420 U	530 U	1900 U	82 U
Acenaphthene	UG/KG	20000	1	50000	0	39	57	78 U	28 J	390 J	160 J	190 J	390 J	82 U
Acenaphthylene	UG/KG	5700	1	41000	0	29	57	78 U	12 J	660 J	120 J	97 J	640 J	82 U
Anthracene	UG/KG	38000	1	50000	0	36	57	78 U	63 J	1400 J	270 J	600	1400 J	82 U
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57	78 U	**270**	**4700**	**780**	**1200**	**5000**	52 J
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57	78 U	**230**	**5400** J	**870**	**1100**	**5500** J	44 J
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57	78 U	180	**5000** J	730	860	**5100** J	59 J
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57	78 U	180	1900 J	430	560	2400 J	20 J
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57	78 U	280	**5800** J	800	810	**6100** J	70 J
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57	13 J	15 J	1500 U	80 J	260 J	1900 U	15 J
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57	78 U	73 U	1500 U	420 U	530 U	1900 U	82 U
Carbazole	UG/KG	33000	1	0	0	36	57	78 U	80	1200 J	210 J	260 J	1300 J	82 U
Chrysene	UG/KG	63000	1	400	26	45	57	78 U	280	**4800**	**930**	**1200**	**5100**	61 J
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57	78 U	8 J	1500 U	30 J	29 J	1900 U	7 J
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57	78 U	4 J	1500 UJ	420 U	530 U	1900 UJ	5 J
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57	78 U	**60** J	**930** J	420 U	530 U	1900 UJ	10 J
Dibenzofuran	UG/KG	18000	1	6200	1	34	57	78 U	22 J	280 J	110 J	130 J	280 J	82 U
Diethyl phthalate	UG/KG	12	0	7100	0	15	57	6 J	11 J	1500 U	420 U	530 U	1900 U	8 J
Fluoranthene	UG/KG	160000	1	50000	1	46	57	78 U	540	9700	1500	2600	9900	22 J
Fluorene	UG/KG	38000	1	50000	0	38	57	78 U	42 J	730 J	200 J	280 J	730 J	82 U
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57	78 U	180	2000 J	400 J	590	2200 J	23 J
Naphthalene	UG/KG	29000	1	13000	2	35	57	78 U	12 J	130 J	160 J	110 J	140 J	82 U
Phenanthrene	UG/KG	140000	1	50000	2	46	57	78 U	360	6100	980	1800	6200	82 U
Phenol	UG/KG	17	0	30	0	2	57	78 U	73 U	1500 U	420 U	530 U	1900 U	82 U
Pyrene	UG/KG	120000	1	50000	1	47	57	78 U	470	12000	1400	2200	13000	49 J
PESTICIDES/PCBs														
4,4'-DDD	UG/KG	450	1	2900	0	31	57	4 U	2 J	6	36	11		4 U
4,4'-DDE	UG/KG	150	1	2100	0	34	57	4 J	25	11 J	25	7 J		4 U
4,4'-DDT	UG/KG	350	1	2100	0	31	57	4	33	38 J	25	21		4 U
Aldrin	UG/KG	1	0	41	0	2	57	2 U	2 U	2 U	2 U	2 U		2 U
Alpha-BHC	UG/KG	14	0	110	0	4	57	10 J	2 U	2 U	2 U	2 U		2 U
Alpha-Chlordane	UG/KG	81	0	0	0	13	57	2 U	1 J	2 U	2 U	2 U		2 U
Aroclor-1254	UG/KG	63	0	1000	0	2	57	39 U	37 U	38 U	42 U	40 U		41 U
Beta-BHC	UG/KG	5	0	200	0	7	57	3 J	2 U	2 U	2 U	2 U		2 U
Delta-BHC	UG/KG	9	0	300	0	7	57	1 J	2 U	2 U	2 U	2 U		2 U
Dieldrin	UG/KG	5	0	44	0	4	57	4 U	4 U	4 U	4 U	4 U		4 U

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses							
STUDY ID:								RI Phase 1 Step 1	RI Phase 1 Step 1	ESI	ESI	ESI	ESI	RI Phase 1 Step 1
SDG								SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
ES ID								MW59-4	MW59-6	SB59-1	SB59-1	SB59-1	SB59-1	SB59-10
LAB ID								59055	59129	SB59-1-01	SB59-1-04	SB59-1-06	SB59-1-08	59130
FIELD QC CODE:								SA	SA	SA	SA	SA	DU	SA
SAMP. DETH TOP								4	1	0	6	10	6	0
SAMP. DEPTH BOT:								6	2.6	0 2	8	12	8	0.8
MATRIX:								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:								20-Oct-97	24-Oct-97	20-Feb-94	20-Feb-94	20-Feb-94	20-Feb-94	24-Oct-97
								Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Endosulfan I	UG/KG	26	0	900	0	8	57	2 U	2 U	2 U	2 U	2 U		2 U
Endosulfan II	UG/KG	7	0	900	0	5	57	4 U	4 U	5 J	4 U	4 U		4 U
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57	4 U	4 U	4 U	4 U	4 U		4 U
Endrin	UG/KG	46	0	100	0	9	57	4 U	4 U	4 U	4 U	4 U		4 U
Endrin aldehyde	UG/KG	17	0	0	0	12	57	4 U	4 U	6 J	4 U	4 J		4 U
Endrin ketone	UG/KG	77	0	0	0	9	57	4 U	4	4 U	4 U	4 U		4 U
Gamma-Chlordane	UG/KG	100	0	540	0	11	57	2 U	2 J	2 U	2 U	2 U		2 U
Heptachlor epoxide	UG/KG	10	0	20	0	14	57	2 U	1 J	2 U	2 U	2 U		2 U
Methoxychlor	UG/KG	110	0	0	0	2	57	20 U	19 U	20 U	22 U	21 U		21 U
METALS														
Aluminum	MG/KG	20600	1	19520	1	54	56	10700	15100	11200 J	13000 J	11800 J		**20600**
Antimony	MG/KG	424	0	6	1	12	56	1 UJ	1 UJ	1 J	1 J	0 J		1 UJ
Arsenic	MG/KG	6	1	9	0	54	56	5	5	5 J	4 J	4 J		5
Barium	MG/KG	304	1	300	1	54	56	50	89	78 J	108 J	76 J		154
Beryllium	MG/KG	1	1	1	0	54	56	0	0	0 J	1 J	0 J		1
Cadmium	MG/KG	3	0	2	1	20	56	0 U	0 U	1 J	0 J	0 J		0 U
Calcium	MG/KG	214000	1	125300	4	54	56	2060	34200	**150000** J	83700 J	37400 J		4030
Chromium	MG/KG	26	1	30	0	54	56	19	24	18 J	18 J	18 J		26
Cobalt	MG/KG	15	1	30	0	54	56	11	12	9 J	7 J	9 J		9
Copper	MG/KG	36	1	33	1	54	56	13	31	25 J	33 J	24 J		25
Iron	MG/KG	33300	1	37410	0	54	56	25300	28600	20400 J	18300 J	20500 J		29000
Lead	MG/KG	139	1	24	29	54	56	16	**33**	**52** J	**38** J	11 J		15
Magnesium	MG/KG	34400	1	21700	1	54	56	4390	7020	8690 J	8610 J	14500 J		4880
Manganese	MG/KG	1150	1	1100	1	54	56	376	623	516 J	418 J	329 J		313
Mercury	MG/KG	2	1	0	11	34	56	0 U	0	0 J	**0** J	0 J		0
Nickel	MG/KG	41	1	50	0	54	56	30	40	27 J	23 J	28 J		31
Potassium	MG/KG	2520	1	2623	0	54	56	1110	2060	2140 J	2290 J	2520 J		2340
Selenium	MG/KG	2	0	2	1	18	56	1 U	**2**	0 J	1 J	0 J		1
Silver	MG/KG	4	0	1	1	4	56	0 U	0 U	0 U	0 U	0 U		0 U
Sodium	MG/KG	2310	1	188	17	43	56	98	103 U	135 J	**353** J	164 J		**287**
Vanadium	MG/KG	42	1	150	0	54	56	15	24	42 J	25 J	22 J		34
Zinc	MG/KG	1550	1	115	6	54	56	**133**	86	86 J	**116** J	70 J		81
OTHER ANALYSES														
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57	28 U	50	360	220	78	182	27 U
Nitrate/Nitrite Nitrogen	MG/KG							1	3					0

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

STUDY ID							RI Pha	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	e 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
SDG								SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
ES ID								SB59-11	SB59-13	SB59-14	SB59-15	SB59-16	SB59-17
LAB ID								59132	59060	59062	59061	59064	59068
FIELD QC CODE:								SA	SA	SA	SA	SA	SA
SAMP. DETH TOP								3	6	0	4	0	8
SAMP. DEPTH BOT:								5	6.9	1.6	5.3	1.5	9.2
MATRIX:								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:								24-Oct-97	21-Oct-97	22-Oct-97	21-Oct-97	23-Oct-97	23-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS													
Acetone	UG/KG	150	0	200	0	1	56	11 U	55 U	150	11 U	11 U	11 U
Benzene	UG/KG	5900	0	60	2	3	56	11 U	55 U	11 U	11 U	11 U	11 U
Carbon disulfide	UG/KG	4	0	2700	0	1	56	11 U	55 U	11 U	11 U	11 U	11 U
Ethyl benzene	UG/KG	260000	0	5500	1	4	56	11 U	55 U	11 U	11 U	11 U	11 U
Methyl chloride	UG/KG	1	0	0	0	1	56	11 U	55 U	11 U	11 U	11 U	11 U
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56	11 U	55 U	11 U	11 U	11 U	11 U
Methylene chloride	UG/KG	2	0	100	0	2	56	11 U	55 U	2 J	11 U	11 U	11 U
Toluene	UG/KG	830000	0	1500	1	8	56	11 U	55 U	11 U	11 U	11 U	11 U
Total Xylenes	UG/KG	1000000	0	1200	1	6	56	11 U	55 U	11 U	11 U	11 U	11 U
Trichloroethene	UG/KG	2	0	700	0	2	56	11 U	55 U	2 J	11 U	11 U	11 U
SEMIVOLATILE ORGANICS													
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57	70 U	140 U	190 U	77 U	190 U	75 U
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57	70 U	93 J	35 J	77 U	20 J	22 J
4-Methylphenol	UG/KG	83	0	900	0	2	57	70 U	140 U	190 U	77 U	190 U	75 U
Acenaphthene	UG/KG	20000	1	50000	0	39	57	70 U	110 J	50 J	77 U	52 J	16 J
Acenaphthylene	UG/KG	5700	1	41000	0	29	57	70 U	140 U	190 U	77 U	14 J	5 J
Anthracene	UG/KG	38000	1	50000	0	36	57	70 U	140 U	140 J	77 U	94 J	35 J
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57	4 J	140 U	**530**	77 U	**420**	71 J
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57	4 J	140 U	**380**	77 U	**410**	54 J
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57	4 J	140 U	320	8 J	420	56 J
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57	70 U	140 U	250	77 U	250	35 J
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57	4 J	140 U	380	77 U	390	66 J
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57	16 J	38 J	47 J	17 J	22 J	26 J
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57	70 U	140 U	190 U	77 U	190 U	75 U
Carbazole	UG/KG	33000	1	0	0	36	57	70 U	140 U	140 J	77 U	220	29 J
Chrysene	UG/KG	63000	1	400	26	45	57	5 J	140 U	**610**	5 J	**490**	72 J
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57	10 J	140 U	190 U	5 J	190 U	5 J
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57	70 U	140 U	190 U	77 U	190 U	75 U
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57	70 U	140 U	**110** J	77 U	**130** J	13 J
Dibenzofuran	UG/KG	18000	1	6200	1	34	57	70 U	110 J	30 J	77 U	20 J	16 J
Diethyl phthalate	UG/KG	12	0	7100	0	15	57	5 J	140 U	12 J	11 J	190 U	9 J
Fluoranthene	UG/KG	160000	1	50000	1	46	57	9 J	140 U	1100	5 J	1000	170
Fluorene	UG/KG	38000	1	50000	0	38	57	70 U	260	51 J	77 U	40 J	34 J
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57	70 U	140 U	230	77 U	250	33 J
Naphthalene	UG/KG	29000	1	13000	2	35	57	70 U	69 J	33 J	77 U	62 J	20 J
Phenanthrene	UG/KG	140000	1	50000	2	46	57	11 J	280	800	5 J	520	180
Phenol	UG/KG	17	0	30	0	2	57	70 U	140 U	190 U	77 U	190 U	75 U
Pyrene	UG/KG	120000	1	50000	1	47	57	7 J	25 J	1100	5 J	790	170
PESTICIDES/PCBs													
4,4'-DDD	UG/KG	450	1	2900	0	31	57	4 U	4 U	30	4 U	41	4 U
4,4'-DDE	UG/KG	150	1	2100	0	34	57	4 U	4 U	42	2 J	21	4 U
4,4'-DDT	UG/KG	350	1	2100	0	31	57	4 U	4 U	52	4 U	23	4 U
Aldrin	UG/KG	1	0	41	0	2	57	2 U	2 U	2 U	2 U	2 U	2 U
Alpha-BHC	UG/KG	14	0	110	0	4	57	2 U	7 UJ	18 UJ	6 UJ	2 U	2 U
Alpha-Chlordane	UG/KG	81	0	0	0	13	57	2 U	2 U	5	2 U	2 U	2 U
Aroclor-1254	UG/KG	63	0	1000	0	2	57	35 U	36 U	38 U	38 U	37 U	38 U
Beta-BHC	UG/KG	5	0	200	0	7	57	2 U	3 J	2 U	2 J	2 U	2 U
Delta-BHC	UG/KG	9	0	300	0	7	57	2 U	1 J	9 J	2 U	2 U	2 U
Dieldrin	UG/KG	5	0	44	0	4	57	4 U	4 U	4 U	4 U	4 U	4 U

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID.						RI Pha	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	e 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							SB59-11	SB59-13	SB59-14	SB59-15	SB59-16	SB59-17
	LAB ID							59132	59060	59062	59061	59064	59068
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							3	6	0	4	0	8
	SAMP. DEPTH BOT:							5	6.9	1.6	5.3	1.5	9.2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							24-Oct-97	21-Oct-97	22-Oct-97	21-Oct-97	23-Oct-97	23-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Endosulfan I	UG/KG	26	0	900	0	8	57	2 U	2 U	2 U	2 U	2 U	2 U
Endosulfan II	UG/KG	7	0	900	0	5	57	4 U	4 U	4 U	4 U	4 U	4 U
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57	4 U	4 U	10	4 U	4 U	4 U
Endrin	UG/KG	46	0	100	0	9	57	4 U	4 U	4 J	4 U	6	4 U
Endrin aldehyde	UG/KG	17	0	0	0	12	57	4 U	4 U	3 J	4 U	4	4 U
Endrin ketone	UG/KG	77	0	0	0	9	57	4 U	4 U	11	4 U	5	4 U
Gamma-Chlordane	UG/KG	100	0	540	0	11	57	2 U	2 U	6	2 U	2 U	2 U
Heptachlor epoxide	UG/KG	10	0	20	0	14	57	2 U	2 U	3	2 U	2 J	2 U
Methoxychlor	UG/KG	110	0	0	0	2	57	18 U	18 U	19 U	20 U	19 U	19 U
METALS													
Aluminum	MG/KG	20600	1	19520	1	54	56	7740	11100	8970	7450	10500	5400
Antimony	MG/KG	424	0	6	1	12	56	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Arsenic	MG/KG	6	1	9	0	54	56	4	6	5	4	5	3
Barium	MG/KG	304	1	300	1	54	56	44	52	67	53	86	36
Beryllium	MG/KG	1	1	1	0	54	56	0	0	0	0	0	0
Cadmium	MG/KG	3	0	2	1	20	56	0 U	0 U	0 U	0 U	0 U	0 U
Calcium	MG/KG	214000	1	125300	4	54	56	72200	33900	51000	123000	71000	101000
Chromium	MG/KG	26	1	30	0	54	56	13	19	17	13	16	9
Cobalt	MG/KG	15	1	30	0	54	56	8	14	9	8	10	6
Copper	MG/KG	36	1	33	1	54	56	20	21	21	19	22	17
Iron	MG/KG	33300	1	37410	0	54	56	18400	28900	19300	16900	19300	12300
Lead	MG/KG	139	1	24	29	54	56	10	9	**46**	8	20	6
Magnesium	MG/KG	34400	1	21700	1	54	56	13600	7990	8340	14900	8410	14200
Manganese	MG/KG	1150	1	1100	1	54	56	356	576	406	469	370	334
Mercury	MG/KG	2	1	0	11	34	56	0 U	0 U	0	0 U	0	0 U
Nickel	MG/KG	41	1	50	0	54	56	23	36	25	24	28	17
Potassium	MG/KG	2520	1	2623	0	54	56	1000	1060	1480	1160	1400	936
Selenium	MG/KG	2	0	2	1	18	56	1 U	1 U	1 U	1 U	1 U	1 U
Silver	MG/KG	4	0	1	1	4	56	0 U	0 U	0 U	0 U	0 U	0 U
Sodium	MG/KG	2310	1	188	17	43	56	127	112	**1440**	**817**	**194**	152
Vanadium	MG/KG	42	1	150	0	54	56	13	15	17	13	19	10
Zinc	MG/KG	1550	1	115	6	54	56	81	61	73	67	71	51
OTHER ANALYSES													
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57	24 U	691	197	25 U	2390	23 U
Nitrate/Nitrite Nitrogen	MG/KG							0	0	0	0	3	0

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

STUDY ID:							RI Pha	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	ESI	ESI	ESI
SDG								SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
ES ID								SB59-17	SB59-18	SB59-19	SB59-19	SB59-2	SB59-2	SB59-2
LAB ID								59131	59127	59065	59065DL	SB59-2-00	SB59-2-02	SB59-2-04
FIELD QC CODE:								DU	SA	SA	SA2	SA	SA	SA
SAMP. DETH TOP:								8	10	2	2	0	2	6
SAMP. DEPTH BOT:								9.2	11	2.7	2.7	0.2	4	7
MATRIX:								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:								23-Oct-97	24-Oct-97	22-Oct-97	22-Oct-97	26-May-94	26-May-94	26-May-94
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value
VOLATILE ORGANICS														
Acetone	UG/KG	150	0	200	0	1	56	60 U	11 U	53 U		11 U	45 U	23
Benzene	UG/KG	5900	0	60	2	3	56	6 J	11 U	53 U		11 U	12 U	12
Carbon disulfide	UG/KG	4	0	2700	0	1	56	60 U	11 U	53 U		11 U	12 U	12
Ethyl benzene	UG/KG	260000	0	5500	1	4	56	14 J	11 U	53 U		11 U	12 U	12
Methyl chloride	UG/KG	1	0	0	0	1	56	60 U	11 U	53 U		11 U	12 U	12
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56	60 U	11 U	53 U		11 U	12 J	12
Methylene chloride	UG/KG	2	0	100	0	2	56	60 U	11 U	53 U		11 U	12 U	12
Toluene	UG/KG	830000	0	1500	1	8	56	16 J	11 U	12 J		11 U	12 U	12
Total Xylenes	UG/KG	1000000	0	1200	1	6	56	140	11 U	98		11 U	12 U	12
Trichloroethene	UG/KG	2	0	700	0	2	56	60 U	11 U	53 U		11 U	12 U	12
SEMIVOLATILE ORGANICS														
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57	75 U	380 U	22000 U		740 U	820 U	390
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57	18 J	250 J	29000		75 J	160 J	150
4-Methylphenol	UG/KG	83	0	900	0	2	57	75 U	380 UJ	22000 U		740 U	820 U	28
Acenaphthene	UG/KG	20000	1	50000	0	39	57	11 J	180 J	20000 J		60 J	230 J	100
Acenaphthylene	UG/KG	5700	1	41000	0	29	57	75 U	41 J	5700 J		390 J	100 J	23
Anthracene	UG/KG	38000	1	50000	0	36	57	16 J	380	38000		250 J	440 J	160
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57	23 J	**620**	**67000**		**1700** J	**1600**	**260**
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57	18 J	**570**	**70000**		**1900**	**1500**	**250**
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57	20 J	920	**58000**		**3700** J	**3100** J	290
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57	10 J	320 J	35000		1100	740 J	130
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57	20 J	380 U	**48000**		740 UJ	820 UJ	270
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57	15 J	380 U	22000 U		67 J	72 J	35
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57	75 U	380 U	22000 U		740 U	820 U	390
Carbazole	UG/KG	33000	1	0	0	36	57	14 J	370 J	33000		97 J	220 J	64
Chrysene	UG/KG	63000	1	400	26	45	57	22 J	**600**	**63000**		**1600** J	**1500**	270
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57	5 J	380 U	22000 U		740 U	820 U	390
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57	75 U	380 U	22000 U		740 U	820 U	390
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57	5 J	**150** J	**17000** J		**610** J	**470** J	**84**
Dibenzofuran	UG/KG	18000	1	6200	1	34	57	9 J	280 J	**18000** J		53 J	820 U	82
Diethyl phthalate	UG/KG	12	0	7100	0	15	57	7 J	380 U	22000 U		740 U	820 U	390
Fluoranthene	UG/KG	160000	1	50000	1	46	57	55 J	1500	**160000**		2600 J	3200	750
Fluorene	UG/KG	38000	1	50000	0	38	57	15 J	530	38000		130 J	380 J	160
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57	10 J	300 J	**34000**		1600	940	130
Naphthalene	UG/KG	29000	1	13000	2	35	57	23 J	750	**29000**		68 J	170 J	160
Phenanthrene	UG/KG	140000	1	50000	2	46	57	63 J	1900	**140000**		870 J	1800	620
Phenol	UG/KG	17	0	30	0	2	57	75 U	380 U	22000 U		740 U	820 U	390
Pyrene	UG/KG	120000	1	50000	1	47	57	53 J	1300	**120000**		3200 J	3200	510
PESTICIDES/PCBs														
4,4'-DDD	UG/KG	450	1	2900	0	31	57	4 U	12	16	18. U	4 J	48 J	5
4,4'-DDE	UG/KG	150	1	2100	0	34	57	4 U	8	10	18. U	11 J	81 J	8
4,4'-DDT	UG/KG	350	1	2100	0	31	57	4 U	11	43	47. J	26 J	16 J	4
Aldrin	UG/KG	1	0	41	0	2	57	2 U	2 U	2 U	9. U	2 UJ	1 J	2
Alpha-BHC	UG/KG	14	0	110	0	4	57	2 U	2 U	2 U	9. U	2 UJ	2 UJ	2
Alpha-Chlordane	UG/KG	81	0	0	0	13	57	2 U	2 U	2 U	9. U	2 J	5 J	2
Aroclor-1254	UG/KG	63	0	1000	0	2	57	38 U	38 U	35 U	180. U	37 UJ	41 UJ	39
Beta-BHC	UG/KG	5	0	200	0	7	57	2 U	2 U	2 U	9. U	2 UJ	2 UJ	2
Delta-BHC	UG/KG	9	0	300	0	7	57	2 U	2 U	2 U	9. U	2 UJ	2 UJ	2
Dieldrin	UG/KG	5	0	44	0	4	57	4 U	4 U	3 J	18. U	4 UJ	4 UJ	4

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

STUDY ID:								RI Pha	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	ESI	ESI	ESI
SDG									SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
ES ID									SB59-17	SB59-18	SB59-19	SB59-19	SB59-2	SB59-2	SB59-2
LAB ID									59131	59127	59065	59065DL	SB59-2-00	SB59-2-02	SB59-2-04
FIELD QC CODE:									DU	SA	SA	SA2	SA	SA	SA
SAMP. DETH TOP:									8	10	2	2	0	2	6
SAMP. DEPTH BOT:									9.2	11	2.7	2.7	0.2	4	7
MATRIX:									SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:									23-Oct-97	24-Oct-97	22-Oct-97	22-Oct-97	26-May-94	26-May-94	26-May-94
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses		Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value
Endosulfan I	UG/KG	26	0	900	0	8	57		2 U	2 U	4	9. U	22 J	16 J	4
Endosulfan II	UG/KG	7	0	900	0	5	57		4 U	4 U	3 J	18. U	4 UJ	4 UJ	4
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57		4 U	4 U	20	10. J	4 UJ	4 UJ	4
Endrin	UG/KG	46	0	100	0	9	57		4 U	4 U	32	46. J	4 J	4 UJ	4
Endrin aldehyde	UG/KG	17	0	0	0	12	57		4 U	4 U	15	17. J	4 UJ	4 UJ	4
Endrin ketone	UG/KG	77	0	0	0	9	57		4 U	4 U	77 J	51. J	4 UJ	4 UJ	4
Gamma-Chlordane	UG/KG	100	0	540	0	11	57		2 U	2 U	2 U	9. U	2 UJ	2 UJ	2
Heptachlor epoxide	UG/KG	10	0	20	0	14	57		2 U	2 U	3	9. U	2 UJ	2 UJ	2
Methoxychlor	UG/KG	110	0	0	0	2	57		19 U	19 U	110	90. U	19 UJ	21 UJ	20
METALS															
Aluminum	MG/KG	20600	1	19520	1	54	56		6390	9660	11500		8640	12500	9340
Antimony	MG/KG	424	0	6	1	12	56		1 UJ	1 UJ	1 UJ		0 J	1 J	0
Arsenic	MG/KG	6	1	9	0	54	56		4	3	4		6	6	4
Barium	MG/KG	304	1	300	1	54	56		40	72	75		76	93	66
Beryllium	MG/KG	1	1	1	0	54	56		0	0	0		0 J	1 J	0
Cadmium	MG/KG	3	0	2	1	20	56		0 U	0 U	0 U		1 J	1 J	0
Calcium	MG/KG	214000	1	125300	4	54	56		88800	95900	60000		**135000**	44500	65800
Chromium	MG/KG	26	1	30	0	54	56		10	14	19		16	21	16
Cobalt	MG/KG	15	1	30	0	54	56		7	7	11		8 J	12	9
Copper	MG/KG	36	1	33	1	54	56		18	19	26		**22**	28	20
Iron	MG/KG	33300	1	37410	0	54	56		14800	16500	22400		18200	24600	20900
Lead	MG/KG	139	1	24	29	54	56		7	20	21		**40**	**50**	13
Magnesium	MG/KG	34400	1	21700	1	54	56		14800	17200	11000		11100	8540	9190
Manganese	MG/KG	1150	1	1100	1	54	56		391	378	436		410	664	836
Mercury	MG/KG	2	1	0	11	34	56		0 U	0	0		0 J	0 J	0
Nickel	MG/KG	41	1	50	0	54	56		20	21	36		24	32	25
Potassium	MG/KG	2520	1	2623	0	54	56		1230	1940	1950		1590 J	1690 J	1280
Selenium	MG/KG	2	0	2	1	18	56		1 U	1 U	1 U		0 U	1	0
Silver	MG/KG	4	0	1	1	4	56		0 U	0 U	0 U		0 UJ	0 J	0
Sodium	MG/KG	2310	1	188	17	43	56		165	**258**	101 U		**189** J	168 J	148
Vanadium	MG/KG	42	1	150	0	54	56		12	19	22		18	24	16
Zinc	MG/KG	1550	1	115	6	54	56		65	50	76		**77**	115	76
OTHER ANALYSES															
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57		25 U	1290	2880		951	513	69
Nitrate/Nitrite Nitrogen	MG/KG								0	0	0				

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID:						RI Pha	ESI	RI Phase 1 Step 1	RI Phase 1 Step 1	ESI	ESI	ESI	ESI
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							SB59-2	SB59-20	SB59-21	SB59-3	SB59-3	SB59-3	SB59-4
	LAB ID							SB59-2-20	59066	59067	SB59-3-00	SB59-3-02	SB59-3-04	SB59-4-00
	FIELD QC CODE:							DU	SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	4	0	0	2	6	0
	SAMP. DEPTH BOT:							0.2	4.5	1.1	0.2	4	8	0.2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							26-May-94	22-Oct-97	22-Oct-97	25-May-94	25-May-94	25-May-94	25-May-94
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS														
Acetone	UG/KG	150	0	200	0	1	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Benzene	UG/KG	5900	0	60	2	3	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Carbon disulfide	UG/KG	4	0	2700	0	1	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Ethyl benzene	UG/KG	260000	0	5500	1	4	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Methyl chloride	UG/KG	1	0	0	0	1	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Methylene chloride	UG/KG	2	0	100	0	2	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Toluene	UG/KG	830000	0	1500	1	8	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Total Xylenes	UG/KG	1000000	0	1200	1	6	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
Trichloroethene	UG/KG	2	0	700	0	2	56 U	11 U	11 U	12 U	11 U	12 U	11 U	11 U
SEMIVOLATILE ORGANICS														
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57 U	740 U	66 U	66 U	370 U	380 U	360 U	740 U
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57 J	68 J	14 J	66 U	370 U	380 U	360 U	56 J
4-Methylphenol	UG/KG	83	0	900	0	2	57 J	740 U	66 U	66 U	370 U	380 U	360 U	740 U
Acenaphthene	UG/KG	20000	1	50000	0	39	57 J	110 J	6 J	66 U	56 J	380 U	360 U	63 J
Acenaphthylene	UG/KG	5700	1	41000	0	29	57 J	490 J	66 U	66 U	120 J	380 U	360 U	610 J
Anthracene	UG/KG	38000	1	50000	0	36	57 J	560 J	8 J	66 U	290 J	380 U	360 U	740 J
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57 J	**3500** J	20 J	10 J	**910**	34 J	360 U	**2100**
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57 J	**3000**	22 J	8 J	47 J	380 U	360 U	**420** J
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57 J	**4400**	19 J	15 J	430	45 J	360 U	**2200**
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57 J	1500	22 J	11 J	370 U	380 U	360 U	740 U
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57 J	**2100** J	20 J	12 J	440	28 J	360 U	**1500**
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57 J	37 J	16 J	21 J	660	1300	360 U	740 U
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57 U	740 U	66 U	66 U	370 U	380 U	360 U	740 U
Carbazole	UG/KG	33000	1	0	0	36	57 J	190 J	11 J	7 J	39 J	380 U	360 U	63 J
Chrysene	UG/KG	63000	1	400	26	45	57 J	**2700** J	25 J	14 J	**700**	42 J	360 U	**1800**
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57 U	740 U	6 J	5 J	67 J	380 U	360 U	250 J
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57 U	740 U	66 U	66 U	370 U	380 U	360 U	740 U
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57 J	**870**	5 J	66 U	**160** J	380 U	360 U	**570** J
Dibenzofuran	UG/KG	18000	1	6200	1	34	57 J	83 J	6 J	66 U	26 J	380 U	360 U	45 J
Diethyl phthalate	UG/KG	12	0	7100	0	15	57 U	740 U	10 J	8 J	370 U	380 U	360 U	740 U
Fluoranthene	UG/KG	160000	1	50000	1	46	57	4400 J	54 J	28 J	1700	67 J	360 U	3200
Fluorene	UG/KG	38000	1	50000	0	38	57 J	220 J	9 J	66 U	79 J	380 U	360 U	90 J
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57 J	2200	14 J	10 J	82 J	380 U	360 U	470 J
Naphthalene	UG/KG	29000	1	13000	2	35	57 J	78 J	19 J	66 U	21 J	380 U	360 U	95 J
Phenanthrene	UG/KG	140000	1	50000	2	46	57	2100 J	43 J	20 J	740	380 U	360 U	1100
Phenol	UG/KG	17	0	30	0	2	57 U	740 U	66 U	66 U	370 U	380 U	360 U	740 U
Pyrene	UG/KG	120000	1	50000	1	47	57	5800 J	48 J	21 J	190 J	32 J	360 U	1200
PESTICIDES/PCBs														
4,4`-DDD	UG/KG	450	1	2900	0	31	57 J	5 J	4 U	4 U	8 J	4 U	4 UJ	6 J
4,4`-DDE	UG/KG	150	1	2100	0	34	57 J	7 J	4 U	4 U	19 J	4 U	4 UJ	7 J
4,4`-DDT	UG/KG	350	1	2100	0	31	57 UJ	13 J	4 U	4 U	33	4 U	4 UJ	15 J
Aldrin	UG/KG	1	0	41	0	2	57 UJ	1 J	2 U	2 U	4 U	2 U	2 UJ	4 U
Alpha-BHC	UG/KG	14	0	110	0	4	57 UJ	2 UJ	2 U	2 U	4 U	2 U	2 UJ	4 U
Alpha-Chlordane	UG/KG	81	0	0	0	13	57 UJ	3 J	2 U	2 U	5 J	2 U	2 UJ	4 U
Aroclor-1254	UG/KG	63	0	1000	0	2	57 UJ	37 UJ	37 U	42 U	73 U	25 J	36 UJ	74 U
Beta-BHC	UG/KG	5	0	200	0	7	57 UJ	2 UJ	2 U	2 U	4 U	2 U	2 UJ	4 U
Delta-BHC	UG/KG	9	0	300	0	7	57 UJ	2 UJ	2 U	2 U	4 U	2 U	2 UJ	4 U
Dieldrin	UG/KG	5	0	44	0	4	57 UJ	4 UJ	4 U	4 U	7 U	4 U	4 UJ	7 U

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses (Q)							
STUDY ID:							RI Pha	ESI	RI Phase 1 Step 1	RI Phase 1 Step 1	ESI	ESI	ESI	ESI
SDG								SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
ES ID								SB59-2	SB59-20	SB59-21	SB59-3	SB59-3	SB59-3	SB59-4
LAB ID								SB59-2-20	59066	59067	SB59-3-00	SB59-3-02	SB59-3-04	SB59-4-00
FIELD QC CODE:								DU	SA	SA	SA	SA	SA	SA
SAMP. DETH TOP:								0	4	0	0	2	6	0
SAMP. DEPTH BOT:								0.2	4.5	1.1	0.2	4	8	0.2
MATRIX:								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:								26-May-94	22-Oct-97	22-Oct-97	25-May-94	25-May-94	25-May-94	25-May-94
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Endosulfan I	UG/KG	26	0	900	0	8	57 J	3 J	2 U	2 U	4 U	2 U	2 UJ	4 U
Endosulfan II	UG/KG	7	0	900	0	5	57 UJ	4 J	4 U	4 U	7 U	4 U	4 UJ	7 U
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57 UJ	4 UJ	4 U	4 U	7 U	4 U	4 UJ	7 U
Endrin	UG/KG	46	0	100	0	9	57 UJ	4 UJ	4 U	4 U	7 U	4 U	4 UJ	7 U
Endrin aldehyde	UG/KG	17	0	0	0	12	57 UJ	4 UJ	4 U	4 U	13 J	4 U	4 UJ	7 U
Endrin ketone	UG/KG	77	0	0	0	9	57 UJ	4 UJ	4 U	4 U	7 U	4 U	4 UJ	7 U
Gamma-Chlordane	UG/KG	100	0	540	0	11	57 UJ	2 UJ	2 U	2 U	7	2 U	2 UJ	3 J
Heptachlor epoxide	UG/KG	10	0	20	0	14	57 UJ	2 UJ	2 U	2 U	4 U	2 U	2 UJ	4 U
Methoxychlor	UG/KG	110	0	0	0	2	57 UJ	19 UJ	19 U	22 U	38 U	20 U	19 UJ	38 U
METALS														
Aluminum	MG/KG	20600	1	19520	1	54	56	11800	10700	14300	9020	11700	8020	13100
Antimony	MG/KG	424	0	6	1	12	56 J	0 J	1 UJ	1 UJ	0 UJ	0 UJ	0 UJ	0 UJ
Arsenic	MG/KG	6	1	9	0	54	56	6	4	5	5	4	4	5
Barium	MG/KG	304	1	300	1	54	56	80	88	167	59	78	63	90
Beryllium	MG/KG	1	1	1	0	54	56 J	1 J	0	0	0 J	1 J	0 J	1 J
Cadmium	MG/KG	3	0	2	1	20	56 J	1 J	0 U	0 U	1	1 J	1 J	1
Calcium	MG/KG	214000	1	125300	4	54	56	66400	44000	5450	108000	69500	71100	51000
Chromium	MG/KG	26	1	30	0	54	56	21	16	21	15	18	13	21
Cobalt	MG/KG	15	1	30	0	54	56	12	8	11	9	8 J	8	11
Copper	MG/KG	36	1	33	1	54	56	29	18	25	21	24	18	31
Iron	MG/KG	33300	1	37410	0	54	56	24500	19100	24700	18100	19400	17600	23800
Lead	MG/KG	139	1	24	29	54	56	**50**	9	**59**	**29** J	11 J	9 J	**60** J
Magnesium	MG/KG	34400	1	21700	1	54	56	15200	9770	4300	11500	17500	18500	10600
Manganese	MG/KG	1150	1	1100	1	54	56	542	407	1050	555	411	403	653
Mercury	MG/KG	2	1	0	11	34	56 J	**2** J	0 U	**0**	0 J	0 J	0 J	0
Nickel	MG/KG	41	1	50	0	54	56	32	24	29	23	29	23	41
Potassium	MG/KG	2520	1	2623	0	54	56 J	1750 J	1440	1600	1460 J	1880 J	1370 J	1850 J
Selenium	MG/KG	2	0	2	1	18	56 J	1 J	1 U	2	0 J	0 U	0 U	0 U
Silver	MG/KG	4	0	1	1	4	56 UJ	0 UJ	0 U	0 U	0 UJ	0 UJ	0 UJ	0 UJ
Sodium	MG/KG	2310	1	188	17	43	56 J	171 J	**696**	113 U	183 J	**556** J	**198** J	80 J
Vanadium	MG/KG	42	1	150	0	54	56	21	19	23	17	20	14	23
Zinc	MG/KG	1550	1	115	6	54	56	102	82	87	75	59	54	**131**
OTHER ANALYSES														
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57	774	25	26 U	1360	29 U	29 U	594
Nitrate/Nitrite Nitrogen	MG/KG								0	1				

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

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SOIL ANALYSIS RESULTS - SEAD-59

Decision Document - SEADs-59 and 71

Seneca Army Depot Activity

STUDY ID:							RI Pha	ESI	ESI	ESI	ESI	ESI	e 1 Step 1	e 1 Step 1	e 1 Step 1
SDG								SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
ES ID								SB59-4	SB59-4	SB59-5	SB59-5	SB59-5	SB59-7	SB59-8	SB59-9
LAB ID								SB59-4-05	SB59-4-10	SB59-5-00	SB59-5-03	SB59-5-06	59056	59057	59059
FIELD QC CODE:								SA	SA	SA	SA	SA	SA	SA	SA
SAMP. DETH TOP:								8	10	0	4	10	0	0	2
SAMP. DEPTH BOT:								10	20	0.2	6	12	2	2	3.7
MATRIX:								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:								25-May-94	25-May-94	25-May-94	25-May-94	25-May-94	20-Oct-97	20-Oct-97	21-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS															
Acetone	UG/KG	150	0	200	0	1	56	18 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Benzene	UG/KG	5900	0	60	2	3	56	18 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Carbon disulfide	UG/KG	4	0	2700	0	1	56	4 J	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Ethyl benzene	UG/KG	260000	0	5500	1	4	56	18 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Methyl chloride	UG/KG	1	0	0	0	1	56	18 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56	18 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Methylene chloride	UG/KG	2	0	100	0	2	56	2 J	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Toluene	UG/KG	830000	0	1500	1	8	56	18 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Total Xylenes	UG/KG	1000000	0	1200	1	6	56	18 U	11 U	11 U	11 U	11 U	11 U	13 U	10 U
Trichloroethene	UG/KG	2	0	700	0	2	56	18 U	11 U	11 U	1 J	11 U	11 U	13 U	10 U
SEMIVOLATILE ORGANICS															
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57	420 U	360 U	1800 U	370 U	380 U	81 U	81 U	69 U
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57	37 J	360 U	1800 U	45 J	380 U	15 J	81 U	69 U
4-Methylphenol	UG/KG	83	0	900	0	2	57	420 U	360 U	1800 U	370 U	380 U	81 U	81 U	69 U
Acenaphthene	UG/KG	20000	1	50000	0	39	57	93 J	360 U	310 J	44 J	380 U	9 J	81 U	69 U
Acenaphthylene	UG/KG	5700	1	41000	0	29	57	52 J	360 U	1100 J	190 J	380 U	81 U	81 U	69 U
Anthracene	UG/KG	38000	1	50000	0	36	57	250 J	360 U	1500 J	410 J	380 U	19 J	81 U	69 U
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57	**740**	360 U	**6400**	**1400**	380 U	160	7 J	69 U
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57	**360** J	360 U	**5800**	**1200** J	380 U	**140**	7 J	69 U
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57	730	360 U	**6300**	1100 J	380 U	180	8 J	5 J
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57	420 U	360 U	790 J	150 J	380 U	88	6 J	69 U
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57	590	360 U	**4600**	870 J	380 U	160	8 J	69 U
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57	420 U	360 U	1800 U	370 U	380 U	42 J	69 J	24 J
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57	420 U	360 U	1800 U	370 U	380 U	10 J	81 U	69 U
Carbazole	UG/KG	33000	1	0	0	36	57	160 J	360 U	180 J	370 U	380 U	33 J	81 U	69 U
Chrysene	UG/KG	63000	1	400	26	45	57	**820**	360 U	**6200**	**1400**	380 U	180	8 J	69 U
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57	120 J	360 U	1800 U	370 U	380 U	8 J	6 J	7 J
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57	420 U	360 U	1800 U	370 U	380 U	8 J	11 J	69 U
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57	**160** J	360 U	**1900**	**300** J	380 U	**36** J	81 U	69 U
Dibenzofuran	UG/KG	18000	1	6200	1	34	57	64 J	360 U	1800 U	28 J	380 U	9 J	81 U	69 U
Diethyl phthalate	UG/KG	12	0	7100	0	15	57	420 U	360 U	1800 U	370 U	380 U	12 J	10 J	12 J
Fluoranthene	UG/KG	160000	1	50000	1	46	57	1900	19 J	9900	2300 J	380 U	320	11 J	69 U
Fluorene	UG/KG	38000	1	50000	0	38	57	100 J	360 U	300 J	90 J	380 U	81 U	81 U	69 U
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57	300 J	360 U	**5300**	570 J	380 U	83	6 J	69 U
Naphthalene	UG/KG	29000	1	13000	2	35	57	100 J	360 U	240 J	44 J	380 U	11 J	81 U	69 U
Phenanthrene	UG/KG	140000	1	50000	2	46	57	1100	360 U	4300	1200 J	380 U	120	6 J	69 U
Phenol	UG/KG	17	0	30	0	2	57	420 U	360 U	1800 U	370 U	380 U	81 U	81 U	69 U
Pyrene	UG/KG	120000	1	50000	1	47	57	940	28 J	10000	2800	380 U	290	13 J	69 U
PESTICIDES/PCBs															
4,4'-DDD	UG/KG	450	1	2900	0	31	57	450	4 UJ	37 U	22 J	4 U	6	4 U	4 U
4,4'-DDE	UG/KG	150	1	2100	0	34	57	140	4 UJ	37 U	21	4 U	14	4 U	3 J
4,4'-DDT	UG/KG	350	1	2100	0	31	57	350	4 UJ	37 U	23 J	4 U	21	4 U	4
Aldrin	UG/KG	1	0	41	0	2	57	22 U	2 UJ	19 U	4 U	2 U	2 U	2 U	2 U
Alpha-BHC	UG/KG	14	0	110	0	4	57	22 U	2 UJ	19 U	4 U	2 U	14 J	9	8 UJ
Alpha-Chlordane	UG/KG	81	0	0	0	13	57	22 U	2 UJ	19 U	4 U	2 U	4	2 U	2 U
Aroclor-1254	UG/KG	63	0	1000	0	2	57	420 U	36 UJ	370 U	75 U	38 U	41 U	41 U	35 U
Beta-BHC	UG/KG	5	0	200	0	7	57	22 U	2 UJ	19 U	4 U	2 U	5 J	4 J	3 J
Delta-BHC	UG/KG	9	0	300	0	7	57	22 U	2 UJ	19 U	4 U	2 U	2 J	1 J	1 J
Dieldrin	UG/KG	5	0	44	0	4	57	42 U	4 UJ	37 U	8 U	4 U	4 U	4 U	4 U

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID:						RI Pha	ESI	ESI	ESI	ESI	ESI	e 1 Step 1	e 1 Step 1	e 1 Step 1
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							SB59-4	SB59-4	SB59-5	SB59-5	SB59-5	SB59-7	SB59-8	SB59-9
	LAB ID							SB59-4-05	SB59-4-10	SB59-5-00	SB59-5-03	SB59-5-06	59056	59057	59059
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							8	10	0	4	10	0	0	2
	SAMP. DEPTH BOT:							10	20	0.2	6	12	2	2	3.7
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							25-May-94	25-May-94	25-May-94	25-May-94	25-May-94	20-Oct-97	20-Oct-97	21-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Endosulfan I	UG/KG	26	0	900	0	8	57	22 U	2 UJ	19 U	4 U	2 U	2 U	2 U	2 U
Endosulfan II	UG/KG	7	0	900	0	5	57	42 U	4 UJ	37 U	8 U	4 U	4 U	4 U	4 U
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57	42 U	4 UJ	37 U	8 U	4 U	4 U	4 U	4 U
Endrin	UG/KG	46	0	100	0	9	57	42 U	4 UJ	37 U	8 U	4 U	4 U	4 U	4 U
Endrin aldehyde	UG/KG	17	0	0	0	12	57	42 U	4 UJ	37 U	8 U	4 U	4 U	4 U	4 U
Endrin ketone	UG/KG	77	0	0	0	9	57	42 U	4 UJ	37 U	8 U	4 U	4 U	4 U	4 U
Gamma-Chlordane	UG/KG	100	0	540	0	11	57	22 U	2 UJ	19 U	2 J	2 U	4	2 U	2 U
Heptachlor epoxide	UG/KG	10	0	20	0	14	57	22 U	2 UJ	19 U	4 U	2 U	1 J	2 U	2 U
Methoxychlor	UG/KG	110	0	0	0	2	57	220 U	18 UJ	190 U	39 U	20 U	21 U	21 U	18 U
METALS															
Aluminum	MG/KG	20600	1	19520	1	54	56	4200	7550	12600	12800	7030	9840	15200	7180
Antimony	MG/KG	424	0	6	1	12	56	**424** J	0 UJ	0 J	0 UJ	0 UJ	1 UJ	1 UJ	1 UJ
Arsenic	MG/KG	6	1	9	0	54	56	4	4	5	6	5	4	5	4
Barium	MG/KG	304	1	300	1	54	56	**304**	21 J	101	82	36 J	66	192	48
Beryllium	MG/KG	1	1	1	0	54	56	0 J	0 J	1 J	1 J	0 J	0	0	0
Cadmium	MG/KG	3	0	2	1	20	56	**3**	0 J	1	1 J	1 J	0 U	0 U	0 U
Calcium	MG/KG	214000	1	125300	4	54	56	**214000**	61700	59500	62800	85200	59700	7390	91000
Chromium	MG/KG	26	1	30	0	54	56	15	13	22	20	13	20	21	12
Cobalt	MG/KG	15	1	30	0	54	56	4 J	8 J	11	11	8 J	9	13	8
Copper	MG/KG	36	1	33	1	54	56	14	16	33	26	19	25	28	19
Iron	MG/KG	33300	1	37410	0	54	56	6540	17300	24800	24100	18100	19900	26300	16100
Lead	MG/KG	139	1	24	29	54	56	**139** J	10 J	**92** J	**42** J	12 J	**41**	**56**	9
Magnesium	MG/KG	34400	1	21700	1	54	56	7980	14600	8640	11500	**34400**	7840	4740	18300
Manganese	MG/KG	1150	1	1100	1	54	56	298	328	586	640	477	367	**1150**	385
Mercury	MG/KG	2	1	0	11	34	56	**0**	0 J	0 J	**0**	0 J	0	**0**	0 U
Nickel	MG/KG	41	1	50	0	54	56	11	21	33	30	27	26	29	21
Potassium	MG/KG	2520	1	2623	0	54	56	845 J	1100 J	1620 J	1710 J	922 J	1500	1770	1430
Selenium	MG/KG	2	0	2	1	18	56	0 J	1 J	0 U	1 J	0 U	1 U	1	1 U
Silver	MG/KG	4	0	1	1	4	56	0 J	0 UJ	0 UJ	0 UJ	0 UJ	0 U	0 U	0 U
Sodium	MG/KG	2310	1	188	17	43	56	125 J	140 J	79 J	161 J	**274** J	**1510**	115 U	142
Vanadium	MG/KG	42	1	150	0	54	56	14	12	22	23	13	18	25	14
Zinc	MG/KG	1550	1	115	6	54	56	**341**	55	106	101	65	68	86	61
OTHER ANALYSES															
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57	778	40	527	637	70	133	27 U	23 U
Nitrate/Nitrite Nitrogen	MG/KG												1	8	0

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
	STUDY ID:						RI Pha	ESI	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							TP59-1	P59-10-2	59-11A-2	59-12A-1	59-12A-2	59-12B-2	59-13A-1	59-13C-1
	LAB ID							TP59-1	59004	59026	59018	59019	59023	59010	59015
	FIELD QC CODE:							SA	SA	SA	SA	DU	SA	SA	SA
	SAMP. DETH TOP:							2	3	4	1	1	2.5	3.5	3
	SAMP. DEPTH BOT:							2	3.5	4.5	1.5	1.5	3	4	3.5
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							08-Jun-94	07-Oct-97	09-Oct-97	09-Oct-97	09-Oct-97	09-Oct-97	08-Oct-97	08-Oct-97
VOLATILE ORGANICS															
Acetone	UG/KG	150	0	200	0	1	56	30000 U	5 U	11 U	12 U	12 U	11 U	120 U	11 U
Benzene	UG/KG	5900	0	60	2	3	56	**5900** J	11 U	11 U	12 U	12 U	11 U	120 U	11 U
Carbon disulfide	UG/KG	4	0	2700	0	1	56	30000 U	11 U	11 U	12 U	12 U	11 U	120 U	11 U
Ethyl benzene	UG/KG	260000	0	5500	1	4	56	**260000**	11 U	11 U	12 U	12 U	11 U	110 J	11 U
Methyl chloride	UG/KG	1	0	0	0	1	56	30000 U	11 U	11 U	12 U	12 U	11 U	120 U	11 U
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56	30000 U	11 U	11 U	12 U	12 U	11 U	120 U	11 U
Methylene chloride	UG/KG	2	0	100	0	2	56	30000 U	11 U	11 U	12 U	12 U	11 U	120 U	11 U
Toluene	UG/KG	830000	0	1500	1	8	56	**830000**	11 U	11 U	12 U	12 U	11 U	120 U	11 U
Total Xylenes	UG/KG	1000000	0	1200	1	6	56	**1000000**	11 U	11 U	12 U	12 U	11 U	120 U	11 U
Trichloroethene	UG/KG	2	0	700	0	2	56	30000 U	11 U	11 U	12 U	12 U	11 U	120 U	11 U
SEMIVOLATILE ORGANICS															
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57	87000 U	9400 U	1400 U	200 U	160 U	74 U	8000 U	76 U
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57	87000 U	3600 J	210 J	21 J	16 J	74 U	10000	76 U
4-Methylphenol	UG/KG	83	0	900	0	2	57	87000 U	9400 U	1400 U	200 U	160 U	74 U	8000 U	76 U
Acenaphthene	UG/KG	20000	1	50000	0	39	57	87000 U	4200 J	340 J	92 J	59 J	74 U	1600 J	76 U
Acenaphthylene	UG/KG	5700	1	41000	0	29	57	87000 U	1200 J	290 J	200 U	160 U	74 U	8000 U	76 U
Anthracene	UG/KG	38000	1	50000	0	36	57	87000 U	13000	1100 J	130 J	110 J	74 U	8000 U	76 U
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57	87000 U	**20000**	**3500**	**450**	**480**	74 U	8000 U	8 J
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57	87000 U	**18000**	**4100**	**480**	**450**	74 U	8000 U	10 J
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57	87000 U	**14000**	**3400**	480	470	74 U	8000 U	11 J
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57	87000 U	9900	2400	340	290	74 U	8000 U	8 J
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57	87000 U	**14000**	**3200**	430	380	74 U	8000 U	10 J
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57	15000 J	9400 U	1400 U	200 U	14 J	7 J	8000 U	7 J
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57	87000 U	9400 U	1400 U	200 U	160 U	74 U	8000 U	76 U
Carbazole	UG/KG	33000	1	0	0	36	57	87000 U	4100 J	610 J	250	150 J	74 U	8000 U	76 U
Chrysene	UG/KG	63000	1	400	26	45	57	87000 U	**19000**	**3700**	**520**	**500**	74 U	8000 U	12 J
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57	87000 U	9400 U	1400 U	200 U	160 U	6 J	8000 U	76 U
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57	87000 U	9400 U	1400 U	200 U	160 U	74 U	8000 U	76 U
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57	87000 U	**3700** J	**890** J	**110** J	**140** J	74 U	8000 U	76 U
Dibenzofuran	UG/KG	18000	1	6200	1	34	57	87000 U	4200 J	230 J	42 J	27 J	74 U	1400 J	76 U
Diethyl phthalate	UG/KG	12	0	7100	0	15	57	87000 U	9400 U	1400 U	200 U	160 U	74 U	8000 U	5 J
Fluoranthene	UG/KG	160000	1	50000	1	46	57	87000 U	50000 B	7300	1100	1000	74 U	8000 U	14 J
Fluorene	UG/KG	38000	1	50000	0	38	57	87000 U	10000	640 J	81 J	55 J	74 U	3000 J	76 U
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57	87000 U	**9200** J	2300	300	270	74 U	8000 U	8 J
Naphthalene	UG/KG	29000	1	13000	2	35	57	87000 U	2000 J	110 J	34 J	17 J	74 U	8000 U	76 U
Phenanthrene	UG/KG	140000	1	50000	2	46	57	87000 U	46000	5000	750	610	74 U	5200 J	9 J
Phenol	UG/KG	17	0	30	0	2	57	87000 U	9400 U	1400 U	200 U	160 U	74 U	8000 U	76 U
Pyrene	UG/KG	120000	1	50000	1	47	57	87000 U	36000	7000	800	890	74 U	8000 U	14 J
PESTICIDES/PCBs															
4,4`-DDD	UG/KG	450	1	2900	0	31	57	7	4 J	13	10	8	4 U	26	4 U
4,4`-DDE	UG/KG	150	1	2100	0	34	57	13 J	6 J	13	29	21	4 U	10	4 U
4,4`-DDT	UG/KG	350	1	2100	0	31	57	4 U	9 J	12	8	5	4 U	4 U	4 U
Aldrin	UG/KG	1	0	41	0	2	57	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Alpha-BHC	UG/KG	14	0	110	0	4	57	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Alpha-Chlordane	UG/KG	81	0	0	0	13	57	1 J	2 U	1 J	2 U	2 U	2 U	17	2 U
Aroclor-1254	UG/KG	63	0	1000	0	2	57	43 U	35 U	36 U	40 U	40 U	37 U	40 U	38 U
Beta-BHC	UG/KG	5	0	200	0	7	57	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Delta-BHC	UG/KG	9	0	300	0	7	57	2 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Dieldrin	UG/KG	5	0	44	0	4	57	4 J	4 U	4 U	4 U	4 U	4 U	4 U	4 U

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID:						RI Pha	ESI	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							TP59-1	P59-10-2	59-11A-2	59-12A-1	59-12A-2	59-12B-2	59-13A-1	59-13C-1
	LAB ID							TP59-1	59004	59026	59018	59019	59023	59010	59015
	FIELD QC CODE:							SA	SA	SA	SA	DU	SA	SA	SA
	SAMP. DETH TOP:							2	3	4	1	1	2.5	3.5	3
	SAMP. DEPTH BOT:							2	3.5	4.5	1.5	1.5	3	4	3.5
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							08-Jun-94	07-Oct-97	09-Oct-97	09-Oct-97	09-Oct-97	09-Oct-97	08-Oct-97	08-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Endosulfan I	UG/KG	26	0	900	0	8	57	2 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Endosulfan II	UG/KG	7	0	900	0	5	57	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Endrin	UG/KG	46	0	100	0	9	57	4 U	17	8	4 U	4 U	4 U	4 U	4 U
Endrin aldehyde	UG/KG	17	0	0	0	12	57	4 U	7	4 J	4 U	4 U	4 U	4 U	4 U
Endrin ketone	UG/KG	77	0	0	0	9	57	4 U	12	4	4 U	4 U	4 U	4 U	4 U
Gamma-Chlordane	UG/KG	100	0	540	0	11	57	2 U	2 U	1 J	2 U	2 U	2 U	18	2 U
Heptachlor epoxide	UG/KG	10	0	20	0	14	57	2 U	1 J	1 J	2 J	1 J	2 U	2 U	2 U
Methoxychlor	UG/KG	110	0	0	0	2	57	22 U	23 J	18 U	21 U	20 U	19 U	21 U	20 U
METALS															
Aluminum	MG/KG	20600	1	19520	1	54	56	16000 J	10200 J	9950 J	12000 J	10000 J	11900 J	9510 J	6630 J
Antimony	MG/KG	424	0	6	1	12	56	0 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Arsenic	MG/KG	6	1	9	0	54	56	6	3	4	3	3	4	5	4
Barium	MG/KG	304	1	300	1	54	56	120 J	72	78	92	80	85	33	34
Beryllium	MG/KG	1	1	1	0	54	56	1 J	0	0	0	0	0	0	0
Cadmium	MG/KG	3	0	2	1	20	56	1 J	0 U	0 U	0 U	0 U	0 U	0 U	0 U
Calcium	MG/KG	214000	1	125300	4	54	56	7690 J	39700	98900	26900	63900	2770	8570	73900
Chromium	MG/KG	26	1	30	0	54	56	24 J	17	16	19	15	18	18	12
Cobalt	MG/KG	15	1	30	0	54	56	15 J	10	10	12	9	8	14	9
Copper	MG/KG	36	1	33	1	54	56	20 J	22	**36**	28	23	17	27	16
Iron	MG/KG	33300	1	37410	0	54	56	33300 J	19000	18200	22600	17600	20800	22200	15400
Lead	MG/KG	139	1	24	29	54	56	15	17 J	**65** J	**82** J	**38** J	9 J	18 J	11 J
Magnesium	MG/KG	34400	1	21700	1	54	56	5210 J	7500 J	8970 J	6770 J	9300 J	4240 J	6250 J	7700 J
Manganese	MG/KG	1150	1	1100	1	54	56	507 J	352 J	442 J	375 J	463 J	226 J	285 J	340 J
Mercury	MG/KG	2	1	0	11	34	56	0 JR	0 U	**0**	0	**0**	0 U	0 U	0 U
Nickel	MG/KG	41	1	50	0	54	56	34 J	30	27	28	23	24	35	22
Potassium	MG/KG	2520	1	2623	0	54	56	1540	1480	1540	1510	1590	1580	1090	1000
Selenium	MG/KG	2	0	2	1	18	56	1	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Silver	MG/KG	4	0	1	1	4	56	0 UJ	0 U	0	0 U	0 U	0 U	0 U	0 U
Sodium	MG/KG	2310	1	188	17	43	56	140 J	162	100	80 U	86 U	91 U	**1150**	**385**
Vanadium	MG/KG	42	1	150	0	54	56	25 J	17	19	21	18	20	16	12
Zinc	MG/KG	1550	1	115	6	54	56	**1550** J	55 J	91 J	**122** J	88 J	70 J	97 J	70 J
OTHER ANALYSES															
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57	3820	607	1220	156	151	26 U	5090	25 U
Nitrate/Nitrite Nitrogen	MG/KG								1	2	2	1	0	0	0

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
STUDY ID:								RI Pha e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	ESI	ESI
SDG								SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
ES ID								P59-14-3	P59-15-1	P59-15-5	P59-16-1	P59-17-3	P59-18-1	TP59-2	TP59-3
LAB ID								59030	59031	59035	59036	59044	59047	TP59-2	TP59-3-1
FIELD QC CODE:								SA	SA	SA	SA	SA	SA	SA	SA
SAMP. DETH TOP:								1.5	6	6	3.5	3	2	7	3
SAMP. DEPTH BOT:								2	6	6.5	4	3.5	2.5	7	3
MATRIX:								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:								10-Oct-97	10-Oct-97	10-Oct-97	10-Oct-97	13-Oct-97	13-Oct-97	########	8-Jun-94
VOLATILE ORGANICS															
Acetone	UG/KG	150	0	200	0	1	56	12 U	57 U	12 U	13 U	11 U	13 U	17 U	
Benzene	UG/KG	5900	0	60	2	3	56	12 U	57 U	12 U	13 U	11 U	13 U	11 U	
Carbon disulfide	UG/KG	4	0	2700	0	1	56	12 U	57 U	12 U	13 U	11 U	13 U	11 U	
Ethyl benzene	UG/KG	260000	0	5500	1	4	56	12 U	22 J	12 U	13 U	11 U	13 U	11 U	
Methyl chloride	UG/KG	1	0	0	0	1	56	12 U	57 U	12 U	13 U	11 U	1 J	11 U	
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56	12 U	57 U	12 U	30	11 U	13 U	11 U	
Methylene chloride	UG/KG	2	0	100	0	2	56	12 U	57 U	12 U	13 U	11 U	13 U	11 U	
Toluene	UG/KG	830000	0	1500	1	8	56	12 U	9 J	2 J	13 U	2 J	13 U	11 U	
Total Xylenes	UG/KG	1000000	0	1200	1	6	56	12 U	190	12 U	13 U	11 U	13 U	11 U	
Trichloroethene	UG/KG	2	0	700	0	2	56	12 U	57 U	12 U	13 U	11 U	13 U	11 U	
SEMIVOLATILE ORGANICS															
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57	380 U	76000 U	1500 U	78 U	360 U	28 J	1800 U	4000 U
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57	26 J	66000 J	100 J	16 J	970	29 J	400 J	4000 U
4-Methylphenol	UG/KG	83	0	900	0	2	57	380 U	76000 U	1500 U	78 U	360 U	81 U	1800 U	4000 U
Acenaphthene	UG/KG	20000	1	50000	0	39	57	68 J	12000 J	270 J	19 J	510	13 J	870 J	4000 U
Acenaphthylene	UG/KG	5700	1	41000	0	29	57	53 J	76000 U	130 J	10 J	130 J	81 U	460 J	4000 U
Anthracene	UG/KG	38000	1	50000	0	36	57	120 J	11000 J	390 J	27 J	210 J	81 U	2100	4000 U
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57	800	20000 J	3200	210	1000	17 J	4200	930 J
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57	910	22000 J	3600	220	1300	21 J	4600 J	900 J
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57	880	16000 J	3200	250	1000	22 J	4400 J	830 J
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57	580	11000 J	2300	160	900	16 J	1400 J	640 J
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57	710	18000 J	3100	180	1200	18 J	4900 J	710 J
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57	380 U	76000 U	1500 U	17 J	360 U	74 J	1800 U	4000 U
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57	380 U	76000 U	1000 J	4 J	360 U	81 U	1800 U	320 J
Carbazole	UG/KG	33000	1	0	0	36	57	160 J	76000 U	590 J	34 J	150 J	5 J	1500 J	4000 U
Chrysene	UG/KG	63000	1	400	26	45	57	1100	21000 J	4400	240	1100	23 J	4400	1100 J
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57	380 U	76000 U	1500 U	78 U	360 U	5 J	1800 U	4000 U
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57	380 U	76000 U	1500 U	6 J	360 U	81 U	1800 UJ	4000 U
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57	210 J	4100 J	710 J	74 J	350 J	7 J	1800 UJ	4000 U
Dibenzofuran	UG/KG	18000	1	6200	1	34	57	34 J	76000 U	140 J	78 U	440	12 J	1800 U	4000 U
Diethyl phthalate	UG/KG	12	0	7100	0	15	57	380 U	76000 U	1500 U	78 U	360 U	81 U	1800 U	4000 U
Fluoranthene	UG/KG	160000	1	50000	1	46	57	1900	47000 J	8600	430	1900	39 J	10000	1500 J
Fluorene	UG/KG	38000	1	50000	0	38	57	120 J	26000 J	620 J	78 U	220 J	6 J	1300 J	4000 U
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57	510	10000 J	2000	160	840	15 J	1500 J	520 J
Naphthalene	UG/KG	29000	1	13000	2	35	57	380 U	14000 J	1500 U	10 J	610	17 J	290 J	4000 U
Phenanthrene	UG/KG	140000	1	50000	2	46	57	1400	53000 J	6500	160	830	22 J	8300	980 J
Phenol	UG/KG	17	0	30	0	2	57	380 U	76000 U	1500 U	78 U	360 U	7 J	1800 U	4000 U
Pyrene	UG/KG	120000	1	50000	1	47	57	1800	43000 J	8000	370	1600	30 J	12000	1700 J
PESTICIDES/PCBs															
4,4`-DDD	UG/KG	450	1	2900	0	31	57	4 U	37	4 U	4 U	11 J	4 U	15	7 J
4,4`-DDE	UG/KG	150	1	2100	0	34	57	4 U	4 U	4 U	4 U	15	4 U	26 J	8 J
4,4`-DDT	UG/KG	350	1	2100	0	31	57	4 U	17 J	4 U	4 U	24	4 U	20 J	8 J
Aldrin	UG/KG	1	0	41	0	2	57	2 U	2 U	2 U	2 U	2 U	2 U	4 U	2 U
Alpha-BHC	UG/KG	14	0	110	0	4	57	2 U	1 J	2 U	2 U	2 U	2 U	4 U	2 U
Alpha-Chlordane	UG/KG	81	0	0	0	13	57	2 U	2 J	2 U	2 U	2 U	3 J	4 U	2 U
Aroclor-1254	UG/KG	63	0	1000	0	2	57	38 U	38 U	38 U	39 U	36 U	41 U	73 U	63
Beta-BHC	UG/KG	5	0	200	0	7	57	2 U	2 J	2 U	2 U	2 U	2 U	4 U	2 U
Delta-BHC	UG/KG	9	0	300	0	7	57	2 U	2 U	2 U	2 U	2 U	2 U	4 U	2 U
Dieldrin	UG/KG	5	0	44	0	4	57	4 U	4 U	4 U	4 U	4 U	4 U	7 U	4 U

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses								
	STUDY ID:							RI Pha e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	e 1 Step 1	ESI	ESI
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							P59-14-3	P59-15-1	P59-15-5	P59-16-1	P59-17-3	P59-18-1	TP59-2	TP59-3
	LAB ID							59030	59031	59035	59036	59044	59047	TP59-2	TP59-3-1
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							1.5	6	6	3.5	3	2	7	3
	SAMP. DEPTH BOT:							2	6	6.5	4	3.5	2.5	7	3
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							10-Oct-97	10-Oct-97	10-Oct-97	10-Oct-97	13-Oct-97	13-Oct-97	########	8-Jun-94
								Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Endosulfan I	UG/KG	26	0	900	0	8	57	2 U	26 J	2 U	2 U	2 U	2 U	4 U	2 U
Endosulfan II	UG/KG	7	0	900	0	5	57	4 U	2 J	4 U	4 U	4 U	4 U	7 J	4 U
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57	4 U	4 U	4 U	4 U	4 U	4 U	7 U	3 J
Endrin	UG/KG	46	0	100	0	9	57	4 U	6 J	4 U	4 U	6	4 U	7 U	4 U
Endrin aldehyde	UG/KG	17	0	0	0	12	57	4 U	8	4 U	4 U	4 J	4 U	6 J	4 U
Endrin ketone	UG/KG	77	0	0	0	9	57	4 U	6 J	4 U	4 U	3 J	4 U	7 U	4 U
Gamma-Chlordane	UG/KG	100	0	540	0	11	57	2 U	2 U	2 U	2 U	1 J	2 J	4 U	2 U
Heptachlor epoxide	UG/KG	10	0	20	0	14	57	2 U	2 U	2 U	2 U	2 J	2 U	2 J	2 U
Methoxychlor	UG/KG	110	0	0	0	2	57	20 U	19 U	20 U	20 U	19 U	21 U	38 U	21 U
METALS															
Aluminum	MG/KG	20600	1	19520	1	54	56	8210 J	8390 J	11900 J	12400 J	12300 J	12900 J	10200 J	12300 J
Antimony	MG/KG	424	0	6	1	12	56	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	0 UJ	0 J	0 J
Arsenic	MG/KG	6	1	9	0	54	56	4	4	4	4	6	5	5 J	5
Barium	MG/KG	304	1	300	1	54	56	81	49	73	94	70	121	53 J	104 J
Beryllium	MG/KG	1	1	1	0	54	56	0	0	0	0	0	0	0 J	1 J
Cadmium	MG/KG	3	0	2	1	20	56	0 U	0 U	0 U	0 U	0 U	0 U	0 J	1 J
Calcium	MG/KG	214000	1	125300	4	54	56	85000	71700	29200	5590	59600	5650	42700 J	53100 J
Chromium	MG/KG	26	1	30	0	54	56	16 *	20	18	19	21	20	17 J	21 J
Cobalt	MG/KG	15	1	30	0	54	56	9	8	9	10	13	9	9 J	10 J
Copper	MG/KG	36	1	33	1	54	56	30	30	28	20	30	29	24 J	27 J
Iron	MG/KG	33300	1	37410	0	54	56	17600	32700	21300	22700	25800	22500	19700 J	23600 J
Lead	MG/KG	139	1	24	29	54	56	37 J	65 J	47 J	14 J	30 J	55 J	30 J	31
Magnesium	MG/KG	34400	1	21700	1	54	56	10000 J	9580 J	9520 J	4810 J	12900 J	3850 J	6380 J	14600 J
Manganese	MG/KG	1150	1	1100	1	54	56	358 J	528 J	496 J	561 J	454 J	561 J	425 J	426 J
Mercury	MG/KG	2	1	0	11	34	56	0 U	0 U	0 U	0 U	0 U	0	0 J	0 R
Nickel	MG/KG	41	1	50	0	54	56	30	27	24	30	41	28	25 J	30 J
Potassium	MG/KG	2520	1	2623	0	54	56	1180	1340	1590	1610	1780	1530	1350 J	1820
Selenium	MG/KG	2	0	2	1	18	56	1 U	1 U	1 U	1 U	1 U	1	0 U	0 U
Silver	MG/KG	4	0	1	1	4	56	0 U	0 U	0 U	0 U	0 U	0 U	0 U	0 UJ
Sodium	MG/KG	2310	1	188	17	43	56	120	110	93 U	355	155	73 U	116 J	272 J
Vanadium	MG/KG	42	1	150	0	54	56	18	18	26	22	21	22	19 J	22 J
Zinc	MG/KG	1550	1	115	6	54	56	82 J	102 J	84 J	73 J	84 J	88 J	72 J	90 J
OTHER ANALYSES															
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57	430	19700	667	218	24 U	26 U	1790	440
Nitrate/Nitrite Nitrogen	MG/KG							1	0	4	0	1	10		

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils

Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses							
	STUDY ID:						RI Pha	ESI	ESI	ESI	RI Phase	RI Phase	RI Phase	RI Phase
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							TP59-3	TP59-3X	TP59-4	TP59-6-2	TP59-7-2	TP59-8-2	TP59-9-2
	LAB ID							TP59-3-2	TP59-3X	TP59-4	59002	59008	59050	59052
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							1.5	1.5	2	6	3	1.5	2
	SAMP. DEPTH BOT:							1.5	1.5	2	6.5	3.5	2	2.5
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							28-Jun-94	28-Jun-94	8-Jun-94	7-Oct-97	8-Oct-97	13-Oct-97	13-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
VOLATILE ORGANICS														
Acetone	UG/KG	150	0	200	0	1	56	16 U	3300 U	1800 U	13 U	9 U	12 U	12 U
Benzene	UG/KG	5900	0	60	2	3	56	12 U	**2000** J	1800 U	13 U	11 U	12 U	12 U
Carbon disulfide	UG/KG	4	0	2700	0	1	56	12 U	3300 U	1800 U	13 U	11 U	12 U	12 U
Ethyl benzene	UG/KG	260000	0	5500	1	4	56	12 U	3300 U	1800 U	13 U	11 U	12 U	12 U
Methyl chloride	UG/KG	1	0	0	0	1	56	12 U	3300 U	1800 U	13 U	11 U	12 U	12 U
Methyl ethyl ketone	UG/KG	36	0	300	0	3	56	12 U	3300 U	1800 U	36 J	11 U	12 U	12 U
Methylene chloride	UG/KG	2	0	100	0	2	56	12 U	3300 U	1800 U	13 U	11 U	12 U	12 U
Toluene	UG/KG	830000	0	1500	1	8	56	12 U	440 J	220 J	13 U	11 U	12 U	12 U
Total Xylenes	UG/KG	1000000	0	1200	1	6	56	12 U	1200 J	410 J	13 U	11 U	12 U	12 U
Trichloroethene	UG/KG	2	0	700	0	2	56	12 U	3300 U	1800 U	13 U	11 U	12 U	12 U
SEMIVOLATILE ORGANICS														
1,2,4-Trichlorobenzene	UG/KG	28	0	3400	0	1	57			98000 U	89 U	88 U	150 U	150 U
2-Methylnaphthalene	UG/KG	67000	1	36400	2	37	57			**67000** J	17 J	88 U	14 J	10 J
4-Methylphenol	UG/KG	83	0	900	0	2	57			98000 U	83 J	88 U	150 U	150 U
Acenaphthene	UG/KG	20000	1	50000	0	39	57			98000 U	29 J	15 J	18 J	44 J
Acenaphthylene	UG/KG	5700	1	41000	0	29	57			98000 U	11 J	18 J	8 J	8 J
Anthracene	UG/KG	38000	1	50000	0	36	57			98000 U	61 J	54 J	43 J	88 J
Benzo[a]anthracene	UG/KG	67000	1	224	31	44	57			98000 U	**280**	**290**	200	**320**
Benzo[a]pyrene	UG/KG	70000	1	61	33	43	57			98000 U	**260**	**330**	**210**	**340**
Benzo[b]fluoranthene	UG/KG	58000	1	1100	13	46	57			98000 U	220 J	310	230	320
Benzo[ghi]perylene	UG/KG	35000	1	50000	0	39	57			98000 U	180	200	140 J	210
Benzo[k]fluoranthene	UG/KG	48000	1	1100	12	41	57			98000 U	260	300	180	300
Bis(2-Ethylhexyl)phthalate	UG/KG	15000	1	50000	0	33	57			98000 U	13 J	14 J	19 J	41 J
Butylbenzylphthalate	UG/KG	1000	0	50000	0	4	57			98000 U	89 U	88 U	150 U	150 U
Carbazole	UG/KG	33000	1	0	0	36	57			98000 U	82 J	51 J	56 J	120 J
Chrysene	UG/KG	63000	1	400	26	45	57			98000 U	310	340	220	360
Di-n-butylphthalate	UG/KG	250	0	8100	0	22	57			98000 U	8 J	13 J	12 JB	80 J
Di-n-octylphthalate	UG/KG	11	0	50000	0	5	57			98000 U	89 U	88 U	150 U	150 U
Dibenz[a,h]anthracene	UG/KG	17000	1	14	29	34	57			98000 U	**74** J	**92**	**52** J	**84** J
Dibenzofuran	UG/KG	18000	1	6200	1	34	57			98000 U	14 J	10 J	13 J	21 J
Diethyl phthalate	UG/KG	12	0	7100	0	15	57			98000 U	89 U	5 J	150 U	150 U
Fluoranthene	UG/KG	160000	1	50000	1	46	57			98000 U	590	590	460	790 B
Fluorene	UG/KG	38000	1	50000	0	38	57			22000 J	27 J	22 J	18 J	46 J
Indeno[1,2,3-cd]pyrene	UG/KG	34000	1	3200	4	42	57			98000 U	180	190	140 J	200
Naphthalene	UG/KG	29000	1	13000	2	35	57			98000 U	15 J	88 U	11 J	12 J
Phenanthrene	UG/KG	140000	1	50000	2	46	57			46000 J	370	280	200	460
Phenol	UG/KG	17	0	30	0	2	57			98000 U	17 J	88 U	150 U	150 U
Pyrene	UG/KG	120000	1	50000	1	47	57			98000 U	500	500	340	550
PESTICIDES/PCBs														
4,4`-DDD	UG/KG	450	1	2900	0	31	57			25 J	70	42 J	4 U	3 J
4,4`-DDE	UG/KG	150	1	2100	0	34	57			12	48	150 J	10	80
4,4`-DDT	UG/KG	350	1	2100	0	31	57			5 U	59	290 J	10	36
Aldrin	UG/KG	1	0	41	0	2	57			3 U	2 U	4 U	2 U	2 U
Alpha-BHC	UG/KG	14	0	110	0	4	57			3 U	2 U	4 U	2 U	2 U
Alpha-Chlordane	UG/KG	81	0	0	0	13	57			3 U	2 U	81 J	2 U	2 U
Aroclor-1254	UG/KG	63	0	1000	0	2	57			49 U	44 U	70 U	37 U	38 U
Beta-BHC	UG/KG	5	0	200	0	7	57			3 U	2 U	4 U	2 U	2 U
Delta-BHC	UG/KG	9	0	300	0	7	57			3 U	2 U	4 U	2 U	2 U
Dieldrin	UG/KG	5	0	44	0	4	57			5 U	4 U	5 J	2 J	4 U

TABLE A-1
SOIL ANALYSIS RESULTS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses							
	STUDY ID						RI Pha	ESI	ESI	ESI	RI Phase	RI Phase	RI Phase	RI Phase
	SDG							SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59	SEAD-59
	ES ID							TP59-3	TP59-3X	TP59-4	TP59-6-2	TP59-7-2	TP59-8-2	TP59-9-2
	LAB ID							TP59-3-2	TP59-3X	TP59-4	59002	59008	59050	59052
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							1.5	1.5	2	6	3	1.5	2
	SAMP. DEPTH BOT:							1.5	1.5	2	6.5	3.5	2	2.5
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							28-Jun-94	28-Jun-94	8-Jun-94	7-Oct-97	8-Oct-97	13-Oct-97	13-Oct-97
Parameter	Units	Maximum	Frequenc	Action Level	Exceed	Detect	Analyses	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)	Value (Q)
Endosulfan I	UG/KG	26	0	900	0	8	57			2 J	2 U	4 U	2 U	2 U
Endosulfan II	UG/KG	7	0	900	0	5	57			5 U	4 U	7 U	4 U	4 U
Endosulfan sulfate	UG/KG	20	0	1000	0	5	57			5 U	4 J	7 U	4 U	4 U
Endrin	UG/KG	46	0	100	0	9	57			5 U	4 U	7 U	4 U	4 U
Endrin aldehyde	UG/KG	17	0	0	0	12	57			5 U	4 U	7 U	4 U	4 U
Endrin ketone	UG/KG	77	0	0	0	9	57			5 U	4 U	7 U	4 U	4 U
Gamma-Chlordane	UG/KG	100	0	540	0	11	57			3 U	2 U	100 J	2 U	2 U
Heptachlor epoxide	UG/KG	10	0	20	0	14	57			3 U	6 J	10	2 U	3 P
Methoxychlor	UG/KG	110	0	0	0	2	57			25 U	23 U	36 U	19 U	20 U
METALS														
Aluminum	MG/KG	20600	1	19520	1	54	56			14600 J	12600 J	4450 J	12500 J	10700 J
Antimony	MG/KG	424	0	6	1	12	56			1 J	1 UJ	1 UJ	1 UJ	1 UJ
Arsenic	MG/KG	6	1	9	0	54	56			5	6	3	5	5
Barium	MG/KG	304	1	300	1	54	56			114 J	101	51	113	77
Beryllium	MG/KG	1	1	1	0	54	56			1 J	1	0	0	0
Cadmium	MG/KG	3	0	2	1	20	56			1 J	0 U	0 U	0 U	0 U
Calcium	MG/KG	214000	1	125300	4	54	56			7780 J	28000	190000	28200	25900
Chromium	MG/KG	26	1	30	0	54	56			20 J	19	8	19	16
Cobalt	MG/KG	15	1	30	0	54	56			8 J	11	4	12	9
Copper	MG/KG	36	1	33	1	54	56			23 J	25	21	25	21
Iron	MG/KG	33300	1	37410	0	54	56			21000 J	25600	8280	23200	19500
Lead	MG/KG	139	1	24	29	54	56			20	66 J	31 J	54 J	30 J
Magnesium	MG/KG	34400	1	21700	1	54	56			2710 J	4600 J	8290 J	5710 J	5940 J
Manganese	MG/KG	1150	1	1100	1	54	56			1050 J	572 J	249 J	886 J	422 J
Mercury	MG/KG	2	1	0	11	34	56			0 R	0	0	0	0
Nickel	MG/KG	41	1	50	0	54	56			17 J	25	12	28	23
Potassium	MG/KG	2520	1	2623	0	54	56			1320	1490	726	1460	1180
Selenium	MG/KG	2	0	2	1	18	56			2	1 U	1 U	1	1 U
Silver	MG/KG	4	0	1	1	4	56			0 UJ	0 U	4	0 U	0 U
Sodium	MG/KG	2310	1	188	17	43	56			2310	134	88	83 U	90 U
Vanadium	MG/KG	42	1	150	0	54	56			24 J	22	14	21	17
Zinc	MG/KG	1550	1	115	6	54	56			73 J	114 J	62 J	105 J	69 J
OTHER ANALYSES														
Total Petroleum Hydrocarbons	MG/KG	19700	1		0	39	57			7870	111	393	55	28 U
Nitrate/Nitrite Nitrogen	MG/KG										1	0	2	3

Notes:
(a) The TAGM values for PCBs is 1000ug/kg for surface soils and 10,000ug/kg for subsurface soils.

TABLE A-2
GROUNDWATER ANALYSIS RESULTS FROM SEAD-59 ESI
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	MATRIX LOCATION SAMPLE DATE ES ID LAB ID SDG NUMBER UNITS	MAXIMUM	FREQUENCY OF DETECTION	LOWEST CRITERIA	CRITERIA	NUMBER ABOVE CRITERIA	WATER SEAD-59 3/30/1994 MW59-1 216042 43179	WATER SEAD-59 7/21/1994 MW59-2 227726 45448	WATER SEAD-59 7/21/1994 MW59-3 227727 45448
SEMIVOLATILE ORGANICS									
Phenol	ug/L	2	67%	1	GA	2	10 U	2 J	1 J
METALS									
Aluminum	ug/L	2680	100%	50	SEC. MCL	3	1940	299	2680
Arsenic	ug/L	2	33%	5	MCL	0	2 J	2 U	2 U
Barium	ug/L	103	100%	1000	GA	0	102 J	99.6 J	103 J
Calcium	ug/L	146000	100%	NA		0	140000	125000	146000
Chromium	ug/L	3.6	100%	50	GA	0	3.4 J	0.78 J	3.6 J
Cobalt	ug/L	3.5	100%	NA		0	3.5 J	1.1 J	2.1 J
Copper	ug/L	4.3	67%	200	GA	0	4.3 J	0.5 U	3.6 J
Iron	ug/L	3940	100%	300	GA	3	3120	731 J	3940 J
Lead	ug/L	2.4	67%	15	MCL	0	2.4 J	0.9 U	1.5 J
Magnesium	ug/L	29200	100%	NA		0	29000	29200	21200
Manganese	ug/L	780	100%	50	SEC. MCL	3	780	109	253
Mercury	ug/L	0.06	67%	0.7	GA	0	0.03 U	0.05 J	0.06 J
Nickel	ug/L	7.6	100%	100	GA	0	7.6 J	1.9 J	6.7 J
Potassium	ug/L	4150	100%	NA		0	2110 J	2640 J	4150 J
Sodium	ug/L	239000	100%	20000	GA	3	66000	32100	239000
Thallium	ug/L	4	67%	2	MCL	2	1.6 U	4 J	2.8 J
Vanadium	ug/L	4.7	100%	NA		0	3.4 J	1.1 J	4.7 J
Zinc	ug/L	26.2	100%	5000	SEC. MCL	0	21.8	4 J	26.2
OTHER ANALYSES									
Total Petroleum Hydrocarbons	mg/L	2.6				NA	2.6 J	1.38	0.34 U
pH	Standard Units						7.2	7.9	7.1
Conductivity	umhos/cm						650	750	1600
Temperature	°C						3.9	14.6	17.6
Turbidity	NTU						146	14	56

NOTES:
GA = NY State Class GA Groundwater Regulations
MCL = Federal Primary Drinking Water Maximum Contaminnat Level
SEC. MCL = Federal Secondary Drinking Water Level
NA = Not Available
U = The compound was not detected below this concentration.
J = The reported value is an estimated concentration.

TABLE A-3
INORGANICS ANALYSIS OF SOIL
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	Average of SEAD-59 Soils mg/Kg	2 x Average of Background Soils mg/Kg	Is Average of Site data > 2 x Average of Background Data?
Aluminum	10,768	26,411	NO
Antimony	8.61	5.46	YES
Arsenic	4.46	10.43	NO
Barium	84	158	NO
Beryllium	0.44	1.33	NO
Cadmium	0.31	1.08	NO
Calcium	59,294	93,716	NO
Chromium	17	40	NO
Cobalt	10	23	NO
Copper	24	42	NO
Iron	21,030	49,321	NO
Lead	33	35	NO
Magnesium	9,841	20,901	NO
Manganese	494	1,218	NO
Mercury	0.085	0.076	YES
Nickel	27	62	NO
Potassium	1,506	2,991	NO
Selenium	0.57	0.71	NO
Silver	0.18	0.77	NO
Sodium	291	178	YES
Vanadium	20	42	NO
Zinc	116	143	NO

TABLE A-4
INORGANIC ANALYSIS OF GROUNDWATER
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	Average of SEAD-59 Groundwater µg/L	2 x Average of Background Groundwater µg/L	Is Average of Site data > 2 x Average of Background Data?
Aluminum	1640	5460	NO
Arsenic	1.33	3.4	NO
Barium	102	156.4	NO
Calcium	137000	232000	NO
Chromium	2.59	9.4	NO
Cobalt	2.23	7.4	NO
Copper	2.72	6.6	NO
Iron	2597	8960	NO
Lead	1.45	5.0	NO
Magnesium	26467	57200	NO
Manganese	381	448	NO
Mercury	0.04	0.08	NO
Nickel	5.40	14.6	NO
Potassium	2967	7660	NO
Sodium	112367	29200	YES
Thallium	2.53	3.0	NO
Vanadium	3.07	10.4	NO
Zinc	17	46.2	NO

Table A-5
SEAD-59 Total Soil Exposure Point Concentration Summary
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organic Compounds										
Acetone	57	0	2	4%	3.20E-01	1.99E+00	1.50E-01	FALSE	6.50E-02	6.50E-02
Benzene	57	0	3	5%	1.62E-01	8.25E-01	5.90E+00	FALSE	4.00E-02	4.00E-02
Carbon disulfide	53	4	1	2%	7.21E-03	5.30E-03	4.00E-03	FALSE	7.67E-03	4.00E-03
Ethyl benzene	57	0	4	7%	4.61E+00	3.44E+01	2.60E+02	FALSE	9.59E-02	9.59E-02
Methyl chloride	53	4	2	4%	7.14E-03	5.39E-03	3.00E-03	FALSE	7.89E-03	3.00E-03
Methyl ethyl ketone	56	1	5	9%	5.48E-02	2.48E-01	3.60E-02	FALSE	2.40E-02	2.40E-02
Methylene chloride	53	4	3	6%	7.01E-03	5.44E-03	2.00E-03	FALSE	7.85E-03	2.00E-03
Toluene	57	0	9	16%	1.46E+01	1.10E+02	8.30E+02	FALSE	8.94E-02	8.94E-02
Total Xylenes	57	0	6	11%	1.76E+01	1.32E+02	1.00E+03	FALSE	1.59E-01	1.59E-01
Trichloroethene	53	4	2	4%	7.15E-03	5.40E-03	2.00E-03	FALSE	7.95E-03	2.00E-03
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	49	7	1	2%	2.08E-01	2.36E-01	2.80E-02	FALSE	3.02E-01	2.80E-02
2-Methylnaphthalene	56	0	38	68%	4.05E+00	1.40E+01	6.70E+01	FALSE	4.39E+00	4.39E+00
4-Methylphenol	49	7	2	4%	2.05E-01	2.37E-01	8.30E-02	FALSE	2.96E-01	8.30E-02
Acenaphthene	56	0	40	71%	2.47E+00	9.07E+00	2.00E+01	FALSE	2.65E+00	2.65E+00
Acenaphthylene	56	0	30	54%	2.69E+00	9.90E+00	5.70E+00	FALSE	3.08E+00	3.08E+00
Anthracene	56	0	37	66%	3.12E+00	1.00E+01	3.80E+01	FALSE	4.89E+00	4.89E+00
Benzo(a)anthracene	56	0	45	80%	4.46E+00	1.25E+01	6.70E+01	FALSE	2.10E+01	2.10E+01
Benzo(a)pyrene	56	0	44	79%	4.49E+00	1.28E+01	7.00E+01	FALSE	1.93E+01	1.93E+01
Benzo(b)fluoranthene	56	0	47	84%	4.19E+00	1.15E+01	5.80E+01	FALSE	2.46E+01	2.46E+01
Benzo(ghi)perylene	56	0	40	71%	3.10E+00	9.76E+00	3.50E+01	FALSE	6.55E+00	6.55E+00
Benzo(k)fluoranthene	56	0	42	75%	3.86E+00	1.08E+01	4.80E+01	FALSE	1.39E+01	1.39E+01
Bis(2-Ethylhexyl)phthalate	56	0	35	63%	2.38E+00	8.44E+00	1.50E+01	FALSE	4.15E+00	4.15E+00
Butylbenzylphthalate	53	3	4	8%	5.73E-01	1.68E+00	1.00E+00	FALSE	7.79E-01	7.79E-01
Carbazole	56	0	37	66%	3.27E+00	1.07E+01	3.30E+01	FALSE	4.21E+00	4.21E+00
Chrysene	56	0	46	82%	4.42E+00	1.22E+01	6.30E+01	FALSE	2.15E+01	2.15E+01
Di-n-butylphthalate	50	6	24	48%	2.17E-01	3.52E-01	4.90E-01	FALSE	7.26E-01	4.90E-01
Di-n-octylphthalate	49	7	4	8%	2.05E-01	2.38E-01	1.10E-02	FALSE	3.89E-01	1.10E-02
Dibenz(a,h)anthracene	56	0	35	63%	2.42E+00	8.86E+00	1.70E+01	FALSE	4.04E+00	4.04E+00
Dibenzofuran	56	0	35	63%	2.90E+00	1.01E+01	1.80E+01	FALSE	3.53E+00	3.53E+00
Diethyl phthalate	49	7	14	29%	1.99E-01	2.43E-01	1.20E-02	FALSE	5.76E-01	1.20E-02
Fluoranthene	56	0	47	84%	7.94E+00	2.40E+01	1.60E+02	FALSE	5.67E+01	5.67E+01
Fluorene	56	0	39	70%	2.74E+00	8.73E+00	3.80E+01	FALSE	3.80E+00	3.80E+00
Indeno(1,2,3-cd)pyrene	56	0	43	77%	3.15E+00	9.68E+00	3.40E+01	FALSE	8.27E+00	8.27E+00
Naphthalene	56	0	36	64%	2.67E+00	9.49E+00	2.90E+01	FALSE	2.78E+00	2.78E+00
Phenanthrene	56	0	47	84%	6.99E+00	2.18E+01	1.40E+02	FALSE	3.06E+01	3.06E+01
Phenol	49	7	2	4%	2.07E-01	2.37E-01	1.70E-02	FALSE	3.28E-01	1.70E-02
Pyrene	55	0	48	87%	7.02E+00	1.91E+01	1.20E+02	FALSE	5.54E+01	5.54E+01
Pesticides/PCB										
4,4'-DDD	56	0	31	55%	1.97E-02	6.04E-02	4.50E-01	FALSE	2.36E-02	2.36E-02
4,4'-DDE	56	0	33	59%	1.93E-02	3.12E-02	1.50E-01	FALSE	3.12E-02	3.12E-02
4,4'-DDT	56	0	29	52%	2.39E-02	5.95E-02	3.50E-01	FALSE	3.43E-02	3.43E-02
Aldrin	54	2	2	4%	1.09E-03	2.70E-04	1.20E-03	FALSE	1.13E-03	1.13E-03
Alpha-BHC	56	0	3	5%	2.06E-03	2.79E-03	1.40E-02	FALSE	2.19E-03	2.19E-03
Alpha-Chlordane	56	0	12	21%	3.50E-03	1.09E-02	8.10E-02	FALSE	2.96E-03	2.96E-03
Aroclor-1254	56	0	2	4%	2.81E-02	3.38E-02	6.30E-02	FALSE	2.90E-02	2.90E-02
Beta-BHC	56	0	6	11%	1.62E-03	1.83E-03	4.70E-03	FALSE	1.72E-03	1.72E-03
Delta-BHC	56	0	6	11%	1.59E-03	1.98E-03	8.50E-03	FALSE	1.64E-03	1.64E-03
Dieldrin	56	0	4	7%	2.80E-03	3.36E-03	4.90E-03	FALSE	2.88E-03	2.88E-03
Endosulfan I	56	0	8	14%	2.77E-03	5.01E-03	2.60E-02	FALSE	2.78E-03	2.78E-03
Endosulfan II	56	0	5	9%	2.89E-03	3.41E-03	7.10E-03	FALSE	2.99E-03	2.99E-03
Endosulfan sulfate	56	0	4	7%	3.24E-03	4.17E-03	2.00E-02	FALSE	3.36E-03	3.36E-03
Endrin	56	0	8	14%	3.93E-03	5.48E-03	3.20E-02	FALSE	4.13E-03	4.13E-03
Endrin aldehyde	56	0	11	20%	3.59E-03	4.03E-03	1.50E-02	FALSE	3.89E-03	3.89E-03
Endrin ketone	56	0	7	13%	4.62E-03	1.05E-02	7.70E-02	FALSE	4.35E-03	4.35E-03
Gamma-Chlordane	56	0	10	18%	3.73E-03	1.34E-02	1.00E-01	FALSE	2.81E-03	2.81E-03
Heptachlor epoxide	56	0	14	25%	1.82E-03	2.16E-03	1.00E-02	FALSE	1.95E-03	1.95E-03
Methoxychlor	56	0	2	4%	1.61E-02	2.16E-02	1.10E-01	FALSE	1.65E-02	1.65E-02
Metals										
Antimony	56	0	13	23%	7.88E+00	5.66E+01	4.24E+02	FALSE	8.55E-01	8.55E-01
Mercury	56	0	35	63%	8.28E-02	1.19E-01	8.40E-01	FALSE	9.57E-02	9.57E-02
Sodium	56	0	45	80%	2.92E+02	4.19E+02	2.31E+03	FALSE	3.65E+02	3.65E+02

Table A-6
SEAD-59 Surface Soil (0ft - 2ft) Exposure Point Concentration Summary
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organic Compounds										
Acetone	18	2	1	6%	6.41E-02	2.11E-01	1.50E-01	FALSE	7.39E-02	7.39E-02
Benzene	20	0	2	10%	4.45E-01	1.37E+00	5.90E+00	FALSE	1.58E+00	1.58E+00
Ethyl benzene	20	0	1	5%	1.31E+01	5.81E+01	2.60E+02	FALSE	3.26E+01	3.26E+01
Methyl ethyl ketone	17	3	1	6%	5.99E-03	7.73E-04	8.75E-03	FALSE	6.28E-03	6.28E-03
Methylene chloride	17	3	1	6%	5.60E-03	9.73E-04	2.00E-03	FALSE	6.39E-03	2.00E-03
Toluene	20	0	3	15%	4.15E+01	1.86E+02	8.30E+02	FALSE	3.68E+01	3.68E+01
Total BTEX	23	0	9	39%	2.43E-03	1.78E-03	6.50E-03	FALSE	3.17E-03	3.17E-03
Total Xylenes	20	0	3	15%	5.01E+01	2.24E+02	1.00E+03	FALSE	8.59E+01	8.59E+01
Trichloroethene	17	3	1	6%	5.60E-03	9.73E-04	2.00E-03	FALSE	6.39E-03	2.00E-03
Semivolatile Organic Compounds										
2-Methylnaphthalene	18	0	12	67%	6.24E+00	1.83E+01	6.70E+01	FALSE	5.89E+01	5.89E+01
Acenaphthene	18	0	13	72%	5.22E+00	1.50E+01	3.90E-01	FALSE	3.00E+01	3.90E-01
Acenaphthylene	18	0	9	50%	5.34E+00	1.49E+01	1.10E+00	FALSE	6.50E+01	1.10E+00
Anthracene	18	0	13	72%	5.44E+00	1.49E+01	1.50E+00	FALSE	4.71E+01	1.50E+00
Benzo(a)anthracene	18	0	16	89%	6.33E+00	1.47E+01	6.40E+00	FALSE	2.58E+02	6.40E+00
Benzo(a)pyrene	18	0	16	89%	6.19E+00	1.47E+01	5.80E+00	FALSE	2.99E+02	5.80E+00
Benzo(b)fluoranthene	18	0	16	89%	6.50E+00	1.46E+01	6.30E+00	FALSE	2.40E+02	6.30E+00
Benzo(ghi)perylene	18	0	14	78%	5.55E+00	1.48E+01	1.90E+00	FALSE	1.01E+02	1.90E+00
Benzo(k)fluoranthene	18	0	15	83%	6.07E+00	1.47E+01	5.80E+00	FALSE	1.34E+02	5.80E+00
Bis(2-Ethylhexyl)phthalate	17	1	12	71%	1.08E+00	3.60E+00	1.50E+01	FALSE	3.88E+00	3.88E+00
Butylbenzylphthalate	16	2	1	6%	2.33E-01	2.64E-01	9.60E-03	FALSE	7.08E-01	9.60E-03
Carbazole	18	0	14	78%	5.30E+00	1.49E+01	1.20E+00	FALSE	3.89E+01	1.20E+00
Chrysene	18	0	16	89%	6.30E+00	1.47E+01	6.20E+00	FALSE	1.80E+02	6.20E+00
Di-n-butylphthalate	16	2	7	44%	2.08E-01	2.72E-01	2.50E-01	FALSE	2.26E+00	2.50E-01
Di-n-octylphthalate	16	2	3	19%	2.29E-01	2.67E-01	1.10E-02	FALSE	1.44E+00	1.10E-02
Dibenz(a,h)anthracene	18	0	14	78%	5.46E+00	1.49E+01	1.90E+00	FALSE	5.89E+01	1.90E+00
Dibenzofuran	18	0	12	67%	5.24E+00	1.50E+01	2.80E-01	FALSE	5.21E+01	2.80E-01
Diethyl phthalate	16	2	5	31%	2.23E-01	2.72E-01	1.20E-02	FALSE	1.80E+00	1.20E-02
Fluoranthene	18	0	16	89%	7.24E+00	1.45E+01	9.90E+00	FALSE	3.23E+02	9.90E+00
Fluorene	18	0	13	72%	3.76E+00	1.12E+01	2.20E+01	FALSE	1.61E+01	1.61E+01
Indeno(1,2,3-cd)pyrene	18	0	16	89%	5.85E+00	1.48E+01	5.30E+00	FALSE	2.08E+02	5.30E+00
Naphthalene	18	0	12	67%	5.20E+00	1.50E+01	2.40E-01	FALSE	3.30E+01	2.40E-01
Phenanthrene	18	0	16	89%	6.06E+00	1.42E+01	4.60E+01	FALSE	1.81E+02	4.60E+01
Pyrene	18	0	16	89%	7.20E+00	1.46E+01	1.20E+01	FALSE	2.68E+02	1.20E+01
Total Unknown PAHs as SV	21	0	15	71%	9.87E-03	1.02E-02	2.50E-02	FALSE	8.29E-02	2.50E-02
Pesticides/PCB										
4,4'-DDD	18	0	12	67%	1.15E-02	1.16E-02	4.10E-02	FALSE	2.36E-02	2.36E-02
4,4'-DDE	18	0	13	72%	1.58E-02	1.26E-02	4.38E-02	FALSE	3.56E-02	3.56E-02
4,4'-DDT	18	0	11	61%	1.55E-02	1.45E-02	5.20E-02	FALSE	4.11E-02	4.11E-02
Aldrin	17	1	1	6%	1.14E-03	2.96E-04	1.08E-03	FALSE	1.25E-03	1.08E-03
Alpha-BHC	18	0	2	11%	3.21E-03	4.08E-03	1.40E-02	FALSE	5.42E-03	5.42E-03
Alpha-Chlordane	18	0	6	33%	2.41E-03	2.30E-03	5.10E-03	FALSE	3.53E-03	3.53E-03
Beta-BHC	18	0	2	11%	1.94E-03	2.15E-03	4.70E-03	FALSE	2.58E-03	2.58E-03
Delta-BHC	18	0	4	22%	2.14E-03	2.53E-03	8.50E-03	FALSE	2.87E-03	2.87E-03
Dieldrin	17	1	2	12%	2.28E-03	6.69E-04	3.60E-03	FALSE	2.55E-03	2.55E-03
Endosulfan I	18	0	4	22%	3.27E-03	5.38E-03	2.20E-02	FALSE	4.93E-03	4.93E-03
Endosulfan II	18	0	2	11%	3.34E-03	3.88E-03	5.10E-03	FALSE	4.11E-03	4.11E-03
Endosulfan sulfate	18	0	1	6%	3.56E-03	4.19E-03	1.00E-02	FALSE	4.55E-03	4.55E-03
Endrin	18	0	3	17%	3.53E-03	3.88E-03	5.60E-03	FALSE	4.42E-03	4.42E-03
Endrin aldehyde	18	0	4	22%	4.02E-03	4.48E-03	1.30E-02	FALSE	5.38E-03	5.38E-03
Endrin ketone	18	0	2	11%	3.79E-03	4.28E-03	1.10E-02	FALSE	4.99E-03	4.99E-03
Gamma-Chlordane	18	0	4	22%	2.37E-03	2.58E-03	7.40E-03	FALSE	3.53E-03	3.53E-03
Heptachlor epoxide	18	0	5	28%	1.81E-03	1.97E-03	2.60E-03	FALSE	2.23E-03	2.23E-03
Metals										
Antimony	18	0	5	28%	3.37E-01	1.59E-01	6.50E-01	TRUE	4.02E-01	4.02E-01
Mercury	18	0	15	83%	1.29E-01	1.91E-01	8.40E-01	FALSE	1.92E-01	1.92E-01
Sodium	18	0	13	72%	3.93E+02	6.51E+02	2.31E+03	FALSE	8.67E+02	8.67E+02

Table A-7
SEAD-59 Surface Soil (0ft - 0.5ft) Exposure Point Concentration Summary
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organic Compounds										
Methyl ethyl ketone	6	0	1	17%	6.13E-03	1.30E-03	8.75E-03	FALSE	7.29E-03	7.29E-03
Semivolatile Organic Compounds										
2-Methylnaphthalene	6	0	4	67%	2.47E-01	3.24E-01	1.50E-01	FALSE	1.55E+00	1.50E-01
Acenaphthene	6	0	6	100%	1.75E-01	1.45E-01	3.90E-01	TRUE	2.89E-01	2.89E-01
Acenaphthylene	6	0	6	100%	5.29E-01	3.44E-01	1.10E+00	TRUE	8.02E-01	8.02E-01
Anthracene	6	0	6	100%	7.80E-01	5.48E-01	1.50E+00	TRUE	1.22E+00	1.22E+00
Benzo(a)anthracene	6	0	6	100%	3.06E+00	2.07E+00	6.40E+00	TRUE	4.70E+00	4.70E+00
Benzo(a)pyrene	6	0	6	100%	2.64E+00	2.45E+00	5.80E+00	TRUE	4.58E+00	4.58E+00
Benzo(b)fluoranthene	6	0	6	100%	3.56E+00	2.06E+00	6.30E+00	TRUE	5.20E+00	5.20E+00
Benzo(ghi)perylene	6	0	4	67%	9.11E-01	6.15E-01	1.90E+00	TRUE	1.40E+00	1.40E+00
Benzo(k)fluoranthene	6	0	5	83%	2.33E+00	2.30E+00	5.80E+00	TRUE	4.15E+00	4.15E+00
Bis(2-Ethylhexyl)phthalate	6	0	3	50%	4.67E-01	3.59E-01	6.60E-01	TRUE	7.52E-01	6.60E-01
Carbazole	6	0	6	100%	2.97E-01	4.47E-01	1.20E+00	FALSE	4.55E+00	1.20E+00
Chrysene	6	0	6	100%	2.87E+00	2.14E+00	6.20E+00	TRUE	4.56E+00	4.56E+00
Di-n-butylphthalate	6	0	2	33%	4.55E-01	3.13E-01	2.50E-01	TRUE	7.03E-01	2.50E-01
Dibenz(a,h)anthracene	6	0	6	100%	8.07E-01	5.90E-01	1.90E+00	TRUE	1.27E+00	1.27E+00
Dibenzofuran	6	0	5	83%	2.58E-01	3.33E-01	2.80E-01	FALSE	9.70E+00	2.80E-01
Fluoranthene	6	0	6	100%	5.15E+00	3.67E+00	9.90E+00	TRUE	8.06E+00	8.06E+00
Fluorene	6	0	6	100%	2.72E-01	2.46E-01	7.30E-01	TRUE	4.66E-01	4.66E-01
Indeno(1,2,3-cd)pyrene	6	0	6	100%	1.84E+00	1.85E+00	5.30E+00	TRUE	3.30E+00	3.30E+00
Naphthalene	6	0	6	100%	1.13E-01	7.40E-02	2.40E-01	TRUE	1.72E-01	1.72E-01
Phenanthrene	6	0	6	100%	2.51E+00	2.20E+00	6.10E+00	TRUE	4.26E+00	4.26E+00
Pyrene	6	0	6	100%	5.18E+00	4.79E+00	1.20E+01	TRUE	8.98E+00	8.98E+00
Pesticides/PCB										
4,4'-DDD	6	0	5	83%	1.15E-02	8.92E-03	2.64E-02	TRUE	1.86E-02	1.86E-02
4,4'-DDE	6	0	5	83%	1.84E-02	1.32E-02	4.38E-02	TRUE	2.89E-02	2.89E-02
4,4'-DDT	6	0	5	83%	2.42E-02	9.82E-03	3.80E-02	TRUE	3.20E-02	3.20E-02
Aldrin	6	0	1	17%	2.72E-03	3.35E-03	1.08E-03	FALSE	1.18E-02	1.08E-03
Alpha-Chlordane	6	0	3	50%	3.98E-03	3.12E-03	5.10E-03	TRUE	6.46E-03	5.10E-03
Endosulfan I	6	0	2	33%	7.60E-03	8.03E-03	2.20E-02	TRUE	1.40E-02	1.40E-02
Endosulfan II	6	0	2	33%	5.97E-03	6.23E-03	5.10E-03	FALSE	2.05E-02	5.10E-03
Endrin	6	0	1	17%	5.60E-03	6.38E-03	3.90E-03	FALSE	2.18E-02	3.90E-03
Endrin aldehyde	6	0	2	33%	7.43E-03	6.81E-03	1.30E-02	TRUE	1.28E-02	1.28E-02
Gamma-Chlordane	6	0	2	33%	3.76E-03	3.75E-03	7.40E-03	FALSE	3.47E-02	7.40E-03
Metals										
Antimony	6	0	4	67%	3.62E-01	2.31E-01	6.10E-01	TRUE	5.45E-01	5.45E-01
Mercury	6	0	6	100%	1.85E-01	3.21E-01	8.40E-01	FALSE	2.10E+00	8.40E-01
Sodium	6	0	6	100%	1.39E+02	4.99E+01	1.89E+02	TRUE	1.79E+02	1.79E+02

Table A-8
SEAD-59 Groundwater Exposure Point Concentration Summary
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/L)	Standard Deviation (mg/L)	Max Hit (mg/L)	Normal?	95% UCL of Mean (mg/L)	Exposure Point Concentration (EPC)* (mg/L)
Semivolatile Organic Compounds										
Phenol	3	0	2	67%	2.67E-03	2.08E-03	2.00E-03	TRUE	5.49E-03	2.00E-03
Metals										
Sodium	3	0	3	100%	1.12E+02	1.11E+02	2.39E+02	TRUE	2.63E+02	2.39E+02

TABLE A-9
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m³) = CS dsurf x PM d10 x CF

Variables:
CS dsurf = Chemical Concentration in Surface Soil, from EPC data (mg/kg)
PM d10 = Average Measured PM d10 Concentration = 17 ug/m³
CF = Conversion Factor = 1E-9 kg/ug

Equation for Air EPC from Total Soils (mg/m³) = CS dtot x PM d10 x CF

Variables:
CS dtot = Chemical Concentration in Total Soils, from EPC data (mg/kg)
PM d10 = PM d10 Concentration Calculated for Construction Worker= 139 ug/m³
CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Air EPC from Surface Soil (mg/m³)	Air EPC from Total Soils (mg/m³)
Volatile Organics				
Acetone		6.50E-002	0.00E+000	9.04E-009
Benzene		4.00E-002	0.00E+000	5.56E-009
Carbon disulfide		4.00E-003	0.00E+000	5.56E-010
Ethyl benzene		9.59E-002	0.00E+000	1.33E-008
Methyl chloride		3.00E-003	0.00E+000	4.17E-010
Methyl ethyl ketone	7.29E-003	2.40E-002	1.24E-010	3.34E-009
Methylene chloride		2.00E-003	0.00E+000	2.78E-010
Toluene		8.94E-002	0.00E+000	1.24E-008
Xylene (total)		1.59E-001	0.00E+000	2.21E-008
Trichloroethene		2.00E-003	0.00E+000	2.78E-010
Semivolatile Organics				
1,2,4-Trichlorobenzene		2.80E-002	0.00E+000	3.89E-009
2-Methylnaphthalene	1.50E-001	4.39E+000	2.55E-009	6.10E-007
4-Methylphenol		8.30E-002	0.00E+000	1.15E-008
Acenaphthene	2.89E-001	2.65E+000	4.91E-009	3.68E-007
Acenaphthylene	8.02E-001	3.08E+000	1.36E-008	4.28E-007
Anthracene	1.22E+000	4.89E+000	2.07E-008	6.80E-007
Benzo(a)anthracene	4.70E+000	2.10E+001	7.99E-008	2.92E-006
Benzo(a)pyrene	4.58E+000	1.93E+001	7.79E-008	2.68E-006
Benzo(b)fluoranthene	5.20E+000	2.46E+001	8.84E-008	3.42E-006
Benzo(ghi)perylene	1.40E+000	6.55E+000	2.38E-008	9.10E-007
Benzo(k)fluoranthene	4.15E+000	1.39E+001	7.06E-008	1.93E-006
bis(2-Ethylhexyl)phthalate	6.60E-001	4.15E+000	1.12E-008	5.77E-007
Butylbenzylphthalate		7.79E-001	0.00E+000	1.08E-007
Carbazole	1.20E+000	4.21E+000	2.04E-008	5.85E-007
Chrysene	4.56E+000	2.15E+001	7.75E-008	2.99E-006
Di-n-butylphthalate	2.50E-001	4.90E-001	4.25E-009	6.81E-008
Di-n-octylphthalate		1.10E-002	0.00E+000	1.53E-009
Dibenz(a,h)anthracene	1.27E+000	4.04E+000	2.16E-008	5.62E-007
Dibenzofuran	2.80E-001	3.53E+000	4.76E-009	4.91E-007
Diethyl phthalate		1.20E-002	0.00E+000	1.67E-009
Fluoranthene	8.06E+000	5.67E+001	1.37E-007	7.88E-006
Fluorene	4.66E-001	3.80E+000	7.92E-009	5.28E-007
Indeno(1,2,3-cd)pyrene	3.30E+000	8.27E+000	5.61E-008	1.15E-006
Naphthalene	1.72E-001	2.78E+000	2.92E-009	3.86E-007
Phenanthrene	4.26E+000	3.06E+001	7.24E-008	4.25E-006
Phenol		1.70E-002	0.00E+000	2.36E-009
Pyrene	8.98E+000	5.54E+001	1.53E-007	7.70E-006
Pesticides				
4,4'-DDD	1.86E-002	2.36E-002	3.16E-010	3.28E-009
4,4'-DDE	2.89E-002	3.12E-002	4.91E-010	4.34E-009
4,4'-DDT	3.20E-002	3.43E-002	5.44E-010	4.77E-009
Aldrin	1.08E-003	1.13E-003	1.84E-011	1.57E-010
alpha-BHC		2.19E-003	0.00E+000	3.04E-010
alpha-Chlordane	5.10E-003	2.96E-003	8.67E-011	4.11E-010
Aroclor-1254		2.90E-002	0.00E+000	4.03E-009
beta-BHC		1.72E-003	0.00E+000	2.39E-010
delta-BHC		1.64E-003	0.00E+000	2.28E-010
Dieldrin		2.88E-003	0.00E+000	4.00E-010
Endosulfan I	1.40E-002	2.78E-003	2.38E-010	3.86E-010
Endosulfan II	5.10E-003	2.99E-003	8.67E-011	4.16E-010
Endosulfan sulfate		3.36E-003	0.00E+000	4.67E-010
Endrin	3.90E-003	4.13E-003	6.63E-011	5.74E-010
Endrin aldehyde	1.28E-002	3.89E-003	2.18E-010	5.41E-010
Endrin ketone		4.35E-003	0.00E+000	6.05E-010
gamma-Chlordane	7.40E-003	2.81E-003	1.26E-010	3.91E-010
Heptachlor epoxide		1.95E-003	0.00E+000	2.71E-010
Methoxychlor		1.65E-002	0.00E+000	2.29E-009
Metals				
Antimony	5.45E-001	8.55E-001	9.27E-009	1.19E-007
Mercury	8.40E-001	9.57E-002	1.43E-008	1.33E-008
Sodium	1.79E+002	3.65E+002	3.04E-006	5.07E-005

TABLE A-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CA = Chemical Concentration in Air, Calculated from Air EPC Data

IR = Inhalation Rate

EF = Exposure Frequency

ED = Exposure Duration

BW = Bodyweight

AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Current Site Worker Intake (mg/kg-day)		Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day)		Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											Inhalation of	
Acetone	NA	NA		9.04E-009							Dust in Ambient Air	
Benzene	1.71E-003	2.91E-002		5.56E-009							Not Applicable	
Carbon disulfide	2.00E-001	NA		5.56E-010							for Future	
Ethyl benzene	2.86E-001	NA		1.33E-008							Industrial Worker	
Methyl chloride	NA	6.33E-003		4.17E-010								
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	3.34E-009	9.31E-013		3E-012					
Methylene chloride	8.57E-001	1.65E-003		2.78E-010								
Toluene	1.14E-001	NA		1.24E-008								
Xylene (total)	NA	NA		2.21E-008								
Trichloroethene	NA	6.00E-003		2.78E-010								
Semivolatile Organics												
1,2,4-Trichlorobenzene	NA	NA		3.89E-009								
2-Methylnaphthalene	NA	NA	2.55E-009	6.10E-007								
4-Methylphenol	NA	NA		1.15E-008								
Acenaphthene	NA	NA	4.91E-009	3.68E-007								
Acenaphthylene	NA	NA	1.36E-008	4.28E-007								
Anthracene	NA	NA	2.07E-008	6.80E-007								
Benzo(a)anthracene	NA	NA	7.99E-008	2.92E-006								
Benzo(a)pyrene	NA	NA	7.79E-008	2.68E-006								
Benzo(b)fluoranthene	NA	NA	8.84E-008	3.42E-006								
Benzo(ghi)perylene	NA	NA	2.38E-008	9.10E-007								
Benzo(k)fluoranthene	NA	NA	7.06E-008	1.93E-006								
bis(2-Ethylhexyl)phthalate	NA	NA	1.12E-008	5.77E-007								
Butylbenzylphthalate	NA	NA		1.08E-007								
Carbazole	NA	NA	2.04E-008	5.85E-007								
Chrysene	NA	NA	7.75E-008	2.99E-006								
Di-n-butylphthalate	NA	NA	4.25E-009	6.81E-008								
Di-n-octylphthalate	NA	NA		1.53E-009								
Dibenz(a,h)anthracene	NA	NA	2.16E-008	5.62E-007								
Dibenzofuran	NA	NA	4.76E-009	4.91E-007								
Diethyl phthalate	NA	NA		1.67E-009								
Fluoranthene	NA	NA	1.37E-007	7.88E-006								
Fluorene	NA	NA	7.92E-009	5.28E-007								
Indeno(1,2,3-cd)pyrene	NA	NA	5.61E-008	1.15E-006								
Naphthalene	NA	NA	2.92E-009	3.86E-007								
Phenanthrene	NA	NA	7.24E-008	4.25E-006								
Phenol	NA	NA		2.36E-009								
Pyrene	NA	NA	1.53E-007	7.70E-006								
Pesticides												
4,4'-DDD	NA	NA	3.16E-010	3.28E-009								
4,4'-DDE	NA	NA	4.91E-010	4.34E-009								
4,4'-DDT	NA	3.40E-001	5.44E-010	4.77E-009		1.46E-012		5E-013				
Aldrin	NA	1.72E+001	1.84E-011	1.57E-010		4.93E-014		8E-013				
alpha-BHC	NA	6.30E+000		3.04E-010								
alpha-Chlordane	NA	1.30E+000	8.67E-011	4.11E-010		2.33E-013		3E-013				
Aroclor-1254	NA	4.00E-001		4.03E-009								
beta-BHC	NA	1.86E+000		2.39E-010								
delta-BHC	NA	NA		2.28E-010								
Dieldrin	NA	1.61E+001		4.00E-010								
Endosulfan I	NA	NA	2.38E-010	3.86E-010								
Endosulfan II	NA	NA	8.67E-011	4.16E-010								
Endosulfan sulfate	NA	NA		4.67E-010								
Endrin	NA	NA	6.63E-011	5.74E-010								
Endrin aldehyde	NA	NA	2.18E-010	5.41E-010								
Endrin ketone	NA	NA		6.05E-010								
gamma-Chlordane	NA	1.30E+000	1.26E-010	3.91E-010		3.38E-013		4E-013				
Heptachlor epoxide	NA	9.10E+000		2.71E-010								
Methoxychlor	NA	NA		2.29E-009								
Metals												
Antimony	NA	NA	9.27E-009	1.19E-007								
Mercury	8.57E-005	NA	1.43E-008	1.33E-008	1.07E-010		1E-006					
Sodium	NA	NA	3.04E-006	5.07E-005								
Total Hazard Quotient and Cancer Risk:							**1E-006**	**2E-012**				

Assumptions for Current Site Worker

CA =	EPC Surface Only	
IR =	9.6	m3/day
EF =	20	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

NA= Information not available.

TABLE A-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Intake (mg/kg-day) (Nc)	Future Tresspasser Child Intake (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
Volatile Organics												
Acetone	NA	NA		9.04E-009								
Benzene	1.71E-003	2.91E-002		5.56E-009	5.66E-010	8.08E-012	3E-007	2E-013				
Carbon disulfide	2.00E-001	NA		5.56E-010	5.66E-011		3E-010					
Ethyl benzene	2.86E-001	NA		1.33E-008	1.36E-009		5E-009					
Methyl chloride	NA	6.33E-003		4.17E-010		6.06E-013		4E-015				
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	3.34E-009	3.39E-010		1E-009		4.07E-013		1E-012	
Methylene chloride	8.57E-001	1.65E-003		2.78E-010	2.83E-011	4.04E-013	3E-011	7E-016				
Toluene	1.14E-001	NA		1.24E-008	1.26E-009		1E-008					
Xylene (total)	NA	NA		2.21E-008								
Trichloroethene	NA	6.00E-003		2.78E-010		4.04E-013		2E-015				
Semivolatile Organics												
1,2,4-Trichlorobenzene	NA	NA		3.89E-009								
2-Methylnaphthalene	NA	NA	2.55E-009	6.10E-007								
4-Methylphenol	NA	NA		1.15E-008								
Acenaphthene	NA	NA	4.91E-009	3.68E-007								
Acenaphthylene	NA	NA	1.36E-008	4.28E-007								
Anthracene	NA	NA	2.07E-008	6.80E-007								
Benzo(a)anthracene	NA	NA	7.99E-008	2.92E-006								
Benzo(a)pyrene	NA	NA	7.79E-008	2.68E-006								
Benzo(b)fluoranthene	NA	NA	8.84E-008	3.42E-006								
Benzo(ghi)perylene	NA	NA	2.38E-008	9.10E-007								
Benzo(k)fluoranthene	NA	NA	7.06E-008	1.93E-006								
bis(2-Ethylhexyl)phthalate	NA	NA	1.12E-008	5.77E-007								
Butylbenzylphthalate	NA	NA		1.08E-007								
Carbazole	NA	NA	2.04E-008	5.85E-007								
Chrysene	NA	NA	7.75E-008	2.99E-006								
Di-n-butylphthalate	NA	NA	4.25E-009	6.81E-008								
Di-n-octylphthalate	NA	NA		1.53E-009								
Dibenz(a,h)anthracene	NA	NA	2.16E-008	5.62E-007								
Dibenzofuran	NA	NA	4.76E-009	4.91E-007								
Diethyl phthalate	NA	NA		1.67E-009								
Fluoranthene	NA	NA	1.37E-007	7.88E-006								
Fluorene	NA	NA	7.92E-009	5.28E-007								
Indeno(1,2,3-cd)pyrene	NA	NA	5.61E-008	1.15E-006								
Naphthalene	NA	NA	2.92E-009	3.86E-007								
Phenanthrene	NA	NA	7.24E-008	4.25E-006								
Phenol	NA	NA		2.36E-009								
Pyrene	NA	NA	1.53E-007	7.70E-006								
Pesticides												
4,4'-DDD	NA	NA	3.16E-010	3.28E-009								
4,4'-DDE	NA	NA	4.91E-010	4.34E-009								
4,4'-DDT	NA	3.40E-001	5.44E-010	4.77E-009		6.93E-012		2E-012		1.28E-013		4E-014
Aldrin	NA	1.72E+001	1.84E-011	1.57E-010		2.28E-013		4E-012		4.31E-015		7E-014
alpha-BHC	NA	6.30E+000		3.04E-010		4.43E-013		3E-012				
alpha-Chlordane	NA	1.30E+000	8.67E-011	4.11E-010		5.98E-013		8E-013		2.04E-014		3E-014
Aroclor-1254	NA	4.00E-001		4.03E-009		5.86E-012		2E-012				
beta-BHC	NA	1.86E+000		2.39E-010		3.48E-013		6E-013				
delta-BHC	NA	NA		2.28E-010								
Dieldrin	NA	1.61E+001		4.00E-010		5.82E-013		9E-012				
Endosulfan I	NA	NA	2.38E-010	3.86E-010								
Endosulfan II	NA	NA	8.67E-011	4.16E-010								
Endosulfan sulfate	NA	NA		4.67E-010								
Endrin	NA	NA	6.63E-011	5.74E-010								
Endrin aldehyde	NA	NA	2.18E-010	5.41E-010								
Endrin ketone	NA	NA		6.05E-010								
gamma-Chlordane	NA	1.30E+000	1.26E-010	3.91E-010		5.68E-013		7E-013		2.95E-014		4E-014
Heptachlor epoxide	NA	9.10E+000		2.71E-010		3.94E-013		4E-012				
Methoxychlor	NA	NA		2.29E-009								
Metals												
Antimony	NA	NA	9.27E-009	1.19E-007								
Mercury	8.57E-005	NA	1.43E-008	1.33E-008	1.35E-009		2E-005		4.69E-011		5E-007	
Sodium	NA	NA	3.04E-006	5.07E-005								
Total Hazard Quotient and Cancer Risk:							**2E-005**	**3E-011**			**5E-007**	**2E-013**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CA =	EPC Surface and Sub-Surface		CA =	EPC Surface Only	
IR =	10.4	m3/day	IR =	1.2	m3/day
EF =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CA x IR x EF x ED / BW x AT

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Day Care Center Child Intake (mg/kg-day) (Nc)	Future Day Care Center Child Intake (mg/kg-day) (Car)	Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Future Day Care Center Adult Intake (mg/kg-day) (Nc)	Future Day Care Center Adult Intake (mg/kg-day) (Car)	Future Day Care Center Adult Hazard Quotient	Future Day Care Center Adult Cancer Risk
Volatile Organics												
Acetone	NA	NA		9.04E-009								
Benzene	1.71E-003	2.91E-002		5.56E-009								
Carbon disulfide	2.00E-001	NA		5.56E-010								
Ethyl benzene	2.86E-001	NA		1.33E-008								
Methyl chloride	NA	6.33E-003		4.17E-010								
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	3.34E-009	2.26E-011		8E-011		9.70E-012		3E-011	
Methylene chloride	8.57E-001	1.65E-003		2.78E-010								
Toluene	1.14E-001	NA		1.24E-008								
Xylene (total)	NA	NA		2.21E-008								
Trichloroethene	NA	6.00E-003		2.78E-010								
Semivolatile Organics												
1,2,4-Trichlorobenzene	NA	NA		3.89E-009								
2-Methylnaphthalene	NA	NA	2.55E-009	6.10E-007								
4-Methylphenol	NA	NA		1.15E-008								
Acenaphthene	NA	NA	4.91E-009	3.68E-007								
Acenaphthylene	NA	NA	1.36E-008	4.28E-007								
Anthracene	NA	NA	2.07E-008	6.80E-007								
Benzo(a)anthracene	NA	NA	7.99E-008	2.92E-006								
Benzo(a)pyrene	NA	NA	7.79E-008	2.68E-006								
Benzo(b)fluoranthene	NA	NA	8.84E-008	3.42E-006								
Benzo(ghi)perylene	NA	NA	2.38E-008	9.10E-007								
Benzo(k)fluoranthene	NA	NA	7.06E-008	1.93E-006								
bis(2-Ethylhexyl)phthalate	NA	NA	1.12E-008	5.77E-007								
Butylbenzylphthalate	NA	NA		1.08E-007								
Carbazole	NA	NA	2.04E-008	5.85E-007								
Chrysene	NA	NA	7.75E-008	2.99E-006								
Di-n-butylphthalate	NA	NA	4.25E-009	6.81E-008								
Di-n-octylphthalate	NA	NA		1.53E-009								
Dibenz(a,h)anthracene	NA	NA	2.16E-008	5.62E-007								
Dibenzofuran	NA	NA	4.76E-009	4.91E-007								
Diethyl phthalate	NA	NA		1.67E-009								
Fluoranthene	NA	NA	1.37E-007	7.88E-006								
Fluorene	NA	NA	7.92E-009	5.28E-007								
Indeno(1,2,3-cd)pyrene	NA	NA	5.61E-008	1.15E-006								
Naphthalene	NA	NA	2.92E-009	3.86E-007								
Phenanthrene	NA	NA	7.24E-008	4.25E-006								
Phenol	NA	NA		2.36E-009								
Pyrene	NA	NA	1.53E-007	7.70E-006								
Pesticides												
4,4'-DDD	NA	NA	3.16E-010	3.28E-009								
4,4'-DDE	NA	NA	4.91E-010	4.34E-009								
4,4'-DDT	NA	3.40E-001	5.44E-010	4.77E-009		8.52E-012		3E-012		1.52E-011		5E-012
Aldrin	NA	1.72E+001	1.84E-011	1.57E-010		2.87E-013		5E-012		5.13E-013		9E-012
alpha-BHC	NA	6.30E+000		3.04E-010								
alpha-Chlordane	NA	1.30E+000	8.67E-011	4.11E-010		1.36E-012		2E-012		2.42E-012		3E-012
Aroclor-1254	NA	4.00E-001		4.03E-009								
beta-BHC	NA	1.86E+000		2.39E-010								
delta-BHC	NA	NA		2.28E-010								
Dieldrin	NA	1.61E+001		4.00E-010								
Endosulfan I	NA	NA	2.38E-010	3.86E-010								
Endosulfan II	NA	NA	8.67E-011	4.16E-010								
Endosulfan sulfate	NA	NA		4.67E-010								
Endrin	NA	NA	6.63E-011	5.74E-010								
Endrin aldehyde	NA	NA	2.18E-010	5.41E-010								
Endrin ketone	NA	NA		6.05E-010								
gamma-Chlordane	NA	1.30E+000	1.26E-010	3.91E-010		1.97E-012		3E-012		3.52E-012		5E-012
Heptachlor epoxide	NA	9.10E+000		2.71E-010								
Methoxychlor	NA	NA		2.29E-009								
Metals												
Antimony	NA	NA	9.27E-009	1.19E-007								
Mercury	8.57E-005	NA	1.43E-008	1.33E-008	2.61E-009		3E-005		1.12E-009		1E-005	
Sodium	NA	NA	3.04E-006	5.07E-005								
Total Hazard Quotient and Cancer Risk:							**3E-005**	**1E-011**			**1E-005**	**2E-011**

Assumptions for Future Day Care Center Child			Assumptions for Future Day Care Center Adult		
CA =	EPC Surface Only		CA =	EPC Surface Only	
IR =	4	m3/day	IR =	8	m3/day
EF =	250	days/year	EF =	250	days/year
ED =	6	years	ED =	25	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	2190	days	AT (Nc) =	9125	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC* from Surface Soil (mg/m3)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics												
Acetone	NA	NA										
Benzene	1.71E-003	2.91E-002										
Carbon disulfide	2.00E-001	NA										
Ethyl benzene	2.86E-001	NA										
Methyl chloride	NA	6.33E-003										
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	3.40E-011		1E-010		6.89E-011		2E-010		
Methylene chloride	8.57E-001	1.65E-003										
Toluene	1.14E-001	NA										
Xylene (total)	NA	NA										
Trichloroethene	NA	6.00E-003										
Semivolatile Organics												
1,2,4-Trichlorobenzen	NA	NA										
2-Methylnaphthalene	NA	NA	2.55E-009									
4-Methylphenol	NA	NA										
Acenaphthene	NA	NA	4.91E-009									
Acenaphthylene	NA	NA	1.36E-008									
Anthracene	NA	NA	2.07E-008									
Benzo(a)anthracene	NA	NA	7.99E-008									
Benzo(a)pyrene	NA	NA	7.79E-008									
Benzo(b)fluoranthene	NA	NA	8.84E-008									
Benzo(ghi)perylene	NA	NA	2.38E-008									
Benzo(k)fluoranthene	NA	NA	7.06E-008									
bis(2-Ethylhexyl)phth	NA	NA	1.12E-008									
Butylbenzylphthalate	NA	NA										
Carbazole	NA	NA	2.04E-008									
Chrysene	NA	NA	7.75E-008									
Di-n-butylphthalate	NA	NA	4.25E-009									
Di-n-octylphthalate	NA	NA										
Dibenz(a,h)anthracene	NA	NA	2.16E-008									
Dibenzofuran	NA	NA	4.76E-009									
Diethyl phthalate	NA	NA										
Fluoranthene	NA	NA	1.37E-007									
Fluorene	NA	NA	7.92E-009									
Indeno(1,2,3-cd)pyren	NA	NA	5.61E-008									
Naphthalene	NA	NA	2.92E-009									
Phenanthrene	NA	NA	7.24E-008									
Phenol	NA	NA										
Pyrene	NA	NA	1.53E-007									
Pesticides												
4,4'-DDD	NA	NA	3.16E-010									
4,4'-DDE	NA	NA	4.91E-010									
4,4'-DDT	NA	3.40E-001	5.44E-010		5.11E-011		2E-011		2.59E-011		9E-012	2.62E-011
Aldrin	NA	1.72E+001	1.84E-011		1.72E-012		3E-011		8.75E-013		2E-011	4.47E-011
alpha-BHC	NA	6.30E+000										
alpha-Chlordane	NA	1.30E+000	8.67E-011		8.14E-012		1E-011		4.13E-012		5E-012	1.60E-011
Aroclor-1254	NA	4.00E-001										
beta-BHC	NA	1.86E+000										
delta-BHC	NA	NA										
Dieldrin	NA	1.61E+001										
Endosulfan I	NA	NA	2.38E-010									
Endosulfan II	NA	NA	8.67E-011									
Endosulfan sulfate	NA	NA										
Endrin	NA	NA	6.63E-011									
Endrin aldehyde	NA	NA	2.18E-010									
Endrin ketone	NA	NA										
gamma-Chlordane	NA	1.30E+000	1.26E-010		1.18E-011		2E-011		6.00E-012		8E-012	2.32E-011
Heptachlor epoxide	NA	9.10E+000										
Methoxychlor	NA	NA										
Metals												
Antimony	NA	NA	9.27E-009									
Mercury	8.57E-005	NA	1.43E-008	3.91E-009		5E-005		7.94E-009		9E-005		
Sodium	NA	NA	3.04E-006									
						5E-005	**7E-011**			**9E-005**	**4E-011**	**1E-010**

Assumptions for Resident (Adult)		Assumptions for Resident (Child)	
CA =	EPC Surface Only	CA =	EPC Surface Only
BW =	70 kg	BW =	15 kg
IR =	20 m3/day	IR =	8.7 m3/day
EF =	350 days/year	EF =	350 days/year
ED =	24 years	ED =	6 years
AT (Nc) =	8,760 days	AT (Nc) =	2,190 days
AT (Car) =	25,550 days	AT (Car) =	25,550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-59
Decision Document SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Current Site Worker				Future Industrial Worker			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											Inhalation of	
Acetone	NA	NA	0.00E+000	9.04E-009							Dust in Ambient Air	
Benzene	1.71E-003	2.91E-002	0.00E+000	5.56E-009	0.00E+000	0.00E+000	0E+000	0E+000			Not Applicable	
Carbon disulfide	2.00E-001	NA	0.00E+000	5.56E-010	0.00E+000		0E+000				for Future	
Ethyl benzene	2.86E-001	NA	0.00E+000	1.33E-008	0.00E+000		0E+000				Industrial Worker	
Methyl chloride	NA	6.33E-003	0.00E+000	4.17E-010		0.00E+000		0E+000				
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	3.34E-009	4.66E-013		2E-012					
Methylene chloride	8.57E-001	1.65E-003	0.00E+000	2.78E-010	0.00E+000	0.00E+000	0E+000	0E+000				
Toluene	1.14E-001	NA	0.00E+000	1.24E-008	0.00E+000		0E+000					
Xylene (total)	NA	NA	0.00E+000	2.21E-008								
Trichloroethene	NA	6.00E-003	0.00E+000	2.78E-010		0.00E+000		0E+000				
Semivolatile Organics												
1,2,4-Trichlorobenzene	NA	NA	0.00E+000	3.89E-009								
2-Methylnaphthalene	NA	NA	2.55E-009	6.10E-007								
4-Methylphenol	NA	NA	0.00E+000	1.15E-008								
Acenaphthene	NA	NA	4.91E-009	3.68E-007								
Acenaphthylene	NA	NA	1.36E-008	4.28E-007								
Anthracene	NA	NA	2.07E-008	6.80E-007								
Benzo(a)anthracene	NA	NA	7.99E-008	2.92E-006								
Benzo(a)pyrene	NA	NA	7.79E-008	2.68E-006								
Benzo(b)fluoranthene	NA	NA	8.84E-008	3.42E-006								
Benzo(ghi)perylene	NA	NA	2.38E-008	9.10E-007								
Benzo(k)fluoranthene	NA	NA	7.06E-008	1.93E-006								
bis(2-Ethylhexyl)phthalate	NA	NA	1.12E-008	5.77E-007								
Butylbenzylphthalate	NA	NA	0.00E+000	1.08E-007								
Carbazole	NA	NA	2.04E-008	5.85E-007								
Chrysene	NA	NA	7.75E-008	2.99E-006								
Di-n-butylphthalate	NA	NA	4.25E-009	6.81E-008								
Di-n-octylphthalate	NA	NA	0.00E+000	1.53E-009								
Dibenz(a,h)anthracene	NA	NA	2.16E-008	5.62E-007								
Dibenzofuran	NA	NA	4.76E-009	4.91E-007								
Diethyl phthalate	NA	NA	0.00E+000	1.67E-009								
Fluoranthene	NA	NA	1.37E-007	7.88E-006								
Fluorene	NA	NA	7.92E-009	5.28E-007								
Indeno(1,2,3-cd)pyrene	NA	NA	5.61E-008	1.15E-006								
Naphthalene	NA	NA	2.92E-009	3.86E-007								
Phenanthrene	NA	NA	7.24E-008	4.25E-006								
Phenol	NA	NA	0.00E+000	2.36E-009								
Pyrene	NA	NA	1.53E-007	7.70E-006								
Pesticides												
4,4'-DDD	NA	NA	3.16E-010	3.28E-009								
4,4'-DDE	NA	NA	4.91E-010	4.34E-009								
4,4'-DDT	NA	3.40E-001	5.44E-010	4.77E-009		2.04E-013		7E-014				
Aldrin	NA	1.72E+001	1.84E-011	1.57E-010		6.90E-015		1E-013				
alpha-BHC	NA	6.30E+000	0.00E+000	3.04E-010		0.00E+000		0E+000				
alpha-Chlordane	NA	1.30E+000	8.67E-011	4.11E-010		3.26E-014		4E-014				
Aroclor-1254	NA	4.00E-001	0.00E+000	4.03E-009		0.00E+000		0E+000				
beta-BHC	NA	1.86E+000	0.00E+000	2.39E-010		0.00E+000		0E+000				
delta-BHC	NA	NA	0.00E+000	2.28E-010								
Dieldrin	NA	1.61E+001	0.00E+000	4.00E-010		0.00E+000		0E+000				
Endosulfan I	NA	NA	2.38E-010	3.86E-010								
Endosulfan II	NA	NA	8.67E-011	4.16E-010								
Endosulfan sulfate	NA	NA	0.00E+000	4.67E-010								
Endrin	NA	NA	6.63E-011	5.74E-010								
Endrin aldehyde	NA	NA	2.18E-010	5.41E-010								
Endrin ketone	NA	NA	0.00E+000	6.05E-010								
gamma-Chlordane	NA	1.30E+000	1.26E-010	3.91E-010		4.73E-014		6E-014				
Heptachlor epoxide	NA	9.10E+000	0.00E+000	2.71E-010		0.00E+000		0E+000				
Methoxychlor	NA	NA	0.00E+000	2.29E-009								
Metals												
Antimony	NA	NA	9.27E-009	1.19E-007								
Mercury	8.57E-005	NA	1.43E-008	1.33E-008	5.37E-011		6E-007					
Sodium	NA	NA	3.04E-006	5.07E-005								
Total Hazard Quotient and Cancer Risk:							**6E-007**	**3E-013**				

Assumptions for Current Site Worker

CA =	EPC Surface Only	
IR =	9.6	m3/day
EF =	10	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-59
Decision Document SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Future Construction Worker				Future Tresspasser Child			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	NA	NA	0.00E+000	9.04E-009								
Benzene	1.71E-003	2.91E-002	0.00E+000	5.56E-009	4.96E-010	7.08E-012	3E-007	2E-013	0.00E+000	0.00E+000	0E+000	0E+000
Carbon disulfide	2.00E-001	NA	0.00E+000	5.56E-010	4.96E-011		2E-010		0.00E+000		0E+000	
Ethyl benzene	2.86E-001	NA	0.00E+000	1.33E-008	1.19E-009		4E-009		0.00E+000		0E+000	
Methyl chloride	NA	6.33E-003	0.00E+000	4.17E-010		5.31E-013		3E-015		0.00E+000		0E+000
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	3.34E-009	2.97E-010		1E-009		2.04E-013		7E-013	
Methylene chloride	8.57E-001	1.65E-003	0.00E+000	2.78E-010	2.48E-011	3.54E-013	3E-011	6E-016	0.00E+000	0.00E+000	0E+000	0E+000
Toluene	1.14E-001	NA	0.00E+000	1.24E-008	1.11E-009		1E-008		0.00E+000		0E+000	
Xylene (total)	NA	NA	0.00E+000	2.21E-008								
Trichloroethene	NA	6.00E-003	0.00E+000	2.78E-010		3.54E-013		2E-015		0.00E+000		0E+000
Semivolatile Organics												
1,2,4-Trichlorobenzene	NA	NA	0.00E+000	3.89E-009								
2-Methylnaphthalene	NA	NA	2.55E-009	6.10E-007								
4-Methylphenol	NA	NA	0.00E+000	1.15E-008								
Acenaphthene	NA	NA	4.91E-009	3.68E-007								
Acenaphthylene	NA	NA	1.36E-008	4.28E-007								
Anthracene	NA	NA	2.07E-008	6.80E-007								
Benzo(a)anthracene	NA	NA	7.99E-008	2.92E-006								
Benzo(a)pyrene	NA	NA	7.79E-008	2.68E-006								
Benzo(b)fluoranthene	NA	NA	8.84E-008	3.42E-006								
Benzo(ghi)perylene	NA	NA	2.38E-008	9.10E-007								
Benzo(k)fluoranthene	NA	NA	7.06E-008	1.93E-006								
bis(2-Ethylhexyl)phthalate	NA	NA	1.12E-008	5.77E-007								
Butylbenzylphthalate	NA	NA	0.00E+000	1.08E-007								
Carbazole	NA	NA	2.04E-008	5.85E-007								
Chrysene	NA	NA	7.75E-008	2.99E-006								
Di-n-butylphthalate	NA	NA	4.25E-009	6.81E-008								
Di-n-octylphthalate	NA	NA	0.00E+000	1.53E-009								
Dibenz(a,h)anthracene	NA	NA	2.16E-008	5.62E-007								
Dibenzofuran	NA	NA	4.76E-009	4.91E-007								
Diethyl phthalate	NA	NA	0.00E+000	1.67E-009								
Fluoranthene	NA	NA	1.37E-007	7.88E-006								
Fluorene	NA	NA	7.92E-009	5.28E-007								
Indeno(1,2,3-cd)pyrene	NA	NA	5.61E-008	1.15E-006								
Naphthalene	NA	NA	2.92E-009	3.86E-007								
Phenanthrene	NA	NA	7.24E-008	4.25E-006								
Phenol	NA	NA	0.00E+000	2.36E-009								
Pyrene	NA	NA	1.53E-007	7.70E-006								
Pesticides												
4,4'-DDD	NA	NA	3.16E-010	3.28E-009								
4,4'-DDE	NA	NA	4.91E-010	4.34E-009								
4,4'-DDT	NA	3.40E-001	5.44E-010	4.77E-009		6.07E-012		2E-012		1.28E-014		4E-015
Aldrin	NA	1.72E+001	1.84E-011	1.57E-010		2.00E-013		3E-012		4.31E-016		7E-015
alpha-BHC	NA	6.30E+000	0.00E+000	3.04E-010		3.88E-013		2E-012		0.00E+000		0E+000
alpha-Chlordane	NA	1.30E+000	8.67E-011	4.11E-010		5.24E-013		7E-013		2.04E-015		3E-015
Aroclor-1254	NA	4.00E-001	0.00E+000	4.03E-009		5.13E-012		2E-012		0.00E+000		0E+000
beta-BHC	NA	1.86E+000	0.00E+000	2.39E-010		3.04E-013		6E-013		0.00E+000		0E+000
delta-BHC	NA	NA	0.00E+000	2.28E-010								
Dieldrin	NA	1.61E+001	0.00E+000	4.00E-010		5.10E-013		8E-012		0.00E+000		0E+000
Endosulfan I	NA	NA	2.38E-010	3.86E-010								
Endosulfan II	NA	NA	8.67E-011	4.16E-010								
Endosulfan sulfate	NA	NA	0.00E+000	4.67E-010								
Endrin	NA	NA	6.63E-011	5.74E-010								
Endrin aldehyde	NA	NA	2.18E-010	5.41E-010								
Endrin ketone	NA	NA	0.00E+000	6.05E-010								
gamma-Chlordane	NA	1.30E+000	1.26E-010	3.91E-010		4.97E-013		6E-013		2.95E-015		4E-015
Heptachlor epoxide	NA	9.10E+000	0.00E+000	2.71E-010		3.45E-013		3E-012		0.00E+000		0E+000
Methoxychlor	NA	NA	0.00E+000	2.29E-009								
Metals												
Antimony	NA	NA	9.27E-009	1.19E-007								
Mercury	8.57E-005	NA	1.43E-008	1.33E-008	1.19E-009		1E-005		2.35E-011		3E-007	
Sodium	NA	NA	3.04E-006	5.07E-005								
Total Hazard Quotient and Cancer Risk:							**1E-005**	**2E-011**			**3E-007**	**2E-014**

Assumptions for Future Construction Worker		Assumptions for Future Tresspasser Child	
CA =	EPC Surface and Sub-Surface	CA =	EPC Surface Only
IR =	10.4 m3/day	IR =	1.2 m3/day
EF =	219 days/year	EF =	25 days/year
ED =	1 years	ED =	1 years
BW =	70 kg	BW =	50 kg
AT (Nc) =	365 days	AT (Nc) =	365 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-59
Decision Document SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air. Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Future Day Care Center Child				Future Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	NA	NA	0.00E+000	9.04E-009								
Benzene	1.71E-003	2.91E-002	0.00E+000	5.56E-009	0.00E+000	0.00E+000	0E+000	0E+000	0.00E+000	0.00E+000	0E+000	0E+000
Carbon disulfide	2.00E-001	NA	0.00E+000	5.56E-010	0.00E+000		0E+000		0.00E+000		0E+000	
Ethyl benzene	2.86E-001	NA	0.00E+000	1.33E-008	0.00E+000		0E+000		0.00E+000		0E+000	
Methyl chloride	NA	6.33E-003	0.00E+000	4.17E-010		0.00E+000		0E+000		0.00E+000		0E+000
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	3.34E-009	1.98E-011		7E-011		8.50E-012		3E-011	
Methylene chloride	8.57E-001	1.65E-003	0.00E+000	2.78E-010	0.00E+000	0.00E+000	0E+000	0E+000	0.00E+000	0.00E+000	0E+000	0E+000
Toluene	1.14E-001	NA	0.00E+000	1.24E-008	0.00E+000		0E+000		0.00E+000		0E+000	
Xylene (total)	NA	NA	0.00E+000	2.21E-008								
Trichloroethene	NA	6.00E-003	0.00E+000	2.78E-010		0.00E+000		0E+000		0.00E+000		0E+000
Semivolatile Organics												
1,2,4-Trichlorobenzene	NA	NA	0.00E+000	3.89E-009								
2-Methylnaphthalene	NA	NA	2.55E-009	6.10E-007								
4-Methylphenol	NA	NA	0.00E+000	1.15E-008								
Acenaphthene	NA	NA	4.91E-009	3.68E-007								
Acenaphthylene	NA	NA	1.36E-008	4.28E-007								
Anthracene	NA	NA	2.07E-008	6.80E-007								
Benzo(a)anthracene	NA	NA	7.99E-008	2.92E-006								
Benzo(a)pyrene	NA	NA	7.79E-008	2.68E-006								
Benzo(b)fluoranthene	NA	NA	8.84E-008	3.42E-006								
Benzo(ghi)perylene	NA	NA	2.38E-008	9.10E-007								
Benzo(k)fluoranthene	NA	NA	7.06E-008	1.93E-006								
bis(2-Ethylhexyl)phthalate	NA	NA	1.12E-008	5.77E-007								
Butylbenzylphthalate	NA	NA	0.00E+000	1.08E-007								
Carbazole	NA	NA	2.04E-008	5.85E-007								
Chrysene	NA	NA	7.75E-008	2.99E-006								
Di-n-butylphthalate	NA	NA	4.25E-009	6.81E-008								
Di-n-octylphthalate	NA	NA	0.00E+000	1.53E-009								
Dibenz(a,h)anthracene	NA	NA	2.16E-008	5.62E-007								
Dibenzofuran	NA	NA	4.76E-009	4.91E-007								
Diethyl phthalate	NA	NA	0.00E+000	1.67E-009								
Fluoranthene	NA	NA	1.37E-007	7.88E-006								
Fluorene	NA	NA	7.92E-009	5.28E-007								
Indeno(1,2,3-cd)pyrene	NA	NA	5.61E-008	1.15E-006								
Naphthalene	NA	NA	2.92E-009	3.86E-007								
Phenanthrene	NA	NA	7.24E-008	4.25E-006								
Phenol	NA	NA	0.00E+000	2.36E-009								
Pyrene	NA	NA	1.53E-007	7.70E-006								
Pesticides												
4,4'-DDD	NA	NA	3.16E-010	3.28E-009								
4,4'-DDE	NA	NA	4.91E-010	4.34E-009								
4,4'-DDT	NA	3.40E-001	5.44E-010	4.77E-009		3.73E-012		1E-012		3.73E-012		1E-012
Aldrin	NA	1.72E+001	1.84E-011	1.57E-010		1.26E-013		2E-012		1.26E-013		2E-012
alpha-BHC	NA	6.30E+000	0.00E+000	3.04E-010		0.00E+000		0E+000		0.00E+000		0E+000
alpha-Chlordane	NA	1.30E+000	8.67E-011	4.11E-010		5.95E-013		8E-013		5.95E-013		8E-013
Aroclor-1254	NA	4.00E-001	0.00E+000	4.03E-009		0.00E+000		0E+000		0.00E+000		0E+000
beta-BHC	NA	1.86E+000	0.00E+000	2.39E-010		0.00E+000		0E+000		0.00E+000		0E+000
delta-BHC	NA	NA	0.00E+000	2.28E-010								
Dieldrin	NA	1.61E+001	0.00E+000	4.00E-010		0.00E+000		0E+000		0.00E+000		0E+000
Endosulfan I	NA	NA	2.38E-010	3.86E-010								
Endosulfan II	NA	NA	8.67E-011	4.16E-010								
Endosulfan sulfate	NA	NA	0.00E+000	4.67E-010								
Endrin	NA	NA	6.63E-011	5.74E-010								
Endrin aldehyde	NA	NA	2.18E-010	5.41E-010								
Endrin ketone	NA	NA	0.00E+000	6.05E-010								
gamma-Chlordane	NA	1.30E+000	1.26E-010	3.91E-010		8.63E-013		1E-012		8.63E-013		1E-012
Heptachlor epoxide	NA	9.10E+000	0.00E+000	2.71E-010		0.00E+000		0E+000		0.00E+000		0E+000
Methoxychlor	NA	NA	0.00E+000	2.29E-009								
Metals												
Antimony	NA	NA	9.27E-009	1.19E-007								
Mercury	8.57E-005	NA	1.43E-008	1.33E-008	2.28E-009		3E-005		9.79E-010		1E-005	
Sodium	NA	NA	3.04E-006	5.07E-005								
Total Hazard Quotient and Cancer Risk:							**3E-005**	**5E-012**			**1E-005**	**5E-012**

Assumptions for Future Day Care Center Child			Assumptions for Future Day Care Center Adult		
CA =	EPC Surface Only		CA =	EPC Surface Only	
IR =	4	m3/day	IR =	8	m3/day
EF =	219	days/year	EF =	219	days/year
ED =	3	years	ED =	7	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	1095	days	AT (Nc) =	2555	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-59
Decision Document SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CA x IR x EF x ED / BW x AT

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC* from Surface Soil (mg/m3)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics												
Acetone	NA	NA	0.00E+000									0.00E+000
Benzene	1.71E-003	2.91E-002	0.00E+000	0.00E+000	0.00E+000	0E+000	0E+000	0.00E+000	0.00E+000	0E+000	0E+000	0.00E+000
Carbon disulfide	2.00E-001	NA	0.00E+000	0.00E+000		0E+000		0.00E+000		0E+000		0.00E+000
Ethyl benzene	2.86E-001	NA	0.00E+000	0.00E+000		0E+000		0.00E+000		0E+000		0.00E+000
Methyl chloride	NA	6.33E-003	0.00E+000		0.00E+000		0E+000		0.00E+000		0E+000	0.00E+000
Methyl ethyl ketone	2.86E-001	NA	1.24E-010	2.27E-011		8E-011		4.61E-011		2E-010		0.00E+000
Methylene chloride	8.57E-001	1.65E-003	0.00E+000	0.00E+000	0.00E+000	0E+000	0E+000	0.00E+000	0.00E+000	0E+000	0E+000	0.00E+000
Toluene	1.14E-001	NA	0.00E+000	0.00E+000		0E+000		0.00E+000		0E+000		0.00E+000
Xylene (total)	NA	NA	0.00E+000									0.00E+000
Trichloroethene	NA	6.00E-003	0.00E+000		0.00E+000		0E+000		0.00E+000		0E+000	0.00E+000
Semivolatile Organics												
1,2,4-Trichlorobenzene	NA	NA	0.00E+000									0.00E+000
2-Methylnaphthalene	NA	NA	2.55E-009									0.00E+000
4-Methylphenol	NA	NA	0.00E+000									0.00E+000
Acenaphthene	NA	NA	4.91E-009									0.00E+000
Acenaphthylene	NA	NA	1.36E-008									0.00E+000
Anthracene	NA	NA	2.07E-008									0.00E+000
Benzo(a)anthracene	NA	NA	7.99E-008									0.00E+000
Benzo(a)pyrene	NA	NA	7.79E-008									0.00E+000
Benzo(b)fluoranthene	NA	NA	8.84E-008									0.00E+000
Benzo(ghi)perylene	NA	NA	2.38E-008									0.00E+000
Benzo(k)fluoranthene	NA	NA	7.06E-008									0.00E+000
bis(2-Ethylhexyl)phthalate	NA	NA	1.12E-008									0.00E+000
Butylbenzylphthalate	NA	NA	0.00E+000									0.00E+000
Carbazole	NA	NA	2.04E-008									0.00E+000
Chrysene	NA	NA	7.75E-008									0.00E+000
Di-n-butylphthalate	NA	NA	4.25E-009									0.00E+000
Di-n-octylphthalate	NA	NA	0.00E+000									0.00E+000
Dibenz(a,h)anthracene	NA	NA	2.16E-008									0.00E+000
Dibenzofuran	NA	NA	4.76E-009									0.00E+000
Diethyl phthalate	NA	NA	0.00E+000									0.00E+000
Fluoranthene	NA	NA	1.37E-007									0.00E+000
Fluorene	NA	NA	7.92E-009									0.00E+000
Indeno(1,2,3-cd)pyrene	NA	NA	5.61E-008									0.00E+000
Naphthalene	NA	NA	2.92E-009									0.00E+000
Phenanthrene	NA	NA	7.24E-008									0.00E+000
Phenol	NA	NA	0.00E+000									0.00E+000
Pyrene	NA	NA	1.53E-007									0.00E+000
Pesticides												
4,4'-DDD	NA	NA	3.16E-010									0.00E+000
4,4'-DDE	NA	NA	4.91E-010									0.00E+000
4,4'-DDT	NA	3.40E-001	5.44E-010		9.96E-012		3E-012		5.78E-012		2E-012	5.35E-012
Aldrin	NA	1.72E+001	1.84E-011		3.36E-013		6E-012		1.95E-013		3E-012	9.14E-012
alpha-BHC	NA	6.30E+000	0.00E+000		0.00E+000		0E+000		0.00E+000		0E+000	0.00E+000
alpha-Chlordane	NA	1.30E+000	8.67E-011		1.59E-012		2E-012		9.21E-013		1E-012	3.26E-012
Aroclor-1254	NA	4.00E-001	0.00E+000		0.00E+000		0E+000		0.00E+000		0E+000	0.00E+000
beta-BHC	NA	1.86E+000	0.00E+000		0.00E+000		0E+000		0.00E+000		0E+000	0.00E+000
delta-BHC	NA	NA	0.00E+000									0.00E+000
Dieldrin	NA	1.61E+001	0.00E+000		0.00E+000		0E+000		0.00E+000		0E+000	0.00E+000
Endosulfan I	NA	NA	2.38E-010									0.00E+000
Endosulfan II	NA	NA	8.67E-011									0.00E+000
Endosulfan sulfate	NA	NA	0.00E+000									0.00E+000
Endrin	NA	NA	6.63E-011									0.00E+000
Endrin aldehyde	NA	NA	2.18E-010									0.00E+000
Endrin ketone	NA	NA	0.00E+000									0.00E+000
gamma-Chlordane	NA	1.30E+000	1.26E-010		2.30E-012		3E-012		1.34E-012		2E-012	4.73E-012
Heptachlor epoxide	NA	9.10E+000	0.00E+000		0.00E+000		0E+000		0.00E+000		0E+000	0.00E+000
Methoxychlor	NA	NA	0.00E+000									0.00E+000
Metals												
Antimony	NA	NA	9.27E-009									0.00E+000
Mercury	8.57E-005	NA	1.43E-008	2.62E-009		3E-005		5.31E-009		6E-005		0.00E+000
Sodium	NA	NA	3.04E-006									0.00E+000
						3E-005	**1E-011**			**6E-005**	**8E-012**	**2E-011**

Assumptions for Future Resident (Adult)			Assumptions for Future Resident (Child)		
CA =	EPC Surface Only		CA =	EPC Surface Only	
BW =	70	kg	BW =	15	kg
IR =	20	m3/day	IR =	8.7	m3/day
EF =	234	days/year	EF =	234	days/year
ED =	7	years	ED =	2	years
AT (Nc) =	2555	days	AT (Nc) =	730	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= information not available.

TABLE A-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
Volatile Organics											Ingestion of	
Acetone	1.00E-001	NA		6.50E-002							Onsite Soils	
Benzene	3.00E-003	2.90E-002		4.00E-002							Not Applicable	
Carbon disulfide	1.00E-001	NA		4.00E-003							for Future	
Ethyl benzene	1.00E-001	NA		9.59E-002							Industrial Worker	
Methyl chloride	NA	1.30E-002		3.00E-003								
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	5.71E-010		1E-009					
Methylene chloride	6.00E-002	7.50E-003		2.00E-003								
Toluene	2.00E-001	NA		8.94E-002								
Xylene (total)	2.00E+000	NA		1.59E-001								
Trichloroethene	NA	1.10E-002		2.00E-003								
Semivolatile Organics												
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	1.17E-008		3E-007					
4-Methylphenol	5.00E-003	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	2.26E-008		4E-007					
Acenaphthylene	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	9.55E-008		3E-007					
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		1.31E-007		1E-007				
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		1.28E-007		9E-007				
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		1.45E-007		1E-007				
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		1.16E-007		8E-009				
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002	6.60E-001	4.15E+000	5.17E-008	1.85E-008	3E-006	3E-010				
Butylbenzylphthalate	2.00E-001	NA		7.79E-001								
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		3.35E-008		7E-010				
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		1.27E-007		9E-010				
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	1.96E-008		2E-007					
Di-n-octylphthalate	2.00E-002	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		3.55E-008		3E-007				
Dibenzofuran	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	6.31E-007		2E-005					
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	3.65E-008		9E-007					
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		9.23E-008		7E-008				
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	1.35E-008		3E-007					
Phenanthrene	NA	NA	4.26E+000	3.06E+001								
Phenol	6.00E-001	NA		1.70E-002								
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	7.03E-007		2E-005					
Pesticides												
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		5.20E-010		1E-010				
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		8.08E-010		3E-010				
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	2.50E-009	8.95E-010	5E-006	3E-010				
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	8.45E-011	3.02E-011	3E-006	5E-010				
alpha-BHC	NA	6.30E+000		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	3.99E-010	1.43E-010	7E-006	2E-010				
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002								
beta-BHC	NA	1.80E+000		1.72E-003								
delta-BHC	NA	NA		1.64E-003								
Dieldrin	5.00E-005	1.60E+001		2.88E-003								
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	1.10E-009		2E-007					
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	3.99E-010		7E-008					
Endosulfan sulfate	6.00E-003	NA		3.36E-003								
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	3.05E-010		1E-006					
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	5.79E-010	2.07E-010	1E-005	3E-010				
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003								
Methoxychlor	5.00E-003	NA		1.65E-002								
Metals												
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	4.27E-008		1E-004					
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	6.58E-008		2E-004					
Sodium	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:							**4E-004**	**1E-006**				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	20	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x IR x CF x FI x EF x ED / BW x AT

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Future Construction Worker				Future Tresspasser Child			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Acetone	1.00E-001	NA		6.50E-002	3.05E-007		3E-006					
Benzene	3.00E-003	2.90E-002		4.00E-002	1.88E-007	2.68E-009	6E-005	8E-011				
Carbon disulfide	1.00E-001	NA		4.00E-003	1.88E-008		2E-007					
Ethyl benzene	1.00E-001	NA		9.59E-002	4.50E-007		5E-006					
Methyl chloride	NA	1.30E-002		3.00E-003		2.01E-010		3E-012				
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	1.13E-007		2E-007		3.99E-009		7E-009	
Methylene chloride	6.00E-002	7.50E-003		2.00E-003	9.39E-009	1.34E-010	2E-007	1E-012				
Toluene	2.00E-001	NA		8.94E-002	4.20E-007		2E-006					
Xylene (total)	2.00E+000	NA		1.59E-001	7.47E-007		4E-007					
Trichloroethene	NA	1.10E-002		2.00E-003		1.34E-010		1E-012				
Semivolatile Organics												
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002	1.32E-007		1E-005					
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	2.06E-005		5E-004		8.22E-008		2E-006	
4-Methylphenol	5.00E-003	NA		8.30E-002	3.90E-007		8E-005					
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	1.24E-005		2E-004		1.58E-007		3E-006	
Acenaphthylene	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	2.30E-005		8E-005		6.68E-007		2E-006	
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		1.41E-006		1E-006		1.84E-007		1E-007
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		1.29E-006		9E-006		1.79E-007		1E-006
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		1.65E-006		1E-006		2.04E-007		1E-007
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		9.33E-007		7E-008		1.62E-007		1E-008
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002	6.60E-001	4.15E+000	1.95E-005	2.78E-007	1E-003	4E-009	3.62E-007	2.58E-008	2E-005	4E-010
Butylbenzylphthalate	2.00E-001	NA		7.79E-001	3.66E-006		2E-005					
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		2.82E-007		6E-009		4.70E-008		9E-010
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		1.44E-006		1E-008		1.78E-007		1E-009
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	2.30E-006		2E-005		1.37E-007		1E-006	
Di-n-octylphthalate	2.00E-002	NA		1.10E-002	5.17E-008		3E-006					
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		2.71E-007		2E-006		4.97E-008		4E-007
Dibenzofuran	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA		1.20E-002	5.64E-008		7E-008					
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	2.66E-004		7E-003		4.42E-006		1E-004	
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	1.78E-005		4E-004		2.55E-007		6E-006	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		5.55E-007		4E-007		1.29E-007		9E-008
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	1.31E-005		3E-004		9.42E-008		2E-006	
Phenanthrene	NA	NA	4.26E+000	3.06E+001								
Phenol	6.00E-001	NA		1.70E-002	7.98E-008		1E-007					
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	2.60E-004		9E-003		4.92E-006		2E-004	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		1.58E-009		4E-010		7.28E-010		2E-010
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		2.09E-009		7E-010		1.13E-009		4E-010
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	1.61E-007	2.30E-009	3E-004	8E-010	1.75E-008	1.25E-009	4E-005	4E-010
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	5.31E-009	7.58E-011	2E-004	1E-009	5.92E-010	4.23E-011	2E-005	7E-010
alpha-BHC	NA	6.30E+000		2.19E-003		1.47E-010		9E-010				
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	1.39E-008	1.99E-010	2E-004	3E-010	2.79E-009	2.00E-010	5E-005	3E-010
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002	1.36E-007	1.95E-009	7E-003	4E-009				
beta-BHC	NA	1.80E+000		1.72E-003		1.15E-010		2E-010				
delta-BHC	NA	NA		1.64E-003								
Dieldrin	5.00E-005	1.60E+001		2.88E-003	1.35E-008	1.93E-010	3E-004	3E-009				
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	1.31E-008		2E-006		7.67E-009		1E-006	
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	1.40E-008		2E-006		2.79E-009		5E-007	
Endosulfan sulfate	6.00E-003	NA		3.36E-003	1.58E-008		3E-006					
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	1.94E-008		6E-005		2.14E-009		7E-006	
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	1.32E-008	1.89E-010	2E-004	2E-010	4.05E-009	2.90E-010	7E-005	4E-010
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003	9.16E-009	1.31E-010	7E-004	1E-009				
Methoxychlor	5.00E-003	NA		1.65E-002	7.75E-008		2E-005					
Metals												
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	4.02E-006		1E-002		2.99E-007		7E-004	
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	4.49E-007		1E-003		4.60E-007		2E-003	
Sodium	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:							**4E-002**	**1E-005**			**3E-003**	**2E-006**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CS =	EPC Surface and Subsurface		CS =	EPC Surface Only	
IR =	480	mg soil/day	IR =	200	mg soil/day
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
FI =	1	unitless	FI =	1	unitless
EF =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
Acetone	1.00E-001	NA		6.50E-002								
Benzene	3.00E-003	2.90E-002		4.00E-002								
Carbon disulfide	1.00E-001	NA		4.00E-003								
Ethyl benzene	1.00E-001	NA		9.59E-002								
Methyl chloride	NA	1.30E-002		3.00E-003								
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	6.66E-008		1E-007		7.13E-009		1E-008	
Methylene chloride	6.00E-002	7.50E-003		2.00E-003								
Toluene	2.00E-001	NA		8.94E-002								
Xylene (total)	2.00E+000	NA		1.59E-001								
Trichloroethene	NA	1.10E-002		2.00E-003								
Semivolatile Organics												
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	1.37E-006		3E-005		1.47E-007		4E-006	
4-Methylphenol	5.00E-003	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	2.64E-006		4E-005		2.83E-007		5E-006	
Acenaphthylene	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	1.11E-005		4E-005		1.19E-006		4E-006	
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		3.68E-006		3E-006		1.64E-006		1E-006
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		3.59E-006		3E-005		1.60E-006		1E-005
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		4.07E-006		3E-006		1.82E-006		1E-006
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		3.25E-006		2E-007		1.45E-006		1E-007
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002	6.60E-001	4.15E+000	6.03E-006	5.17E-007	3E-004	7E-009	6.46E-007	2.31E-007	3E-005	3E-009
Butylbenzylphthalate	2.00E-001	NA		7.79E-001								
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		9.39E-007		2E-008		4.19E-007		8E-009
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		3.57E-006		3E-008		1.59E-006		1E-008
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	2.28E-006		2E-005		2.45E-007		2E-006	
Di-n-octylphthalate	2.00E-002	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		9.94E-007		7E-006		4.44E-007		3E-006
Dibenzofuran	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	7.36E-005		2E-003		7.89E-006		2E-004	
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	4.26E-006		1E-004		4.56E-007		1E-005	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		2.58E-006		2E-006		1.15E-006		8E-007
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	1.57E-006		4E-005		1.68E-007		4E-006	
Phenanthrene	NA	NA	4.26E+000	3.06E+001								
Phenol	6.00E-001	NA		1.70E-002								
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	8.20E-005		3E-003		8.79E-006		3E-004	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		1.46E-008		3E-009		6.50E-009		2E-009
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		2.26E-008		8E-009		1.01E-008		3E-009
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	2.92E-007	2.50E-008	6E-004	9E-009	3.13E-008	1.12E-008	6E-005	4E-009
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	9.86E-009	8.45E-010	3E-004	1E-008	1.06E-009	3.77E-010	4E-005	6E-009
alpha-BHC	NA	6.30E+000		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	4.66E-008	3.99E-009	8E-004	5E-009	4.99E-009	1.78E-009	8E-005	2E-009
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002								
beta-BHC	NA	1.80E+000		1.72E-003								
delta-BHC	NA	NA		1.64E-003								
Dieldrin	5.00E-005	1.60E+001		2.88E-003								
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	1.28E-007		2E-005		1.37E-008		2E-006	
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	4.66E-008		8E-006		4.99E-009		8E-007	
Endosulfan sulfate	6.00E-003	NA		3.36E-003								
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	3.56E-008		1E-004		3.82E-009		1E-005	
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	6.76E-008	5.79E-009	1E-003	8E-009	7.24E-009	2.59E-009	1E-004	3E-009
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003								
Methoxychlor	5.00E-003	NA		1.65E-002								
Metals												
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	4.98E-006		1E-002		5.33E-007		1E-003	
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	7.67E-006		3E-002		8.22E-007		3E-003	
Sodium	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:							5E-002	4E-005			5E-003	2E-005

Assumptions for Future Day Care Center Child			Assumptions for Future Day Care Center Adult		
CS =	EPC Surface Only		CS =	EPC Surface Only	
IR =	200	mg soil/day	IR =	100	mg soil/day
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
FI =	1	unitless	FI =	1	unitless
EF =	250	days/year	EF =	250	days/year
ED =	6	years	ED =	25	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	2190	days	AT (Nc) =	9125	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested

EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics													
Acetone	1.00E-001	NA		6.50E-002									
Benzene	3.00E-003	2.90E-002		4.00E-002									
Carbon disulfide	1.00E-001	NA		4.00E-003									
Ethyl benzene	1.00E-001	NA		9.59E-002									
Methyl chloride	NA	1.30E-002		3.00E-003									
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	9.99E-009		2E-008		9.32E-008		2E-007		
Methylene chloride	6.00E-002	7.50E-003		2.00E-003									
Toluene	2.00E-001	NA		8.94E-002									
Xylene (total)	2.00E+000	NA		1.59E-001									
Trichloroethene	NA	1.10E-002		2.00E-003									
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002									
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	2.05E-007		5E-006		1.92E-006		5E-005		
4-Methylphenol	5.00E-003	NA		8.30E-002									
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	3.96E-007		7E-006		3.69E-006		6E-005		
Acenaphthylene	NA	NA	8.02E-001	3.08E+000									
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	1.67E-006		6E-006		1.56E-005		5E-005		
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		2.21E-006		2E-006		5.15E-006		4E-006	5E-006
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		2.15E-006		2E-005		5.02E-006		4E-005	5E-005
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		2.44E-006		2E-006		5.70E-006		4E-006	6E-006
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000									
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		1.95E-006		1E-007		4.55E-006		3E-007	5E-007
bis(2-Ethylhexyl)phthalat	2.00E-002	1.40E-002	6.60E-001	4.15E+000	9.04E-007	3.10E-007	5E-005	4E-009	8.44E-006	7.23E-007	4E-004	1E-008	1E-008
Butylbenzylphthalate	2.00E-001	NA		7.79E-001									
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		5.64E-007		1E-008		1.32E-006		3E-008	4E-008
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		2.14E-006		2E-008		5.00E-006		4E-008	5E-008
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	3.42E-007		3E-006		3.20E-006		3E-005		
Di-n-octylphthalate	2.00E-002	NA		1.10E-002									
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		5.96E-007		4E-006		1.39E-006		1E-005	1E-005
Dibenzofuran	NA	NA	2.80E-001	3.53E+000									
Diethyl phthalate	8.00E-001	NA		1.20E-002									
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	1.10E-005		3E-004		1.03E-004		3E-003		
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	6.38E-007		2E-005		5.96E-006		1E-004		
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		1.55E-006		1E-006		3.62E-006		3E-006	4E-006
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	2.36E-007		6E-006		2.20E-006		5E-005		
Phenanthrene	NA	NA	4.26E+000	3.06E+001									
Phenol	6.00E-001	NA		1.70E-002									
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	1.23E-005		4E-004		1.15E-004		4E-003		
Pesticides													
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		8.74E-009		2E-009		2.04E-008		5E-009	7E-009
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		1.36E-008		5E-009		3.17E-008		1E-008	2E-008
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	4.38E-008	1.50E-008	9E-005	5E-009	4.09E-007	3.51E-008	8E-004	1E-008	2E-008
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	1.48E-009	5.07E-010	5E-005	9E-009	1.38E-008	1.18E-009	5E-004	2E-008	3E-008
alpha-BHC	NA	6.30E+000		2.19E-003									
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	6.99E-009	2.40E-009	1E-004	3E-009	6.52E-008	5.59E-009	1E-003	7E-009	1E-008
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002									
beta-BHC	NA	1.80E+000		1.72E-003									
delta-BHC	NA	NA		1.64E-003									
Dieldrin	5.00E-005	1.60E+001		2.88E-003									
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	1.92E-008		3E-006		1.79E-007		3E-005		
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	6.99E-009		1E-006		6.52E-008		1E-005		
Endosulfan sulfate	6.00E-003	NA		3.36E-003									
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	5.34E-009		2E-005		4.99E-008		2E-004		
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003									
Endrin ketone	NA	NA		4.35E-003									
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	1.01E-008	3.48E-009	2E-004	5E-009	9.46E-008	8.11E-009	2E-003	1E-008	2E-008
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003									
Methoxychlor	5.00E-003	NA		1.65E-002									
Metals													
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	7.47E-007		2E-003		6.97E-006		2E-002		
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	1.15E-006		4E-003		1.07E-005		4E-002		
Sodium	NA	NA	1.79E+002	3.65E+002									
Total Hazard Quotient and Cancer Risk:							**7E-003**	**2E-005**			**6E-002**	**6E-005**	**8E-005**

Assumptions for Resident (Adult)		Assumptions for Resident (Child)	
CF =	1E-006 kg/mg	CF =	1E-006 kg/mg
CS =	EPC Surface Only	CS =	EPC Surface Only
BW =	70 kg	BW =	15 kg
IR =	100 mg soil/day	IR =	200 mg soil/day
FI =	1 unitless	FI =	1 unitless
EF =	350 days/year	EF =	350 days/year
ED =	24 years	ED =	6 years
AT (Nc) =	8,760 days	AT (Nc) =	2,190 days
AT (Car) =	25,550 days	AT (Car) =	25,550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC from Surface Soil	EPC from Total Soils	Current Site Worker Intake (mg/kg-day)		Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day)		Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics											Ingestion of	
Acetone	1.00E-001	NA		6.50E-002							Onsite Soils	
Benzene	3.00E-003	2.90E-002		4.00E-002							Not Applicable	
Carbon disulfide	1.00E-001	NA		4.00E-003							for Future	
Ethyl benzene	1.00E-001	NA		9.59E-002							Industrial Worker	
Methyl chloride	NA	1.30E-002		3.00E-003								
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	1.43E-010		2E-010					
Methylene chloride	6.00E-002	7.50E-003		2.00E-003								
Toluene	2.00E-001	NA		8.94E-002								
Xylene (total)	2.00E+000	NA		1.59E-001								
Trichloroethene	NA	1.10E-002		2.00E-003								
Semivolatile Organics												
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	2.94E-009		7E-008					
4-Methylphenol	5.00E-003	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	5.66E-009		9E-008					
Acenaphthylene	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	2.39E-008		8E-008					
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		9.20E-009		7E-009				
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		8.96E-009		7E-008				
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		1.02E-008		7E-009				
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		8.12E-009		6E-010				
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002	6.60E-001	4.15E+000	1.29E-008	1.29E-009	6E-007	2E-011				
Butylbenzylphthalate	2.00E-001	NA		7.79E-001								
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		2.35E-009		5E-011				
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		8.92E-009		7E-011				
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	4.89E-009		5E-008					
Di-n-octylphthalate	2.00E-002	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		2.49E-009		2E-008				
Dibenzofuran	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	1.58E-007		4E-006					
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	9.12E-009		2E-007					
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		6.46E-009		5E-009				
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	3.37E-009		8E-008					
Phenanthrene	NA	NA	4.26E+000	3.06E+001								
Phenol	6.00E-001	NA		1.70E-002								
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	1.76E-007		6E-006					
Pesticides												
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		3.64E-011		9E-012				
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		5.66E-011		2E-011				
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	6.26E-010	6.26E-011	1E-006	2E-011				
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	2.11E-011	2.11E-012	7E-007	4E-011				
alpha-BHC	NA	6.30E+000		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	9.98E-011	9.98E-012	2E-006	1E-011				
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002								
beta-BHC	NA	1.80E+000		1.72E-003								
delta-BHC	NA	NA		1.64E-003								
Dieldrin	5.00E-005	1.60E+001		2.88E-003								
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	2.74E-010		5E-008					
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	9.98E-011		2E-008					
Endosulfan sulfate	6.00E-003	NA		3.36E-003								
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	7.63E-011		3E-007					
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	1.45E-010	1.45E-011	2E-006	2E-011				
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003								
Methoxychlor	5.00E-003	NA		1.65E-002								
Metals												
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	1.07E-008		3E-005					
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	1.64E-008		5E-005					
Sodium	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:							**1E-004**	**1E-007**				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
IR =	50	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	10	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Construction Worker: Intake (mg/kg-day) (Nc)	Future Construction Worker: Intake (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Intake (mg/kg-day) (Nc)	Future Tresspasser Child: Intake (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
Volatile Organics												
Acetone	1.00E-001	NA		6.50E-002	5.57E-008		6E-007					
Benzene	3.00E-003	2.90E-002		4.00E-002	3.43E-008	4.90E-010	1E-005	1E-011				
Carbon disulfide	1.00E-001	NA		4.00E-003	3.43E-009		3E-008					
Ethyl benzene	1.00E-001	NA		9.59E-002	8.22E-008		8E-007					
Methyl chloride	NA	1.30E-002		3.00E-003		3.67E-011		5E-013				
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	2.06E-008		3E-008		9.99E-010		2E-009	
Methylene chloride	6.00E-002	7.50E-003		2.00E-003	1.71E-009	2.45E-011	3E-008	2E-013				
Toluene	2.00E-001	NA		8.94E-002	7.66E-008		4E-007					
Xylene (total)	2.00E+000	NA		1.59E-001	1.36E-007		7E-008					
Trichloroethene	NA	1.10E-002		2.00E-003		2.45E-011		3E-013				
Semivolatile Organics												
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002	2.40E-008		2E-006					
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	3.76E-006		9E-005		2.05E-008		5E-007	
4-Methylphenol	5.00E-003	NA		8.30E-002	7.11E-008		1E-005					
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	2.27E-006		4E-005		3.96E-008		7E-007	
Acenaphthylene	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	4.19E-006		1E-005		1.67E-007		6E-007	
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		2.57E-007		2E-007		9.20E-009		7E-009
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		2.36E-007		2E-006		8.96E-009		7E-008
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		3.01E-007		2E-007		1.02E-008		7E-009
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		1.70E-007		1E-008		8.12E-009		6E-010
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002	6.60E-001	4.15E+000	3.56E-006	5.08E-008	2E-004	7E-010	9.04E-008	1.29E-009	5E-006	2E-011
Butylbenzylphthalate	2.00E-001	NA		7.79E-001	6.68E-007		3E-006					
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		5.16E-008		1E-009		2.35E-009		5E-011
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		2.63E-007		2E-009		8.92E-009		7E-011
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	4.20E-007		4E-006		3.42E-008		3E-007	
Di-n-octylphthalate	2.00E-002	NA		1.10E-002	9.43E-009		5E-007					
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		4.95E-008		4E-007		2.49E-009		2E-008
Dibenzofuran	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA		1.20E-002	1.03E-008		1E-008					
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	4.86E-005		1E-003		1.10E-006		3E-005	
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	3.26E-006		8E-005		6.38E-008		2E-006	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		1.01E-007		7E-008		6.46E-009		5E-009
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	2.38E-006		6E-005		2.36E-008		6E-007	
Phenanthrene	NA	NA	4.26E+000	3.06E+001								
Phenol	6.00E-001	NA		1.70E-002	1.46E-008		2E-008					
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	4.75E-005		2E-003		1.23E-006		4E-005	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		2.89E-010		7E-011		3.64E-011		9E-012
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		3.82E-010		1E-010		5.66E-011		2E-011
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	2.94E-008	4.20E-010	6E-005	1E-010	4.38E-009	6.26E-011	9E-006	2E-011
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	9.69E-010	1.38E-011	3E-005	2E-010	1.48E-010	2.11E-012	5E-006	4E-011
alpha-BHC	NA	6.30E+000		2.19E-003		2.68E-011		2E-010				
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	2.54E-009	3.62E-011	4E-005	5E-011	6.99E-010	9.98E-012	1E-005	1E-011
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002	2.49E-008	3.55E-010	1E-003	7E-010				
beta-BHC	NA	1.80E+000		1.72E-003		2.11E-011		4E-011				
delta-BHC	NA	NA		1.64E-003								
Dieldrin	5.00E-005	1.60E+001		2.88E-003	2.47E-009	3.53E-011	5E-005	6E-010				
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	2.38E-009		4E-007		1.92E-009		3E-007	
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	2.56E-009		4E-007		6.99E-010		1E-007	
Endosulfan sulfate	6.00E-003	NA		3.36E-003	2.88E-009		5E-007					
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	3.54E-009		1E-005		5.34E-010		2E-006	
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	2.41E-009	3.44E-011	4E-005	4E-011	1.01E-009	1.45E-011	2E-005	2E-011
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003	1.67E-009	2.39E-011	1E-004	2E-010				
Methoxychlor	5.00E-003	NA		1.65E-002	1.41E-008		3E-006					
Metals												
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	7.33E-007		2E-003		7.47E-008		2E-004	
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	8.20E-008		3E-004		1.15E-007		4E-004	
Sodium	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:							**7E-003**	**3E-006**			**7E-004**	**1E-007**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CS =	EPC Surface and Subsurface		CS =	EPC Surface Only	
IR =	100	mg soil/day	IR =	100	mg soil/day
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
FI =	1	unitless	FI =	1	unitless
EF =	219	days/year	EF =	25	days/year
ED =	1	years	ED =	1	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	365	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EPC	EF = Exposure Frequency
IR = Ingestion Rate	ED = Exposure Duration
CF = Conversion Factor	BW = Bodyweight
FI = Fraction Ingested	AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
Acetone	1.00E-001	NA		6.50E-002								
Benzene	3.00E-003	2.90E-002		4.00E-002								
Carbon disulfide	1.00E-001	NA		4.00E-003								
Ethyl benzene	1.00E-001	NA		9.59E-002								
Methyl chloride	NA	1.30E-002		3.00E-003								
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	2.92E-008		5E-008		3.12E-009		5E-009	
Methylene chloride	6.00E-002	7.50E-003		2.00E-003								
Toluene	2.00E-001	NA		8.94E-002								
Xylene (total)	2.00E+000	NA		1.59E-001								
Trichloroethene	NA	1.10E-002		2.00E-003								
Semivolatile Organics												
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	6.00E-007		2E-005		6.43E-008		2E-006	
4-Methylphenol	5.00E-003	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	1.16E-006		2E-005		1.24E-007		2E-006	
Acenaphthylene	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	4.88E-006		2E-005		5.23E-007		2E-006	
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		8.06E-007		6E-007		2.01E-007		1E-007
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		7.85E-007		6E-006		1.96E-007		1E-006
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		8.91E-007		7E-007		2.23E-007		2E-007
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		7.11E-007		5E-008		1.78E-007		1E-008
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002	6.60E-001	4.15E+000	2.64E-006	1.13E-007	1E-004	2E-009	2.83E-007	2.83E-008	1E-005	4E-010
Butylbenzylphthalate	2.00E-001	NA		7.79E-001								
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		2.06E-007		4E-009		5.14E-008		1E-009
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		7.82E-007		6E-009		1.95E-007		1E-009
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	1.00E-006		1E-005		1.07E-007		1E-006	
Di-n-octylphthalate	2.00E-002	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		2.18E-007		2E-006		5.44E-008		4E-007
Dibenzofuran	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	3.22E-005		8E-004		3.45E-006		9E-005	
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	1.86E-006		5E-005		2.00E-007		5E-006	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		5.66E-007		4E-007		1.41E-007		1E-007
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	6.88E-007		2E-005		7.37E-008		2E-006	
Phenanthrene	NA	NA	4.26E+000	3.06E+001								
Phenol	6.00E-001	NA		1.70E-002								
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	3.59E-005		1E-003		3.85E-006		1E-004	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		3.19E-009		8E-010		7.97E-010		2E-010
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		4.95E-009		2E-009		1.24E-009		4E-010
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	1.28E-007	5.49E-009	3E-004	2E-009	1.37E-008	1.37E-009	3E-005	5E-010
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	4.32E-009	1.85E-010	1E-004	3E-009	4.63E-010	4.63E-011	2E-005	8E-010
alpha-BHC	NA	6.30E+000		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	2.04E-008	8.74E-010	3E-004	1E-009	2.19E-009	2.19E-010	4E-005	3E-010
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002								
beta-BHC	NA	1.80E+000		1.72E-003								
delta-BHC	NA	NA		1.64E-003								
Dieldrin	5.00E-005	1.60E+001		2.88E-003								
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	5.60E-008		9E-006		6.00E-009		1E-006	
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	2.04E-008		3E-006		2.19E-009		4E-007	
Endosulfan sulfate	6.00E-003	NA		3.36E-003								
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	1.56E-008		5E-005		1.67E-009		6E-006	
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	2.96E-008	1.27E-009	5E-004	2E-009	3.17E-009	3.17E-010	5E-005	4E-010
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003								
Methoxychlor	5.00E-003	NA		1.65E-002								
Metals												
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	2.18E-006		5E-003		2.34E-007		6E-004	
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	3.36E-006		1E-002		3.60E-007		1E-003	
Sodium	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:							**2E-002**	**9E-006**			**2E-003**	**2E-006**

Assumptions for Future Day Care Center Child		Assumptions for Future Day Care Center Adult	
CS =	EPC Surface Only	CS =	EPC Surface Only
IR =	100 mg soil/day	IR =	50 mg soil/day
CF =	1E-006 kg/mg	CF =	1E-006 kg/mg
FI =	1 unitless	FI =	1 unitless
EF =	219 days/year	EF =	219 days/year
ED =	3 years	ED =	7 years
BW =	15 kg	BW =	70 kg
AT (Nc) =	1095 days	AT (Nc) =	2555 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-59
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested

EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics													
Acetone	1.00E-001	NA		6.50E-002									
Benzene	3.00E-003	2.90E-002		4.00E-002									
Carbon disulfide	1.00E-001	NA		4.00E-003									
Ethyl benzene	1.00E-001	NA		9.59E-002									
Methyl chloride	NA	1.30E-002		3.00E-003									
Methyl ethyl ketone	6.00E-001	NA	7.29E-003	2.40E-002	3.34E-009		6E-009		3.12E-008		5E-008		
Methylene chloride	6.00E-002	7.50E-003		2.00E-003									
Toluene	2.00E-001	NA		8.94E-002									
Xylene (total)	2.00E+000	NA		1.59E-001									
Trichloroethene	NA	1.10E-002		2.00E-003									
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.00E-002	NA		2.80E-002									
2-Methylnaphthalene	4.00E-002	NA	1.50E-001	4.39E+000	6.87E-008		2E-006		6.41E-007		2E-005		
4-Methylphenol	5.00E-003	NA		8.30E-002									
Acenaphthene	6.00E-002	NA	2.89E-001	2.65E+000	1.32E-007		2E-006		1.24E-006		2E-005		
Acenaphthylene	NA	NA	8.02E-001	3.08E+000									
Anthracene	3.00E-001	NA	1.22E+000	4.89E+000	5.59E-007		2E-006		5.21E-006		2E-005		
Benzo(a)anthracene	NA	7.30E-001	4.70E+000	2.10E+001		2.15E-007		2E-007		5.74E-007		4E-007	6E-007
Benzo(a)pyrene	NA	7.30E+000	4.58E+000	1.93E+001		2.10E-007		2E-006		5.59E-007		4E-006	6E-006
Benzo(b)fluoranthene	NA	7.30E-001	5.20E+000	2.46E+001		2.38E-007		2E-007		6.35E-007		5E-007	6E-007
Benzo(ghi)perylene	NA	NA	1.40E+000	6.55E+000									
Benzo(k)fluoranthene	NA	7.30E-002	4.15E+000	1.39E+001		1.90E-007		1E-008		5.07E-007		4E-008	5E-008
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002	6.60E-001	4.15E+000	3.02E-007	3.02E-008	2E-005	4E-010	2.82E-006	8.06E-008	1E-004	1E-009	2E-009
Butylbenzylphthalate	2.00E-001	NA		7.79E-001									
Carbazole	NA	2.00E-002	1.20E+000	4.21E+000		5.50E-008		1E-009		1.47E-007		3E-009	4E-009
Chrysene	NA	7.30E-003	4.56E+000	2.15E+001		2.09E-007		2E-009		5.57E-007		4E-009	6E-009
Di-n-butylphthalate	1.00E-001	NA	2.50E-001	4.90E-001	1.14E-007		1E-006		1.07E-006		1E-005		
Di-n-octylphthalate	2.00E-002	NA		1.10E-002									
Dibenz(a,h)anthracene	NA	7.30E+000	1.27E+000	4.04E+000		5.82E-008		4E-007		1.55E-007		1E-006	2E-006
Dibenzofuran	NA	NA	2.80E-001	3.53E+000									
Diethyl phthalate	8.00E-001	NA		1.20E-002									
Fluoranthene	4.00E-002	NA	8.06E+000	5.67E+001	3.69E-006		9E-005		3.44E-005		9E-004		
Fluorene	4.00E-002	NA	4.66E-001	3.80E+000	2.13E-007		5E-006		1.99E-006		5E-005		
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	3.30E+000	8.27E+000		1.51E-007		1E-007		4.03E-007		3E-007	4E-007
Naphthalene	4.00E-002	NA	1.72E-001	2.78E+000	7.88E-008		2E-006		7.35E-007		2E-005		
Phenanthrene	NA	NA	4.26E+000	3.06E+001									
Phenol	6.00E-001	NA		1.70E-002									
Pyrene	3.00E-002	NA	8.98E+000	5.54E+001	4.11E-006		1E-004		3.84E-005		1E-003		
Pesticides													
4,4'-DDD	NA	2.40E-001	1.86E-002	2.36E-002		8.52E-010		2E-010		2.27E-009		5E-010	7E-010
4,4'-DDE	NA	3.40E-001	2.89E-002	3.12E-002		1.32E-009		4E-010		3.53E-009		1E-009	2E-009
4,4'-DDT	5.00E-004	3.40E-001	3.20E-002	3.43E-002	1.47E-008	1.47E-009	3E-005	5E-010	1.37E-007	3.91E-009	3E-004	1E-009	2E-009
Aldrin	3.00E-005	1.70E+001	1.08E-003	1.13E-003	4.95E-010	4.95E-011	2E-005	8E-010	4.62E-009	1.32E-010	2E-004	2E-009	3E-009
alpha-BHC	NA	6.30E+000		2.19E-003									
alpha-Chlordane	6.00E-005	1.30E+000	5.10E-003	2.96E-003	2.34E-009	2.34E-010	4E-005	3E-010	2.18E-008	6.23E-010	4E-004	8E-010	1E-009
Aroclor-1254	2.00E-005	2.00E+000		2.90E-002									
beta-BHC	NA	1.80E+000		1.72E-003									
delta-BHC	NA	NA		1.64E-003									
Dieldrin	5.00E-005	1.60E+001		2.88E-003									
Endosulfan I	6.00E-003	NA	1.40E-002	2.78E-003	6.41E-009		1E-006		5.98E-008		1E-005		
Endosulfan II	6.00E-003	NA	5.10E-003	2.99E-003	2.34E-009		4E-007		2.18E-008		4E-006		
Endosulfan sulfate	6.00E-003	NA		3.36E-003									
Endrin	3.00E-004	NA	3.90E-003	4.13E-003	1.79E-009		6E-006		1.67E-008		6E-005		
Endrin aldehyde	NA	NA	1.28E-002	3.89E-003									
Endrin ketone	NA	NA		4.35E-003									
gamma-Chlordane	6.00E-005	1.30E+000	7.40E-003	2.81E-003	3.39E-009	3.39E-010	6E-005	4E-010	3.16E-008	9.04E-010	5E-004	1E-009	2E-009
Heptachlor epoxide	1.30E-005	9.10E+000		1.95E-003									
Methoxychlor	5.00E-003	NA		1.65E-002									
Metals													
Antimony	4.00E-004	NA	5.45E-001	8.55E-001	2.50E-007		6E-004		2.33E-006		6E-003		
Mercury	3.00E-004	NA	8.40E-001	9.57E-002	3.85E-007		1E-003		3.59E-006		1E-002		
Sodium	NA	NA	1.79E+002	3.65E+002									
Total Hazard Quotient and Cancer Risk:							2E-003	2E-006			2E-002	6E-006	9E-006

Assumptions for Future Resident (Adult)		Assumptions for Future Resident (Child)	
CF =	1E-006 kg/mg	CF =	1E-006 kg/mg
CS =	EPC Surface Only	CS =	EPC Surface Only
BW =	70 kg	BW =	15 kg
IR =	50 mg soil/day	IR =	100 mg soil/day
FI =	1 unitless	FI =	1 unitless
EF =	234 days/year	EF =	234 days/year
ED =	7 years	ED =	2 years
AT (Nc) =	2555 days	AT (Nc) =	730 days
AT (Car) =	25,550 days	AT (Car) =	25,550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-14
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor	EPC Surface Soil	EPC from Total Soils	Current Site Worker: Absorbed Dose (mg/kg-day)				Future Industrial Worker: Absorbed Dose (mg/kg-day)			
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)	Hazard Quotient	Cancer Risk	(Nc)	(Car)	Hazard Quotient	Cancer Risk
Volatile Organics												Contact to	
Acetone	1.00E-001	NA	NA		6.50E-002							Onsite Soils	
Benzene	2.85E-003	3.05E-002	NA		4.00E-002							Not Applicable	
Carbon disulfide	6.30E-002	NA	NA		4.00E-003							for Future	
Ethyl benzene	NA	NA	NA		9.59E-002							Industrial Worker	
Methyl chloride	NA	1.30E-002	NA		3.00E-003								
Methyl ethyl ketone	6.00E-001	NA	NA	7.29E-003	2.40E-002								
Methylene chloride	5.88E-002	7.65E-003	NA		2.00E-003								
Toluene	2.00E-001	NA	NA		8.94E-002								
Xylene (total)	1.80E+000	NA	NA		1.59E-001								
Trichloroethene	NA	1.22E-002	NA		2.00E-003								
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.00E-002	NA	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	NA	1.50E-001	4.39E+000								
4-Methylphenol	NA	NA	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	NA	2.89E-001	2.65E+000								
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	NA	1.22E+000	4.89E+000								
Benzo(a)anthracene	NA	7.30E-001	NA	4.70E+000	2.10E+001								
Benzo(a)pyrene	NA	1.83E+001	NA	4.58E+000	1.93E+001								
Benzo(b)fluoranthene	NA	7.30E-001	NA	5.20E+000	2.46E+001								
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	NA	4.15E+000	1.39E+001								
bis(2-Ethylhexyl)phthalate	1.00E-002	2.80E-002	NA	6.60E-001	4.15E+000								
Butylbenzylphthalate	2.00E-001	NA	NA		7.79E-001								
Carbazole	NA	2.00E-002	NA	1.20E+000	4.21E+000								
Chrysene	NA	7.30E-003	NA	4.56E+000	2.15E+001								
Di-n-butylphthalate	9.00E-002	NA	NA	2.50E-001	4.90E-001								
Di-n-octylphthalate	NA	NA	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	NA	1.27E+000	4.04E+000								
Dibenzofuran	NA	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	NA	8.06E+000	5.67E+001								
Fluorene	4.00E-002	NA	NA	4.66E-001	3.80E+000								
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	NA	3.30E+000	8.27E+000								
Naphthalene	4.00E-002	NA	NA	1.72E-001	2.78E+000								
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001								
Phenol	5.40E-001	NA	NA		1.70E-002								
Pyrene	3.00E-002	NA	NA	8.98E+000	5.54E+001								
Pesticides													
4,4'-DDD	NA	1.20E+000	NA	1.86E-002	2.36E-002								
4,4'-DDE	NA	1.70E+000	NA	2.89E-002	3.12E-002								
4,4'-DDT	1.00E-004	1.70E+000	NA	3.20E-002	3.43E-002								
Aldrin	1.50E-005	3.40E+001	NA	1.08E-003	1.13E-003								
alpha-BHC	NA	NA	NA		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	NA	5.10E-003	2.96E-003								
Aroclor-1254	1.80E-005	2.22E+000	0.06		2.90E-002								
beta-BHC	NA	1.80E+000	NA		1.72E-003								
delta-BHC	NA	NA	NA		1.64E-003								
Dieldrin	2.50E-005	3.20E+001	NA		2.88E-003								
Endosulfan I	6.00E-003	NA	NA	1.40E-002	2.78E-003								
Endosulfan II	6.00E-003	NA	NA	5.10E-003	2.99E-003								
Endosulfan sulfate	6.00E-003	NA	NA		3.36E-003								
Endrin	3.00E-004	NA	NA	3.90E-003	4.13E-003								
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	NA	7.40E-003	2.81E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	NA		1.95E-003								
Methoxychlor	5.00E-003	NA	NA		1.65E-002								
Metals													
Antimony	4.00E-004	NA	NA	5.45E-001	8.55E-001								
Mercury	3.00E-006	NA	NA	8.40E-001	9.57E-002								
Sodium	NA	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:								NQ	NQ				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
CF =	1.00E-006	kg/mg
SA =	5800	cm2
AF =	1	mg/cm2
EF =	20	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

TABLE A-14
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD	Carc. Slope Dermal	Absorption Factor	EPC Surface Soil	EPC from Total Soils	Future Construction Worker Absorbed Dose (mg/kg-day)		Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Absorbed Dose (mg/kg-day)		Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(unitless)	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics													
Acetone	1.00E-001	NA	NA		6.50E-002								
Benzene	2.85E-003	3.05E-002	NA		4.00E-002								
Carbon disulfide	6.30E-002	NA	NA		4.00E-003								
Ethyl benzene	NA	NA	NA		9.59E-002								
Methyl chloride	NA	1.30E-002	NA		3.00E-003								
Methyl ethyl ketone	6.00E-001	NA	NA	7.29E-003	2.40E-002								
Methylene chloride	5.88E-002	7.65E-003	NA		2.00E-003								
Toluene	2.00E-001	NA	NA		8.94E-002								
Xylene (total)	1.80E+000	NA	NA		1.59E-001								
Trichloroethene	NA	1.22E-002	NA		2.00E-003								
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.00E-002	NA	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	NA	1.50E-001	4.39E+000								
4-Methylphenol	NA	NA	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	NA	2.89E-001	2.65E+000								
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	NA	1.22E+000	4.89E+000								
Benzo(a)anthracene	NA	7.30E-001	NA	4.70E+000	2.10E+001								
Benzo(a)pyrene	NA	1.83E+001	NA	4.58E+000	1.93E+001								
Benzo(b)fluoranthene	NA	7.30E-001	NA	5.20E+000	2.46E+001								
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	NA	4.15E+000	1.39E+001								
bis(2-Ethylhexyl)phthalate	1.00E-002	2.80E-002	NA	6.60E-001	4.15E+000								
Butylbenzylphthalate	2.00E-001	NA	NA		7.79E-001								
Carbazole	NA	2.00E-002	NA	1.20E+000	4.21E+000								
Chrysene	NA	7.30E-003	NA	4.56E+000	2.15E+001								
Di-n-butylphthalate	9.00E-002	NA	NA	2.50E-001	4.90E-001								
Di-n-octylphthalate	NA	NA	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	NA	1.27E+000	4.04E+000								
Dibenzofuran	NA	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	NA	8.06E+000	5.67E+001								
Fluorene	4.00E-002	NA	NA	4.66E-001	3.80E+000								
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	NA	3.30E+000	8.27E+000								
Naphthalene	4.00E-002	NA	NA	1.72E-001	2.78E+000								
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001								
Phenol	5.40E-001	NA	NA		1.70E-002								
Pyrene	3.00E-002	NA	NA	8.98E+000	5.54E+001								
Pesticides													
4,4'-DDD	NA	1.20E+000	NA	1.86E-002	2.36E-002								
4,4'-DDE	NA	1.70E+000	NA	2.89E-002	3.12E-002								
4,4'-DDT	1.00E-004	1.70E+000	NA	3.20E-002	3.43E-002								
Aldrin	1.50E-005	3.40E+001	NA	1.08E-003	1.13E-003								
alpha-BHC	NA	NA	NA		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	NA	5.10E-003	2.96E-003								
Aroclor-1254	1.80E-005	2.22E+000	0.06		2.90E-002	9.87E-008	1.41E-009	5E-003	3E-009	2.20E-008	1.57E-009	1E-003	3E-009
beta-BHC	NA	1.80E+000	NA		1.72E-003								
delta-BHC	NA	NA	NA		1.64E-003								
Dieldrin	2.50E-005	3.20E+001	NA		2.88E-003								
Endosulfan I	6.00E-003	NA	NA	1.40E-002	2.78E-003								
Endosulfan II	6.00E-003	NA	NA	5.10E-003	2.99E-003								
Endosulfan sulfate	6.00E-003	NA	NA		3.36E-003								
Endrin	3.00E-004	NA	NA	3.90E-003	4.13E-003								
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	NA	7.40E-003	2.81E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	NA		1.95E-003								
Methoxychlor	5.00E-003	NA	NA		1.65E-002								
Metals													
Antimony	4.00E-004	NA	NA	5.45E-001	8.55E-001								
Mercury	3.00E-006	NA	NA	8.40E-001	9.57E-002								
Sodium	NA	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:								**5E-003**	**3E-009**			**1E-003**	**3E-009**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CS =	EPC Surface and Subsurface		CS =	EPC Surface Only	
CF =	1.00E-006	kg/mg	CF =	1.00E-006	kg/mg
SA =	5800	cm2	SA =	4625	cm2
AF =	1	mg/cm2	AF =	1	mg/cm2
EF =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

TABLE A-14
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Nc)	(Car)	Hazard Quotient	Cancer Risk	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Nc)	(Car)	Hazard Quotient	Cancer Risk
Volatile Organics													
Acetone	1.00E-001	NA	NA		6.50E-002								
Benzene	2.85E-003	3.05E-002	NA		4.00E-002								
Carbon disulfide	6.30E-002	NA	NA		4.00E-003								
Ethyl benzene	NA	NA	NA		9.59E-002								
Methyl chloride	NA	1.30E-002	NA		3.00E-003								
Methyl ethyl ketone	6.00E-001	NA	NA	7.29E-003	2.40E-002								
Methylene chloride	5.88E-002	7.65E-003	NA		2.00E-003								
Toluene	2.00E-001	NA	NA		8.94E-002								
Xylene (total)	1.80E+000	NA	NA		1.59E-001								
Trichloroethene	NA	1.22E-002	NA		2.00E-003								
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.00E-002	NA	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	NA	1.50E-001	4.39E+000								
4-Methylphenol	NA	NA	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	NA	2.89E-001	2.65E+000								
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	NA	1.22E+000	4.89E+000								
Benzo(a)anthracene	NA	7.30E-001	NA	4.70E+000	2.10E+001								
Benzo(a)pyrene	NA	1.83E+001	NA	4.58E+000	1.93E+001								
Benzo(b)fluoranthene	NA	7.30E-001	NA	5.20E+000	2.46E+001								
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	NA	4.15E+000	1.39E+001								
bis(2-Ethylhexyl)phthalate	1.00E-002	2.80E-002	NA	6.60E-001	4.15E+000								
Butylbenzylphthalate	2.00E-001	NA	NA		7.79E-001								
Carbazole	NA	2.00E-002	NA	1.20E+000	4.21E+000								
Chrysene	NA	7.30E-003	NA	4.56E+000	2.15E+001								
Di-n-butylphthalate	9.00E-002	NA	NA	2.50E-001	4.90E-001								
Di-n-octylphthalate	NA	NA	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	NA	1.27E+000	4.04E+000								
Dibenzofuran	NA	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	NA	8.06E+000	5.67E+001								
Fluorene	4.00E-002	NA	NA	4.66E-001	3.80E+000								
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	NA	3.30E+000	8.27E+000								
Naphthalene	4.00E-002	NA	NA	1.72E-001	2.78E+000								
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001								
Phenol	5.40E-001	NA	NA		1.70E-002								
Pyrene	3.00E-002	NA	NA	8.98E+000	5.54E+001								
Pesticides													
4,4'-DDD	NA	1.20E+000	NA	1.86E-002	2.36E-002								
4,4'-DDE	NA	1.70E+000	NA	2.89E-002	3.12E-002								
4,4'-DDT	1.00E-004	1.70E+000	NA	3.20E-002	3.43E-002								
Aldrin	1.50E-005	3.40E+001	NA	1.08E-003	1.13E-003								
alpha-BHC	NA	NA	NA		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	NA	5.10E-003	2.96E-003								
Aroclor-1254	1.80E-005	2.22E+000	0.06		2.90E-002								
beta-BHC	NA	1.80E+000	NA		1.72E-003								
delta-BHC	NA	NA	NA		1.64E-003								
Dieldrin	2.50E-005	3.20E+001	NA		2.88E-003								
Endosulfan I	6.00E-003	NA	NA	1.40E-002	2.78E-003								
Endosulfan II	6.00E-003	NA	NA	5.10E-003	2.99E-003								
Endosulfan sulfate	6.00E-003	NA	NA		3.36E-003								
Endrin	3.00E-004	NA	NA	3.90E-003	4.13E-003								
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	NA	7.40E-003	2.81E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	NA		1.95E-003								
Methoxychlor	5.00E-003	NA	NA		1.65E-002								
Metals													
Antimony	4.00E-004	NA	NA	5.45E-001	8.55E-001								
Mercury	3.00E-006	NA	NA	8.40E-001	9.57E-002								
Sodium	NA	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:								NQ	NQ			NQ	NQ

Assumptions for Day Care Center Child			Assumptions for Day Care Center Adult		
CS =	EPC Surface Only		CS =	EPC Surface Only	
CF =	1.00E-006	kg/mg	CF =	1.00E-006	kg/mg
SA =	2190	cm2	SA =	5800	cm2
AF =	1	mg/cm2	AF =	1	mg/cm2
EF =	250	days/year	EF =	250	days/year
ED =	6	years	ED =	25	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	2190	days	AT (Nc) =	9125	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

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REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Lifetime Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal mg/kg-day)-	Absorption Factor (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) ontributio to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics														
Acetone	1.00E-001	NA	NA		6.50E-002									
Benzene	2.85E-003	3.05E-002	NA		4.00E-002									
Carbon disulfide	6.30E-002	NA	NA		4.00E-003									
Ethyl benzene	NA	NA	NA		9.59E-002									
Methyl chloride	NA	1.30E-002	NA		3.00E-003									
Methyl ethyl ketone	6.00E-001	NA	NA	7.29E-003	2.40E-002									
Methylene chloride	5.88E-002	7.65E-003	NA		2.00E-003									
Toluene	2.00E-001	NA	NA		8.94E-002									
Xylene (total)	1.80E+000	NA	NA		1.59E-001									
Trichloroethene	NA	1.22E-002	NA		2.00E-003									
Semivolatile Organics														
1,2,4-Trichlorobenzene	1.00E-002	NA	NA		2.80E-002									
2-Methylnaphthalene	4.00E-002	NA	NA	1.50E-001	4.39E+000									
4-Methylphenol	NA	NA	NA		8.30E-002									
Acenaphthene	6.00E-002	NA	NA	2.89E-001	2.65E+000									
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000									
Anthracene	3.00E-001	NA	NA	1.22E+000	4.89E+000									
Benzo(a)anthracene	NA	7.30E-001	NA	4.70E+000	2.10E+001									
Benzo(a)pyrene	NA	1.83E+001	NA	4.58E+000	1.93E+001									
Benzo(b)fluoranthene	NA	7.30E-001	NA	5.20E+000	2.46E+001									
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000									
Benzo(k)fluoranthene	NA	7.30E-002	NA	4.15E+000	1.39E+001									
bis(2-Ethylhexyl)phtha	1.00E-002	2.80E-002	NA	6.60E-001	4.15E+000									
Butylbenzylphthalate	2.00E-001	NA	NA		7.79E-001									
Carbazole	NA	2.00E-002	NA	1.20E+000	4.21E+000									
Chrysene	NA	7.30E-003	NA	4.56E+000	2.15E+001									
Di-n-butylphthalate	9.00E-002	NA	NA	2.50E-001	4.90E-001									
Di-n-octylphthalate	NA	NA	NA		1.10E-002									
Dibenz(a,h)anthracene	NA	7.30E+000	NA	1.27E+000	4.04E+000									
Dibenzofuran	NA	NA	NA	2.80E-001	3.53E+000									
Diethyl phthalate	8.00E-001	NA	NA		1.20E-002									
Fluoranthene	4.00E-002	NA	NA	8.06E+000	5.67E+001									
Fluorene	4.00E-002	NA	NA	4.66E-001	3.80E+000									
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	NA	3.30E+000	8.27E+000									
Naphthalene	4.00E-002	NA	NA	1.72E-001	2.78E+000									
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001									
Phenol	5.40E-001	NA	NA		1.70E-002									
Pyrene	3.00E-002	NA	NA	8.98E+000	5.54E+001									
Pesticides														
4,4'-DDD	NA	1.20E+000	NA	1.86E-002	2.36E-002									
4,4'-DDE	NA	1.70E+000	NA	2.89E-002	3.12E-002									
4,4'-DDT	1.00E-004	1.70E+000	NA	3.20E-002	3.43E-002									
Aldrin	1.50E-005	3.40E+001	NA	1.08E-003	1.13E-003									
alpha-BHC	NA	NA	NA		2.19E-003									
alpha-Chlordane	6.00E-005	1.30E+000	NA	5.10E-003	2.96E-003									
Aroclor-1254	1.80E-005	2.22E+000	0.06		2.90E-002									
beta-BHC	NA	1.80E+000	NA		1.72E-003									
delta-BHC	NA	NA	NA		1.64E-003									
Dieldrin	2.50E-005	3.20E+001	NA		2.88E-003									
Endosulfan I	6.00E-003	NA	NA	1.40E-002	2.78E-003									
Endosulfan II	6.00E-003	NA	NA	5.10E-003	2.99E-003									
Endosulfan sulfate	6.00E-003	NA	NA		3.36E-003									
Endrin	3.00E-004	NA	NA	3.90E-003	4.13E-003									
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003									
Endrin ketone	NA	NA	NA		4.35E-003									
gamma-Chlordane	6.00E-005	1.30E+000	NA	7.40E-003	2.81E-003									
Heptachlor epoxide	1.30E-005	9.10E+000	NA		1.95E-003									
Methoxychlor	5.00E-003	NA	NA		1.65E-002									
Metals														
Antimony	4.00E-004	NA	NA	5.45E-001	8.55E-001									
Mercury	3.00E-006	NA	NA	8.40E-001	9.57E-002									
Sodium	NA	NA	NA	1.79E+002	3.65E+002									
Total Hazard Quotient and Cancer Risk:								NQ				NQ		NQ

Assumptions for Resident (Adult)			Assumptions for Resident (Child)		
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
CS =	EPC Surface Only		CS =	EPC Surface Only	
BW =	70	kg	BW =	15	kg
SA =	5,800	cm2	SA =	2,300	cm2
AF =	1	mg/cm2	AF =	1	mg/cm2
EF =	350	days/year	EF =	350	days/year
ED =	24	years	ED =	6	years
AT (Nc) =	8,760	days	AT (Nc) =	2,190	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

TABLE A-15
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
CENTRAL TENDENCY (CT) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Current Site Worker: Absorbed Dose (mg/kg-day) (Nc)	Current Site Worker: Absorbed Dose (mg/kg-day) (Car)	Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Industrial Worker: Absorbed Dose (mg/kg-day) (Car)	Future Industrial Worker: Hazard Quotient	Future Industrial Worker: Cancer Risk
Volatile Organics													
Acetone	1.00E-001	NA	NA		6.50E-002						Contact to		
Benzene	2.85E-003	3.05E-002	NA		4.00E-002						Onsite Soils		
Carbon disulfide	6.30E-002	NA	NA		4.00E-003						Not Applicable		
Ethyl benzene	NA	NA	NA		9.59E-002						for Future		
Methyl chloride	NA	1.30E-002	NA		3.00E-003						Industrial Worker		
Methyl ethyl ketone	6.00E-001	NA	NA	7.29E-003	2.40E-002								
Methylene chloride	5.88E-002	7.65E-003	NA		2.00E-003								
Toluene	2.00E-001	NA	NA		8.94E-002								
Xylene (total)	1.80E+000	NA	NA		1.59E-001								
Trichloroethene	NA	1.22E-002	NA		2.00E-003								
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.00E-002	NA	NA		2.80E-002								
2-Methylnaphthalene	4.00E-002	NA	NA	1.50E-001	4.39E+000								
4-Methylphenol	NA	NA	NA		8.30E-002								
Acenaphthene	6.00E-002	NA	NA	2.89E-001	2.65E+000								
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.00E-001	NA	NA	1.22E+000	4.89E+000								
Benzo(a)anthracene	NA	7.30E-001	NA	4.70E+000	2.10E+001								
Benzo(a)pyrene	NA	1.83E+001	NA	4.58E+000	1.93E+001								
Benzo(b)fluoranthene	NA	7.30E-001	NA	5.20E+000	2.46E+001								
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.30E-002	NA	4.15E+000	1.39E+001								
bis(2-Ethylhexyl)phthalate	1.00E-002	2.80E-002	NA	6.60E-001	4.15E+000								
Butylbenzylphthalate	2.00E-001	NA	NA		7.79E-001								
Carbazole	NA	2.00E-002	NA	1.20E+000	4.21E+000								
Chrysene	NA	7.30E-003	NA	4.56E+000	2.15E+001								
Di-n-butylphthalate	9.00E-002	NA	NA	2.50E-001	4.90E-001								
Di-n-octylphthalate	NA	NA	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.30E+000	NA	1.27E+000	4.04E+000								
Dibenzofuran	NA	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.00E-001	NA	NA		1.20E-002								
Fluoranthene	4.00E-002	NA	NA	8.06E+000	5.67E+001								
Fluorene	4.00E-002	NA	NA	4.66E-001	3.80E+000								
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	NA	3.30E+000	8.27E+000								
Naphthalene	4.00E-002	NA	NA	1.72E-001	2.78E+000								
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001								
Phenol	5.40E-001	NA	NA		1.70E-002								
Pyrene	3.00E-002	NA	NA	8.98E+000	5.54E+001								
Pesticides													
4,4'-DDD	NA	1.20E+000	NA	1.86E-002	2.36E-002								
4,4'-DDE	NA	1.70E+000	NA	2.89E-002	3.12E-002								
4,4'-DDT	1.00E-004	1.70E+000	NA	3.20E-002	3.43E-002								
Aldrin	1.50E-005	3.40E+001	NA	1.08E-003	1.13E-003								
alpha-BHC	NA	NA	NA		2.19E-003								
alpha-Chlordane	6.00E-005	1.30E+000	NA	5.10E-003	2.96E-003								
Aroclor-1254	1.80E-005	2.22E+000	0.06		2.90E-002								
beta-BHC	NA	1.80E+000	NA		1.72E-003								
delta-BHC	NA	NA	NA		1.64E-003								
Dieldrin	2.50E-005	3.20E+001	NA		2.88E-003								
Endosulfan I	6.00E-003	NA	NA	1.40E-002	2.78E-003								
Endosulfan II	6.00E-003	NA	NA	5.10E-003	2.99E-003								
Endosulfan sulfate	6.00E-003	NA	NA		3.36E-003								
Endrin	3.00E-004	NA	NA	3.90E-003	4.13E-003								
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA	NA		4.35E-003								
gamma-Chlordane	6.00E-005	1.30E+000	NA	7.40E-003	2.81E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	NA		1.95E-003								
Methoxychlor	5.00E-003	NA	NA		1.65E-002								
Metals													
Antimony	4.00E-004	NA	NA	5.45E-001	8.55E-001								
Mercury	3.00E-006	NA	NA	8.40E-001	9.57E-002								
Sodium	NA	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:								NQ	NQ				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
CF =	1.00E-006	kg/mg
SA =	5000	cm2
AF =	0.2	mg/cm2
EF =	10	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

TABLE A-15
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
CENTRAL TENDENCY (CT) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil. Calculated from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Nc)	Future Construction Worker: Absorbed Dose (mg/kg-day) (Car)	Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Nc)	Future Tresspasser Child: Absorbed Dose (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
Volatile Organics													
Acetone	1.0E-001	NA	NA		6.50E-002								
Benzene	2.9E-003	3.1E-002	NA		4.00E-002								
Carbon disulfide	6.3E-002	NA	NA		4.00E-003								
Ethyl benzene	NA	NA	NA		9.59E-002								
Methyl chloride	NA	1.3E-002	NA		3.00E-003								
Methyl ethyl ketone	6.0E-001	NA	NA	7.29E-003	2.40E-002								
Methylene chloride	5.9E-002	7.7E-003	NA		2.00E-003								
Toluene	2.0E-001	NA	NA		8.94E-002								
Xylene (total)	1.8E+000	NA	NA		1.59E-001								
Trichloroethene	NA	1.2E-002	NA		2.00E-003								
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.0E-002	NA	NA		2.80E-002								
2-Methylnaphthalene	4.0E-002	NA	NA	1.50E-001	4.39E+000								
4-Methylphenol	NA	NA	NA		8.30E-002								
Acenaphthene	6.0E-002	NA	NA	2.89E-001	2.65E+000								
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.0E-001	NA	NA	1.22E+000	4.89E+000								
Benzo(a)anthracene	NA	7.3E-001	NA	4.70E+000	2.10E+001								
Benzo(a)pyrene	NA	1.8E+001	NA	4.58E+000	1.93E+001								
Benzo(b)fluoranthene	NA	7.3E-001	NA	5.20E+000	2.46E+001								
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.3E-002	NA	4.15E+000	1.39E+001								
bis(2-Ethylhexyl)phthalate	1.0E-002	2.8E-002	NA	6.60E-001	4.15E+000								
Butylbenzylphthalate	2.0E-001	NA	NA		7.79E-001								
Carbazole	NA	2.0E-002	NA	1.20E+000	4.21E+000								
Chrysene	NA	7.3E-003	NA	4.56E+000	2.15E+001								
Di-n-butylphthalate	9.0E-002	NA	NA	2.50E-001	4.90E-001								
Di-n-octylphthalate	NA	NA	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.3E+000	NA	1.27E+000	4.04E+000								
Dibenzofuran	NA	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.0E-001	NA	NA		1.20E-002								
Fluoranthene	4.0E-002	NA	NA	8.06E+000	5.67E+001								
Fluorene	4.0E-002	NA	NA	4.66E-001	3.80E+000								
Indeno(1,2,3-cd)pyrene	NA	7.3E-001	NA	3.30E+000	8.27E+000								
Naphthalene	4.0E-002	NA	NA	1.72E-001	2.78E+000								
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001								
Phenol	5.4E-001	NA	NA		1.70E-002								
Pyrene	3.0E-002	NA	NA	8.98E+000	5.54E+001								
Pesticides													
4,4'-DDD	NA	1.2E+000	NA	1.86E-002	2.36E-002								
4,4'-DDE	NA	1.7E+000	NA	2.89E-002	3.12E-002								
4,4'-DDT	1.0E-004	1.7E+000	NA	3.20E-002	3.43E-002								
Aldrin	1.5E-005	3.4E+001	NA	1.08E-003	1.13E-003								
alpha-BHC	NA	NA	NA		2.19E-003								
alpha-Chlordane	6.0E-005	1.3E+000	NA	5.10E-003	2.96E-003								
Aroclor-1254	1.8E-005	2.2E+000	0.06		2.90E-002	1.49E-008	2.13E-010	8E-004	5E-010	1.78E-009	2.54E-011	1E-004	6E-011
beta-BHC	NA	1.8E+000	NA		1.72E-003								
delta-BHC	NA	NA	NA		1.64E-003								
Dieldrin	2.5E-005	3.2E+001	NA		2.88E-003								
Endosulfan I	6.0E-003	NA	NA	1.40E-002	2.78E-003								
Endosulfan II	6.0E-003	NA	NA	5.10E-003	2.99E-003								
Endosulfan sulfate	6.0E-003	NA	NA		3.36E-003								
Endrin	3.0E-004	NA	NA	3.90E-003	4.13E-003								
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA	NA		4.35E-003								
gamma-Chlordane	6.0E-005	1.3E+000	NA	7.40E-003	2.81E-003								
Heptachlor epoxide	1.3E-005	9.1E+000	NA		1.95E-003								
Methoxychlor	5.0E-003	NA	NA		1.65E-002								
Metals													
Antimony	4.0E-004	NA	NA	5.45E-001	8.55E-001								
Mercury	3.0E-006	NA	NA	8.40E-001	9.57E-002								
Sodium	NA	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:								**8E-004**	**5E-010**			**1E-004**	**6E-011**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CS =	EPC Surface and Subsurface		CS =	EPC Surface Only	
CF =	1.00E-006	kg/mg	CF =	1.00E-006	kg/mg
SA =	5000	cm2	SA =	3725	cm2
AF =	0.2	mg/cm2	AF =	0.2	mg/cm2
EF =	219	days/year	EF =	25	days/year
ED =	1	years	ED =	1	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	365	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

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CENTRAL TENDENCY (CT) - SEAD-59
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Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center Child: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Nc)	Future Day Care Center Adult: Absorbed Dose (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics													
Acetone	1.0E-001	NA	NA		6.50E-002								
Benzene	2.9E-003	3.1E-002	NA		4.00E-002								
Carbon disulfide	6.3E-002	NA	NA		4.00E-003								
Ethyl benzene	NA	NA	NA		9.59E-002								
Methyl chloride	NA	1.3E-002	NA		3.00E-003								
Methyl ethyl ketone	6.0E-001	NA	NA	7.29E-003	2.40E-002								
Methylene chloride	5.9E-002	7.7E-003	NA		2.00E-003								
Toluene	2.0E-001	NA	NA		8.94E-002								
Xylene (total)	1.8E+000	NA	NA		1.59E-001								
Trichloroethene	NA	1.2E-002	NA		2.00E-003								
Semivolatile Organics													
1,2,4-Trichlorobenzene	1.0E-002	NA	NA		2.80E-002								
2-Methylnaphthalene	4.0E-002	NA	NA	1.50E-001	4.39E+000								
4-Methylphenol	NA	NA	NA		8.30E-002								
Acenaphthene	6.0E-002	NA	NA	2.89E-001	2.65E+000								
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000								
Anthracene	3.0E-001	NA	NA	1.22E+000	4.89E+000								
Benzo(a)anthracene	NA	7.3E-001	NA	4.70E+000	2.10E+001								
Benzo(a)pyrene	NA	1.8E+001	NA	4.58E+000	1.93E+001								
Benzo(b)fluoranthene	NA	7.3E-001	NA	5.20E+000	2.46E+001								
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000								
Benzo(k)fluoranthene	NA	7.3E-002	NA	4.15E+000	1.39E+001								
bis(2-Ethylhexyl)phthalate	1.0E-002	2.8E-002	NA	6.60E-001	4.15E+000								
Butylbenzylphthalate	2.0E-001	NA	NA		7.79E-001								
Carbazole	NA	2.0E-002	NA	1.20E+000	4.21E+000								
Chrysene	NA	7.3E-003	NA	4.56E+000	2.15E+001								
Di-n-butylphthalate	9.0E-002	NA	NA	2.50E-001	4.90E-001								
Di-n-octylphthalate	NA	NA	NA		1.10E-002								
Dibenz(a,h)anthracene	NA	7.3E+000	NA	1.27E+000	4.04E+000								
Dibenzofuran	NA	NA	NA	2.80E-001	3.53E+000								
Diethyl phthalate	8.0E-001	NA	NA		1.20E-002								
Fluoranthene	4.0E-002	NA	NA	8.06E+000	5.67E+001								
Fluorene	4.0E-002	NA	NA	4.66E-001	3.80E+000								
Indeno(1,2,3-cd)pyrene	NA	7.3E-001	NA	3.30E+000	8.27E+000								
Naphthalene	4.0E-002	NA	NA	1.72E-001	2.78E+000								
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001								
Phenol	5.4E-001	NA	NA		1.70E-002								
Pyrene	3.0E-002	NA	NA	8.98E+000	5.54E+001								
Pesticides													
4,4'-DDD	NA	1.2E+000	NA	1.86E-002	2.36E-002								
4,4'-DDE	NA	1.7E+000	NA	2.89E-002	3.12E-002								
4,4'-DDT	1.0E-004	1.7E+000	NA	3.20E-002	3.43E-002								
Aldrin	1.5E-005	3.4E+001	NA	1.08E-003	1.13E-003								
alpha-BHC	NA	NA	NA		2.19E-003								
alpha-Chlordane	6.0E-005	1.3E+000	NA	5.10E-003	2.96E-003								
Aroclor-1254	1.8E-005	2.2E+000	0.06		2.90E-002								
beta-BHC	NA	1.8E+000	NA		1.72E-003								
delta-BHC	NA	NA	NA		1.64E-003								
Dieldrin	2.5E-005	3.2E+001	NA		2.88E-003								
Endosulfan I	6.0E-003	NA	NA	1.40E-002	2.78E-003								
Endosulfan II	6.0E-003	NA	NA	5.10E-003	2.99E-003								
Endosulfan sulfate	6.0E-003	NA	NA		3.36E-003								
Endrin	3.0E-004	NA	NA	3.90E-003	4.13E-003								
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003								
Endrin ketone	NA	NA	NA		4.35E-003								
gamma-Chlordane	6.0E-005	1.3E+000	NA	7.40E-003	2.81E-003								
Heptachlor epoxide	1.3E-005	9.1E+000	NA		1.95E-003								
Methoxychlor	5.0E-003	NA	NA		1.65E-002								
Metals													
Antimony	4.0E-004	NA	NA	5.45E-001	8.55E-001								
Mercury	3.0E-006	NA	NA	8.40E-001	9.57E-002								
Sodium	NA	NA	NA	1.79E+002	3.65E+002								
Total Hazard Quotient and Cancer Risk:								NQ	NQ			NQ	NQ

Assumptions for Day Care Center Child			Assumptions for Day Care Center Adult		
CS =	EPC Surface Only		CS =	EPC Surface Only	
CF =	1.00E-006	kg/mg	CF =	1.00E-006	kg/mg
SA =	1820	cm2	SA =	5000	cm2
AF =	0.2	mg/cm2	AF =	0.2	mg/cm2
EF =	219	days/year	EF =	219	days/year
ED =	3	years	ED =	7	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	1095	days	AT (Nc) =	2555	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

TABLE A-15
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
CENTRAL TENDENCY (CT) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, from Soil EPC Data
CF = Conversion Factor
SA = Surface Area Contact
AF = Adherence Factor
ABS = Absorption Factor
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Lifetime Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Absorption Factor (unitless)	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics														
Acetone	1.0E-001	NA	NA		6.50E-002									
Benzene	2.9E-003	3.1E-002	NA		4.00E-002									
Carbon disulfide	6.3E-002	NA	NA		4.00E-003									
Ethyl benzene	NA	NA	NA		9.59E-002									
Methyl chloride	NA	1.3E-002	NA		3.00E-003									
Methyl ethyl ketone	6.0E-001	NA	NA	7.29E-003	2.40E-002									
Methylene chloride	5.9E-002	7.7E-003	NA		2.00E-003									
Toluene	2.0E-001	NA	NA		8.94E-002									
Xylene (total)	1.8E+000	NA	NA		1.59E-001									
Trichloroethene	NA	1.2E-002	NA		2.00E-003									
Semivolatile Organics														
1,2,4-Trichlorobenzene	1.0E-002	NA	NA		2.80E-002									
2-Methylnaphthalene	4.0E-002	NA	NA	1.50E-001	4.39E+000									
4-Methylphenol	NA	NA	NA		8.30E-002									
Acenaphthene	6.0E-002	NA	NA	2.89E-001	2.65E+000									
Acenaphthylene	NA	NA	NA	8.02E-001	3.08E+000									
Anthracene	3.0E-001	NA	NA	1.22E+000	4.89E+000									
Benzo(a)anthracene	NA	7.3E-001	NA	4.70E+000	2.10E+001									
Benzo(a)pyrene	NA	1.8E+001	NA	4.58E+000	1.93E+001									
Benzo(b)fluoranthene	NA	7.3E-001	NA	5.20E+000	2.46E+001									
Benzo(ghi)perylene	NA	NA	NA	1.40E+000	6.55E+000									
Benzo(k)fluoranthene	NA	7.3E-002	NA	4.15E+000	1.39E+001									
bis(2-Ethylhexyl)phthala	1.0E-002	2.8E-002	NA	6.60E-001	4.15E+000									
Butylbenzylphthalate	2.0E-001	NA	NA		7.79E-001									
Carbazole	NA	2.0E-002	NA	1.20E+000	4.21E+000									
Chrysene	NA	7.3E-003	NA	4.56E+000	2.15E+001									
Di-n-butylphthalate	9.0E-002	NA	NA	2.50E-001	4.90E-001									
[illegible]octylphthalate	NA	NA	NA		1.10E-002									
[illegible]nz(a,h)anthracene	NA	7.3E+000	NA	1.27E+000	4.04E+000									
[illegible]oenzofuran	NA	NA	NA	2.80E-001	3.53E+000									
Diethyl phthalate	8.0E-001	NA	NA		1.20E-002									
Fluoranthene	4.0E-002	NA	NA	8.06E+000	5.67E+001									
Fluorene	4.0E-002	NA	NA	4.66E-001	3.80E+000									
Indeno(1,2,3-cd)pyrene	NA	7.3E-001	NA	3.30E+000	8.27E+000									
Naphthalene	4.0E-002	NA	NA	1.72E-001	2.78E+000									
Phenanthrene	NA	NA	NA	4.26E+000	3.06E+001									
Phenol	5.4E-001	NA	NA		1.70E-002									
Pyrene	3.0E-002	NA	NA	8.98E+000	5.54E+001									
Pesticides														
4,4'-DDD	NA	1.2E+000	NA	1.86E-002	2.36E-002									
4,4'-DDE	NA	1.7E+000	NA	2.89E-002	3.12E-002									
4,4'-DDT	1.0E-004	1.7E+000	NA	3.20E-002	3.43E-002									
Aldrin	1.5E-005	3.4E+001	NA	1.08E-003	1.13E-003									
alpha-BHC	NA	NA	NA		2.19E-003									
alpha-Chlordane	6.0E-005	1.3E+000	NA	5.10E-003	2.96E-003									
Aroclor-1254	1.8E-005	2.2E+000	0.06		2.90E-002									
beta-BHC	NA	1.8E+000	NA		1.72E-003									
delta-BHC	NA	NA	NA		1.64E-003									
Dieldrin	2.5E-005	3.2E+001	NA		2.88E-003									
Endosulfan I	6.0E-003	NA	NA	1.40E-002	2.78E-003									
Endosulfan II	6.0E-003	NA	NA	5.10E-003	2.99E-003									
Endosulfan sulfate	6.0E-003	NA	NA		3.36E-003									
Endrin	3.0E-004	NA	NA	3.90E-003	4.13E-003									
Endrin aldehyde	NA	NA	NA	1.28E-002	3.89E-003									
Endrin ketone	NA	NA	NA		4.35E-003									
gamma-Chlordane	6.0E-005	1.3E+000	NA	7.40E-003	2.81E-003									
Heptachlor epoxide	1.3E-005	9.1E+000	NA		1.95E-003									
Methoxychlor	5.0E-003	NA	NA		1.65E-002									
Metals														
Antimony	4.0E-004	NA	NA	5.45E-001	8.55E-001									
Mercury	3.0E-006	NA	NA	8.40E-001	9.57E-002									
Sodium	NA	NA	NA	1.79E+002	3.65E+002									
Total Hazard Quotient and Cancer Risk:								NQ				NQ		NQ

Assumptions for Resident (Adult)		Assumptions for Resident (Child)	
CF =	1E-006 kg/mg	CF =	1E-006 kg/mg
CS =	EPC Surface Only	CS =	EPC Surface Only
BW =	70 kg	BW =	15 kg
SA =	5,000 cm2	SA =	1,980 cm2
AF =	0.2 mg/cm2	AF =	0.2 mg/cm2
EF =	234 days/year	EF =	234 days/year
ED =	7 years	ED =	2 years
AT (Nc) =	2555 days	AT (Nc) =	730 days
AT (Car) =	25550 days	AT (Car) =	25550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.
* USEPA Region 2 recommends quantifying dermal exposure only for cadmium, arsenic, PCBs, dioxins/furans and pentachlorophenol, since absorption factors are not available for other chemicals of concern.

TABLE A-16
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (WHILE SHOWERING)
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. inhalation RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

TABLE A-17
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (WHILE SHOWERING)
CENTRAL TENDENCY (CT) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. inhalation RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

TABLE A-18
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk
Semivolatile Organics					Ingestion of Groundwater Not Applicable for Current Site Worker								Ingestion of Groundwater Not Applicable for Future Construction Worker		
Phenol	6.00E-001	NA	2.00E-003					3.91E-005		7E-005					
Metals															
Sodium	NA	NA	2.39E+002												
Total Hazard Quotient and Cancer Risk:										7E-005					

Assumptions for Future Industrial Worker

IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-18
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Future Tresspasser Child: Intake (mg/kg-day) (Nc)	Future Tresspasser Child: Intake (mg/kg-day) (Car)	Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Semivolatile Organics				Ingestion of Groundwater Not Applicable for Future Tresspasser Child											
Phenol	6.0E-001	NA	2.00E-003					9.13E-005		2E-004		3.91E-005		7E-005	
Metals															
Sodium	NA	NA	2.39E+002												
Total Hazard Quotient and Cancer Risk:										**2E-004**				**7E-005**	

Assumptions for Future Day Care Center Child

IR =	1	liters/day
EF =	250	days/year
ED =	6	years
BW =	15	kg
AT (Nc) =	2190	days
AT (Car) =	25550	days

Assumptions for Future Day Care Center Adult

IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-18
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CW = Chemical Concentration in Groundwater, from Groundwater EP   ED=Exposure Duration
IR = Ingestion Rate   BW=Bodyweight
EF = Exposure Frequency   AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Semivolatile Organics												
Phenol	6.0E-001	NA	2.00E-003	5.48E-005		9E-005		1.28E-004		2E-004		
Metals												
Sodium	NA	NA	2.39E+002									
Total Hazard Quotient and Cancer Risk:						**9E-005**				**2E-004**		

Assumptions for Resident (Adult)			Assumptions for Resident (Child)		
BW =	70	kg	BW =	15	kg
IR =	2	liters/day	IR =	1	liters/day
EF =	350	days/year	EF =	350	days/year
ED =	24	years	ED =	6	years
AT (Nc) =	8,760	days	AT (Nc) =	2,190	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
CENTRAL TENDENCY (CT) - SEAD-59
Decision Document - SEAD-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED - Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk
Semivolatile Organics					Ingestion of Groundwater Not Applicable for Current Site Worker								Ingestion of Groundwater Not Applicable for Future Construction Worker		
Phenol	6.00E-001	NA	2.00E-003					3.43E-005		6E-005					
Metals															
Sodium	NA	NA	2.39E+002												
Total Hazard Quotient and Cancer Risk:										**6E-005**					

Assumptions for Future Industrial Worker

IR =	2	liters/day
EF =	219	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
CENTRAL TENDENCY (CT) - SEAD-59
Decision Document - SEAD-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Future Tresspasser Child Intake (mg/kg-day) (Nc)	Future Tresspasser Child Intake (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk	Future Day Care Center Child Intake (mg/kg-day) (Nc)	Future Day Care Center Child Intake (mg/kg-day) (Car)	Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Future Day Care Center Adult Intake (mg/kg-day) (Nc)	Future Day Care Center Adult Intake (mg/kg-day) (Car)	Future Day Care Center Adult Hazard Quotient	Future Day Care Center Adult Cancer Risk
Semivolatile Organics					Ingestion of Groundwater Not Applicable for Future Tresspasser Child										
Phenol	6.0E-001	NA	2.00E-003					8.00E-005		1E-004		3.43E-005		6E-005	
Metals															
Sodium	NA	NA	2.39E+002												
Total Hazard Quotient and Cancer Risk:										**1E-004**				**6E-005**	

Assumptions for Future Day Care Center Child

IR =	1	liters/day
EF =	219	days/year
ED =	3	years
BW =	15	kg
AT (Nc) =	1095	days
AT (Car) =	25550	days

Assumptions for Future Day Care Center Adult

IR =	2	liters/day
EF =	219	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
CENTRAL TENDENCY (CT) - SEAD-59
Decision Document - SEAD-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwate ED=Exposure Duration
IR = Ingestion Rate BW=Bodyweight
EF = Exposure Frequency AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Semivolatile Organics												
Phenol	6.0E-001	NA	2.00E-003	2.56E-005		4E-005		6.33E-005		1E-004		
Metals												
Sodium	NA	NA	2.39E+002									
Total Hazard Quotient and Cancer Risk:						**4E-005**				**1E-004**		

Assumptions for Resident (Adult)			Assumptions for Resident (Child)		
BW =	70	kg	BW =	15	kg
IR =	1.4	liters/day	IR =	0.74	liters/day
EF =	234	days/year	EF =	234	days/year
ED =	7	years	ED	2	years
AT (Nc) =	2,555	days	AT (Nc) =	730	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-20

CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (WHILE SHOWERING)

REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-59

Decision Document - SEADs-59 and 71

Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):

DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Absorbed Dose per Event (DA):

For organics: $$DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$$

For inorganics: DA = Kp x CW x ET x CF

Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
CF = Conversion Factor

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Permeability Coefficient *Kp* (cm/hr)	Tau (hours)	EPC Groundwater (mg/liter)	Absorbed Dose/Event (mg-cm²/event)	Future Resident (Adult) Intake (mg/kg-day) (Nc)	Future Resident (Adult) Intake (mg/kg-day) (Car)	Future Resident (Adult) Hazard Quotient	Future Resident (Adult) Contribution to Lifetime Cancer Risk	Future Resident (Child) Intake (mg/kg-day) (Nc)	Future Resident (Child) Intake (mg/kg-day) (Car)	Future Resident (Child) Hazard Quotient	Future Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Semivolatile Organics															
Phenol	5.40E-001	NA	5.50E-003	3.30E-001	2.00E-003	8.73E-009	2.75E-006		5E-006		5.12E-006		9E-006		
Metals															
Sodium	NA	NA	1.00E-003	NA	2.39E+002	5.98E-005									
Total Hazard Quotient and Cancer Risk:									**5E-006**				**9E-006**		

Assumptions for Future Resident (Adult)			Assumptions for Future Resident (Child)		
CF =	0.001	l/cm3	CF =	0.001	l/cm3
BW =	70	kg	BW =	15	kg
SA =	23,000	cm2	SA =	9,180	cm2
ET =	0.25	hours/day	ET =	0.25	hours/day
EF =	350	days/year	EF =	350	days/year
ED =	24	years	ED =	6	years
AT (Nc) =	8,760	days	AT (Nc) =	2,190	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-21
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (WHILE SHOWERING)
CENTRAL TENDENCY (CT) SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Absorbed Dose per Event (DA):

For organics: $DA = 2Kp \cdot CW \sqrt{\frac{6 \cdot \tau \cdot ET}{\pi}} \cdot CF$

For inorganics: DA = Kp x CW x ET x CF

Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Dermal RfD	Carc. Slope Dermal	Permeability Coefficient *Kp*	Tau	EPC Groundwater	Absorbed Dose/Event	Future Resident (Adult) Intake (mg/kg-day)		Future Resident (Adult) Hazard Quotient	Future Resident (Adult) Contribution to Lifetime Cancer Risk	Future Resident (Child) Intake (mg/kg-day)		Future Resident (Child) Hazard Quotient	Future Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(cm/hr)	(hours)	(mg/liter)	(mg-cm²/event)	(Nc)	(Car)			(Nc)	(Car)			
Semivolatile Organics															
Phenol	5.40E-001	NA	5.50E-003	3.30E-001	2.00E-003	7.20E-009	1.32E-006		2E-006		2.44E-006		5E-006		
Metals															
Sodium	NA	NA	1.00E-003	NA	2.39E+002	4.06E-005									
Total Hazard Quotient and Cancer Risk:									**2E-006**				**5E-006**		

Assumptions for Future Resident (Adult)

CF =	0.001	l/cm3
BW =	70	kg
SA =	20,000	cm2
ET =	0.17	hours/day
EF =	234	days/year
ED =	7	years
AT (Nc) =	2555	days
AT (Car) =	25,550	days

Assumptions for Future Resident (Child)

CF =	0.001	l/cm3
BW =	15	kg
SA =	7,930	cm2
ET =	0.17	hours/day
EF =	234	days/year
ED =	2	years
AT (Nc)	730	days
AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE A-22
CALCULATED SOIL RECEPTOR EXPOSURE - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	RME Concentration (mg/kg)	SP1	BAF2	Deer Mouse Exposure (mg/kg/day) 3	Short-tailed Shrew Exposure (mg/kg/day) 3	American Robin Exposure (mg/kg/day)
Volatile Organics						
Acetone	1.50E-01	5.33E+01	3.90E-01	8.70E-01	2.89E-01	2.25E+00
Benzene	5.90E+00	2.34E+00	2.45E+01	1.71E+01	8.25E+01	5.52E+01
Ethylbenzene	2.60E+02	6.01E-01	1.00E+00	4.61E+01	1.53E+02	1.54E+02
Methyl ethyl ketone	8.75E-03	2.74E+01	9.60E-01	2.68E-02	1.24E-02	7.00E-02
Methylene chloride	2.00E-03	6.86E+00	5.25E+00	2.63E-03	6.40E-03	7.65E-03
Toluene	8.30E+02	1.39E+00	7.24E+01	6.62E+03	3.42E+04	2.16E+04
Total Xylenes	1.00E+03	5.62E-01	6.00E+00	7.13E+02	3.43E+03	2.34E+03
Trichloroethene	2.00E-03	1.22E+00	6.76E+01	1.49E-02	7.68E-02	4.84E-02
Semivolatile Organics						
2-Methylnaphthalene	6.70E+01	1.63E-01	3.42E-01	3.95E+00	1.34E+01	1.60E+01
Acenaphthene	3.90E-01	2.10E-01	3.42E-01	2.50E-02	7.84E-02	9.82E-02
Acenaphthylene	1.10E+00	1.72E-01	1.00E+00	1.44E-01	6.31E-01	5.21E-01
Anthracene	1.50E+00	1.04E-01	5.10E-02	3.17E-02	4.84E-02	1.80E-01
Benzo(a)anthracene	6.40E+00	1.51E-02	1.25E-01	1.25E-01	4.57E-01	7.76E-01
Benzo(a)pyrene	5.80E+00	1.02E+00	4.50E+00	3.48E+00	1.50E+01	1.13E+01
Benzo(b)fluoranthene	6.30E+00	6.17E-03	3.20E-01	2.50E-01	1.15E+00	1.18E+00
Benzo(ghi)perylene	1.90E+00	3.05E-03	2.40E-01	5.82E-02	2.59E-01	3.01E-01
Benzo(k)fluoranthene	5.80E+00	4.25E-03	2.53E-01	1.87E-01	8.34E-01	9.48E-01
Bis(2-Ethylhexyl)phthalate	1.50E+01	5.10E-03	1.20E+01	1.95E+01	1.02E+02	6.46E+01
Butylbenzylphthalate	9.60E-03	1.00E+00	1.00E+00	2.12E-03	5.76E-03	6.74E-03
Carbazole	1.20E+00	1.00E+00	1.15E+02	1.50E+01	7.84E+01	4.91E+01
Chrysene	6.20E+00	2.22E-02	1.75E-01	1.59E-01	6.21E-01	8.74E-01
Di-n-butylphthalate	2.50E-01	8.84E-02	1.25E-01	6.86E-03	1.85E-02	3.54E-02
Di-n-octylphthalate	1.10E-02	1.60E-04	4.90E+03	5.82E+00	3.06E+01	1.90E+01
Dibenz(a,h)anthracene	1.90E+00	8.16E-03	1.75E-01	4.59E-02	1.89E-01	2.60E-01
Dibenzofuran	2.80E-01	1.51E-01	1.00E+00	3.60E-02	1.60E-01	1.31E-01
Diethylphthalate	1.20E-02	7.14E-01	1.17E+02	1.53E-01	7.98E-01	4.98E-01
Fluoranthene	9.90E+00	3.72E-02	7.92E-01	9.30E-01	4.47E+00	3.59E+00
Fluorene	2.20E+01	1.49E-01	3.42E-01	1.26E+00	4.38E+00	5.17E+00
Indeno(1,2,3-cd)pyrene	5.30E+00	1.37E-03	4.19E-01	2.64E-01	1.26E+00	1.17E+00
Naphthalene	2.40E-01	4.43E-01	3.42E-01	2.14E-02	5.00E-02	7.59E-02
Phenanthrene	4.60E+01	1.02E-01	1.22E-01	1.32E+00	3.34E+00	6.64E+00
Pyrene	1.20E+01	4.43E-02	9.20E-02	2.29E-01	6.44E-01	1.41E+00
					--	--
Pesticides/PCBs					--	--
4,4'-DDD	4.10E-02	1.34E-02	1.00E-01	6.82E-04	2.35E-03	4.59E-03
4,4'-DDE	4.38E-02	1.79E-02	2.50E-02	3.95E-04	6.46E-04	3.80E-03
4,4'-DDT	5.20E-02	1.00E-02	1.00E-01	8.47E-04	2.97E-03	5.78E-03
Aldrin	1.08E-03	1.00E-02	3.50E+00	4.14E-04	2.15E-03	1.41E-03
Alpha-BHC	1.40E-02	3.00E-01	1.00E+00	2.03E-03	8.09E-03	7.12E-03
Alpha-Chlordane	5.10E-03	1.45E-02	2.40E-01	1.63E-04	6.98E-04	8.25E-04
Beta-BHC	4.70E-03	no data	no data	--	--	--
Delta-BHC	8.50E-03	3.00E-01	2.80E+02	2.57E-01	1.35E+00	8.40E-01
Dieldrin	3.60E-03	1.20E-01	4.70E-02	8.08E-05	1.10E-04	4.42E-04
Endosulfan I	2.20E-02	3.44E-01	2.50E-01	1.51E-03	3.37E-03	5.64E-03
Endosulfan II	5.10E-03	3.13E-01	2.50E-01	3.33E-04	7.75E-04	1.26E-03
Endosulfan sulfate	1.00E-02	2.97E-01	2.50E-01	6.35E-04	1.51E-03	2.43E-03
Endrin	5.60E-03	5.80E-02	1.80E-01	1.69E-04	5.83E-04	8.54E-04
Endrin aldehyde	1.30E-02	no data	no data	--	--	--
Endrin ketone	1.10E-02	2.20E-02	1.80E-01	2.88E-04	1.13E-03	1.57E-03
Gamma-Chlordane	7.40E-03	2.40E-02	2.40E-01	2.44E-04	1.01E-03	1.22E-03
Heptachlor epoxide	2.60E-03	7.00E-02	1.30E-01	6.76E-05	1.98E-04	3.60E-04
Metals						
Antimony	6.50E-01	1.30E-04	4.30E+00	3.05E-01	1.59E+00	1.03E+00
Mercury	8.40E-01	9.00E-01	2.30E+01	2.11E+00	1.10E+01	6.91E+00
Sodium	2.31E+03	1.00E+00	1.00E+00	3.10E+02	1.33E+03	1.11E+03

(1) SP: soil-to-plant uptake factor.
(2) BAF: bioaccumulation factor.
(3) Receptor exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * SFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor
(0.2 for inorganics only, 1 for organics)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day for mouse, 0.00048 kg/day for shrew, 0.03658 kg/day for robin)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day for mouse, 0.00852 kg/day for shrew, 0.04656 kg/day for robin)
Is = incidental soil intake rate (0.000088 kg/day for mouse, 0 kg/day for shrew, 0.00965 kg/day for robin)
SFF = Site foraging factor (1 for mouse and shrew; 0.583 for robin)
BW = body weight (0.02 kg for mouse, 0.015 kg for shrew, 0.077 kg for robin)

TABLE A-23
CALCULATION OF SOIL HAZARD QUOTIENTS USING MAX VALUES AS INPUT - SEAD-59 - MAMMALS
Decision Document - SEAD-59 and 71
Seneca Army Depot Activity

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Short-tailed Shrew Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	Deer Mouse Hazard Quotient [3]	Short-tailed Shrew Hazard Quotient [3]
Volatile Organics					
Acetone	8.70E-01	2.89E-01	1.00E+01	8.7E-02	2.9E-02
Benzene	1.71E+01	8.25E+01	2.64E+01	6.5E-01	**3.1E+00**
Ethylbenzene	4.61E+01	1.53E+02	4.73E+01	9.7E-01	**3.2E+00**
Methyl ethyl ketone	2.68E-02	1.24E-02	1.77E+02	1.5E-04	7.0E-05
Methylene chloride	2.63E-03	6.40E-03	no data	--	--
Toluene	6.62E+03	3.42E+04	2.60E+01	**2.5E+02**	**1.3E+03**
Total Xylenes	7.13E+02	3.43E+03	2.10E+00	**3.4E+02**	**1.6E+03**
Trichloroethene	1.49E-02	7.68E-02	7.00E+00	2.1E-03	1.1E-02
Semivolatile Organics					
2-Methylnaphthalene	3.95E+00	1.34E+01	7.16E+00	5.5E-01	**1.9E+00**
Acenaphthene	2.50E-02	7.84E-02	1.75E+00	1.4E-02	4.5E-02
Acenaphthylene	1.44E-01	6.31E-01	1.00E+00	1.4E-01	6.3E-01
Anthracene	3.17E-02	4.84E-02	1.00E+02	3.2E-04	4.8E-04
Benzo(a)anthracene	1.25E-01	4.57E-01	1.00E+00	1.2E-01	4.6E-01
Benzo(a)pyrene	3.48E+00	1.50E+01	1.00E+00	**3.5E+00**	**1.5E+01**
Benzo(b)fluoranthene	2.50E-01	1.15E+00	1.00E+00	2.5E-01	**1.1E+00**
Benzo(ghi)perylene	5.82E-02	2.59E-01	1.00E+00	5.8E-02	2.6E-01
Benzo(k)fluoranthene	1.87E-01	8.34E-01	1.00E+00	1.9E-01	8.3E-01
Bis(2-Ethylhexyl)phthalate	1.95E+01	1.02E+02	1.83E+01	**1.1E+00**	**5.6E+00**
Butylbenzylphthalate	2.12E-03	5.76E-03	1.59E+01	1.3E-04	3.6E-04
Carbazole	1.50E+01	7.84E+01	no data	--	--
Chrysene	1.59E-01	6.21E-01	1.00E+00	1.6E-01	6.2E-01
Di-n-butylphthalate	6.86E-03	1.85E-02	5.50E+02	1.2E-05	3.4E-05
Di-n-octylphthalate	5.82E+00	3.06E+01	1.83E+01	3.2E-01	**1.7E+00**
Dibenz(a,h)anthracene	4.59E-02	1.89E-01	1.00E+00	4.6E-02	1.9E-01
Dibenzofuran	3.60E-02	1.60E-01	no data	--	--
Diethylphthalate	1.53E-01	7.98E-01	4.58E+03	3.3E-05	1.7E-04
Fluoranthene	9.30E-01	4.47E+00	1.25E+00	7.4E-01	**3.6E+00**
Fluorene	1.26E+00	4.38E+00	1.25E+00	**1.0E+00**	**3.5E+00**
Indeno(1,2,3-cd)pyrene	2.64E-01	1.26E+00	1.00E+00	2.6E-01	**1.3E+00**
Naphthalene	2.14E-02	5.00E-02	7.16E+00	3.0E-03	7.0E-03
Phenanthrene	1.32E+00	3.34E+00	1.00E+00	**1.3E+00**	**3.3E+00**
Pyrene	2.29E-01	6.44E-01	1.00E+00	2.3E-01	**6.4E-01**
Pesticides/PCBs					
4,4'-DDD	6.82E-04	2.35E-03	8.00E-01	8.5E-04	2.9E-03
4,4'-DDE	3.95E-04	6.46E-04	8.00E-01	4.9E-04	8.1E-04
4,4'-DDT	8.47E-04	2.97E-03	8.00E-01	1.1E-03	3.7E-03
Aldrin	4.14E-04	2.15E-03	2.00E-01	2.1E-03	1.1E-02
Alpha-BHC	2.03E-03	8.09E-03	1.60E+00	1.3E-03	5.1E-03
Alpha-Chlordane	1.63E-04	6.98E-04	4.58E+00	3.6E-05	1.5E-04
Beta-BHC	--	--	no data	--	--
Delta-BHC	2.57E-01	1.35E+00	1.60E+00	1.6E-01	8.4E-01
Dieldrin	8.08E-05	1.10E-04	2.00E-02	4.0E-03	5.5E-03
Endosulfan I	1.51E-03	3.37E-03	1.50E+00	1.0E-03	2.2E-03
Endosulfan II	3.33E-04	7.75E-04	1.50E+00	2.2E-04	5.2E-04
Endosulfan sulfate	6.35E-04	1.51E-03	1.50E+00	4.2E-04	1.0E-03
Endrin	1.69E-04	5.83E-04	no data	--	--
Endrin aldehyde	--	--	no data	--	--
Endrin ketone	2.88E-04	1.13E-03	9.20E-02	3.1E-03	1.2E-02
Gamma-Chlordane	2.44E-04	1.01E-03	4.58E+00	5.3E-05	2.2E-04
Heptachlor epoxide	6.76E-05	1.98E-04	1.00E-01	6.8E-04	2.0E-03
Metals					
Antimony	3.05E-01	1.59E+00	1.25E-01	**2.4E+00**	**1.3E+01**
Mercury	2.11E+00	1.10E+01	1.32E+01	1.6E-01	8.3E-01
Sodium	3.10E+02	1.33E+03	no data	--	--

(1) Receptor exposure from Table A-22.
(2) Toxicity reference value from Table 3.6-4.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

TABLE A-24
CALCULATION OF SOIL HAZARD QUOTIENTS USING MAX VALUES AS INPUT- SEAD-59 - BIRD
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	American Robin Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	American Robin Hazard Quotient [3]
Volatile Organics			
Acetone	2.25E+00	6.10E+02	3.7E-03
Benzene	5.52E+01	no data	--
Ethylbenzene	1.54E+02	no data	--
Methyl ethyl ketone	7.00E-02	no data	--
Methylene chloride	7.65E-03	no data	--
Toluene	2.16E+04	no data	--
Total Xylenes	2.34E+03	3.06E+02	7.7E+00
Trichloroethene	4.84E-02	no data	--
Semivolatile Organics			
2-Methylnaphthalene	1.60E+01	2.85E+01	5.6E-01
Acenaphthene	9.82E-02	1.00E+03	9.8E-05
Acenaphthylene	5.21E-01	1.00E+03	5.2E-04
Anthracene	1.80E-01	1.00E+03	1.8E-04
Benzo(a)anthracene	7.76E-01	4.00E+01	1.9E-02
Benzo(a)pyrene	1.13E+01	4.00E+01	2.8E-01
Benzo(b)fluoranthene	1.18E+00	4.00E+01	3.0E-02
Benzo(ghi)perylene	3.01E-01	4.00E+01	7.5E-03
Benzo(k)fluoranthene	9.48E-01	4.00E+01	2.4E-02
Bis(2-Ethylhexyl)phthalate	6.46E+01	1.10E+00	**5.9E+01**
Butylbenzylphthalate	6.74E-03	no data	--
Carbazole	4.91E+01	no data	--
Chrysene	8.74E-01	4.00E+01	2.2E-02
Di-n-butylphthalate	3.54E-02	1.10E-01	3.2E-01
Di-n-octylphthalate	1.90E+01	1.10E+00	**1.7E+01**
Dibenz(a,h)anthracene	2.60E-01	4.00E+01	6.5E-03
Dibenzofuran	1.31E-01	2.18E-01	6.0E-01
Diethylphthalate	4.98E-01	1.10E-02	**4.5E+01**
Fluoranthene	3.59E+00	4.00E+01	9.0E-02
Fluorene	5.17E+00	2.85E+01	1.8E-01
Indeno(1,2,3-cd)pyrene	1.17E+00	4.00E+01	2.9E-02
Naphthalene	7.59E-02	2.85E+01	2.7E-03
Phenanthrene	6.64E+00	2.85E+01	2.3E-01
Pyrene	1.41E+00	4.00E+01	3.5E-02
Pesticides/PCBs			
4,4'-DDD	4.59E-03	5.60E-02	8.2E-02
4,4'-DDE	3.80E-03	5.60E-02	6.8E-02
4,4'-DDT	5.78E-03	5.60E-02	1.0E-01
Aldrin	1.41E-03	5.00E-01	2.8E-03
Alpha-BHC	7.12E-03	5.60E-01	1.3E-02
Alpha-Chlordane	8.25E-04	2.14E+00	3.9E-04
Beta-BHC	--	no data	--
Delta-BHC	8.40E-01	5.60E-01	**1.5E+00**
Dieldrin	4.42E-04	7.70E-02	5.7E-03
Endosulfan I	5.64E-03	1.00E+00	5.6E-03
Endosulfan II	1.26E-03	1.00E+01	1.3E-04
Endosulfan sulfate	2.43E-03	1.00E+00	2.4E-03
Endrin	8.54E-04	1.04E-02	8.3E-02
Endrin aldehyde	--	no data	--
Endrin ketone	1.57E-03	3.00E-01	5.2E-03
Gamma-Chlordane	1.22E-03	2.14E+00	5.7E-04
Heptachlor epoxide	3.60E-04	4.80E+00	7.5E-05
Metals			
Antimony	1.03E+00	no data	--
Mercury	6.91E+00	4.50E-01	**1.5E+01**
Sodium	1.11E+03	no data	--

(1) Receptor exposure from Table A-22.
(2) Toxicity reference value from Table 3.6-5.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

TABLE A-25
CALCULATED SOIL RECEPTOR EXPOSURE - SEAD-59
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Mean Concentration (mg/kg)	SP1	BAF2	Deer Mouse Exposure (mg/kg/day) 3	Short-tailed Shrew Exposure (mg/kg/day) 3	American Robin Exposure (mg/kg/day)
Volatile Organics						
Acetone	6.41E-02	5.33E+01	3.90E-01	3.72E-01	1.23E-01	9.59E-01
Benzene	4.45E-01	2.34E+00	2.45E+01	1.29E+00	6.22E+00	4.16E+00
Ethylbenzene	1.31E+01	6.01E-01	1.00E+00	2.33E+00	7.71E+00	7.77E+00
Methyl ethyl ketone	5.99E-03	2.74E+01	9.60E-01	1.84E-02	8.51E-03	4.79E-02
Methylene chloride	5.60E-03	6.86E+00	5.25E+00	7.36E-03	1.79E-02	2.14E-02
Toluene	4.15E+01	1.39E+00	7.24E+01	3.31E+02	1.71E+03	1.08E+03
Total Xylenes	5.01E+01	5.62E-01	6.00E+00	3.57E+01	1.72E+02	1.17E+02
Trichloroethene	5.60E-03	1.22E+00	6.76E+01	4.16E-02	2.15E-01	1.36E-01
Semivolatile Organics						
2-Methylnaphthalene	6.24E+00	1.63E-01	3.42E-01	3.68E-01	1.24E+00	1.49E+00
Acenaphthene	5.22E+00	2.10E-01	3.42E-01	3.34E-01	1.05E+00	1.32E+00
Acenaphthylene	5.34E+00	1.72E-01	1.00E+00	7.00E-01	3.06E+00	2.53E+00
Anthracene	5.44E+00	1.04E-01	5.10E-02	1.15E-01	1.76E-01	6.52E-01
Benzo(a)anthracene	6.33E+00	1.51E-02	1.25E-01	1.24E-01	4.53E-01	7.68E-01
Benzo(a)pyrene	6.19E+00	1.02E+00	4.50E+00	3.72E+00	1.60E+01	1.20E+01
Benzo(b)fluoranthene	6.50E+00	6.17E-03	3.20E-01	2.57E-01	1.18E+00	1.22E+00
Benzo(ghi)perylene	5.55E+00	3.05E-03	2.40E-01	1.70E-01	7.58E-01	8.80E-01
Benzo(k)fluoranthene	6.07E+00	4.25E-03	2.53E-01	1.95E-01	8.73E-01	9.92E-01
Bis(2-Ethylhexyl)phthalate	1.08E+00	5.10E-03	1.20E+01	1.41E+00	7.37E+00	4.66E+00
Butylbenzylphthalate	2.33E-01	1.00E+00	1.00E+00	5.14E-02	1.40E-01	1.64E-01
Carbazole	5.30E+00	1.00E+00	1.15E+02	6.64E+01	3.46E+02	2.17E+02
Chrysene	6.30E+00	2.22E-02	1.75E-01	1.62E-01	6.31E-01	8.88E-01
Di-n-butylphthalate	2.08E-01	8.84E-02	1.25E-01	5.72E-03	1.54E-02	2.95E-02
Di-n-octylphthalate	2.29E-01	1.60E-04	4.90E+03	1.21E+02	6.38E+02	3.96E+02
Dibenz(a,h)anthracene	5.46E+00	8.16E-03	1.75E-01	1.32E-01	5.44E-01	7.47E-01
Dibenzofuran	5.24E+00	1.51E-01	1.00E+00	6.74E-01	3.00E+00	2.45E+00
Diethylphthalate	2.23E-01	7.14E-01	1.17E+02	2.83E+00	1.48E+01	9.25E+00
Fluoranthene	7.24E+00	3.72E-02	7.92E-01	6.81E-01	3.27E+00	2.63E+00
Fluorene	3.76E+00	1.49E-01	3.42E-01	2.16E-01	7.48E-01	8.83E-01
Indeno(1,2,3-cd)pyrene	5.85E+00	1.37E-03	4.19E-01	2.91E-01	1.39E+00	1.29E+00
Naphthalene	5.20E+00	4.43E-01	3.42E-01	4.64E-01	1.08E+00	1.65E+00
Phenanthrene	6.06E+00	1.02E-01	1.22E-01	1.74E-01	4.40E-01	8.75E-01
Pyrene	7.20E+00	4.43E-02	9.20E-02	1.38E-01	3.87E-01	8.48E-01
					--	--
Pesticides/PCBs					--	--
4,4'-DDD	1.15E-02	1.34E-02	1.00E-01	1.91E-04	6.57E-04	1.29E-03
4,4'-DDE	1.58E-02	1.79E-02	2.50E-02	1.43E-04	2.34E-04	1.37E-03
4,4'-DDT	1.55E-02	1.00E-02	1.00E-01	2.52E-04	8.83E-04	1.72E-03
Aldrin	1.14E-03	1.00E-02	3.50E+00	4.37E-04	2.26E-03	1.49E-03
Alpha-BHC	3.21E-03	3.00E-01	1.00E+00	4.64E-04	1.85E-03	1.63E-03
Alpha-Chlordane	2.41E-03	1.45E-02	2.40E-01	7.67E-05	3.29E-04	3.89E-04
Beta-BHC	1.94E-03	no data	no data	--	--	--
Delta-BHC	2.14E-03	3.00E-01	2.80E+02	6.48E-02	3.40E-01	2.12E-01
Dieldrin	2.28E-03	1.20E-01	4.70E-02	5.12E-05	6.97E-05	2.80E-04
Endosulfan I	3.27E-03	3.44E-01	2.50E-01	2.24E-04	5.00E-04	8.37E-04
Endosulfan II	3.34E-03	3.13E-01	2.50E-01	2.18E-04	5.08E-04	8.29E-04
Endosulfan sulfate	3.56E-03	2.97E-01	2.50E-01	2.26E-04	5.39E-04	8.65E-04
Endrin	3.53E-03	5.80E-02	1.80E-01	1.06E-04	3.67E-04	5.38E-04
Endrin aldehyde	4.02E-03	no data	no data	--	--	--
Endrin ketone	3.79E-03	2.20E-02	1.80E-01	9.94E-05	3.90E-04	5.41E-04
Gamma-Chlordane	2.37E-03	2.40E-02	2.40E-01	7.80E-05	3.25E-04	3.90E-04
Heptachlor epoxide	1.81E-03	7.00E-02	1.30E-01	4.69E-05	1.37E-04	2.50E-04
Metals						
Antimony	3.37E-01	1.30E-04	4.30E+00	1.58E-01	8.22E-01	5.35E-01
Mercury	1.29E-01	9.00E-01	2.30E+01	3.25E-01	1.69E+00	1.07E+00
Sodium	3.93E+02	1.00E+00	1.00E+00	5.27E+01	2.26E+02	1.89E+02

(1) SP: soil-to-plant uptake factor.
(2) BAF: bioaccumulation factor.
(3) Receptor exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * SFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor
(0.2 for inorganics only, 1 for organics)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day for mouse, 0.00048 kg/day for shrew, 0.03658 kg/day for robin)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day for mouse, 0.00852 kg/day for shrew, 0.04656 kg/day for robin)
Is = incidental soil intake rate (0.000088 kg/day for mouse, 0 kg/day for shrew, 0.00965 kg/day for robin)
SFF = Site foraging factor (1 for mouse and shrew; 0.583 for robin)
BW = body weight (0.02 kg for mouse, 0.015 kg for shrew, 0.077 kg for robin)

TABLE A-26
CALCULATION OF SOIL HAZARD QUOTIENTS - SEAD-59 - MAMMALS
USING MEAN VALUES AS INPUT
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Short-tailed Shrew Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	Deer Mouse Hazard Quotient [3]	Short-tailed Shrew Hazard Quotient [3]
Volatile Organics					
Acetone	3.72E-01	1.23E-01	1.00E+01	3.7E-02	1.2E-02
Benzene	1.29E+00	6.22E+00	2.64E+01	4.9E-02	2.4E-01
Ethylbenzene	2.33E+00	7.71E+00	4.73E+01	4.9E-02	1.6E-01
Methyl ethyl ketone	1.84E-02	8.51E-03	1.77E+02	1.0E-04	4.8E-05
Methylene chloride	7.36E-03	1.79E-02	no data	--	--
Toluene	3.31E+02	1.71E+03	2.60E+01	**1.3E+01**	**6.6E+01**
Total Xylenes	3.57E+01	1.72E+02	2.10E+00	**1.7E+01**	**8.2E+01**
Trichloroethene	4.16E-02	2.15E-01	7.00E+00	5.9E-03	3.1E-02
Semivolatile Organics					
2-Methylnaphthalene	3.68E-01	1.24E+00	7.16E+00	5.1E-02	1.7E-01
Acenaphthene	3.34E-01	1.05E+00	1.75E+00	1.9E-01	6.0E-01
Acenaphthylene	7.00E-01	3.06E+00	1.00E+00	7.0E-01	**3.1E+00**
Anthracene	1.15E-01	1.76E-01	1.00E+02	1.1E-03	1.8E-03
Benzo(a)anthracene	1.24E-01	4.53E-01	1.00E+00	1.2E-01	4.5E-01
Benzo(a)pyrene	3.72E+00	1.60E+01	1.00E+00	**3.7E+00**	**1.6E+01**
Benzo(b)fluoranthene	2.57E-01	1.18E+00	1.00E+00	2.6E-01	**1.2E+00**
Benzo(ghi)perylene	1.70E-01	7.58E-01	1.00E+00	1.7E-01	7.6E-01
Benzo(k)fluoranthene	1.95E-01	8.73E-01	1.00E+00	2.0E-01	8.7E-01
Bis(2-Ethylhexyl)phthalate	1.41E+00	7.37E+00	1.83E+01	7.7E-02	4.0E-01
Butylbenzylphthalate	5.14E-02	1.40E-01	1.59E+01	3.2E-03	8.8E-03
Carbazole	6.64E-01	3.46E+02	no data	--	--
Chrysene	1.62E-01	6.31E-01	1.00E+00	1.6E-01	6.3E-01
Di-n-butylphthalate	5.72E-03	1.54E-02	5.50E+02	1.0E-05	2.8E-05
Di-n-octylphthalate	1.21E+02	6.38E+02	1.83E+01	**6.6E+00**	**3.5E+01**
Dibenz(a,h)anthracene	1.32E-01	5.44E-01	1.00E+00	1.3E-01	5.4E-01
Dibenzofuran	6.74E-01	3.00E+00	no data	--	--
Diethylphthalate	2.83E+00	1.48E+01	4.58E+03	6.2E-04	3.2E-03
Fluoranthene	6.81E-01	3.27E+00	1.25E+00	5.4E-01	**2.6E+00**
Fluorene	2.16E-01	7.48E-01	1.25E+00	1.7E-01	6.0E-01
Indeno(1,2,3-cd)pyrene	2.91E-01	1.39E+00	1.00E+00	2.9E-01	**1.4E+00**
Naphthalene	4.64E-01	1.08E+00	7.16E+00	6.5E-02	1.5E-01
Phenanthrene	1.74E-01	4.40E-01	1.00E+00	1.7E-01	4.4E-01
Pyrene	1.38E-01	3.87E-01	1.00E+00	1.4E-01	3.9E-01
Pesticides/PCBs					
4,4'-DDD	1.91E-04	6.57E-04	8.00E-01	2.4E-04	8.2E-04
4,4'-DDE	1.43E-04	2.34E-04	8.00E-01	1.8E-04	2.9E-04
4,4'-DDT	2.52E-04	8.83E-04	8.00E-01	3.1E-04	1.1E-03
Aldrin	4.37E-04	2.26E-03	2.00E-01	2.2E-03	1.1E-02
Alpha-BHC	4.64E-04	1.85E-03	1.60E+00	2.9E-04	1.2E-03
Alpha-Chlordane	7.67E-05	3.29E-04	4.58E+00	1.7E-05	7.2E-05
Beta-BHC	--	--	no data	--	--
Delta-BHC	6.48E-02	3.40E-01	1.60E+00	4.1E-02	2.1E-01
Dieldrin	5.12E-05	6.97E-05	2.00E-02	2.6E-03	3.5E-03
Endosulfan I	2.24E-04	5.00E-04	1.50E+00	1.5E-04	3.3E-04
Endosulfan II	2.18E-04	5.08E-04	1.50E+00	1.5E-04	3.4E-04
Endosulfan sulfate	2.26E-04	5.39E-04	1.50E+00	1.5E-04	3.6E-04
Endrin	1.06E-04	3.67E-04	no data	--	--
Endrin aldehyde	--	--	no data	--	--
Endrin ketone	9.94E-05	3.90E-04	9.20E-02	1.1E-03	4.2E-03
Gamma-Chlordane	7.80E-05	3.25E-04	4.58E+00	1.7E-05	7.1E-05
Heptachlor epoxide	4.69E-05	1.37E-04	1.00E-01	4.7E-04	1.4E-03
Metals					
Antimony	1.58E-01	8.22E-01	1.25E-01	**1.3E+00**	**6.6E+00**
Mercury	3.25E-01	1.69E+00	1.32E+01	2.5E-02	1.3E-01
Sodium	5.27E+01	2.26E+02	no data	--	--

(1) Receptor exposure from Table A-25
(2) Toxicity reference value from Table 3.6-4.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

TABLE A-27
CALCULATION OF SOIL HAZARD QUOTIENTS - SEAD-59 - BIRD
USING MEAN VALUES
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	American Robin Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	American Robin Hazard Quotient [3]
Volatile Organics			
Acetone	9.59E-01	6.10E+02	1.6E-03
Benzene	4.16E+00	no data	--
Ethylbenzene	7.77E+00	no data	--
Methyl ethyl ketone	4.79E-02	no data	--
Methylene chloride	2.14E-02	no data	--
Toluene	1.08E+03	no data	--
Total Xylenes	1.17E+02	3.06E+02	3.8E-01
Trichloroethene	1.36E-01	no data	--
Semivolatile Organics			
2-Methylnaphthalene	1.49E+00	2.85E+01	5.2E-02
Acenaphthene	1.32E+00	1.00E+03	1.3E-03
Acenaphthylene	2.53E+00	1.00E+03	2.5E-03
Anthracene	6.52E-01	1.00E+03	6.5E-04
Benzo(a)anthracene	7.68E-01	4.00E+01	1.9E-02
Benzo(a)pyrene	1.20E-01	4.00E-01	3.0E-01
Benzo(b)fluoranthene	1.22E+00	4.00E+01	3.0E-02
Benzo(ghi)perylene	8.80E-01	4.00E+01	2.2E-02
Benzo(k)fluoranthene	9.92E-01	4.00E+01	2.5E-02
Bis(2-Ethylhexyl)phthalat	4.66E+00	1.10E+00	**4.2E+00**
Butylbenzylphthalate	1.64E-01	no data	--
Carbazole	2.17E+02	no data	--
Chrysene	8.88E-01	4.00E+01	2.2E-02
Di-n-butylphthalate	2.95E-02	1.10E-01	2.7E-01
Di-n-octylphthalate	3.96E+02	1.10E+00	**3.6E+02**
Dibenz(a,h)anthracene	7.47E-01	4.00E+01	1.9E-02
Dibenzofuran	2.45E+00	2.18E-01	**1.1E+01**
Diethylphthalate	9.25E+00	1.10E-02	**8.4E+02**
Fluoranthene	2.63E+00	4.00E+01	6.6E-02
Fluorene	8.83E-01	2.85E+01	3.1E-02
Indeno(1,2,3-cd)pyrene	1.29E+00	4.00E+01	3.2E-02
Naphthalene	1.65E+00	2.85E+01	5.8E-02
Phenanthrene	8.75E-01	2.85E+01	3.1E-02
Pyrene	8.48E-01	4.00E+01	2.1E-02
Pesticides/PCBs			
4,4'-DDD	1.29E-03	5.60E-02	2.3E-02
4,4'-DDE	1.37E-03	5.60E-02	2.5E-02
4,4'-DDT	1.72E-03	5.60E-02	3.1E-02
Aldrin	1.49E-03	5.00E-01	3.0E-03
Alpha-BHC	1.63E-03	5.60E-01	2.9E-03
Alpha-Chlordane	3.89E-04	2.14E+00	1.8E-04
Beta-BHC	--	no data	--
Delta-BHC	2.12E-01	5.60E-01	3.8E-01
Dieldrin	2.80E-04	7.70E-02	3.6E-03
Endosulfan I	8.37E-04	1.00E+00	8.4E-04
Endosulfan II	8.29E-04	1.00E+01	8.3E-05
Endosulfan sulfate	8.65E-04	1.00E+00	8.7E-04
Endrin	5.38E-04	1.04E-02	5.2E-02
Endrin aldehyde	--	no data	--
Endrin ketone	5.41E-04	3.00E-01	1.8E-03
Gamma-Chlordane	3.90E-04	2.14E+00	1.8E-04
Heptachlor epoxide	2.50E-04	4.80E+00	5.2E-05
Metals			
Antimony	5.35E-01	no data	--
Mercury	1.07E+00	4.50E-01	**2.4E+00**
Sodium	1.89E+02	no data	--

(1) Receptor exposure from Table A-25.
(2) Toxicity reference value from Table 3.6-5.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

APPENDIX B
Laboratory Analyses Results – SEAD-71
Risk Calculation Tables for Planned Industrial Land Use

SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM					
	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							SS71-1	SS71-10	SS71-11	SS71-12	SS71-13
	SAMP_ID:							71013	71017	71024	71023	71027
	FIELD QC CODE:							SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	0	0	0	0
	SAMP. DEPTH BOT:							0.2	0.2	0.2	0.2	0.2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							19-Nov-97	19-Nov-97	20-Nov-97	20-Nov-97	21-Nov-97
VOLATILE ORGANICS												
1,1,1-Trichloroethane	UG/KG	34	6	17.65%	23	0	800.	13. U	12. U	11. U	11. U	18. U
Acetone	UG/KG	34	2	5.88%	74	0	200.	13. U	12. U	11. U	11. U	18. U
Benzene	UG/KG	34	1	2.94%	2	0	60.	2. J	12. U	11. U	11. U	18. U
Ethyl benzene	UG/KG	34	2	5.88%	4	0	5,500.	13. U	12. U	11. U	11. U	4. J
Methylene chloride	UG/KG	34	9	26.47%	11	0	100.	2. J	12. U	11. U	11. U	18. U
Styrene	UG/KG	34	1	2.94%	1	0		13. U	12. U	11. U	11. U	18. U
Tetrachloroethene	UG/KG	34	4	11.76%	33	0	1,400.	13. U	12. U	11. U	11. U	18. U
Toluene	UG/KG	34	8	23.53%	16	0	1,500.	4. J	12. U	4. J	4. J	9. J
Total Xylenes	UG/KG	34	4	11.76%	96	0	1,200.	13. U	12. U	11. U	11. U	11. J
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	34	14	41.18%	31000	0	36,400.	72. J	8.6 J	5,300. J	4,000. J	19,000. J
Acenaphthene	UG/KG	34	24	70.59%	42000	0	50,000.	300. U	22. J	28,000. J	12,000. J	42,000. J
Acenaphthylene	UG/KG	34	5	14.71%	340	0	41,000.	300 U	93. U	72,000. U	23,000. U	70,000. U
Anthracene	UG/KG	34	27	79.41%	100000	3	50,000.	68. J	47. J	100,000.	32,000.	100,000.
Benzo[a]anthracene	UG/KG	34	32	94.12%	150000	25	224.	500.	220.	150,000.	38,000.	100,000.
Benzo[a]pyrene	UG/KG	34	31	91.18%	120000	29	61.	550.	220.	120,000.	34,000.	80,000.
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	88000	16	1,100.	750.	280.	88,000.	21,000. J	63,000. J
Benzo[ghi]perylene	UG/KG	34	30	88.24%	62000	1	50,000.	370.	140.	62,000. J	19,000. J	42,000. J
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	13	1,100.	750.	250.	130,000.	39,000.	76,000.
Bis(2-Ethylhexyl)phthalate	UG/KG	34	3	8.82%	15	0	50,000.	300. U	93. U	72,000. U	23,000. U	70,000. U
Carbazole	UG/KG	34	28	82.35%	77000	0		110. J	75. J	39,000. J	20,000. J	77,000.
Chrysene	UG/KG	34	32	94.12%	150000	23	400.	930.	290.	150,000.	37,000.	90,000.
Di-n-butylphthalate	UG/KG	34	2	5.88%	140	0	8,100.	300. U	93. U	72,000. U	23,000. U	70,000. U
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	27	14.	130. J	51. J	25,000. J	8,200. J	17,000. J
Dibenzofuran	UG/KG	34	22	64.71%	38000	5	6,200.	100. J	13. J	14,000. J	10,000. J	38,000. J
Fluoranthene	UG/KG	34	33	97.06%	440000	7	50,000.	1,100.	480.	440,000.	96,000.	240,000.
Fluorene	UG/KG	34	25	73.53%	62000	1	50,000.	300. U	18. J	35,000. J	19,000. J	62,000. J
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	9	3,200.	360.	140.	65,000. J	19,000. J	38,000. J
Naphthalene	UG/KG	34	15	44.12%	46000	2	13,000.	78. J	93. U	6,000. J	8,000. J	46,000. J
Phenanthrene	UG/KG	34	32	94.12%	290000	6	50,000.	440.	210.	280,000.	98,000.	290,000.
Phenol	UG/KG	34	1	2.94%	4.5	0	30.	300. U	93. U	72,000. U	23,000. U	70,000. U
Pyrene	UG/KG	34	33	97.06%	280000	7	50,000.	900.	380.	280,000.	74,000.	200,000.
PESTICIDES/PCBS												
4,4'-DDD	UG/KG	34	11	32.35%	240	0	2,900.	5.9	4.6 U	26. J	35. U	57.
4,4'-DDE	UG/KG	34	21	61.76%	810	0	2,100.	88.	22.	26. J	35. U	35. U
4,4'-DDT	UG/KG	34	22	64.71%	1300	0	2,100.	54.	25.	43.	35. U	40.
Alpha-BHC	UG/KG	34	8	23.53%	18	0	110.	2.2 J	2.4 U	19. U	18. U	18. U
Alpha-Chlordane	UG/KG	34	2	5.88%	74	0		2.3 U	2.4 U	19. U	18. U	18. U
Beta-BHC	UG/KG	34	7	20.59%	32	0	200.	2.3 U	2.4 U	21.	18. U	32.
Delta-BHC	UG/KG	34	1	2.94%	1.8	0	300.	2.3 U	2.4 U	19. U	18. U	18. U
Dieldrin	UG/KG	34	3	8.82%	3.5	0	44.	4.4 U	4.6 U	37. U	35. U	35. U
Endosulfan I	UG/KG	34	11	32.35%	200	0	900.	2.3 U	2.4 U	15. J	18. U	15. J
Endosulfan II	UG/KG	34	6	17.65%	52	0	900.	4.4 U	4.6 U	37. U	35. U	35. U
Endosulfan sulfate	UG/KG	34	12	35.29%	110	0	1,000.	2.7 J	4.6 U	37. U	48.	110.
Endrin	UG/KG	34	11	32.35%	120	1	100.	6.3	4.6 U	55.	35. U	22. J
Endrin aldehyde	UG/KG	34	19	55.88%	120	0		4.8	9.1	70.	34. J	22. J
Endrin ketone	UG/KG	34	18	52.94%	160	0		7.7	17.	160.	35. U	87.
Gamma-BHC/Lindane	UG/KG	34	1	2.94%	4	0	60.	2.3 U	2.4 U	19. U	18. U	18. U
Gamma-Chlordane	UG/KG	34	4	11.76%	22	0	540.	1.2 J	2.4 U	19. U	18. U	18. U
Heptachlor	UG/KG	34	1	2.94%	1.2	0	100.	2.3 U	2.4 U	19. U	18. U	18. U

TABLE B-1
SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM					
	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							SS71-1	SS71-10	SS71-11	SS71-12	SS71-13
	SAMP_ID:							71013	71017	71024	71023	71027
	FIELD QC CODE:							SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	0	0	0	0
	SAMP. DEPTH BOT:							0.2	0.2	0.2	0.2	0.2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							19-Nov-97	19-Nov-97	20-Nov-97	20-Nov-97	21-Nov-97
Heptachlor epoxide	UG/KG	34	14	41.18%	180	4	20.	4.3	2.4 U	17. J	18. U	9.8 J
Methoxychlor	UG/KG	34	12	35.29%	520	0		23. U	24. U	270.	210.	250.
METALS												
Aluminum	MG/KG	34	34	100.00%	18000	0	19,520.	7,250.	9,080.	2,900.	2,450.	1,890.
Antimony	MG/KG	34	12	35.29%	19.3	1	6	1.9 J	.95 UJ	.98 J	.7 UJ	.63 UJ
Arsenic	MG/KG	34	34	100.00%	14.6	4	8.9	4.9	7.4	5.8	3.2	3.5
Barium	MG/KG	34	34	100.00%	179	0	300.	51.2 J	53.4 J	50.5 J	88.1 J	65.1 J
Beryllium	MG/KG	34	33	97.06%	0.88	0	1.13	.26	.25	.08	.08	.05
Cadmium	MG/KG	34	15	44.12%	12.1	4	2.46	.08 UJ	.08 UJ	5.2 J	.06 UJ	.05 UJ
Calcium	MG/KG	34	34	100.00%	295000	11	125,300.	35,100.	11,100.	205,000.	222,000.	190,000.
Chromium	MG/KG	34	34	100.00%	60.3	4	30	13.4 J	14.2 J	19.1 J	5.8 J	4.2 J
Cobalt	MG/KG	34	34	100.00%	14.6	0	30.	7.4	8.7	5.6	4.3	3.7
Copper	MG/KG	34	34	100.00%	134	12	33.	47.7 J	28.8 J	24.8 J	5.4 J	5.9 J
Iron	MG/KG	34	34	100.00%	65100	2	37,410.	31,800.	24,100.	19,100.	5,990.	6,220.
Lead	MG/KG	34	34	100.00%	3470	22	24.4	185. J	28.5 J	92.8 J	16.9 J	11.4 J
Magnesium	MG/KG	34	34	100.00%	59300	6	21,700.	5,050.	4,170.	24,500.	34,300.	33,800.
Manganese	MG/KG	34	34	100.00%	853	0	1,100.	383. J	554. J	361. J	286. J	306. J
Mercury	MG/KG	34	16	47.06%	2.7	4	.1	.14 J	.07 UJ	.29 J	.05 UJ	.05 UJ
Nickel	MG/KG	34	34	100.00%	110	2	50.	19.9	110.	18.2	11.9	10.7
Potassium	MG/KG	34	34	100.00%	2940	1	2,623.	1,330.	1,030.	1,190.	1,370.	903.
Selenium	MG/KG	34	15	44.12%	1.8	0	2.	1.4 J	1.8 J	.99 UJ	.94 UJ	.85 UJ
Silver	MG/KG	34	5	14.71%	0.69	0	.8	.54 UJ	.57 UJ	2.2 UJ	.42 UJ	.38 UJ
Sodium	MG/KG	34	30	88.24%	1040	19	188.	215.	636.	324.	257.	224.
Thallium	MG/KG	34	1	2.94%	2.3	1	.855	1.6 U	1.7 U	1.3 U	1.3 U	1.1 U
Vanadium	MG/KG	34	34	100.00%	29.2	0	150.	16.	13.7	14.8	10.	6.9
Zinc	MG/KG	34	33	97.06%	3660	13	115.	95.3 J	1,740. J	201. J	44.7 J	44.4 J
OTHER ANALYSES	MG/KG											
Total Petroleum Hydrocarbons	MG/KG	26	22	84.62%	9060			243.	26. U	29.7 U	182.	325.
Nitrate/Nitrite Nitrogen		26	26	100.00%	30.2			.11	.52	.12	.02	.02

T -1
SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM						
STUDY ID:								RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	I Phase 1 Step 1
SDG								SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
ES ID								SS71-14	SS71-15	SS71-16	SS71-17	SS71-18	SS71-19
SAMP_ID:								71025	71032	71021	71030	71022	71020
FIELD QC CODE.								SA	SA	SA	SA	SA	SA
SAMP. DETH TOP:								0	0	0	0	0	0
SAMP. DEPTH BOT:								0.2	0.2	0.2	0.2	0.2	0 2
MATRIX:								SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SAMP. DATE:								20-Nov-97	21-Nov-97	20-Nov-97	21-Nov-97	20-Nov-97	20-Nov-97
VOLATILE ORGANICS													
1,1,1-Trichloroethane	UG/KG	34	6	17.65%	23	0	800.	12. U	13. U	12. U	11. U	11. U	13. U
Acetone	UG/KG	34	2	5.88%	74	0	200.	74.	13. U	12. U	11. U	11. U	13. U
Benzene	UG/KG	34	1	2.94%	2	0	60.	12. U	13. U	12. U	11. U	11. U	13. U
Ethyl benzene	UG/KG	34	2	5.88%	4	0	5,500.	12. U	13. U	12. U	11. U	11. U	13. U
Methylene chloride	UG/KG	34	9	26.47%	11	0	100.	12. U	13. U	12. U	11. U	11. U	13. U
Styrene	UG/KG	34	1	2.94%	1	0		12. U	13. U	12. U	11. U	11. U	13. U
Tetrachloroethene	UG/KG	34	4	11.76%	33	0	1,400.	12. U	13. U	33.	11. U	11. U	13. U
Toluene	UG/KG	34	8	23.53%	16	0	1,500.	12. U	2. J	12. U	16.	11. U	13. U
Total Xylenes	UG/KG	34	4	11.76%	96	0	1,200.	12. U	13. U	12. U	11. U	11. U	13. U
SEMIVOLATILE ORGANICS													
2-Methylnaphthalene	UG/KG	34	14	41.18%	31000	0	36,400	23. J	8,400. U	39,000. U	5,100. J	56. J	2,800. U
Acenaphthene	UG/KG	34	24	70.59%	42000	0	50,000.	10. J	1,600. J	6,400. J	30,000. J	230. J	510. J
Acenaphthylene	UG/KG	34	5	14.71%	340	0	41,000.	20. J	8,400. U	39,000. U	35,000. U	900 U	2,800. U
Anthracene	UG/KG	34	27	79.41%	100000	3	50,000.	380.	7,900. J	30,000. J	77,000.	390. J	1,000. J
Benzo[a]anthracene	UG/KG	34	32	94.12%	150000	25	224	360.	18,000.	91,000.	120,000.	2,200.	4,500.
Benzo[a]pyrene	UG/KG	34	31	91 18%	120000	29	61	350.	16,000.	70,000.	96,000.	2,100.	4,400.
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	88000	16	1,100.	830. E	14,000.	59,000.	78,000.	4,000.	4,600.
Benzo[ghi]perylene	UG/KG	34	30	88.24%	62000	1	50,000.	220.	12,000.	36,000. J	46,000.	1,300	2,600. J
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	13	1,100.	89. U	19,000.	74,000.	93,000.	900. U	4,700.
Bis(2-Ethylhexyl)phthalate	UG/KG	34	3	8.82%	15	0	50,000.	89. U	8,400. U	39,000. U	35,000. U	900. U	2,800. U
Carbazole	UG/KG	34	28	82.35%	77000	0		150.	5,100. J	9,300. J	47,000.	780 J	1,700. J
Chrysene	UG/KG	34	32	94.12%	150000	23	400	560.	20,000.	82,000.	110,000.	2,800.	5,500.
Di-n-butylphthalate	UG/KG	34	2	5.88%	140	0	8,100.	89. U	8,400. U	39,000. U	35,000. U	900. U	140. J
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	27	14.	83. J	3,600. J	16,000. J	21,000. J	440. J	1,100. J
Dibenzofuran	UG/KG	34	22	64.71%	38000	5	6,200.	31. J	680. J	3,000. J	23,000. J	110. J	270. J
Fluoranthene	UG/KG	34	33	97.06%	440000	7	50,000.	480.	37,000.	190,000.	270,000.	5,300.	12,000.
Fluorene	UG/KG	34	25	73.53%	62000	1	50,000.	47. J	1,900. J	7,300. J	39,000.	190. J	570. J
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	9	3,200.	190.	11,000.	36,000. J	45,000.	1,200.	2,500. J
Naphthalene	UG/KG	34	15	44.12%	46000	2	13,000.	31. J	8,400. U	39,000. U	5,500. J	88. J	2,800. U
Phenanthrene	UG/KG	34	32	94.12%	290000	6	50,000.	210.	24,000.	92,000.	240,000.	2,800.	8,300.
Phenol	UG/KG	34	1	2.94%	4.5	0	30.	89. U	8,400. U	39,000. U	35,000. U	900. U	2,800. U
Pyrene	UG/KG	34	33	97.06%	280000	7	50,000.	520.	35,000.	170,000.	220,000.	4,700.	11,000.
PESTICIDES/PCBS													
4,4'-DDD	UG/KG	34	11	32.35%	240	0	2,900.	4.4 U	110.	53.	240.	3.1 J	40. J
4,4'-DDE	UG/KG	34	21	61.76%	810	0	2,100.	18.	440.	360.	810.	20	390.
4,4'-DDT	UG/KG	34	22	64.71%	1300	0	2,100.	21.	910.	1,300.	1,300.	46.	960.
Alpha-BHC	UG/KG	34	8	23.53%	18	0	110.	2.3 U	22. U	20. U	18. J	1.2 J	22. U
Alpha-Chlordane	UG/KG	34	2	5.88%	74	0		2.3 U	22. U	20. U	18. U	1.8 U	22. U
Beta-BHC	UG/KG	34	7	20.59%	32	0	200.	2.3 U	21. J	11. J	35.	1.9	22. U
Delta-BHC	UG/KG	34	1	2.94%	1.8	0	300.	2.3 U	22. U	20. U	18. U	1.8 U	22. U
Dieldrin	UG/KG	34	3	8.82%	3.5	0	44.	3.4 J	42. U	39. U	35. U	3.6 U	42. U
Endosulfan I	UG/KG	34	11	32.35%	200	0	900.	2.3 U	13. J	20. U	18. U	1.5 J	22. U
Endosulfan II	UG/KG	34	6	17.65%	52	0	900.	4.4 U	52.	39. U	35. U	3.6 U	42. U
Endosulfan sulfate	UG/KG	34	12	35.29%	110	0	1,000.	4.4 U	110.	39. U	35. U	12.	31. J
Endrin	UG/KG	34	11	32.35%	120	1	100.	8.1	53.	120.	53.	2.7 J	42. U
Endrin aldehyde	UG/KG	34	19	55.88%	120	0		5.2	110.	61.	53.	7.8	36. J
Endrin ketone	UG/KG	34	18	52.94%	160	0		14.	130.	140.	180.	12.	26. J
Gamma-BHC/Lindane	UG/KG	34	1	2.94%	4	0	60.	2.3 U	22. U	20. U	18. U	1.8 U	22. U
Gamma-Chlordane	UG/KG	34	4	11.76%	22	0	540.	2.3 U	22. U	22.	48.	1.5 J	22. U
Heptachlor	UG/KG	34	1	2.94%	1.2	0	100.	2.3 U	22. U	20. U	18. U	1.8 U	22. U

TABLE B-1
SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM						
	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	I Phase 1 Step 1
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							SS71-14	SS71-15	SS71-16	SS71-17	SS71-18	SS71-19
	SAMP_ID:							71025	71032	71021	71030	71022	71020
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	0	0	0	0	0
	SAMP. DEPTH BOT:							0.2	0.2	0.2	0.2	0.2	0.2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							20-Nov-97	21-Nov-97	20-Nov-97	21-Nov-97	20-Nov-97	20-Nov-97
Heptachlor epoxide	UG/KG	34	14	41.18%	180	4	20	2.3 U	28.	24.	180.	3.1	19. J
Methoxychlor	UG/KG	34	12	35.29%	520	0		39.	140. J	200.	240.	11. J	220. U
METALS													
Aluminum	MG/KG	34	34	100.00%	18000	0	19,520.	10,500.	4,230.	4,690.	1,910.	1,710.	12,400.
Antimony	MG/KG	34	12	35.29%	19.3	1	6.	.85 UJ	1.8 J	19.3 J	.67 UJ	.75 J	1.9 J
Arsenic	MG/KG	34	34	100.00%	14.6	4	8.9	4.1	5.9	9.8	3.5	2.1	11.5
Barium	MG/KG	34	34	100.00%	179	0	300	58.8 J	40.4 J	179. J	127. J	20.9 J	110. J
Beryllium	MG/KG	34	33	97.06%	0.88	0	1.13	.31	.19	.08	.07	.08	.36
Cadmium	MG/KG	34	15	44.12%	12.1	4	2.46	.07 UJ	12.1 J	3.1 J	.06 UJ	1.5 J	3.9 J
Calcium	MG/KG	34	34	100.00%	295000	11	125,300	295,000.	192,000.	245,000.	221,000.	222,000.	8,780.
Chromium	MG/KG	34	34	100.00%	60.3	4	30.	16.5 J	23.1 J	33.2 J	5.3 J	21.4 J	60.3 J
Cobalt	MG/KG	34	34	100.00%	14.6	0	30	10.	7.8	9.8	4.3	3.3	12.4
Copper	MG/KG	34	34	100.00%	134	12	33.	19.5 J	40.3 J	134. J	7.4 J	19.8 J	95.6 J
Iron	MG/KG	34	34	100.00%	65100	2	37,410.	19,600.	18,400.	36,100.	6,420.	8,260.	34,300.
Lead	MG/KG	34	34	100.00%	3470	22	24.4	33.3 J	212. J	3,470. J	15.6 J	205. J	572. J
Magnesium	MG/KG	34	34	100.00%	59300	6	21,700	59,300.	11,800.	10,800.	33,300.	11,300.	4,750.
Manganese	MG/KG	34	34	100.00%	853	0	1,100	640. J	389. J	534. J	277. J	202. J	660. J
Mercury	MG/KG	34	16	47.06%	2.7	4	.1	.07 J	.06 UJ	2.7 J	.05 UJ	.05 UJ	.06 UJ
Nickel	MG/KG	34	34	100.00%	110	2	50	20.8	27.3	32.6	11.1	8.7	98.8
Potassium	MG/KG	34	34	100.00%	2940	1	2,623	1,540.	1,120.	1,020.	849.	671.	1,610.
Selenium	MG/KG	34	15	44.12%	1.8	0	2.	1.3 J	1.1 UJ	1.8 J	.9 UJ	.9 UJ	1.5 J
Silver	MG/KG	34	5	14.71%	0.69	0	8	.51 UJ	.6 J	.44 J	.4 UJ	.4 UJ	.69 J
Sodium	MG/KG	34	30	88.24%	1040	19	188.	233.	573.	314.	302.	208.	514.
Thallium	MG/KG	34	1	2.94%	2.3	1	.855	1.5 U	1.5 U	1.3 U	1.2 U	1.2 U	1.5 U
Vanadium	MG/KG	34	34	100.00%	29.2	0	150	17.8	20.1	17.3	7.4	8.8	22.3
Zinc	MG/KG	34	33	97.06%	3660	13	115	389. J	1,810. J	351. J	43.4 J	73.1 J	1,790. J
OTHER ANALYSES	MG/KG												
Total Petroleum Hydrocarbons	MG/KG	26	22	84.62%	9060			45.3	5,220.	1,120.	411.	851.	307.
Nitrate/Nitrite Nitrogen		26	26	100.00%	30.2			52	.03	4.91	.51	5.07	.2

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SOIL ANALYSIS RESULTS - SEAD-71

Decision Document - SEADs-59 and 71

Seneca Army Depot Activity

	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							SS71-2	SS71-20	SS71-3	SS71-4	SS71-5
	SAMP_ID:							71014	71031	71015	71016	71029
	FIELD QC CODE:							SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	0	0	0	0
	SAMP. DEPTH BOT:							0.2	0.2	0.2	0.2	0.2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							19-Nov-97	21-Nov-97	19-Nov-97	19-Nov-97	21-Nov-97
COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM					
VOLATILE ORGANICS												
1,1,1-Trichloroethane	UG/KG	34	6	17.65%	23	0	800.	15. U	13. U	12. U	12. U	11. U
Acetone	UG/KG	34	2	5.88%	74	0	200.	8. J	13. U	12. U	12. U	11. U
Benzene	UG/KG	34	1	2.94%	2	0	60.	15. U	13. U	12. U	12. U	11. U
Ethyl benzene	UG/KG	34	2	5.88%	4	0	5,500.	15. U	4. J	12. U	12. U	11. U
Methylene chloride	UG/KG	34	9	26.47%	11	0	100.	15. U	13. U	12. U	12. U	11. U
Styrene	UG/KG	34	1	2.94%	1	0		15. U	1. J	12. U	12. U	11. U
Tetrachloroethene	UG/KG	34	4	11.76%	33	0	1,400.	15. U	13. U	12. U	12. U	11. U
Toluene	UG/KG	34	8	23.53%	16	0	1,500.	15. U	7. J	12. U	12. U	5. J
Total Xylenes	UG/KG	34	4	11.76%	96	0	1,200.	15. U	9. J	12. U	12. U	11. U
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	34	14	41.18%	31000	0	36,400	880. U	800. U	15. J	9.4 J	1,500. U
Acenaphthene	UG/KG	34	24	70.59%	42000	0	50,000.	69. J	160. J	52. J	5.5 J	290. J
Acenaphthylene	UG/KG	34	5	14.71%	340	0	41,000.	880. U	800. U	170. U	80. U	1,500. U
Anthracene	UG/KG	34	27	79.41%	100000	3	50,000.	170. J	440. J	120. J	12. J	590. J
Benzo[a]anthracene	UG/KG	34	32	94.12%	150000	25	224	1,100.	2,100.	570.	70. J	3,200.
Benzo[a]pyrene	UG/KG	34	31	91.18%	120000	29	61.	1,300.	2,000.	540.	83.	3,400.
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	88000	16	1,100.	1,200.	1,900.	950.	130.	4,300.
Benzo[ghi]perylene	UG/KG	34	30	88.24%	62000	1	50,000.	820. J	1,200.	310.	69. J	2,300.
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	13	1,100.	1,600.	2,000.	170. U	80. U	4,500.
Bis(2-Ethylhexyl)phthalate	UG/KG	34	3	8.82%	15	0	50,000.	880. U	800. U	170. U	80. U	1,500. U
Carbazole	UG/KG	34	28	82.35%	77000	0		350. J	680. J	160. J	15. J	1,300. J
Chrysene	UG/KG	34	32	94.12%	150000	23	400.	1,600.	2,400.	660.	80.	6,200.
Di-n-butylphthalate	UG/KG	34	2	5.88%	140	0	8,100.	880. U	800. U	170. U	80. U	1,500. U
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	27	14.	300. J	430. J	120. J	29. J	760. J
Dibenzofuran	UG/KG	34	22	64.71%	38000	5	6,200.	64. J	89. J	22. J	80. U	190. J
Fluoranthene	UG/KG	34	33	97.06%	440000	7	50,000.	3,000.	4,300.	1,200.	140.	12,000.
Fluorene	UG/KG	34	25	73.53%	62000	1	50,000.	67. J	160. J	36. J	4.7 J	290. J
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	9	3,200.	780. J	1,100.	310.	57. J	2,100.
Naphthalene	UG/KG	34	15	44.12%	46000	2	13,000.	880. U	800. U	11. J	10. J	1,500. U
Phenanthrene	UG/KG	34	32	94.12%	290000	6	50,000.	1,400.	2,600.	530.	50. J	5,700.
Phenol	UG/KG	34	1	2.94%	4.5	0	30.	880. U	800. U	170. U	80. U	1,500. U
Pyrene	UG/KG	34	33	97.06%	280000	7	50,000.	2,300.	3,900.	950.	110.	9,400.
PESTICIDES/PCBS												
4,4`-DDD	UG/KG	34	11	32.35%	240	0	2,900	2.8 J	40. U	4.2 U	3.2 J	37. U
4,4`-DDE	UG/KG	34	21	61.76%	810	0	2,100	44.	86.	21.	19.	45.
4,4`-DDT	UG/KG	34	22	64.71%	1300	0	2,100.	53.	100.	19.	16.	37. U
Alpha-BHC	UG/KG	34	8	23.53%	18	0	110.	1.9 J	21. U	2.2 U	2. U	14. J
Alpha-Chlordane	UG/KG	34	2	5.88%	74	0		2.3 U	21. U	2.2 U	2. U	19. U
Beta-BHC	UG/KG	34	7	20.59%	32	0	200.	2.3 U	21. U	2.2 U	2. U	19. U
Delta-BHC	UG/KG	34	1	2.94%	1.8	0	300.	2.3 U	21. U	2.2 U	2. U	19. U
Dieldrin	UG/KG	34	3	8.82%	3.5	0	44.	3. J	40. U	4.2 U	4. U	37. U
Endosulfan I	UG/KG	34	11	32.35%	200	0	900.	2.3 U	21. U	2.2 U	2. U	19. U
Endosulfan II	UG/KG	34	6	17.65%	52	0	900.	4.4 U	40. U	4.2 U	4. U	37. U
Endosulfan sulfate	UG/KG	34	12	35.29%	110	0	1,000	4.4	40. U	4. J	4. U	37. U
Endrin	UG/KG	34	11	32.35%	120	1	100.	2.4 J	40. U	4.2 U	4. U	37. U
Endrin aldehyde	UG/KG	34	19	55.88%	120	0		4.7	40. U	8.3	4.	37. U
Endrin ketone	UG/KG	34	18	52.94%	160	0		6.6	40. U	6.4	4. U	23. J
Gamma-BHC/Lindane	UG/KG	34	1	2.94%	4	0	60.	2.3 U	21. U	2.2 U	2. U	19. U
Gamma-Chlordane	UG/KG	34	4	11.76%	22	0	540.	2.3 U	21. U	2.2 U	2. U	19. U
Heptachlor	UG/KG	34	1	2.94%	1.2	0	100.	2.3 U	21. U	2.2 U	2. U	19. U

TABLE B-1
SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							SS71-2	SS71-20	SS71-3	SS71-4	SS71-5
	SAMP_ID:							71014	71031	71015	71016	71029
	FIELD QC CODE:							SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	0	0	0	0
	SAMP. DEPTH BOT:							0.2	0.2	0.2	0.2	0.2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							19-Nov-97	21-Nov-97	19-Nov-97	19-Nov-97	21-Nov-97
COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM					
Heptachlor epoxide	UG/KG	34	14	41.18%	180	4	20.	6.4	21. U	2.2 U	1.5 J	19. U
Methoxychlor	UG/KG	34	12	35.29%	520	0		23. U	210. U	22. U	20. U	520.
METALS												
Aluminum	MG/KG	34	34	100.00%	18000	0	19,520.	14,000.	10,600.	12,500.	13,400.	2,060.
Antimony	MG/KG	34	12	35.29%	19.3	1	6.	1. J	.77 UJ	.85 UJ	.82 UJ	5.2 J
Arsenic	MG/KG	34	34	100.00%	14.6	4	8.9	6.1	6.1	4.6	4.7	9.5
Barium	MG/KG	34	34	100.00%	179	0	300.	76.5 J	111. J	75.4 J	76.9 J	42.1 J
Beryllium	MG/KG	34	33	97.06%	0.88	0	1.13	.46	.52	.41	.44	.02 U
Cadmium	MG/KG	34	15	44.12%	12.1	4	2.46	.08 UJ	.62 J	.07 UJ	.07 UJ	.07 UJ
Calcium	MG/KG	34	34	100.00%	295000	11	125,300.	8,370.	13,800.	27,100.	43,200.	204,000.
Chromium	MG/KG	34	34	100.00%	60.3	4	30.	21. J	31.9 J	18. J	19.5 J	39.9 J
Cobalt	MG/KG	34	34	100.00%	14.6	0	30.	11.1	9.7	9.4	11.2	7.8
Copper	MG/KG	34	34	100.00%	134	12	33.	55. J	98.7 J	40.5 J	24.9 J	48.3 J
Iron	MG/KG	34	34	100.00%	65100	2	37,410.	25,900.	25,900.	22,800.	24,900.	65,100.
Lead	MG/KG	34	34	100.00%	3470	22	24.4	171. J	346. J	90.8 J	30.1 J	148. J
Magnesium	MG/KG	34	34	100.00%	59300	6	21,700	5,570	4,490.	6,250	10,200.	23,200.
Manganese	MG/KG	34	34	100.00%	853	0	1,100.	602. J	523. J	482. J	510. J	520. J
Mercury	MG/KG	34	16	47.06%	2.7	4	.1	.09 J	.07 J	.06 UJ	.05 UJ	.05 UJ
Nickel	MG/KG	34	34	100.00%	110	2	50.	28.3	27.7	25.1	30.6	33.6
Potassium	MG/KG	34	34	100.00%	2940	1	2,623	2,070.	1,700.	1,960.	1,810.	918.
Selenium	MG/KG	34	15	44.12%	1.8	0	2.	1.4 J	1.3 J	1.1 UJ	1.1 UJ	1.7 J
Silver	MG/KG	34	5	14.71%	0.69	0	.8	.54 UJ	.63 J	.51 UJ	.49 UJ	.46 UJ
Sodium	MG/KG	34	30	88.24%	1040	19	188.	176.	344.	226.	251.	1,040.
Thallium	MG/KG	34	1	2.94%	2.3	1	.855	1.6 U	1.4 U	1.5 U	1.5 U	1.4 U
Vanadium	MG/KG	34	34	100.00%	29.2	0	150.	23.9	19.2	20.	19.6	9.2
Zinc	MG/KG	34	33	97.06%	3660	13	115.	144. J	525. J	105. J	352. UJ	3,660. J
OTHER ANALYSES	MG/KG											
Total Petroleum Hydrocarbons	MG/KG	26	22	84.62%	9060			90.4	343.	100.	53.6	29.
Nitrate/Nitrite Nitrogen		26	26	100.00%	30.2			.98	.32	2.6	2.06	.33

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SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	ESI
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							SS71-6	SS71-7	SS71-7	SS71-8	SS71-9	TP71-1
	SAMP_ID:							71028	71026	71203	71019	71018	TP71-1-1
	FIELD QC CODE:							SA	SA	DU	SA	SA	SA
	SAMP. DETH TOP:							0	0	0	0	0	3
	SAMP. DEPTH BOT:							0.2	0.2	0.2	0.2	0 2	3
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							21-Nov-97	20-Nov-97	20-Nov-97	19-Nov-97	19-Nov-97	07-Jun-94
COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM						
VOLATILE ORGANICS													
1,1,1-Trichloroethane	UG/KG	34	6	17.65%	23	0	800.	11. U	12. U	12. U	12. U	12. U	4. J
Acetone	UG/KG	34	2	5.88%	74	0	200.	11. U	12. U	12. U	12. U	12. U	12. U
Benzene	UG/KG	34	1	2.94%	2	0	60.	11. U	12. U	12. U	12. U	12. U	12. U
Ethyl benzene	UG/KG	34	2	5.88%	4	0	5,500.	11. U	12. U	12. U	12. U	12. U	12. U
Methylene chloride	UG/KG	34	9	26.47%	11	0	100.	11 U	12. U	12. U	12. U	12. U	2. J
Styrene	UG/KG	34	1	2.94%	1	0		11. U	12. U	12. U	12. U	12. U	12. U
Tetrachloroethene	UG/KG	34	4	11.76%	33	0	1,400.	11. U	12. U	12. U	12. U	12. U	1. J
Toluene	UG/KG	34	8	23.53%	16	0	1,500.	11. U	12. U	12. U	12. U	12. U	12. U
Total Xylenes	UG/KG	34	4	11.76%	96	0	1,200.	11. U	12. U	12. U	12. U	12. U	12. U
SEMIVOLATILE ORGANICS													
2-Methylnaphthalene	UG/KG	34	14	41.18%	31000	0	36,400.	18,000. U	1,600. U	530. U	430. U	9.6 J	19,000. U
Acenaphthene	UG/KG	34	24	70.59%	42000	0	50,000.	2,600 J	1,600. U	530. U	96. J	38. J	5,800. J
Acenaphthylene	UG/KG	34	5	14.71%	340	0	41,000.	18,000. U	1,600. U	220. J	73. J	22. J	19,000. U
Anthracene	UG/KG	34	27	79.41%	100000	3	50,000	10,000 J	2,600.	730.	240. J	70. J	11,000. J
Benzo[a]anthracene	UG/KG	34	32	94.12%	[illegible]	[illegible]	224.	42,000.	11,000.	4,800. J	880.	310.	37,000.
Benzo[a]pyrene	UG/KG	34	31	91.18%	120000	29	61.	47,000.	8,200.	4,100.	1,100.	360.	22,000.
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	88000	16	1,100.	56,000.	22,000. J	13,000. J	1,400.	810.	26,000.
Benzo[ghi]perylene	UG/KG	34	30	88.24%	62000	1	50,000.	31,000.	5,100.	2,700.	940.	220.	10,000. J
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	13	1,100.	47,000.	1,600. U	530. U	1,400.	89. U	15,000. J
Bis(2-Ethylhexyl)phthalate	UG/KG	34	3	8.82%	15	0	50,000.	18,000. U	1,600. U	530. U	430. U	89. U	19,000. U
Carbazole	UG/KG	34	28	82.35%	77000	0		16,000. J	2,500.	1,100.	510.	160.	9,500. J
Chrysene	UG/KG	34	32	94.12%	150000	23	400.	64,000.	19,000. J	9,000. J	1,600.	500.	36,000.
Di-n-butylphthalate	UG/KG	34	2	5.88%	140	0	8,100.	18,000. U	1,600. U	530. U	430. U	6.4 J	19,000. U
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	27	14.	12,000. J	2,300.	1,400.	340. J	93.	9,800. J
Dibenzofuran	UG/KG	34	22	64.71%	38000	5	6,200.	1,300. J	1,600. U	87. J	75. J	21. J	19,000. U
Fluoranthene	UG/KG	34	33	97.06%	440000	7	50,000.	110,000.	37,000. J	14,000. J	2,400.	710.	88,000.
Fluorene	UG/KG	34	25	73.53%	62000	1	50,000.	3,200. J	230. J	75. J	100. J	31. J	2,800. J
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	9	3,200.	28,000.	4,900.	2,700.	780.	200.	12,000. J
Naphthalene	UG/KG	34	15	44.12%	46000	2	13,000.	18,000. U	1,600. U	120. J	430. U	15. J	19,000. U
Phenanthrene	UG/KG	34	32	94.12%	290000	6	50,000.	49,000.	5,200.	2,100.	880.	390.	66,000.
Phenol	UG/KG	34	1	2.94%	4.5	0	30.	18,000 U	1,600. U	530. U	430. U	89. U	19,000. U
Pyrene	UG/KG	34	33	97.06%	280000	7	50,000.	98,000.	35,000. J	14,000. E	1,900.	590.	63,000.
PESTICIDES/PCBS													
4,4`-DDD	UG/KG	34	11	32.35%	240	0	2,900.	50.	40. U	40. U	4.3 U	4.4 U	37 U
4,4`-DDE	UG/KG	34	21	61.76%	810	0	2,100.	99.	21. J	20. J	19.	15.	37. U
4,4`-DDT	UG/KG	34	22	64.71%	1300	0	2,100.	250.	220.	210.	77.	25.	37. U
Alpha-BHC	UG/KG	34	8	23.53%	18	0	110.	19. U	20. U	20. U	2.2 U	2.3 U	19. U
Alpha-Chlordane	UG/KG	34	2	5.88%	74	0		19 U	20. U	20. U	2.2 U	2.3 U	74. J
Beta-BHC	UG/KG	34	7	20.59%	32	0	200.	19. U	20. U	20. U	2.2 U	2.3 U	19. U
Delta-BHC	UG/KG	34	1	2.94%	1.8	0	300.	19. U	20. U	20. U	2.2 U	2.3 U	19. U
Dieldrin	UG/KG	34	3	8.82%	3.5	0	44.	37. U	40. U	40. U	4.3 U	4.4 U	37. U
Endosulfan I	UG/KG	34	11	32.35%	200	0	900.	19. U	20. U	20. U	2.2 U	2.3 U	200. J
Endosulfan II	UG/KG	34	6	17.65%	52	0	900.	50.	52.	40. U	4.3 U	4.4 U	26. J
Endosulfan sulfate	UG/KG	34	12	35.29%	110	0	1,000.	36. J	62.	40. U	4.6	4.4 U	37. U
Endrin	UG/KG	34	11	32.35%	120	1	100.	54.	40. U	40. U	4.3 U	4.4 U	29. J
Endrin aldehyde	UG/KG	34	19	55.88%	120	0		120.	86.	46.	6.1	4.4 U	37. U
Endrin ketone	UG/KG	34	18	52.94%	160	0		120.	62.	44.	11.	4.4 U	37. U
Gamma-BHC/Lindane	UG/KG	34	1	2.94%	4	0	60.	19. U	20. U	20. U	2.2 U	2.3 U	19. U
Gamma-Chlordane	UG/KG	34	4	11.76%	22	0	540.	19. U	20. U	20. U	2.2 U	2.3 U	19. U
Heptachlor	UG/KG	34	1	2.94%	1.2	0	100.	19. U	20. U	20. U	2.2 U	2.3 U	19. U

TABLE B-1
SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	ESI
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							SS71-6	SS71-7	SS71-7	SS71-8	SS71-9	TP71-1
	SAMP_ID:							71028	71026	71203	71019	71018	TP71-1-1
	FIELD QC CODE:							SA	SA	DU	SA	SA	SA
	SAMP. DETH TOP:							0	0	0	0	0	3
	SAMP. DEPTH BOT:							0.2	0.2	0.2	0.2	0.2	3
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							21-Nov-97	20-Nov-97	20-Nov-97	19-Nov-97	19-Nov-97	07-Jun-94
COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM						
Heptachlor epoxide	UG/KG	34	14	41.18%	180	4	20.	70.	12. J	15. J	2.2 U	2.3 U	19. U
Methoxychlor	UG/KG	34	12	35.29%	520	0		170. J	200. U	200. U	62.	23. U	190. U
METALS													
Aluminum	MG/KG	34	34	100.00%	18000	0	19,520.	2,860.	3,020.	3,040.	13,600.	15,900.	12,900.
Antimony	MG/KG	34	12	35.29%	19.3	1	6.	.76 UJ	.78 UJ	1.2 J	.84 UJ	.93 UJ	.19 J
Arsenic	MG/KG	34	34	100.00%	14.6	4	8.9	4.8	2.5	2.4	5.9	14.6	5.4
Barium	MG/KG	34	34	100.00%	179	0	300.	39.9 J	48.6 J	48.7 J	101. J	86.2 J	86.2
Beryllium	MG/KG	34	33	97.06%	0.88	0	1.13	.11	.16	.16	.38	.43	.58 J
Cadmium	MG/KG	34	15	44.12%	12.1	4	2.46	1.1 J	.07 UJ	.07 UJ	.07 UJ	.08 UJ	.53 J
Calcium	MG/KG	34	34	100.00%	295000	11	125,300.	261,000.	4,210.	9,990.	27,300.	9,080.	38,000. J
Chromium	MG/KG	34	34	100.00%	60.3	4	30.	14.6 J	10.2 J	12.6 J	22.2 J	23.8 J	18.4
Cobalt	MG/KG	34	34	100.00%	14.6	0	30.	6.4	5.6	5.	11.5	12.5	9.4
Copper	MG/KG	34	34	100.00%	134	12	33.	18.4 J	27.5 J	33.4 J	23.6 J	45.3 J	25.4
Iron	MG/KG	34	34	100.00%	65100	2	37,410.	11,000.	9,050.	10,200.	27,200.	38,000.	23,600.
Lead	MG/KG	34	34	100.00%	3470	22	24.4	99.9 J	64.7 J	72.4 J	74.3 J	33. J	96.9
Magnesium	MG/KG	34	[illegible]	100.00%	59300	[illegible]	[illegible]	18,500.	[illegible]	[illegible]	6,820	[illegible]	8,690.
Manganese	MG/KG	34	34	100.00%	853	0	1,100	427. J	175. J	188. J	743. J	735. J	497.
Mercury	MG/KG	34	16	47.06%	2.7	4	1	05 UJ	.05 J	.06 J	.06 UJ	.07 UJ	.03 J
Nickel	MG/KG	34	34	100.00%	110	2	50.	16.4	16.8	14.2	26.9	30.9	26.8
Potassium	MG/KG	34	34	100.00%	2940	1	2,623.	1,240.	574.	510.	1,750.	2,180.	1,340. J
Selenium	MG/KG	34	15	44.12%	1.8	0	2.	1. UJ	1. UJ	1.1 J	1.1 UJ	1.4 J	.43 J
Silver	MG/KG	34	5	14.71%	0.69	0	.8	.46 UJ	.47 UJ	.47 UJ	.51 UJ	.67 J	.07 UJ
Sodium	MG/KG	34	30	88.24%	1040	19	188.	297.	135. U	217.	215.	237.	54.9 J
Thallium	MG/KG	34	1	2.94%	2.3	1	.855	1.4 U	1.4 U	1.4 U	1.5 U	2.3	.25 U
Vanadium	MG/KG	34	34	100.00%	29.2	0	150.	11.	15.6	11.6	19.8	23.4	19.7
Zinc	MG/KG	34	33	97.06%	3660	13	115	94.4 J	128. J	182. J	118. J	95.5 J	96.2
OTHER ANALYSES	MG/KG												
Total Petroleum Hydrocarbons	MG/KG	26	22	84.62%	9060			174.	78.6	89.	292.	148.	
Nitrate/Nitrite Nitrogen		26	26	100.00%	30.2			.52	30.2	26.9	.03	.97	

TA 1

SOIL ANALYSIS RESULTS - SEAD-71

Decision Document - SEADs-59 and 71

Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM							
	STUDY ID:							ESI	ESI	ESI	ESI	ESI	ESI	ESI
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							TP71-1	TP71-1	TP71-1	TP71-2	TP71-2	TP71-2	TP71-2
	SAMP_ID:							TP71-1-2	TP71-1-3	TP71-1-4	TP71-2-1	TP71-2-2	TP71-2-3	TP71-2-4
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							3	3	4	1	2	2	2
	SAMP. DEPTH BOT:							3	3	4	1	2	3.3	2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94
VOLATILE ORGANICS														
1,1,1-Trichloroethane	UG/KG	34	6	17.65%	23	0	800.	7. J	10. J	23.	11. U	11. U	3. J	12. U
Acetone	UG/KG	34	2	5.88%	74	0	200.	12. U	11. U	12. U	11. U	11. U	12. U	12. U
Benzene	UG/KG	34	1	2.94%	2	0	60.	12. U	11. U	12. U	11. U	11. U	12. U	12. U
Ethyl benzene	UG/KG	34	2	5.88%	4	0	5,500.	12. U	11. U	12. U	11. U	11. U	12. U	12. U
Methylene chloride	UG/KG	34	9	26.47%	11	0	100.	2. J	2. J	2. J	2. J	2. J	3. J	11. J
Styrene	UG/KG	34	1	2.94%	1	0		12. U	11. U	12. U	11. U	11. U	12. U	12. U
Tetrachloroethene	UG/KG	34	4	11.76%	33	0	1,400.	1. J	3. J	12. U	11. U	11. U	12. U	12. U
Toluene	UG/KG	34	8	23.53%	16	0	1,500.	12. U	11. U	12. U	11. U	11. U	12. U	12. U
Total Xylenes	UG/KG	34	4	11.76%	96	0	1,200.	12. U	11. U	12. U	11. U	11. U	12. U	12. U
SEMIVOLATILE ORGANICS														
2-Methylnaphthalene	UG/KG	34	14	41.18%	31000	0	36,400.	29. J	370. U	390. U	1,500. U	380. U	420. U	380. U
Acenaphthene	UG/KG	34	24	70.59%	42000	0	50,000.	280. J	76. J	38. J	1,500. U	380. U	420. U	380. U
Acenaphthylene	UG/KG	34	5	14.71%	340	0	41,000.	500. U	370. U	390. U	1,500 U	380. U	420. U	380. U
Anthracene	UG/KG	34	27	79.41%	100000	3	50,000	560	120. J	59 J	1,500 U	380 U	420. U	360 U
Benzo[a]anthracene	UG/KG	34	[illegible]	[illegible]	[illegible]	[illegible]	224	1,200.	660.	160 J	370	250. J	420 U	[illegible]
Benzo[a]pyrene	UG/KG	34	31	91.18%	[illegible]	29	61.	750.	630.	160. J	490. J	290. J	420. U	94. J
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	88000	16	1,100.	930.	710.	130. J	750 J	400.	420. U	110. J
Benzo[ghi]perylene	UG/KG	34	30	88.24%	62000	1	50,000.	500.	500.	82. J	370. J	150. J	420. U	36. J
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	13	1,100.	570.	490.	140. J	490. J	240. J	420. U	77. J
Bis(2-Ethylhexyl)phthalate	UG/KG	34	3	8.82%	15	0	50,000.	500. U	370. U	390. U	1,500. U	380. U	420. U	380. U
Carbazole	UG/KG	34	28	82.35%	77000	0		360. J	100. J	30. J	1,500. U	380. U	420. U	380. U
Chrysene	UG/KG	34	32	94.12%	150000	23	400.	1,000.	750.	220. J	610. J	360 J	420. U	130. J
Di-n-butylphthalate	UG/KG	34	2	5.88%	140	0	8,100.	500. U	370. U	390. U	1,500. U	380. U	420. U	380. U
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	27	14	190. J	320. J	38. J	170. J	130. J	420. U	380. U
Dibenzofuran	UG/KG	34	22	64.71%	38000	5	6,200.	120. J	370. U	390. U	1,500. U	380. U	420. U	380. U
Fluoranthene	UG/KG	34	33	97.06%	440000	7	50,000.	2,600.	1,400.	330. J	690. J	580.	63. J	240. J
Fluorene	UG/KG	34	25	73.53%	62000	1	50,000.	230. J	56. J	390. U	1,500. U	380. U	420. U	380. U
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	9	3,200.	390. J	520.	88. J	430. J	220. J	420. U	52. J
Naphthalene	UG/KG	34	15	44.12%	46000	2	13,000.	77. J	370. U	29. J	1,500 U	380. U	420. U	380. U
Phenanthrene	UG/KG	34	32	94.12%	290000	6	50,000.	1,900	770.	260. J	270. J	180. J	30. J	80. J
Phenol	UG/KG	34	1	2.94%	4.5	0	30.	500. U	370. U	390. U	1,500. U	380. U	420. U	380. U
Pyrene	UG/KG	34	33	97.06%	280000	7	50,000.	1,600.	2,000.	390.	1,000. J	660.	73. J	260. J
PESTICIDES/PCBS														
4,4`-DDD	UG/KG	34	11	32.35%	240	0	2,900.	3.7 U	3.7 U	3.9 U	3.4 J	3.8 U	4.2 U	3.8 U
4,4`-DDE	UG/KG	34	21	61.76%	810	0	2,100.	3.7 U	3.1 J	4.2 J	3.7 U	3.8 U	4.2 U	3.8 U
4,4`-DDT	UG/KG	34	22	64.71%	1300	0	2,100.	3.7 U	8.4	13.	2.7 J	3.8 U	4.2 U	3.8 U
Alpha-BHC	UG/KG	34	8	23.53%	18	0	110.	1.9 U	1.9 U	2. U	1.9 U	2. U	2.2 U	2. U
Alpha-Chlordane	UG/KG	34	2	5.88%	74	0		1.9 U	1.9 U	2. U	2. J	2. U	2.2 U	2. U
Beta-BHC	UG/KG	34	7	20.59%	32	0	200.	1.9 U	1.9 U	2. U	1.9 U	2. U	2.2 U	2. U
Delta-BHC	UG/KG	34	1	2.94%	1.8	0	300.	1.9 U	1.9 U	2. U	1.9 U	2. U	2.2 U	2. U
Dieldrin	UG/KG	34	3	8.82%	3.5	0	44.	3.5 J	3.7 U	3.9 U	3.7 U	3.8 U	4.2 U	3.8 U
Endosulfan I	UG/KG	34	11	32.35%	200	0	900.	3.5	6.6 J	2.8 J	5.1 J	6.9 J	2.2 U	3.4 J
Endosulfan II	UG/KG	34	6	17.65%	52	0	900.	2.5 J	3.7 U	3.9 U	2. J	3.8 U	4.2 U	3.8 U
Endosulfan sulfate	UG/KG	34	12	35.29%	110	0	1,000.	3.7 U	3.7 U	3.9 U	2.2 J	3.8 U	4.2 U	3.8 U
Endrin	UG/KG	34	11	32.35%	120	1	100.	3.7 U	3.7 U	3.9 U	3.7 U	3.8 U	4.2 U	3.8 U
Endrin aldehyde	UG/KG	34	19	55.88%	120	0		3.7 U	3.7 U	3.9 U	3.7 U	3.8 U	4.2 U	3.8 U
Endrin ketone	UG/KG	34	18	52.94%	160	0		3.7 U	3.7 U	3.9 U	3.7 U	3.8 U	4.2 U	3.8 U
Gamma-BHC/Lindane	UG/KG	34	1	2.94%	4	0	60.	1.9 U	1.9 U	2. U	1.9 U	2. U	2.2 U	2. U
Gamma-Chlordane	UG/KG	34	4	11.76%	22	0	540.	1.9 U	1.9 U	2. U	1.9 U	2. U	2.2 U	2. U
Heptachlor	UG/KG	34	1	2.94%	1.2	0	100.	1.2 J	1.9 U	2. U	1.9 U	2. U	2.2 U	2. U

TABLE B-1
SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM							
	STUDY ID.							ESI	ESI	ESI	ESI	ESI	ESI	ESI
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							TP71-1	TP71-1	TP71-1	TP71-2	TP71-2	TP71-2	TP71-2
	SAMP_ID:							TP71-1-2	TP71-1-3	TP71-1-4	TP71-2-1	TP71-2-2	TP71-2-3	TP71-2-4
	FIELD QC CODE:							SA	SA	SA	SA	SA	SA	SA
	SAMP. DETH TOP:							3	3	4	1	2	2	2
	SAMP. DEPTH BOT:							3	3	4	1	2	3.3	2
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94	07-Jun-94
Heptachlor epoxide	UG/KG	34	14	41.18%	180	4	20.	1.9 U	1.9 U	2. U	1.9 U	2. U	2.2 U	2. U
Methoxychlor	UG/KG	34	12	35.29%	520	0		19. U	19. U	20. U	19. U	20. U	22. U	20. U
METALS														
Aluminum	MG/KG	34	34	100.00%	18000	0	19,520.	13,100.	10,900.	9,960.	9,630.	12,500.	18,000.	15,200.
Antimony	MG/KG	34	12	35.29%	19.3	1	6.	.27 UJ	.23 UJ	.47 J	.21 J	.18 UJ	.23 UJ	.25 UJ
Arsenic	MG/KG	34	34	100.00%	14.6	4	8.9	5.1	5.2	4.8	4.2	4.8	7.6	7.8
Barium	MG/KG	34	34	100.00%	179	0	300.	69.2	69 8	63.5	37.5	57.6	108.	76.1
Beryllium	MG/KG	34	33	97.06%	0.88	0	1.13	.56 J	.53 J	.47 J	.44 J	.48 J	.88 J	.7 J
Cadmium	MG/KG	34	15	44.12%	12.1	4	2.46	.39 J	.45 J	.45 J	.44 J	.43 J	.45 J	.48 J
Calcium	MG/KG	34	34	100.00%	295000	11	125,300.	52,800. J	32,200 J	36,500. J	10,500. J	37,200. J	4,260. J	27,300. J
Chromium	MG/KG	34	34	100.00%	60.3	4	30.	17.9	16.3	15.5	18.1	16.7	25.8	22.
Cobalt	MG/KG	34	34	100.00%	14.6	0	30.	9.3 J	9.7	8.7 J	11.4	9.	14.6	13.4
Copper	MG/KG	34	34	100.00%	134	12	33.	19.	23.	26.7	37.5	17.5	36.2	23.5
Iron	MG/KG	34	34	100.00%	65100	2	37,410.	22,700.	21,600	20,000.	22,400.	22,100.	32,700.	32,100.
Lead	MG/KG	34	34	100 00%	[illegible]	[illegible]	24.4	10 3	43.8	67.8	25.3	11 2	15 3	15.1
Magnesium	MG/KG	34	34	100.00%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4,830.	[illegible]	[illegible]	6,320
Manganese	MG/KG	34	34	100.00%	[illegible]	0	1,100.	390	474	458	255.	[illegible]	749.	503.
Mercury	MG/KG	34	16	47.06%	2 7	4	1	03 J	03 J	.03 J	.04 J	.15	.04 J	.02 J
Nickel	MG/KG	34	34	100.00%	110	2	50.	25.2	24.9	24.6	42 5	23 2	38.8	36.1
Potassium	MG/KG	34	34	100.00%	2940	1	2,623.	1,540. J	1,230 J	1 520. J	992. J	1,010. J	1,830. J	1,300. J
Selenium	MG/KG	34	15	44.12%	1 8	0	2.	.57 U	.47 U	.56 U	.91	.37 U	.61 J	.74 J
Silver	MG/KG	34	5	14.71%	0.69	0	.8	.11 UJ	09 UJ	.1 UJ	.06 UJ	07 UJ	.09 UJ	.1 UJ
Sodium	MG/KG	34	30	88 24%	[illegible]	19	188	108 J	140 J	[illegible] J	50. J	[illegible] J	17.6 U	37.2 J
Thallium	MG/KG	34	1	2.94%	2 3	1	855	.4 U	33 U	.4 U	.24 U	26 U	.34 U	.36 U
Vanadium	MG/KG	34	34	100.00%	29.2	0	150.	20.1	17 9	18.2	15.4	19.2	29.2	23.1
Zinc	MG/KG	34	33	97.06%	3660	13	115.	63.9	86 1	79.7	128.	58.9	71.8	79.3
OTHER ANALYSES	MG/KG													
Total Petroleum Hydrocarbons	MG/KG	26	22	84.62%	9060									
Nitrate/Nitrite Nitrogen		26	26	100.00%	30 2									

SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							TP71-3-1	TP71-3-2	TP71-4-2	TP71-5-1	TP71-6-1
	SAMP_ID:							71002	71003	71006	71007	71010
	FIELD QC CODE:							SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	10.5	10	7	12.5
	SAMP. DEPTH BOT:							8	11	10.5	7.5	13
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							14-Oct-97	14-Oct-97	14-Oct-97	14-Oct-97	15-Oct-97
VOLATILE ORGANICS												
1,1,1-Trichloroethane	UG/KG	34	6	17.65%	23	0	800.	11. U	110. U	12. U	12. U	4. J
Acetone	UG/KG	34	2	5.88%	74	0	200.	11. U	110. U	12. U	12. U	12. U
Benzene	UG/KG	34	1	2.94%	2	0	60.	11. U	110. U	12. U	12. U	12. U
Ethyl benzene	UG/KG	34	2	5.88%	4	0	5,500.	11. U	110. U	12. U	12. U	12. U
Methylene chloride	UG/KG	34	9	26.47%	11	0	100.	11. U	110. U	12. U	12. U	12. U
Styrene	UG/KG	34	1	2.94%	1	0		11. U	110. U	12. U	12. U	12. U
Tetrachloroethene	UG/KG	34	4	11.76%	33	0	1,400.	11. U	110. U	12. U	12. U	12. U
Toluene	UG/KG	34	8	23.53%	16	0	1,500.	11. U	110. U	12. U	12. U	12. U
Total Xylenes	UG/KG	34	4	11.76%	96	0	1,200.	3. J	96. J	12. U	12. U	12. U
SEMIVOLATILE ORGANICS												
2-Methylnaphthalene	UG/KG	34	14	41.18%	31000	0	36,400.	520.	31,000. J	78. U	78. U	78. U
Acenaphthene	UG/KG	34	24	70.59%	42000	0	50,000.	830. J	13,000. J	78. U	78. U	78. U
Acenaphthylene	UG/KG	34	5	14.71%	340	0	41,000	66. U	340. J	78. U	78. U	78. U
Anthracene	UG/KG	34	27	79.41%	100000	3	50,000	48. J	590. J	78. U	78. U	78. U
Benzo[a]anthracene	UG/KG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32. J	240. J	[illegible] U	18. J	
Benzo[a]pyrene	UG/KG	34	31	91.18%	120000	29	[illegible]	66. U	160. J	78. U	19. J	[illegible]
Benzo[b]fluoranthene	UG/KG	34	31	91.18%	85000	16	1,100	66. U	130. J	78. U	21. J	4.4 J
Benzo[ghi]perylene	UG/KG	34	30	88.24%	62000	1	50,000.	66. U	76. J	78. U	12. J	78. U
Benzo[k]fluoranthene	UG/KG	34	24	70.59%	130000	13	1,100.	66. U	98. J	78. U	24. J	4.6 J
Bis(2-Ethylhexyl)phthalate	UG/KG	34	3	8.82%	15	0	50,000.	66. U	760. U	7.8 J	15. J	7.6 J
Carbazole	UG/KG	34	28	82.35%	77000	0		40. J	380. J	78. U	4.2 J	78. U
Chrysene	UG/KG	34	32	94.12%	150000	23	400	49. J	290. J	78. U	28. J	4.6 J
Di-n-butylphthalate	UG/KG	34	2	5.88%	140	0	8,100	66. U	760. U	78. U	78. U	78. U
Dibenz[a,h]anthracene	UG/KG	34	28	82.35%	25000	27	14.	66. U	760. U	78. U	4.4 J	78. U
Dibenzofuran	UG/KG	34	22	64.71%	38000	5	6,200	670. J	11,000. J	78. U	78. U	78. U
Fluoranthene	UG/KG	34	33	97.06%	440000	7	50,000.	220.	1,900.	78. U	52. J	6.9 J
Fluorene	UG/KG	34	25	73.53%	62000	1	50,000.	270.	4,100.	78. U	78. U	78. U
Indeno[1,2,3-cd]pyrene	UG/KG	34	30	88.24%	65000	9	3,200	66. U	56. J	78. U	12. J	78. U
Naphthalene	UG/KG	34	15	44.12%	46000	2	13,000.	590. J	17,000. J	78. U	78. U	78. U
Phenanthrene	UG/KG	34	32	94.12%	290000	6	50,000.	350.	3,800.	78. U	24. J	78. U
Phenol	UG/KG	34	1	2.94%	4.5	0	30.	4.5 J	760. U	78. U	78. U	78. U
Pyrene	UG/KG	34	33	97.06%	280000	7	50,000.	370.	1,700.	78. U	44. J	6. J
PESTICIDES/PCBS												
4,4'-DDD	UG/KG	34	11	32.35%	240	0	2,900.	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U
4,4'-DDE	UG/KG	34	21	61.76%	810	0	2,100.	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U
4,4'-DDT	UG/KG	34	22	64.71%	1300	0	2,100.	3.9 U	5.1 J	3.9 U	3.9 U	3.9 U
Alpha-BHC	UG/KG	34	8	23.53%	18	0	110.	2. U	2. U	2.9	4.9	18.
Alpha-Chlordane	UG/KG	34	2	5.88%	74	0		2. U	2. U	2. U	2. U	2. U
Beta-BHC	UG/KG	34	7	20.59%	32	0	200.	2. U	2. U	2. U	2. J	2.7
Delta-BHC	UG/KG	34	1	2.94%	1.8	0	300.	2. U	2. U	2. U	2. U	1.8 J
Dieldrin	UG/KG	34	3	8.82%	3.5	0	44.	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U
Endosulfan I	UG/KG	34	11	32.35%	200	0	900.	2. U	2. U	2. U	2. U	2. U
Endosulfan II	UG/KG	34	6	17.65%	52	0	900.	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U
Endosulfan sulfate	UG/KG	34	12	35.29%	110	0	1,000.	3.9 U	3.8 U	3.9 U	3.9 U	3.9 U
Endrin	UG/KG	34	11	32.35%	120	1	100.	3.9 U	3.7 J	3.9 U	3.9 U	3.9 U
Endrin aldehyde	UG/KG	34	19	55.88%	120	0		3.9 U	7.2 J	3.9 U	3. J	3.9 U
Endrin ketone	UG/KG	34	18	52.94%	160	0		3.9 U	2.2 J	3.9 U	3.9 U	3.9 U
Gamma-BHC/Lindane	UG/KG	34	1	2.94%	4	0	60.	2. U	2. U	2. U	2. U	4.
Gamma-Chlordane	UG/KG	34	4	11.76%	22	0	540.	2. U	1.1 J	2. U	2. U	2. U
Heptachlor	UG/KG	34	1	2.94%	1.2	0	100.	2. U	2. U	2. U	2. U	2. U

TABLE B-1
SOIL ANALYSIS RESULTS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	UNIT	Number of Analyses	Number of Detections	Frequency of Detection	Maximum Value	Number of Exceedances	TAGM					
	STUDY ID:							RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1	RI Phase 1 Step 1
	SDG							SEAD-71	SEAD-71	SEAD-71	SEAD-71	SEAD-71
	ES ID							TP71-3-1	TP71-3-2	TP71-4-2	TP71-5-1	TP71-6-1
	SAMP_ID:							71002	71003	71006	71007	71010
	FIELD QC CODE:							SA	SA	SA	SA	SA
	SAMP. DETH TOP:							0	10.5	10	7	12.5
	SAMP. DEPTH BOT:							8	11	10.5	7.5	13
	MATRIX:							SOIL	SOIL	SOIL	SOIL	SOIL
	SAMP. DATE:							14-Oct-97	14-Oct-97	14-Oct-97	14-Oct-97	15-Oct-97
Heptachlor epoxide	UG/KG	34	14	41.18%	180	4	20.	2. U	1.5 J	2. U	2. U	2. U
Methoxychlor	UG/KG	34	12	35.29%	520	0		20. U	19. J	20. U	20. U	20. U
METALS												
Aluminum	MG/KG	34	34	100.00%	18000	0	19,520.	8,090. J	8,430. J	14,500. J	12,400.	9,400.
Antimony	MG/KG	34	12	35.29%	19.3	1	6.	.56 UJ	.52 UJ	.68 UJ	.65 UJ	.64 UJ
Arsenic	MG/KG	34	34	100.00%	14.6	4	8.9	4.3	2.9	3.1	5.3	4.1
Barium	MG/KG	34	34	100.00%	179	0	300.	51.3	60.6	94.1	78.1	48.8
Beryllium	MG/KG	34	33	97.06%	0.88	0	1.13	.21	.13	.56	.31	.31
Cadmium	MG/KG	34	15	44.12%	12.1	4	2.46	.08 U	.07 U	.09 U	.09 U	.09 U
Calcium	MG/KG	34	34	100.00%	295000	11	125,300.	**134,000.**	66,100.	36,000.	42,800.	46,600.
Chromium	MG/KG	34	34	100.00%	60.3	4	30.	12.9	13.9	21.2	17.6	14.5
Cobalt	MG/KG	34	34	100.00%	14.6	0	30.	11.	7.	9.	9.4	8.6
Copper	MG/KG	34	34	100.00%	134	12	33.	15.2	17.1	19.1	19.4	18.8
Iron	MG/KG	34	34	100.00%	65100	2	37,410.	18,000	15,900.	21,600.	21,500.	19,200.
Lead	MG/KG	34	34	100.00%	3470	22	24.4	8.9 J	7.6 J	9.8 J	16.	7.3
Magnesium	MG/KG	34	34	[illegible]	[illegible]	6	21,700	[illegible]	17,700	[illegible]	[illegible]	10,100
Manganese	MG/KG	34	34	100.00%	853	0	1,100	784 J	853. J	345 J	623.	345
Mercury	MG/KG	34	16	47.06	2.7	4	.1	.05 U	.05 U	.05 U	.05 U	.05 U
Nickel	MG/KG	34	34	100.00%	110	2	50.	26.2	21	28.	24.1	23.3
Potassium	MG/KG	34	34	100.00%	2940	1	2,623	1,120	1,440.	**2,940.**	1,950.	1,340.
Selenium	MG/KG	34	15	44.12%	1.8	0	2.	.77 U	.72 U	.93 U	1.2	.88 U
Silver	MG/KG	34	5	14.71%	0.69	0	8	.21 U	.2 U	.26 U	.25 U	.24 U
Sodium	MG/KG	34	30	88.24%	1040	19	188	83.3 J	92	109	108. U	138.
Thallium	MG/KG	34	1	2.94%	2.3	1	.855	1.2 U	1.1 U	1.4 U	.92 UJ	.91 UJ
Vanadium	MG/KG	34	34	100.00%	29.2	0	150.	15.1	15.	24.9	20.2	14.8
Zinc	MG/KG	34	33	97.06%	3660	13	115.	57. J	64.3 J	61.5 J	82.1	73.4
OTHER ANALYSES	MG/KG											
Total Petroleum Hydrocarbons	MG/KG	26	22	84.62%	9060			1,800.	9,060.	23.3 U	24.4 U	74.
Nitrate/Nitrite Nitrogen		26	26	100.00%	30.2			.02	.06	.02	.21	.02

TABLE B-2
GROUNDWATER ANALYSIS RESULTS FROM SEAD-71 ESI
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	MATRIX LOCATION SAMPLE DATE ES ID LAB ID SDG NUMBER UNITS	MAXIMUM	FREQUENCY OF DETECTION	LOWEST CRITERIA (a)	CRITERIA	NUMBER ABOVE CRITERIA	WATER SEAD-71 3/29/1994 MW71-1 215839 43179	WATER SEAD-71 7/7/1994 MW71-3 226311 45257
METALS								
Aluminum	ug/L	19700	100%	50	SEC. MCL	2	19700	334
Arsenic	ug/L	2.7	50%	5	MCL	0	2.7 J	2 U
Barium	ug/L	164	100%	1000	GA	0	164 J	37.7 J
Beryllium	ug/L	0.88	50%	4	MCL	0	0.88 J	0.1 U
Cadmium	ug/L	0.33	50%	5	GA	0	0.33 J	0.2 U
Calcium	ug/L	212000	100%	NA		0	212000	146000
Chromium	ug/L	33.1	100%	50	GA	0	33.1	0.59 J
Cobalt	ug/L	22.1	100%	NA		0	22.1 J	1.1 J
Copper	ug/L	16.1	100%	200	GA	0	16.1 J	0.75 J
Iron	ug/L	35100	100%	300	GA	2	35100	613
Lead	ug/L	17.2	50%	15	MCL	1	17.2	0.89 U
Magnesium	ug/L	32400	100%	NA		0	32400	18000
Manganese	ug/L	1680	100%	50	SEC. MCL	2	1680	557
Mercury	ug/L	0.06	100%	0.7	GA	0	0.06 J	0.05 J
Nickel	ug/L	49.4	100%	100	GA	0	49.4	2.6 J
Potassium	ug/L	4910	100%	NA		0	3260 J	4910 J
Sodium	ug/L	9180	100%	20,000	GA	0	9180	4130 J
Thallium	ug/L	2.5	50%	2	MCL	1	1.6 U	2.5 J
Vanadium	ug/L	25.7	100%	NA		0	25.7 J	0.9 J
Zinc	ug/L	97.3	100%	5000	SEC. MCL	0	97.3	6.5 J
OTHER ANALYSES								
pH	Standard Units						6.8	7.1
Conductivity	umhos/cm						620	660
Temperature	°C						6.1	17.5
Turbidity	NTU						1860	64

NOTES:
GA = NY State Class GA Groundwater Regulations
MCL = Federal Primary Drinking Water Maximum Contaminant Levels (40 CRF 141.61-62 and 40 CFR 143.3)
SEC MCL = Federal Secondary Drinking Water Maximum Contaminant Levels
NA = Not Available
U = The compound was not detected below this concentration.
J = The reported value is an estimated concentration.
UJ = The compound may have been present above this concentration,
but was not detected due to problems with the analysis.
R = The data was rejected during the data validation process.

TABLE B-3
INORGANICS ANALYSIS OF SOIL
Decision Document SEADs- 59 and 71
Seneca Army Depot Activity

	Average of SEAD-71 Soils mg/Kg	2 x Average of Background Soils mg/Kg	Is Average of Site data > 2 x Average of Background Data?
Aluminum	9,151	26,411	NO
Antimony	1.24	5.46	NO
Arsenic	5.61	10.43	NO
Barium	73	158	NO
Beryllium	0.33	1.33	NO
Cadmium	0.96	1.08	NO
Calcium	91,278	93,716	NO
Chromium	20	40	NO
Cobalt	9	23	NO
Copper	34	42	NO
Cyanide	0.30	0.60	NO
Iron	22,852	49,321	NO
Lead	189	35	YES
Magnesium	13,191	20,901	NO
Manganese	486	1,218	NO
Mercury	0.130	0.076	YES
Nickel	29	62	NO
Potassium	1,405	2,991	NO
Selenium	0.79	0.71	YES
Silver	0.25	0.77	NO
Sodium	233	178	YES
Thallium	1	2.40	NO
Vanadium	17	42	NO
Zinc	384	143	YES

Table B-4
SEAD-71 Groundwater Exposure Point Concentration Summary

Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

COMPOUND	Average of SEAD-71 Groundwater µg/L	Average of Background Groundwater µg/L	2 x Average of Background Groundwater µg/L	Is Average of Site data > 2 x Average of Background Data?
Aluminum	10017	2730	5460	YES
Arsenic	1.85	1.7	3.4	NO
Barium	100.85	78.2	156.4	NO
Beryllium	0.465	0.21	0.42	YES
Cadmium	0.215	0.5	1	NO
Calcium	179000	116000	232000	NO
Chromium	16.845	4.7	9.4	YES
Cobalt	11.6	3.7	7.4	YES
Copper	8.425	3.3	6.6	YES
Iron	17856.5	4480	8960	YES
Lead	8.8225	2.5	5	YES
Magnesium	25200	28600	57200	NO
Manganese	1118.5	224	448	YES
Mercury	0.055	0.04	0.08	NO
Nickel	26	7.3	14.6	YES
Potassium	4085	3830	7660	NO
Sodium	6655	14600	29200	NO
Thallium	1.65	1.5	3	NO
Vanadium	13.3	5.2	10.4	YES
Zinc	51.9	23.1	46.2	YES

Table B-5
SEAD-71 Total Soil Exposure Point Concentration Summary
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organic Compounds										
1,1,1-Trichloroethane	34	0	6	18%	7.94E-03	8.89E-03	2.30E-02	FALSE	8.66E-03	8.66E-03
Acetone	34	0	2	6%	9.50E-03	1.42E-02	7.40E-02	FALSE	9.95E-03	9.95E-03
Benzene	33	1	1	3%	5.91E-03	9.72E-04	2.00E-03	FALSE	6.35E-03	2.00E-03
Ethyl benzene	33	1	2	6%	5.82E-03	6.23E-04	4.00E-03	FALSE	6.03E-03	4.00E-03
Methylene chloride	34	0	9	26%	6.75E-03	8.78E-03	1.10E-02	FALSE	7.94E-03	7.94E-03
Styrene	33	1	1	3%	5.88E-03	1.10E-03	1.00E-03	FALSE	6.65E-03	1.00E-03
Tetrachloroethene	34	0	4	12%	7.91E-03	9.66E-03	3.30E-02	FALSE	9.55E-03	9.55E-03
Toluene	34	0	8	24%	7.50E-03	8.65E-03	1.60E-02	FALSE	8.20E-03	8.20E-03
Total BTEX	9	0	5	56%	3.42E-03	3.29E-03	1.16E-02	FALSE	7.37E-03	7.37E-03
Total Xylenes	34	0	4	12%	8.75E-03	1.55E-02	9.60E-02	FALSE	8.80E-03	8.80E-03
Semivolatile Organic Compounds										
2-Methylnaphthalene	33	1	14	42%	2.86E+00	6.42E+00	3.10E+01	FALSE	2.87E+01	2.87E+01
Acenaphthene	34	0	24	71%	4.32E+00	9.87E+00	4.20E+01	FALSE	3.76E+01	3.76E+01
Acenaphthylene	26	8	5	19%	2.94E-01	3.29E-01	5.10E-01	FALSE	6.73E-01	5.10E-01
Anthracene	34	0	27	79%	1.11E+01	2.69E+01	1.00E+02	FALSE	1.11E+02	1.00E+02
Benzo(a)anthracene	34	0	32	94%	1.87E+01	3.83E+01	1.50E+02	FALSE	5.67E+02	1.50E+02
Benzo(a)pyrene	34	0	31	91%	1.53E+01	3.08E+01	1.20E+02	FALSE	3.81E+02	1.20E+02
Benzo(b)fluoranthene	34	0	31	91%	1.38E+01	2.47E+01	8.80E+01	FALSE	3.70E+02	8.80E+01
Benzo(ghi)perylene	34	0	30	88%	8.22E+00	1.59E+01	6.20E+01	FALSE	1.08E+02	6.20E+01
Benzo(k)fluoranthene	34	0	24	71%	1.51E+01	3.18E+01	1.30E+02	FALSE	4.33E+02	1.30E+02
Bis(2-Ethylhexyl)phthal	26	8	3	12%	3.00E-01	3.29E-01	1.50E-02	FALSE	9.86E-01	1.50E-02
Carbazole	34	0	28	82%	6.93E+00	1.64E+01	7.70E+01	FALSE	7.61E+01	7.61E+01
Chrysene	34	0	32	94%	1.91E+01	3.69E+01	1.50E+02	FALSE	5.59E+02	1.50E+02
Di-n-butylphthalate	26	8	2	8%	2.54E-01	2.39E-01	1.40E-01	FALSE	6.06E-01	1.40E-01
Dibenz(a,h)anthracene	34	0	28	82%	3.60E+00	6.75E+00	2.50E+01	FALSE	2.89E+01	2.50E+01
Dibenzofuran	34	0	22	65%	3.39E+00	7.98E+00	3.80E+01	FALSE	1.75E+01	1.75E+01
Fluoranthene	34	0	33	97%	4.66E+01	9.83E+01	4.40E+02	FALSE	2.22E+03	4.40E+02
Fluorene	34	0	25	74%	5.25E+00	1.36E+01	6.20E+01	FALSE	3.22E+01	3.22E+01
Indeno(1,2,3-cd)pyrene	34	0	30	88%	8.07E+00	1.58E+01	6.50E+01	FALSE	1.01E+02	6.50E+01
Naphthalene	34	0	15	44%	3.88E+00	8.87E+00	4.60E+01	FALSE	3.92E+01	3.92E+01
Phenanthrene	34	0	32	94%	3.47E+01	7.88E+01	2.90E+02	FALSE	1.06E+03	2.90E+02
Phenol	26	8	1	4%	3.03E-01	3.27E-01	4.50E-03	FALSE	8.26E-01	4.50E-03
Pyrene	34	0	33	97%	3.66E+01	7.23E+01	2.80E+02	FALSE	1.44E+03	2.80E+02
Pesticides										
4,4'-DDD	34	0	12	35%	2.18E-02	4.50E-02	2.40E-01	FALSE	4.15E-02	4.15E-02
4,4'-DDE	34	0	21	62%	7.78E-02	1.71E-01	8.10E-01	FALSE	2.37E-01	2.37E-01
4,4'-DDT	34	0	23	68%	1.70E-01	3.63E-01	1.30E+00	FALSE	8.08E-01	8.08E-01
Alpha-BHC	33	0	7	21%	5.14E-03	4.97E-03	1.80E-02	FALSE	9.01E-03	9.01E-03
Alpha-Chlordane	33	0	2	6%	6.24E-03	1.29E-02	7.40E-02	FALSE	9.65E-03	9.65E-03
Beta-BHC	34	0	8	24%	6.60E-03	8.85E-03	3.50E-02	FALSE	1.20E-02	1.20E-02
Delta-BHC	33	0	1	3%	4.28E-03	4.32E-03	1.80E-03	FALSE	7.09E-03	1.80E-03
Dieldrin	33	0	3	9%	8.38E-03	8.36E-03	3.50E-03	FALSE	1.38E-02	3.50E-03
Endosulfan I	33	0	11	33%	1.11E-02	3.42E-02	2.00E-01	FALSE	1.51E-02	1.51E-02
Endosulfan II	33	0	7	21%	1.19E-02	1.57E-02	5.20E-02	FALSE	2.18E-02	2.18E-02
Endosulfan sulfate	33	0	13	39%	1.80E-02	2.83E-02	1.10E-01	FALSE	3.65E-02	3.65E-02
Endrin	34	0	12	35%	1.64E-02	2.50E-02	1.20E-01	FALSE	3.24E-02	3.24E-02
Endrin aldehyde	34	0	20	59%	2.34E-02	3.28E-02	1.20E-01	FALSE	5.24E-02	5.24E-02
Endrin ketone	34	0	18	53%	3.35E-02	5.17E-02	1.80E-01	FALSE	9.33E-02	9.33E-02
Gamma-BHC/Lindane	33	0	1	3%	4.34E-03	4.30E-03	4.00E-03	FALSE	7.29E-03	4.00E-03
Gamma-Chlordane	34	0	5	15%	5.91E-03	9.04E-03	4.80E-02	FALSE	1.00E-02	1.00E-02
Heptachlor	33	0	1	3%	4.26E-03	4.33E-03	1.20E-03	FALSE	7.06E-03	1.20E-03
Heptachlor epoxide	34	0	14	41%	1.31E-02	3.23E-02	1.80E-01	FALSE	2.35E-02	2.35E-02
Methoxychlor	34	0	12	35%	8.29E-02	1.13E-01	5.20E-01	FALSE	1.74E-01	1.74E-01
Metals										
Lead	34	0	34	100%	1.85E+02	5.92E+02	3.47E+03	FALSE	2.67E+02	2.67E+02
Mercury	34	0	16	47%	1.27E-01	4.58E-01	2.70E+00	FALSE	1.00E-01	1.00E-01
Selenium	34	0	15	44%	7.78E-01	4.94E-01	1.80E+00	FALSE	9.74E-01	9.74E-01
Sodium	34	0	29	85%	2.27E+02	2.09E+02	1.04E+03	FALSE	3.77E+02	3.77E+02
Zinc	34	0	33	97%	3.76E+02	7.57E+02	3.66E+03	FALSE	4.79E+02	4.79E+02

Table B-6
SEAD-71 Surface Soil (0ft - 2ft) Exposure Point Concentration Summary
Decision Document - SEAD-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organic Compounds										
Acetone	24	0	2	8%	8.96E-03	1.39E-02	7.40E-02	FALSE	9.63E-03	9.63E-03
Benzene	24	0	1	4%	5.92E-03	1.14E-03	2.00E-03	FALSE	6.55E-03	2.00E-03
Ethyl benzene	24	0	2	8%	5.79E-03	7.21E-04	4.00E-03	FALSE	6.08E-03	4.00E-03
Methylene chloride	24	0	4	17%	5.83E-03	1.93E-03	1.10E-02	FALSE	7.02E-03	7.02E-03
Styrene	24	0	1	4%	5.88E-03	1.30E-03	1.00E-03	FALSE	7.02E-03	1.00E-03
Tetrachloroethene	24	0	1	4%	7.23E-03	5.54E-03	3.30E-02	FALSE	8.01E-03	8.01E-03
Toluene	24	0	8	33%	6.13E-03	2.49E-03	1.60E-02	FALSE	7.04E-03	7.04E-03
Total Xylenes	24	0	2	8%	6.29E-03	1.27E-03	1.10E-02	FALSE	6.68E-03	6.68E-03
Semivolatile Organic Compounds										
2-Methylnaphthalene	22	2	11	50%	1.98E+00	4.18E+00	1.90E+01	FALSE	4.19E+01	1.90E+01
Acenaphthene	24	0	18	75%	5.28E+00	1.14E+01	4.20E+01	FALSE	1.19E+02	4.20E+01
Acenaphthylene	24	0	4	17%	5.79E+00	1.07E+01	5.10E-01	FALSE	1.04E+02	5.10E-01
Anthracene	24	0	21	88%	1.52E+01	3.12E+01	1.00E+02	FALSE	5.05E+02	1.00E+02
Benzo(a)anthracene	24	0	24	100%	2.48E+01	4.38E+01	1.50E+02	FALSE	5.50E+02	1.50E+02
Benzo(a)pyrene	24	0	24	100%	2.06E+01	3.52E+01	1.20E+02	FALSE	3.51E+02	1.20E+02
Benzo(b)fluoranthene	24	0	24	100%	1.84E+01	2.78E+01	8.80E+01	FALSE	2.13E+02	8.80E+01
Benzo(ghi)perylene	24	0	24	100%	1.12E+01	1.81E+01	6.20E+01	FALSE	1.86E+02	6.20E+01
Benzo(k)fluoranthene	24	0	17	71%	2.07E+01	3.65E+01	1.30E+02	FALSE	1.12E+03	1.30E+02
Carbazole	24	0	21	88%	9.37E+00	1.90E+01	7.70E+01	FALSE	1.31E+02	7.70E+01
Chrysene	24	0	24	100%	2.54E+01	4.19E+01	1.50E+02	FALSE	4.72E+02	1.50E+02
Di-n-butylphthalate	17	7	2	12%	3.08E-01	2.70E-01	1.40E-01	FALSE	1.19E+00	1.40E-01
Dibenz(a,h)anthracene	24	0	23	96%	4.64E+00	7.60E+00	2.50E+01	FALSE	4.79E+01	2.50E+01
Dibenzofuran	24	0	19	79%	3.89E+00	9.13E+00	3.80E+01	FALSE	4.07E+01	3.80E+01
Fluoranthene	24	0	24	100%	6.21E+01	1.13E+02	4.40E+02	FALSE	1.93E+03	4.40E+02
Fluorene	24	0	20	83%	7.11E+00	1.59E+01	6.20E+01	FALSE	1.79E+02	6.20E+01
Indeno(1,2,3-cd)pyrene	24	0	24	100%	1.09E+01	1.80E+01	6.50E+01	FALSE	1.59E+02	6.50E+01
Naphthalene	22	2	11	50%	3.44E+00	9.78E+00	4.60E+01	FALSE	4.84E+01	4.60E+01
Phenanthrene	24	0	24	100%	4.61E+01	9.10E+01	2.90E+02	FALSE	2.46E+03	2.90E+02
Pyrene	24	0	24	100%	4.90E+01	8.25E+01	2.80E+02	FALSE	1.34E+03	2.80E+02
Pesticides										
4,4'-DDD	24	0	12	50%	2.94E-02	5.18E-02	2.40E-01	FALSE	8.60E-02	8.60E-02
4,4'-DDE	24	0	19	79%	1.09E-01	1.96E-01	8.10E-01	FALSE	3.77E-01	3.77E-01
4,4'-DDT	24	0	20	83%	2.38E-01	4.15E-01	1.30E+00	FALSE	1.46E+00	1.30E+00
Alpha-BHC	23	0	4	17%	5.58E-03	4.74E-03	1.40E-02	FALSE	1.18E-02	1.18E-02
Alpha-Chlordane	23	0	1	4%	5.34E-03	4.50E-03	2.00E-03	FALSE	1.13E-02	2.00E-03
Beta-BHC	24	0	6	25%	8.47E-03	9.87E-03	3.50E-02	FALSE	2.20E-02	2.20E-02
Dieldrin	23	0	2	9%	1.04E-02	8.75E-03	3.40E-03	FALSE	2.21E-02	3.40E-03
Endosulfan I	23	0	7	30%	6.45E-03	5.01E-03	1.50E-02	FALSE	1.36E-02	1.36E-02
Endosulfan II	23	0	5	22%	1.51E-02	1.72E-02	5.20E-02	FALSE	4.04E-02	4.04E-02
Endosulfan sulfate	23	0	13	57%	2.42E-02	3.20E-02	1.10E-01	FALSE	7.26E-02	7.26E-02
Endrin	24	0	10	42%	2.12E-02	2.80E-02	1.20E-01	FALSE	5.96E-02	5.96E-02
Endrin aldehyde	24	0	18	75%	3.14E-02	3.61E-02	1.20E-01	FALSE	9.29E-02	9.29E-02
Endrin ketone	24	0	17	71%	4.60E-02	5.72E-02	1.80E-01	FALSE	1.72E-01	1.72E-01
Gamma-Chlordane	24	0	4	17%	7.60E-03	1.02E-02	4.80E-02	FALSE	1.75E-02	1.75E-02
Heptachlor epoxide	24	0	13	54%	1.78E-02	3.76E-02	1.80E-01	FALSE	4.87E-02	4.87E-02
Methoxychlor	24	0	11	46%	1.09E-01	1.25E-01	5.20E-01	FALSE	3.35E-01	3.35E-01
Metals										
Lead	24	0	24	100%	2.51E+02	6.98E+02	3.47E+03	FALSE	4.59E+02	4.59E+02
Mercury	24	0	11	46%	1.68E-01	5.43E-01	2.70E+00	FALSE	1.69E-01	1.69E-01
Selenium	24	0	12	50%	9.05E-01	5.12E-01	1.80E+00	FALSE	1.20E+00	1.20E+00
Sodium	24	0	23	96%	2.89E+02	2.20E+02	1.04E+03	FALSE	4.53E+02	4.53E+02
Zinc	24	0	23	96%	5.02E+02	8.75E+02	3.66E+03	FALSE	9.42E+02	9.42E+02

Table B-7
SEAD-71 Surface Soil (0ft - 0.5ft) Exposure Point Concentration Summary
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/kg)	Standard Deviation (mg/kg)	Max Hit (mg/kg)	Normal?	95% UCL of Mean (mg/kg)	Exposure Point Concentration (EPC)* (mg/kg)
Volatile Organic Compounds										
Acetone	21	0	2	10%	9.43E-03	1.48E-02	7.40E-02	FALSE	1.04E-02	1.04E-02
Benzene	21	0	1	5%	5.95E-03	1.21E-03	2.00E-03	FALSE	6.70E-03	2.00E-03
Ethyl benzene	21	0	2	10%	5.81E-03	7.66E-04	4.00E-03	FALSE	6.15E-03	4.00E-03
Methylene chloride	21	0	1	5%	5.95E-03	1.21E-03	2.00E-03	FALSE	6.70E-03	2.00E-03
Styrene	21	0	1	5%	5.90E-03	1.38E-03	1.00E-03	FALSE	7.27E-03	1.00E-03
Tetrachloroethene	21	0	1	5%	7.45E-03	5.91E-03	3.30E-02	FALSE	8.42E-03	8.42E-03
Toluene	21	0	8	38%	6.19E-03	2.66E-03	1.60E-02	FALSE	7.29E-03	7.29E-03
Total Xylenes	21	0	2	10%	6.38E-03	1.33E-03	1.10E-02	FALSE	6.82E-03	6.82E-03
Semivolatile Organic Compounds										
2-Methylnaphthalene	21	0	11	52%	3.37E+00	5.81E+00	1.90E+01	FALSE	2.59E+02	1.90E+01
Acenaphthene	21	0	18	86%	5.98E+00	1.20E+01	4.20E+01	FALSE	3.52E+02	4.20E+01
Acenaphthylene	21	0	4	19%	6.57E+00	1.13E+01	5.10E-01	FALSE	2.66E+02	5.10E-01
Anthracene	21	0	21	100%	1.74E+01	3.29E+01	1.00E+02	FALSE	1.51E+03	1.00E+02
Benzo(a)anthracene	21	0	21	100%	2.83E+01	4.59E+01	1.50E+02	FALSE	7.62E+02	1.50E+02
Benzo(a)pyrene	21	0	21	100%	2.35E+01	3.68E+01	1.20E+02	FALSE	4.58E+02	1.20E+02
Benzo(b)fluoranthene	21	0	21	100%	2.09E+01	2.89E+01	8.80E+01	FALSE	2.42E+02	8.80E+01
Benzo(ghi)perylene	21	0	21	100%	1.27E+01	1.89E+01	6.20E+01	FALSE	2.02E+02	6.20E+01
Benzo(k)fluoranthene	21	0	14	67%	2.36E+01	3.83E+01	1.30E+02	FALSE	2.50E+03	1.30E+02
Carbazole	21	0	21	100%	1.07E+01	2.01E+01	7.70E+01	FALSE	2.86E+02	7.70E+01
Chrysene	21	0	21	100%	2.90E+01	4.37E+01	1.50E+02	FALSE	5.99E+02	1.50E+02
Di-n-butylphthalate	21	0	2	10%	6.51E+00	1.13E+01	1.40E-01	FALSE	2.90E+02	1.40E-01
Dibenz(a,h)anthracene	21	0	21	100%	5.28E+00	7.94E+00	2.50E+01	FALSE	9.05E+01	2.50E+01
Dibenzofuran	21	0	19	90%	4.39E+00	9.68E+00	3.80E+01	FALSE	1.00E+02	3.80E+01
Fluoranthene	21	0	21	100%	7.09E+01	1.18E+02	4.40E+02	FALSE	2.62E+03	4.40E+02
Fluorene	21	0	20	95%	8.07E+00	1.68E+01	6.20E+01	FALSE	5.73E+02	6.20E+01
Indeno(1,2,3-cd)pyrene	21	0	21	100%	1.24E+01	1.88E+01	6.50E+01	FALSE	2.10E+02	6.50E+01
Naphthalene	21	0	11	52%	4.90E+00	1.05E+01	4.60E+01	FALSE	2.60E+02	4.60E+01
Phenanthrene	21	0	21	100%	5.26E+01	9.57E+01	2.90E+02	FALSE	3.24E+03	2.90E+02
Pyrene	21	0	21	100%	5.59E+01	8.62E+01	2.80E+02	FALSE	2.12E+03	2.80E+02
Pesticides										
4,4'-DDD	21	0	11	52%	3.32E-02	5.44E-02	2.40E-01	FALSE	1.12E-01	1.12E-01
4,4'-DDE	21	0	19	90%	1.24E-01	2.05E-01	8.10E-01	FALSE	2.53E-01	2.53E-01
4,4'-DDT	21	0	19	90%	2.72E-01	4.34E-01	1.30E+00	FALSE	8.39E-01	8.39E-01
Alpha-BHC	20	0	4	20%	6.28E-03	4.71E-03	1.40E-02	FALSE	1.40E-02	1.40E-02
Beta-BHC	21	0	6	29%	9.54E-03	1.01E-02	3.50E-02	FALSE	2.73E-02	2.73E-02
Dieldrin	20	0	2	10%	1.17E-02	8.69E-03	3.40E-03	FALSE	2.66E-02	3.40E-03
Endosulfan I	20	0	4	20%	6.65E-03	5.33E-03	1.50E-02	FALSE	1.65E-02	1.50E-02
Endosulfan II	20	0	4	20%	1.71E-02	1.77E-02	5.20E-02	FALSE	5.28E-02	5.20E-02
Endosulfan sulfate	20	0	12	60%	2.75E-02	3.31E-02	1.10E-01	FALSE	8.89E-02	8.89E-02
Endrin	21	0	10	48%	2.40E-02	2.90E-02	1.20E-01	FALSE	7.16E-02	7.16E-02
Endrin aldehyde	21	0	18	86%	3.57E-02	3.67E-02	1.20E-01	FALSE	9.27E-02	9.27E-02
Endrin ketone	21	0	17	81%	5.23E-02	5.86E-02	1.80E-01	FALSE	1.64E-01	1.64E-01
Gamma-Chlordane	21	0	4	19%	8.55E-03	1.06E-02	4.80E-02	FALSE	2.15E-02	2.15E-02
Heptachlor epoxide	21	0	13	62%	2.02E-02	3.97E-02	1.80E-01	FALSE	5.84E-02	5.84E-02
Methoxychlor	21	0	11	52%	1.24E-01	1.27E-01	5.20E-01	FALSE	4.00E-01	4.00E-01
Metals										
Lead	21	0	21	100%	2.84E+02	7.42E+02	3.47E+03	FALSE	5.57E+02	5.57E+02
Mercury	21	0	8	38%	1.82E-01	5.80E-01	2.70E+00	FALSE	1.92E-01	1.92E-01
Selenium	21	0	10	48%	9.47E-01	5.22E-01	1.80E+00	FALSE	1.23E+00	1.23E+00
Sodium	21	0	20	95%	3.24E+02	2.14E+02	1.04E+03	FALSE	4.21E+02	4.21E+02
Zinc	21	0	20	95%	5.61E+02	9.23E+02	3.66E+03	FALSE	1.27E+03	1.27E+03

Table B-8
SEAD-71 Groundwater Exposure Point Concentration Summary
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Analyte	No. of Valid Analyses	No. of Rejected	No. of Hits	Frequency (%)	Mean (mg/L)	Max Hit (mg/L)	Exposure Point Concentration (EPC)* (mg/L)
Metals							
Aluminum	2	0	2	100%	10.017	19.700	19.700
Beryllium	2	0	1	50%	0.000	0.001	0.001
Chromium	2	0	2	100%	0.017	0.033	0.033
Cobalt	2	0	2	100%	0.012	0.022	0.022
Copper	2	0	2	100%	0.008	0.016	0.016
Iron	2	0	2	100%	17.857	35.100	35.100
Lead	2	0	1	50%	0.009	0.017	0.017
Manganese	2	0	2	100%	1.119	1.680	1.680
Nickel	2	0	2	100%	0.026	0.049	0.049
Vanadium	2	0	2	100%	0.013	0.026	0.026
Zinc	2	0	2	100%	0.052	0.097	0.097

Note:
The maximum concentration was used for the EPC because there were only two groundwater samples.

TABLE B-9
AMBIENT AIR EXPOSURE POINT CONCENTRATIONS - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Air EPC from Surface Soil (mg/m³) = CS dsurf x PM d10 x CF

Variables:
CS dsurf = Chemical Concentration in Surface Soil, from EPC data (mg/kg)
PM d10 = Average Measured PM d10 Concentration = 17 ug/m³
CF = Conversion Factor = 1E-9 kg/ug

Equation for Air EPC from Total Soils (mg CS dtot x PM d10 x CF

Variables:
CS dtot = Chemical Concentration in Total Soils, from EPC data (mg/kg)
PM d10 = PM d10 Concentration Calculated for Construction Worker= 139 ug/m³
CF = Conversion Factor = 1E-9 kg/ug

Analyte	EPC Data for Surface Soil (mg/kg)	EPC Data for Total Soils (mg/kg)	Air EPC from Surface Soil (mg/m³)	Air EPC from Total Soils (mg/m³)
Volatile Organics				
Trichloroethane, 1,1,1-		8.66E-003	0.00E+000	1.20E-009
Acetone	1.04E-002	9.95E-003	1.77E-010	1.38E-009
Benzene	2.00E-003	2.00E-003	3.40E-011	2.78E-010
Ethyl benzene	4.00E-003	4.00E-003	6.80E-011	5.56E-010
Methylene chloride	2.00E-003	7.94E-003	3.40E-011	1.10E-009
Styrene	1.00E-003	1.00E-003	1.70E-011	1.39E-010
Tetrachloroethene	8.42E-003	9.55E-003	1.43E-010	1.33E-009
Toluene	7.29E-003	8.20E-003	1.24E-010	1.14E-009
Total BTEX		7.37E-003	0.00E+000	1.02E-009
Total Xylenes	6.82E-003	8.80E-003	1.16E-010	1.22E-009
Semivolatile Organic Compounds				
2-Methylnaphthalene	1.90E+001	2.87E+001	3.23E-007	3.99E-006
Acenaphthene	4.20E+001	3.76E+001	7.14E-007	5.23E-006
Acenaphthylene	5.10E-001	5.10E-001	8.67E-009	7.09E-008
Anthracene	1.00E+002	1.00E+002	1.70E-006	1.39E-005
Benzo(a)anthracene	1.50E+002	1.50E+002	2.55E-006	2.09E-005
Benzo(a)pyrene	1.20E+002	1.20E+002	2.04E-006	1.67E-005
Benzo(b)fluoranthene	8.80E+001	8.80E+001	1.50E-006	1.22E-005
Benzo(ghi)perylene	6.20E+001	6.20E+001	1.05E-006	8.62E-006
Benzo(k)fluoranthene	1.30E+002	1.30E+002	2.21E-006	1.81E-005
bis(2-Ethylhexyl)phthalate		1.50E-002	0.00E+000	2.09E-009
Carbazole	7.70E+001	7.61E+001	1.31E-006	1.06E-005
Chrysene	1.50E+002	1.50E+002	2.55E-006	2.09E-005
Di-n-butylphthalate	1.40E-001	1.40E-001	2.38E-009	1.95E-008
Dibenz(a,h)anthracene	2.50E+001	2.50E+001	4.25E-007	3.48E-006
Dibenzofuran	3.80E+001	1.75E+001	6.46E-007	2.43E-006
Fluoranthene	4.40E+002	4.40E+002	7.48E-006	6.12E-005
Fluorene	6.20E+001	3.22E+001	1.05E-006	4.48E-006
Indeno(1,2,3-cd)pyrene	6.50E+001	6.50E+001	1.11E-006	9.04E-006
Naphthalene	4.60E+001	3.92E+001	7.82E-007	5.45E-006
Phenanthrene	2.90E+002	2.90E+002	4.93E-006	4.03E-005
Phenol		4.50E-003	0.00E+000	6.26E-010
Pyrene	2.80E+002	2.80E+002	4.76E-006	3.89E-005
Pesticides				
4,4'-DDD	1.12E-001	4.15E-002	1.90E-009	5.77E-009
4,4'-DDE	2.53E-001	2.37E-001	4.30E-009	3.29E-008
4,4'-DDT	8.39E-001	8.08E-001	1.43E-008	1.12E-007
alpha-BHC	1.40E-002	9.01E-003	2.38E-010	1.25E-009
alpha-Chlordane		9.65E-003	0.00E+000	1.34E-009
beta-BHC	2.73E-002	1.20E-002	4.64E-010	1.67E-009
delta-BHC		1.80E-003	0.00E+000	2.50E-010
Dieldrin	3.40E-003	3.50E-003	5.78E-011	4.87E-010
Endosulfan I	1.50E-002	1.51E-002	2.55E-010	2.10E-009
Endosulfan II	5.20E-002	2.18E-002	8.84E-010	3.03E-009
Endosulfan sulfate	8.89E-002	3.65E-002	1.51E-009	5.07E-009
Endrin	7.16E-002	3.24E-002	1.22E-009	4.50E-009
Endrin aldehyde	9.27E-002	5.24E-002	1.58E-009	7.28E-009
Endrin ketone	1.64E-001	9.33E-002	2.79E-009	1.30E-008
gamma-BHC (Lindane)		4.00E-003	0.00E+000	5.56E-010
gamma-Chlordane	2.15E-002	1.00E-002	3.66E-010	1.39E-009
Heptachlor		1.20E-003	0.00E+000	1.67E-010
Heptachlor epoxide	5.84E-002	2.35E-002	9.93E-010	3.27E-009
Methoxychlor	4.00E-001	1.74E-001	6.80E-009	2.42E-008
Metals				
Lead	5.57E+002	2.67E+002	9.47E-006	3.71E-005
Mercury	1.92E-001	1.00E-001	3.26E-009	1.39E-008
Selenium	1.23E+000	9.74E-001	2.09E-008	1.35E-007
Sodium	4.21E+002	3.77E+002	7.16E-006	5.24E-005
Zinc	1.27E+003	4.79E+002	2.16E-005	6.66E-005

TABLE B-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Current Site Worker: Intake (mg/kg-day) (Nc)	Current Site Worker: Intake (mg/kg-day) (Car)	Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Intake (mg/kg-day) (Nc)	Future Industrial Worker: Intake (mg/kg-day) (Car)	Future Industrial Worker: Hazard Quotient	Future Industrial Worker: Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.86E-001	NA		1.20E-009							Inhalation of Not Applicable for Future Industrial Worker	
Acetone	NA	NA	1.77E-010	1.38E-009								
Benzene	1.71E-003	2.91E-002	3.40E-011	2.78E-010	2.55E-013	9.12E-014	1.49E-010	2.66E-015				
Ethyl benzene	2.86E-001	NA	6.80E-011	5.56E-010	5.11E-013		1.79E-012					
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	1.10E-009	2.55E-013	9.12E-014	2.98E-013	1.51E-016				
Styrene	2.86E-001	NA	1.70E-011	1.39E-010	1.28E-013		4.47E-013					
Tetrachloroethene	NA	2.00E-003	1.43E-010	1.33E-009		3.84E-013		7.68E-016				
Toluene	1.14E-001	NA	1.24E-010	1.14E-009	9.31E-013		8.15E-012					
Total Xylenes	NA	NA	1.16E-010	1.22E-009								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	3.23E-007	3.99E-006								
Acenaphthene	NA	NA	7.14E-007	5.23E-006								
Acenaphthylene	NA	NA	8.67E-009	7.09E-008								
Anthracene	NA	NA	1.70E-006	1.39E-005								
Benzo(a)anthracene	NA	NA	2.55E-006	2.09E-005								
Benzo(a)pyrene	NA	NA	2.04E-006	1.67E-005								
Benzo(b)fluoranthene	NA	NA	1.50E-006	1.22E-005								
Benzo(ghi)perylene	NA	NA	1.05E-006	8.62E-006								
Benzo(k)fluoranthene	NA	NA	2.21E-006	1.81E-005								
bis(2-Ethylhexyl)phthalate	NA	NA		2.09E-009								
Carbazole	NA	NA	1.31E-006	1.06E-005								
Chrysene	NA	NA	2.55E-006	2.09E-005								
Di-n-butylphthalate	NA	NA	2.38E-009	1.95E-008								
Dibenz(a,h)anthracene	NA	NA	4.25E-007	3.48E-006								
Dibenzofuran	NA	NA	6.46E-007	2.43E-006								
Fluoranthene	NA	NA	7.48E-006	6.12E-005								
Fluorene	NA	NA	1.05E-006	4.48E-006								
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006	9.04E-006								
Naphthalene	NA	NA	7.82E-007	5.45E-006								
Phenanthrene	NA	NA	4.93E-006	4.03E-005								
Phenol	NA	NA		6.26E-010								
Pyrene	NA	NA	4.76E-006	3.89E-005								
Pesticides												
4,4'-DDD	NA	NA	1.90E-009	5.77E-009								
4,4'-DDE	NA	NA	4.30E-009	3.29E-008								
4,4'-DDT	NA	3.40E-001	1.43E-008	1.12E-007		3.83E-011		1.30E-011				
alpha-BHC	NA	6.30E+000	2.38E-010	1.25E-009		6.39E-013		4.02E-012				
alpha-Chlordane	NA	1.30E+000		1.34E-009								
beta-BHC	NA	1.86E+000	4.64E-010	1.67E-009		1.25E-012		2.32E-012				
delta-BHC	NA	NA		2.50E-010								
Dieldrin	NA	1.61E+001	5.78E-011	4.87E-010		1.55E-013		2.50E-012				
Endosulfan I	NA	NA	2.55E-010	2.10E-009								
Endosulfan II	NA	NA	8.84E-010	3.03E-009								
Endosulfan sulfate	NA	NA	1.51E-009	5.07E-009								
Endrin	NA	NA	1.22E-009	4.50E-009								
Endrin aldehyde	NA	NA	1.58E-009	7.28E-009								
Endrin ketone	NA	NA	2.79E-009	1.30E-008								
gamma-BHC (Lindane)	NA	NA		5.56E-010								
gamma-Chlordane	NA	1.30E+000	3.66E-010	1.39E-009		9.81E-013		1.28E-012				
Heptachlor	NA	4.55E+000		1.67E-010								
Heptachlor epoxide	NA	9.10E+000	9.93E-010	3.27E-009		2.66E-012		2.42E-011				
Methoxychlor	NA	NA	6.80E-009	2.42E-008								
Metals												
Lead	NA	NA	9.47E-006	3.71E-005								
Mercury	8.57E-005	NA	3.26E-009	1.39E-008	2.45E-011		2.86E-007					
Selenium	NA	NA	2.09E-008	1.35E-007								
Sodium	NA	NA	7.16E-006	5.24E-005								
Zinc	NA	NA	2.16E-005	6.66E-005								
Total Hazard Quotient and Cancer Risk:							3E-007	5E-011				

Assumptions for Current Site Worker

CA =	EPC Surface Only	
IR =	9.6	m3/day
EF =	20	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Future Construction Worker				Future Tresspasser Child			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
1,1,1-Trichloroethane	2.86E-001	NA		1.20E-009	1.22E-010		4.28E-010					
Acetone	NA	NA	1.77E-010	1.38E-009								
Benzene	1.71E-003	2.91E-002	3.40E-011	2.78E-010	2.83E-011	4.04E-013	1.65E-008	1.18E-014	1.12E-013	7.98E-015	6.54E-011	2.32E-016
Ethyl benzene	2.86E-001	NA	6.80E-011	5.56E-010	5.66E-011		1.98E-010		2.24E-013		7.82E-013	
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	1.10E-009	1.12E-010	1.60E-012	1.31E-010	2.65E-015	1.12E-013	7.98E-015	1.30E-013	1.32E-017
Styrene	2.86E-001	NA	1.70E-011	1.39E-010	1.41E-011		4.95E-011		5.59E-014		1.95E-013	
Tetrachloroethene	NA	2.00E-003	1.43E-010	1.33E-009		1.93E-012		3.86E-015		3.36E-014		6.72E-017
Toluene	1.14E-001	NA	1.24E-010	1.14E-009	1.16E-010		1.01E-009		4.07E-013		3.57E-012	
Total Xylenes	NA	NA	1.16E-010	1.22E-009								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	3.23E-007	3.99E-006								
Acenaphthene	NA	NA	7.14E-007	5.23E-006								
Acenaphthylene	NA	NA	8.67E-009	7.09E-008								
Anthracene	NA	NA	1.70E-006	1.39E-005								
Benzo(a)anthracene	NA	NA	2.55E-006	2.09E-005								
Benzo(a)pyrene	NA	NA	2.04E-006	1.67E-005								
Benzo(b)fluoranthene	NA	NA	1.50E-006	1.22E-005								
Benzo(ghi)perylene	NA	NA	1.05E-006	8.62E-006								
Benzo(k)fluoranthene	NA	NA	2.21E-006	1.81E-005								
bis(2-Ethylhexyl)phthalate	NA	NA		2.09E-009								
Carbazole	NA	NA	1.31E-006	1.06E-005								
Chrysene	NA	NA	2.55E-006	2.09E-005								
Di-n-butylphthalate	NA	NA	2.38E-009	1.95E-008								
Dibenz(a,h)anthracene	NA	NA	4.25E-007	3.48E-006								
Dibenzofuran	NA	NA	6.46E-007	2.43E-006								
Fluoranthene	NA	NA	7.48E-006	6.12E-005								
Fluorene	NA	NA	1.05E-006	4.48E-006								
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006	9.04E-006								
Naphthalene	NA	NA	7.82E-007	5.45E-006								
Phenanthrene	NA	NA	4.93E-006	4.03E-005								
Phenol	NA	NA		6.26E-010								
Pyrene	NA	NA	4.76E-006	3.89E-005								
Pesticides												
4,4'-DDD	NA	NA	1.90E-009	5.77E-009								
4,4'-DDE	NA	NA	4.30E-009	3.29E-008								
4,4'-DDT	NA	3.40E-001	1.43E-008	1.12E-007		1.63E-010		5.55E-011		3.35E-012		1.14E-012
alpha-BHC	NA	6.30E+000	2.38E-010	1.25E-009		1.82E-012		1.15E-011		5.59E-014		3.52E-013
alpha-Chlordane	NA	1.30E+000		1.34E-009		1.95E-012		2.53E-012				
beta-BHC	NA	1.86E+000	4.64E-010	1.67E-009		2.42E-012		4.51E-012		1.09E-013		2.03E-013
delta-BHC	NA	NA		2.50E-010								
Dieldrin	NA	1.61E+001	5.78E-011	4.87E-010		7.07E-013		1.14E-011		1.36E-014		2.19E-013
Endosulfan I	NA	NA	2.55E-010	2.10E-009								
Endosulfan II	NA	NA	8.84E-010	3.03E-009								
Endosulfan sulfate	NA	NA	1.51E-009	5.07E-009								
Endrin	NA	NA	1.22E-009	4.50E-009								
Endrin aldehyde	NA	NA	1.58E-009	7.28E-009								
Endrin ketone	NA	NA	2.79E-009	1.30E-008								
gamma-BHC/Lindane	NA	NA		5.56E-010								
gamma-Chlordane	NA	1.30E+000	3.66E-010	1.39E-009		2.02E-012		2.63E-012		8.58E-014		1.12E-013
Heptachlor	NA	4.55E+000		1.67E-010		2.42E-013		1.10E-012				
Heptachlor epoxide	NA	9.10E+000	9.93E-010	3.27E-009		4.75E-012		4.32E-011		2.33E-013		2.12E-012
Methoxychlor	NA	NA	6.80E-009	2.42E-008								
Metals												
Lead	NA	NA	9.47E-006	3.71E-005								
Mercury	8.57E-005	NA	3.26E-009	1.39E-008	1.41E-009		1.65E-005		1.07E-011		1.25E-007	
Selenium	NA	NA	2.09E-008	1.35E-007								
Sodium	NA	NA	7.16E-006	5.24E-005								
Zinc	NA	NA	2.16E-005	6.66E-005								
Total Hazard Quotient and Cancer Risk:							2E-005	1E-010			1E-007	4E-012

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CA =	EPC Surface and Sub-Surface		CA =	EPC Surface Only	
IR =	10.4	m3/day	IR =	1.2	m3/day
EF =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
1,1,1-Trichloroethane	2.86E-001	NA		1.20E-009								
Acetone	NA	NA	1.77E-010	1.38E-009								
Benzene	1.71E-003	2.91E-002	3.40E-011	2.78E-010	6.21E-012	5.32E-013	3.63E-009	1.55E-014	2.66E-012	9.51E-013	1.56E-009	2.77E-014
Ethyl benzene	2.86E-001	NA	6.80E-011	5.56E-010	1.24E-011		4.34E-011		5.32E-012		1.86E-011	
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	1.10E-009	6.21E-012	5.32E-013	7.25E-012	8.78E-016	2.66E-012	9.51E-013	3.11E-012	1.57E-015
Styrene	2.86E-001	NA	1.70E-011	1.39E-010	3.11E-012		1.09E-011		1.33E-012		4.65E-012	
Tetrachloroethene	NA	2.00E-003	1.43E-010	1.33E-009		2.24E-012		4.48E-015		4.00E-012		8.00E-015
Toluene	1.14E-001	NA	1.24E-010	1.14E-009	2.26E-011		1.98E-010		9.70E-012		8.49E-011	
Total Xylenes	NA	NA	1.16E-010	1.22E-009								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	3.23E-007	3.99E-006								
Acenaphthene	NA	NA	7.14E-007	5.23E-006								
Acenaphthylene	NA	NA	8.67E-009	7.09E-008								
Anthracene	NA	NA	1.70E-006	1.39E-005								
Benzo(a)anthracene	NA	NA	2.55E-006	2.09E-005								
Benzo(a)pyrene	NA	NA	2.04E-006	1.67E-005								
Benzo(b)fluoranthene	NA	NA	1.50E-006	1.22E-005								
Benzo(ghi)perylene	NA	NA	1.05E-006	8.62E-006								
Benzo(k)fluoranthene	NA	NA	2.21E-006	1.81E-005								
bis(2-Ethylhexyl)phthalate	NA	NA		2.09E-009								
Carbazole	NA	NA	1.31E-006	1.06E-005								
Chrysene	NA	NA	2.55E-006	2.09E-005								
Di-n-butylphthalate	NA	NA	2.38E-009	1.95E-008								
Dibenz(a,h)anthracene	NA	NA	4.25E-007	3.48E-006								
Dibenzofuran	NA	NA	6.46E-007	2.43E-006								
Fluoranthene	NA	NA	7.48E-006	6.12E-005								
Fluorene	NA	NA	1.05E-006	4.48E-006								
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006	9.04E-006								
Naphthalene	NA	NA	7.82E-007	5.45E-006								
Phenanthrene	NA	NA	4.93E-006	4.03E-005								
Phenol	NA	NA		6.26E-010								
Pyrene	NA	NA	4.76E-006	3.89E-005								
Pesticides												
4,4'-DDD	NA	NA	1.90E-009	5.77E-009								
4,4'-DDE	NA	NA	4.30E-009	3.29E-008								
4,4'-DDT	NA	3.40E-001	1.43E-008	1.12E-007		2.23E-010		7.59E-011		3.99E-010		1.36E-010
alpha-BHC	NA	6.30E+000	2.38E-010	1.25E-009		3.73E-012		2.35E-011		6.65E-012		4.19E-011
alpha-Chlordane	NA	1.30E+000		1.34E-009								
beta-BHC	NA	1.86E+000	4.64E-010	1.67E-009		7.27E-012		1.35E-011		1.30E-011		2.41E-011
delta-BHC	NA	NA		2.50E-010								
Dieldrin	NA	1.61E+001	5.78E-011	4.87E-010		9.05E-013		1.46E-011		1.62E-012		2.60E-011
Endosulfan I	NA	NA	2.55E-010	2.10E-009								
Endosulfan II	NA	NA	8.84E-010	3.03E-009								
Endosulfan sulfate	NA	NA	1.51E-009	5.07E-009								
Endrin	NA	NA	1.22E-009	4.50E-009								
Endrin aldehyde	NA	NA	1.58E-009	7.28E-009								
Endrin ketone	NA	NA	2.79E-009	1.30E-008								
gamma-BHC/Lindane	NA	NA		5.56E-010								
gamma-Chlordane	NA	1.30E+000	3.66E-010	1.39E-009		5.72E-012		7.44E-012		1.02E-011		1.33E-011
Heptachlor	NA	4.55E+000		1.67E-010								
Heptachlor epoxide	NA	9.10E+000	9.93E-010	3.27E-009		1.55E-011		1.41E-010		2.78E-011		2.53E-010
Methoxychlor	NA	NA	6.80E-009	2.42E-008								
Metals												
Lead	NA	NA	9.47E-006	3.71E-005								
Mercury	8.57E-005	NA	3.26E-009	1.39E-008	5.96E-010		6.96E-006		2.55E-010		2.98E-006	
Selenium	NA	NA	2.09E-008	1.35E-007								
Sodium	NA	NA	7.16E-006	5.24E-005								
Zinc	NA	NA	2.16E-005	6.66E-005								
Total Hazard Quotient and Cancer Risk:							7E-006	3E-010			3E-006	5E-010

Assumptions for Future Day Care Center Child			Assumptions for Future Day Care Center Adult		
CA =	EPC Surface Only		CA =	EPC Surface Only	
IR =	4	m3/day	IR =	8	m3/day
EF =	250	days/year	EF =	250	days/year
ED =	6	years	ED =	25	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	2190	days	AT (Nc) =	9125	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-10
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC* from Surface Soil	Resident (Adult) Intake (mg/kg-day)		Resident (Adult) Hazard Quotient	Resident (Adult) Cancer Risk	Resident (Child) Intake (mg/kg-day)		Resident (Child) Hazard Quotient	Resident (Child) Cancer Risk	Resident Total Lifetime Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)			
Volatile Organics												
1,1,1-Trichloroethane	2.86E-001	NA										
Acetone	NA	NA	1.77E-010									
Benzene	1.71E-003	2.91E-002	3.40E-011	9.32E-012	3.19E-012	5.45E-009	9.29E-014	1.89E-011	1.62E-012	1.11E-008	4.72E-014	1.40E-013
Ethyl benzene	2.86E-001	NA	6.80E-011	1.86E-011		6.51E-011		3.78E-011		1.32E-010		
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	9.32E-012	3.19E-012	1.09E-011	5.27E-015	1.89E-011	1.62E-012	2.21E-011	2.67E-015	7.94E-015
Styrene	2.86E-001	NA	1.70E-011	4.66E-012		1.63E-011		9.45E-012		3.31E-011		
Tetrachloroethene	NA	2.00E-003	1.43E-010		1.34E-011		2.69E-014		6.82E-012		1.36E-014	4.05E-014
Toluene	1.14E-001	NA	1.24E-010	3.40E-011		2.97E-010		6.89E-011		6.03E-010		
Total Xylenes	NA	NA	1.16E-010									
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	3.23E-007									
Acenaphthene	NA	NA	7.14E-007									
Acenaphthylene	NA	NA	8.67E-009									
Anthracene	NA	NA	1.70E-006									
Benzo(a)anthracene	NA	NA	2.55E-006									
Benzo(a)pyrene	NA	NA	2.04E-006									
Benzo(b)fluoranthene	NA	NA	1.50E-006									
Benzo(ghi)perylene	NA	NA	1.05E-006									
Benzo(k)fluoranthene	NA	NA	2.21E-006									
bis(2-Ethylhexyl)phthal	NA	NA										
Carbazole	NA	NA	1.31E-006									
Chrysene	NA	NA	2.55E-006									
Di-n-butylphthalate	NA	NA	2.38E-009									
Dibenz(a,h)anthracene	NA	NA	4.25E-007									
Dibenzofuran	NA	NA	6.46E-007									
Fluoranthene	NA	NA	7.48E-006									
Fluorene	NA	NA	1.05E-006									
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006									
Naphthalene	NA	NA	7.82E-007									
Phenanthrene	NA	NA	4.93E-006									
Phenol	NA	NA										
Pyrene	NA	NA	4.76E-006									
Pesticides												
4,4'-DDD	NA	NA	1.90E-009									
4,4'-DDE	NA	NA	4.30E-009									
4,4'-DDT	NA	3.40E-001	1.43E-008		1.34E-009		4.56E-010		6.80E-010		2.31E-010	6.87E-010
alpha-BHC	NA	6.30E+000	2.38E-010		2.24E-011		1.41E-010		1.13E-011		7.15E-011	2.12E-010
alpha-Chlordane	NA	1.30E+000										
beta-BHC	NA	1.86E+000	4.64E-010		4.36E-011		8.11E-011		2.21E-011		4.12E-011	1.22E-010
delta-BHC	NA	NA										
Dieldrin	NA	1.61E+001	5.78E-011		5.43E-012		8.74E-011		2.76E-012		4.44E-011	1.32E-010
Endosulfan I	NA	NA	2.55E-010									
Endosulfan II	NA	NA	8.84E-010									
Endosulfan sulfate	NA	NA	1.51E-009									
Endrin	NA	NA	1.22E-009									
Endrin aldehyde	NA	NA	1.58E-009									
Endrin ketone	NA	NA	2.79E-009									
gamma-BHC/Lindane	NA	NA										
gamma-Chlordane	NA	1.30E+000	3.66E-010		3.43E-011		4.46E-011		1.74E-011		2.27E-011	6.73E-011
Heptachlor	NA	4.55E+000										
Heptachlor epoxide	NA	9.10E+000	9.93E-010		9.33E-011		8.49E-010		4.73E-011		4.31E-010	1.28E-009
Methoxychlor	NA	NA	6.80E-009									
Metals												
Lead	NA	NA	9.47E-006									
Mercury	8.57E-005	NA	3.26E-009	8.94E-010		1.04E-005		1.82E-009		2.12E-005		
Selenium	NA	NA	2.09E-008									
Sodium	NA	NA	7.16E-006									
Zinc	NA	NA	2.16E-005									
Total Hazard Quotient and Cancer Risk:						**1E-005**	**2E-009**			**2E-005**	**8E-010**	**2E-009**

Assumptions for Resident (Adult)		Assumptions for Resident (Child)	
CA =	EPC Surface Only	CA =	EPC Surface Only
BW =	70 kg	BW =	15 kg
IR =	20 m3/day	IR =	8.7 m3/day
EF =	350 days/year	EF =	350 days/year
ED =	24 years	ED =	6 years
AT (Nc) =	8,760 days	AT (Nc) =	2,190 days
AT (Car) =	25,550 days	AT (Car) =	25,550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC from Surface Soil (mg/m3)	Air EPC from Total Soils (mg/m3)	Current Site Worker: Intake (mg/kg-day) (Nc)	Current Site Worker: Intake (mg/kg-day) (Car)	Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Intake (mg/kg-day) (Nc)	Future Industrial Worker: Intake (mg/kg-day) (Car)	Future Industrial Worker: Hazard Quotient	Future Industrial Worker: Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.86E-001	NA		1.20E-009							Inhalation of	
Acetone	NA	NA	1.77E-010	1.38E-009							Not Applicable	
Benzene	1.71E-003	2.91E-002	3.40E-011	2.78E-010	1.28E-013	1.28E-014	7E-011	4E-016			for Future	
Ethyl benzene	2.86E-001	NA	6.80E-011	5.56E-010	2.55E-013		9E-013				Industrial Worker	
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	1.10E-009	1.28E-013	1.28E-014	1E-013	2E-017				
Styrene	2.86E-001	NA	1.70E-011	1.39E-010	6.39E-014		2E-013					
Tetrachloroethene	NA	2.00E-003	1.43E-010	1.33E-009		5.38E-014		1E-016				
Toluene	1.14E-001	NA	1.24E-010	1.14E-009	4.66E-013		4E-012					
Total Xylenes	NA	NA	1.16E-010	1.22E-009								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	3.23E-007	3.99E-006								
Acenaphthene	NA	NA	7.14E-007	5.23E-006								
Acenaphthylene	NA	NA	8.67E-009	7.09E-008								
Anthracene	NA	NA	1.70E-006	1.39E-005								
Benzo(a)anthracene	NA	NA	2.55E-006	2.09E-005								
Benzo(a)pyrene	NA	NA	2.04E-006	1.67E-005								
Benzo(b)fluoranthene	NA	NA	1.50E-006	1.22E-005								
Benzo(ghi)perylene	NA	NA	1.05E-006	8.62E-006								
Benzo(k)fluoranthene	NA	NA	2.21E-006	1.81E-005								
bis(2-Ethylhexyl)phthalate	NA	NA		2.09E-009								
Carbazole	NA	NA	1.31E-006	1.06E-005								
Chrysene	NA	NA	2.55E-006	2.09E-005								
Di-n-butylphthalate	NA	NA	2.38E-009	1.95E-008								
Dibenz(a,h)anthracene	NA	NA	4.25E-007	3.48E-006								
Dibenzofuran	NA	NA	6.46E-007	2.43E-006								
Fluoranthene	NA	NA	7.48E-006	6.12E-005								
Fluorene	NA	NA	1.05E-006	4.48E-006								
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006	9.04E-006								
Naphthalene	NA	NA	7.82E-007	5.45E-006								
Phenanthrene	NA	NA	4.93E-006	4.03E-005								
Phenol	NA	NA		6.26E-010								
Pyrene	NA	NA	4.76E-006	3.89E-005								
Pesticides												
4,4'-DDD	NA	NA	1.90E-009	5.77E-009								
4,4'-DDE	NA	NA	4.30E-009	3.29E-008								
4,4'-DDT	NA	3.40E-001	1.43E-008	1.12E-007		5.36E-012		2E-012				
alpha-BHC	NA	6.30E+000	2.38E-010	1.25E-009		8.94E-014		6E-013				
alpha-Chlordane	NA	1.30E+000		1.34E-009								
beta-BHC	NA	1.86E+000	4.64E-010	1.67E-009		1.74E-013		3E-013				
delta-BHC	NA	NA		2.50E-010								
Dieldrin	NA	1.61E+001	5.78E-011	4.87E-010		2.17E-014		3E-013				
Endosulfan I	NA	NA	2.55E-010	2.10E-009								
Endosulfan II	NA	NA	8.84E-010	3.03E-009								
Endosulfan sulfate	NA	NA	1.51E-009	5.07E-009								
Endrin	NA	NA	1.22E-009	4.50E-009								
Endrin aldehyde	NA	NA	1.58E-009	7.28E-009								
Endrin ketone	NA	NA	2.79E-009	1.30E-008								
gamma-BHC (Lindane)	NA	NA		5.56E-010								
gamma-Chlordane	NA	1.30E+000	3.66E-010	1.39E-009		1.37E-013		2E-013				
Heptachlor	NA	4.55E+000		1.67E-010								
Heptachlor epoxide	NA	9.10E+000	9.93E-010	3.27E-009		3.73E-013		3E-012				
Methoxychlor	NA	NA	6.80E-009	2.42E-008								
Metals												
Lead	NA	NA	9.47E-006	3.71E-005								
Mercury	8.57E-005	NA	3.26E-009	1.39E-008	1.23E-011		1E-007					
Selenium	NA	NA	2.09E-008	1.35E-007								
Sodium	NA	NA	7.16E-006	5.24E-005								
Zinc	NA	NA	2.16E-005	6.66E-005								
Total Hazard Quotient and Cancer Risk:							1E-007	7E-012				

Assumptions for Current Site Worker

CA =	EPC Surface Only	
IR =	9.6	m3/day
EF =	10	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CA x IR x EF x ED / BW x AT

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Future Construction Worker				Future Tresspasser Child			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Trichloroethane, 1,1,1-	2.86E-001	NA		1.20E-009	1.07E-010		4E-010					
Acetone	NA	NA	1.77E-010	1.38E-009								
Benzene	1.71E-003	2.91E-002	3.40E-011	2.78E-010	2.48E-011	3.54E-013	1E-008	1E-014	5.59E-014	7.98E-016	3E-011	2E-017
Ethyl benzene	2.86E-001	NA	6.80E-011	5.56E-010	4.96E-011		2E-010		1.12E-013		4E-013	
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	1.10E-009	9.84E-011	1.41E-012	1E-010	2E-015	5.59E-014	7.98E-016	7E-014	1E-018
Styrene	2.86E-001	NA	1.70E-011	1.39E-010	1.24E-011		4E-011		2.79E-014		1E-013	
Tetrachloroethene	NA	2.00E-003	1.43E-010	1.33E-009		1.69E-012		3E-015		3.36E-015		7E-018
Toluene	1.14E-001	NA	1.24E-010	1.14E-009	1.02E-010		9E-010		2.04E-013		2E-012	
Total Xylenes	NA	NA	1.16E-010	1.22E-009								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	3.23E-007	3.99E-006								
Acenaphthene	NA	NA	7.14E-007	5.23E-006								
Acenaphthylene	NA	NA	8.67E-009	7.09E-008								
Anthracene	NA	NA	1.70E-006	1.39E-005								
Benzo(a)anthracene	NA	NA	2.55E-006	2.09E-005								
Benzo(a)pyrene	NA	NA	2.04E-006	1.67E-005								
Benzo(b)fluoranthene	NA	NA	1.50E-006	1.22E-005								
Benzo(ghi)perylene	NA	NA	1.05E-006	8.62E-006								
Benzo(k)fluoranthene	NA	NA	2.21E-006	1.81E-005								
bis(2-Ethylhexyl)phthalate	NA	NA		2.09E-009								
Carbazole	NA	NA	1.31E-006	1.06E-005								
Chrysene	NA	NA	2.55E-006	2.09E-005								
Di-n-butylphthalate	NA	NA	2.38E-009	1.95E-008								
Dibenz(a,h)anthracene	NA	NA	4.25E-007	3.48E-006								
Dibenzofuran	NA	NA	6.46E-007	2.43E-006								
Fluoranthene	NA	NA	7.48E-006	6.12E-005								
Fluorene	NA	NA	1.05E-006	4.48E-006								
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006	9.04E-006								
Naphthalene	NA	NA	7.82E-007	5.45E-006								
Phenanthrene	NA	NA	4.93E-006	4.03E-005								
Phenol	NA	NA		6.26E-010								
Pyrene	NA	NA	4.76E-006	3.89E-005								
Pesticides												
4,4'-DDD	NA	NA	1.90E-009	5.77E-009								
4,4'-DDE	NA	NA	4.30E-009	3.29E-008								
4,4'-DDT	NA	3.40E-001	1.43E-008	1.12E-007		1.43E-010		5E-011		3.35E-013		1E-013
alpha-BHC	NA	6.30E+000	2.38E-010	1.25E-009		1.59E-012		1E-011		5.59E-015		4E-014
alpha-Chlordane	NA	1.30E+000		1.34E-009		1.71E-012		2E-012				
beta-BHC	NA	1.86E+000	4.64E-010	1.67E-009		2.12E-012		4E-012		1.09E-014		2E-014
delta-BHC	NA	NA		2.50E-010								
Dieldrin	NA	1.61E+001	5.78E-011	4.87E-010		6.20E-013		1E-011		1.36E-015		2E-014
Endosulfan I	NA	NA	2.55E-010	2.10E-009								
Endosulfan II	NA	NA	8.84E-010	3.03E-009								
Endosulfan sulfate	NA	NA	1.51E-009	5.07E-009								
Endrin	NA	NA	1.22E-009	4.50E-009								
Endrin aldehyde	NA	NA	1.58E-009	7.28E-009								
Endrin ketone	NA	NA	2.79E-009	1.30E-008								
gamma-BHC (Lindane)	NA	NA		5.56E-010								
gamma-Chlordane	NA	1.30E+000	3.66E-010	1.39E-009		1.77E-012		2E-012		8.58E-015		1E-014
Heptachlor	NA	4.55E+000		1.67E-010		2.12E-013		1E-012				
Heptachlor epoxide	NA	9.10E+000	9.93E-010	3.27E-009		4.16E-012		4E-011		2.33E-014		2E-013
Methoxychlor	NA	NA	6.80E-009	2.42E-008								
Metals												
Lead	NA	NA	9.47E-006	3.71E-005								
Mercury	8.57E-005	NA	3.26E-009	1.39E-008	1.24E-009		1E-005		5.37E-012		6E-008	
Selenium	NA	NA	2.09E-008	1.35E-007								
Sodium	NA	NA	7.16E-006	5.24E-005								
Zinc	NA	NA	2.16E-005	6.66E-005								
Total Hazard Quotient and Cancer Risk:							**1E-005**	**1E-010**			**6E-008**	**4E-013**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CA =	EPC Surface and Sub-Surface		CA =	EPC Surface Only	
IR =	10.4	m3/day	IR =	1.2	m3/day
EF =	219	days/year	EF =	25	days/year
ED =	1	years	ED =	1	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	365	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CA x IR x EF x ED / BW x AT

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Inhalation RfD	Carc. Slope Inhalation	Air EPC from Surface Soil	Air EPC from Total Soils	Future Day Care Center Child				Future Day Care Center Adult			
					Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/m3)	(mg/m3)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Trichloroethane, 1,1,1-	2.86E-001	NA		1.20E-009								
Acetone	NA	NA	1.77E-010	1.38E-009								
Benzene	1.71E-003	2.91E-002	3.40E-011	2.78E-010	5.44E-012	2.33E-013	3E-009	7E-015	2.3E-012	2.3E-013	1E-009	7E-015
Ethyl benzene	2.86E-001	NA	6.80E-011	5.56E-010	1.09E-011		4E-011		4.7E-012		2E-011	
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	1.10E-009	5.44E-012	2.33E-013	6E-012	4E-016	2.3E-012	2.3E-013	3E-012	4E-016
Styrene	2.86E-001	NA	1.70E-011	1.39E-010	2.72E-012		1E-011		1.2E-012		4E-012	
Tetrachloroethene	NA	2.00E-003	1.43E-010	1.33E-009		9.82E-013		2E-015		9.8E-013		2E-015
Toluene	1.14E-001	NA	1.24E-010	1.14E-009	1.98E-011		2E-010		8.5E-012		7E-011	
Total Xylenes	NA	NA	1.16E-010	1.22E-009								
Semivolatile Organics												
2-Methylnaphthalene	NA	NA	3.23E-007	3.99E-006								
Acenaphthene	NA	NA	7.14E-007	5.23E-006								
Acenaphthylene	NA	NA	8.67E-009	7.09E-008								
Anthracene	NA	NA	1.70E-006	1.39E-005								
Benzo(a)anthracene	NA	NA	2.55E-006	2.09E-005								
Benzo(a)pyrene	NA	NA	2.04E-006	1.67E-005								
Benzo(b)fluoranthene	NA	NA	1.50E-006	1.22E-005								
Benzo(ghi)perylene	NA	NA	1.05E-006	8.62E-006								
Benzo(k)fluoranthene	NA	NA	2.21E-006	1.81E-005								
bis(2-Ethylhexyl)phthalate	NA	NA		2.09E-009								
Carbazole	NA	NA	1.31E-006	1.06E-005								
Chrysene	NA	NA	2.55E-006	2.09E-005								
Di-n-butylphthalate	NA	NA	2.38E-009	1.95E-008								
Dibenz(a,h)anthracene	NA	NA	4.25E-007	3.48E-006								
Dibenzofuran	NA	NA	6.46E-007	2.43E-006								
Fluoranthene	NA	NA	7.48E-006	6.12E-005								
Fluorene	NA	NA	1.05E-006	4.48E-006								
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006	9.04E-006								
Naphthalene	NA	NA	7.82E-007	5.45E-006								
Phenanthrene	NA	NA	4.93E-006	4.03E-005								
Phenol	NA	NA		6.26E-010								
Pyrene	NA	NA	4.76E-006	3.89E-005								
Pesticides												
4,4'-DDD	NA	NA	1.90E-009	5.77E-009								
4,4'-DDE	NA	NA	4.30E-009	3.29E-008								
4,4'-DDT	NA	3.40E-001	1.43E-008	1.12E-007		9.78E-011		3E-011		9.8E-011		3E-011
alpha-BHC	NA	6.30E+000	2.38E-010	1.25E-009		1.63E-012		1E-011		1.6E-012		1E-011
alpha-Chlordane	NA	1.30E+000		1.34E-009								
beta-BHC	NA	1.86E+000	4.64E-010	1.67E-009		3.18E-012		6E-012		3.2E-012		6E-012
delta-BHC	NA	NA		2.50E-010								
Dieldrin	NA	1.61E+001	5.78E-011	4.87E-010		3.96E-013		6E-012		4.0E-013		6E-012
Endosulfan I	NA	NA	2.55E-010	2.10E-009								
Endosulfan II	NA	NA	8.84E-010	3.03E-009								
Endosulfan sulfate	NA	NA	1.51E-009	5.07E-009								
Endrin	NA	NA	1.22E-009	4.50E-009								
Endrin aldehyde	NA	NA	1.58E-009	7.28E-009								
Endrin ketone	NA	NA	2.79E-009	1.30E-008								
gamma-BHC (Lindane)	NA	NA		5.56E-010								
gamma-Chlordane	NA	1.30E+000	3.66E-010	1.39E-009		2.51E-012		3E-012		2.5E-012		3E-012
Heptachlor	NA	4.55E+000		1.67E-010								
Heptachlor epoxide	NA	9.10E+000	9.93E-010	3.27E-009		6.81E-012		6E-011		6.8E-012		6E-011
Methoxychlor	NA	NA	6.80E-009	2.42E-008								
Metals												
Lead	NA	NA	9.47E-006	3.71E-005								
Mercury	8.57E-005	NA	3.26E-009	1.39E-008	5.22E-010		6E-006		2.2E-010		3E-006	
Selenium	NA	NA	2.09E-008	1.35E-007								
Sodium	NA	NA	7.16E-006	5.24E-005								
Zinc	NA	NA	2.16E-005	6.66E-005								
Total Hazard Quotient and Cancer Risk:							**6E-006**	**1E-010**			**3E-006**	**1E-010**

Assumptions for Future Day Care Center Child			Assumptions for Future Day Care Center Adult		
CA =	EPC Surface Only		CA =	EPC Surface Only	
IR =	4	m3/day	IR =	8	m3/day
EF =	219	days/year	EF =	219	days/year
ED =	3	years	ED =	7	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	1095	days	AT (Nc) =	2555	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-11
CALCULATION OF INTAKE AND RISK FROM INHALATION OF DUST IN AMBIENT AIR
CENTRAL TENDENCY (CT) SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CA \times IR \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CA = Chemical Concentration in Air, Calculated from Air EPC Data
IR = Inhalation Rate
EF = Exposure Frequency

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Inhalation RfD (mg/kg-day)	Carc. Slope Inhalation (mg/kg-day)-1	Air EPC* from Surface Soil (mg/m3)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.86E-001	NA										
Acetone	NA	NA	1.77E-010									
Benzene	1.71E-003	2.91E-002	3.40E-011	6.23E-012	6.23E-013	4E-009	2E-014	1.26E-011	3.61E-013	7E-009	1E-014	2.86E-014
Ethylbenzene	2.86E-001	NA	6.80E-011	1.25E-011		4E-011		2.53E-011		9E-011		
Methylene chloride	8.57E-001	1.65E-003	3.40E-011	6.23E-012	6.23E-013	7E-012	1E-015	1.26E-011	3.61E-013	1E-011	6E-016	1.62E-015
Styrene	2.86E-001	NA	1.70E-011	3.11E-012		1E-011		6.32E-012		2E-011		
Tetrachloroethene	NA	2.00E-003	1.43E-010		2.62E-012		5E-015		1.52E-012		3E-015	8.29E-015
Toluene	1.14E-001	NA	1.24E-010	2.27E-011		2E-010		4.61E-011		4E-010		
Total Xylenes	NA	NA	1.16E-010									
2-Methylnaphthalene	NA	NA	3.23E-007									
Acenaphthene	NA	NA	7.14E-007									
Acenaphthylene	NA	NA	8.67E-009									
Anthracene	NA	NA	1.70E-006									
Benzo(a)anthracene	NA	NA	2.55E-006									
Benzo(a)pyrene	NA	NA	2.04E-006									
Benzo(b)fluoranthene	NA	NA	1.50E-006									
Benzo(ghi)perylene	NA	NA	1.05E-006									
Benzo(k)fluoranthene	NA	NA	2.21E-006									
bis(2-Ethylhexyl)phthalate	NA	NA										
Carbazole	NA	NA	1.31E-006									
Chrysene	NA	NA	2.55E-006									
Di-n-butylphthalate	NA	NA	2.38E-009									
Dibenz(a,h)anthracene	NA	NA	4.25E-007									
Dibenzofuran	NA	NA	6.46E-007									
Fluoranthene	NA	NA	7.48E-006									
Fluorene	NA	NA	1.05E-006									
Indeno(1,2,3-cd)pyrene	NA	NA	1.11E-006									
Naphthalene	NA	NA	7.82E-007									
Phenanthrene	NA	NA	4.93E-006									
Phenol	NA	NA										
Pyrene	NA	NA	4.76E-006									
Pesticides												
4,4'-DDD	NA	NA	1.90E-009									
4,4'-DDE	NA	NA	4.30E-009									
4,4'-DDT	NA	3.40E-001	1.43E-008		2.61E-010		9E-011		1.52E-010		5E-011	1.40E-010
alpha-BHC	NA	6.30E+000	2.38E-010		4.36E-012		3E-011		2.53E-012		2E-011	4.34E-011
alpha-Chlordane	NA	1.30E+000										
beta-BHC	NA	1.86E+000	4.64E-010		8.50E-012		2E-011		4.93E-012		9E-012	2.50E-011
delta-BHC	NA	NA										
Dieldrin	NA	1.61E+001	5.78E-011		1.06E-012		2E-011		6.14E-013		1E-011	2.69E-011
Endosulfan I	NA	NA	2.55E-010									
Endosulfan II	NA	NA	8.84E-010									
Endosulfan sulfate	NA	NA	1.51E-009									
Endrin	NA	NA	1.22E-009									
Endrin aldehyde	NA	NA	1.58E-009									
Endrin ketone	NA	NA	2.79E-009									
gamma-BHC (Lindane)	NA	NA										
gamma-Chlordane	NA	1.30E+000	3.66E-010		6.69E-012		9E-012		3.88E-012		5E-012	1.38E-011
Heptachlor	NA	4.55E+000										
Heptachlor epoxide	NA	9.10E+000	9.93E-010		1.82E-011		2E-010		1.05E-011		1E-010	2.61E-010
Methoxychlor	NA	NA	6.80E-009									
Metals												
Lead	NA	NA	9.47E-006									
Mercury	8.57E-005	NA	3.26E-009	5.98E-010		7E-006		1.21E-009		1E-005		
Selenium	NA	NA	2.09E-008									
Sodium	NA	NA	7.16E-006									
Zinc	NA	NA	2.16E-005									
Total Hazard Quotient and Cancer Risk:						**7E-006**	**3E-010**			**1E-005**	**2E-010**	**5E-010**

Assumptions for Future Resident (Adult)			Assumptions for Future Resident (Child)		
CA =	EPC Surface Only		CA =	EPC Surface Only	
BW =	70	kg	BW =	15	kg
IR =	20	m3/day	IR =	8.7	m3/day
EF =	234	days/year	EF =	234	days/year
ED =	7	years	ED =	2	years
AT (Nc) =	2555	days	AT (Nc) =	730	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003								
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	8.14E-010		8E-009				**Ingestion of**	
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	1.57E-010	5.59E-011	5E-008	2E-012			**Onsite Soils**	
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	3.13E-010		3E-009				**Not Applicable**	
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	1.57E-010	5.59E-011	3E-009	4E-013			**for Future**	
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	7.83E-011		4E-010				**Industrial Worker**	
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	6.59E-010	2.35E-010	7E-008	1E-011				
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	5.71E-010		3E-009					
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	5.34E-010		3E-010					
Semivolatile Organics												
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	1.49E-006		4E-005					
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	3.29E-006		5E-005					
Acenaphthylene	NA	NA	5.10E-001	5.10E-001								
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	7.83E-006		3E-005					
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		4.19E-006		3E-006				
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		3.35E-006		2E-005				
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		2.46E-006		2E-006				
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001								
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		3.63E-006		3E-007				
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002		1.50E-002								
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		2.15E-006		4E-008				
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		4.19E-006		3E-008				
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	1.10E-008		1E-007					
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		6.99E-007		5E-006				
Dibenzofuran	NA	NA	3.80E+001	1.75E+001								
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	3.44E-005		9E-004					
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	4.85E-006		1E-004					
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		1.82E-006		1E-006				
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	3.60E-006		9E-005					
Phenanthrene	NA	NA	2.90E+002	2.90E+002								
Phenol	6.00E-001	NA		4.50E-003								
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	2.19E-005		7E-004					
Pesticides												
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		3.13E-009		8E-010				
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		7.07E-009		2E-009				
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	6.57E-008	2.35E-008	1E-004	8E-009				
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		3.91E-010		2E-009				
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003								
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		7.63E-010		1E-009				
delta-BHC	NA	NA		1.80E-003								
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	2.66E-010	9.51E-011	5E-006	2E-009				
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	1.17E-009		2E-007					
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	4.07E-009		7E-007					
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	6.96E-009		1E-006					
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	5.60E-009		2E-005					
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002								
Endrin ketone	NA	NA	1.64E-001	9.33E-002								
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003								
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	1.68E-009	6.01E-010	3E-005	8E-010				
Heptachlor	5.00E-004	4.50E+000		1.20E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	4.57E-009	1.63E-009	4E-004	1E-008				
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	3.13E-008		6E-006					
Metals												
Lead	NA	NA	5.57E+002	2.67E+002								
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	1.50E-008		5E-005					
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	9.63E-008		2E-005					
Sodium	NA	NA	4.21E+002	3.77E+002								
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	9.94E-005		3E-004					
Total Hazard Quotient and Cancer Risk:							**3E-003**	**4E-005**				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
IR =	100	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	20	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD	Carc. Slope Oral	EPC Surface Soil	EPC from Total Soils	Future Construction Worker: Intake (mg/kg-day)		Future Construction Worker: Hazard Quotient	Future Construction Worker: Cancer Risk	Future Tresspasser Child: Intake (mg/kg-day)		Future Tresspasser Child: Hazard Quotient	Future Tresspasser Child: Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/kg)	(mg/kg)	(Nc)	(Car)			(Nc)	(Car)		
Volatile Organics												
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003	4.07E-008		2E-006					
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	4.67E-008		5E-007		5.70E-009		6E-008	
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	9.39E-009	1.34E-010	3E-006	4E-012	1.10E-009	7.83E-011	4E-007	2E-012
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	1.88E-008		2E-007		2.19E-009		2E-008	
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	3.73E-008	5.33E-010	6E-007	4E-012	1.10E-009	7.83E-011	2E-008	6E-013
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	4.70E-009		2E-008		5.48E-010		3E-009	
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	4.49E-008	6.41E-010	4E-006	3E-011	4.61E-009	3.30E-010	5E-007	2E-011
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	3.85E-008		2E-007		3.99E-009		2E-008	
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	4.13E-008		2E-008		3.74E-009		2E-009	
Semivolatile Organics												
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	1.35E-004		3E-003		1.04E-005		3E-004	
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	1.77E-004		3E-003		2.30E-005		4E-004	
Acenaphthylene	NA	NA	5.10E-001	5.10E-001								
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	4.70E-004		2E-003		5.48E-005		2E-004	
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		1.01E-005		7E-006		5.87E-006		4E-006
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		8.05E-006		6E-005		4.70E-006		3E-005
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		5.90E-006		4E-006		3.44E-006		3E-006
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001								
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		8.72E-006		6E-007		5.09E-006		4E-007
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002		1.50E-002	7.05E-008	1.01E-009	4E-006	1E-011				
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		5.11E-006		1E-007		3.01E-006		6E-008
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		1.01E-005		7E-008		5.87E-006		4E-008
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	6.58E-007		7E-006		7.67E-008		8E-007	
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		1.68E-006		1E-005		9.78E-007		7E-006
Dibenzofuran	NA	NA	3.80E+001	1.75E+001								
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	2.07E-003		5E-002		2.41E-004		6E-003	
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	1.51E-004		4E-003		3.40E-005		8E-004	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		4.36E-006		3E-006		2.54E-006		2E-006
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	1.84E-004		5E-003		2.52E-005		6E-004	
Phenanthrene	NA	NA	2.90E+002	2.90E+002								
Phenol	6.00E-001	NA		4.50E-003	2.11E-008		4E-008					
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	1.32E-003		4E-002		1.53E-004		5E-003	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		2.78E-009		7E-010		4.38E-009		1E-009
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		1.59E-008		5E-009		9.90E-009		3E-009
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	3.79E-006	5.42E-008	8E-003	2E-008	4.60E-007	3.28E-008	9E-004	1E-008
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		6.05E-010		4E-009		5.48E-010		3E-009
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003	4.53E-008	6.47E-010	8E-004	8E-010				
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		8.05E-010		1E-009		1.07E-009		2E-009
delta-BHC	NA	NA		1.80E-003								
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	1.64E-008	2.35E-010	3E-004	4E-009	1.86E-009	1.33E-010	4E-005	2E-009
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	7.09E-008		1E-005		8.22E-009		1E-006	
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	1.02E-007		2E-005		2.85E-008		5E-006	
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	1.71E-007		3E-005		4.87E-008		8E-006	
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	1.52E-007		5E-004		3.92E-008		1E-004	
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002								
Endrin ketone	NA	NA	1.64E-001	9.33E-002								
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003	1.88E-008	2.68E-010	6E-005	3E-010				
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	4.70E-008	6.71E-010	8E-004	9E-010	1.18E-008	8.41E-010	2E-004	1E-009
Heptachlor	5.00E-004	4.50E+000		1.20E-003	5.64E-009	8.05E-011	1E-005	4E-010				
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	1.10E-007	1.58E-009	8E-003	1E-008	3.20E-008	2.29E-009	2E-003	2E-008
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	8.17E-007		2E-004		2.19E-007		4E-005	
Metals												
Lead	NA	NA	5.57E+002	2.67E+002								
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	4.70E-007		2E-003		1.05E-007		4E-004	
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	4.57E-006		9E-004		6.74E-007		1E-004	
Sodium	NA	NA	4.21E+002	3.77E+002								
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	2.25E-003		7E-003		6.96E-004		2E-003	
Total Hazard Quotient and Cancer Risk:							**1E-001**	**9E-005**			**2E-002**	**5E-005**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CS =	EPC Surface and Subsurface		CS =	EPC Surface Only	
IR =	480	mg soil/day	IR =	200	mg soil/day
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
FI =	1	unitless	FI =	1	unitless
EF =	250	days/year	EF =	50	days/year
ED =	1	years	ED =	5	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	1825	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71

Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EP
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003								
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	9.50E-008		9E-007		1.02E-008		1E-007	
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	1.83E-008	1.57E-009	6E-006	5E-011	1.96E-009	6.99E-010	7E-007	2E-011
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	3.65E-008		4E-007		3.91E-009		4E-008	
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	1.83E-008	1.57E-009	3E-007	1E-011	1.96E-009	6.99E-010	3E-008	5E-012
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	9.13E-009		5E-008		9.78E-010		5E-009	
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	7.69E-008	6.59E-009	8E-006	3E-010	8.24E-009	2.94E-009	8E-007	2E-010
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	6.66E-008		3E-007		7.13E-009		4E-008	
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	6.23E-008		3E-008		6.67E-009		3E-009	
Semivolatile Organics												
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	1.74E-004		4E-003		1.86E-005		5E-004	
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	3.84E-004		6E-003		4.11E-005		7E-004	
Acenaphthylene	NA	NA	5.10E-001	5.10E-001								
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	9.13E-004		3E-003		9.78E-005		3E-004	
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		1.17E-004		9E-005		5.24E-005		4E-005
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		9.39E-005		7E-004		4.19E-005		3E-004
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		6.89E-005		5E-005		3.08E-005		2E-005
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001								
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		1.02E-004		7E-006		4.54E-005		3E-006
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002		1.50E-002								
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		6.03E-005		1E-006		2.69E-005		5E-007
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		1.17E-004		9E-007		5.24E-005		4E-007
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	1.28E-006		1E-005		1.37E-007		1E-006	
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		1.96E-005		1E-004		8.74E-006		6E-005
Dibenzofuran	NA	NA	3.80E+001	1.75E+001								
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	4.02E-003		1E-001		4.31E-004		1E-002	
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	5.66E-004		1E-002		6.07E-005		2E-003	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		5.09E-005		4E-005		2.27E-005		2E-005
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	4.20E-004		1E-002		4.50E-005		1E-003	
Phenanthrene	NA	NA	2.90E+002	2.90E+002								
Phenol	6.00E-001	NA		4.50E-003								
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	2.56E-003		9E-002		2.74E-004		9E-003	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		8.77E-008		2E-008		3.91E-008		9E-009
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		1.98E-007		7E-008		8.84E-008		3E-008
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	7.66E-006	6.57E-007	2E-002	2E-007	8.21E-007	2.93E-007	2E-003	1E-007
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		1.10E-008		7E-008		4.89E-009		3E-008
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003								
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		2.14E-008		4E-008		9.54E-009		2E-008
delta-BHC	NA	NA		1.80E-003								
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	3.11E-008	2.66E-009	6E-004	4E-008	3.33E-009	1.19E-009	7E-005	2E-008
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	1.37E-007		2E-005		1.47E-008		2E-006	
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	4.75E-007		8E-005		5.09E-008		8E-006	
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	8.12E-007		1E-004		8.70E-008		1E-005	
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	6.54E-007		2E-003		7.01E-008		2E-004	
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002								
Endrin ketone	NA	NA	1.64E-001	9.33E-002								
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003								
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	1.96E-007	1.68E-008	3E-003	2E-008	2.10E-008	7.51E-009	4E-004	1E-008
Heptachlor	5.00E-004	4.50E+000		1.20E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	5.33E-007	4.57E-008	4E-002	4E-007	5.71E-008	2.04E-008	4E-003	2E-007
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	3.65E-006		7E-004		3.91E-007		8E-005	
Metals												
Lead	NA	NA	5.57E+002	2.67E+002								
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	1.75E-006		6E-003		1.88E-007		6E-004	
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	1.12E-005		2E-003		1.20E-006		2E-004	
Sodium	NA	NA	4.21E+002	3.77E+002								
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	1.16E-002		4E-002		1.24E-003		4E-003	
Total Hazard Quotient and Cancer Risk:							**3E-001**	**1E-003**			**4E-002**	**5E-004**

Assumptions for Future Day Care Center Child			Assumptions for Future Day Care Center Adult		
CS =	EPC Surface Only		CS =	EPC Surface Only	
IR =	200	mg soil/day	IR =	100	mg soil/day
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
FI =	1	unitless	FI =	1	unitless
EF =	250	days/year	EF =	250	days/year
ED =	6	years	ED =	25	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	2190	days	AT (Nc) =	9125	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

NA= Information not available.

TABLE B-12
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics													
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003									
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	1.42E-008		1E-007		1.33E-007		1E-006		
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	2.74E-009	9.39E-010	9E-007	3E-011	2.56E-008	2.19E-009	9E-006	6E-011	9E-011
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	5.48E-009		5E-008		5.11E-008		5E-007		
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	2.74E-009	9.39E-010	5E-008	7E-012	2.56E-008	2.19E-009	4E-007	2E-011	2E-011
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	1.37E-009		7E-009		1.28E-008		6E-008		
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	1.15E-008	3.95E-009	1E-006	2E-010	1.08E-007	9.23E-009	1E-005	5E-010	7E-010
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	9.99E-009		5E-008		9.32E-008		5E-007		
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	9.34E-009		5E-009		8.72E-008		4E-008		
Semivolatile Organics													
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	2.60E-005		7E-004		2.43E-004		6E-003		
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	5.75E-005		1E-003		5.37E-004		9E-003		
Acenaphthylene	NA	NA	5.10E-001	5.10E-001									
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	1.37E-004		5E-004		1.28E-003		4E-003		
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		7.05E-005		5E-005		1.64E-004		1E-004	2E-004
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		5.64E-005		4E-004		1.32E-004		1E-003	1E-003
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		4.13E-005		3E-005		9.64E-005		7E-005	1E-004
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001									
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		6.11E-005		4E-006		1.42E-004		1E-005	1E-005
bis(2-Ethylhexyl)phthalat	2.00E-002	1.40E-002		1.50E-002									
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		3.62E-005		7E-007		8.44E-005		2E-006	2E-006
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		7.05E-005		5E-007		1.64E-004		1E-006	2E-006
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	1.92E-007		2E-006		1.79E-006		2E-005		
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		1.17E-005		9E-005		2.74E-005		2E-004	3E-004
Dibenzofuran	NA	NA	3.80E+001	1.75E+001									
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	6.03E-004		2E-002		5.63E-003		1E-001		
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	8.49E-005		2E-003		7.93E-004		2E-002		
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		3.05E-005		2E-005		7.12E-005		5E-005	7E-005
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	6.30E-005		2E-003		5.88E-004		1E-002		
Phenanthrene	NA	NA	2.90E+002	2.90E+002									
Phenol	6.00E-001	NA		4.50E-003									
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	3.84E-004		1E-002		3.58E-003		1E-001		
Pesticides													
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		5.26E-008		1E-008		1.23E-007		3E-008	4E-008
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		1.19E-007		4E-008		2.77E-007		9E-008	1E-007
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	1.15E-006	3.94E-007	2E-003	1E-007	1.07E-005	9.19E-007	2E-002	3E-007	4E-007
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		6.58E-009		4E-008		1.53E-008		1E-007	1E-007
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003									
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		1.28E-008		2E-008		2.99E-008		5E-008	8E-008
delta-BHC	NA	NA		1.80E-003									
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	4.66E-009	1.60E-009	9E-005	3E-008	4.35E-008	3.73E-009	9E-004	6E-008	9E-008
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	2.05E-008		3E-006		1.92E-007		3E-005		
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	7.12E-008		1E-005		6.65E-007		1E-004		
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	1.22E-007		2E-005		1.14E-006		2E-004		
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	9.81E-008		3E-004		9.15E-007		3E-003		
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002									
Endrin ketone	NA	NA	1.64E-001	9.33E-002									
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003									
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	2.95E-008	1.01E-008	5E-004	1E-008	2.75E-007	2.36E-008	5E-003	3E-008	4E-008
Heptachlor	5.00E-004	4.50E+000		1.20E-003									
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	8.00E-008	2.74E-008	6E-003	2E-007	7.47E-007	6.40E-008	6E-002	6E-007	8E-007
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	5.48E-007		1E-004		5.11E-006		1E-003		
Metals													
Lead	NA	NA	5.57E+002	2.67E+002									
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	2.63E-007		9E-004		2.45E-006		8E-003		
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	1.68E-006		3E-004		1.57E-005		3E-003		
Sodium	NA	NA	4.21E+002	3.77E+002									
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	1.74E-003		6E-003		1.62E-002		5E-002		
Total Hazard Quotient and Cancer Risk:							**5E-002**	**6E-004**			**5E-001**	**1E-003**	**2E-003**

Assumptions for Resident (Adult)		Assumptions for Resident (Child)	
CF =	1E-006 kg/mg	CF =	1E-006 kg/mg
CS =	EPC Surface Only	CS =	EPC Surface Only
BW =	70 kg	BW =	15 kg
IR =	100 mg soil/day	IR =	200 mg soil/day
FI =	1 unitless	FI =	1 unitless
EF =	350 days/year	EF =	350 days/year
ED =	24 years	ED =	6 years
AT (Nc) =	8,760 days	AT (Nc) =	2,190 days
AT (Car) =	25,550 days	AT (Car) =	25,550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EPC
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Current Site Worker: Intake (mg/kg-day) (Nc)	Current Site Worker: Intake (mg/kg-day) (Car)	Current Site Worker: Hazard Quotient	Current Site Worker: Cancer Risk	Future Industrial Worker: Intake (mg/kg-day) (Nc)	Future Industrial Worker: Intake (mg/kg-day) (Car)	Future Industrial Worker: Hazard Quotient	Future Industrial Worker: Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003							**Ingestion of**	
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	2.04E-010		2E-009				**Onsite Soils**	
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	3.91E-011	3.91E-012	1E-008	1E-013			**Not Applicable**	
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	7.83E-011		8E-010				**for Future**	
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	3.91E-011	3.91E-012	7E-010	3E-014			**Industrial Worker**	
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	1.96E-011		1E-010					
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	1.65E-010	1.65E-011	2E-008	9E-013				
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	1.43E-010		7E-010					
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	1.33E-010		7E-011					
Semivolatile Organics												
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	3.72E-007		9E-006					
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	8.22E-007		1E-005					
Acenaphthylene	NA	NA	5.10E-001	5.10E-001								
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	1.96E-006		7E-006					
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		2.94E-007		2E-007				
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		2.35E-007		2E-006				
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		1.72E-007		1E-007				
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001								
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		2.54E-007		2E-008				
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002		1.50E-002								
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		1.51E-007		3E-009				
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		2.94E-007		2E-009				
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	2.74E-009		3E-008					
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		4.89E-008		4E-007				
Dibenzofuran	NA	NA	3.80E+001	1.75E+001								
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	8.61E-006		2E-004					
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	1.21E-006		3E-005					
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		1.27E-007		9E-008				
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	9.00E-007		2E-005					
Phenanthrene	NA	NA	2.90E+002	2.90E+002								
Phenol	6.00E-001	NA		4.50E-003								
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	5.48E-006		2E-004					
Pesticides												
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		2.19E-010		5E-011				
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		4.95E-010		2E-010				
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	1.64E-008	1.64E-009	3E-005	6E-010				
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		2.74E-011		2E-010				
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003								
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		5.34E-011		1E-010				
delta-BHC	NA	NA		1.80E-003								
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	6.65E-011	6.65E-012	1E-006	1E-010				
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	2.94E-010		5E-008					
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	1.02E-009		2E-007					
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	1.74E-009		3E-007					
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	1.40E-009		5E-006					
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002								
Endrin ketone	NA	NA	1.64E-001	9.33E-002								
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003								
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	4.21E-010	4.21E-011	7E-006	5E-011				
Heptachlor	5.00E-004	4.50E+000		1.20E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	1.14E-009	1.14E-010	9E-005	1E-009				
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	7.83E-009		2E-006					
Metals												
Lead	NA	NA	5.57E+002	2.67E+002								
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	3.76E-009		1E-005					
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	2.41E-008		5E-006					
Sodium	NA	NA	4.21E+002	3.77E+002								
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	2.49E-005		8E-005					
Total Hazard Quotient and Cancer Risk:							**7E-004**	**3E-006**				

Assumptions for Current Site Worker

CS =	EPC Surface Only	
IR =	50	mg soil/day
CF =	1E-006	kg/mg
FI =	1	unitless
EF =	10	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EPC
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk	Future Tresspasser Child Intake (mg/kg-day) (Nc)	Future Tresspasser Child Intake (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003	7.42E-009		4E-007					
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	8.53E-009		9E-008		1.42E-009		1E-008	
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	1.71E-009	2.45E-011	6E-007	7E-013	2.74E-010	3.91E-012	9E-008	1E-013
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	3.43E-009		3E-008		5.48E-010		5E-009	
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	6.81E-009	9.72E-011	1E-007	7E-013	2.74E-010	3.91E-012	5E-009	3E-014
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	8.57E-010		4E-009		1.37E-010		7E-010	
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	8.19E-009	1.17E-010	8E-007	6E-012	1.15E-009	1.65E-011	1E-007	9E-013
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	7.03E-009		4E-008		9.99E-010		5E-009	
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	7.54E-009		4E-009		9.34E-010		5E-010	
Semivolatile Organics												
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	2.46E-005		6E-004		2.60E-006		7E-005	
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	3.22E-005		5E-004		5.75E-006		1E-004	
Acenaphthylene	NA	NA	5.10E-001	5.10E-001								
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	8.57E-005		3E-004		1.37E-005		5E-005	
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		1.84E-006		1E-006		2.94E-007		2E-007
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		1.47E-006		1E-005		2.35E-007		2E-006
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		1.08E-006		8E-007		1.72E-007		1E-007
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001								
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		1.59E-006		1E-007		2.54E-007		2E-008
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002		1.50E-002	1.29E-008	1.84E-010	6E-007	3E-012				
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		9.32E-007		2E-008		1.51E-007		3E-009
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		1.84E-006		1E-008		2.94E-007		2E-009
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	1.20E-007		1E-006		1.92E-008		2E-007	
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		3.06E-007		2E-006		4.89E-008		4E-007
Dibenzofuran	NA	NA	3.80E+001	1.75E+001								
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	3.77E-004		9E-003		6.03E-005		2E-003	
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	2.76E-005		7E-004		8.49E-006		2E-004	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		7.96E-007		6E-007		1.27E-007		9E-008
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	3.36E-005		8E-004		6.30E-006		2E-004	
Phenanthrene	NA	NA	2.90E+002	2.90E+002								
Phenol	6.00E-001	NA		4.50E-003	3.86E-009		6E-009					
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	2.40E-004		8E-003		3.84E-005		1E-003	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		5.08E-010		1E-010		2.19E-010		5E-011
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		2.90E-009		1E-009		4.95E-010		2E-010
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	6.93E-007	9.89E-009	1E-003	3E-009	1.15E-007	1.64E-009	2E-004	6E-010
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		1.10E-010		7E-010		2.74E-011		2E-010
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003	8.27E-009	1.18E-010	1E-004	2E-010				
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		1.47E-010		3E-010		5.34E-011		1E-010
delta-BHC	NA	NA		1.80E-003								
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	3.00E-009	4.29E-011	6E-005	7E-010	4.66E-010	6.65E-012	9E-006	1E-010
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	1.29E-008		2E-006		2.05E-009		3E-007	
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	1.87E-008		3E-006		7.12E-009		1E-006	
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	3.13E-008		5E-006		1.22E-008		2E-006	
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	2.78E-008		9E-005		9.81E-009		3E-005	
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002								
Endrin ketone	NA	NA	1.64E-001	9.33E-002								
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003	3.43E-009	4.90E-011	1E-005	6E-011				
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	8.57E-009	1.22E-010	1E-004	2E-010	2.95E-009	4.21E-011	5E-005	5E-011
Heptachlor	5.00E-004	4.50E+000		1.20E-003	1.03E-009	1.47E-011	2E-006	7E-011				
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	2.01E-008	2.88E-010	2E-003	3E-009	8.00E-009	1.14E-010	6E-004	1E-009
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	1.49E-007		3E-005		5.48E-008		1E-005	
Metals												
Lead	NA	NA	5.57E+002	2.67E+002								
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	8.57E-008		3E-004		2.63E-008		9E-005	
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	8.35E-007		2E-004		1.68E-007		3E-005	
Sodium	NA	NA	4.21E+002	3.77E+002								
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	4.11E-004		1E-003		1.74E-004		6E-004	
Total Hazard Quotient and Cancer Risk:							**3E-002**	**2E-005**			**5E-003**	**3E-006**

Assumptions for Future Construction Worker			Assumptions for Future Tresspasser Child		
CS =	EPC Surface and Subsurface		CS =	EPC Surface Only	
IR =	100	mg soil/day	IR =	100	mg soil/day
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
FI =	1	unitless	FI =	1	unitless
EF =	219	days/year	EF =	25	days/year
ED =	1	years	ED =	1	years
BW =	70	kg	BW =	50	kg
AT (Nc) =	365	days	AT (Nc) =	365	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CS x IR x CF x FI x EF x ED / BW x AT

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Variables (Assumptions for Each Receptor are Listed at the Bottom):

CS = Chemical Concentration in Soil, Calculated from Soil EPC
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Future Day Care Center Adult: Intake (mg/kg-day) (Nc)	Future Day Care Center Adult: Intake (mg/kg-day) (Car)	Future Day Care Center Adult: Hazard Quotient	Future Day Care Center Adult: Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003								
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	4.16E-008		4E-007		4.46E-009		4E-008	
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	8.00E-009	3.43E-010	3E-006	1E-011	8.57E-010	8.57E-011	3E-007	2E-012
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	1.60E-008		2E-007		1.71E-009		2E-008	
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	8.00E-009	3.43E-010	1E-007	3E-012	8.57E-010	8.57E-011	1E-008	6E-013
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	4.00E-009		2E-008		4.29E-010		2E-009	
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	3.37E-008	1.44E-009	3E-006	8E-011	3.61E-009	3.61E-010	4E-007	2E-011
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	2.92E-008		1E-007		3.12E-009		2E-008	
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	2.73E-008		1E-008		2.92E-009		1E-009	
Semivolatile Organics												
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	7.60E-005		2E-003		8.14E-006		2E-004	
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	1.68E-004		3E-003		1.80E-005		3E-004	
Acenaphthylene	NA	NA	5.10E-001	5.10E-001								
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	4.00E-004		1E-003		4.29E-005		1E-004	
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		2.57E-005		2E-005		6.43E-006		5E-006
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		2.06E-005		2E-004		5.14E-006		4E-005
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		1.51E-005		1E-005		3.77E-006		3E-006
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001								
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		2.23E-005		2E-006		5.57E-006		4E-007
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002		1.50E-002								
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		1.32E-005		3E-007		3.30E-006		7E-008
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		2.57E-005		2E-007		6.43E-006		5E-008
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	5.60E-007		6E-006		6.00E-008		6E-007	
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		4.29E-006		3E-005		1.07E-006		8E-006
Dibenzofuran	NA	NA	3.80E+001	1.75E+001								
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	1.76E-003		4E-002		1.89E-004		5E-003	
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	2.48E-004		6E-003		2.66E-005		7E-004	
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		1.11E-005		8E-006		2.79E-006		2E-006
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	1.84E-004		5E-003		1.97E-005		5E-004	
Phenanthrene	NA	NA	2.90E+002	2.90E+002								
Phenol	6.00E-001	NA		4.50E-003								
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	1.12E-003		4E-002		1.20E-004		4E-003	
Pesticides												
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		1.92E-008		5E-009		4.80E-009		1E-009
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		4.34E-008		1E-008		1.08E-008		4E-009
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	3.36E-006	1.44E-007	7E-003	5E-008	3.60E-007	3.60E-008	7E-004	1E-008
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		2.40E-009		2E-008		6.00E-010		4E-009
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003								
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		4.68E-009		8E-009		1.17E-009		2E-009
delta-BHC	NA	NA		1.80E-003								
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	1.36E-008	5.83E-010	3E-004	9E-009	1.46E-009	1.46E-010	3E-005	2E-009
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	6.00E-008		1E-005		6.43E-009		1E-006	
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	2.08E-007		3E-005		2.23E-008		4E-006	
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	3.56E-007		6E-005		3.81E-008		6E-006	
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	2.86E-007		1E-003		3.07E-008		1E-004	
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002								
Endrin ketone	NA	NA	1.64E-001	9.33E-002								
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003								
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	8.60E-008	3.69E-009	1E-003	5E-009	9.21E-009	9.21E-010	2E-004	1E-009
Heptachlor	5.00E-004	4.50E+000		1.20E-003								
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	2.34E-007	1.00E-008	2E-002	9E-008	2.50E-008	2.50E-009	2E-003	2E-008
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	1.60E-006		3E-004		1.71E-007		3E-005	
Metals												
Lead	NA	NA	5.57E+002	2.67E+002								
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	7.68E-007		3E-003		8.23E-008		3E-004	
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	4.92E-006		1E-003		5.27E-007		1E-004	
Sodium	NA	NA	4.21E+002	3.77E+002								
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	5.08E-003		2E-002		5.44E-004		2E-003	
Total Hazard Quotient and Cancer Risk:							**1E-001**	**2E-004**			**2E-002**	**6E-005**

Assumptions for Future Day Care Center Child			Assumptions for Future Day Care Center Adult		
CS =	EPC Surface Only		CS =	EPC Surface Only	
IR =	100	mg soil/day	IR =	50	mg soil/day
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
FI =	1	unitless	FI =	1	unitless
EF =	219	days/year	EF =	219	days/year
ED =	3	years	ED =	7	years
BW =	15	kg	BW =	70	kg
AT (Nc) =	1095	days	AT (Nc) =	2555	days
AT (Car) =	25550	days	AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-13
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF SOIL FOR SEAD-71
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated from Soil EPC Data
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested

EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC from Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Volatile Organics													
Trichloroethane, 1,1,1-	2.00E-002	NA		8.66E-003									
Acetone	1.00E-001	NA	1.04E-002	9.95E-003	4.76E-009		5E-008		4.44E-008		4E-007		
Benzene	3.00E-003	2.90E-002	2.00E-003	2.00E-003	9.16E-010	9.16E-011	3E-007	3E-012	8.55E-009	2.44E-010	3E-006	7E-012	1E-011
Ethyl benzene	1.00E-001	NA	4.00E-003	4.00E-003	1.83E-009		2E-008		1.71E-008		2E-007		
Methylene chloride	6.00E-002	7.50E-003	2.00E-003	7.94E-003	9.16E-010	9.16E-011	2E-008	7E-013	8.55E-009	2.44E-010	1E-007	2E-012	3E-012
Styrene	2.00E-001	NA	1.00E-003	1.00E-003	4.58E-010		2E-009		4.27E-009		2E-008		
Tetrachloroethene	1.00E-002	5.20E-002	8.42E-003	9.55E-003	3.86E-009	3.86E-010	4E-007	2E-011	3.60E-008	1.03E-009	4E-006	5E-011	7E-011
Toluene	2.00E-001	NA	7.29E-003	8.20E-003	3.34E-009		2E-008		3.12E-008		2E-007		
Total Xylenes	2.00E+000	NA	6.82E-003	8.80E-003	3.12E-009		2E-009		2.91E-008		1E-008		
Semivolatile Organics													
2-Methylnaphthalene	4.00E-002	NA	1.90E+001	2.87E+001	8.70E-006		2E-004		8.12E-005		2E-003		
Acenaphthene	6.00E-002	NA	4.20E+001	3.76E+001	1.92E-005		3E-004		1.80E-004		3E-003		
Acenaphthylene	NA	NA	5.10E-001	5.10E-001									
Anthracene	3.00E-001	NA	1.00E+002	1.00E+002	4.58E-005		2E-004		4.27E-004		1E-003		
Benzo(a)anthracene	NA	7.30E-001	1.50E+002	1.50E+002		6.87E-006		5E-006		1.83E-005		1E-005	2E-005
Benzo(a)pyrene	NA	7.30E+000	1.20E+002	1.20E+002		5.50E-006		4E-005		1.47E-005		1E-004	1E-004
Benzo(b)fluoranthene	NA	7.30E-001	8.80E+001	8.80E+001		4.03E-006		3E-006		1.07E-005		8E-006	1E-005
Benzo(ghi)perylene	NA	NA	6.20E+001	6.20E+001									
Benzo(k)fluoranthene	NA	7.30E-002	1.30E+002	1.30E+002		5.95E-006		4E-007		1.59E-005		1E-006	2E-006
bis(2-Ethylhexyl)phthalate	2.00E-002	1.40E-002		1.50E-002									
Carbazole	NA	2.00E-002	7.70E+001	7.61E+001		3.53E-006		7E-008		9.40E-006		2E-007	3E-007
Chrysene	NA	7.30E-003	1.50E+002	1.50E+002		6.87E-006		5E-008		1.83E-005		1E-007	2E-007
Di-n-butylphthalate	1.00E-001	NA	1.40E-001	1.40E-001	6.41E-008		6E-007		5.98E-007		6E-006		
Dibenz(a,h)anthracene	NA	7.30E+000	2.50E+001	2.50E+001		1.14E-006		8E-006		3.05E-006		2E-005	3E-005
Dibenzofuran	NA	NA	3.80E+001	1.75E+001									
Fluoranthene	4.00E-002	NA	4.40E+002	4.40E+002	2.01E-004		5E-003		1.88E-003		5E-002		
Fluorene	4.00E-002	NA	6.20E+001	3.22E+001	2.84E-005		7E-004		2.65E-004		7E-003		
Indeno(1,2,3-cd)pyrene	NA	7.30E-001	6.50E+001	6.50E+001		2.98E-006		2E-006		7.94E-006		6E-006	8E-006
Naphthalene	4.00E-002	NA	4.60E+001	3.92E+001	2.11E-005		5E-004		1.97E-004		5E-003		
Phenanthrene	NA	NA	2.90E+002	2.90E+002									
Phenol	6.00E-001	NA		4.50E-003									
Pyrene	3.00E-002	NA	2.80E+002	2.80E+002	1.28E-004		4E-003		1.20E-003		4E-002		
Pesticides													
4,4'-DDD	NA	2.40E-001	1.12E-001	4.15E-002		5.13E-009		1E-009		1.37E-008		3E-009	5E-009
4,4'-DDE	NA	3.40E-001	2.53E-001	2.37E-001		1.16E-008		4E-009		3.09E-008		1E-008	1E-008
4,4'-DDT	5.00E-004	3.40E-001	8.39E-001	8.08E-001	3.84E-007	3.84E-008	8E-004	1E-008	3.59E-006	1.02E-007	7E-003	3E-008	5E-008
alpha-BHC	NA	6.30E+000	1.40E-002	9.01E-003		6.41E-010		4E-009		1.71E-009		1E-008	1E-008
alpha-Chlordane	6.00E-005	1.30E+000		9.65E-003									
beta-BHC	NA	1.80E+000	2.73E-002	1.20E-002		1.25E-009		2E-009		3.33E-009		6E-009	8E-009
delta-BHC	NA	NA		1.80E-003									
Dieldrin	5.00E-005	1.60E+001	3.40E-003	3.50E-003	1.56E-009	1.56E-010	3E-005	2E-009	1.45E-008	4.15E-010	3E-004	7E-009	9E-009
Endosulfan I	6.00E-003	NA	1.50E-002	1.51E-002	6.87E-009		1E-006		6.41E-008		1E-005		
Endosulfan II	6.00E-003	NA	5.20E-002	2.18E-002	2.38E-008		4E-006		2.22E-007		4E-005		
Endosulfan sulfate	6.00E-003	NA	8.89E-002	3.65E-002	4.07E-008		7E-006		3.80E-007		6E-005		
Endrin	3.00E-004	NA	7.16E-002	3.24E-002	3.28E-008		1E-004		3.06E-007		1E-003		
Endrin aldehyde	NA	NA	9.27E-002	5.24E-002									
Endrin ketone	NA	NA	1.64E-001	9.33E-002									
gamma-BHC (Lindane)	3.00E-004	1.30E+000		4.00E-003									
gamma-Chlordane	6.00E-005	1.30E+000	2.15E-002	1.00E-002	9.85E-009	9.85E-010	2E-004	1E-009	9.19E-008	2.63E-009	2E-003	3E-009	5E-009
Heptachlor	5.00E-004	4.50E+000		1.20E-003									
Heptachlor epoxide	1.30E-005	9.10E+000	5.84E-002	2.35E-002	2.67E-008	2.67E-009	2E-003	2E-008	2.50E-007	7.13E-009	2E-002	6E-008	9E-008
Methoxychlor	5.00E-003	NA	4.00E-001	1.74E-001	1.83E-007		4E-005		1.71E-006		3E-004		
Metals													
Lead	NA	NA	5.57E+002	2.67E+002									
Mercury	3.00E-004	NA	1.92E-001	1.00E-001	8.79E-008		3E-004		8.21E-007		3E-003		
Selenium	5.00E-003	NA	1.23E+000	9.74E-001	5.63E-007		1E-004		5.26E-006		1E-003		
Sodium	NA	NA	4.21E+002	3.77E+002									
Zinc	3.00E-001	NA	1.27E+003	4.79E+002	5.82E-004		2E-003		5.43E-003		2E-002		
Total Hazard Quotient and Cancer Risk:							**2E-002**	**6E-005**			**2E-001**	**2E-004**	**2E-004**

Assumptions for Future Resident (Adult)			Assumptions for Future Resident (Child)		
CF =	1E-006	kg/mg	CF =	1E-006	kg/mg
CS =	EPC Surface Only		CS =	EPC Surface Only	
BW =	70	kg	BW =	15	kg
IR =	50	mg soil/day	IR =	100	mg soil/day
FI =	1	unitless	FI =	1	unitless
EF =	234	days/year	EF =	234	days/year
ED =	7	years	ED =	2	years
AT (Nc) =	2555	days	AT (Nc) =	730	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-14
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. dermal RfDs, carcinogenic slope factors, and absorbtion factors for the analytes detected) risks from this pathway were not quantified.

TABLE B-15
CALCULATION OF ABSORBED DOSE AND RISK FROM DERMAL CONTACT TO SOIL
CENTRAL TENDENCY (CT) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. dermal RfDs, carcinogenic slope factors, and absorbtion factors for the analytes detected) risks from this pathway were not quantified.

TABLE B-16
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (WHILE SHOWERING)
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. inhalation RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

TABLE B-17
CALCULATION OF INTAKE AND RISK FROM INHALATION OF GROUNDWATER (WHILE SHOWERING)
CENTRAL TENDENCY (CT) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Based on a lack of toxicity data (i.e. inhalation RfDs and carcinogenic slope factors for the analytes detected) risks from this pathway were not quantified.

TABLE B-18
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER - SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk
Metals															
Aluminum	1.00E+000	NA	1.97E+001		**Ingestion of**			3.86E-001		4E-001			**Ingestion of**		
Beryllium	5.00E-003	4.30E+000	8.80E-004		**Groundwater**			1.72E-005	6.15E-006	3E-003	3E-005		**Groundwater**		
Chromium	5.00E-003	NA	3.31E-002		**Not Applicable**			6.48E-004		1E-001			**Not Applicable**		
Cobalt	6.00E-002	NA	2.21E-002		**for Current**			4.32E-004		7E-003			**for Future**		
Copper	4.00E-002	NA	1.61E-002		**Site Worker**			3.15E-004		8E-003			**Construction Worker**		
Iron	3.00E-001	NA	3.51E+001					6.87E-001		2E+000					
Lead	NA	NA	1.72E-002												
Manganese	5.00E-002	NA	1.68E+000					3.29E-002		7E-001					
Mercury	3.00E-004	NA													
Nickel	2.00E-002	NA	4.94E-002					9.67E-004		5E-002					
Selenium	5.00E-003	NA													
Sodium	NA	NA													
Vanadium	7.00E-003	NA	2.57E-002					5.03E-004		7E-002					
Zinc	3.00E-001	NA	9.73E-002					1.90E-003		6E-003					
Total Hazard Quotient and Cancer Risk:										**4E+000**	**3E-005**				

Assumptions for Future Industrial Worker

IR	2	liters/day
EF	250	days/year
ED	25	years
BW =	70	kg
AT (Nc)	9125	days
AT (Car)	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-18
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER - SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Future Tresspasser Child Intake (mg/kg-day) (Nc)	Future Tresspasser Child Intake (mg/kg-day) (Car)	Future Tresspasser Child Hazard Quotient	Future Tresspasser Child Cancer Risk	Future Day Care Center Child Intake (mg/kg-day) (Nc)	Future Day Care Center Child Intake (mg/kg-day) (Car)	Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Future Day Care Center Adult Intake (mg/kg-day) (Nc)	Future Day Care Center Adult Intake (mg/kg-day) (Car)	Future Day Care Center Adult Hazard Quotient	Future Day Care Center Adult Cancer Risk
Metals															
Aluminum	1.0E+000	NA	1.97E+001		**Ingestion of**			9.00E-001		9E-001		3.86E-001		4E-001	
Beryllium	5.0E-003	4.3E+000	8.80E-004		**Groundwater**			4.02E-005	3.44E-006	8E-003	1E-005	1.72E-005	6.15E-006	3E-003	3E-005
Chromium	5.0E-003	NA	3.31E-002		**Not Applicable**			1.51E-003		3E-001		6.48E-004		1E-001	
Cobalt	6.0E-002	NA	2.21E-002		**for Future**			1.01E-003		2E-002		4.32E-004		7E-003	
Copper	4.0E-002	NA	1.61E-002		**Tresspasser Child**			7.35E-004		2E-002		3.15E-004		8E-003	
Iron	3.0E-001	NA	3.51E+001					1.60E+000		5E+000		6.87E-001		2E+000	
Lead	NA	NA	1.72E-002												
Manganese	5.0E-002	NA	1.68E+000					7.67E-002		2E+000		3.29E-002		7E-001	
Mercury	3.0E-004	NA													
Nickel	2.0E-002	NA	4.94E-002					2.26E-003		1E-001		9.67E-004		5E-002	
Selenium	5.0E-003	NA													
Sodium	NA	NA													
Vanadium	7.0E-003	NA	2.57E-002					1.17E-003		2E-001		5.03E-004		7E-002	
Zinc	3.0E-001	NA	9.73E-002					4.44E-003		1E-002		1.90E-003		6E-003	
Total Hazard Quotient and Cancer Risk:										**8E+000**	**1E-005**			**4E+000**	**3E-005**

Assumptions for Future Day Care Center Child

IR =	1	liters/day
EF =	250	days/year
ED	6	years
BW =	15	kg
AT (Nc)	2190	days
AT (Car)	25550	days

Assumptions for Future Day Care Center Adult

IR =	2	liters/day
EF =	250	days/year
ED =	25	years
BW =	70	kg
AT (Nc) =	9125	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-18
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER - SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater E
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Metals												
Aluminum	1.0E+000	NA	1.97E+001	5.40E-001		5E-001		1.26E+000		1E+000		
Beryllium	5.0E-003	4.3E+000	8.80E-004	2.41E-005	8.27E-006	5E-003	4E-005	5.63E-005	4.82E-006	1E-002	2E-005	6E-005
Chromium	5.0E-003	NA	3.31E-002	9.07E-004		2E-001		2.12E-003		4E-001		
Cobalt	6.0E-002	NA	2.21E-002	6.05E-004		1E-002		1.41E-003		2E-002		
Copper	4.0E-002	NA	1.61E-002	4.41E-004		1E-002		1.03E-003		3E-002		
Iron	3.0E-001	NA	3.51E+001	9.62E-001		3E+000		2.24E+000		7E+000		
Lead	NA	NA	1.72E-002									
Manganese	5.0E-002	NA	1.68E+000	4.60E-002		9E-001		1.07E-001		2E+000		
Mercury	3.0E-004	NA										
Nickel	2.0E-002	NA	4.94E-002	1.35E-003		7E-002		3.16E-003		2E-001		
Selenium	5.0E-003	NA										
Sodium	NA	NA										
Vanadium	7.0E-003	NA	2.57E-002	7.04E-004		1E-001		1.64E-003		2E-001		
Zinc	3.0E-001	NA	9.73E-002	2.67E-003		9E-003		6.22E-003		2E-002		
Total Hazard Quotient and Cancer Risk:						**5E+000**	**4E-005**			**1E+001**	**2E-005**	**6E-005**

Assumptions for Resident (Adult)			Assumptions for Resident (Child)		
BW =	70	kg	BW =	15	kg
IR =	2	liters/day	IR =	1	liters/day
EF =	350	days/year	EF =	350	days/year
ED =	24	years	ED =	6	years
AT (Nc) =	8,760	days	AT (Nc) =	2,190	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Current Site Worker Intake (mg/kg-day) (Nc)	Current Site Worker Intake (mg/kg-day) (Car)	Current Site Worker Hazard Quotient	Current Site Worker Cancer Risk	Future Industrial Worker Intake (mg/kg-day) (Nc)	Future Industrial Worker Intake (mg/kg-day) (Car)	Future Industrial Worker Hazard Quotient	Future Industrial Worker Cancer Risk	Future Construction Worker Intake (mg/kg-day) (Nc)	Future Construction Worker Intake (mg/kg-day) (Car)	Future Construction Worker Hazard Quotient	Future Construction Worker Cancer Risk
Metals															
Aluminum	1.00E+000	NA	1.97E+001		Ingestion of Groundwater Not Applicable for Current Site Worker			3.38E-001		3E-001			Ingestion of Groundwater Not Applicable for Future Construction Worker		
Beryllium	5.00E-003	4.30E+000	8.80E-004					1.51E-005	1.51E-006	3E-003	6E-006				
Chromium	5.00E-003	NA	3.31E-002					5.67E-004		1E-001					
Cobalt	6.00E-002	NA	2.21E-002					3.79E-004		6E-003					
Copper	4.00E-002	NA	1.61E-002					2.76E-004		7E-003					
Iron	3.00E-001	NA	3.51E+001					6.02E-001		2E+000					
Lead	NA	NA	1.72E-002												
Manganese	5.00E-002	NA	1.68E+000					2.88E-002		6E-001					
Mercury	3.00E-004	NA													
Nickel	2.00E-002	NA	4.94E-002					8.47E-004		4E-002					
Selenium	5.00E-003	NA													
Sodium	NA	NA													
Vanadium	7.00E-003	NA	2.57E-002					4.41E-004		6E-002					
Zinc	3.00E-001	NA	9.73E-002					1.67E-003		6E-003					
Total Hazard Quotient and Cancer Risk:										**3E+000**	**6E-006**				

Assumptions for Future Industrial Worker

IR =	2	liters/day
EF =	219	days/year
ED	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car)	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CW \times IR \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groundwater EPC Data
IR = Ingestion Rate
EF = Exposure Frequency
ED=Exposure Duration
BW=Bodyweight
AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Analyte	Oral RfD	Carc. Slope Oral	EPC Groundwater	Future Tresspasser Child				Future Day Care Center Child				Future Day Care Center Adult			
				Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(mg/liter)	(Nc)	(Car)			(Nc)	(Car)			(Nc)	(Car)		
Metals															
Aluminum	1.0E+000	NA	1.97E+001		Ingestion of Groundwater Not Applicable for Future Tresspasser Child			7.88E-001		8E-001		3.38E-001		3E-001	
Beryllium	5.0E-003	4.3E+000	8.80E-004					3.52E-005	1.51E-006	7E-003	6E-006	1.51E-005	1.51E-006	3E-003	6E-006
Chromium	5.0E-003	NA	3.31E-002					1.32E-003		3E-001		5.67E-004		1E-001	
Cobalt	6.0E-002	NA	2.21E-002					8.84E-004		1E-002		3.79E-004		6E-003	
Copper	4.0E-002	NA	1.61E-002					6.44E-004		2E-002		2.76E-004		7E-003	
Iron	3.0E-001	NA	3.51E+001					1.40E+000		5E+000		6.02E-001		2E+000	
Lead	NA	NA	1.72E-002												
Manganese	5.0E-002	NA	1.68E+000					6.72E-002		1E+000		2.88E-002		6E-001	
Mercury	3.0E-004	NA													
Nickel	2.0E-002	NA	4.94E-002					1.98E-003		1E-001		8.47E-004		4E-002	
Selenium	5.0E-003	NA													
Sodium	NA	NA													
Vanadium	7.0E-003	NA	2.57E-002					1.03E-003		1E-001		4.41E-004		6E-002	
Zinc	3.0E-001	NA	9.73E-002					3.89E-003		1E-002		1.67E-003		6E-003	
Total Hazard Quotient and Cancer Risk:										**7E+000**	**6E-006**			**3E+000**	**6E-006**

Assumptions for Future Day Care Center Child

IR =	1	liters/day
EF =	219	days/year
ED =	3	years
BW =	15	kg
AT (Nc) =	1095	days
AT (Car) =	25550	days

Assumptions for Future Day Care Center Adult

IR =	2	liters/day
EF =	219	days/year
ED =	7	years
BW =	70	kg
AT (Nc) =	2555	days
AT (Car) =	25550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-19
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF GROUNDWATER
CENTRAL TENDENCY (CT)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = CW x IR x EF x ED / BW x AT

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CW = Chemical Concentration in Groundwater, from Groun ED=Exposure Duration
IR = Ingestion Rate BW=Bodyweight
EF = Exposure Frequency AT=Averaging Time

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-1	EPC Groundwater (mg/liter)	Resident (Adult) Intake (mg/kg-day) (Nc)	Resident (Adult) Intake (mg/kg-day) (Car)	Resident (Adult) Hazard Quotient	Resident (Adult) Contribution to Lifetime Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Metals												
Aluminum	1.0E+000	NA	1.97E+001	2.53E-001		3E-001		6.23E-001		6E-001		
Beryllium	5.0E-003	4.3E+000	8.80E-004	1.13E-005	1.13E-006	2E-003	5E-006	2.78E-005	7.95E-007	6E-003	3E-006	8E-006
Chromium	5.0E-003	NA	3.31E-002	4.24E-004		8E-002		1.05E-003		2E-001		
Cobalt	6.0E-002	NA	2.21E-002	2.83E-004		5E-003		6.99E-004		1E-002		
Copper	4.0E-002	NA	1.61E-002	2.06E-004		5E-003		5.09E-004		1E-002		
Iron	3.0E-001	NA	3.51E+001	4.50E-001		2E+000		1.11E+000		4E+000		
Lead	NA	NA	1.72E-002									
Manganese	5.0E-002	NA	1.68E+000	2.15E-002		4E-001		5.31E-002		1E+000		
Mercury	3.0E-004	NA										
Nickel	2.0E-002	NA	4.94E-002	6.33E-004		3E-002		1.56E-003		8E-002		
Selenium	5.0E-003	NA										
Sodium	NA	NA										
Vanadium	7.0E-003	NA	2.57E-002	3.30E-004		5E-002		8.13E-004		1E-001		
Zinc	3.0E-001	NA	9.73E-002	1.25E-003		4E-003		3.08E-003		1E-002		
Total Hazard Quotient and Cancer Risk:						**2E+000**	**5E-006**			**6E+000**	**3E-006**	**8E-006**

Assumptions for Resident (Adult)			Assumptions for Resident (Child)		
BW =	70	kg	BW =	15	kg
IR =	1.4	liters/day	IR =	0.74	liters/day
EF =	234	days/year	EF	234	days/year
ED	7	years	ED	2	years
AT (Nc) =	2,555	days	AT (Nc)	730	days
AT (Car) =	25,550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-20
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (WHILE SHOWERING)
REASONABLE MAXIMUM EXPOSURE (RME) - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):

DA = Absorbed Dose per Event

SA = Surface Area Contact

EF = Exposure Frequency

ED = Exposure Duration

BW = Bodyweight

AT = Averaging Time

Equation for Absorbed Dose per Event (DA):

For organics: $DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics: DA = Kp x CW x ET x CF

Kp = Permeability Coefficient

CW = EPC Cderm

ET = Exposure Time

CF = Conversion Factor

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Dermal RfD	Carc. Slope Dermal	Permeability Coefficient *Kp*	Tau	EPC Groundwater	Absorbed Dose/Event	Future Resident (Adult)				Future Resident (Child)				Resident
							Intake (mg/kg-day)		Hazard Quotient	Contribution to Lifetime Cancer Risk	Intake (mg/kg-day)		Hazard Quotient	Contribution to Lifetime Cancer Risk	Total Lifetime Cancer Risk
	(mg/kg-day)	(mg/kg-day)-1	(cm/hr)	(hours)	(mg/liter)	(mg-cm²/event)	(Nc)	(Car)			(Nc)	(Car)			
Metals															
Aluminum	NA	NA	1.00E-003	NA	1.97E+001	4.93E-006									
Beryllium	5.00E-005	4.30E+002	1.00E-003	NA	8.80E-004	2.20E-010	6.93E-008	2.38E-008	1E-003	1E-005	1.29E-007	1.11E-008	3E-003	5E-006	1E-005
Chromium	1.00E-004	NA	2.00E-003	NA	3.31E-002	1.66E-008	5.21E-006		5E-002		9.71E-006		1E-001		
Cobalt	NA	NA	4.00E-003	NA	2.21E-002	2.21E-008									
Copper	2.40E-002	NA	1.00E-003	NA	1.61E-002	4.03E-009	1.27E-006		5E-005		2.36E-006		1E-004		
Iron	3.00E-001	NA	1.00E-003	NA	3.51E+001	8.78E-006	2.76E-003		9E-003		5.15E-003		2E-002		
Lead	NA	NA	1.00E-003	NA	1.72E-002	4.30E-009									
Manganese	1.50E-003	NA	1.00E-003	NA	1.68E+000	4.20E-007	1.32E-004		9E-002		2.46E-004		2E-001		
Mercury	3.00E-006	NA	1.00E-003	NA											
Nickel	8.00E-004	NA	1.00E-003	NA	4.94E-002	1.24E-008	3.89E-006		5E-003		7.25E-006		9E-003		
Selenium	4.50E-003	NA	1.00E-003	NA											
Sodium	NA	NA	1.00E-003	NA											
Vanadium	7.00E-005	NA	1.00E-003	NA	2.57E-002	6.43E-009	2.02E-006		3E-002		3.77E-006		5E-002		
Zinc	7.50E-002	NA	6.00E-003	NA	9.73E-002	1.46E-007	4.60E-005		6E-004		8.57E-005		1E-003		
Total Hazard Quotient and Cancer Risk:									**2E-001**	**1E-005**			**3E-001**	**5E-006**	**1E-005**

Assumptions for Future Resident (Adult)

CF =	0.001	l/cm3
BW =	70	kg
SA =	23,000	cm2
ET =	0.25	hours/day
EF =	350	days/year
ED =	24	years
AT (Nc) =	8,760	days
AT (Car) =	25,550	days

Assumptions for Future Resident (Child)

CF =	0.001	l/cm3
BW =	15	kg
SA =	9,180	cm2
ET =	0.25	hours/day
EF =	350	days/year
ED =	6	years
AT (Nc) =	2,190	days
AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-21
CALCULATION OF INTAKE AND RISK FROM DERMAL CONTACT TO GROUNDWATER (WHILE SHOWERING)
CENTRAL TENDENCY (CT) SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{DA \times SA \times EF \times ED}{BW \times AT}$

Variables (Assumptions for Each Receptor are Listed at the Bottom):
DA = Absorbed Dose per Event
SA = Surface Area Contact
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Equation for Absorbed Dose per Event (DA):

For organics: $DA = 2Kp \times CW \sqrt{\frac{6 \times \tau \times ET}{\pi}} \times CF$

For inorganics: DA = Kp x CW x ET x CF

Kp = Permeability Coefficient
CW = EPC Cderm
ET = Exposure Time
τ = Lag Time
CF = Conversion Factor

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Contribution to Cancer Risk = Chronic Daily Intake (Car) x Slope Factor
Equation for Total Lifetime Cancer Risk = Adult Contribution + Child Contribution

Analyte	Dermal RfD (mg/kg-day)	Carc. Slope Dermal (mg/kg-day)-1	Permeability Coefficient *Kp* (cm/hr)	Tau (hours)	EPC Groundwater (mg/liter)	Absorbed Dose/Event (mg-cm²/event)	Future Resident (Adult) Intake (mg/kg-day) (Nc)	Future Resident (Adult) Intake (mg/kg-day) (Car)	Future Resident (Adult) Hazard Quotient	Future Resident (Adult) Contribution to Lifetime Cancer Risk	Future Resident (Child) Intake (mg/kg-day) (Nc)	Future Resident (Child) Intake (mg/kg-day) (Car)	Future Resident (Child) Hazard Quotient	Future Resident (Child) Contribution to Lifetime Cancer Risk	Resident Total Lifetime Cancer Risk
Metals															
Aluminum	NA	NA	1.00E-003	NA	1.97E+001	3.35E-006									
Beryllium	5.00E-005	4.30E+002	1.00E-003	NA	8.80E-004	1.50E-010	2.74E-008	2.74E-009	5E-004	1E-006	5.07E-008	1.45E-009	1E-003	6E-007	2E-006
Chromium	1.00E-004	NA	2.00E-003	NA	3.31E-002	1.13E-008	2.06E-006		2E-002		3.81E-006		4E-002		
Cobalt	NA	NA	4.00E-003	NA	2.21E-002	1.50E-008									
Copper	2.40E-002	NA	1.00E-003	NA	1.61E-002	2.74E-009	5.01E-007		2E-005		9.28E-007		4E-005		
Iron	3.00E-001	NA	1.00E-003	NA	3.51E+001	5.97E-006	1.09E-003		4E-003		2.02E-003		7E-003		
Lead	NA	NA	1.00E-003	NA	1.72E-002	2.92E-009									
Manganese	1.50E-003	NA	1.00E-003	NA	1.68E+000	2.86E-007	5.23E-005		3E-002		9.68E-005		6E-002		
Mercury	3.00E-006	NA	1.00E-003	NA											
Nickel	8.00E-004	NA	1.00E-003	NA	4.94E-002	8.40E-009	1.54E-006		2E-003		2.85E-006		4E-003		
Selenium	4.50E-003	NA	1.00E-003	NA											
Sodium	NA	NA	1.00E-003	NA											
Vanadium	7.00E-005	NA	1.00E-003	NA	2.57E-002	4.37E-009	8.00E-007		1E-002		1.48E-006		2E-002		
Zinc	7.50E-002	NA	6.00E-003	NA	9.73E-002	9.92E-008	1.82E-005		2E-004		3.36E-005		4E-004		
Total Hazard Quotient and Cancer Risk:									**7E-002**	**1E-006**			**1E-001**	**6E-007**	**2E-006**

Assumptions for Future Resident (Adult)

CF =	0.001	l/cm3
BW =	70	kg
SA =	20,000	cm2
ET =	0.17	hours/day
EF =	234	days/year
ED =	7	years
AT (Nc) =	2555	days
AT (Car) =	25,550	days

Assumptions for Future Resident (Child)

CF =	0.001	l/cm3
BW =	15	kg
SA =	7,930	cm2
ET =	0.17	hours/day
EF =	234	days/year
ED =	2	years
AT (Nc) =	730	days
AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

TABLE B-22
CALCULATED SOIL RECEPTOR EXPOSURE - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	MAX Concentration (mg/kg)	SP1	BAF2	Deer Mouse Exposure (mg/kg/day) 3	Short-tailed Shrew Exposure (mg/kg/day) 3	American Robin Exposure (mg/kg/day)
Volatile Organics						
Acetone	7.40E-02	5.33E+01	3.90E-01	4.29E-01	1.18E-01	8.17E-01
Benzene	2.00E-03	2.34E+00	2.45E+01	5.80E-03	2.32E-02	1.38E-02
Ethylbenzene	4.00E-03	6.01E-01	1.00E+00	7.09E-04	1.95E-03	1.75E-03
Methylene chloride	1.10E-02	6.86E+00	5.25E+00	1.44E-02	2.92E-02	3.10E-02
Styrene	1.00E-03	no data	no data	--	--	--
Tetrachloroethene	3.30E-02	1.22E+00	1.00E+00	8.05E-03	1.66E-02	1.86E-02
Toluene	1.60E-02	1.39E+00	7.24E+01	1.28E-01	5.47E-01	3.07E-01
Total Xylenes	1.10E-02	5.62E-01	6.00E+00	7.84E-03	3.13E-02	1.90E-02
Semivolatile Organics						
2-Methylnaphthalene	1.90E+01	1.63E-01	3.42E-01	1.12E+00	3.15E+00	3.35E+00
Acenaphthene	4.20E+01	2.10E-01	3.42E-01	2.69E+00	7.01E+00	7.80E+00
Acenaphthylene	5.10E-01	1.72E-01	1.00E+00	6.68E-02	2.43E-01	1.78E-01
Anthracene	1.00E+02	1.04E-01	5.10E-02	2.11E+00	2.68E+00	8.83E+00
Benzo(a)anthracene	1.50E+02	1.51E-02	1.25E-01	2.93E+00	8.90E+00	1.34E+01
Benzo(a)pyrene	1.20E+02	1.02E+00	4.50E+00	7.21E+01	2.58E+02	1.72E+02
Benzo(b)fluoranthene	8.80E+01	6.17E-03	3.20E-01	3.49E+00	1.33E+01	1.22E+01
Benzo(ghi)perylene	6.20E+01	3.05E-03	2.40E-01	1.90E+00	7.02E+00	7.25E+00
Benzo(k)fluoranthene	1.30E+02	4.25E-03	2.53E-01	4.18E+00	1.55E-01	1.57E+01
Carbazole	7.70E+01	1.00E+00	1.15E+02	9.65E+02	4.18E+03	2.32E+03
Chrysene	1.50E+02	2.22E-02	1.75E-01	3.85E+00	1.25E+01	1.56E+01
Di-n-butylphthalate	1.40E-01	8.84E-02	1.25E-01	3.84E-03	8.58E-03	1.46E-02
Dibenz(a,h)anthracene	2.50E+01	8.16E-03	1.75E-01	6.05E-01	2.07E+00	2.53E+00
Dibenzofuran	3.80E+01	1.51E-01	1.00E+00	4.89E+00	1.81E+01	1.31E+01
Fluoranthene	4.40E+02	3.72E-02	7.92E-01	4.13E+01	1.65E+02	1.18E+02
Fluorene	6.20E+01	1.49E-01	3.42E-01	3.56E+00	1.02E+01	1.07E+01
Indeno(1,2,3-cd)pyrene	6.50E+01	1.37E-03	4.19E-01	3.24E+00	1.28E+01	1.06E+01
Naphthalene	4.60E+01	4.43E-01	3.42E-01	4.10E+00	7.96E+00	1.07E+01
Phenanthrene	2.90E+02	1.02E-01	1.22E-01	8.30E+00	1.75E+01	3.09E+01
Pyrene	2.80E+02	4.43E-02	9.20E-02	5.35E+00	1.25E+01	2.43E+01
Pesticides/PCBs						
4,4'-DDD	2.40E-01	1.34E-02	1.00E-01	3.99E-03	1.14E-02	1.98E-02
4,4'-DDE	8.10E-01	1.79E-02	2.50E-02	7.32E-03	9.93E-03	5.19E-02
4,4'-DDT	1.30E+00	1.00E-02	1.00E-01	2.12E-02	6.16E-02	1.07E-01
Alpha-BHC	1.40E-02	3.00E-01	1.00E+00	2.03E-03	6.71E-03	5.25E-03
Alpha-Chlordane	2.00E-03	1.45E-02	2.40E-01	6.38E-05	2.27E-04	2.38E-04
Beta-BHC	3.50E-02	no data	no data	--	--	--
Dieldrin	3.40E-03	1.20E-01	4.70E-02	7.63E-05	8.62E-05	3.08E-04
Endosulfan I	1.50E-02	3.44E-01	2.50E-01	1.03E-03	1.90E-03	2.84E-03
Endosulfan II	5.20E-02	3.13E-01	2.50E-01	3.39E-03	6.56E-03	9.51E-03
Endosulfan sulfate	1.10E-01	2.97E-01	2.50E-01	6.98E-03	1.38E-02	1.97E-02
Endrin	1.20E-01	5.80E-02	1.80E-01	3.61E-03	1.04E-02	1.35E-02
Endrin aldehyde	1.20E-01	no data	no data	--	--	--
Endrin ketone	1.80E-01	2.20E-02	1.80E-01	4.72E-03	1.54E-02	1.89E-02
Gamma-Chlordane	4.80E-02	2.40E-02	2.40E-01	1.58E-03	5.46E-03	5.82E-03
Heptachlor epoxide	1.80E-01	7.00E-02	1.30E-01	4.68E-03	1.14E-02	1.84E-02
Methoxychlor	5.20E-01	no data	no data	--	--	--
Metals						
Lead	3.47E+03	5.80E-03	2.10E+00	8.03E+02	3.44E+03	2.08E+03
Mercury	2.70E+00	9.00E-01	2.30E+01	6.77E+00	2.93E+01	1.64E+01
Selenium	1.80E+00	6.20E+00	5.00E+00	1.22E+00	4.30E+00	2.89E+00
Sodium	1.04E+03	1.00E+00	1.00E+00	1.39E+02	4.96E+02	3.69E+02
Zinc	3.66E+03	1.40E+00	9.90E+00	4.04E+03	1.71E+04	9.83E+03

(1) SP: soil-to-plant uptake factor.
(2) BAF: bioaccumulation factor.
(3) Receptor exposure calculated as
ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * SFF / BW
Where, ED = exposure dose
Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor
(0.2 for inorganics only, 1 for organics)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day for mouse, 0.00048 kg/day for shrew, 0.03658 kg/day for robin)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day for mouse, 0.00852 kg/day for shrew, 0.04656 kg/day for robin)
Is = incidental soil intake rate (0.000088 kg/day for mouse, 0 kg/day for shrew, 0.00965 kg/day for robin)
SFF = Site foraging factor (1 for mouse; 0.83 for shrew; 0.43 for robin)
BW = body weight (0.02 kg for mouse, 0.015 kg for shrew, 0.077 kg for robin)

TABLE B-23
CALCULATION OF SOIL HAZARD QUOTIENTS USING MAX VALUES AS INPUT - SEAD-71 - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Short-tailed Shrew Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	Deer Mouse Hazard Quotient [3]	Short-tailed Shrew Hazard Quotient [3]
Volatile Organics					
Acetone	4.29E-01	1.18E-01	1.00E+01	4.3E-02	1.2E-02
Benzene	5.80E-03	2.32E-02	2.64E+01	2.2E-04	8.8E-04
Ethylbenzene	7.09E-04	1.95E-03	4.73E+01	1.5E-05	4.1E-05
Methylene chloride	1.44E-02	2.92E-02	no data	--	--
Styrene	--	--	no data	--	--
Tetrachloroethene	8.05E-03	1.66E-02	1.40E+00	5.7E-03	1.2E-02
Toluene	1.28E-01	5.47E-01	2.60E+01	4.9E-03	2.1E-02
Total Xylenes	7.84E-03	3.13E-02	2.10E+00	3.7E-03	1.5E-02
Semivolatile Organics					
2-Methylnaphthalene	1.12E+00	3.15E+00	7.16E+00	1.6E-01	4.4E-01
Acenaphthene	2.69E+00	7.01E+00	1.75E+00	**1.5E+00**	**4.0E+00**
Acenaphthylene	6.68E-02	2.43E-01	1.00E+00	6.7E-02	2.4E-01
Anthracene	2.11E+00	2.68E+00	1.00E+02	2.1E-02	2.7E-02
Benzo(a)anthracene	2.93E+00	8.90E+00	1.00E+00	**2.9E+00**	**8.9E+00**
Benzo(a)pyrene	7.21E+01	2.58E+02	1.00E+00	**7.2E+01**	**2.6E+02**
Benzo(b)fluoranthene	3.49E+00	1.33E+01	1.00E+00	**3.5E+00**	**1.3E+01**
Benzo(ghi)perylene	1.90E+00	7.02E+00	1.00E+00	**1.9E+00**	**7.0E+00**
Benzo(k)fluoranthene	4.18E+00	1.55E+01	1.00E+00	**4.2E+00**	**1.6E+01**
Carbazole	9.65E+02	4.18E+03	no data	--	--
Chrysene	3.85E+00	1.25E+01	1.00E+00	**3.9E+00**	**1.2E+01**
Di-n-butylphthalate	3.84E-03	8.58E-03	5.50E+02	7.0E-06	1.6E-05
Dibenz(a,h)anthracene	6.05E-01	2.07E+00	1.00E+00	6.0E-01	**2.1E+00**
Dibenzofuran	4.89E+00	1.81E+01	no data	--	--
Fluoranthene	4.13E+01	1.65E+02	1.25E+00	**3.3E+01**	**1.3E+02**
Fluorene	3.56E+00	1.02E+01	1.25E+00	**2.8E+00**	**8.2E+00**
Indeno(1,2,3-cd)pyrene	3.24E+00	1.28E+01	1.00E+00	**3.2E+00**	**1.3E+01**
Naphthalene	4.10E+00	7.96E+00	7.16E+00	5.7E-01	**1.1E+00**
Phenanthrene	8.30E+00	1.75E+01	1.00E+00	**8.3E+00**	**1.7E+01**
Pyrene	5.35E+00	1.25E+01	1.00E+00	**5.4E+00**	**1.2E+01**
Pesticides/PCBs					
4,4'-DDD	3.99E-03	1.14E-02	8.00E-01	5.0E-03	1.4E-02
4,4'-DDE	7.32E-03	9.93E-03	8.00E-01	9.1E-03	1.2E-02
4,4'-DDT	2.12E-02	6.16E-02	8.00E-01	2.6E-02	7.7E-02
Alpha-BHC	2.03E-03	6.71E-03	1.60E+00	1.3E-03	4.2E-03
Alpha-Chlordane	6.38E-05	2.27E-04	4.58E+00	1.4E-05	5.0E-05
Beta-BHC	--	--	no data	--	--
Dieldrin	7.63E-05	8.62E-05	2.00E-02	3.8E-03	4.3E-03
Endosulfan I	1.03E-03	1.90E-03	1.50E+00	6.9E-04	1.3E-03
Endosulfan II	3.39E-03	6.56E-03	1.50E+00	2.3E-03	4.4E-03
Endosulfan sulfate	6.98E-03	1.38E-02	1.50E+00	4.7E-03	9.2E-03
Endrin	3.61E-03	1.04E-02	no data	--	--
Endrin aldehyde	--	--	no data	--	--
Endrin ketone	4.72E-03	1.54E-02	9.20E-02	5.1E-02	1.7E-01
Gamma-Chlordane	1.58E-03	5.46E-03	4.58E+00	3.4E-04	1.2E-03
Heptachlor epoxide	4.68E-03	1.14E-02	1.00E-01	4.7E-02	1.1E-01
Methoxychlor	--	--	no data	--	--
Metals					
Lead	8.03E+02	3.44E+03	8.00E+00	**1.0E+02**	**4.3E+02**
Mercury	6.77E+00	2.93E+01	1.32E+01	5.1E-01	**2.2E+00**
Selenium	1.22E+00	4.30E+00	2.00E-01	**6.1E+00**	**2.2E+01**
Sodium	1.39E+02	4.96E+02	no data	--	--
Zinc	4.04E+03	1.71E+04	1.60E+02	**2.5E+01**	**1.1E+02**

(1) Receptor exposure from Table B-22.
(2) Toxicity reference value from Table 3.6-4.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

TABLE B-24

CALCULATION OF SOIL HAZARD QUOTIENTS USING MAX VALUES AS INPUT- SEAD-71 - BIRD

Decision Document - SEADs-59 and 71

Seneca Army Depot Activity

Constituent	American Robin Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	American Robin Hazard Quotient [3]
Volatile Organics			
Acetone	8.17E-01	6.10E+02	1.3E-03
Benzene	1.38E-02	no data	--
Ethylbenzene	1.75E-03	no data	--
Methylene chloride	3.10E-02	no data	--
Styrene	--	no data	--
Tetrachloroethene	1.86E-02	no data	--
Toluene	3.07E-01	no data	--
Total Xylenes	1.90E-02	3.06E+02	6.2E-05
Semivolatile Organics			
2-Methylnaphthalene	3.35E+00	2.85E+01	1.2E-01
Acenaphthene	7.80E+00	1.00E+03	7.8E-03
Acenaphthylene	1.78E-01	1.00E+03	1.8E-04
Anthracene	8.83E+00	1.00E+03	8.8E-03
Benzo(a)anthracene	1.34E+01	4.00E+01	3.4E-01
Benzo(a)pyrene	1.72E+02	4.00E+01	**4.3E+00**
Benzo(b)fluoranthene	1.22E+01	4.00E+01	3.0E-01
Benzo(ghi)perylene	7.25E+00	4.00E+01	1.8E-01
Benzo(k)fluoranthene	1.57E+01	4.00E+01	3.9E-01
Carbazole	2.32E+03	no data	--
Chrysene	1.56E+01	4.00E+01	3.9E-01
Di-n-butylphthalate	1.46E-02	1.10E-01	1.3E-01
Dibenz(a,h)anthracene	2.53E+00	4.00E+01	6.3E-02
Dibenzofuran	1.31E+01	2.18E-01	**6.0E+01**
Fluoranthene	1.18E+02	4.00E+01	**2.9E+00**
Fluorene	1.07E+01	2.85E+01	3.8E-01
Indeno(1,2,3-cd)pyrene	1.06E+01	4.00E+01	2.7E-01
Naphthalene	1.07E+01	2.85E+01	3.8E-01
Phenanthrene	3.09E+01	2.85E+01	**1.1E+00**
Pyrene	2.43E+01	4.00E+01	6.1E-01
Pesticides/PCBs			
4,4'-DDD	1.98E-02	5.60E-02	3.5E-01
4,4'-DDE	5.19E-02	5.60E-02	9.3E-01
4,4'-DDT	1.07E-01	5.60E-02	**1.9E+00**
Alpha-BHC	5.25E-03	5.60E-01	9.4E-03
Alpha-Chlordane	2.38E-04	2.14E+00	1.1E-04
Beta-BHC	--	no data	--
Dieldrin	3.08E-04	7.70E-02	4.0E-03
Endosulfan I	2.84E-03	1.00E+00	2.8E-03
Endosulfan II	9.51E-03	1.00E+01	9.5E-04
Endosulfan sulfate	1.97E-02	1.00E+00	2.0E-02
Endrin	1.35E-02	1.04E-02	1.3E+00
Endrin aldehyde	--	no data	--
Endrin ketone	1.89E-02	3.00E-01	6.3E-02
Gamma-Chlordane	5.82E-03	2.14E+00	2.7E-03
Heptachlor epoxide	1.84E-02	4.80E+00	3.8E-03
Methoxychlor	--	no data	--
Metals			
Lead	2.08E+03	3.85E+00	**5.4E+02**
Mercury	1.64E+01	4.50E-01	**3.6E+01**
Selenium	2.89E+00	4.00E-01	**7.2E+00**
Sodium	3.69E+02	no data	--
Zinc	9.83E+03	1.45E+01	**6.8E+02**

(1) Receptor exposure from Table B-22.
(2) Toxicity reference value from Table 3.6-5.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

TABLE B-25
CALCULATED SOIL RECEPTOR EXPOSURE - SEAD-71
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	MEAN Concentration (mg/kg)	SP1	BAF2	Deer Mouse Exposure (mg/kg/day) 3	Short-tailed Shrew Exposure (mg/kg/day) 3	American Robin Exposure (mg/kg/day)
Volatile Organics						
Acetone	8.96E-03	5.33E+01	3.90E-01	5.20E-02	1.43E-02	9.89E-02
Benzene	5.92E-03	2.34E+00	2.45E+01	1.72E-02	6.87E-02	4.08E-02
Ethylbenzene	5.79E-03	6.01E-01	1.00E+00	1.03E-03	2.82E-03	2.53E-03
Methylene chloride	5.83E-03	6.86E+00	5.25E+00	7.66E-03	1.55E-02	1.65E-02
Styrene	5.88E-03	no data	no data	--	--	--
Tetrachloroethene	7.23E-03	1.22E+00	1.00E+00	1.76E-03	3.64E-03	4.07E-03
Toluene	6.13E-03	1.39E+00	7.24E+01	4.89E-02	2.09E-01	1.17E-01
Total Xylenes	6.29E-03	5.62E-01	6.00E+00	4.49E-03	1.79E-02	1.09E-02
Semivolatile Organics						
2-Methylnaphthalene	1.98E+00	1.63E-01	3.42E-01	1.16E-01	3.27E-01	3.48E-01
Acenaphthene	5.28E+00	2.10E-01	3.42E-01	3.38E-01	8.81E-01	9.80E-01
Acenaphthylene	5.79E+00	1.72E-01	1.00E+00	7.59E-01	2.76E+00	2.02E+00
Anthracene	1.52E+01	1.04E-01	5.10E-02	3.22E-01	4.08E-01	1.35E+00
Benzo(a)anthracene	2.48E+01	1.51E-02	1.25E-01	4.84E-01	1.47E+00	2.22E+00
Benzo(a)pyrene	2.06E+01	1.02E+00	4.50E+00	1.24E+01	4.43E+01	2.95E+01
Benzo(b)fluoranthene	1.84E+01	6.17E-03	3.20E-01	7.28E-01	2.77E+00	2.54E+00
Benzo(ghi)perylene	1.12E+01	3.05E-03	2.40E-01	3.42E-01	1.26E+00	1.31E+00
Benzo(k)fluoranthene	2.07E+01	4.25E-03	2.53E-01	6.65E-01	2.47E+00	2.49E+00
Carbazole	9.37E+00	1.00E+00	1.15E+02	1.17E+02	5.08E+02	2.83E+02
Chrysene	2.54E+01	2.22E-02	1.75E-01	6.53E-01	2.11E+00	2.64E+00
Di-n-butylphthalate	3.08E-01	8.84E-02	1.25E-01	8.44E-03	1.88E-02	3.21E-02
Dibenz(a,h)anthracene	4.64E+00	8.16E-03	1.75E-01	1.12E-01	3.84E-01	4.69E-01
Dibenzofuran	3.89E+00	1.51E-01	1.00E+00	5.01E-01	1.85E+00	1.34E+00
Fluoranthene	6.21E+01	3.72E-02	7.92E-01	5.83E+00	2.32E+01	1.66E+01
Fluorene	7.11E+00	1.49E-01	3.42E-01	4.08E-01	1.17E+00	1.23E+00
Indeno(1,2,3-cd)pyrene	1.09E+01	1.37E-03	4.19E-01	5.42E-01	2.15E+00	1.77E+00
Naphthalene	3.44E+00	4.43E-01	3.42E-01	3.06E-01	5.94E-01	8.01E-01
Phenanthrene	4.61E+01	1.02E-01	1.22E-01	1.32E+00	2.78E+00	4.91E+00
Pyrene	4.90E+01	4.43E-02	9.20E-02	9.36E-01	2.18E+00	4.25E+00
Pesticides/PCBs						
4,4'-DDD	2.94E-02	1.34E-02	1.00E-01	4.89E-04	1.40E-03	2.43E-03
4,4'-DDE	1.09E-01	1.79E-02	2.50E-02	9.80E-04	1.33E-03	6.95E-03
4,4'-DDT	2.38E-01	1.00E-02	1.00E-01	3.88E-03	1.13E-02	1.95E-02
Alpha-BHC	5.58E-03	3.00E-01	1.00E+00	8.09E-04	2.68E-03	2.10E-03
Alpha-Chlordane	5.34E-03	1.45E-02	2.40E-01	1.70E-04	6.07E-04	6.37E-04
Beta-BHC	8.47E-03	no data	no data	--	--	--
Dieldrin	1.04E-02	1.20E-01	4.70E-02	2.33E-04	2.63E-04	9.41E-04
Endosulfan I	6.45E-03	3.44E-01	2.50E-01	4.42E-04	8.19E-04	1.22E-03
Endosulfan II	1.51E-02	3.13E-01	2.50E-01	9.85E-04	1.91E-03	2.76E-03
Endosulfan sulfate	2.42E-02	2.97E-01	2.50E-01	1.54E-03	3.04E-03	4.35E-03
Endrin	2.12E-02	5.80E-02	1.80E-01	6.40E-04	1.84E-03	2.39E-03
Endrin aldehyde	3.14E-02	no data	no data	--	--	--
Endrin ketone	4.60E-02	2.20E-02	1.80E-01	1.20E-03	3.93E-03	4.83E-03
Gamma-Chlordane	7.60E-03	2.40E-02	2.40E-01	2.50E-04	8.65E-04	9.22E-04
Heptachlor epoxide	1.78E-02	7.00E-02	1.30E-01	4.62E-04	1.12E-03	1.81E-03
Methoxychlor	1.09E-01	no data	no data	--	--	--
Metals						
Lead	2.51E+02	5.80E-03	2.10E+00	5.80E+01	2.48E+02	1.51E+02
Mercury	1.68E-01	9.00E-01	2.30E+01	4.22E-01	1.83E+00	1.02E+00
Selenium	9.05E-01	6.20E+00	5.00E+00	6.14E-01	2.16E+00	1.45E+00
Sodium	2.89E+02	1.00E+00	1.00E+00	3.87E+01	1.38E+02	1.02E+02
Zinc	5.02E+02	1.40E+00	9.90E+00	5.54E+02	2.35E+03	1.35E+03

(1) SP: soil-to-plant uptake factor.
(2) BAF: bioaccumulation factor.
(3) Receptor exposure calculated as

ED = [(Cs * SP * CF * Ip) + (Cs * BAF * Ia) + (Cs * Is)] * SFF / BW

Where, ED = exposure dose

Cs = RME conc in soil (mg/kg)
CF = plant dry-to-wet-weight conversion factor
(0.2 for inorganics only, 1 for organics)
SP = soil-to-plant uptake factor
Ip = plant-matter intake rate (0.00216 kg/day for mouse, 0.00048 kg/day for shrew, 0.03658 kg/day for robin)
BAF = bioaccumulation factor (unitless)
Ia = animal-matter intake rate (0.00216 kg/day for mouse, 0.00852 kg/day for shrew, 0.04656 kg/day for robin)
Is = incidental soil intake rate (0.000088 kg/day for mouse, 0 kg/day for shrew, 0.00965 kg/day for robin)
SFF = Site foraging factor (1 for mouse; 0.83 for shrew; 0.43 for robin)
BW = body weight (0.02 kg for mouse, 0.015 kg for shrew, 0.077 kg for robin)

TABLE B-26
CALCULATION OF SOIL HAZARD QUOTIENTS USING MEAN VALUES AS INPUT - SEAD-71 - MAMMALS
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	Deer Mouse Exposure (mg/kg/day) [1]	Short-tailed Shrew Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	Deer Mouse Hazard Quotient [3]	Short-tailed Shrew Hazard Quotient [3]
Volatile Organics					
Acetone	5.20E-02	1.43E-02	1.00E+01	5.2E-03	1.4E-03
Benzene	1.72E-02	6.87E-02	2.64E+01	6.5E-04	2.6E-03
Ethylbenzene	1.03E-03	2.82E-03	4.73E+01	2.2E-05	6.0E-05
Methylene chloride	7.66E-03	1.55E-02	no data	--	--
Styrene	--	--	no data	--	--
Tetrachloroethene	1.76E-03	3.64E-03	1.40E+00	1.3E-03	2.6E-03
Toluene	4.89E-02	2.09E-01	2.60E+01	1.9E-03	8.1E-03
Total Xylenes	4.49E-03	1.79E-02	2.10E+00	2.1E-03	8.5E-03
Semivolatile Organics					
2-Methylnaphthalene	1.16E-01	3.27E-01	7.16E+00	1.6E-02	4.6E-02
Acenaphthene	3.38E-01	8.81E-01	1.75E+00	1.9E-01	5.0E-01
Acenaphthylene	7.59E-01	2.76E+00	1.00E+00	7.6E-01	**2.8E+00**
Anthracene	3.22E-01	4.08E-01	1.00E+02	3.2E-03	4.1E-03
Benzo(a)anthracene	4.84E-01	1.47E+00	1.00E+00	4.8E-01	**1.5E+00**
Benzo(a)pyrene	1.24E+01	4.43E+01	1.00E+00	**1.2E+01**	**4.4E+01**
Benzo(b)fluoranthene	7.28E-01	2.77E+00	1.00E+00	7.3E-01	**2.8E+00**
Benzo(ghi)perylene	3.42E-01	1.26E+00	1.00E+00	3.4E-01	**1.3E+00**
Benzo(k)fluoranthene	6.65E-01	2.47E+00	1.00E+00	6.7E-01	**2.5E+00**
Carbazole	1.17E-02	5.08E+02	no data	--	--
Chrysene	6.53E-01	2.11E+00	1.00E+00	6.5E-01	**2.1E+00**
Di-n-butylphthalate	8.44E-03	1.88E-02	5.50E+02	1.5E-05	3.4E-05
Dibenz(a,h)anthracene	1.12E-01	3.84E-01	1.00E+00	1.1E-01	3.8E-01
Dibenzofuran	5.01E-01	1.85E+00	no data	--	--
Fluoranthene	5.83E+00	2.32E+01	1.25E+00	**4.7E+00**	**1.9E+01**
Fluorene	4.08E-01	1.17E+00	1.25E+00	3.3E-01	9.4E-01
Indeno(1,2,3-cd)pyrene	5.42E-01	2.15E+00	1.00E+00	5.4E-01	**2.1E+00**
Naphthalene	3.06E-01	5.94E-01	7.16E+00	4.3E-02	8.3E-02
Phenanthrene	1.32E+00	2.78E+00	1.00E+00	**1.3E+00**	**2.8E+00**
Pyrene	9.36E-01	2.18E+00	1.00E+00	9.4E-01	**2.2E+00**
Pesticides/PCBs					
4,4'-DDD	4.89E-04	1.40E-03	8.00E-01	6.1E-04	1.7E-03
4,4'-DDE	9.80E-04	1.33E-03	8.00E-01	1.2E-03	1.7E-03
4,4'-DDT	3.88E-03	1.13E-02	8.00E-01	4.8E-03	1.4E-02
Alpha-BHC	8.09E-04	2.68E-03	1.60E+00	5.1E-04	1.7E-03
Alpha-Chlordane	1.70E-04	6.07E-04	4.58E+00	3.7E-05	1.3E-04
Beta-BHC	--	--	no data	--	--
Dieldrin	2.33E-04	2.63E-04	2.00E-02	1.2E-02	1.3E-02
Endosulfan I	4.42E-04	8.19E-04	1.50E+00	2.9E-04	5.5E-04
Endosulfan II	9.85E-04	1.91E-03	1.50E+00	6.6E-04	1.3E-03
Endosulfan sulfate	1.54E-03	3.04E-03	1.50E+00	1.0E-03	2.0E-03
Endrin	6.40E-04	1.84E-03	no data	--	--
Endrin aldehyde	--	--	no data	--	--
Endrin ketone	1.20E-03	3.93E-03	9.20E-02	1.3E-02	4.3E-02
Gamma-Chlordane	2.50E-04	8.65E-04	4.58E+00	5.5E-05	1.9E-04
Heptachlor epoxide	4.62E-04	1.12E-03	1.00E-01	4.6E-03	1.1E-02
Methoxychlor	--	--	no data	--	--
Metals					
Lead	5.80E+01	2.48E+02	8.00E+00	**7.3E+00**	**3.1E+01**
Mercury	4.22E-01	1.83E+00	1.32E+01	3.2E-02	1.4E-01
Selenium	6.14E-01	2.16E+00	2.00E-01	**3.1E+00**	**1.1E+01**
Sodium	3.87E+01	1.38E+02	no data	--	--
Zinc	5.54E+02	2.35E+03	1.60E+02	**3.5E+00**	**1.5E+01**

(1) Receptor exposure from Table B-25.
(2) Toxicity reference value from Table 3 6-4.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

TABLE B-27
CALCULATION OF SOIL HAZARD QUOTIENTS USING MEAN VALUES AS INPUT- SEAD-71 - BIRD
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Constituent	American Robin Exposure (mg/kg/day) [1]	NOAEL Toxicity Reference Value (mg/kg/day) [2]	American Robin Hazard Quotient [3]
Volatile Organics			
Acetone	9.89E-02	6.10E+02	1.6E-04
Benzene	4.08E-02	no data	--
Ethylbenzene	2.53E-03	no data	--
Methylene chloride	1.65E-02	no data	--
Styrene	--	no data	--
Tetrachloroethene	4.07E-03	no data	--
Toluene	1.17E-01	no data	--
Total Xylenes	1.09E-02	3.06E+02	3.6E-05
Semivolatile Organics			
2-Methylnaphthalene	3.48E-01	2.85E+01	1.2E-02
Acenaphthene	9.80E-01	1.00E+03	9.8E-04
Acenaphthylene	2.02E+00	1.00E+03	2.0E-03
Anthracene	1.35E+00	1.00E+03	1.3E-03
Benzo(a)anthracene	2.22E+00	4.00E+01	5.5E-02
Benzo(a)pyrene	2.95E-01	4.00E-01	7.4E-01
Benzo(b)fluoranthene	2.54E+00	4.00E+01	6.4E-02
Benzo(ghi)perylene	1.31E+00	4.00E+01	3.3E-02
Benzo(k)fluoranthene	2.49E+00	4.00E+01	6.2E-02
Carbazole	2.83E+02	no data	--
Chrysene	2.64E+00	4.00E+01	6.6E-02
Di-n-butylphthalate	3.21E-02	1.10E-01	2.9E-01
Dibenz(a,h)anthracene	4.69E-01	4.00E+01	1.2E-02
Dibenzofuran	1.34E+00	2.18E-01	**6.2E+00**
Fluoranthene	1.66E+01	4.00E+01	4.2E-01
Fluorene	1.23E+00	2.85E+01	4.3E-02
Indeno(1,2,3-cd)pyrene	1.77E+00	4.00E+01	4.4E-02
Naphthalene	8.01E-01	2.85E+01	2.8E-02
Phenanthrene	4.91E+00	2.85E+01	1.7E-01
Pyrene	4.25E+00	4.00E+01	1.1E-01
Pesticides/PCBs			
4,4'-DDD	2.43E-03	5.60E-02	4.3E-02
4,4'-DDE	6.95E-03	5.60E-02	1.2E-01
4,4'-DDT	1.95E-02	5.60E-02	3.5E-01
Alpha-BHC	2.10E-03	5.60E-01	3.7E-03
Alpha-Chlordane	6.37E-04	2.14E+00	3.0E-04
Beta-BHC	--	no data	--
Dieldrin	9.41E-04	7.70E-02	1.2E-02
Endosulfan I	1.22E-03	1.00E+00	1.2E-03
Endosulfan II	2.76E-03	1.00E+01	2.8E-04
Endosulfan sulfate	4.35E-03	1.00E+00	4.3E-03
Endrin	2.39E-03	1.04E-02	2.3E-01
Endrin aldehyde	--	no data	--
Endrin ketone	4.83E-03	3.00E-01	1.6E-02
Gamma-Chlordane	9.22E-04	2.14E+00	4.3E-04
Heptachlor epoxide	1.81E-03	4.80E+00	3.8E-04
Methoxychlor	--	no data	--
Metals			
Lead	1.51E+02	3.85E+00	**3.9E+01**
Mercury	1.02E+00	4.50E-01	**2.3E+00**
Selenium	1.45E+00	4.00E-01	**3.6E+00**
Sodium	1.02E+02	no data	--
Zinc	1.35E+03	1.45E+01	**9.3E+01**

(1) Receptor exposure from Table B-25.
(2) Toxicity reference value from Table 3.6-5.
(3) Hazard quotient calculated as HQ = exposure rate / toxicity reference value
with HQ < 1, no effects expected
1 < HQ =< 10, small potential for effects
10 < HQ =< 100, potential for greater exposure to result in effects, and
HQ > 100, highest potential for effects.
(4) -- : no HQ could be calculated, as no toxicity data could be found.
(5) Bold HQ indicate that hazard quotient is greater than 1.

APPENDIX C

Background Data

Table C-1: All Background Metals Data in Soils at SEDA

Table C-2: Groundwater Background Data

Tal 1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE: METALs	UNIT	MAXIMUM CONCENTRATION	FREQUENCY OF DETECTION	TAGM VALUE	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	11/05/91 S1105-24SOIL1 VALUE (Q)	11/05/91 S1105-25SOIL1 VALUE (Q)	11/05/91 S1105-26(1)SOIL1 VALUE (Q)	11/05/91 S1105-27SOIL1 VALUE (Q)	11/05/91 S1105-28SOIL1 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	19200	**20500**	17700	12700	14800
Antimony	MG/KG	6.55	17%	5.9	1	9	54	10.3 UJ	8.8 UJ	8.2 UJ	8.4 UJ	9.9 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	5.1 J	6.1 J	6 J	4.2 J	4.3 J
Barium	MG/KG	159	100%	300	0	54	54	136 J	98.9 J	86.7 J	56.2 J	101 J
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	**1.4**	**1.2**	1	0.78 J	1.1
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	**2.6**	**2.9**	**2.4**	1.9	2.3
Calcium	MG/KG	293000	100%	121000	3	54	54	5390	4870	3560	85900	45600
Chromium	MG/KG	32.7	100%	29.6	3	54	54	27.4 J	**30.1** J	26.9 J	19.8 J	22.5 J
Cobalt	MG/KG	29.1	100%	30	0	54	54	13.8	18.4	14	14.2	13.7
Copper	MG/KG	62.8	100%	33	3	54	54	22.3	27.6	26	16.2	22.6
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.6 U	0.63 U	0.67 U	0.58 U	0.7 U
Iron	MG/KG	38600	100%	36500	3	54	54	**37200**	36100	32500	27400	31000
Lead	MG/KG	266	94%	24.8	3	51	54	14.5	11.4	13.6	10.1	10.8
Magnesium	MG/KG	29100	100%	21500	2	51	51	5850	7300	6490	6720	8860
Manganese	MG/KG	2380	96%	1060	3	51	53	**1130**	956	832	926	903
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.09	0.06 J	0.06 J	0.05 J	0.08 J
Nickel	MG/KG	62.3	98%	49	3	53	54	42.3	48.7	44.4	30.4	38.4
Potassium	MG/KG	3160	100%	2380	3	54	54	1910	2110	1760	1430	1320
Selenium	MG/KG	1.7	41%	2	0	22	54	0.17 UJ	0.21 UJ	0.2 UJ	0.61 UJ	0.21 UJ
Silver	MG/KG	0.87	4%	0.75	1	2	51	1.6 U	1.3 U	1.2 U	1.3 U	1.5 U
Sodium	MG/KG	269	83%	172	3	45	54	79.2 U	67.5 U	62.6 U	75.3 J	84.2 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.47 U	0.58 U	0.57 U	0.34 U	0.59 U
Vanadium	MG/KG	32.7	100%	150	0	54	54	32.2	25.4	26.4	15.7	19.7
Zinc	MG/KG	126	93%	110	3	50	54	85.1 J	94.2 J	85 J	75 J	**126** J

Notes:
Italicized data represents duplicate pair; average of both samples, presented to right, is compared to TAGM.
Shaded cells with bolded text indicates TAGM value exceeded.

p:\pit\projects\seneca\backgnd\spss\soil\Backsoil.xls\Bold_Shade

Table C-1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE: METALs	UNIT	MAXIMUM CONCENTRATION	FREQUENCY OF DETECTION	TAGM VALUE	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	11/05/91 S1105-29SOIL1 VALUE (Q)	11/05/91 S1105-30RESOIL1 VALUE (Q)	12/16/92 BK-1SOIL3 VALUE (Q)	12/16/92 BK-2RESOIL3 VALUE (Q)	01/20/93 GB35-1GRID VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	8880	7160	**19400**	14400	18000
Antimony	MG/KG	6.55	17%	5.9	1	9	54	9.9 UJ	7 UJ	7.9 U	7.2 U	5.8 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	3.8 J	4.4 J	3	2.7	6.2
Barium	MG/KG	159	100%	300	0	54	54	110 J	39.9 J	159	106	93.6
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.76	0.52 J	1.1	0.81	0.85
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	1.7	1.5	0.45 U	0.41 U	0.33 U
Calcium	MG/KG	293000	100%	121000	3	54	54	104000	101000	4590	22500	1590
Chromium	MG/KG	32.7	100%	29.6	3	54	54	13.8 J	11.2 J	**30**	22.3	23.5
Cobalt	MG/KG	29.1	100%	30	0	54	54	10.7	8.1	14.4	12.3	9.4
Copper	MG/KG	62.8	100%	33	3	54	54	21.6	19.3	26.9	18.8	17.5
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.63 U	0.62 U	0.57 U	0.61 U	0.78 U
Iron	MG/KG	38600	100%	36500	3	54	54	19600	17300	**38600**	26600	25200
Lead	MG/KG	266	94%	24.8	3	51	54	10.1	7.8	15.8	18.9	14.4
Magnesium	MG/KG	29100	100%	21500	2	51	51	17000	12600	5980	7910	3850
Manganese	MG/KG	2380	96%	1060	3	51	53	532	514	**2380**	800	701
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.04 J	0.05 J	**0.13 J**	**0.11**	0.06 J
Nickel	MG/KG	62.3	98%	49	3	53	54	23.8	19	47.7	31	26.3
Potassium	MG/KG	3160	100%	2380	3	54	54	1080	1050	1720	1210	1110
Selenium	MG/KG	1.7	41%	2	0	22	54	0.65 UJ	0.21 UJ	0.73 J	0.94	0.23 UJ
Silver	MG/KG	0.87	4%	0.75	1	2	51	1.5 U	1.1 U	0.47 U	0.43 U	0.34 U
Sodium	MG/KG	269	83%	172	3	45	54	112 J	116 J	49.1 J	61.1 J	35.6 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.36 U	0.6 U	0.42 U	0.38 U	0.55 U
Vanadium	MG/KG	32.7	100%	150	0	54	54	19.5	12.9	28	22.4	27.1
Zinc	MG/KG	126	93%	110	3	50	54	84.3 J	74.8 J	98.6	63.7	55

Notes:
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Shaded cells with bolded text indicates TAGM value exceeded.

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ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE: METALs	UNIT	MAXIMUM CONCENTRATION	FREQUENCY OF DETECTION	TAGM VALUE	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	*01/20/93* *GB35-2GRID* *VALUE (Q)*	*01/20/93* *GB35-6DUGRID* *VALUE (Q)*	01/20/93 gb35-Pair VALUE (Q)	01/20/93 GB36-1GRID VALUE (Q)	01/20/93 GB36-2GRID VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	*17600*	*16200*	16900	18100	16200
Antimony	MG/KG	6.55	17%	5.9	1	9	54	*6.8 J*	*6.3 J*	**6.55**	5.9 J	5.8 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	*7.7*	*5.3*	6.5	4.6	**9.7**
Barium	MG/KG	159	100%	300	0	54	54	*61.7*	*61.7*	61.7	74.8	50.8
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	*0.74*	*0.77*	0.755	0.77	0.65
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	*0.31 U*	*0.35 U*	0.165 U	0.3 U	0.33 U
Calcium	MG/KG	293000	100%	121000	3	54	54	*17700*	*1370*	9535	1660	22900
Chromium	MG/KG	32.7	100%	29.6	3	54	54	*29.3*	*25.1*	27.2	24.8	27.4
Cobalt	MG/KG	29.1	100%	30	0	54	54	*16.3*	*10.3*	13.3	20.4	13.2
Copper	MG/KG	62.8	100%	33	3	54	54	*24.5*	*17.2*	20.85	17.7	17.5
Cyanide	MG/KG	0	0%	0.35	0	0	48	*0.71 U*	*0.82 U*	0.3825 u	0.7 U	0.68 U
Iron	MG/KG	38600	100%	36500	3	54	54	*34200*	*30800*	32500	26100	30700
Lead	MG/KG	266	94%	24.8	3	51	54	*5.4*	*19.1*	12.25	12.7	6.2
Magnesium	MG/KG	29100	100%	21500	2	51	51	*7790*	*4490*	6140	4490	7150
Manganese	MG/KG	2380	96%	1060	3	51	53	*646*	*775*	710.5	426	507
Mercury	MG/KG	0.13	72%	0.1	2	39	54	*0.03 U*	*0.07 J*	0.0425 J	0.02 J	0.02 J
Nickel	MG/KG	62.3	98%	49	3	53	54	*48.7*	*28.3*	38.5	28.3	42.8
Potassium	MG/KG	3160	100%	2380	3	54	54	*1110*	*975*	1042.5	1400	1100
Selenium	MG/KG	1.7	41%	2	0	22	54	*0.23 UJ*	*0.21 UJ*	0.11 UJ	0.2 UJ	0.18 UJ
Silver	MG/KG	0.87	4%	0.75	1	2	51	*0.32 U*	*0.36 U*	0.17 U	0.31 U	0.34 U
Sodium	MG/KG	269	83%	172	3	45	54	*77.5 J*	*34.6 J*	56.05 J	46.6 J	97.6 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	*0.54 U*	*0.5 U*	0.26 U	0.46 U	0.43 U
Vanadium	MG/KG	32.7	100%	150	0	54	54	*22.3*	*26.1*	24.2	27.8	19.7
Zinc	MG/KG	126	93%	110	3	50	54	*83.4*	*53.1*	68.25	59.2	74.1

Notes:
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Table C-1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE:			FREQUENCY		NUMBER	NUMBER	NUMBER	01/11/93	11/20/91	12/02/93	12/02/93	12/02/93
METALs	UNIT	MAXIMUM CONCENTRATION	OF DETECTION	TAGM VALUE	ABOVE TAGM	OF DETECTS	OF ANALYSES	MW36-3GRID VALUE (Q)	S2011121M W34GRID VALUE (Q)	SB24-5-1 VALUE (Q)	SB24-5-3 VALUE (Q)	SB24-5-5 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	12700	16100	16200	10100	13700
Antimony	MG/KG	6.55	17%	5.9	1	9	54	5.7 UJ	5.7 J	12.5 UJ	5.8 UJ	11.3 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	2.9 J	6.3 U	4.2	3.3	5
Barium	MG/KG	159	100%	300	0	54	54	46.9 J	67.5	117	58.3	67.2
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.59	0.86	0.98 J	0.48 J	0.62 J
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.33 U	2.3	0.78 U	0.36 U	0.7 U
Calcium	MG/KG	293000	100%	121000	3	54	54	4170	28600	4540	74200	49000
Chromium	MG/KG	32.7	100%	29.6	3	54	54	23.3 J	26.6	24.5	16.9	23.1
Cobalt	MG/KG	29.1	100%	30	0	54	54	18.6	17	16	8.2	12
Copper	MG/KG	62.8	100%	33	3	54	54	19.2 J	32.7	28.4	20.9	22.2
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.56 U	0.54 U	0.6 U	0.51 U	0.57 U
Iron	MG/KG	38600	100%	36500	3	54	54	27500	35000	33600	21300	26700
Lead	MG/KG	266	94%	24.8	3	51	54	20.2	11.9	**45.5** J	8.7 J	7.9 J
Magnesium	MG/KG	29100	100%	21500	2	51	51	5750	6850	5150	12100	11400
Manganese	MG/KG	2380	96%	1060	3	51	53	540	803	**1080**	400	450
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.02 J	0.07 R	0.07 JR	0.06 JR	0.04 JR
Nickel	MG/KG	62.3	98%	49	3	53	54	43.3 J	**49.3** J	37.3	26.4	35.2
Potassium	MG/KG	3160	100%	2380	3	54	54	754	1290	1170 J	993	1660
Selenium	MG/KG	1.7	41%	2	0	22	54	0.19 UJ	0.18 UJ	0.15 UJ	0.23 UJ	0.22 UJ
Silver	MG/KG	0.87	4%	0.75	1	2	51	0.34 U	**0.87** J	1.6 U	0.73 U	1.4 U
Sodium	MG/KG	269	83%	172	3	45	54	31.6 U	55.2 J	50.9 J	153 J	139 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.45 U	0.51 U	0.16 U	0.25 U	0.24 U
Vanadium	MG/KG	32.7	100%	150	0	54	54	16.2 J	22.3	29.9	14.4	19.5
Zinc	MG/KG	126	93%	110	3	50	54	34.7 J	95.7	85.7	62.8	63.2

Notes:
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Shaded cells with bolded text indicates TAGM value exceeded.

Tab

ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE:			FREQUENCY		NUMBER	NUMBER	NUMBER	12/03/93	12/03/93	*09/25/95*	*09/25/95*	
METALs	**UNIT**	**MAXIMUM CONCENTRATION**	**OF DETECTION**	**TAGM VALUE**	**ABOVE TAGM**	**OF DETECTS**	**OF ANALYSES**	SB25-6-01 VALUE (Q)	SB25-6-02 VALUE (Q)	*SB25-7-00 VALUE (Q)*	*SB25-7-10 VALUE (Q)*	SB25-7 Pair VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	10600	7070	*12500*	*12500*	12500
Antimony	MG/KG	6.55	17%	5.9	1	9	54	4.2 U	3 U	*0.4*	*0.4 UJ*	0.3 J
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	**8.3**	4.8	*4.3*	*4.3*	4.3
Barium	MG/KG	159	100%	300	0	54	54	59.1	35	*71.3*	*71.3*	71.3
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.48 J	0.35 J	*0.56*	*0.56*	0.56
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.41 U	0.29 U	*0.05 U*	*0.05 U*	0.025
Calcium	MG/KG	293000	100%	121000	3	54	54	82500	**122000**	*47400 J*	*47400 J*	47400 J
Chromium	MG/KG	32.7	100%	29.6	3	54	54	16.9	11.3	*16.9 J*	*16.9 J*	16.9 J
Cobalt	MG/KG	29.1	100%	30	0	54	54	11.2	6.6 J	*8*	*8*	8
Copper	MG/KG	62.8	100%	33	3	54	54	20.2 J	12 J	*15.7*	*15.7*	15.7
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.58 U	0.64 U	*0.44 U*	*0.444 U*	0.221 U
Iron	MG/KG	38600	100%	36500	3	54	54	21400	15800	*20500*	*20500*	20500
Lead	MG/KG	266	94%	24.8	3	51	54	9.5	13.8	*11.1*	*11.1*	11.1
Magnesium	MG/KG	29100	100%	21500	2	51	51	19600	**22800**	*11700*	*11700*	11700
Manganese	MG/KG	2380	96%	1060	3	51	53	722 J	610 J	*452*	*452*	452
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.03 J	0.04 U	*0.03*	*0.03*	0.03
Nickel	MG/KG	62.3	98%	49	3	53	54	26.8	18	*22.3*	*22.3*	22.3
Potassium	MG/KG	3160	100%	2380	3	54	54	1480	1060	*1110*	*1110*	1110
Selenium	MG/KG	1.7	41%	2	0	22	54	0.97 J	0.63 J	*0.63 U*	*0.66 U*	0.3225 U
Silver	MG/KG	0.87	4%	0.75	1	2	51	0.82 U	0.59 U	*0.89 U*	*0.92 U*	0.4525 U
Sodium	MG/KG	269	83%	172	3	45	54	**269** J	**186** J	*59.9*	*57.5*	58.7
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.24 UJ	0.21 UJ	*1.2*	*1.2*	**1.2**
Vanadium	MG/KG	32.7	100%	150	0	54	54	18.5	12	*21*	*21*	21
Zinc	MG/KG	126	93%	110	3	50	54	71.6 J	40.6 J	*54.1*	*54.1*	54.1

Notes:
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Table C-1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE:			FREQUENCY		NUMBER	NUMBER	NUMBER	09/25/95	09/25/95	04/02/94	04/02/94	04/02/94
		MAXIMUM	OF	TAGM	ABOVE	OF	OF	SB25-7-03	SB25-7-04	MW64A-1-1	MW64A-1-2	MW64A-1-3
METALs	UNIT	CONCENTRATION	DETECTION	VALUE	TAGM	DETECTS	ANALYSES	VALUE (Q)	VALUE (Q)	VALUE (Q)	VALUE (Q)	VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	8020	7550	16100	**19800**	12600
Antimony	MG/KG	6.55	17%	5.9	1	9	54	0.42 UJ	0.44 U	0.23 J	0.2 UJ	0.2 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	4.1	3.4	7.1	8.2	5
Barium	MG/KG	159	100%	300	0	54	54	58	52	83.7	91.2	62.3
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.43	0.39	0.68 J	0.74 J	0.53 J
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.06 U	0.06 U	0.11 J	0.02 U	0.12 J
Calcium	MG/KG	293000	100%	121000	3	54	54	120000 J	**133000** J	7210	4300	72400
Chromium	MG/KG	32.7	100%	29.6	3	54	54	13.7 J	12.4 J	23	25	19
Cobalt	MG/KG	29.1	100%	30	0	54	54	8.2	6.9	11.8	11.3	9.1 J
Copper	MG/KG	62.8	100%	33	3	54	54	17.7	16.4	25.5	21	23.7
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.57 U	0.51 U	0.66 U	0.56 U	0.55 U
Iron	MG/KG	38600	100%	36500	3	54	54	18900	15400	28500	28000	22600
Lead	MG/KG	266	94%	24.8	3	51	54	7	6.5	21.6	13.6	15.4
Magnesium	MG/KG	29100	100%	21500	2	51	51	17400	20700	5480	5010	14800
Manganese	MG/KG	2380	96%	1060	3	51	53	735	402	558	604	402
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.02	0.01	0.05 J	0.03 J	0.02 J
Nickel	MG/KG	62.3	98%	49	3	53	54	26.4	22.4	32.2	28.6	26.7
Potassium	MG/KG	3160	100%	2380	3	54	54	1280	1430	**2590** J	2260 J	**2700** J
Selenium	MG/KG	1.7	41%	2	0	22	54	0.7 U	0.74 U	0.96	1.7	0.34 U
Silver	MG/KG	0.87	4%	0.75	1	2	51	0.98 U	1 U	0.12 U	0.14 U	0.14 U
Sodium	MG/KG	269	83%	172	3	45	54	89.1	110	27.5 U	31.8 U	92.1 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	**1.1**	0.6 U	0.42 J	0.32 U	0.32 U
Vanadium	MG/KG	32.7	100%	150	0	54	54	13.4	13.7	27.6	32.2	22.8
Zinc	MG/KG	126	93%	110	3	50	54	64.9	65.1	104	87.1	64.9

Notes:
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ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE:			FREQUENCY		NUMBER	NUMBER	NUMBER	05/13/94	05/13/94	05/13/94	05/13/94	03/30/94
METALs	UNIT	MAXIMUM CONCENTRATION	OF DETECTION	TAGM VALUE	ABOVE TAGM	OF DETECTS	OF ANALYSES	MW64B-1-1 VALUE (Q)	MW64B-1-2 VALUE (Q)	MW64B-1-3 VALUE (Q)	MW64B-1-04 VALUE (Q)	MW67-2-1 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	13400	8870	7620	7620	16700
Antimony	MG/KG	6.55	17%	5.9	1	9	54	0.3 J	0.15 UJ	0.15 UJ	0.15 UJ	0.27 J
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	5.5	4.3	5.5	5.5	4.4
Barium	MG/KG	159	100%	300	0	54	54	75.5	70.8	76.7	76.7	114
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.56 J	0.43 J	0.37 J	0.37 J	0.67 J
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.63 J	0.64 J	0.54 J	0.54 J	0.2 J
Calcium	MG/KG	293000	100%	121000	3	54	54	5530	70000	75900	75900	3580
Chromium	MG/KG	32.7	100%	29.6	3	54	54	17.5	14.1	13.5	13.5	19.5
Cobalt	MG/KG	29.1	100%	30	0	54	54	7.2 J	10	7.4 J	7.4 J	7.5 J
Copper	MG/KG	62.8	100%	33	3	54	54	18.9	20.2	17.6	17.6	16.5
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.6 U	0.5 U	0.48 U	0.48 U	0.64 U
Iron	MG/KG	38600	100%	36500	3	54	54	20900	18400	17100	17100	20500
Lead	MG/KG	266	94%	24.8	3	51	54	21.4	8.8	8.3	8.3	17.5
Magnesium	MG/KG	29100	100%	21500	2	51	51	3720	18900	21500	21500	
Manganese	MG/KG	2380	96%	1060	3	51	53	207	434	389	389	438
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.05 J	0.02 J	0.01 U	0.01 U	0.04
Nickel	MG/KG	62.3	98%	49	3	53	54	19.8	28.2	22.6	22.6	18.7
Potassium	MG/KG	3160	100%	2380	3	54	54	1700	1630	1650	1650	1780 J
Selenium	MG/KG	1.7	41%	2	0	22	54	0.99 J	0.26 U	0.57 J	0.57 J	0.81
Silver	MG/KG	0.87	4%	0.75	1	2	51	0.16 UJ	0.11 UJ	0.11 UJ	0.11 UJ	0.11 U
Sodium	MG/KG	269	83%	172	3	45	54	35.9 U	96.8 J	79.6 J	79.6 J	25.1 U
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.41 J	0.24 U	0.24 U	0.24 U	0.48 J
Vanadium	MG/KG	32.7	100%	150	0	54	54	23.3	14.8	14.2	14.2	28.2
Zinc	MG/KG	126	93%	110	3	50	54	72.2	59	45.6	45.600	64.8

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Table C-1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE:			FREQUENCY		NUMBER	NUMBER	NUMBER	03/30/94	03/30/94	05/11/94	05/11/94	05/11/94
METALs	UNIT	MAXIMUM CONCENTRATION	OF DETECTION	TAGM VALUE	ABOVE TAGM	OF DETECTS	OF ANALYSES	MW67-2-2 VALUE (Q)	MW67-2-3 VALUE (Q)	MW70-1-1 VALUE (Q)	MW70-1-2 VALUE (Q)	MW70-1-3 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	14900	9460	12200	9480	11000
Antimony	MG/KG	6.55	17%	5.9	1	9	54	0.22 J	0.2 UJ	0.23 UJ	0.21 UJ	0.19 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	4.5	4.2	5.4	4.1	5.7
Barium	MG/KG	159	100%	300	0	54	54	105	80.8	67.5	56.6	79.9
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.61 J	0.4 J	0.44 J	0.41 J	0.54 J
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.11 J	0.12 J	0.57 J	0.43 J	0.8 J
Calcium	MG/KG	293000	100%	121000	3	54	54	79000	77800	3600	51600	48600
Chromium	MG/KG	32.7	100%	29.6	3	54	54	22.5	14.8	13.7	14.7	17.8
Cobalt	MG/KG	29.1	100%	30	0	54	54	10.4 J	9.7 J	5.5 J	7.1 J	21
Copper	MG/KG	62.8	100%	33	3	54	54	20.3	20.5	12.4	19.7	**33.5**
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.5 U	0.54 U			
Iron	MG/KG	38600	100%	36500	3	54	54	24400	18700	17700	16000	26400
Lead	MG/KG	266	94%	24.8	3	51	54	9.3	8.5	20.7	9.1	13.6
Magnesium	MG/KG	29100	100%	21500	2	51	51			2830	13600	7980
Manganese	MG/KG	2380	96%	1060	3	51	53	528	411	233	470	1040
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.01 J	0.02 J	0.1 J	0.03 J	0.02 J
Nickel	MG/KG	62.3	98%	49	3	53	54	32.3	25.9	12.3	17.6	**52.4**
Potassium	MG/KG	3160	100%	2380	3	54	54	**3160 J**	1970 J	982 J	1590	1350
Selenium	MG/KG	1.7	41%	2	0	22	54	0.36 U	0.34 U	1 J	0.64 J	0.32 U
Silver	MG/KG	0.87	4%	0.75	1	2	51	0.15 U	0.14 U			
Sodium	MG/KG	269	83%	172	3	45	54	112 J	107 J	36.4 U	126 J	165 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.34 U	0.32 U			
Vanadium	MG/KG	32.7	100%	150	0	54	54	24.8	16.5	23.3	17.2	17.6
Zinc	MG/KG	126	93%	110	3	50	54	62	60.1	55.4	42.4	**116**

Notes:
Italicized data represents duplicate pair; average of both samples, presented to right, is compared to TAGM.
Shaded cells with bolded text indicates TAGM value exceeded.

Ta -1

ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE: METALs	UNIT	MAXIMUM CONCENTRATION	FREQUENCY OF DETECTION	TAGM VALUE	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	11/02/93 SB11-3-1 VALUE (Q)	11/02/93 SB11-3-2 VALUE (Q)	11/03/93 SB11-3-6 VALUE (Q)	12/08/93 SB13-1-1 VALUE (Q)	SB13-1-2 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	17600	6330	10900	18300	8250
Antimony	MG/KG	6.55	17%	5.9	1	9	54	10.8 UJ	8 UJ	7.6 UJ	5.1 J	3.7 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	5.6 R	3.4 R	6 R	7	6.2
Barium	MG/KG	159	100%	300	0	54	54	113	57.4	62.7	106	88.1
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.85 J	0.34 J	0.47 J	0.92 J	0.42 J
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.67 U	0.5 U	0.48 U	0.45 U	0.36 U
Calcium	MG/KG	293000	100%	121000	3	54	54	4950	91300	48600	3570	87700
Chromium	MG/KG	32.7	100%	29.6	3	54	54	24	11.1	18.6	29.4	13.3
Cobalt	MG/KG	29.1	100%	30	0	54	54	11.3	6.5 J	10.1	12	7.2 J
Copper	MG/KG	62.8	100%	33	3	54	54	20	12.2	21.7	11.6	18.4
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.57 U	0.47 U	0.53 U	0.61 U	0.5 U
Iron	MG/KG	38600	100%	36500	3	54	54	27200	13200	28300	32500	17400
Lead	MG/KG	266	94%	24.8	3	51	54	27.9	11.4	10.1	15 R	9 R
Magnesium	MG/KG	29100	100%	21500	2	51	51	4160	12900	10100	5890	20800
Manganese	MG/KG	2380	96%	1060	3	51	53	674	356	434	451	517
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.05 J	0.04 U	0.03 U	0.03 J	0.07 J
Nickel	MG/KG	62.3	98%	49	3	53	54	28.3	16.7	29.5	34.9	24
Potassium	MG/KG	3160	100%	2380	3	54	54	2110	1110	1230	2190	1390
Selenium	MG/KG	1.7	41%	2	0	22	54	0.24 J	0.13 UJ	0.21 UJ	0.26 J	0.56 J
Silver	MG/KG	0.87	4%	0.75	1	2	51	1.4 UJ	1 UJ	0.97 UJ	0.9 U	0.71 U
Sodium	MG/KG	269	83%	172	3	45	54	66.3 J	136 J	146 J	80.6 J	155 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.19 U	1.5 U	0.23 U	0.43 J	0.43 J
Vanadium	MG/KG	32.7	100%	150	0	54	54	31.8	13.3	17	32.7	13.3
Zinc	MG/KG	126	93%	110	3	50	54	83.2 R	65 R	77.3 R	81.9	56.2

Notes:
Italicized data represents duplicate pair; average of both samples, presented to right, is compared to TAGM.
Shaded cells with bolded text indicates TAGM value exceeded.

Table C-1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE: METALs	UNIT	MAXIMUM CONCENTRATION	FREQUENCY OF DETECTION	TAGM VALUE	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	12/08/93 SB13-1-3 VALUE (Q)	12/15/93 SB13-6-1 VALUE (Q)	12/15/93 SB13-6-3 VALUE (Q)	12/15/93 SB13-6-4 VALUE (Q)	12/01/93 SB17-1-1 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	11700	16000	13500	10200	13700
Antimony	MG/KG	6.55	17%	5.9	1	9	54	2.8 UJ	3.2 UJ	2.5 UJ	2.9 UJ	11.7 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	5.7	4.6	2.7	2.3	4.3
Barium	MG/KG	159	100%	300	0	54	54	33.9	103	60.4	56.8	107
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.54 J	0.92	0.71	0.58 J	0.7 J
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.27 U	0.31 U	0.25 U	0.28 U	0.73 U
Calcium	MG/KG	293000	100%	121000	3	54	54	50300	5140	31800	45200	2870
Chromium	MG/KG	32.7	100%	29.6	3	54	54	19.6	21.5	23.5	17.8	17.6
Cobalt	MG/KG	29.1	100%	30	0	54	54	11.1	10.6	15	11.3	9.9 J
Copper	MG/KG	62.8	100%	33	3	54	54	17.6	16	27.4	14.5	**46.4**
Cyanide	MG/KG	0	0%	0.35	0	0	48	0.53 U	0.6 U	0.53 U	0.51 U	0 NA
Iron	MG/KG	38600	100%	36500	3	54	54	24700	25300	26900	20700	25100
Lead	MG/KG	266	94%	24.8	3	51	54	11.7 R	13.8	11.6	11.7	**266**
Magnesium	MG/KG	29100	100%	21500	2	51	51	12600	3750	6640	5220	3330
Manganese	MG/KG	2380	96%	1060	3	51	53	404	934	508	556	547
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.02 U	0.03 J	0.01 U	0.01 U	0.05 J
Nickel	MG/KG	62.3	98%	49	3	53	54	33.1	22.7	41.9	33	19.1
Potassium	MG/KG	3160	100%	2380	3	54	54	1270	1330	1120	1000	628 J
Selenium	MG/KG	1.7	41%	2	0	22	54	0.51 J	1.2	0.11 J	0.24 J	0.25 UJ
Silver	MG/KG	0.87	4%	0.75	1	2	51	0.54 U	0.62 U	0.49 U	0.56 U	1.5 U
Sodium	MG/KG	269	83%	172	3	45	54	134 J	61.9 J	116 J	141 J	46.2 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.64 J	0.18 U	0.14 U	0.23 U	0.28 UJ
Vanadium	MG/KG	32.7	100%	150	0	54	54	16.3	29.9	18.5	13.8	23.1
Zinc	MG/KG	126	93%	110	3	50	54	45.8	62.5	64.7	39.3	93.4

Notes:
Italicized data represents duplicate pair; average of both samples, presented to right, is compared to TAGM.
Shaded cells with bolded text indicates TAGM value exceeded.

Table 1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE: METALs	UNIT	MAXIMUM CONCENTRATION	FREQUENCY OF DETECTION	TAGM VALUE	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	12/01/93 SB17-1-2 VALUE (Q)	12/01/93 SB17-1-3 VALUE (Q)	11/17/93 SB26-1-1 VALUE (Q)	11/17/93 SB26-1-2 VALUE (Q)	12/06/93 SB4-1-1 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	18100	8700	5560	9040	*14800*
Antimony	MG/KG	6.55	17%	5.9	1	9	54	11.8 UJ	9 UJ	7.3 UJ	6.7 UJ	*4.8 UJ*
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	5.2	3.4	3.2	5.3	*6.2*
Barium	MG/KG	159	100%	300	0	54	54	114	59.4	73.2	43.7	*72*
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	0.9 J	0.42 J	0.35 J	0.41 J	*0.73 J*
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	0.74 U	0.56 U	0.46 U	0.42 U	*0.47 U*
Calcium	MG/KG	293000	100%	121000	3	54	54	20900	72800	**293000**	47300	*4280*
Chromium	MG/KG	32.7	100%	29.6	3	54	54	25.1	13.9	10.3	15.7	*23.2*
Cobalt	MG/KG	29.1	100%	30	0	54	54	13.3	8.8	5.9 J	9.5	*11.3*
Copper	MG/KG	62.8	100%	33	3	54	54	26.9	20	9.7	14.3	*14.1*
Cyanide	MG/KG	0	0%	0.35	0	0	48	0 NA	0 NA	0.48 U	0.57 U	*0.52 U*
Iron	MG/KG	38600	100%	36500	3	54	54	29900	18800	8770	19100	*27500*
Lead	MG/KG	266	94%	24.8	3	51	54	11.4 J	7.5 J	6.33	8.5	*17.7 J*
Magnesium	MG/KG	29100	100%	21500	2	51	51	8490	18100	**29100**	9160	*4270*
Manganese	MG/KG	2380	96%	1060	3	51	53	487	391	309	551	*615 JR*
Mercury	MG/KG	0.13	72%	0.1	2	39	54	0.06 J	0.03 UJ	0.02 U	0.02 U	*0.05 J*
Nickel	MG/KG	62.3	98%	49	3	53	54	42	25.2	31.6 R	23.9	*27.8*
Potassium	MG/KG	3160	100%	2380	3	54	54	1560	1090	1710	901	*1250*
Selenium	MG/KG	1.7	41%	2	0	22	54	0.24 UJ	0.14 UJ	0.13 UJ	0.26 J	*0.4 J*
Silver	MG/KG	0.87	4%	0.75	1	2	51	1.5 U	1.1 U	0.92 UJ	0.85 UJ	*0.93 U*
Sodium	MG/KG	269	83%	172	3	45	54	74.6 J	137 J	**192 J**	108 J	*43.8 U*
Thallium	MG/KG	1.2	16%	0.7	2	8	51	0.26 UJ	0.15 UJ	0.73 U	0.17 U	*0.23 U*
Vanadium	MG/KG	32.7	100%	150	0	54	54	27	13.9	12.7	14.4	*28.6*
Zinc	MG/KG	126	93%	110	3	50	54	80.2	57.1	283 R	90.6	*79.6*

Notes:
Italicized data represents duplicate pair; average of both samples, presented to right, is compared to TAGM.
Shaded cells with bolded text indicates TAGM value exceeded.

Table C-1
ALL BACKGROUND METALS DATA IN SOILS AT SEDA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

SAMPLE DATE: METALs	UNIT	MAXIMUM CONCENTRATION	FREQUENCY OF DETECTION	TAGM VALUE	NUMBER ABOVE TAGM	NUMBER OF DETECTS	NUMBER OF ANALYSES	*12/06/93* *SB4-1-10* *VALUE (Q)*	*12/06/93* *SB4-pair* *VALUE (Q)*	12/06/93 SB4-1-2 VALUE (Q)	12/06/93 SB4-1-3 VALUE (Q)	11/08/93 TP57-11 VALUE (Q)
Aluminum	MG/KG	20500	100%	19300	3	54	54	*21000*	17900	15300	19200	14600
Antimony	MG/KG	6.55	17%	5.9	1	9	54	*3.8 UJ*	2.15 UJ	5 UJ	2.8 UJ	11.3 UJ
Arsenic	MG/KG	21.5	93%	8.2	3	50	54	*4.2*	5.2	3.9	**21.5**	5.9
Barium	MG/KG	159	100%	300	0	54	54	*97.7*	84.85	40.4 J	81.2	120
Beryllium	MG/KG	1.4	100%	1.1	2	54	54	*0.64 J*	0.685 J	0.74 J	1	0.81 J
Cadmium	MG/KG	2.9	39%	2.3	3	21	54	*0.37 U*	0.21 U	0.49 U	0.27 U	0.71 U
Calcium	MG/KG	293000	100%	121000	3	54	54	*2460*	3370	30900	14400	22300
Chromium	MG/KG	32.7	100%	29.6	3	54	54	*27.9*	25.55	27.6	**32.7**	20.1
Cobalt	MG/KG	29.1	100%	30	0	54	54	*5.9 J*	8.6 J	16.5	29.1	8.8 J
Copper	MG/KG	62.8	100%	33	3	54	54	*15.1*	14.6	**62.8**	21.6	21.7
Cyanide	MG/KG	0	0%	0.35	0	0	48	*0.53 U*	0.2625 U	0.53 U	0.47 U	0.54 U
Iron	MG/KG	38600	100%	36500	3	54	54	*19500*	23500	34300	**37900**	24900
Lead	MG/KG	266	94%	24.8	3	51	54	*9.8 J*	13.75 J	7.5 J	9.1 J	11.3
Magnesium	MG/KG	29100	100%	21500	2	51	51	*4460*	4365	7130	8040	5360
Manganese	MG/KG	2380	96%	1060	3	51	53	*119 JR*		337 R	0	329
Mercury	MG/KG	0.13	72%	0.1	2	39	54	*0.04 J*	0.045 J	0.04 J	0.04 J	0.04 J
Nickel	MG/KG	62.3	98%	49	3	53	54	*25.1*	26.45 J	47.6	**62.3**	25.7
Potassium	MG/KG	3160	100%	2380	3	54	54	*2490*	1870	1300	2030	1430
Selenium	MG/KG	1.7	41%	2	0	22	54	*0.23 J*	0.315 J	0.09 U	0.14 U	0.46 J
Silver	MG/KG	0.87	4%	0.75	1	2	51	*0.74 U*	0.4175 U	0.98 U	0.64 J	1.4 UJ
Sodium	MG/KG	269	83%	172	3	45	54	*39.2 J*	30.55 J	105 J	91.6 J	93 J
Thallium	MG/KG	1.2	16%	0.7	2	8	51	*0.23 U*	0.115 U	0.16 U	0.24 U	0.17 U
Vanadium	MG/KG	32.7	100%	150	0	54	54	*31*	29.8	22.2	29.3	27.8
Zinc	MG/KG	126	93%	110	3	50	54	*72.1*	75.85	102	**115**	57.9

Notes:
Italicized data represents duplicate pair; average of both samples, presented to right, is compared to TAGM.
Shaded cells with bolded text indicates TAGM value exceeded.

TABLE C-2
GROUNDWATER BACKGROUND DATA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

									MW-35		MW-35		MW11-1		MW13-1		MW13-6	
STUDY ID:									3Q93		RI PHASE1		ESI		ESI		ESI	
LOC ID:									MW-35		MW-35		MW11-1		MW13-1		MW13-6	
QC CODE:									SA		SA		SA		SA		SA	
SAMP. DETH TOP:									NONE		NONE		NONE		NONE		NONE	
SAMP. DEPTH BOT:									NONE		NONE		NONE		NONE		NONE	
MATRIX:									GROUNDW		GROUNDW		GROUNDW		GROUNDW		GROUNDW	
SAMP ID:	UNIT		FREQUENCY OF	CRITERIA	TYPE OF	NUMBER OF	NUMBER OF	NUMBER OF	MW35OB3Q		MW-35GW		MW11-1-1		MW13-1-1		MW13-6-1	
PARAMETER	UNIT	MAXIMUM	DETECTION	VALUE	CRITERIA	EXCEEDENCES	DETECTS	ANALYSES	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Aluminum	UG/L	42400	87%	50	MCL	25	27	31	**207**		**7550**	J	**53.7**	J	**42400**		**2810**	
Antimony	UG/L	52.7	13%	3	GA	3	4	31	16.8	U	55.5	U	21.4	U	**33.9**	J	**52.7**	J
Arsenic	UG/L	10	13%	5	MCL	2	4	31	1	B	3.5	U	0.8	U	**9.3**	J	1.4	U
Barium	UG/L	337	94%	1000	GA	0	29	31	97.3	B	103	J	25.2	J	337		34.3	J
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31	0.3	U	1.8	R	0.4	U	2.2	J	0.4	U
Cadmium	UG/L	0	0%	5	GA	0	0	31	2.4	U	2.9	U	2.1	U	2.1	U	2.1	U
Calcium	UG/L	181000	100%			0	31	31	108000		94700		97500		181000		81500	
Chromium	UG/L	69.4	48%	50	GA	1	15	31	3.3	U	15.3	R	2.6	U	**69.4**		6.1	J
Cobalt	UG/L	34.6	45%			0	14	31	2.7	U	19.9	J	4.4	U	34.6	J	4.4	U
Copper	UG/L	32.5	48%	200	GA	0	15	31	2.1	U	14.4	U	3.1	U	23.3	J	3.1	U
Cyanide	UG/L	2.8	3%	200	GA	0	1	31	2.8	B	10	UJ	5	U	5	U	5	U
Iron	UG/L	69400	100%	300	GA	22	31	31	**321**		**10500**		41.4	J	**69400**		**4550**	
Lead	UG/L	34.8	32%	15	MCL	1	10	31	2.8	B	3.3		1.1	J	**34.8**		1.5	J
Magnesium	UG/L	58200	100%			0	31	31	15600		14600		29700		50300		51500	
Manganese	UG/L	1120	97%	50	SEC	22	30	31	23.4		**557**	J	**278**		**1120**		**376**	
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31	0.1	U	0.18	R	0.04	U	0.05	J	0.04	U
Nickel	UG/L	99.8	61%	100	GA	0	19	31	8.3	U	15.9	U	4	U	99.8		8.6	J
Potassium	UG/L	10200	94%			0	29	31	1400	B	4180	J	7100		10100		6780	J
Selenium	UG/L	3.6	19%	10	GA	0	6	31	1.2	B	1.1	J	0.7	U	3.6	J	2.3	J
Silver	UG/L	0.98	6%	50	GA	0	2	31	2.6	U	9	U	4.2	U	4.2	U	4.2	U
Sodium	UG/L	59400	97%	20000	GA	7	30	31	13400		**44100**		4860	J	9350		7880	
Thallium	UG/L	4.7	13%	2	MCL	4	4	31	1.2	U	3.2	U	1.2	U	1.2	U	1.2	U
Vanadium	UG/L	70.8	52%			0	16	31	3	U	30.3	U	3.7	U	70.8		5.9	J
Zinc	UG/L	143	84%	5000	MCL	0	26	31	72.7		58.2		21.4		143		50.6	

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 C-2
GROUNDWATER BACKGROUND DATA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

									MW16-1		MW16-1		MW17-1		MW17-1	
STUDY ID:									RI ROUND1		RI ROUND2		RI ROUND1		RI ROUND2	
LOC ID:									MW16-1		MW16-1		MW17-1		MW17-1	
QC CODE:									SA		SA		SA		SA	
SAMP. DETH TOP:									3.3		731.5		3.4		731.1	
SAMP. DEPTH BOT:									5.3		728.4		7.4		727.1	
MATRIX:									GROUNDW		GROUNDW		GROUNDW		GROUNDW	
SAMP ID:	UNIT		FREQUENCY OF	CRITERIA	TYPE OF	NUMBER OF	NUMBER OF	NUMBER OF	16101		16152		16108		16171	
PARAMETER	UNIT	MAXIMUM	DETECTION	VALUE	CRITERIA	EXCEEDENCES	DETECTS	ANALYSES	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Aluminum	UG/L	42400	87%	50	MCL	25	27	31	**1850**		143	U	**90.4**		**386**	
Antimony	UG/L	52.7	13%	3	GA	3	4	31	2	U	3	U	2	U	3	U
Arsenic	UG/L	10	13%	5	MCL	2	4	31	2.7	U	4.4	U	2.7	U	4.4	U
Barium	UG/L	337	94%	1000	GA	0	29	31	74.2		48.2	U	85		90.4	U
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31	0.23		0.2	U	0.26		0.2	U
Cadmium	UG/L	0	0%	5	GA	0	0	31	0.3	U	0.6	U	0.3	U	0.6	U
Calcium	UG/L	181000	100%			0	31	31	157000		116000		108000		104000	
Chromium	UG/L	69.4	48%	50	GA	1	15	31	2.7		1	U	1	U	1	U
Cobalt	UG/L	34.6	45%			0	14	31	2.1		1.3	U	1.2	U	2	U
Copper	UG/L	32.5	48%	200	GA	0	15	31	4.9		1.9	U	3.1		1.1	U
Cyanide	UG/L	2.8	3%	200	GA	0	1	31	5	U	5	UJ	5	U	5	UJ
Iron	UG/L	69400	100%	300	GA	22	31	31	**2400**	J	296		119		**572**	J
Lead	UG/L	34.8	32%	15	MCL	1	10	31	1.7	U	1.5	U	1.7	U	1.5	U
Magnesium	UG/L	58200	100%			0	31	31	23300		17600		22600		22900	
Manganese	UG/L	1120	97%	50	SEC	22	30	31	**210**		**64.2**		21.3		9.7	U
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31	0.1	U	0.1	U	0.1	U	0.1	U
Nickel	UG/L	99.8	61%	100	GA	0	19	31	4.7		2.5	U	1.8		2.5	U
Potassium	UG/L	10200	94%			0	29	31	1670		998	U	472		843	U
Selenium	UG/L	3.6	19%	10	GA	0	6	31	2.4	U	4.7	UJ	2.4	U	4.7	UJ
Silver	UG/L	0.98	6%	50	GA	0	2	31	1.3	U	1.5	U	1.3	U	1.5	U
Sodium	UG/L	59400	97%	20000	GA	7	30	31	8750		3870	U	9290		8190	
Thallium	UG/L	4.7	13%	2	MCL	4	4	31	4.2	U	5.9	U	**4.4**		4.1	U
Vanadium	UG/L	70.8	52%			0	16	31	3.3		1.6	U	1.2	U	1.6	U
Zinc	UG/L	143	84%	5000	MCL	0	26	31	15.6	R	5.8	U	2.5	R	14.4	U

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 C-2
GROUNDWATER BACKGROUND DATA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

									MW25-6		MW25-6		MW26-1		MW26-1		MW26-1	
STUDY ID:									RI ROUND1		RI ROUND2		ESI		RI ROUND1		RI ROUND2	
LOC ID:									MW25-6		MW25-6		MW26-1		MW26-1		MW26-1	
QC CODE:									SA		SA		SA		SA		SA	
SAMP. DETH TOP:									NONE		NONE		NONE		NONE		NONE	
SAMP. DEPTH BOT:									NONE		NONE		NONE		NONE		NONE	
MATRIX:									GROUNDW		GROUNDW		GROUNDW		GROUNDW		GROUNDW	
SAMP ID:	UNIT		FREQUENCY OF	CRITERIA	TYPE OF	NUMBER OF	NUMBER OF	NUMBER OF	MW25-6		25008		MW26-1-1		MW26-1		26001	
PARAMETER	UNIT	MAXIMUM	DETECTION	VALUE	CRITERIA	EXCEEDENCES	DETECTS	ANALYSES	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Aluminum	UG/L	42400	87%	50	MCL	25	27	31	**162**		**529**		**188**	J	**457**		38.7	
Antimony	UG/L	52.7	13%	3	GA	3	4	31	2.2	U	2.3	U	21.5	U	2.2	U	1.4	
Arsenic	UG/L	10	13%	5	MCL	2	4	31	2.1	U	3.5	U	0.8	U	2.1	U	4	U
Barium	UG/L	337	94%	1000	GA	0	29	31	85.6		72.3		31.9	J	33.2		29.9	
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31	0.27	U	0.13	U	0.4	U	0.27	U	0.1	U
Cadmium	UG/L	0	0%	5	GA	0	0	31	0.3	U	0.32	U	2.1	U	0.3	U	0.3	U
Calcium	UG/L	181000	100%			0	31	31	133000		118000		115000		121000		110000	
Chromium	UG/L	69.4	48%	50	GA	1	15	31	2.2		1.3	U	2.6	U	4.7		0.73	
Cobalt	UG/L	34.6	45%			0	14	31	1.3		1.1	U	4.4	U	1.1		0.9	U
Copper	UG/L	32.5	48%	200	GA	0	15	31	0.99		1.1		3.1	U	5.7		1	U
Cyanide	UG/L	2.8	3%	200	GA	0	1	31	5	U	5	UJ	5	U	5	U	5	U
Iron	UG/L	69400	100%	300	GA	22	31	31	**308**		**623**		286		**867**		58.4	J
Lead	UG/L	34.8	32%	15	MCL	1	10	31	4.4		1.1	U	0.5	U	7.8		1.9	U
Magnesium	UG/L	58200	100%			0	31	31	35900		32900		16700		16600		15500	
Manganese	UG/L	1120	97%	50	SEC	22	30	31	**56**		22		**529**		27.5		2.5	
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31	0.02	U	0.1	U	0.05	J	0.02	U	0.2	U
Nickel	UG/L	99.8	61%	100	GA	0	19	31	2.6		1.7	U	4	U	6.2		1.6	U
Potassium	UG/L	10200	94%			0	29	31	1840	J	1420		10200		3620		3860	J
Selenium	UG/L	3.6	19%	10	GA	0	6	31	3.7	U	3.4	U	0.7	U	3.7	U	3.4	U
Silver	UG/L	0.98	6%	50	GA	0	2	31	0.8	U	1.1	U	4.2	U	0.8	U	1.3	U
Sodium	UG/L	59400	97%	20000	GA	7	30	31	**20400**	J	16500		**30300**		**24600**		**34800**	
Thallium	UG/L	4.7	13%	2	MCL	4	4	31	3	U	3.5	U	1.2	U	**4.3**		4.7	U
Vanadium	UG/L	70.8	52%			0	16	31	1.4		1.2	U	3.7	U	1.3	J	1.1	U
Zinc	UG/L	143	84%	5000	MCL	0	26	31	7.5		2.2		26.7		20.5		3.1	J

GA = NYSDEC Ambient Water Quality Standards for a source of Drinking Water from Groundwater (TOGS 1.1.1)
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TABLE C-2
GROUNDWATER BACKGROUND DATA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

									MW4-1		MW44A-1		MW44B-1		MW57-1	
STUDY ID:									ESI		ESI		ESI		ESI	
LOC ID:									MW4-1		MW44A-1		MW44B-1		MW57-1	
QC CODE:									SA		SA		SA		SA	
SAMP. DETH TOP:									NONE		NONE		NONE		NONE	
SAMP. DEPTH BOT:									NONE		NONE		NONE		NONE	
MATRIX:									GROUNDW		GROUNDW		GROUNDW		GROUNDW	
SAMP ID:	UNIT		FREQUENCY		TYPE	NUMBER	NUMBER	NUMBER	MW4-1-1		MW44A-1-1		MW44B-1-1		MW57-1-1	
			OF	CRITERIA	OF	OF	OF	OF								
PARAMETER	UNIT	MAXIMUM	DETECTION	VALUE	CRITERIA	EXCEEDENCES	DETECTS	ANALYSES	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Aluminum	UG/L	42400	87%	50	MCL	25	27	31	41.9	U	69	J	288	J	4200	
Antimony	UG/L	52.7	13%	3	GA	3	4	31	21.6	U	1.3	U	1.3	U	44.7	J
Arsenic	UG/L	10	13%	5	MCL	2	4	31	2.2	J	2	U	2	U	1.4	U
Barium	UG/L	337	94%	1000	GA	0	29	31	19.6	J	102	J	72.6	J	36.5	J
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31	0.4	U	0.1	U	0.1	U	0.4	U
Cadmium	UG/L	0	0%	5	GA	0	0	31	2.1	U	0.2	U	0.2	U	2.1	U
Calcium	UG/L	181000	100%			0	31	31	137000		92200		120000		82000	
Chromium	UG/L	69.4	48%	50	GA	1	15	31	2.6	U	0.4	U	0.4	U	7.7	J
Cobalt	UG/L	34.6	45%			0	14	31	4.6	J	0.5	U	0.91	J	4.4	U
Copper	UG/L	32.5	48%	200	GA	0	15	31	3.1	U	0.5	U	0.5	U	3.1	U
Cyanide	UG/L	2.8	3%	200	GA	0	1	31	5	U	5	U	5	U	5	U
Iron	UG/L	69400	100%	300	GA	22	31	31	332		114	J	666		6360	
Lead	UG/L	34.8	32%	15	MCL	1	10	31	0.5	U	0.9	U	0.9	U	2.1	J
Magnesium	UG/L	58200	100%			0	31	31	57600		19000		31800		11400	
Manganese	UG/L	1120	97%	50	SEC	22	30	31	346		18.2		219		245	
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31	0.04	U	0.04	U	0.04	U	0.04	U
Nickel	UG/L	99.8	61%	100	GA	0	19	31	4	U	0.7	U	0.73	J	8.2	J
Potassium	UG/L	10200	94%			0	29	31	7380		1050	J	2150	J	3860	J
Selenium	UG/L	3.6	19%	10	GA	0	6	31	2.1	J	2.7	U	2.7	U	0.69	U
Silver	UG/L	0.98	6%	50	GA	0	2	31	4.2	U	0.5	U	0.68	J	4.2	U
Sodium	UG/L	59400	97%	20000	GA	7	30	31	11700		2310	J	7190		4080	J
Thallium	UG/L	4.7	13%	2	MCL	4	4	31	1.2	U	1.9	U	4.7	J	1.2	U
Vanadium	UG/L	70.8	52%			0	16	31	3.7	U	0.5	U	0.5	U	7.6	J
Zinc	UG/L	143	84%	5000	MCL	0	26	31	19.1	J	3.8	J	2.2	U	57.4	

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TABLE C-2
GROUNDWATER BACKGROUND DATA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

									MW58-1		MW64A-1		MW64B-1		MW64C-9		MW64D-1	
STUDY ID:									ESI		ESI		ESI		ESI		ESI	
LOC ID:									MW58-1		MW64A-1		MW64B-1		MW64C-9		MW64D-1	
QC CODE:									SA		SA		SA		SA		SA	
SAMP. DETH TOP:									NONE		NONE		NONE		NONE		NONE	
SAMP. DEPTH BOT:									NONE		NONE		NONE		NONE		NONE	
MATRIX:									GROUNDW		GROUNDW		GROUNDW		GROUNDW		GROUNDW	
SAMP ID:	UNIT		FREQUENCY OF		TYPE OF	NUMBER OF	NUMBER OF	NUMBER OF	MW58-1-1		MW64A-1-1		MW64B-1-1		MW64C-9-1		MW64D-1-1	
PARAMETER	UNIT	MAXIMUM	DETECTION	CRITERIA VALUE	CRITERIA	EXCEEDENCES	DETECTS	ANALYSES	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Aluminum	UG/L	42400	87%	50	MCL	25	27	31	**440**		**398**		**198**	J	38.2	J	**177**	J
Antimony	UG/L	52.7	13%	3	GA	3	4	31	1.3	U	1.3	U	1.3	U	1.3	U	1.3	U
Arsenic	UG/L	10	13%	5	MCL	2	4	31	2	U	2	U	2	U	2	U	2	U
Barium	UG/L	337	94%	1000	GA	0	29	31	71.9	J	42	J	104	J	20.4	J	88.6	J
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Cadmium	UG/L	0	0%	5	GA	0	0	31	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Calcium	UG/L	181000	100%			0	31	31	113000		109000		138000		121000		142000	
Chromium	UG/L	69.4	48%	50	GA	1	15	31	0.82	J	0.49	J	0.41	J	0.4	U	0.4	U
Cobalt	UG/L	34.6	45%			0	14	31	0.64	J	0.5	U	1.1	J	0.5	U	0.69	J
Copper	UG/L	32.5	48%	200	GA	0	15	31	1.5	J	0.61	J	1	J	0.55	J	0.5	U
Cyanide	UG/L	2.8	3%	200	GA	0	1	31	5	U	5	U	5	U	5	U	5	U
Iron	UG/L	69400	100%	300	GA	22	31	31	**678**		**773**	J	**400**		**681**		**440**	
Lead	UG/L	34.8	32%	15	MCL	1	10	31	0.89	U	0.89	U	0.9	U	0.9	U	0.9	U
Magnesium	UG/L	58200	100%			0	31	31	17300		16800		45600		49400		14800	
Manganese	UG/L	1120	97%	50	SEC	22	30	31	**84**		28.3		**98.9**		**96**		**223**	
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31	0.04	U	0.04	J	0.04	U	0.04	U	0.04	U
Nickel	UG/L	99.8	61%	100	GA	0	19	31	1.6	J	1	J	1.4	J	1.2	J	1.4	J
Potassium	UG/L	10200	94%			0	29	31	1460	J	1790	J	4780	J	1670	J	3340	J
Selenium	UG/L	3.6	19%	10	GA	0	6	31	2.7	U	2.7	U	2.7	U	2.7	U	2.7	U
Silver	UG/L	0.98	6%	50	GA	0	2	31	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Sodium	UG/L	59400	97%	20000	GA	7	30	31	4180	J	2180	J	8140		6420		12300	
Thallium	UG/L	4.7	13%	2	MCL	4	4	31	1.9	U	1.9	U	1.9	U	1.9	U	**2.2**	J
Vanadium	UG/L	70.8	52%			0	16	31	0.81	J	1.3	J	0.73	J	0.61	J	0.69	J
Zinc	UG/L	143	84%	5000	MCL	0	26	31	7.1	J	3.9	J	3.9	J	3.9	J	3.8	J

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

TABLE C-2
GROUNDWATER BACKGROUND DATA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

									PT-10		MW24-1		MW45-4		MW60-1	
STUDY ID:									RI PHASE2		ESI		QUARTERL		ESI	
LOC ID:									PT-10		MW24-1		MW45-4		MW60-1	
QC CODE:									SA		SA		SA		SA	
SAMP. DETH TOP:									NONE		NONE		NONE		NONE	
SAMP. DEPTH BOT:									NONE		NONE		NONE		NONE	
MATRIX:									GROUNDW		GROUNDW		GROUNDW		GROUNDW	
SAMP ID:	UNIT		FREQUENCY		TYPE	NUMBER	NUMBER	NUMBER	PT10GW1		MW24-1		OB108		MW60-1	
			OF	CRITERIA	OF	OF	OF	OF								
PARAMETER	UNIT	MAXIMUM	DETECTION	VALUE	CRITERIA	EXCEEDENCES	DETECTS	ANALYSES	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Aluminum	UG/L	42400	87%	50	MCL	25	27	31	72	U	**19100**		36.8	U	**348**	
Antimony	UG/L	52.7	13%	3	GA	3	4	31	49.5	UJ	21.5	U	2.8	U	1.3	U
Arsenic	UG/L	10	13%	5	MCL	2	4	31	1.4	UJ	**10**		3.6	U	2	U
Barium	UG/L	337	94%	1000	GA	0	29	31	193	J	156	J	23.4		88.7	J
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31	0.89	U	0.89	J	0.1	U	0.1	U
Cadmium	UG/L	0	0%	5	GA	0	0	31	2.8	U	2.1	U	0.4	U	0.2	U
Calcium	UG/L	181000	100%			0	31	31	79100		180000		112000		95100	
Chromium	UG/L	69.4	48%	50	GA	1	15	31	2.7	UJ	29.8		1.3	U	0.56	J
Cobalt	UG/L	34.6	45%			0	14	31	5.4	U	18.7	J	1.4	U	0.5	U
Copper	UG/L	32.5	48%	200	GA	0	15	31	4.7	U	32.5		1.5		0.5	U
Cyanide	UG/L	2.8	3%	200	GA	0	1	31	10	UJ	5	U			5	U
Iron	UG/L	69400	100%	300	GA	22	31	31	85.6	J	**32000**		62.8		**1290**	
Lead	UG/L	34.8	32%	15	MCL	1	10	31	0.79	U	7		2	U	0.9	U
Magnesium	UG/L	58200	100%			0	31	31	34200		39800		24200		31100	
Manganese	UG/L	1120	97%	50	SEC	22	30	31	**124**		**712**		5	J	**377**	
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31	0.09	UJ	0.06	J	0.2	U	0.05	J
Nickel	UG/L	99.8	61%	100	GA	0	19	31	7.4	UJ	41.4		2.2		0.7	U
Potassium	UG/L	10200	94%			0	29	31	2870	J	9220		2180		8760	
Selenium	UG/L	3.6	19%	10	GA	0	6	31	0.99	UJ	2.5	J	3.1	U	2.7	U
Silver	UG/L	0.98	6%	50	GA	0	2	31	5.4	U	4.2	U	0.98		0.5	U
Sodium	UG/L	59400	97%	20000	GA	7	30	31	**41100**		5950		10600		**59400**	
Thallium	UG/L	4.7	13%	2	MCL	4	4	31			1.2	U	4	U	1.9	U
Vanadium	UG/L	70.8	52%			0	16	31	6.7	UJ	30.9	J	1.2	U	1	J
Zinc	UG/L	143	84%	5000	MCL	0	26	31	8.8	J	107		6.8		6.9	J

GA = NYSDEC Ambient Water Quality Standards for a source of Drinking Water from Groundwater (TOGS 1.1.1)
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TABLE C-2
GROUNDWATER BACKGROUND DATA
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

									MW62-1		MW63-1		MW67-1		MW70-1	
STUDY ID:									ESI		ESI		ESI		ESI	
LOC ID:									MW62-1		MW63-1		MW67-1		MW70-1	
QC CODE:									SA		SA		SA		SA	
SAMP. DETH TOP:									NONE		NONE		NONE		NONE	
SAMP. DEPTH BOT:									NONE		NONE		NONE		NONE	
MATRIX:									GROUNDW		GROUNDW		GROUNDW		GROUNDW	
SAMP ID:	UNIT		FREQUENCY		TYPE	NUMBER	NUMBER	NUMBER	MW62-1		MW63-1		MW67-2		MW70-1	
			OF	CRITERIA	OF	OF	OF	OF								
PARAMETER	UNIT	MAXIMUM	DETECTION	VALUE	CRITERIA	EXCEEDENCES	DETECTS	ANALYSES	VALUE	Q	VALUE	Q	VALUE	Q	VALUE	Q
Aluminum	UG/L	42400	87%	50	MCL	25	27	31	**499**		**747**		**1240**		**88.2**	J
Antimony	UG/L	52.7	13%	3	GA	3	4	31	1.3	U	1.3	U	1.3	U	1.3	U
Arsenic	UG/L	10	13%	5	MCL	2	4	31	2	U	2	U	2	U	2	U
Barium	UG/L	337	94%	1000	GA	0	29	31	68.1	J	72.6	J	100	J	86.5	J
Beryllium	UG/L	2.2	13%	4	MCL	0	4	31	0.1	U	0.1	U	0.1	U	0.1	U
Cadmium	UG/L	0	0%	5	GA	0	0	31	0.2	U	0.2	U	0.2	U	0.2	U
Calcium	UG/L	181000	100%			0	31	31	91700		89400		119000		119000	
Chromium	UG/L	69.4	48%	50	GA	1	15	31	1.4	J	1.1	J	2	J	0.4	U
Cobalt	UG/L	34.6	45%			0	14	31	2.5	J	6.2	J	1.4	J	0.5	U
Copper	UG/L	32.5	48%	200	GA	0	15	31	0.54	J	2.1	J	1.5	J	0.5	U
Cyanide	UG/L	2.8	3%	200	GA	0	1	31	5	UJ	5	U	5	U	5	U
Iron	UG/L	69400	100%	300	GA	22	31	31	**797**	J	**1260**		**2270**		213	
Lead	UG/L	34.8	32%	15	MCL	1	10	31	0.89	U	1.1	J	0.9	U	0.9	U
Magnesium	UG/L	58200	100%			0	31	31	58200		16400		24200		28100	
Manganese	UG/L	1120	97%	50	SEC	22	30	31	**271**		**548**		**153**		**107**	
Mercury	UG/L	0.06	23%	0.7	GA	0	7	31	0.05	J	0.04	U	0.04	U	0.06	J
Nickel	UG/L	99.8	61%	100	GA	0	19	31	3.9	J	9.7	J	2.9	J	1.5	J
Potassium	UG/L	10200	94%			0	29	31	7470	J	3870	J	1870	J	1540	J
Selenium	UG/L	3.6	19%	10	GA	0	6	31	2.7	U	2.7	U	2.7	U	2.7	U
Silver	UG/L	0.98	6%	50	GA	0	2	31	0.5	U	0.5	U	0.5	U	0.5	U
Sodium	UG/L	59400	97%	20000	GA	7	30	31	18100		5710		13700		5220	
Thallium	UG/L	4.7	13%	2	MCL	4	4	31	1.9	U	1.9	U	1.9	U	1.9	U
Vanadium	UG/L	70.8	52%			0	16	31	1.8	J	1.5	J	2.1	J	0.5	U
Zinc	UG/L	143	84%	5000	MCL	0	26	31	4.2	J	7.1	J	6.5	J	3.5	J

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)

APPENDIX D

TABLE D-1
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF TOTAL SOIL FOR SEAD-59
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated fr
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral (mg/kg-day)-	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child: Intake (mg/kg-day) (Nc)	Future Day Care Center Child: Intake (mg/kg-day) (Car)	Future Day Care Center Child: Hazard Quotient	Future Day Care Center Child: Cancer Risk	Resident (Child): Intake (mg/kg-day) (Nc)	Resident (Child): Intake (mg/kg-day) (Car)	Resident (Child): Hazard Quotient	Contribution to Lifetime Cancer Risk
Volatile Organics												
Acetone	1.00E-01	NA		6.50E-02	5.94E-07		6E-06		8.31E-07		8E-06	
Benzene	3.00E-03	2.90E-02		4.00E-02	3.65E-07	3.13E-08	1E-04	9E-10	5.11E-07	4.38E-08	2E-04	1E-09
Carbon disulfide	1.00E-01	NA		4.00E-03	3.65E-08		4E-07		5.11E-08		5E-07	
Ethyl benzene	1.00E-01	NA		9.59E-02	8.76E-07		9E-06		1.23E-06		1E-05	
Methyl chloride	NA	1.30E-02		3.00E-03		2.35E-09		3E-11		3.29E-09		4E-11
Methyl ethyl ketone	6.00E-01	NA	7.29E-03	2.40E-02	2.19E-07		4E-07		3.07E-07		5E-07	
Methylene chloride	6.00E-02	7.50E-03		2.00E-03	1.83E-08	1.57E-09	3E-07	1E-11	2.56E-08	2.19E-09	4E-07	2E-11
Toluene	2.00E-01	NA		8.94E-02	8.16E-07		4E-06		1.14E-06		6E-06	
Xylene (total)	2.00E+00	NA		1.59E-01	1.45E-06		7E-07		2.03E-06		1E-06	
Trichloroethene	NA	1.10E-02		2.00E-03		1.57E-09		2E-11		2.19E-09		2E-11
Semivolatile Organics												
1,2,4-Trichlorobenzene	1.00E-02	NA		2.80E-02	2.56E-07		3E-05		3.58E-07		4E-05	
2-Methylnaphthalene	4.00E-02	NA	1.50E-01	4.39E-00	4.01E-05		1E-03		5.61E-05		1E-03	
4-Methylphenol	5.00E-03	NA		8.30E-02	7.58E-07		2E-04		1.06E-06		2E-04	
Acenaphthene	6.00E-02	NA	2.89E-01	2.65E+00	2.42E-05		4E-04		3.39E-05		6E-04	
Acenaphthylene	NA	NA	8.02E-01	3.08E+00								
Anthracene	3.00E-01	NA	1.22E+00	4.89E-00	4.47E-05		1E-04		6.25E-05		2E-04	
Benzo(a)anthracene	NA	7.30E-01	4.70E+00	2.10E-01		1.64E-05		1E-05		2.30E-05		2E-05
Benzo(a)pyrene	NA	7.30E+00	4.58E+00	1.93E+01		1.51E-05		1E-04		2.12E-05		2E-04
Benzo(b)fluoranthene	NA	7.30E-01	5.20E+00	2.46E-01		1.93E-05		1E-05		2.70E-05		2E-05
Benzo(ghi)perylene	NA	NA	1.40E+00	6.55E+00								
Benzo(k)fluoranthene	NA	7.30E-02	4.15E+00	1.39E+01		1.09E-05		8E-07		1.52E-05		1E-06
bis(2-Ethylhexyl)phthala	2.00E-02	1.40E-02	6.60E-01	4.15E+00	3.79E-05	3.25E-06	2E-03	5E-08	5.31E-05	4.55E-06	3E-03	6E-08
Butylbenzylphthalate	2.00E-01	NA		7.79E-01	7.11E-06		4E-05		9.96E-06		5E-05	
Carbazole	NA	2.00E-02	1.20E+00	4.21E+00		3.30E-06		7E-08		4.61E-06		9E-08
Chrysene	NA	7.30E-03	4.56E+00	2.15E+01		1.68E-05		1E-07		2.36E-05		2E-07
Di-n-butylphthalate	1.00E-01	NA	2.50E-01	4.90E-01	4.47E-06		4E-05		6.26E-06		6E-05	
Di-n-octylphthalate	2.00E-02	NA		1.10E-02	1.00E-07		5E-06		1.41E-07		7E-06	
Dibenz(a,h)anthracene	NA	7.30E+00	1.27E+00	4.04E+00		3.16E-06		2E-05		4.43E-06		3E-05
Dibenzofuran	NA	NA	2.80E-01	3.53E+00								
Diethyl phthalate	8.00E-01	NA		1.20E-02	1.10E-07		1E-07		1.53E-07		2E-07	
Fluoranthene	4.00E-02	NA	8.06E+00	5.67E+01	5.18E-04		1E-02		7.25E-04		2E-02	
Fluorene	4.00E-02	NA	4.66E-01	3.80E+00	3.47E-05		9E-04		4.86E-05		1E-03	
Indeno(1,2,3-cd)pyrene	NA	7.30E-01	3.30E+00	8.27E+00		6.47E-06		5E-06		9.06E-06		7E-06
Naphthalene	4.00E-02	NA	1.72E-01	2.78E+00	2.54E-05		6E-04		3.55E-05		9E-04	
Phenanthrene	NA	NA	4.26E+00	3.06E+01								
Phenol	6.00E-01	NA		1.70E-02	1.55E-07		3E-07		2.17E-07		4E-07	
Pyrene	3.00E-02	NA	8.98E+00	5.54E-01	5.06E-04		2E-02		7.08E-04		2E-02	
Pesticides												
4,4'-DDD	NA	2.40E-01	1.86E-02	2.36E-02		1.85E-08		4E-09		2.59E-08		6E-09
4,4'-DDE	NA	3.40E-01	2.89E-02	3.12E-02		2.44E-08		8E-09		3.42E-08		1E-08
4,4'-DDT	5.00E-04	3.40E-01	3.20E-02	3.43E-02	3.13E-07	2.68E-08	6E-04	9E-09	4.39E-07	3.76E-08	9E-04	1E-08
Aldrin	3.00E-05	1.70E+01	1.08E-03	1.13E-03	1.03E-08	8.85E-10	3E-04	2E-08	1.44E-08	1.24E-09	5E-04	2E-08
alpha-BHC	NA	6.30E+00		2.19E-03		1.71E-09		1E-08		2.40E-09		2E-08
alpha-Chlordane	6.00E-05	1.30E+00	5.10E-03	2.96E-03	2.70E-08	2.32E-09	5E-04	3E-09	3.78E-08	3.24E-09	6E-04	4E-09
Aroclor-1254	2.00E-05	2.00E+00		2.90E-02	2.65E-07	2.27E-08	1E-02	5E-08	3.71E-07	3.18E-08	2E-02	6E-08
beta-BHC	NA	1.80E+00		1.72E-03		1.35E-09		2E-09		1.88E-09		3E-09
delta-BHC	NA	NA		1.64E-03								
Dieldrin	5.00E-05	1.60E+01		2.88E-03	2.63E-08	2.25E-09	5E-04	4E-08	3.68E-08	3.16E-09	7E-04	5E-08
Endosulfan I	6.00E-03	NA	1.40E-02	2.78E-03	2.54E-08		4E-06		3.55E-08		6E-06	
Endosulfan II	6.00E-03	NA	5.10E-03	2.99E-03	2.73E-08		5E-06		3.82E-08		6E-06	
Endosulfan sulfate	6.00E-03	NA		3.36E-03	3.07E-08		5E-06		4.30E-08		7E-06	
Endrin	3.00E-04	NA	3.90E-03	4.13E-03	3.77E-08		1E-04		5.28E-08		2E-04	
Endrin aldehyde	NA	NA	1.28E-02	3.89E-03								
Endrin ketone	NA	NA		4.35E-03								
gamma-Chlordane	6.00E-05	1.30E+00	7.40E-03	2.81E-03	2.57E-08	2.20E-09	4E-04	3E-09	3.59E-08	3.08E-09	6E-04	4E-09
Heptachlor epoxide	1.30E-05	9.10E+00		1.95E-03	1.78E-08	1.53E-09	1E-03	1E-08	2.49E-08	2.14E-09	2E-03	2E-08
Methoxychlor	5.00E-03	NA		1.65E-02	1.51E-07		3E-05		2.11E-07		4E-05	
Metals												
Antimony	4.00E-04	NA	5.45E-01	8.55E-01	7.81E-06		2E-02		1.09E-05		3E-02	
Mercury	3.00E-04	NA	8.40E-01	9.57E-02	8.74E-07		3E-03		1.22E-06		4E-03	
Sodium	NA	NA	1.79E+02	3.65E+02								
Total Hazard Quotient and Cancer Risk:							**7.48E-02**	**1.65E-04**			**1E-01**	**2E-04**

Assumptions for Future Day Care Center Child			Assumptions for Resident (Child)		
CS =	EPC Surface Only		CF =	1E-06	kg/mg
IR =	200	mg soil/day	CS =	EPC Surface Only	
CF =	1E-06	kg/mg	BW =	15	kg
FI =	1	unitless	IR =	200	mg soil/day
EF =	250	days/year	FI =	1	unitless
ED =	6	years	EF =	350	days/year
BW =	15	kg	ED =	6	years
AT (Nc) =	2190	days	AT (Nc) =	2,190	days
AT (Car) =	25550	days	AT (Car) =	25,550	days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.

Table D-2
MAXIMUM CONCENTRATIONS TO BE PROTECTIVE OF HUMAN HEALTH FROM INGESTION OF SOILS UNDER THE INDUSTRIAL SCENARIO
SENECA ARMY DEPOT ACTIVITY
SEAD-59 & 71 EE/CA
SEAD-59

Equation for back calculation of maximum concentrations (mg/kg): $CS = \frac{HQ \times BW \times AT \times RfD}{IR \times CF \times FI \times EF \times ED}$

	HQ Distribution (1)		Ref Dose(RfD) (2)	Cleanup level (mg/kg)
	Pre-Remediation Risks	Normalized HQ	(mg/kg/day)	Industrial Use Day Care Child
2-Methylnaphthalene	1.00E-03	0.0149	4.00E-02	65.47
bis(2-Ethylhexyl)phthalate	2.00E-03	0.0299	2.00E-02	65.47
Fluoranthene	1.30E-02	0.1943	4.00E-02	851.12
Pyrene	1.70E-02	0.2541	3.00E-02	834.75
Aroclor-1254	1.00E-02	0.1495	2.00E-05	0.33
Heptaclor epoxide	1.00E-03	0.0149	1.30E-05	0.02
Antimony	2.00E-02	0.2990	4.00E-04	13.09
Mercury	2.90E-03	0.0433	3.00E-04	1.42
Total HI	6.69E-02	1.0000		

Assumptions for Day Care Child (3)

Body Weight (BW)=	15	kg
Averaging Time (AT)=	2190	days
Ingestion Rate (IR)=	200	mg soil/day
Conversion Factor (CF)=	1.00E-06	kg/mg
Fraction Ingestion (FI)=	1	unitless
Exposure Frequency (EF)=	250	day/year
Exposure Duration (ED)=	6	years

Note: 1) The HQ distribution is based on the HQ distribution for day-care child at industrial scenario according to risk assessment for SEAD-59. Risk has been recalculated for exposure to total soils.

2) The Exposure Frequency for day care child was estimated based on the assumption that the child attends 5 days/week and 10 days vacation. All the other assumptions are complied with USEPA's Soil Screening Guidance: User's Guide. 1996.

Table D-3
MAXIMUM CONCENTRATIONS TO BE PROTECTIVE OF HUMAN HEALTH FROM INGESTION OF SOILS UNDER THE INDUSTRIAL USE SCENARIO SENECA ARMY DEPOT ACTIVITY SEAD-59 & 71 EE/CA SEAD-59

Equation for back calculation of maximum concentrations (mg/kg): CS = $\dfrac{CancerR \times BW \times AT}{IR \times CF \times FI \times EF \times ED \times slope}$

	Cancer Risk (1)		Cancer Slope (2)	Cleanup level (mg/kg)
	Pre-Remediation Risks	Normalized Cancer Risk	(mg/kg/day)	Industrial Use Day Care Child
Benzo(a)anthracene	1.20E-05	7.55E-06	7.30E-01	1.32E+01
Benzo(a)pyrene	1.10E-04	6.92E-05	7.30E+00	1.21E+01
Benzo(b)fluoranthene	1.40E-05	8.81E-06	7.30E-01	1.54E+01
Dibenz(a,h)anthracene	2.30E-05	1.45E-05	7.30E+00	2.53E+00
Total Cancer Risk	1.59E-04	1.0000E-04		
Acceptable Cancer Risk	1.00E-04			
Assumuptions for Day Care Child (3)				
Body Weight (BW)=	15	kg		
Averaging Time (AT)=	25550	days		
Ingestion Rate (IR)=	200	mg soil/day		
Conversion Factor (CF)=	1.00E-06	kg/mg		
Fraction Ingestion (FI)=	1	unitless		
Exposure Frequency (EF)=	250	day/year		
Exposure Duration (ED)=	6	years		

Note: 1) The Cancer Risk distribution is based on the Cancer Risk distribution for day-care child at industrial scenario according to risk assessment for SEAD-59. Risk has been re-calculated for exposure to total soils.
2) The Exposure Frequency for day care child was estimated based on the assumption that the child attends 5 days/week and 10 days vacation. All the other assumptions are complied with USEPA's Soil Screening Guidance: User's Guide, 1996.

TABLE D-4
CALCULATION OF INTAKE AND RISK FROM THE INGESTION OF TOTAL SOIL FOR SEAD-71
REASONABLE MAXIMUM EXPOSURE (RME)
Decision Document - SEADs-59 and 71
Seneca Army Depot Activity

Equation for Intake (mg/kg-day) = $\frac{CS \times IR \times CF \times FI \times EF \times ED}{BW \times AT}$

Equation for Hazard Quotient = Chronic Daily Intake (Nc)/Reference Dose

Equation for Cancer Risk = Chronic Daily Intake (Car) x Slope Factor

Variables (Assumptions for Each Receptor are Listed at the Bottom):
CS = Chemical Concentration in Soil, Calculated f
IR = Ingestion Rate
CF = Conversion Factor
FI = Fraction Ingested
EF = Exposure Frequency
ED = Exposure Duration
BW = Bodyweight
AT = Averaging Time

Analyte	Oral RfD (mg/kg-day)	Carc. Slope Oral mg/kg-day)-	EPC Surface Soil (mg/kg)	EPC from Total Soils (mg/kg)	Future Day Care Center Child Intake (mg/kg-day) (Nc)	Future Day Care Center Child Intake (mg/kg-day) (Car)	Future Day Care Center Child Hazard Quotient	Future Day Care Center Child Cancer Risk	Resident (Child) Intake (mg/kg-day) (Nc)	Resident (Child) Intake (mg/kg-day) (Car)	Resident (Child) Hazard Quotient	ontributio to Lifetime Cancer Risk
Volatile Organics												
Trichloroethane, 1,1,1-	2.00E-02	NA	0.00E+00	8.66E-03	7.91E-08		4E-06		1.11E-07		6E-06	
Acetone	1.00E-01	NA	1.04E-02	9.95E-03	9.09E-08		9E-07		1.27E-07		1E-06	
Benzene	3.00E-03	2.90E-02	2.00E-03	2.00E-03	1.83E-08	1.57E-09	6E-06	5E-11	2.56E-08	2.19E-09	9E-06	6E-11
Ethyl benzene	1.00E-01	NA	4.00E-03	4.00E-03	3.65E-08		4E-07		5.11E-08		5E-07	
Methylene chloride	6.00E-02	7.50E-03	2.00E-03	7.94E-03	7.25E-08	6.22E-09	1E-06	5E-11	1.02E-07	8.70E-09	2E-06	7E-11
Styrene	2.00E-01	NA	1.00E-03	1.00E-03	9.13E-09		5E-08		1.28E-08		6E-08	
Tetrachloroethene	1.00E-02	5.20E-02	8.42E-03	9.55E-03	8.72E-08	7.48E-09	9E-06	4E-10	1.22E-07	1.05E-08	1E-05	5E-10
Toluene	2.00E-01	NA	7.29E-03	8.20E-03	7.49E-08		4E-07		1.05E-07		5E-07	
Total Xylenes	2.00E+00	NA	6.82E-03	8.80E-03	8.04E-08		4E-08		1.13E-07		6E-08	
Semivolatile Organics												
2-Methylnaphthalene	4.00E-02	NA	1.90E+01	2.87E+01	2.62E-04		7E-03		3.67E-04		9E-03	
Acenaphthene	6.00E-02	NA	4.20E+01	3.76E+01	3.43E-04		6E-03		4.81E-04		8E-03	
Acenaphthylene	NA	NA	5.10E-01	5.10E-01								
Anthracene	3.00E-01	NA	1.00E+02	1.00E+02	9.13E-04		3E-03		1.28E-03		4E-03	
Benzo(a)anthracene	NA	7.30E-01	1.50E+02	1.50E+02		1.17E-04		9E-05		1.64E-04		1E-04
Benzo(a)pyrene	NA	7.30E+00	1.20E+02	1.20E+02		9.39E-05		7E-04		1.32E-04		1E-03
Benzo(b)fluoranthene	NA	7.30E-01	8.80E+01	8.80E+01		6.89E-05		5E-05		9.64E-05		7E-05
Benzo(ghi)perylene	NA	NA	6.20E+01	6.20E+01								
Benzo(k)fluoranthene	NA	7.30E-02	1.30E+02	1.30E+02		1.02E-04		7E-06		1.42E-04		1E-05
bis(2-Ethylhexyl)phtha	2.00E-02	1.40E-02	0.00E+00	1.50E-02	1.37E-07	1.17E-08	7E-06	2E-10	1.92E-07	1.64E-08	1E-05	2E-10
Carbazole	NA	2.00E-02	7.70E+01	7.61E+01		5.96E-05		1E-06		8.34E-05		2E-06
Chrysene	NA	7.30E-03	1.50E+02	1.50E+02		1.17E-04		9E-07		1.64E-04		1E-06
Di-n-butylphthalate	1.00E-01	NA	1.40E-01	1.40E-01	1.28E-06		1E-05		1.79E-06		2E-05	
Dibenz(a,h)anthracene	NA	7.30E+00	2.50E+01	2.50E+01		1.96E-05		1E-04		2.74E-05		2E-04
Dibenzofuran	NA	NA	3.80E+01	1.75E+01								
Fluoranthene	4.00E-02	NA	4.40E+02	4.40E+02	4.02E-03		1E-01		5.63E-03		1E-01	
Fluorene	4.00E-02	NA	6.20E+01	3.22E+01	2.94E-04		7E-03		4.12E-04		1E-02	
Indeno(1,2,3-cd)pyrene	NA	7.30E-01	6.50E+01	6.50E+01		5.09E-05		4E-05		7.12E-05		5E-05
Naphthalene	4.00E-02	NA	4.60E+01	3.92E+01	3.58E-04		9E-03		5.01E-04		1E-02	
Phenanthrene	NA	NA	2.90E+02	2.90E+02								
Phenol	6.00E-01	NA	0.00E+00	4.50E-03	4.11E-08		7E-08		5.75E-08		1E-07	
Pyrene	3.00E-02	NA	2.80E+02	2.80E+02	2.56E-03		9E-02		3.58E-03		1E-01	
Pesticides												
4,4'-DDD	NA	2.40E-01	1.12E-01	4.15E-02		3.25E-08		8E-09		4.55E-08		1E-08
4,4'-DDE	NA	3.40E-01	2.53E-01	2.37E-01		1.86E-07		6E-08		2.60E-07		9E-08
4,4'-DDT	5.00E-04	3.40E-01	8.39E-01	8.08E-01	7.38E-06	6.32E-07	1E-02	2E-07	1.03E-05	8.85E-07	2E-02	3E-07
alpha-BHC	NA	6.30E+00	1.40E-02	9.01E-03		7.05E-09		4E-08		9.87E-09		6E-08
alpha-Chlordane	6.00E-05	1.30E+00	0.00E+00	9.65E-03	8.81E-08	7.55E-09	1E-03	1E-08	1.23E-07	1.06E-08	2E-03	1E-08
beta-BHC	NA	1.80E+00	2.73E-02	1.20E-02		9.39E-09		2E-08		1.32E-08		2E-08
delta-BHC	NA	NA	0.00E+00	1.80E-03								
Dieldrin	5.00E-05	1.60E+01	3.40E-03	3.50E-03	3.20E-08	2.74E-09	6E-04	4E-08	4.47E-08	3.84E-09	9E-04	6E-08
Endosulfan I	6.00E-03	NA	1.50E-02	1.51E-02	1.38E-07		2E-05		1.93E-07		3E-05	
Endosulfan II	6.00E-03	NA	5.20E-02	2.18E-02	1.99E-07		3E-05		2.79E-07		5E-05	
Endosulfan sulfate	6.00E-03	NA	8.89E-02	3.65E-02	3.33E-07		6E-05		4.67E-07		8E-05	
Endrin	3.00E-04	NA	7.16E-02	3.24E-02	2.96E-07		1E-03		4.14E-07		1E-03	
Endrin aldehyde	NA	NA	9.27E-02	5.24E-02								
Endrin ketone	NA	NA	1.64E-01	9.33E-02								
gamma-BHC (Lindane	3.00E-04	1.30E+00	0.00E+00	4.00E-03	3.65E-08	3.13E-09	1E-04	4E-09	5.11E-08	4.38E-09	2E-04	6E-09
gamma-Chlordane	6.00E-05	1.30E+00	2.15E-02	1.00E-02	9.13E-08	7.83E-09	2E-03	1E-08	1.28E-07	1.10E-08	2E-03	1E-08
Heptachlor	5.00E-04	4.50E+00	0.00E+00	1.20E-03	1.10E-08	9.39E-10	2E-05	4E-09	1.53E-08	1.32E-09	3E-05	6E-09
Heptachlor epoxide	1.30E-05	9.10E+00	5.84E-02	2.35E-02	2.15E-07	1.84E-08	2E-02	2E-07	3.00E-07	2.58E-08	2E-02	2E-07
Methoxychlor	5.00E-03	NA	4.00E-01	1.74E-01	1.59E-06		3E-04		2.22E-06		4E-04	
Metals												
Lead	NA	NA	5.57E+02	2.67E+02								
Mercury	3.00E-04	NA	1.92E-01	1.00E-01	9.13E-07		3E-03		1.28E-06		4E-03	
Selenium	5.00E-03	NA	1.23E+00	9.74E-01	8.89E-06		2E-03		1.25E-05		2E-03	
Sodium	NA	NA	4.21E+02	3.77E+02								
Zinc	3.00E-01	NA	1.27E+03	4.79E+02	4.37E-03		1E-02		6.12E-03		2E-02	
Total Hazard Quotient and Cancer Risk:							**3E-01**	**1E-03**			**4E-01**	**1E-03**

Assumptions for Future Day Care Center Child

CS =	EPC Surface Only
IR =	200 mg soil/day
CF =	1E-06 kg/mg
FI =	1 unitless
EF =	250 days/year
ED =	6 years
BW =	15 kg
AT (Nc) =	2190 days
AT (Car) =	25550 days

Assumptions for Resident (Child)

CF =	1E-06 kg/mg
CS =	EPC Surface Only
BW =	15 kg
IR =	200 mg soil/day
FI =	1 unitless
EF =	350 days/year
ED =	6 years
AT (Nc) =	2,190 days
AT (Car) =	25,550 days

Note: Cells in this table were intentionally left blank due to a lack of toxicity data.
NA= Information not available.

Table D-5
MAXIMUM CONCENTRATIONS TO BE PROTECTIVE OF HUMAN HEALTH FROM INGESTION OF SOILS UNDER THE INDUSTRIAL SCENARIO
SENECA ARMY DEPOT ACTIVITY
SEAD-59 & 71 EE/CA
SEAD-71

Equation for back calculation of maximum concentrations (mg/kg): $CS = \dfrac{HQ \times BW \times AT \times RfD}{IR \times CF \times FI \times EF \times ED}$

	HQ Distribution [1]		Ref Dose(RfD) [2]	Cleanup level (mg/kg)
	Pre-Remediation Risks	Normalized HQ	(mg/kg/day)	Industrial Use Day Care Child
2-Methylnaphthalene	7.00E-03	0.0262	4.00E-02	114.55
Acenaphthene	6.00E-03	0.0224	6.00E-02	147.27
Anthracene	3.04E-03	0.0114	3.00E-01	373.09
Fluoranthene	1.00E-01	0.3736	4.00E-02	1636.37
Fluorene	7.35E-03	0.0275	4.00E-02	120.27
Naphthalene	8.95E-03	0.0334	4.00E-02	146.45
Pyrene	8.52E-02	0.3183	3.00E-02	1045.64
4,4-DDT	1.00E-02	0.0374	5.00E-04	2.05
alpha-Chlordane	1.00E-03	0.0037	6.00E-05	0.02
Endrin	9.86E-04	0.0037	3.00E-04	0.12
gamma-Chlordane	2.00E-03	0.0075	6.00E-05	0.05
Heptaclor epoxide	1.65E-02	0.0616	1.30E-05	0.09
Mercury	3.04E-03	0.0114	3.00E-04	0.37
Selenium	2.00E-03	0.0075	5.00E-03	4.09
Zinc	1.46E-02	0.0545	3.00E-01	1791.82
Total HI	3.E-01	1.0000		

Assumuptions for Day Care Child [3]

Body Weight (BW)=	15	kg
Averaging Time (AT)=	2190	days
Ingestion Rate (IR)=	200	mg soil/day
Conversion Factor (CF)=	1.00E-06	kg/mg
Fraction Ingestion (FI)=	1	unitless
Exposure Frequency (EF)=	250	day/year
Exposure Duration (ED)=	6	years

Note: 1) The HQ distribution is based on the HQ distribution for day-care child at industrial scenario according to risk assessment for SEAD-71. Risk has been recalculated for exposure to total soils.
2) The Exposure Frequency for day care child was estimated based on the assumption that the child attends 5 days/week and 10 days vacation. All the other assumptions are complied with USEPA's Soil Screening Guidance: User's Guide, 1996.

Table D-6
MAXIMUM CONCENTRATIONS TO BE PROTECTIVE OF HUMAN HEALTH FROM INGESTION OF SOILS UNDER THE INDUSTRIAL USE SCENARIO
SENECA ARMY DEPOT ACTIVITY
SEAD-59 & 71 EE/CA
SEAD-71

Equation for back calculation of maximum concentrations (mg/kg): CS = $$\frac{CancerR \times BW \times AT}{IR \times CF \times FI \times EF \times ED \times slope}$$

	Cancer Risk (1)		Cancer Slope (2)	Cleanup level (mg/kg)
	Pre-Remediation Risks	Normalized Cancer Risk	(mg/kg/day)	Industrial Use Day Care Child
Benzo(a)anthracene	8.57E-05	8.55E-06	7.30E-01	15.0
Benzo(a)pyrene	6.86E-04	6.85E-05	7.30E+00	12.0
Benzo(b)fluoranthene	5.03E-05	5.02E-06	7.30E-01	8.8
Dibenz(a,h)anthracene	1.43E-04	1.43E-05	7.30E+00	2.5
Indeno(1,2,3-cd)pyrene	3.71E-05	3.70E-06	7.30E-01	6.5
Total Cancer Risk	1.00E-03	1.00E-04		
Acceptable Cancer Risk	1.00E-04			
Assumptions for Day Care Child (3)				
Body Weight (BW)=	15	kg		
Averaging Time (AT)=	25550	days		
Ingestion Rate (IR)=	200	mg soil/day		
Conversion Factor (CF)=	1.00E-06	kg/mg		
Fraction Ingestion (FI)=	1	unitless		
Exposure Frequency (EF)=	250	day/year		
Exposure Duration (ED)=	6	years		

Note: 1) The Cancer Risk distribution is based on the Cancer Risk distribution for day-care child at industrial scenario according to risk assessment for SEAD-71. Risk has been re-calculated for exposure to total soils.
2) The Exposure Frequency for day care child was estimated based on the assumption that the child attends 5 days/week and 10 days vacation. All the other assumptions are complied with USEPA's Soil Screening Guidance: User's Guide, 1996.

Appendix E
Seneca Army Depot Activity
SEAD-59 and 71 Decision Document
Detailed Cost Estimate for Excavation/Off-site Disposal

Introduction

A detailed cost estimate has been developed for excavation and off-site disposal at both SEAD-59 and SEAD-71. The cost estimate was developed using the recommended Removal Action outlined in Section 4.3 of this Decision Document. Quantities used were based on figures presented in Section 4. Costs were based on information from the Micro Computer Aided Cost Engineering System (MCACES, a component of the Tri-Service Automated Cost Engineering System, TRACES), Version 1.2 (copyright 1994-1997). Quotes from area suppliers, generic unit costs, vendor information, conventional cost estimating guides and prior experience were used to supplement this information. The cost estimates presented have been prepared for guidance in project evaluation. The actual costs of the project will depend on true labor and materials costs at the time of construction, actual site conditions, competitive market condition, final project scope, and other variables.

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

Costs to remediate soils with concentrations of semi-volatile organic compounds, pesticides, and metals exceeding the clean up goals listed for each site in Table 4.3-1 have been estimated for the removal action.

<u>Assumptions</u>

The following assumptions were used to develop the cost estimates for this removal action:

- The contractor(s) will mobilize to the site, clear and grub the areas of work, establish access roads and survey the areas to be remediated. It was estimated that 3 acres of land at SEAD-59 and 2 acres at SEAD-71 will require light clearing and grubbing. Clearing and grubbing is necessary to perform soil capping, soil excavation, sediment excavation, and stockpiling.

- Erosion control (silt fence and haybales) will be installed around excavation areas and stockpile areas. Erosion control is necessary to prevent soil particles from migrating off-site and into drainage swales during construction. The erosion control will be maintained throughout construction.
- A temporary fence will be installed around the sites.
- A surveyor will be on site for approximately 10 days to layout the excavation areas and survey record information.
- In situ volumes of material are based on the areas and proposed excavation depths shown in Figures 4-1 and 4-2 of Section 4. For costs based on a per cubic yard basis, such as excavation and hauling, an expansion factor of 30 percent was used to estimate ex situ volumes for soil. An additional 10% was used to address the uncertainty of the volume estimation. For costs based on weight, a conversion factor of 1.5 tons of moist material per cubic yard was used for estimating purposes. The 30 percent expansion factor was not applied to weight calculations. The volume of material requiring excavation, or soil covering may vary depending on the results of the cleanup verification sampling.
- For SEAD-59, the total in situ volume of soil is estimated to be 18,900 cubic yards in the Fill Area and 4,125 cubic yards in Areas 2, 3, 4, and Others. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of soil is estimated to be 27,027 and 5,898 cubic yards, respectively.
- For SEAD-71, the total in-situ volume of soil is estimated to be 871 cubic yards. Using an expansion factor of 30 percent and an additional factor of 10 percent for the uncertainty of the volume estimation, the ex situ volume of soil is estimated to be 1,245 cubic yards.
- Cleanup verification sampling of the soil will be conducted at a frequency of one sample every 2500 square feet (i.e. 50 ft by 50 ft grids in the Fill Area at SEAD-59). For small excavations such as Areas 2, 3, 4, and Others at SEAD-59, five samples will be collected at each site. This frequency will be revised based on the actual cleanup verification work plan.
- Excavated soil will be placed in a stockpile area prior to treatment and/or disposal. The stockpile areas will be lined (and covered) with a 6-mil polyethylene liner. Each pile will consist of 150 cubic yards of soil and will occupy a space of approximately 50 x 50 square feet. Prior to off-site disposal, one composite sample from each pile will be obtained and submitted for Toxicity Characteristic Leaching Procedure (TCLP) analysis.

- TCLP testing for off-site disposal will be conducted at a frequency of one sample every 150 cubic yards. This value will be revised during final design after selection of the off-site landfill. Material passing the TCLP criteria will be transported and disposed off-site in a Subtitle D Landfill.
- Transportation and disposal costs are based on quotes from Earthwatch Waste Systems, Inc. and Waste Management, Inc. Based on these quotes, disposal of RCRA Hazardous Material (i.e. overpacked drums) at an off-site facility will cost $133 each. In addition, transportation and disposal of non-hazardous soil and debris (i.e. soil which passes the TCLP test and does not require stabilization) in an off-site Subtitle D landfill will cost $31.50 per ton. For cost estimating purposes, it has been assumed that all material from SEAD-59 will not fail the TCLP test and will not require stabilization prior to off-site disposal. For SEAD-71, it was assumed that 3% of the excavated material will fail TCLP based on the soil data.
- Based on the soil data from SEAD-59, it was assumed that 11% of the excavated soil (4,180 tons) will have PAH, Aroclor-1254, or metals concentrations above Risk-Based Clean up Goals and will require off-site disposal. For SEAD-71, it was assumed that all of the excavated soil will require off-site disposal.
- Cost estimates were developed for both sites based on removing geophysical anomalies and remediating soils with PAHs, pesticides, and metals greater than site-specific clean up goals.

<u>Post-Closure Monitoring</u>

Site groundwater will be monitored on a semi-annual basis at SEAD-59 and SEAD-71. Currently, there are 5 groundwater monitoring wells at SEAD-59 and three at SEAD-71. New wells will be installed as necessary to ensure that the monitoring program is sufficient to detect any migration from the area.

<u>Operation and Maintenance (O & M)</u>

No O&M costs are required for this removal action.

<u>Markups and Contingencies</u>

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

The following markups were used to develop the detail cost estimates for all the alternatives.

Contractor Costs (cost to owner)

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

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

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

SEAD-59
EXCAVATION/OFF-SITE DISPOSAL
Risk-based Cleanup Goals

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 12/12/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 120 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

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

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

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 3.

Off-Site Disposal: Excavate/Off-site Disposal
- Mobilize, site prep, clear/grub, erosion control, and survey
- Excavate soils in Area 1, 2, 3, 4 and Others.
- Screen excavated soils to remove debris, drums, paint cans.
- Install 40 soil borings in a grid pattern in the Area south of the raod between Areas 2,3,4,Other to fill the data gap by confirming that there is no contamination in this area.
- Treat water by air stripping.
- Dispose of drums in off-site hazardous waste landfill and construction debris in off-site solid waste landfill.
- Dispose soils with concentrations > Cleanup Goals at off site landfill.
- Backfill excavations with excavated soils with concentrations < goals.
- Cover Area 1 with 2' vegetative cover.
- Cover areas south of the road with crushed stone.
- Demobilize
- Install 4 new monitoring wells
- Ground water monitoring for 5 years (costed separately)

PRODUCTIVITY:

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

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

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

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

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

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

Contractor costs are calculated as a percentage of running total as

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

Owner's cost are calculated as a percentage of running total as

2 % for design contingency
3 % for escalation
25 % for construction contingency
3.5 % for other costs
8 % for construction management

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

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

Total, use	3.5%

33.01. Mobilization	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action								
33.01. Mobilization								
USR AA Mobilization	1.00 EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing								
33.02.06. Groundwater Groundwater - from holding tanks								
HTW AA For Disposal: NYSDEC CLP TCL VOCs, volatile organics , groundwater (Severn Trent Lab 9/98) (Assume 1 sample for each tank)	15.00 EA	0	0	0	0	2,625	2,625	175.00
AFH AA For Disposal: NYSDEC CLP TAL SVOCs modified , groundwater, (Severn Trent Lab, 9/98) (Assume 1 sample per tank)	15.00 EA	0	0	0	0	5,550	5,550	370.00
AFH AA For Disposal: NYSDEC TAL - Inorganics, groundwater (Severn Trent Lab, 9/98) (Assume 1 sample per tank)	15.00 EA	0	0	0	0	2,325	2,325	155.00
33.02.11. Soil For disposal; TCLP analysis required for non hazardous landfill disposal. Assuming 1 sample every 150 cy: 23,025 cy x 1.40/150 = 215 x 1.2 = 260 samples								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	260.00 EA	0	0	0	0	31,200	31,200	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	260.00 EA	0	0	0	0	59,800	59,800	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	260.00 EA	0	0	0	0	31,200	31,200	120.00
33.02.13. Confirmatory-Soil - All Areas								
HTW AA Confirmatory: NYSDEC CLP, volatile organics, soil (Severn Trent Lab, 9/99) (Assume 1 sample every 50 ft of wall adn floor or excavation.	156.00 EA	0	0	0	0	27,300	27,300	175.00

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
AFH AA Confirmatory: NYSDEC CLP-SVOCs , soil (Severn Trent Lab, 9/99) (Assume 1 sample every 50 ft of wall and floor of excavation.	156.00	EA	0	0	0	0	57,720	57,720	370.00
AFH AA Confirmatory: NYSDEC CLP TAL - Metals , soil (Severn Trent	156.00	EA	0	0	0	0	24,180	24,180	155.00
33.02.16. Soil Boring Grid South of Road from soil boring south of road to confirm no contamination between Areas 2,3,4, Others									
HTW AA Confirmatory: NYSDEC CLP, volatile organics, soil (Severn Trent Lab, 9/99) (Assume 1 sample per boring)	60.00	EA	0	0	0	0	10,500	10,500	175.00
AFH AA Confirmatory: NYSDEC CLP-SVOCs , soil (Severn Trent Lab, 9/99) (Assume 1 sample per boring)	60.00	EA	0	0	0	0	22,200	22,200	370.00
AFH AA Confirmatory: NYSDEC CLP TAL - Metals , soil (Severn Trent, 9/99) (Assume 1 sample per boring)	60.00	EA	0	0	0	0	9,300	9,300	155.00
33.02.18. IDW from Soil Borings									
HTW AA IDW: NYSDEC CLP, volatile organics, soil (Severn Trent Lab, 9/99) (Assume 1 sample per drum.)	20.00	EA	0	0	0	0	3,500	3,500	175.00
AFH AA IDW: NYSDEC CLP-SVOCs , soil (Severn Trent Lab, 9/99) (Assume 1 sample per drum.	20.00	EA	0	0	0	0	7,400	7,400	370.00
AFH AA IDW: NYSDEC CLP TAL - Metals , soil (Severn Trent - assume one sample per drum)	20.00	EA	0	0	0	0	3,100	3,100	155.00
33.03. Site Work									
33.03.02. Clearing and Grubbing									
AF AA Clearing, brush w/dozer & brush rake, light brush	3.00	ACR	48	1,298	1,887	0	0	3,185	1061.54
33.03.08. Survey Remediation Area Survey remediation area									
USR AA Survey remediation area	10.00	DAY	0	15,000	2,500	2,675	0	20,175	2017.50
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	16000	LF	3,360	80,000	8,000	25,680	0	113,680	7.11
B HTW AA Hay bales - stalked	16000	LF	5	2,720	0	17,120	0	19,840	
B MIL AA Maintain silt fence and remove	16000	LF	107	2,720	0	17,120	0	19,840	1.24

33.04. Fencing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.04. Fencing									
MIL AA Site dml, chain link fence, remove & salvage for reuse	2000.00	LF	103	2,600	0	0	0	2,600	1.30
MIL AA Fence, CL scty, std FE-6, 6' high, no gates/signs	2000.00	LF	96	2,820	0	39,847	0	42,667	21.33
MIL AA Fence, CL, set in conc, 6' H, indl, corner post, galv stl, 4" OD	4.00	EA	2	55	9	295	0	358	89.48
MIL AA Fence, CL, double, 24' W, indl, gates, swing, 6' high	1.00	EA	0	0	0	435	0	435	435.38
33.05. Wastewater									
33.05. 1. Wastewater									
L MIL AA Pump, cntfgl,6"D, horiz mtd, horiz splt, sgl stg,1500GPM,50HP	1.00	EA	0	0	0	10,767	0	10,767	10766.88
M HTW AA 21,000 Gal, Steel, hold tank stationary	4.00	EA	0	0	0	5,264	0	5,264	1316.10
33.07. Air Stripping									
HTW AA HTRW,PTTU,1'dia,14.5'pkng hgt, 30GPM,850CFM,FRP shell	1.00	EA	97	3,257	0	7,009	0	10,265	10265.47
AFH AA HTRW,PTTU, >= 12' high, install air strip tower, 1'- 3' diam.	1.00	EA	91	3,035	226	0	0	3,261	3261.05
HTW AA HTRW, PT opt, air flow switch (loss of air flow - motor failure)	1.00	EA	0	0	0	512	0	512	511.81
33.10. Soil Remediation									
33.10.02. Sitework - Soils Excavating Areas 1,2,3,4, Others Volumes are increased by 30% for expansion and 10% contingency. For weight calculations, the volume is increased by 10% only. All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Soils category.									
USR AA Excavate, stockpile, screen soi l (volumes used for estimate are	32925	CY	0	0	0	0	658,500	658,500	20.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (1000sf	550000	SF	0	0	0	47,080	0	47,080	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	550000	SF	0	0	0	47,080	0	47,080	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	6240.00	CY	550	16,661	8,674	121,718	0	147,052	23.57
USR AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt, 1999) For	0.01	TON	0	0	0	0	0	0	4.65

33.10. Soil Remediation	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
this option, excavated material with concentrations of COCs less than Clean up Goals will be used as backfill.									
AF AA Fill, spread borrow w/dozer	14802	CY	178	5,329	9,621	0	0	14,950	1.01
AF Compaction, steel wheel tandem roller, 5 ton	14802	CY	105	3,108	2,664	0	0	5,773	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	70.20	MSF	70	1,775	0	3,125	0	4,899	69.79
33.10.04. Drum Removal									
Approx. 20 drums in Area 1									
L MIL AA Excavator for drum removal at Level B	20.00	EA	2	323	445	0	0	768	38.40
L MIL AA Excavator for drum moving at Level B	20.00	EA	2	323	445	0	0	768	38.40
L MIL AA Level B breathing unit, suit, overboots, gloves	4.00	EA	0	0	2,000	0	0	2,000	500.00
33.10.06. Disposal:									
Disposal and Transportation of drums to hazardous waste landfill; disposal of debris and soil in solid waste landfill.									
HTW AA HW packaging, overpacks, 18"dia x 34"H, 16ga stl drum, 55gal, DOT 17C	20.00	EA	0	0	0	1,583	0	1,583	
USR AA Drums/Paint Cans: Transportatio n of Drums by dedicated van	1.00	EA	0	0	0	0	546	546	545.70
USR AA Drums/Paint Cans: Disposal of Drums (Price quoted by Waste Management	20.00	EA	0	0	0	2,862	0	2,862	143.11
USR AA Extra fees for overpack use	20.00	EA	0	0	0	0	800	800	40.00
USR AA Debris: Transport and Dispose nonhaz waste, bulk solid,	418.00	TON	0	0	0	0	13,167	13,167	31.50
HTW AA Soils: Transport and Dispose nonhaz waste, bulk (Earthwatch, 7/00)	3762.00	TON	0	0	0	0	118,503	118,503	31.50
33.18. Confirmatory Soil Borings -									
B CIV AA Mob/Demob facility	2.00	EA	0	0	0	0	800	800	400.00
L AFH AA Decon Pad	1.00	EA	0	0	0	0	150	150	150.00
L AFH AA Decon Time	40.00	HR	0	0	0	0	6,000	6,000	150.00
M HTW AA HW packaging, DOT steel drums, 55 gal,	15.00	EA	0	0	0	0	750	750	50.00
L AFH AA Move drums	15.00	EA	0	0	0	0	375	375	25.00
L MIL AA Borings, auger holes in earth, no samples, 4" dia	280.00	LF	0	0	0	0	3,920	3,920	14.00

33.18. Confirmatory Soil Borings -	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
L HTW AA Split spoon sampling OD	16.00 LF	0	0	0	0	192	192	12.00
L AFH AA Standby Time	4.00 HR	0	0	0	0	600	600	150.00
L AFH AA Grout Boreholes	280.00 LF	0	0	0	0	1,680	1,680	6.00
33.26. Demobilization								
TOTAL Decontaminate Equipment	1.00 EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00 EA	0	528	2,500	500	0	3,528	3528.48
33.31. Remedial Design								
B HTW AA Remedial Design Workplan	1.00 EA	0	27,600	0	2,568	0	30,168	30168.00
B HTW AA Preliminary Design Report	1.00 EA	0	46,000	0	4,280	0	50,280	50280.00
B HTW AA Pre-final/Final Design Report, Including O&M Plan, S&A Plan, QA Plan, Contingency Plan, Waste	1.00 EA	0	118,000	0	7,490	0	125,490	125490.00
B HTW AA Remedial Action Workplan, including QA/QC Plan, H&S Plan	1.00 EA	0	47,500	0	2,675	0	50,175	50175.00
B HTW AA Project Closeout Plan	1.00 EA	0	48,000	0	2,140	0	50,140	50140.00
33.33. Well Installation								
B CIV AA Mob/Demob facility	1.00 EA	0	0	0	0	600	600	600.00
L AFH AA Decon Pad	1.00 EA	0	0	0	0	150	150	150.00
B HTW AA Installation of Monitoring well threaded	4.00 EA	0	0	0	0	2,320	2,320	580.00
L HTW AA Monitor well, drilling, HS auger, 4.25" ID x 8" OD	40.00 LF	0	0	0	0	720	720	18.00
TOTAL SEAD-59		4,816	430,766	46,470	372,859	1,107,673	1,957,768	

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

	QUANTY	UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action										
33.01 Mobilization	1.00	EA	5,290	110	160	1,390	240	570	7,760	7761.84
TOTAL Mobilization	1.00	EA	5,290	110	160	1,390	240	570	7,760	7761.84
33.02 Sampling, & Testing										
33.02.06 Groundwater	1.00	EA	14,500	290	440	3,810	670	1,580	21,290	21291.88
33.02.11 Soil	1.00	EA	168,800	3,380	5,170	44,340	7,760	18,360	247,800	247796.91
33.02.13 Confirmatory-Soil	1.00	EA	150,850	3,020	4,620	39,620	6,930	16,400	221,440	221435.54
33.02.16 Soil Boring Grid	1.00	EA	58,020	1,160	1,780	15,240	2,670	6,310	85,170	85167.51
33.02.18 IDW from Soil Bor	1.00	EA	19,340	390	590	5,080	890	2,100	28,390	28389.17
TOTAL Sampling, & Testi	1.00	EA	411,510	8,230	12,590	108,080	18,910	44,750	604,080	604081.01
33.03 Site Work										
33.03.02 Clearing and Grub	3.00	ACR	4,400	90	130	1,160	200	480	6,460	215[illegible]
33.03.08 Survey Remediatio	1.00	ACR	27,870	560	850	7,320	1,280	3,030	40,910	4091[illegible]
33.03.11 Erosion control	1.00	LF	211,850	4,240	6,480	55,640	9,740	23,040	310,980	310983.09
TOTAL Site Work	1.00	EA	244,120	4,880	7,470	64,120	11,220	26,540	358,350	358351.66
33.04 Fencing	1.00	EA	63,630	1,270	1,950	16,710	2,920	6,920	93,400	93400.60
33.05 Wastewater										
33.05. 1 Wastewater	1.00	EA	22,150	440	680	5,820	1,020	2,410	32,510	32508.19
TOTAL Wastewater	1.00	EA	22,150	440	680	5,820	1,020	2,410	32,510	32508.19
33.07 Air Stripping	1.00	EA	19,390	390	590	5,090	890	2,110	28,470	28466.90
33.10 Soil Remediation										
33.10.02 Sitework - Soils	1.00	EA	1,276,040	25,520	39,050	335,150	58,650	138,750	1,873,160	1873159.95
33.10.04 Drum Removal	1.00	EA	4,880	100	150	1,280	220	530	7,170	7170.29
33.10.06 Disposal:	1.00	EA	189,890	3,800	5,810	49,870	8,730	20,650	278,740	278742.08
TOTAL Soil Remediation	1.00	EA	1,470,810	29,420	45,010	386,310	67,600	159,930	2,159,070	2159072.32
33.18 Confirmatory Soil Bo	1.00	EA	19,980	400	610	5,250	920	2,170	29,340	29336.15
33.26 Demobilization										
33.26.04 Decontaminate Equ	1.00	EA	12,190	240	370	3,200	560	1,330	17,890	1788[illegible]

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

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33.26.06 Demobilization	1.00 EA	4,870	100	150	1,280	220	530	7,160	7155.04
TOTAL Demobilization	1.00 EA	17,060	340	520	4,480	780	1,860	25,040	25042.66
33.31 Remedial Design	1.00 EA	423,050	8,460	12,950	111,110	19,450	46,000	621,020	621019.20
33.33 Well Installation	1.00 EA	5,240	0	160	0	190	450	6,030	6027.73
TOTAL Remedial Action	1.00 EA	2,702,220	53,940	82,680	708,360	124,150	293,710	3,965,070	3965068.26

SEAD-71
EXCAVATION/OFF-SITE DISPOSAL

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 12/27/00
Effective Date of Pricing: 10/03/96
Est Construction Time: 200 Days

Sales Tax: 7.0%

PROJECT BREAKDOWN:

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

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

PROJECT DESCRIPTION:

The following is a summary of the activities that are presently included in Alternative 1.

Off-Site Disposal: Excavate/Off-site Disposal

- Mobilize, site prep, clear/grub, erosion control, and survey
- Excavate and screen out debris.
- Dispose of screened debris.
- Transport soils >TCLP for disposal at off-site haz. waste facility.
- Transport remaining excavated soil to an off-site landfill or to SEAD-59.
- Backfill excavation with clean fill.
- Cover with topsoil and seed.
- Install 4 new monitoring wells
- Monitor groundwater for 5 years (costed separately)

PRODUCTIVITY:

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

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

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

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

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

The volume of material requiring stabilization could vary depending on the TCLP test results.

Contractor costs are calculated as a percentage of running total as
5 % for field office support
15 % for home office support
10 % for profit
4 %for bond

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

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

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

Total, use	3.5%

33.01. Mobilization	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action								
33.01. Mobilization								
USR AA Mobilization	1.00 EA	0	793	2,500	535	0	3,828	3827.72
33.02. Sampling, & Testing								
33.02.11. Soil								
For Disposal: 8900 cy x 1.40 = 12,460 cy/150 = 83 samples x 1.2 = 100 samples								
HTW AA For Disposal: TCLP, volatile organics (SW-846 Methods 1311&8240), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	10.00 EA	0	0	0	0	1,200	1,200	120.00
AFH AA For Disposal: TCLP-SVOCs (SW-846 Methods 1311 & 8270A), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	10.00 EA	0	0	0	0	2,300	2,300	230.00
AFH AA For Disposal: TCLP - Metals (SW-846 Methods 1311 & 6010 & 7470), soil (Severn Trent Lab, 9/99) (Assume 1 sample every 150cy)	10.00 EA	0	0	0	0	1,200	1,200	120.00
33.02.12. Confirmatory-Soil								
HTW AA Confirmatory: NYSDEC CLP, volatile organics, soil (Severn Trent Lab, 9/99) (Assume 1 sample every 50 ft of wall adn floor or excavation.	25.00 EA	0	0	0	0	4,375	4,375	175.00
AFH AA Confirmatory: NYSDEC CLP-SVOCs , soil (Severn Trent Lab, 9/99) (Assume 1 sample every 50 ft of wall and floor of excavation.	25.00 EA	0	0	0	0	9,250	9,250	370.00
AFH AA Confirmatory: NYSDEC CLP TAL - Metals , soil (Severn Trent	25.00 EA	0	0	0	0	3,875	3,875	155.00
33.03. Site Work								
33.03.02. Clearing and Grubbing								
AF AA Clearing, brush w/dozer & brush rake, light brush	2.00 ACR	32	865	1,258	0	0	2,123	1061.54
33.03.08. Survey Remediation Area								
Survey remediation area								
USR AA Survey remediation area	10.00 DAY	0	15,000	2,500	2,675	0	20,175	2017.50

33.03. Site Work	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.03.11. Erosion control									
B MIL AA Silt Fence: Installation and materials high, polypropylene	16000	LF	3,360	80,000	8,000	25,680	0	113,680	7.11
B HTW AA Hay bales - stalked	16000	LF	5	2,720	0	17,120	0	19,840	1.24
B MIL AA Maintain silt fence and remove	16000	LF	107	2,720	0	17,120	0	19,840	1.24
33.04. Fencing									
MIL Fence, CL, double, 24' W, indl, gates, swing, 6' high	1.00	EA	0	0	0	435	0	435	435.38
MIL Fence, CL, set in conc, 6' H, indl, corner post, galv stl, 4" OD	4.00	EA	2	55	9	295	0	358	89.48
MIL Fence, CL scty, std FE-6, 6' high, no gates/signs	1600.00	LF	77	2,256	0	31,877	0	34,133	21.33
MIL Site dml, chain link fence, remove & salvage for reuse	1600.00	LF	83	2,080	0	0	0	2,080	1.30
33.10. Soil Remediation									
33.10.02. Sitework - Soils All fill, topsoil, and seeding items for soil remediation are included in the Sitework - Soils.									
L MIL AA Excavate, screen, and stockpile (volumes used for estimate are 30% greater for expansion and 10% greater for contingency)	1245.00	CY	110	0	0	0	24,900	24,900	20.00
USR AA Plastic sheeting for ground: 6mil polyethylene liner (2500 sf per pile	20750	SF	0	0	0	1,776	0	1,776	0.09
USR AA Cover stockpiles w/ plastic sheeting: Plastic sheeting: 6mil polyethylene liner (1000sf / roll; 1 roll = $75)	20750	SF	0	0	0	1,776	0	1,776	0.09
MIL AA Loam or topsoil, furnish & place, imported, 6" deep	354.00	CY	31	945	492	6,905	0	8,342	23.57
USR AA Common fill (6") - Material for Backfill, includes cost of material (bank sand) and delivery (DeWitt 1999)	1357.00	TON	0	0	0	6,316	0	6,316	4.65
AF AA Fill, spread borrow w/dozer	1150.00	CY	14	414	748	0	0	1,162	1.01
AF Compaction, steel wheel tandem roller, 5 ton	1150.00	CY	8	242	207	0	0	449	0.39
RSM AA Seeding, athletic field mix, 8#/MSFpush spreader	9.60	MSF	10	243	0	427	0	670	69.79

33.10. Soil Remediation	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33.10.04. Transport to SEAD-59								
AF Hauling, w/loading, 12 CY truck , 5 mile haul, soil	0.01 CY	0	0	0	0	0	0	2.46
33.10.06. Disposal Assuming that all soils excavated will go off-site for treatment and/or disposal. Assuming that 3% will fail TCLP, 10% is debris, and the remaining 87% is nonhazardous soil.								
HTW AA Soils: Transport and Dispose nonhaz waste, bulk (Earthwatch, 7/00)	1250.00 TON	0	0	0	0	39,375	39,375	31.50
HTW AA Soils: Transport and Dispose hazardous waste, bulk (Earthwatch, 7/00)	43.00 TON	0	0	0	0	4,730	4,730	110.00
USR AA Debris: Transport and Dispose nonhaz waste, bulk solid, (Earthwatch, 7/00)	144.00 TON	0	0	0	0	4,536	4,536	31.50
33.18. Well Installation								
B CIV AA Mob/Demob facility	1.00 EA	0	0	0	0	600	600	600.00
AFH AA Decon Pad	1.00 EA	0	0	0	0	150	150	150.00
B HTW AA Installation of Monitoring well threaded	4.00 EA	0	0	0	0	2,320	2,320	580.00
L HTW AA Monitor well, drilling, HS auger, 4.25" ID x 8" OD	40.00 LF	0	0	0	0	720	720	18.00
33.26. Demobilization								
TOTAL Decontaminate Equipment	1.00 EA	0	1,321	5,000	2,500	0	8,821	8821.20
TOTAL Demobilization	1.00 EA	0	528	2,500	500	0	3,528	3528.48
TOTAL SEAD-71		3,838	110,182	23,213	115,939	99,531	348,864	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CON CONT	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.01 Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
TOTAL Mobilization	1.00 EA	5,290	110	160	1,390	240	570	7,760	7761.84
33.02 Sampling, & Testing									
33.02.11 Soil	1.00 EA	6,490	130	200	1,710	300	710	9,530	9530.65
33.02.12 Confirmatory-Soil	1.00 EA	24,170	480	740	6,350	1,110	2,630	35,490	35486.46
TOTAL Sampling, & Testi	1.00 EA	30,670	610	940	8,050	1,410	3,330	45,020	45017.11
33.03 Site Work									
33.03.02 Clearing and Grub	2.00 ACR	2,930	60	90	770	130	320	4,310	2152.58
33.03.08 Survey Remediatio	1.00 ACR	27,870	560	850	7,320	1,280	3,030	40,910	40910.82
33.03.11 Erosion control	1.00 LF	211,850	4,240	6,480	55,640	9,740	23,040	310,980	310983.09
TOTAL Site Work	1.00 EA	242,650	4,850	7,430	63,730	11,150	26,390	356,200	35619[illegible]
33.04 Fencing	1.00 EA	37,010	740	1,130	9,720	1,700	4,020	54,320	54324.09
33.10 Soil Remediation									
33.10.02 Sitework - Soils	1.00 EA	62,530	1,250	1,910	16,420	2,870	6,800	91,790	91792.60
33.10.04 Transport to SEAD	1.00 EA	0	0	0	0	0	0	0	0.02
33.10.06 Disposal	1.00 EA	67,190	1,340	2,060	17,650	3,090	7,310	98,630	98634.12
TOTAL Soil Remediation	1.00 EA	129,720	2,590	3,970	34,070	5,960	14,110	190,430	190426.75
33.18 Well Installation	1.00 EA	5,240	0	160	0	190	450	6,030	6027.73
33.26 Demobilization									
33.26.04 Decontaminate Equ	1.00 EA	12,190	240	370	3,200	560	1,330	17,890	17887.61
33.26.06 Demobilization	1.00 EA	4,870	100	150	1,280	220	530	7,160	7155.04
TOTAL Demobilization	1.00 EA	17,060	340	520	4,480	780	1,860	25,040	25042.66
TOTAL Remedial Action	1.00 EA	467,630	9,250	14,310	121,450	21,440	50,730	684,800	684799.26

ANNUAL MONITORING COSTS
FOR SEMI-ANNUAL
GROUNDWATER MONITORING
SEAD - 59

Designed By: Parsons ES
Estimated By: Parsons ES

Prepared By: Parsons ES

Preparation Date: 11/22/99
Effective Date of Pricing: 10/03/96

Sales Tax: 7.0%

PROJECT BREAKDOWN:

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

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

PROJECT DESCRIPTION:

The scope of work for the contractors is summarized below.

· Sample 11 wells (total of 13 samples including 1 dup and 1 qa sample)for metals, TPH, SVOCs analyses.
· Assumptions: 2-person crew, 6 wells sampled per day locations
1 day for set-up, 1 day for de-mob, no air travel; 2
events per year, and metals, TPH, SVOC laboratory analyses.

PRODUCTIVITY:

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

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

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

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

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

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

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

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

OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

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

Total, use	3.0%

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.02. Sampling, & Testing									
33.02.01. Health and Safety									
HTW AA Case of 25, disposable coveralls, Tyvek (Pine Environmental Services 9/98)	1.00	EA	0	0	0	115	0	115	114.69
USR AA Poly Tyvek (case of 12) (Pine Environmental Services 9/98)	1.00	EA	0	0	0	74	0	74	73.83
HTW AA First aid kits, 36 ingredients	1.00	EA	0	0	0	80	0	80	79.93
HTW AA Eye prot, safety glasses	2.00	EA	0	0	0	11	0	11	5.62
M HTW AA Latex Gloves (100/box) (Pine Environmental Services 9/98)	4.00	BX	0	0	0	42	0	42	10.43
USR AA North Respirator Cartridges (2 per/pkg) (Pine Environmental Services 9/98)	2.00	PK	0	0	0	9	0	9	4.49
33.02.02. Personnel									
AFH AA Personnel per diem (2 people x 4 days x 2 events)	18.00	DAY	0	0	0	1,907	0	1,907	105.93
AFH AA Car or van mileage charge	2000.00	MI	0	0	0	706	0	706	0.35
HTW AA Daily rate, subcontracted	18.00	EA	0	0	0	0	12,240	12,240	680.00
33.02.04. Sample Groundwater Groundwater monitoring costs for one year are included in this estimate. Each monitoring well is sampled semi-annually for TAL metals.									
USR AA Turbidimeter Rental (Pine Environmental Services 9/98)	2.00	WK	0	0	160	0	0	160	80.00
USR AA Hydrolab Rental (Hydrolab Corp. 9/98)	2.00	WK	0	0	690	0	0	690	345.00
USR AA Bladder Pump Rental (Marschalk Corporation 9/98)	2.00	WK	0	0	190	0	0	190	95.00
USR AA Pump Controller Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	300	0	0	300	150.00
USR AA 12-volt Compressor Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	350	0	0	350	175.00
USR AA Misc. Equipment Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	65	0	0	65	32.50
USR AA Thermo Environmental 580B (OVM) Rental (US Environmental, 12/98)	2.00	WK	0	0	400	0	0	400	200.00
USR AA Teflon Tubing (1/4" ID x 3/8") (Pine Environmental Services 9/98)	1000.00	FT	0	0	0	2,675	0	2,675	2.68
USR AA Isobutylene Calibration Gas (Pine Environmental Services 9/98)	2.00	EA	0	0	0	173	0	173	86.40
USR AA pH4 Buffer Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA pH7 Buffer Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24
USR AA 700 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
USR AA 2060 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
HTW AA 32 oz HDPE bottle, 12/case (including packaging and	72.00	EA	0	0	0	2,372	0	2,372	32.95
HTW AA Custody seals (package of 10)	8.00	EA	0	0	0	126	0	126	15.75
HTW AA 1gal,4/case,safe trans can w/vermiculite	2.00	EA	0	0	0	58	0	58	29.21
AFH AA Packing Tape: Testing, packaging & shipping, per roll	8.00	EA	0	0	0	13	0	13	1.65
HTW AA Shipping coolers: Testing, packaging & shipping, 51# to 70# pkg, overnight dlvy	14.00	EA	0	0	0	0	1,096	1,096	78.27
AFH AA Testing, packaging & shipping, bag ice	100.00	EA	0	0	0	0	119	119	1.19
HTW AA 48 quart ice chest, cooler & ice chest	2.00	EA	0	0	0	0	55	55	2[illegible]
33.02.07. Analysis of Groundwater									
AFH AA NYSDEC CLP TAL SVOCs(unit cost from Severn Trent Lab 9/98)	26.00	EA	0	0	0	0	9,620	9,620	370.00
AFH AA NYSDEC CLP TPH(unit cost from Severn Trent Lab ~~9/98~~) 6/01	26.00	EA	0	0	0	0	5,200	5,200	200.00
AFH AA TAL metals (NYSDEC CLP TAL Inorganics - unit cost from Severn Trent Lab 9/98)	26.00	EA	0	0	0	0	4,030	4,030	155.00
33.02.12. Disposal of IDW Disposal of Investigation Derived Wastes									
USR AA Disposal of purge water drums (1 drum of purge water for 2 rounds of sampling for 12 wells) (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	1.00		0	0	0	0	134	134	133.75

33.02. Sampling, & Testing	QUANTY UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
TOTAL ANNUAL MONITORING COSTS		0	0	2,155	8,483	32,494	43,132	

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CONTINGN	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.02 Sampling, & Testing									
33.02.01 Health and Safety	1.00 EA	400	0	10	0	10	0	430	426.26
33.02.02 Personnel	1.00 EA	18,060	0	540	0	560	0	19,160	19161.89
33.02.04 Sample Groundwate	1.00 EA	10,900	0	330	0	340	0	11,570	11565.13
33.02.07 Analysis of Groun	1.00 EA	22,920	0	690	0	710	0	24,320	24318.53
33.02.12 Disposal of IDW	1.00 EA	160	0	0	0	10	0	170	172.55
TOTAL Sampling, & Testi	1.00 EA	52,450	0	1,570	0	1,620	0	55,640	55644.36
TOTAL Remedial Action	1.00 EA	52,450	0	1,570	0	1,620	0	55,640	55644.36

ANNUAL MONITORING COSTS
FOR SEMI-ANNUAL
GROUNDWATER MONITORING
SEAD-71

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Estimated By: Parsons ES

Prepared By: Parsons ES

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Effective Date of Pricing: 10/03/96

Sales Tax: 7.0%

PROJECT BREAKDOWN:

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

PROJECT DESCRIPTION:

The scope of work for the contractors is summarized below.

· Sample 7 wells (total of 9 samples including 1 dup and 1 qa sample)for metals analyses.
· Assumptions: 2-person crew, 6 wells sampled per day locations 1 day for set-up, 1 day for de-mob, no air travel; 2 events per year, and metals laboratory analyses.

PRODUCTIVITY:

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

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

All activities are conducted in Level of Protection D.

The following daily time breakdown was assumed.

	Level A	Level B	Level C	Level D
Availiable Time (minutes)	480	480	480	480
Non-Productive Time (minutes):				
Safety meetings	20	20	10	10
Suit-up/off	60	60	40	10
Air tank change	160	20	0	0
*Breaks	60	60	40	30
Cleanup/decontamination	20	20	20	20
Productive Time (minutes)	160	300	370	410
Productivity:	160/480 X100%	300/480 X100%	370/480 X100%	410/480 X100%
	33%	63%	77%	85%
Example:				
Normal Production Rate (CY/HR)	250	250	250	250
X Productivity	.33	.63	.77	.85
=Reduced Production Rate(CY/HR)	83	158	193	213
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0.5 % for field office support
10.0 % for home office support
10.0 % for profit
0.0 % for bond

Owner's cost are calculated as a percentage of running total as
- 0.0 % for design contingency
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OTHER GOVERNMENT COSTS:

Other Government Costs consist of:

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As-Builts	0.5%
Operation and Maintenance (O&M) Manuals	0.5%
Laboratory Quality Assurance	1.0%

Total, use	3.0%

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
33. Remedial Action									
33.02. Sampling, & Testing									
33.02.01. Health and Safety									
HTW AA Case of 25, disposable coveralls, Tyvek (Pine Environmental Services 9/98)	1.00	EA	0	0	0	115	0	115	114.69
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M HTW AA Latex Gloves (100/box) (Pine Environmental Services 9/98)	4.00	BX	0	0	0	42	0	42	10.43
USR AA North Respirator Cartridges (2 per/pkg) (Pine Environmental Services 9/98)	2.00	PK	0	0	0	9	0	9	4.49
33.02.02. Personnel									
AFH AA Personnel per diem (2 people x 4 days x 2 events)	18.00	DAY	0	0	0	1,907	0	1,907	105.93
AFH AA Car or van mileage charge	2000.00	MI	0	0	0	706	0	706	0.35
HTW AA Daily rate, subcontracted	18.00	EA	0	0	0	0	12,240	12,240	680.00
33.02.04. Sample Groundwater Groundwater monitoring costs for one year are included in this estimate. Each monitoring well is sampled semi-annually for TAL metals.									
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USR AA Hydrolab Rental (Hydrolab Corp. 9/98)	2.00	WK	0	0	690	0	0	690	345.00
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USR AA 12-volt Compressor Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	350	0	0	350	175.00
USR AA Misc. Equipment Rental (Marschalk Corp. 9/98)	2.00	WK	0	0	65	0	0	65	32.50
USR AA Thermo Environmental 580B (OVM) Rental (US Environmental, 12/98)	2.00	WK	0	0	400	0	0	400	200.00
USR AA Teflon Tubing (1/4" ID x 3/8") (Pine Environmental Services 9/98)	1000.00	FT	0	0	0	2,675	0	2,675	2.68
USR AA Isobutylene Calibration Gas (Pine Environmental Services 9/98)	2.00	EA	0	0	0	173	0	173	86.40
USR AA pH4 Buffer Solution (Cole-Parme r Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24

33.02. Sampling, & Testing	QUANTY	UOM	MANHOUR	LABOR	EQUIPMNT	MATERIAL	SUBCONTR	TOTAL COST	UNIT COST
USR AA pH7 Buffer Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	22	0	22	11.24
USR AA 700 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
USR AA 2060 Conductivity Solution (Cole-Parmer Instrument Co. 9/98)	2.00	EA	0	0	0	39	0	39	19.26
HTW AA 32 oz HDPE bottle, 12/case (including packaging and	72.00	EA	0	0	0	2,372	0	2,372	32.95
HTW AA Custody seals (package of 10)	8.00	EA	0	0	0	126	0	126	15.75
HTW AA 1gal,4/case,safe trans can w/vermiculite	2.00	EA	0	0	0	58	0	58	29.21
AFH AA Packing Tape: Testing, packaging & shipping, per roll	8.00	EA	0	0	0	13	0	13	1.65
HTW AA Shipping coolers: Testing, packaging & shipping, 51# to 70# pkg, overnight dlvy	14.00	EA	0	0	0	0	1,096	1,096	78.27
AFH AA Testing, packaging & shipping, bag ice	100.00	EA	0	0	0	0	119	119	1.19
HTW AA 48 quart ice chest, cooler & ice chest	2.00	EA	0	0	0	0	55	55	2[illegible]
33.02.07. Analysis of Groundwater									
AFH AA TAL metals (NYSDEC CLP TAL Inorganics - unit cost from Severn Trent Lab 9/98)	18.00	EA	0	0	0	0	2,790	2,790	155.00
33.02.12. Disposal of IDW Disposal of Investigation Derived Wastes									
USR AA Disposal of purge water drums (1 drum of purge water for 2 rounds of sampling for 12 wells) (Price quoted by Waste Management Inc., 5/99. Includes 7% sales tax. Does NOT include transportation. Price quoted under assumption that drums contain oily liquid of low viscosity containing PAHs, metals (and does not contain PCBs).)	1.00		0	0	0	0	134	134	133.75
TOTAL ANNUAL MONITORING COSTS			0	0	2,155	8,483	16,434	27,072	

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

	QUANTY UOM	CONTRACT	DES CONT	ESCALATN	CONTINGN	OTHER	CON MGMT	TOTAL COST	UNIT COST
33 Remedial Action									
33.02 Sampling, & Testing									
33.02.01 Health and Safety	1.00 EA	400	0	10	0	10	0	430	426.26
33.02.02 Personnel	1.00 EA	18,060	0	540	0	560	0	19,160	19161.89
33.02.04 Sample Groundwate	1.00 EA	10,900	0	330	0	340	0	11,570	11565.13
33.02.07 Analysis of Groun	1.00 EA	3,390	0	100	0	100	0	3,600	3599.40
33.02.12 Disposal of IDW	1.00 EA	160	0	0	0	10	0	170	172.55
TOTAL Sampling, & Testi	1.00 EA	32,920	0	990	0	1,020	0	34,930	34925.23
TOTAL Remedial Action	1.00 EA	32,920	0	990	0	1,020	0	34,930	34925.23