WORK PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
AT SENECA ARMY DEPOT
Romulus, New York

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
Huntsville, Alabama

Prepared by:

ESE
A CILCORP Company
Environmental
Science &
Engineering, Inc.

ESE No. 3-90-2034

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LIST OF ACRONYMS AND ABBREVIATIONS

AIHA	American Industrial Hygiene Association
ARAR	applicable or relevant and appropriate requirement
AWQC	ambient water quality criteria
BACT	Best Available Control Technology
Ba	barium
BDL	below detection limit
BOD_5	5-day biochemical oxygen demand
°C	degrees Celsius
$CaCO_3$	calcium carbonate
Cd	cadmium
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH2CL2	methylene chloride
CHCL3	chloroform
C2H3CL	vinyl chloride
C2H5CL	chloroethane
cm/sec	centimeters per second
COD	chemical oxygen demand
CPF	cancer potency factor
Cr	chromium
Cu	copper
12DCE	cis-1,2-dichloroethene
12DCLE	1,2-dichloroethane
DOW	Division of Water

LIST OF ACRONYMS AND ABBREVIATIONS
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DQO	data quality objective
DTCH	ditch sample
EM	electromagnetic
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPA/NYSDEC	U.S. Environmental Protection Agency/New York State Department of Environmental Conservation
ESE	Environmental Science & Engineering, Inc.
eV	electron volt
FID	flame ionization detector
FR	Federal Register
FS	feasibility study
ft	foot
ft^3	cubic foot
ft-bls	feet below land surface
ft/day	feet per day
ft/ft	feet per foot
ft/mile	feet per mile
ft/sec	feet per second
ft/yr	feet per year
gal	gallon
gpm	gallons per minute
GC	gas chromatography
GPR	ground-penetrating radar
HEA	Health Effects Assessment

LIST OF ACRONYMS AND ABBREVIATIONS
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IAG	Interagency Agreement
ICF	ICF Technology, Inc.
IIA	Initial Installation Assessment
IP	ionization potential
IRIS	Integrated Risk Information System
km	kilometer
L	liter
L/min	liter per minute
lb	pound
m	meter
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg	milligram
mg/L	milligrams per liter
MHz	megahertz
mmhos/m	millimhos per meter
MTV	mobility, toxicity, and volume
MW	monitor well
NA	not analyzed
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Contingency Plan
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NGVD	National Geodetic Vertical Datum
NIOSH	National Institute of Occupational Safety and Health

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 4 of 6)

NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NSPS	New Source Performance Standard
NTU	nephelometric turbidity unit
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PAC	powdered activated carbon
Pb	lead
PEL	permissible exposure limit
PID	photoionization detector
POC	principal organic contaminant
POTW	publicly owned treatment work
ppm	parts per million
PT	monitor well
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
QC	quality control
RA	risk assessment
RAGS	Risk Assessment Guidance for Superfund

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 5 of 6)

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RFI	RCRA Facility Investigation
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RSCC	Regional Sample Control Center
SARA	Superfund Amendments and Reauthorization Act of 1986
SBR	sequencing batch reactor
SCHD	Seneca County Health Department
SDWA	Safe Drinking Water Act
SEAD	Seneca Army Depot
SHERP	Safety, Health, and Emergency Response Plan
SOW	scope of work
SPT	standard penetration test
SS	soil sample
STP	sewage treatment plant
SW	surface water sample
SWMU	solid waste management unit
TAGM	Technical and Administrative Guidance Memorandum
T12DCLE	trans-1,2-dichloroethene
TCL	total compounds list
TCLP	toxicity characteristics leaching procedure

LIST OF ACRONYMS AND ABBREVIATIONS
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TES	Target Environmental Services, Inc.
TOGS	Technical and Operations Guidance Series
TRCLE	trichloroethene
TRPH	total recoverable petroleum hydrocarbons
TWA	time-weighted average
$\mu g/L$	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USCS	Unified Soil Classification System
USGS	U.S. Geological Survey
UST	underground storage tank
UV	ultraviolet
VOC	volatile organic compound
WP	work plan
Zn	zinc

1.0 INTRODUCTION

Environmental Science & Engineering, Inc. (ESE) has been contracted by the U.S. Army Corps of Engineers (USACE) to prepare a supplemental remedial investigation/feasibility study (RI/FS) project scoping and work plan (WP) document for the Seneca Army Depot (SEAD) ash landfill area. The WP will be used to supplement the existing database, determine the magnitude of environmental contamination, and define appropriate remedial actions. This WP describes the overall scope of the project, the general methodology to be used, and the projected schedule for the completion of the RI/FS.

During the remedial investigation (RI), this WP will be used to investigate the ash landfill area, which contains several potential contamination sources, including:

1. A possible solvent dump located west of the former ash landfill, based on the ICF Technology, Inc. (ICF) (1989) soil gas survey;
2. Buried debris piles north of the ash landfill area;
3. A cooking grease pit/disposal area located within the northeastern edge of the landfill area used to dispose of cooking grease;
4. A former landfill area, used for ash disposal between 1974 and 1979, extending to the north and east of the incinerator [Solid Waste Management Unit (SWMU) No. SEAD-6];
5. A former construction debris disposal area southeast of the incinerator used before 1969 and until 1977 (SWMU No. SEAD-8);
6. Former burn pits used to burn uncontaminated trash from 1941 to 1974 and located within the landfill area

immediately west of the incinerator building (SWMU No. SEAD-14);

7. The former cooling pond associated with the incinerator facility, located north of the incinerator building (SWMU No. SEAD-3);
8. The former underground diesel fuel tank associated with the incinerator facility, located along the east side of the incinerator building;
9. A former incinerator (Building 2207; SWMU No. SEAD-15) used to incinerate trash between 1974 and 1979;

The ash landfill area has been included on the federal facilities National Priorities List (NPL) as of July 13, 1989. The recently completed site investigation (ICF, 1989) of the landfill area has documented the existence of a narrow plume of groundwater contamination that is believed to extend to, and possibly beyond, SEAD's western boundary. The contaminants of concern are chlorinated volatile organic compounds (VOCs): trans-1,2-dichloroethene (T12DCLE); trichloroethene (TRCLE); and to a lesser extent, 1,2-dichloroethane (12DCLE), vinyl chloride (C2H3CL), and chloroform (CHCL3). Additionally, some heavy metals were found at or above background conditions.

The remainder of Section 1.0 (Introduction) provides an overview of the site history and a description of the primary contamination sources under investigation. Section 2.0 (Site Conditions) is a summary of existing data and presents the general environmental setting. Section 3.0 (Scoping of the RI/FS) describes the scoping process, including project objectives, preliminary scoping of remedial alternatives, data gaps, and scoping of the RI. Sections 4.0 and 5.0 contain the detailed task plans for the RI/FS. Section 6.0 (Plans and

Management) presents the overall project management structure and includes the schedule for completing the RI/FS. Appendices to the WP include the Field Sampling and Analysis Plan; Safety, Health, and Emergency Response Plan (SHERP); Quality Assurance Project Plan (QAPP); Sample Handling Protocol; Response to Review Comments; Scope of Work (SOW); New York State Department of Environmental Conservation, Division of Water, Technical and Operational Guidance Series 1.1.1; and New York State Department of Environmental Conservation, Division of Fish and Wildlife, Sediment Criteria.

SEAD is located in the Finger Lakes region of central New York, on the west side of the highland separating Seneca Lake and Cayuga Lake (see Figure 1.1-1). The depot covers approximately 10,600 acres and currently employs approximately 1,000 civilian and military personnel.

Construction activities at SEAD were initiated in 1941. The site originally encompassed 11,000 acres. Subsequent expansion included a 1,524-meter (m) airstrip from the former Sampson Air Force Base. Currently, SEAD's mission includes receiving, storing, and distributing ammunition and explosives, General Services Administration strategic and critical materials, and the Office of Civil Defense engineering equipment; providing receipt, storage, and issue of items that support special weapons activity; and performing depot-level maintenance, demilitarization, and surveillance on conventional ammunition and special weapons.

The general layout of the site and the primary contamination sources are shown in Figure 1.1-2. The landfill area is located midway along the western boundary of SEAD. This area has several potential contamination sources.

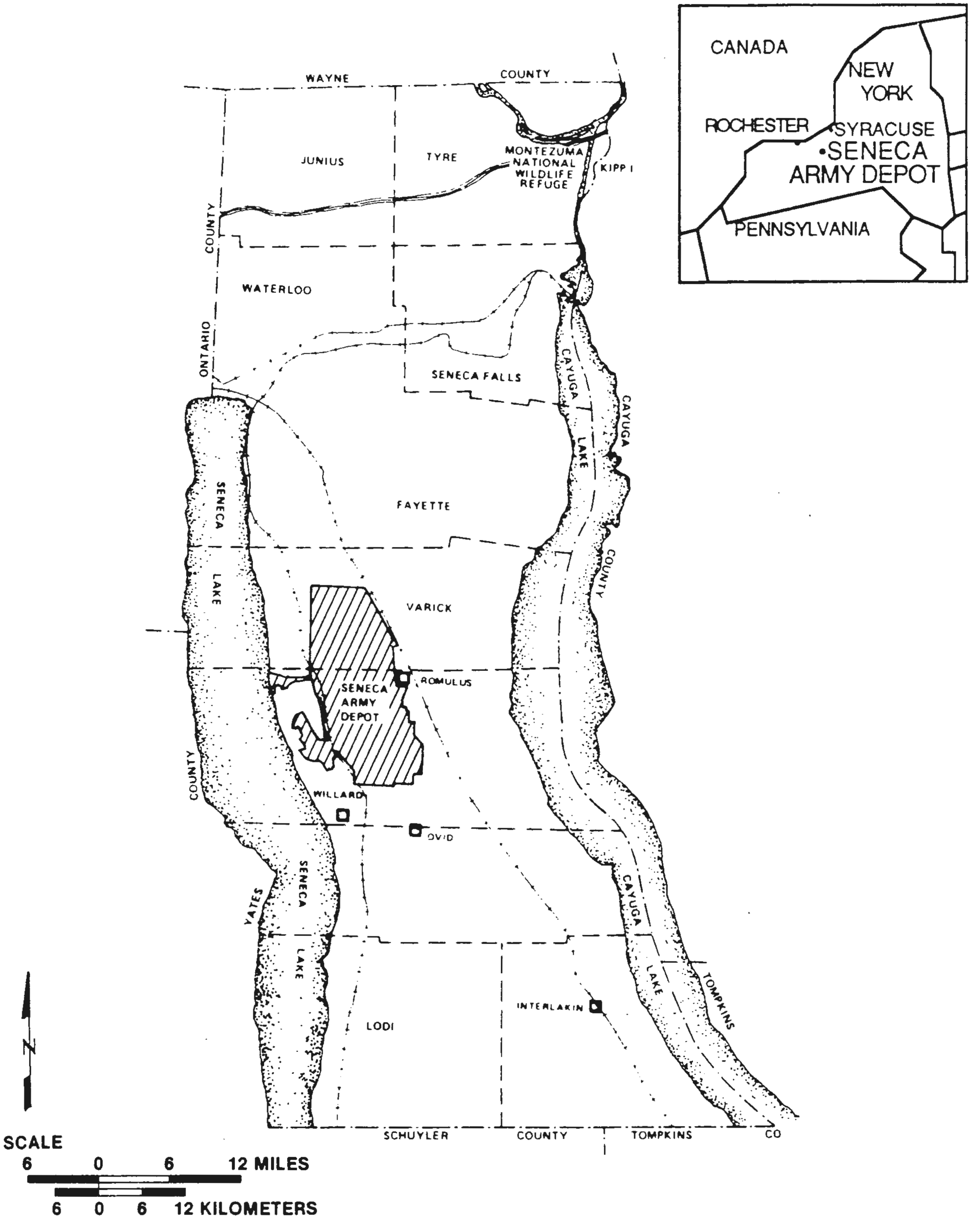

Figure 1.1-1
LOCATION OF SENECA ARMY DEPOT

SOURCE: USATHAMA, 1980; ESE.

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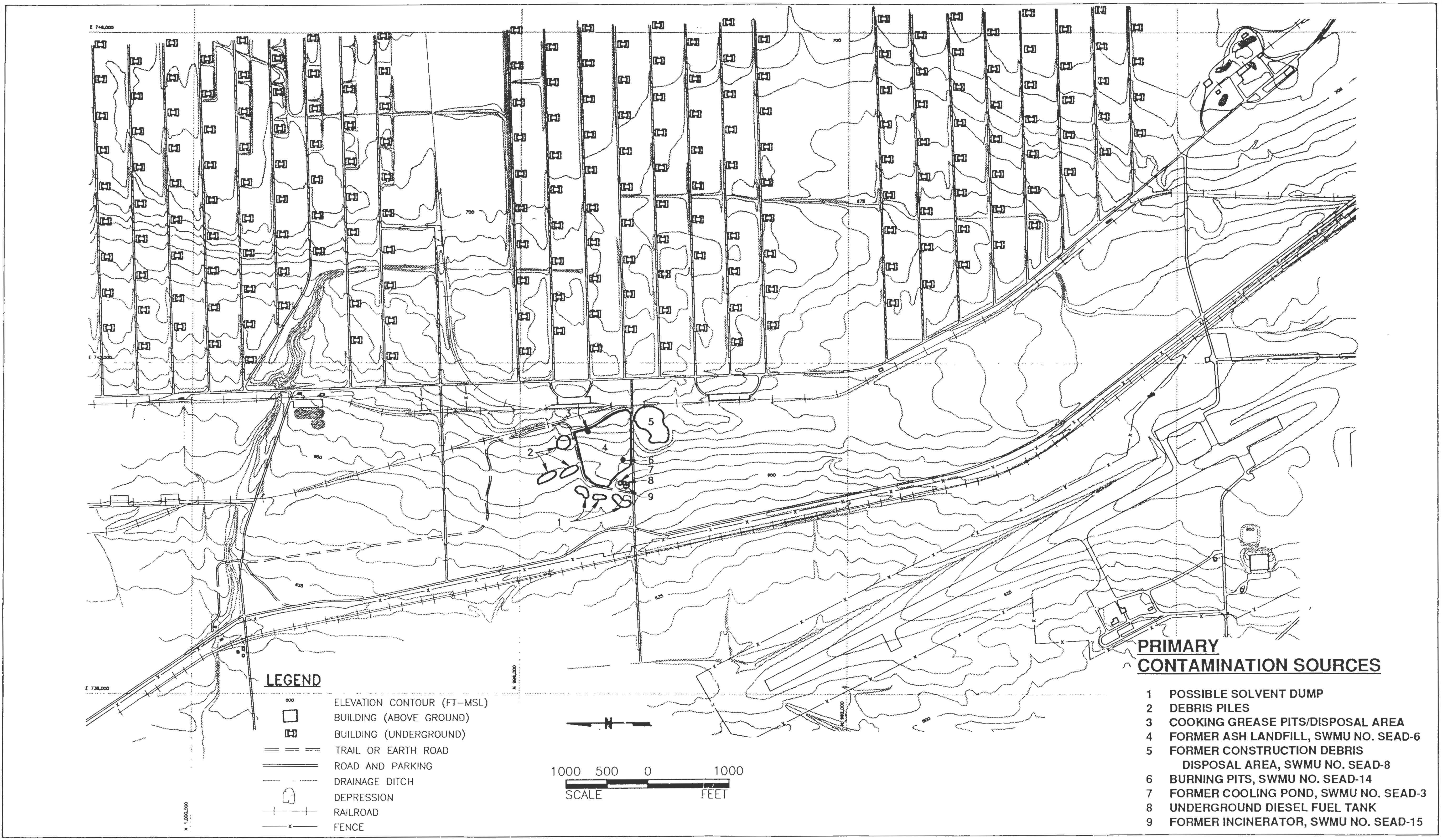

PRIMARY CONTAMINATION SOURCES

1 POSSIBLE SOLVENT DUMP
2 DEBRIS PILES
3 COOKING GREASE PITS/DISPOSAL AREA
4 FORMER ASH LANDFILL, SWMU NO. SEAD-6
5 FORMER CONSTRUCTION DEBRIS DISPOSAL AREA, SWMU NO. SEAD-8
6 BURNING PITS, SWMU NO. SEAD-14
7 FORMER COOLING POND, SWMU NO. SEAD-3
8 UNDERGROUND DIESEL FUEL TANK
9 FORMER INCINERATOR, SWMU NO. SEAD-15

Figure 1.1-2
GENERAL SITE MAP: EXISTING SITE CONDITIONS

SOURCE: ESE.

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From 1941 to 1974, uncontaminated trash was burned in a series of burn pits east of the existing incinerator building (Building 2207). According to the U.S. Army Environmental Hygiene Agency (USAEHA) Solid Waste Survey (1975), a former incinerator operator stated that the burning pits were used for refuse that occasionally contained possible hazardous items.

Between 1974 and 1977, materials intended for disposal were transported to the incinerator. Ashes and other residues from the incinerator were temporarily disposed of in an unlined cooling pond northeast of the incinerator building. When the pond was filled, the ashes and residues were removed, transported, and buried in the adjacent landfill. The incinerator was destroyed by a fire in 1979, and the landfill has subsequently been closed. In the past, the landfill was misconstrued as having been capped, which is not the case. The landfill was covered with native soils of undetermined thickness but has not been closed with an engineered cover or cap.

Due to the possibility of leachate entering the groundwater, five monitor wells were installed to assess groundwater quality. Several indicator parameters (sulfate, chloride, and specific conductance) were found in the subsequent analysis of groundwater samples from these wells. In October 1987, USAEHA installed an additional nine monitor wells in the area to define the contaminant plume. Seven additional monitor wells were installed in November 1989 to further delineate the groundwater contamination at the site.

The area under investigation includes an underground diesel tank located along the east side of the incinerator. Although no visual or olfactory evidence of tank leakage or of major spills has been noticed, a fuel odor was reported in the site investigation (ICF, 1989).

The area under investigation under investigation also includes the construction debris disposal area southeast of the incinerator. This area was used as a disposal site for uncombustible rubble from 1969 until 1977. Several buried debris piles north of the ash landfill were discovered during the geophysical survey performed in October 1989. A grease pit/disposal area (within the northeast edge of the landfill) where cooking grease was disposed of and a possible solvent dump, discovered during a soil gas survey conducted in 1989, will also be included in the investigation.

The ash landfill area will be investigated as one site with several possible contamination sources. After the RI, subareas may be defined. The remediation of each defined subarea, including the incinerator building and underground diesel fuel tank, will be discussed in the feasibility study (FS).

2.0 SITE CONDITIONS

2.1 PHYSICAL SETTING

SEAD, approximately 64 kilometers (km) south of Lake Ontario near Romulus, New York, lies on the western side of a broad north-to-south-trending series of rock terraces mantled by glacial till forming a divide that separates Cayuga Lake on the east and Seneca Lake on the west. The site is in an uplands area [generally over 600 feet (ft) in elevation].

Land use surrounding SEAD is largely dedicated to agricultural production with occasional residential development. Romulus, located adjacent to the eastern SEAD property boundary, is the closest community to the site and consists mostly of residential and small commercial establishments. Two additional communities are located near SEAD: Ovid, 2 miles southeast of SEAD, and Willard, 1 mile south. Both communities consist mostly of residential and light industrial/commercial establishments.

New York State Highways 96 and 96A adjoin the SEAD east and west boundaries. Recreational areas near SEAD include Sampson State Park, located approximately 1 mile west of SEAD, and Lake Seneca and Lake Cayuga, located approximately 2 miles west and 3 miles east, respectively.

The ash landfill area is located on gently sloping terrain along the western boundary of SEAD, immediately east of the magazine area. The majority of the site, which slopes downward to the west-southwest, is vegetated with grasses and occasional brush thickets. Surface runoff from the area is collected in drainage ditches along the east-west roadway (West Smith Farm Road) and the north-south roadway (West Patrol Road). Drainage offpost enters a series of tributaries that intermittently discharge directly to Lake Seneca (Figure 2.1-1).

2.2 GEOLOGIC SETTING

The overburden soils surrounding the landfill area at SEAD are comprised of erosional materials deposited during the Pleistocene glacial advance. This mantle of unconsolidated glacial deposits, described as a glacial till, overlies Middle Devonian bedrock formations of the Hamilton Group that collectively includes the Moscow Shale, Ludlowville Shale, Skaneateles Shale, and the Marcellus Shale Formations, in descending order. The composite thickness of these shale units is approximately 350 to 400 ft beneath SEAD. Beneath the Hamilton Group is the Onondaga Limestone, which ranges in thickness from 70 to 80 ft. These formations dip at a shallow angle to the south-southeast across the area at a rate of approximately 50 feet per mile (ft/mile) (ICF, 1989).

The soils are characterized as a poorly sorted, heterogeneous mixture of silts and clays with some sands. Based upon the previous site investigations, the overburden soil thickness is relatively uniform within and to the west of the landfill, but soil thickness increases to the east. The wells installed west of the landfill are relatively shallow, with bedrock encountered from 6 to 10 feet below land surface (ft-bls). Below the glacial till is weathered and fractured shale, usually about 5 ft thick [USAEHA Geohydrologic Study No. 38-26-0313-(88)], which in turn overlies the unweathered shales of Hamilton Formation.

At the landfill, the surface of the shale bedrock conforms to the topographical relief of the area and generally slopes gently downward to the west. The

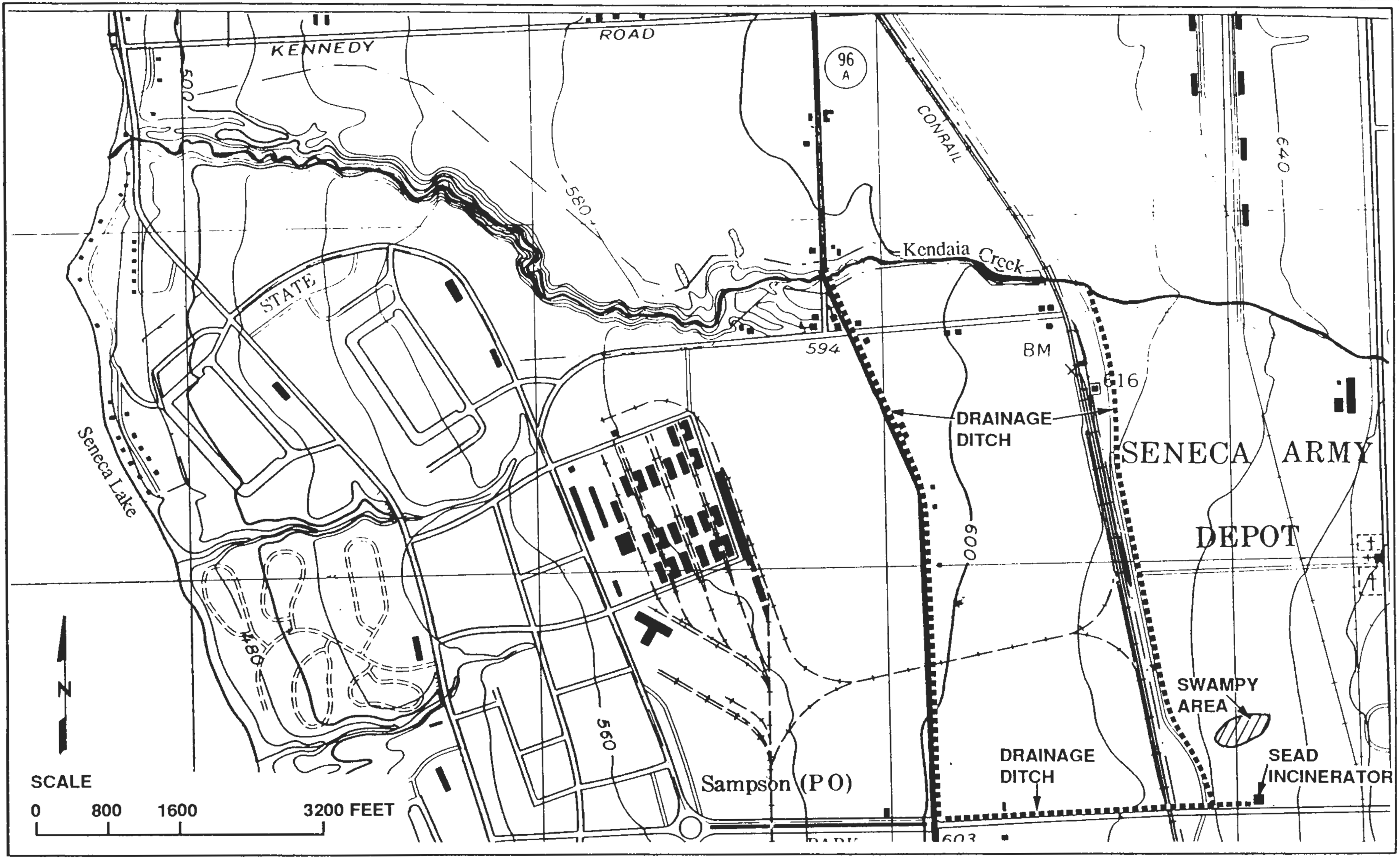

Figure 2.1-1
DRAINAGE SYSTEM AT SEAD ASH LANDFILL AREA

SOURCES: U.S. GEOLOGICAL SURVEY, 1978; ESE.

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results of previous investigations indicate that a ridge of shallow bedrock extends across the western portion of the landfill trending northeast to the southwest and dips downward to the south. Figures 2.2-1 and 2.2-2 are cross sections illustrating the geologic conditions at the site, as constructed from available drilling logs. The locations of these cross sections are illustrated in Figure 2.2-3.

2.3 HYDROGEOLOGY

The groundwater in Seneca County is derived almost entirely from precipitation. The precipitation is unequally distributed throughout the year, the bulk of it falling during the warmer months. In general, the groundwater in the surficial mantle is located within the pore spaces between the grains of the unconsolidated material. The underlying weathered and fractured shale, with a reported thickness of approximately 5 ft at the site, generally contains obtainable amounts of water. In the unweathered bedrock, water is chiefly located within joints, fractures, and other secondary openings.

Nearly all the rocks in the northern third of Seneca County are sandstone and limestone (see Figure 2.3-1). In the areas where these rocks have been covered by a thick mantle of glacial deposits, many successful wells have been drilled in the bedrock. The sandstone and limestone beds are heavily jointed and fractured and in many instances show marked effects of solution cavities. The Camillus Shale Member of the Upper Silurian Salina formation is highly fractured and has many irregularly shaped voids. These openings create a greater storage capacity and are more conducive to movement and recovery of groundwater than are those in most shales.

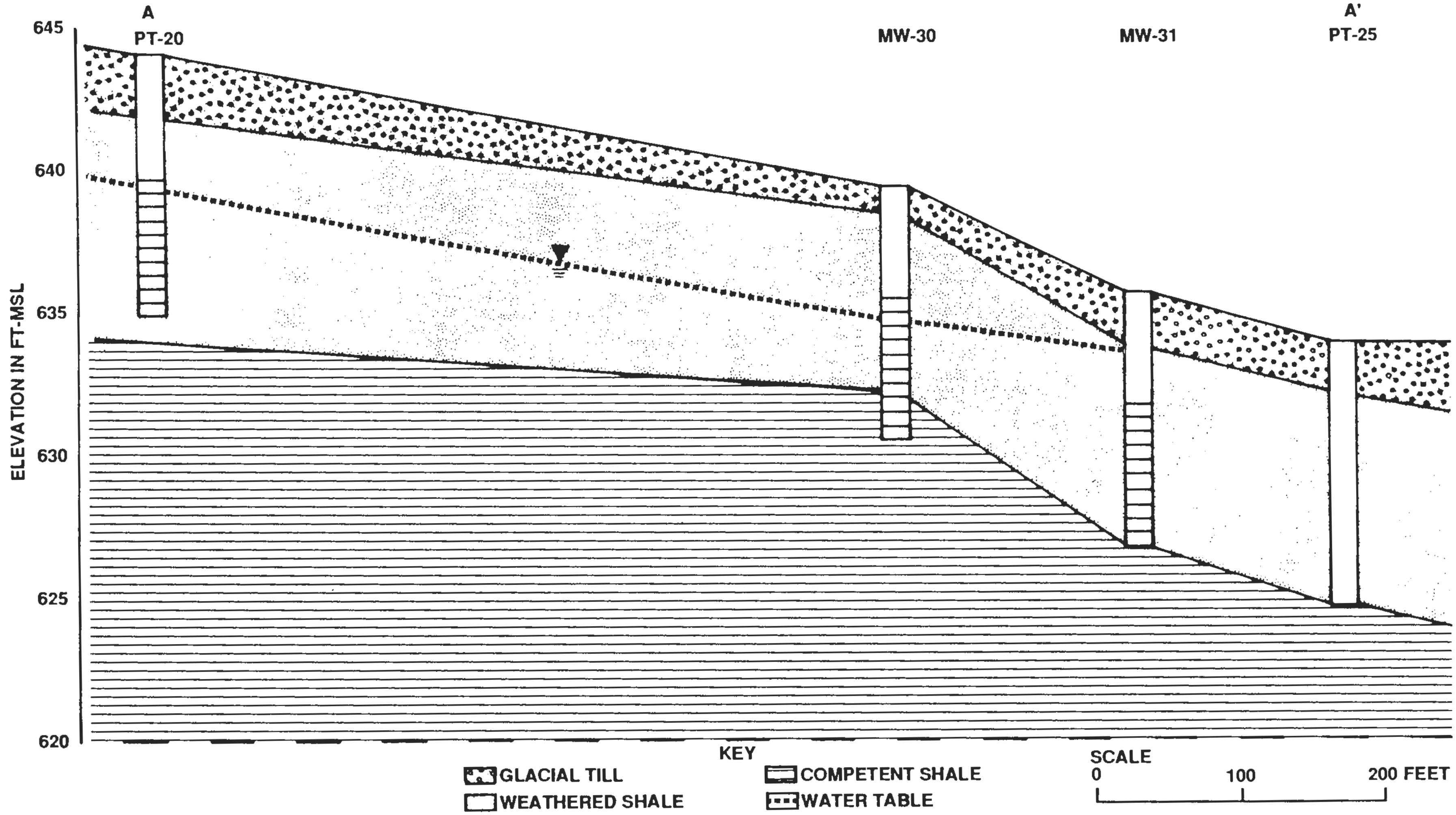

Figure 2.2-1
GEOLOGIC CROSS SECTION A-A'
SEAD ASH LANDFILL AREA

SOURCE: ESE.

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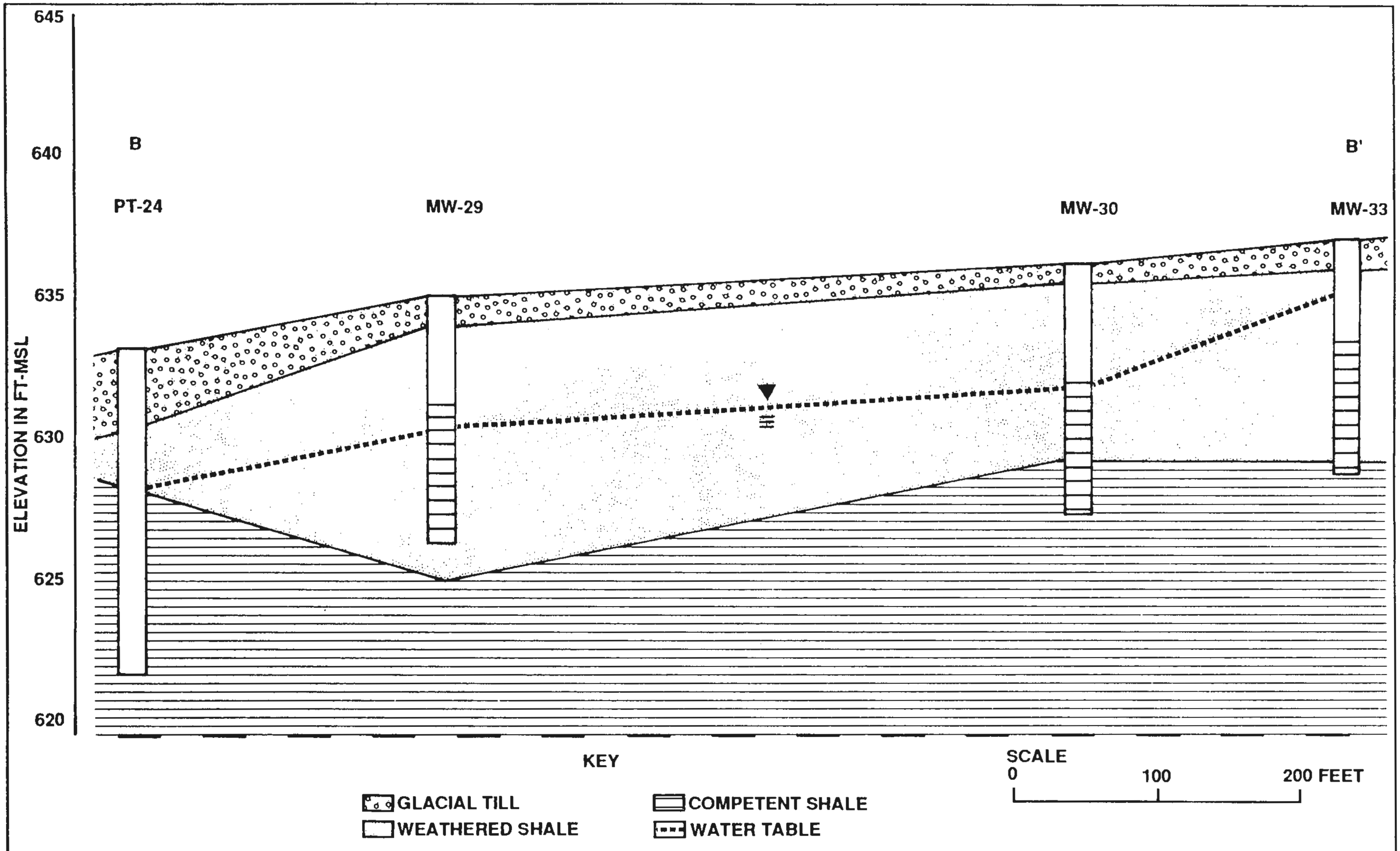

Figure 2.2-2
GEOLOGIC CROSS SECTION B-B'
SEAD ASH LANDFILL AREA

SOURCE: ESE.

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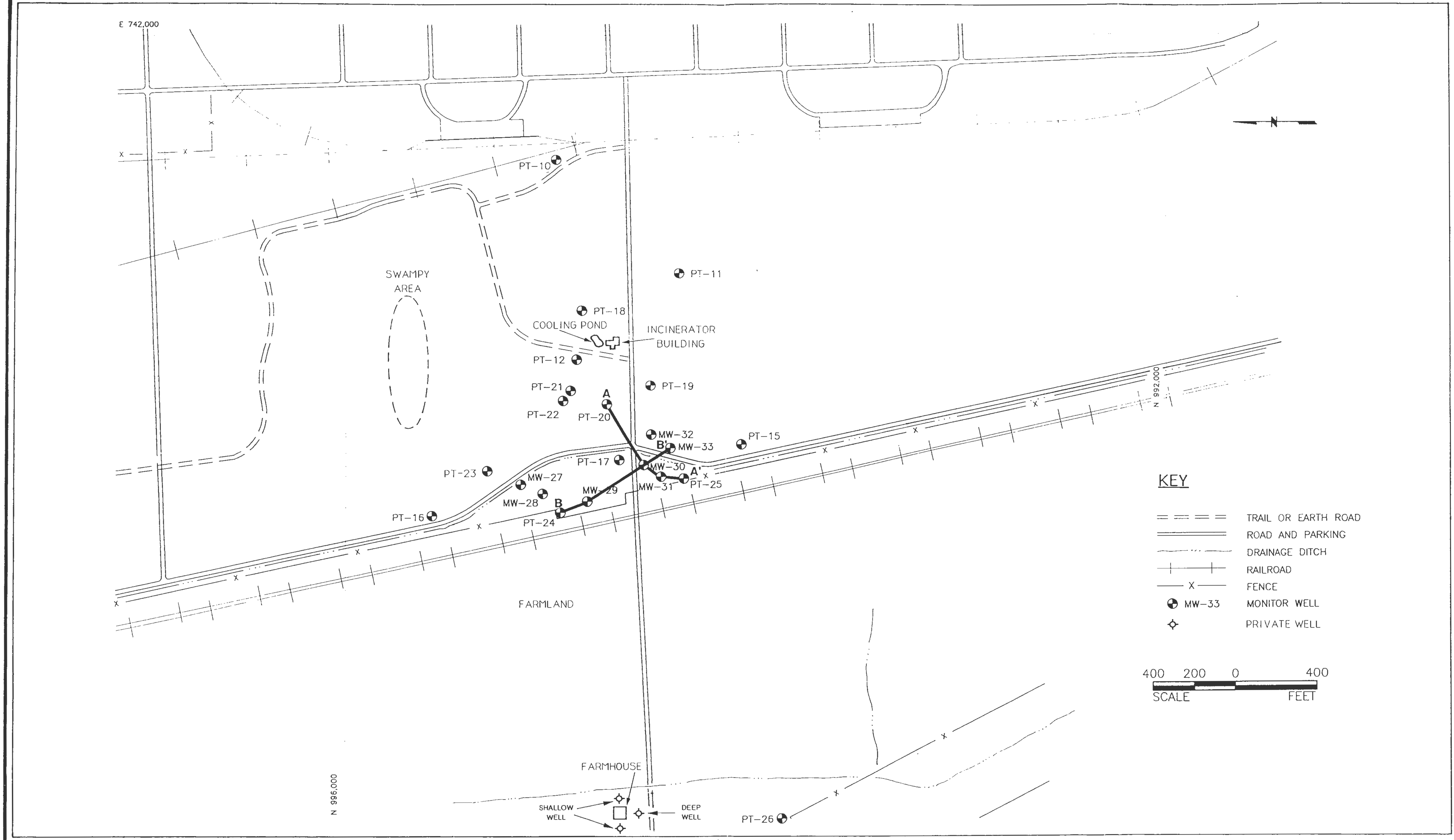

Figure 2.2-3
LOCATION OF CROSS SECTIONS A-A' AND B-B'

SOURCE: ESE.

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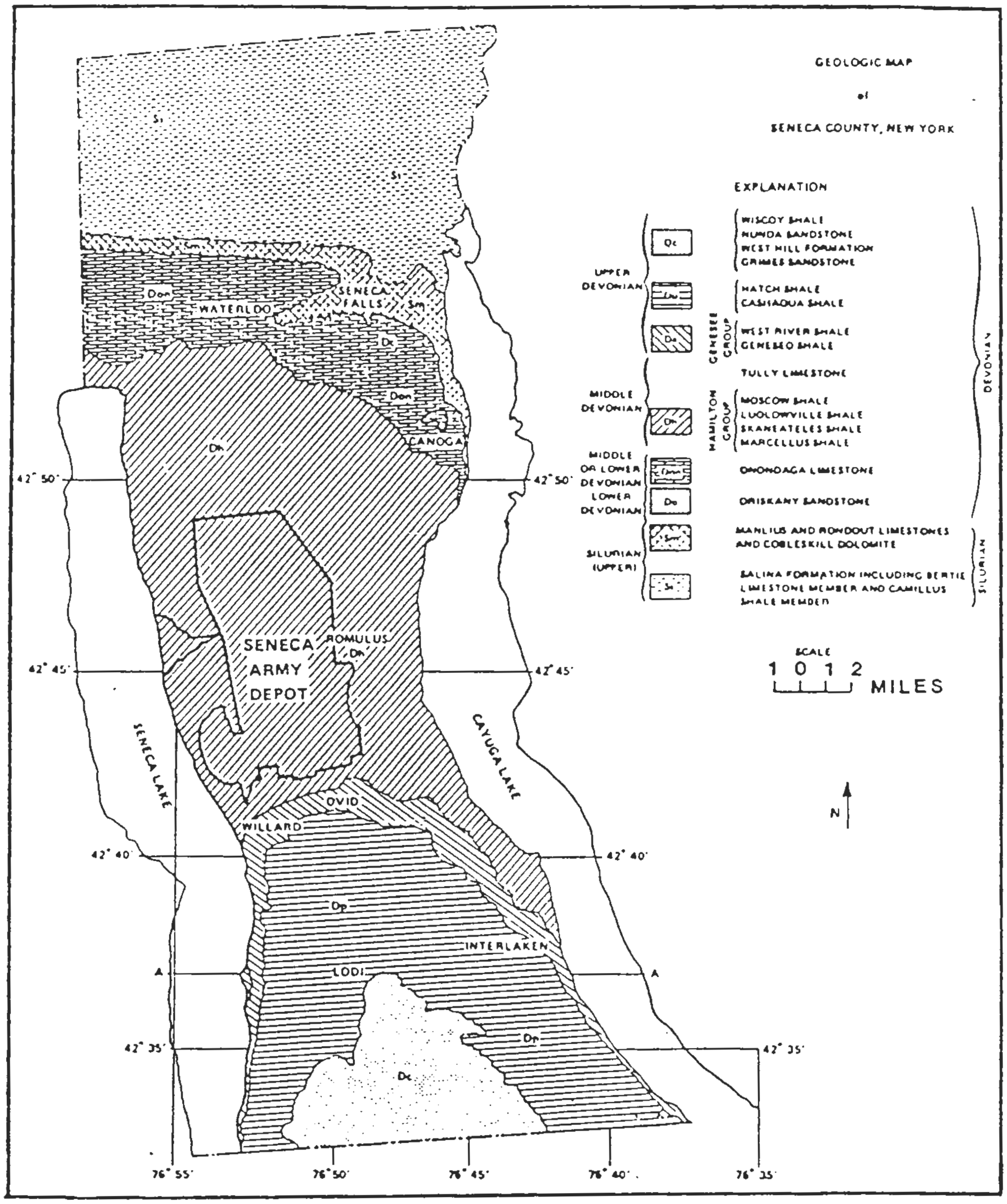

Figure 2.3-1
GEOLOGIC MAP OF SENECA COUNTY, NEW YORK

SOURCE: USATHAMA, 1980.

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The southern two-thirds of the county (the area including SEAD) is underlain by Middle and Upper Devonian sedimentary rocks that consist largely of beds of shale and flagstone interbedded with layers of sandstone and limestone of limited extent. The shales are relatively impermeable and adsorb, transmit, and yield water slowly. Although the porosity of some shales may be high, the small size of the openings between constituent grains inhibits rapid transmission of water. The joints and other secondary openings in the shales are generally very narrow or are filled with fine silt and clay. The number of such openings diminishes with depth. Because the shale beds are composed dominantly of insoluble clay minerals, there is little opportunity for the widening of secondary openings through solution activities (Mozola, 1951).

In the general landfill area, the shallow groundwater is contained within the surficial soils and the upper weathered portion of the bedrock. The groundwater discharge is controlled by the bedrock surface and flows across the site toward the west-southwest. Figure 2.3-2 illustrates the potentiometric surface of the shallow zone measured at the site on October 24, 1988.

The low permeability of the Hamilton Group shales tends to inhibit downward seepage of water from the surficial deposits. Where such beds crop out in steep slopes, springs or seeps generally occur, resulting from lateral movement of water along bedding planes, which due to low permeability of the shale, is prevented from going deeper (Mozola, 1951). A spring may be defined as a natural discharge of groundwater from a single or multiple opening(s). When no opening is sharply defined, but a groundwater discharge is taking place over a large or indefinite area, the term seep is used. Swampy areas to the north

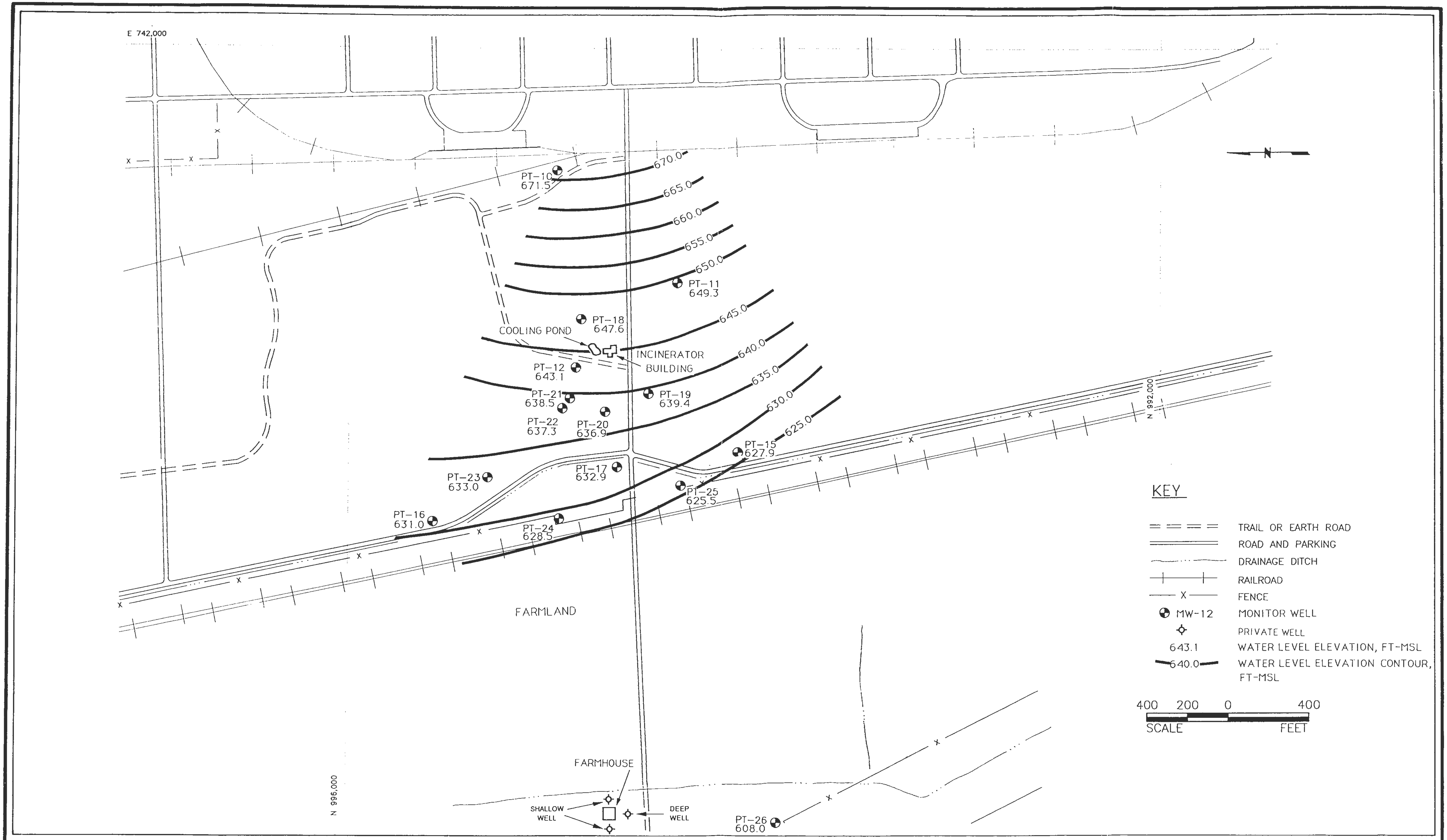

Figure 2.3-2
POTENTIOMETRIC SURFACE, SEAD ASH LANDFILL AREA,
OCTOBER 24, 1988

SOURCE: ICF, 1989; ESE.

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and northwest of the landfill, as illustrated in Figure 2.1-1, may be the result of surface discharge in the form of seeps.

The hydraulic conductivity of the fractured shale is likely to be considerably higher than the overlying glacial till or the underlying unweathered shale. However, the collective transmissivity of these surficial materials is low and results in a low-yield aquifer system with low groundwater flow velocities.

2.4 RESULTS OF PREVIOUS INVESTIGATIONS

Numerous areas of known or suspected waste disposal at SEAD were delineated in the USATHAMA (1980) Initial Installation Assessment (IIA). This investigation consisted of a records search and interviews conducted with current and former SEAD employees. As a result of this investigation, the former incinerator and landfill area was initially recognized as having a potential for groundwater contamination.

After this initial report, USAEHA conducted a monitoring program including installation of monitor wells in the landfill vicinity. From 1980 to 1987, USAEHA installed 15 monitor wells in the area and collected groundwater samples for VOC analysis. The most recent analytical results from the program are presented in the USAEHA Geohydrologic Study No. 38-26-0313-88 (1987). The study concluded that a definite contamination plume with two main constituents, TRCLE and T12DCLE, could be delineated. CHCL3, 12DCLE, C2H3CL, and a floating product that appeared to be diesel fuel were also detected.

Based on these results, SEAD instituted a sampling program for surface water and a privately owned offpost deep well west of the ash landfill area. No groundwater contamination was detected in the sampled offpost deep well. However, surface water sampling indicated that volatile contamination may extend to surface water and may have migrated offpost. It was suggested that the offpost surface water contamination may be due to contaminated groundwater seeping to the surface.

In August 1988, ESE prepared an update of the IIA for USATHAMA and recommended that a site investigation be conducted at the former landfill, burn pit, and incinerator.

ICF (1989) undertook a site investigation of the landfill area from September 1988 to February 1989. The scope of the site investigation included:

1. A soil-gas investigation,
2. Terrain conductivity surveys using low-frequency electromagnetic (EM) induction and ground-penetrating radar (GPR),
3. Soil sample collections within the landfill area for volatile and metals analyses,
4. Collection of 10 groundwater samples from the existing wells for volatile and metals analyses, and
5. Performance of slug tests on several of the existing wells.

The results of the investigation indicated that the landfill contained contaminated fill materials and numerous buried metal objects. Relatively high levels of volatile chlorinated solvent chemicals such as TRCLE, T12DCLE, and CHCL3 were detected in the soils. Low to moderate metals concentrations were detected in the soils. Groundwater within the landfill is contaminated with volatile chlorinated hydrocarbons at levels that have caused the formation of a downgradient plume extending at least to the western limits of SEAD property. The contaminated groundwater has been investigated only in the shallow aquifer extending down to competent bedrock at a depth of approximately 10 ft-bls. The results of the investigation also indicated the potential presence of additional source areas to the north of the projected limits of the landfill.

2.4.1 GROUNDWATER SAMPLING AND ANALYSIS

Analytical results from the November 1988 and January 1990 sampling events are summarized in Table 2.4-1. Concentrations of TRCLE detected during the November 17, 1988 and January 5, 1990 groundwater sampling events are presented in Figure 2.4-1. Concentrations of TRCLE, with the highest levels at well PT-18, have migrated to the western boundary of the SEAD, with concentrations of 2.4 micrograms per liter (μg/L) and 4.0 μg/L detected in PT-15 and PT-24, respectively. These TRCLE concentrations do not include data contouring, as it is likely that more than one source area exists, and migration pathways may include more than just the shallow groundwater system (e.g., surface drainage and underground piping). Concentrations of TRCLE decrease to relatively low values downgradient from PT-18 to PT-20. Concentrations during the January 5, 1990 sampling event decreased from 2,500 μg/L in PT-18 to 23.0 μg/L in PT-20. However, further downgradient, TRCLE concentrations in January 5, 1990, increased significantly from 23.0 μg/L in PT-20 to 170 μg/L in PT-17.

Table 2.4-1. Analytical Results for Groundwater Sampling

Site Identification	Test Name	Sample Date	Concentration (μg/L)	Boolean
MW-28	CHCL3	Jan. 5, 1990	1.0	BDL
MW-29	CHCL3	Jan. 5, 1990	1.0	BDL
MW-30	CHCL3	Jan. 5, 1990	1.0	BDL
MW-31	CHCL3	Jan. 5, 1990	1.0	BDL
MW-32	CHCL3	Jan. 5, 1990	1.0	BDL
MW-33	CHCL3	Jan. 5, 1990	1.0	BDL
PT-10	CHCL3	Jan. 5, 1990	1.0	BDL
PT-10	CHCL3	Nov. 15, 1988	2.25	BDL
PT-10	CHCL3	Nov. 16, 1990	2.25	BDL
PT-11	CHCL3	Jan. 5, 1990	1.0	BDL
PT-12	CHCL3	Jan. 5, 1990	1.0	BDL
PT-12	CHCL3	Nov. 17, 1988	2.25	BDL
PT-13	CHCL3	Jan. 5, 1990	1.0	BDL
PT-14	CHCL3	Jan. 5, 1990	1.0	BDL
PT-15	CHCL3	Jan. 5, 1990	1.0	BDL
PT-15	CHCL3	Nov. 16, 1990	2.25	BDL
PT-16	CHCL3	Jan. 5, 1990	1.0	BDL
PT-17	CHCL3	Jan. 5, 1990	1.0	BDL
PT-17	CHCL3	Nov. 16, 1990	2.25	BDL
PT-18	CHCL3	Jan. 5, 1990	86.0	
PT-18	CHCL3	Nov. 17, 1990	489.0	
PT-19	CHCL3	Jan. 5, 1990	1.0	BDL
PT-20	CHCL3	Jan. 5, 1990	1.0	BDL
PT-20	CHCL3	Nov. 17, 1988	2.25	BDL
PT-21	CHCL3	Jan. 5, 1990	1.0	BDL
PT-21	CHCL3	Nov. 17, 1988	2.25	BDL
PT-22	CHCL3	Jan. 5, 1990	1.0	BDL
PT-22	CHCL3	Nov. 17, 1988	2.25	BDL
PT-23	CHCL3	Jan. 5, 1990	1.0	BDL
PT-24	CHCL3	Jan. 5, 1990	1.0	BDL
PT-24	CHCL3	Nov. 16, 1988	2.25	BDL
PT-25	CHCL3	Jan. 5, 1990	1.0	BDL
PT-25	CHCL3	Nov. 16, 1990	2.25	BDL
MW-28	C2H3CL	Jan. 5, 1990	1.0	BDL
MW-29	C2H3CL	Jan. 5, 1990	1.0	BDL
MW-30	C2H3CL	Jan. 5, 1990	1.0	BDL

Table 2.4-1. Analytical Results for Groundwater Sampling
(Continued, Page 2 of 5)

Site Identification	Test Name	Sample Date	Concentration ($\mu g/L$)	Boolean
PT-10	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-11	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-12	C2H3CL	Jan. 5, 1990	7.0	
PT-13	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-14	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-15	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-16	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-17	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-18	C2H3CL	Jan. 5, 1990	10.0	BDL
PT-19	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-20	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-21	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-22	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-23	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-24	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-25	C2H3CL	Jan. 5, 1990	1.0	BDL
MW-31	C2H3CL	Jan. 5, 1990	1.0	BDL
MW-32	C2H3CL	Jan. 5, 1990	1.0	BDL
MW-33	C2H3CL	Jan. 5, 1990	1.0	BDL
PT-10	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-11	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-12	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-13	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-14	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-15	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-16	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-17	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-18	C2H5CL	Jan. 5, 1990	10.0	BDL
PT-19	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-20	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-21	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-22	C2H5CL	Jan. 5, 1990	1.0	BDL

Table 2.4-1. Analytical Results for Groundwater Sampling
(Continued, Page 3 of 5)

Site Identification	Test Name	Sample Date	Concentration (μg/L)	Boolean
PT-23	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-24	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-25	C2H5CL	Jan. 5, 1990	1.0	BDL
MW-28	C2H5CL	Jan. 5, 1990	1.0	BDL
MW-29	C2H5CL	Jan. 5, 1990	1.0	BDL
MW-30	C2H5CL	Jan. 5, 1990	1.0	BDL
MW-31	C2H5CL	Jan. 5, 1990	1.0	BDL
MW-32	C2H5CL	Jan. 5, 1990	1.0	BDL
MW-33	C2H5CL	Jan. 5, 1990	1.0	BDL
PT-10	TRCLE	Jan. 5, 1990	1.0	BDL
PT-10	TRCLE	Nov. 15, 1988	2.51	BDL
PT-10	TRCLE	Nov. 16, 1988	2.51	BDL
PT-11	TRCLE	Jan. 5, 1990	1.0	BDL
PT-12	TRCLE	Jan. 5, 1990	129.0	
PT-12	TRCLE	Nov. 17, 1988	1,600.0	
PT-13	TRCLE	Jan. 5, 1990	1.0	BDL
PT-14	TRCLE	Jan. 5, 1990	1.0	BDL
PT-15	TRCLE	Nov. 16, 1988	2.51	BDL
PT-15	TRCLE	Jan. 5, 1990	2.40	
PT-16	TRCLE	Jan. 5, 1990	1.0	BDL
PT-17	TRCLE	Jan. 5, 1990	170.0	
PT-17	TRCLE	Nov. 16, 1988	239.0	
PT-18	TRCLE	Jan. 5, 1990	2,500.0	
PT-18	TRCLE	Nov. 17, 1988	9,890.0	
PT-19	TRCLE	Jan. 5, 1990	1.0	BDL
PT-20	TRCLE	Jan. 5, 1990	23.0	
PT-20	TRCLE	Nov. 17, 1988	43.70	
PT-21	TRCLE	Jan. 5, 1990	1.0	BDL
PT-21	TRCLE	Nov. 17, 1988	2.51	BDL
PT-22	TRCLE	Nov. 17, 1988	43.70	
PT-22	TRCLE	Jan. 5, 1990	87.0	
PT-23	TRCLE	Jan. 5, 1990	1.0	BDL
PT-24	TRCLE	Nov. 16, 1988	2.51	BDL

Table 2.4-1. Analytical Results for Groundwater Sampling (Continued, Page 4 of 5)

Site Identification	Test Name	Sample Date	Concentration (μg/L)	Boolean
PT-24	TRCLE	Jan. 5, 1990	4.00	
PT-25	TRCLE	Jan. 5, 1990	1.0	BDL
PT-25	TRCLE	Nov. 16, 1988	2.51	BDL
MW-28	TRCLE	Jan. 5, 1990	27.0	
MW-29	TRCLE	Jan. 5, 1990	1.0	BDL
MW-30	TRCLE	Jan. 5, 1990	1.0	BDL
MW-31	TRCLE	Jan. 5, 1990	27.0	
MW-32	TRCLE	Jan. 5, 1990	1.0	BDL
MW-33	TRCLE	Jan. 5, 1990	1.0	BDL
PT-10	T12DCE	Jan. 5, 1990	1.0	BDL
PT-11	T12DCE	Jan. 5, 1990	1.0	BDL
PT-12	T12DCE	Jan. 5, 1990	1.0	BDL
PT-13	T12DCE	Jan. 5, 1990	1.0	BDL
PT-14	T12DCE	Jan. 5, 1990	1.0	BDL
PT-15	T12DCE	Jan. 5, 1990	1.0	BDL
PT-16	T12DCE	Jan. 5, 1990	1.0	BDL
PT-17	T12DCE	Jan. 5, 1990	1.0	BDL
PT-18	T12DCE	Jan. 5, 1990	10.0	BDL
PT-19	T12DCE	Jan. 5, 1990	1.0	BDL
PT-20	T12DCE	Jan. 5, 1990	1.0	BDL
PT-21	T12DCE	Jan. 5, 1990	1.0	BDL
PT-22	T12DCE	Jan. 5, 1990	4.0	
PT-23	T12DCE	Jan. 5, 1990	1.0	BDL
PT-24	T12DCE	Jan. 5, 1990	1.0	BDL
PT-25	T12DCE	Jan. 5, 1990	1.0	BDL
MW-28	T12DCE	Jan. 5, 1990	1.0	BDL
MW-29	T12DCE	Jan. 5, 1990	1.0	BDL
MW-30	T12DCE	Jan. 5, 1990	1.0	BDL
MW-31	T12DCE	Jan. 5, 1990	1.0	BDL
MW-32	T12DCE	Jan. 5, 1990	1.0	BDL
MW-33	T12DCE	Jan. 5, 1990	1.0	BDL

Table 2.4-1. Analytical Results for Groundwater Sampling
(Continued, Page 5 of 5)

Site Identification	Test Name	Sample Date	Concentration (μg/L)	Boolean
PT-10	12DCE	Nov. 15, 1988	2.66	BDL
PT-10	12DCE	Nov. 16, 1988	2.66	BDL
PT-12	12DCE	Nov. 17, 1988	2,790.0	
PT-15	12DCE	Nov. 16, 1988	2.66	BDL
PT-17	12DCE	Nov. 16, 1988	2.66	BDL
PT-18	12DCE	Nov. 17, 1988	445.0	
PT-20	12DCE	Nov. 17, 1988	53.70	
PT-21	12DCE	Nov. 17, 1988	2.66	BDL
PT-22	12DCE	Nov. 17, 1988	86.90	
PT-24	12DCE	Nov. 16, 1988	72.60	
PT-25	12DCE	Nov. 16, 1988	2.66	BDL
PT-10	12DCLE	Nov. 15, 1988	1.15	BDL
PT-10	12DCLE	Nov. 16, 1988	1.15	BDL
PT-12	12DCLE	Nov. 17, 1988	1.15	BDL
PT-15	12DCLE	Nov. 16, 1988	1.15	BDL
PT-17	12DCLE	Nov. 16, 1988	59.60	
PT-18	12DCLE	Nov. 17, 1988	1.15	BDL
PT-20	12DCLE	Nov. 17, 1988	1.15	BDL
PT-21	12DCLE	Nov. 17, 1988	1.15	BDL
PT-22	12DCLE	Nov. 17, 1988	1.15	BDL
PT-24	12DCLE	Nov. 16, 1988	1.15	BDL
PT-25	12DCLE	Nov. 16, 1988	1.15	BDL

Note: BDL = below detection limit.
Boolean = concentration qualifier.
CHCL3 = chloroform.
C2H3CL = vinyl chloride.
C2H5CL = chloroethane.
12DCE = cis-1,2-dichloroethene.
12DCLE = 1,2-dichloroethane.
MW/PT = monitor well sample.
T12DCLE = trans-1,2-dichloroethene.
TRCLE = trichloroethene.

Source: ESE.

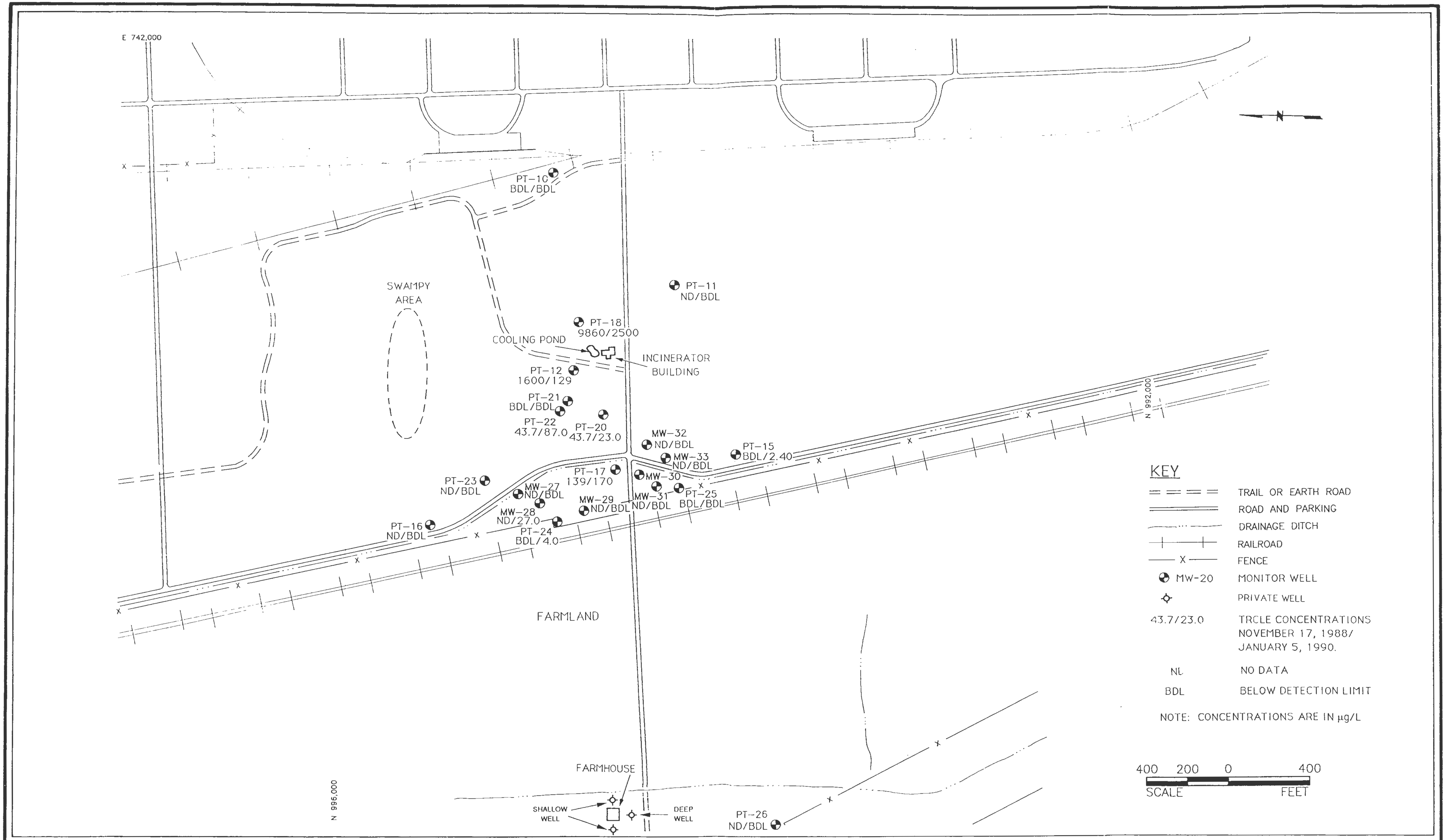

Figure 2.4-1
TRCLE CONCENTRATIONS IN GROUNDWATER
NOVEMBER 17, 1988 AND JANUARY 5, 1990

SOURCE: ESE.

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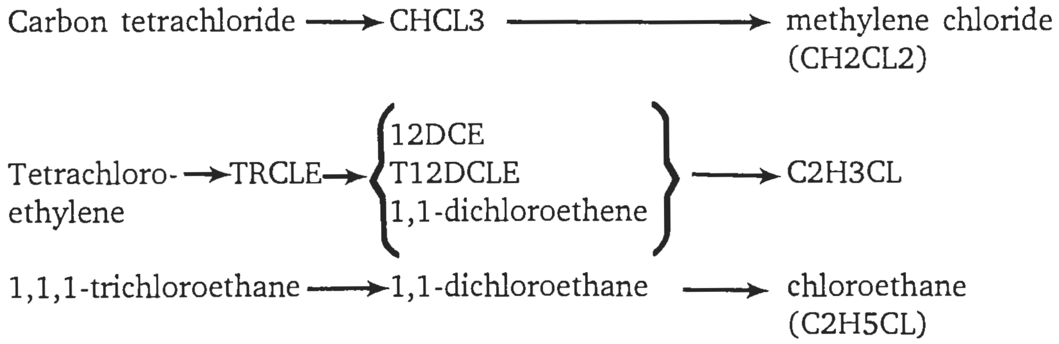
Figure 2.4-2 presents the 12DCE concentrations detected in the groundwater during the November 17, 1988 and January 5, 1990 sampling events. The highest concentration of 12DCE (2,790 μg/L) was detected at PT-12 during the November 1988 sampling event. Well PT-24, at the west boundary of SEAD had a 12DCE concentration of 72.60 μg/L on this date.

CHCL3 (see Table 2.4-1), a volatile constituent, was detected only in well PT-18, at concentrations of 489 μg/L in November 1988 and 86.0 μg/L in January 1990. The reduction in concentrations along the transport pathway is possibly due to loss of the volatile constituents from the shallow groundwater.

Many of these compounds have a parent/daughter product relationship by biodegradation. The following flowchart illustrates the biodegradation of many of the constituents being investigated at SEAD (Ward et al., 1985). An understanding of chemical biodegradation may be useful in comprehending the groundwater geochemistry of the site.



The privately owned wells west of SEAD (see Figure 2.4-2) have also been sampled. None of the contaminants found at SEAD were detected in these wells.

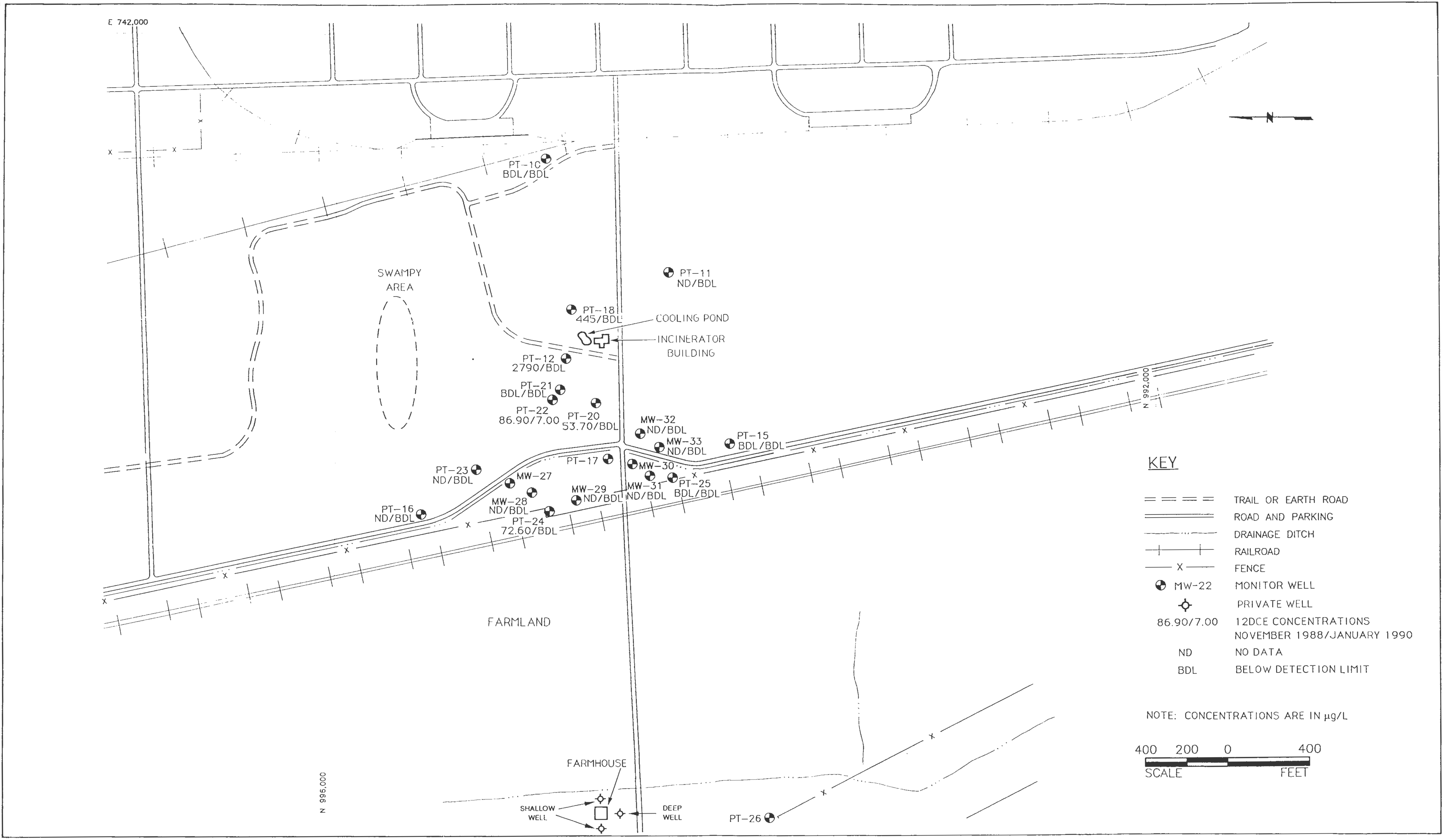


Figure 2.4-2
12DCE CONCENTRATIONS IN GROUNDWATER
NOVEMBER 17, 1988 AND JANUARY 5, 1990

SOURCE: ESE.

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2.4.2 SOIL BORING SAMPLING AND ANALYSIS

Soil samples were collected and analyzed for volatiles and metals. Samples were taken at approximately 2 to 3 ft-bls. The soil boring locations are shown in Figure 2.4-3. Analytical results for the soil boring program are presented in Table 2.4-2.

As shown in Table 2.4-2, several volatiles and metals were detected in the soil samples. The volatile concentrations of TRCLE ranged from 660 μg/L at borehole BH-29 to 4 μg/L at BH-19. Concentrations of T12DCLE ranged from 8,600 μg/L at BH-29 to 3 μg/L at BH-19. C2H3CL was detected in BH-29 at a concentration of 1,700 μg/L. According to the USAEHA Geohydrologic Study (1987), diesel-like material was reportedly observed during the drilling of BH-29. Table 2.4-2 shows additional concentrations of TRCLE and T12DCLE were detected west of BH-29 at BH-18, BH-19, BH-24, and BH-27. East of BH-29, no volatile constituents were detected.

The concentrations of metals found in the soil samples indicate the metal content of the Ash Landfill Area was above background levels. Four samples were collected from the Ash Landfill Area: SS-02, SS-03, SS-04, and SS-05. These samples contained elevated concentrations of zinc (ranging from 33,000 μg/L in SS-05 to 350 μg/L in SS-03), lead (ranging from 620 μg/L in SS-05 to 240 μg/L in SS-02), copper (ranging from 230 μg/L in SS-05 to 68 μg/L in SS-03), chromium (ranging from 41 μg/L in SS-05 to 25 μg/L in SS-02), and cadmium (ranging from 13 μg/L in SS-02 to 2.3 μg/L in SS-04). These concentrations were all above the background levels indicated from SS-01.

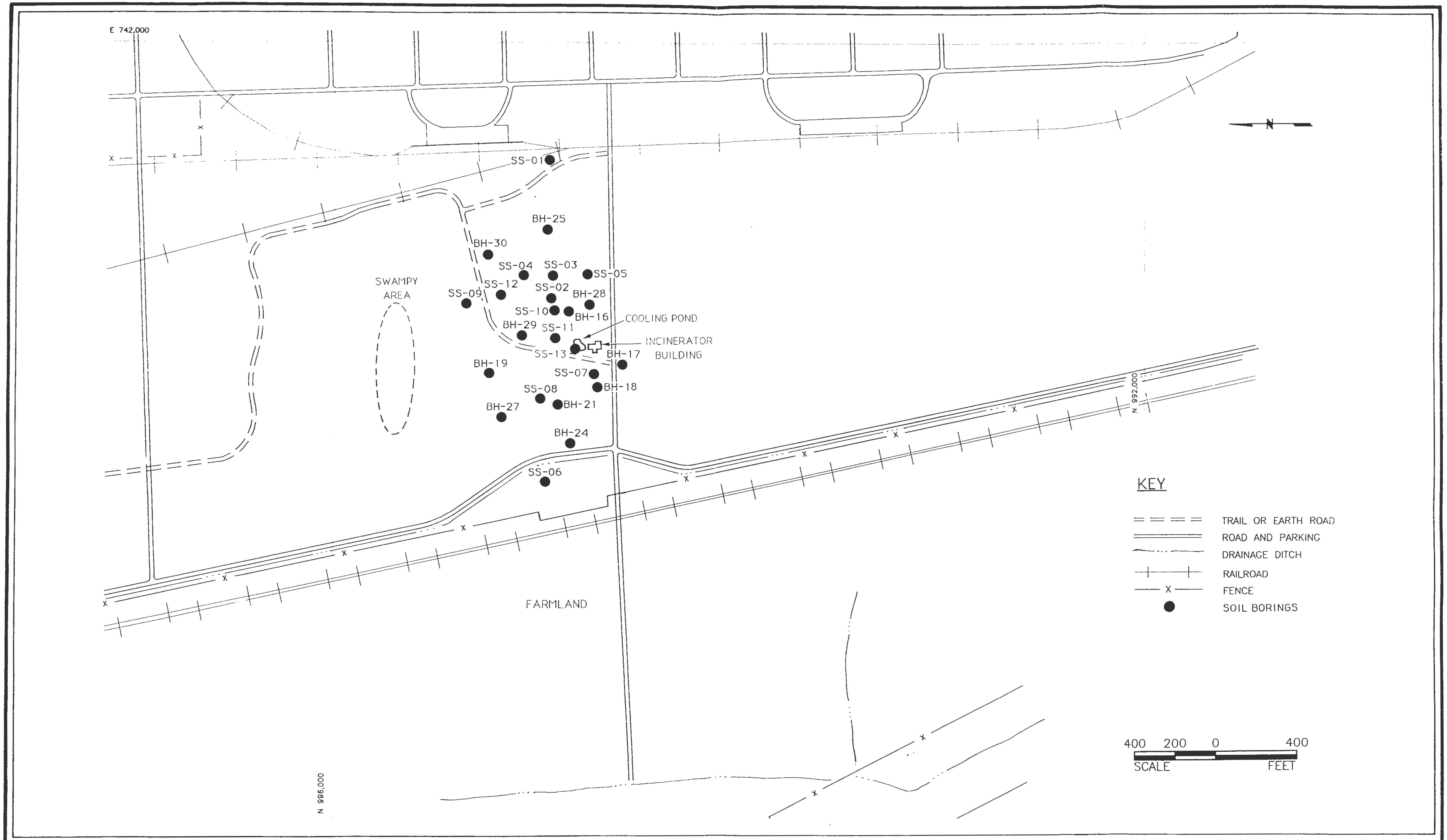

Figure 2.4-3
EXISTING SOIL BORING LOCATIONS IN SEAD ASH LANDFILL AREA

SOURCE: ESE.

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Table 2.4-2. Analytical Results of Subsoil Samples

Boreholes	Date	TRCLE	T12DCLE	C2H3CL	CH2CL2	Zn	Pb	Cu	Cr	Cd
BH-16	October 1987	NA	NA	BDL	NA	NA	NA	NA	NA	NA
BH-17	October 1987	BDL	13	BDL	NA	NA	NA	NA	NA	NA
BH-18	October 1987	37	6	BDL	NA	NA	NA	NA	NA	NA
BH-19	October 1987	4	NA	BDL	NA	NA	NA	NA	NA	NA
BH-21	October 1987	NA	NA	NA	NA	NA	NA	NA	NA	NA
BH-24	October 1987	88	7	BDL	NA	NA	NA	NA	NA	NA
BH-25	October 1987	BDL	BDL	BDL	NA	NA	NA	NA	NA	NA
BH-27	October 1987	51	76	BDL	NA	NA	NA	NA	NA	NA
BH-28	October 1987	BDL	BDL	BDL	NA	NA	NA	NA	NA	NA
BH-29	October 1987	660	8,600	1,700	NA	NA	NA	NA	NA	NA
BH-30	October 1987	BDL	BDL	BDL	NA	NA	NA	NA	NA	NA
SS-01	October 31, 1988	NA	NA	NA	NA	58	10	17	22	BDL
SS-02	October 31, 1988	BDL	16.8	NA	73	7,100	240	75	25	13
SS-03	October 31, 1988	NA	NA	NA	NA	350	290	68	32	3.2
SS-04	October 31, 1988	NA	NA	NA	NA	1,700	250	110	32	2.3
SS-05	October 31, 1988	NA	NA	NA	NA	33,000	620	230	41	8.0
SS-06	October 31, 1988	BDL	BDL	NA	74	NA	NA	NA	NA	NA
SS-07	October 31, 1988	BDL	BDL	NA	BDL	NA	NA	NA	NA	NA

Table 2.4-2. Analytical Results of Subsoil Samples (Continued, Page 2 of 2)

Boreholes	Date	TRCLE	T12DCLE	C2H3CL	CH2CL2	Zn	Pb	Cu	Cr	Cd
SS-08	October 31, 1988	BDL	BDL	NA	70	NA	NA	NA	NA	NA
SS-09	October 31, 1988	BDL	BDL	NA	62	NA	NA	NA	NA	NA
SS-10	November 2, 1988	BDL	BDL	NA	27	NA	NA	NA	NA	NA
SS-11	November 2, 1988	NA	BDL	NA	66	NA	NA	NA	NA	NA
SS-12	November 2, 1988	BDL	BDL	NA	35	NA	NA	NA	NA	NA
SS-13	November 2, 1988	BDL	BDL	NA	38	NA	NA	NA	NA	NA

Note:
Cd = cadmium.
C2H3CL = vinyl chloride.
CH2CL2 = methylene chloride.
Cr = chromium.
Cu = copper.
NA = not analyzed.
Pb = lead.
SS = soil sample.
T12DCLE = trans-1,2-dichloroethene.
TRCLE = trichloroethene.
Zn = zinc.

All concentrations in μg/g.

Source: ESE.

2.4.3 SURFACE WATER SAMPLING AND ANALYSIS

Figure 2.4-4 shows surface water sampling locations near the ash landfill area, including offpost sampling locations. Table 2.4-3 presents the analytical results of the surface water sampling. These locations were selected along drainage ditches that flow downgradient from the landfill. Surface seeps downgradient of the landfill were also sampled.

Volatiles (T12DCLE and TRCLE) and metals (zinc, lead, chromium, cadmium, barium, and copper) were detected in the surface water samples. The concentrations of T12DCLE detected ranged from 110 μg/L at surface water sample SW-32 (taken in the drainage ditch approximately 100 ft west of the incinerator building) to 3.01 μg/L at SW-2 (taken in the drainage ditch approximately 800 ft west of the SEAD boundary fence). Concentrations of TRCLE detected ranged from 50 μg/L at SW-32 to 12.3 μg/L at SW-4, located in the surface water seep area, approximately 700 ft west of the SEAD boundary fence.

Most samples analyzed for metals were collected offpost. Only one onpost sample was analyzed for metals. Surface water sample SW-10, collected just east of the SEAD boundary fence, had concentrations of metals above detection limits: 23.6 μg/L of zinc and 24.9 μg/L of barium.

Surface water analyses indicate that contamination may extend offpost in surface drainage systems and surface water seeps. The offpost surface water contamination may be due to groundwater seepage to the surface and not as a direct result of surface water flow.

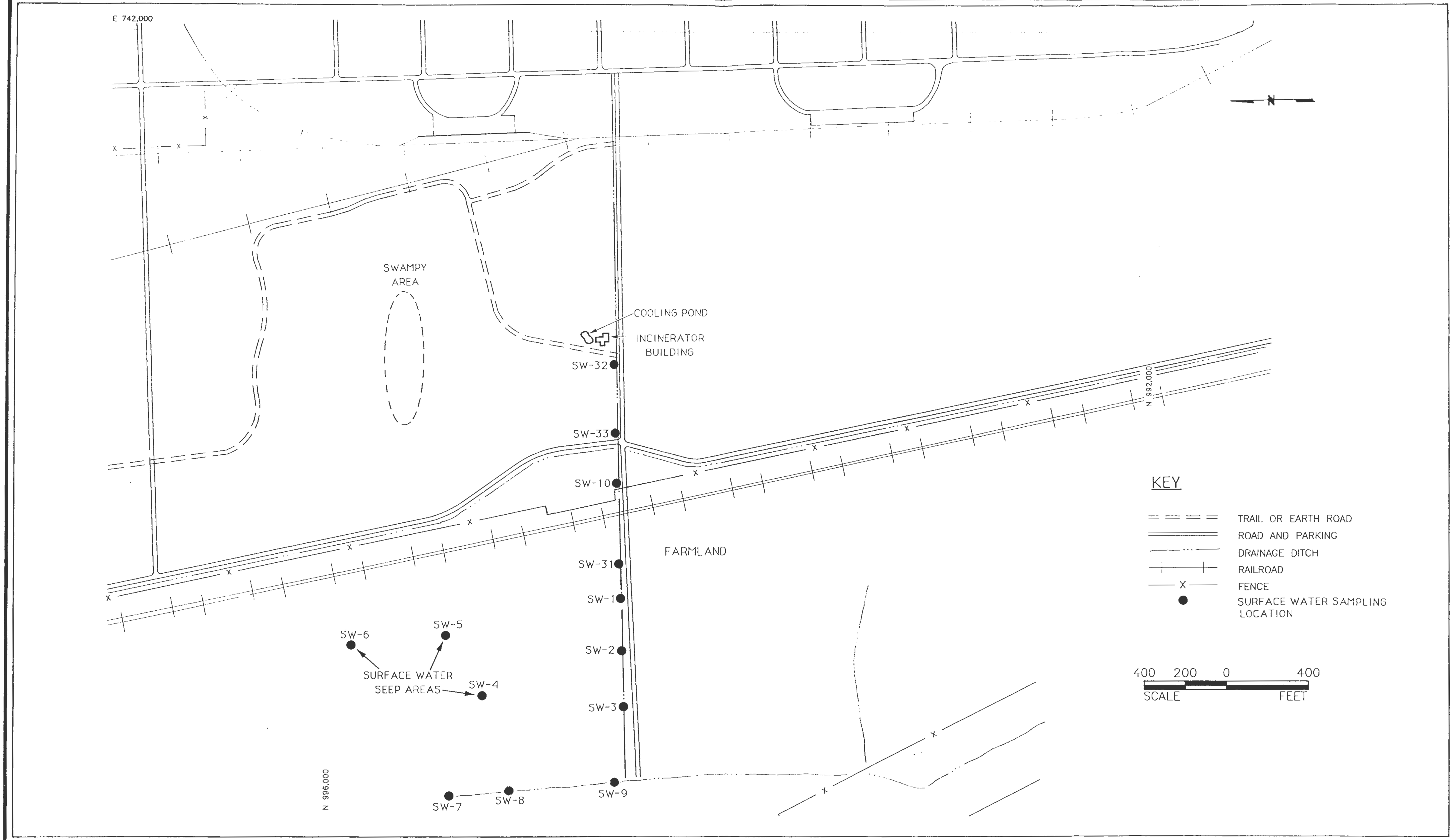

Figure 2.4-4
EXISTING SURFACE WATER LOCATIONS IN SEAD ASH LANDFILL AREA

SOURCE: ESE.

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Table 2.4-3. Analytical Results of Surface Water Samples

Surface Water Samples	Date	T12DCLE	TRCLE	Zn	Pb	Cr	Cd	Ba	Cu
SW-01	May 15, 1989	3.93	30.20	253	54.60	BDL	BDL	59.60	9.83
SW-02	May 15, 1989	3.01	18.50	135	BDL	BDL	BDL	42.90	BDL
SW-03	May 15, 1989	BDL	13.00	35.20	BDL	BDL	4.18	30.30	BDL
SW-04	May 15, 1989	BDL	12.30	274	44.90	BDL	BDL	55.20	BDL
SW-05	May 15, 1989	BDL	BDL	BDL	BDL	BDL	9.54	29.10	BDL
SW-06	May 15, 1989	BDL	BDL	25.30	BDL	7.61	BDL	49.50	BDL
SW-07	May 15, 1989	BDL	BDL	BDL	BDL	BDL	BDL	23.70	BDL
SW-08	May 15, 1989	BDL	BDL	BDL	BDL	BDL	BDL	24.10	9.05
SW-09	May 15, 1989	BDL	BDL	BDL	BDL	BDL	BDL	30.00	BDL
SW-10	May 15, 1989	BDL	BDL	23.60	BDL	BDL	BDL	24.90	BDL
SW-31	October 1987	4	23	NA	NA	NA	NA	NA	NA
SW-32	October 1987	110	50	NA	NA	NA	NA	NA	NA
SW-33	October 1987	BDL	BDL	NA	NA	NA	NA	NA	NA

Note:
Ba = barium.
Cd = cadmium.
Cr = chromium.
Cu = copper.
T12DCLE = trans-1,2-dichloroethene.
Pb = lead.
SW = surface water sample.
TRCLE = trichloroethene.
Zn = zinc.

All concentrations are in μg/L.

Source: ESE.

2.4.4 AQUIFER TESTING

ICF (1989) conducted single-well aquifer tests (slug tests) in the landfill area to estimate the hydraulic conductivity of the water-bearing materials underlying the site. The slug test is applicable for fully or partially penetrating wells in unconfined aquifers. The procedure involves instantaneously displacing a volume of water in a well and measuring the water level within the well over an elapsed time as the well recovers. The rate of groundwater flow is then estimated from the hydraulic permeabilities as determined from these slug tests.

The slug tests were performed on four shallow groundwater monitor wells (PT-11, PT-12, PT-15, and PT-23) screened in the overburden and upper (weathered) portion of the bedrock and one monitor well (PT-21) that extends approximately 10 ft into the bedrock. These wells were chosen because of the adequate thickness of the water column in the wells and their location downgradient of the Ash Landfill Area. Slug test data were analyzed according to the methods developed by Bouwer and Rice (1976). The slug-in portion of the test is invalid if the equilibrium water level is within the screened interval (Bouwer, 1989). Because monitor wells are typically designed so the equilibrium water level is within the screened interval, the slug-in portion of the data from the ICF report was not used in the groundwater flow velocity estimates as presented in this section. Table 2.4-4 presents the hydraulic conductivity values developed from the single-well aquifer tests, in addition to the depths of those monitor wells used in the analysis and the height of the water column in each of these wells. The hydraulic conductivity values generated from the slug test analysis were used in conjunction with the soil porosity estimate and the calculated groundwater flow gradient to develop an estimate for the average groundwater flow rate at the site.

Table 2.4-4. Aquifer Characteristics

Well Identification	Well Depth (ft-bls)	Column of Water in Well (ft)	Hydraulic Conductivity (slug-out) (ft/day)
PT-11	15.8	10.3	0.186
PT-12	10.0	4.0	8.76×10^{-2}
PT-15	15.7	9.2	3.69×10^{-3}
PT-23	9.4	3.7	2.07
Average Hydraulic Conductivity			0.587
PT-21	17.5	10.2	1.66×10^{-7} ft/day

Note: cm/sec = centimeters per second.
ft/day = feet per day.

Source: ICF, 1989.

Excluding PT-21, which had an extremely low hydraulic conductivity (slug-out) value of 1.66 x 10^{-7} feet per day (ft/day), the average hydraulic conductivity, as determined by the slug test analysis, was 0.587 ft/day. Typical tight clay soils have hydraulic conductivity values that range from 10^{-2} to 10^{-5} ft/day, and more permeable silty soils have hydraulic conductivity values that range from 10 to 1 feet per second (ft/sec) (Davis, 1969). These values are similar to those determined by ICF. As an explanation of the low values in well PT-21, ICF (1989) reported that this well is screened in the unweathered portion of the shale. During the slug tests, little recovery of groundwater was observed in the well. The report further states that the well had yet to fully recover after 7 days had elapsed. It is suspected that PT-21 is not screened in a water-bearing zone, and the presence of water in the well is attributed to leakage around the seal from the upper water-bearing zone.

The groundwater flow gradient in the area was calculated using the distance between PT-17 and PT-18 (680 ft), located along the general direction of maximum gradient. The change in groundwater elevation between the two wells, as measured on October 24, 1988 (see Figure 2.3-2), was 14.8 ft. Thus, the gradient obtained for the area of interest was 2.2 x 10^{-2} feet per foot (ft/ft). The effective porosity of the aquifer was estimated to be 11 percent from typical values for silty clays and shale bedrock (ICF, 1989).

The average linear velocity of groundwater flow, calculated using the method described by Freeze and Cherry (1979), is based on the average value of hydraulic conductivity (2.07 x 10^{-4} cm/sec or 5.87 x 10^{-1} ft/day), the gradient measured between PT-17 and PT-18 (2.2 x 10^{-2}), and an estimate of the aquifer porosity (11 percent). The linear velocity in the unconfined aquifer, for the area of the site between PT-17 and PT-18, based on these values is 1.18 x 10^{-6} ft/day or, 43 feet per year (ft/yr).

Figure 2.4-5 illustrates the locations of underground water lines and buried utilities in the ash landfill area. These underground features could serve as preferential paths of contaminant migration.

2.4.5 GEOPHYSICAL SURVEY RESULTS

2.4.5.1 ICF Geophysical Survey Results

ICF (1989) completed a geophysical survey at the site in October and November 1988 with the following objectives:

1. To detect and delineate the presence and/or absence of buried metal within the landfill, grease pit, and ash pit areas;
2. To determine if the buried metal could be drums or other likely contaminant sources;
3. To correlate with the soil gas survey to determine the location and extent of contamination sources and migration pathways; and
4. To scan areas selected for the soil gas survey for buried metal (e.g., drums) and utilities, so that the soil gas probe would not encounter such items.

To meet these objectives, the EM induction technique, commonly referred to as terrain conductivity, and GPR were used. The EM survey, completed with the Geonics EM-31DL Terrain Conductivity Meter, was used for the majority of the surveillance and locating efforts and for surveying of all gridded portions of the site. GPR was used at selected locations to determine whether buried metal

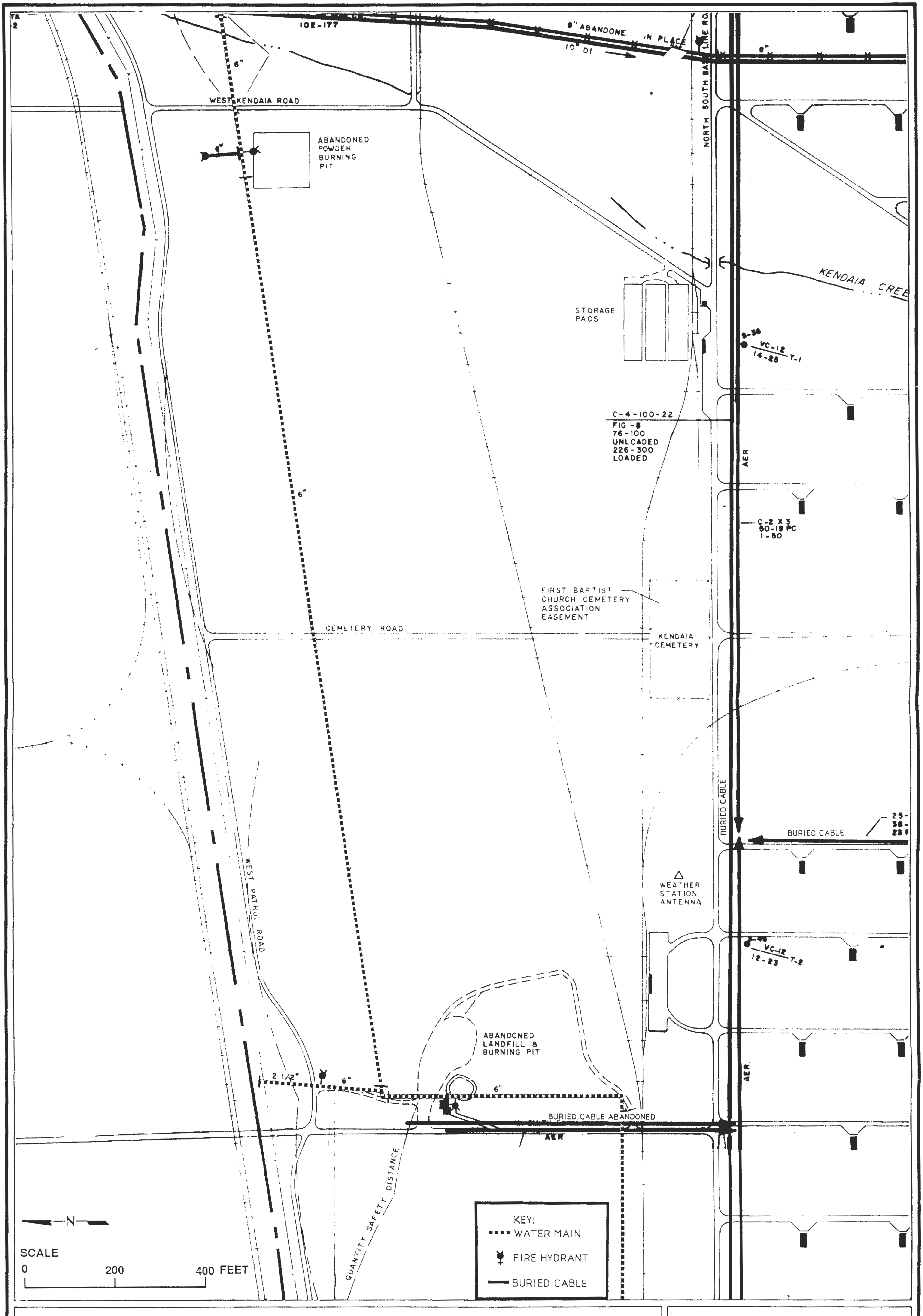

Figure 2.4-5
LOCATIONS OF UNDERGROUND UTILITIES IN THE
SEAD ASH LANDFILL AREA

SOURCE: SEAD, 1988.

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targets would yield container-like signatures and to provide better depth discrimination needed to clear areas for the soil gas survey.

Field measurements were made along a survey grid on 50-ft centers in the landfill, ash pit, and grease pit portions of the site and on 100-ft centers in the portion of the site downgradient from the landfill. EM measurements were made every 20 ft along each 50-ft and 100-ft survey line in the north-south and east-west directions.

EM anomalies indicating buried metal occurred on the northernmost original survey line. Therefore, the survey grid was extended along the north end of the landfill by 100 ft. To establish continuity between the two areas, the survey lines were also extended from the grease pit area into the landfill and ash pit gridded areas.

Figure 2.4-6 illustrates a contour plot of the EM readings taken in the north-south direction. EM readings ranged from 0 to 120 millimhos per meter (mmhos/m) and were contoured in Figure 2.4-6 with 20-mmhos/m increments. Actual contour values are not visible in Figure 2.4-6; however, the concentrations of contour lines is helpful in identifying features. This contour map indicates a buried water line, interpreted to be located in the area trending from east to west past the incinerator building. Because the contours are interpreted as buried metal and/or highly conductive landfill materials, the landfill is suspected to extend to the north outside of the survey area. The grease pit area, located in the eastern portion of the plot, does not exhibit significant changes in conductivity readings; therefore, it probably does not

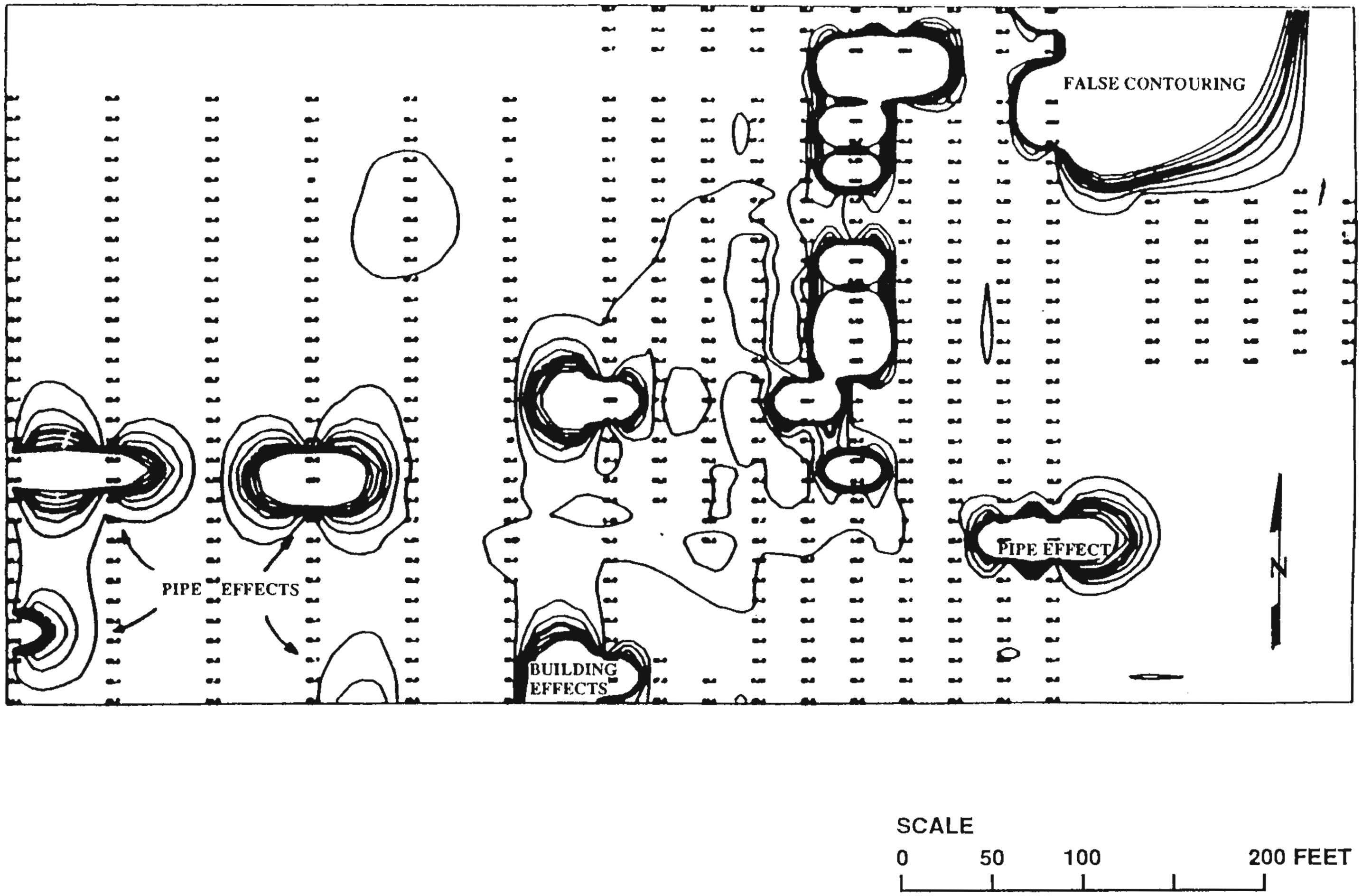

Figure 2.4-6
EM DATA CONTOURS SHOWING LIMITS OF THE ASH LANDFILL AREA (NORTH-SOUTH DIRECTION)

SOURCE: ICF, 1989.

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contain buried metal or other landfilled materials similar to those observed adjacent to the incinerator.

Figure 2.4-7 provides a map based on the interpretation of the EM data and shows where buried metal is believed to be located (ICF, 1989). Although the form of individual objects cannot be determined from the data, it appears that buried metal is scattered throughout the landfill area, generally being concentrated along the J, K, L, and M survey lines. Further information on the identity of the buried metal was provided by interpretation of the GPR survey data.

Generally, the GPR survey confirmed the existence of buried metal in areas identified by the EM survey. Figure 2.4-8 illustrates areas surveyed by GPR where principal targets were detected. The GPR data provide a variety of signatures and particular patterns characteristic of typical landfilled and buried objects. Figure 2.4-8 illustrates those areas where GPR signatures indicate the possible presence of buried drums. These signatures could also be produced by cylindrical objects other than drums, such as pipes, cables, or sections of culvert. However, correlation of the GPR target locations with the metal signatures from the EM surveys shows that the objects are most likely metallic.

2.4.5.2 <u>ESE Geophysical Survey Results</u>

Detection Sciences, Inc. (1990), under the supervision of ESE, completed a geophysical survey at the site in October 1989. In the previous geophysical survey conducted by ICF in October and November 1988, which encompassed the ash landfill area and burning pits, geophysical anomalies were observed along the northern boundary of the grid presented in Figures 2.4-6 and 2.4-7.

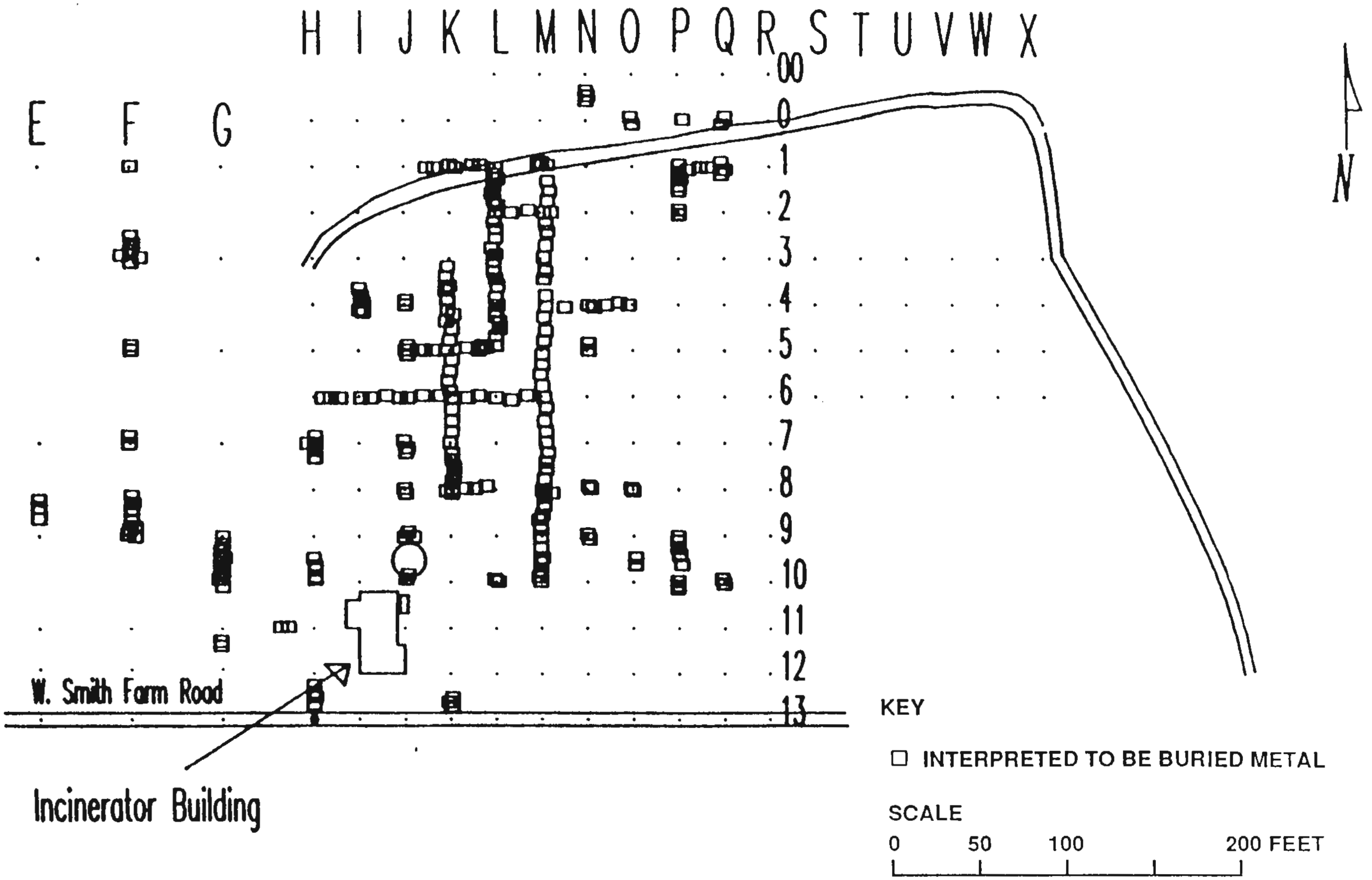

Figure 2.4-7
BURIED METAL LOCATED BY EM MEASUREMENTS

SOURCE: ICF, 1989.

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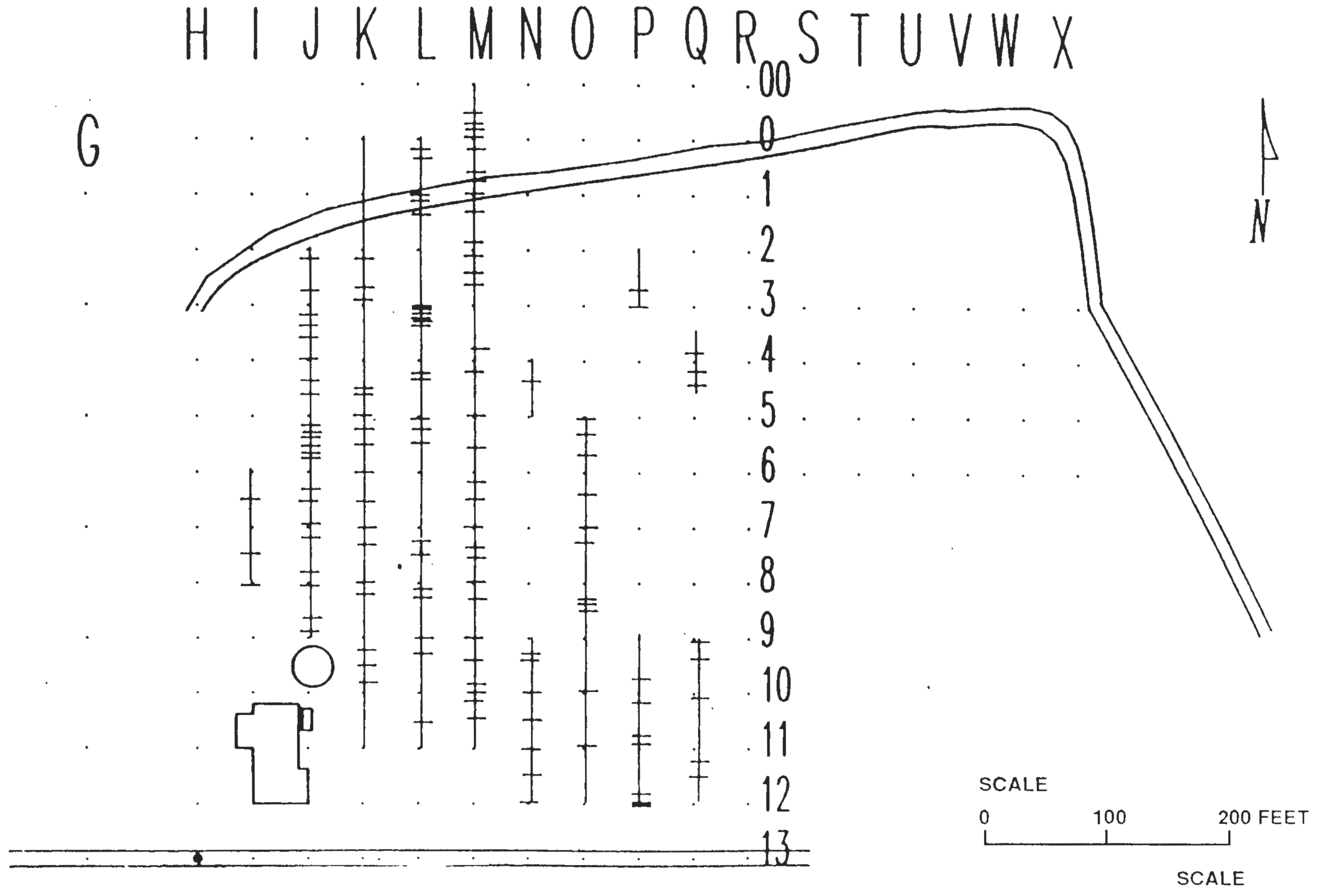

Figure 2.4-8
SURVEYED AREA AND BURIED OBJECTS LOCATED WITH RADAR

SOURCE: ICF, 1989.

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Based on these results, it was necessary to extend the investigation further north to delineate these anomalies.

The ESE geophysical survey (Hunter/ESE, 1989) overlapped the 1988 ICF survey by two east-west trending survey lines, as shown in Figure 2.4-9. Originally, the ESE grid was designed to extend the ICF grid by 360 ft to the north before the site was cleared of brush and small trees in preparation for the geophysical survey. After the proposed grid area was cleared, an ash pile was identified on the surface east of the original grid. The grid was then extended to the east to include this area by shortening the northern reach to 310 ft. The final grid and surface features observed within this grid are presented in Figure 2.4-10.

Figures 2.4-11 and 2.4-12 present the quadrature and in-phase EM contours developed from the survey. The surface features, as previously presented in Figure 2.4-10, have been superimposed on the EM contours. The EM anomalies correspond well to the features observed on the surface. The quadrature-phase or 90-degree (°) component is linearly proportional to the earth's conductivity, whereas the in-phase or 180° component is extremely sensitive to high-conductivity objects such as buried metal. The 180° component allows better detection of buried metal where the soils are highly conductive. As seen by comparing Figures 2.4-11 and 2.4-12, the correlation between the in-phase and quadrature-phase contours is good. Good correlation of the two data sets is expected, because background soils consist of relatively resistant silt and weathered shale, and the debris areas contain an abundance of metallic objects. Therefore, the background conductivities were resistive enough that the anomalies were evident.

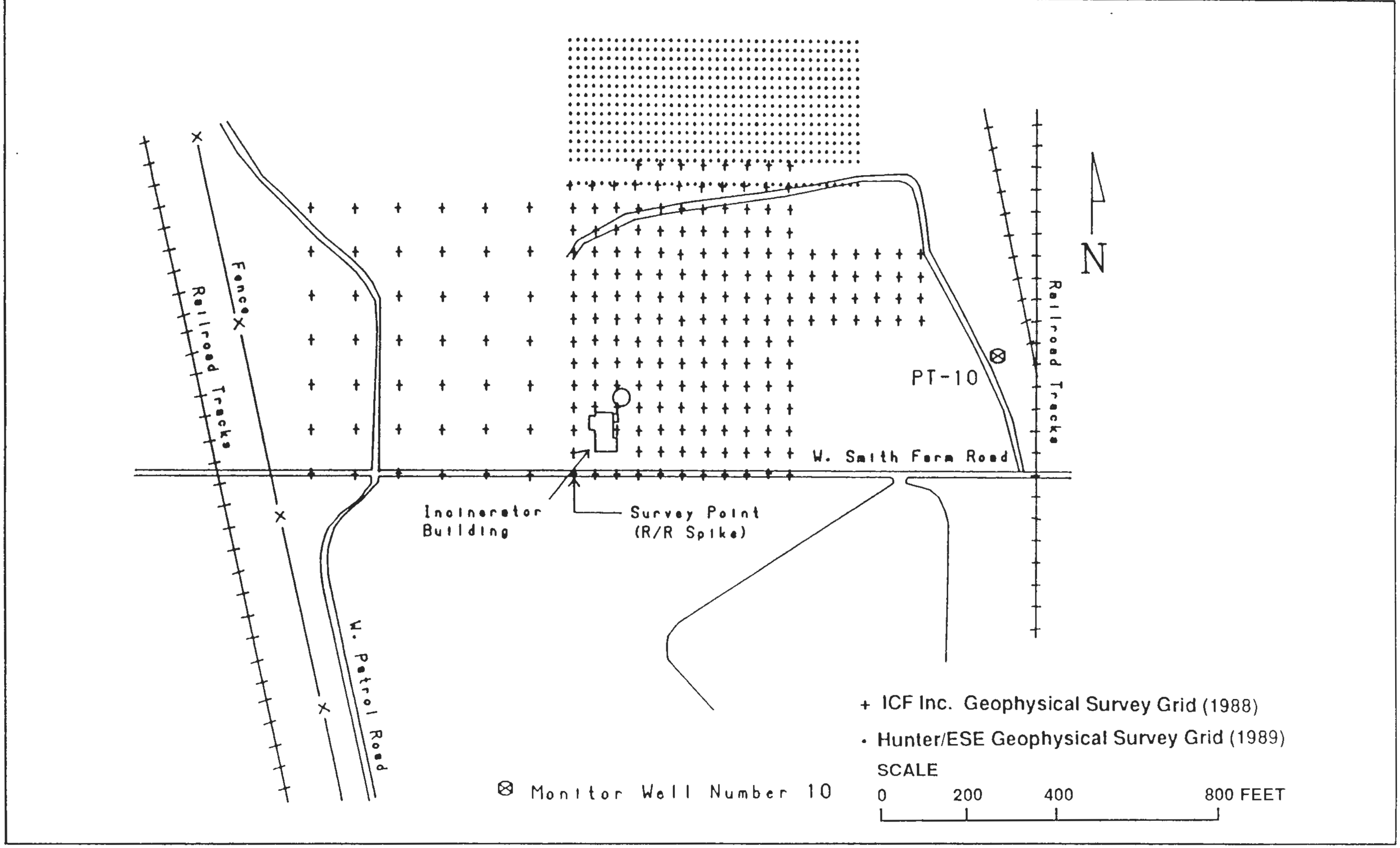

Figure 2.4-9
GEOPHYSICAL SURVEYS AT SEAD ASH LANDFILL AREA

SOURCE: ICF, 1989.

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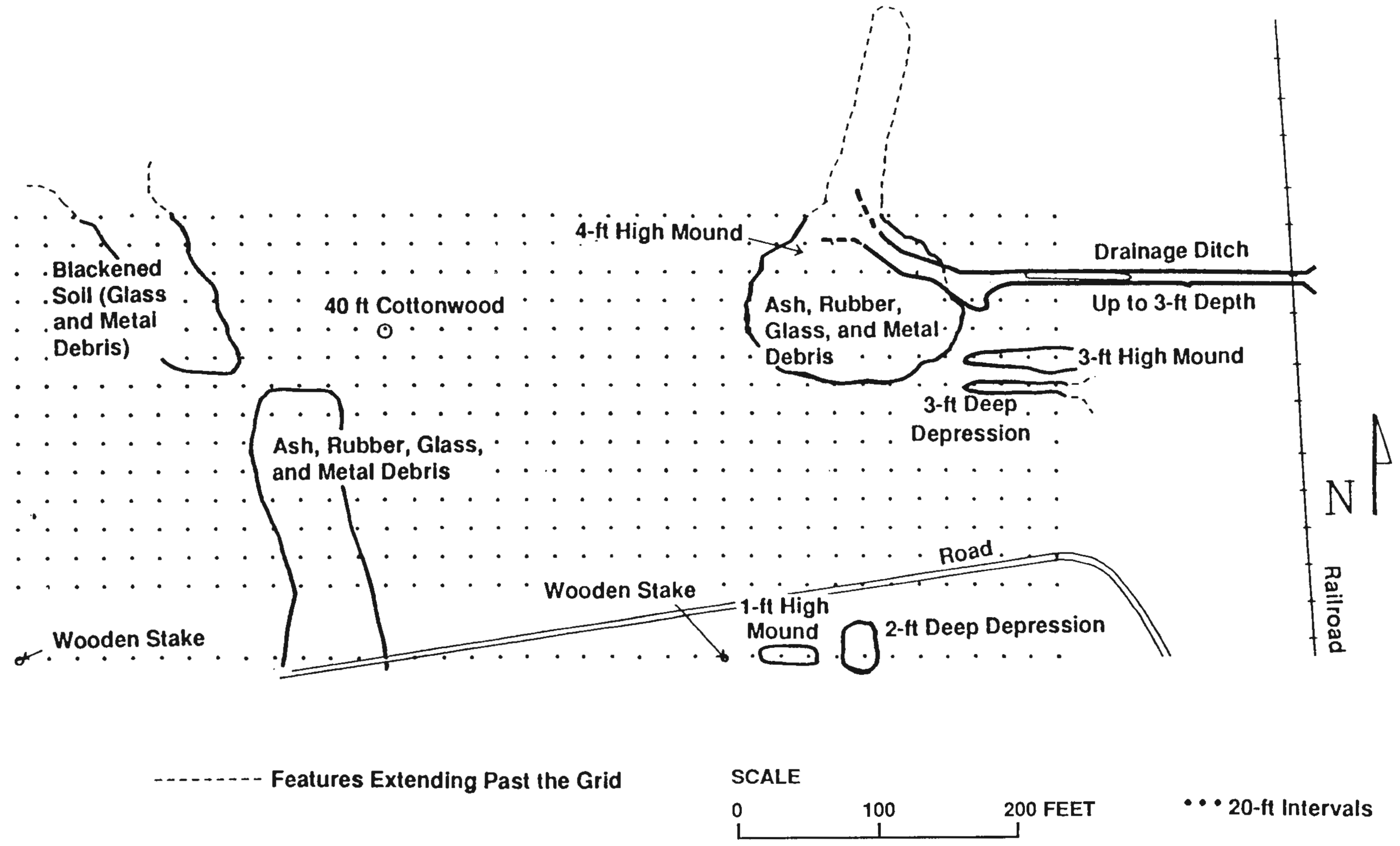

Figure 2.4-10
ESE GEOPHYSICAL SURVEY GRID WITH SURFACE FEATURES

SOURCE: ESE.

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

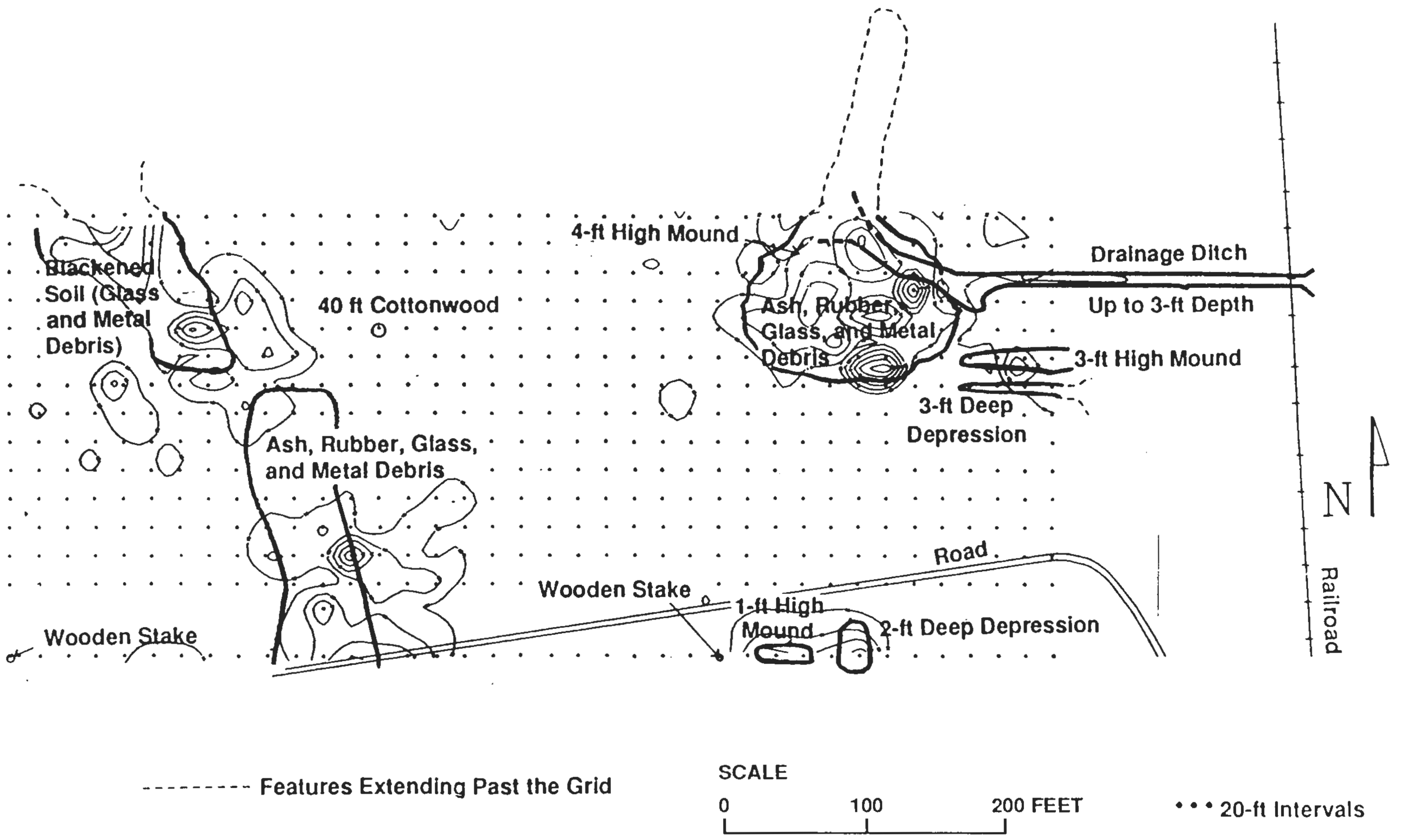

Figure 2.4-11
QUADRATURE EM CONTOURS (mmhos/m) SUPERIMPOSED OVER EXISTING SURFACE FEATURES

SOURCE: ESE.

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

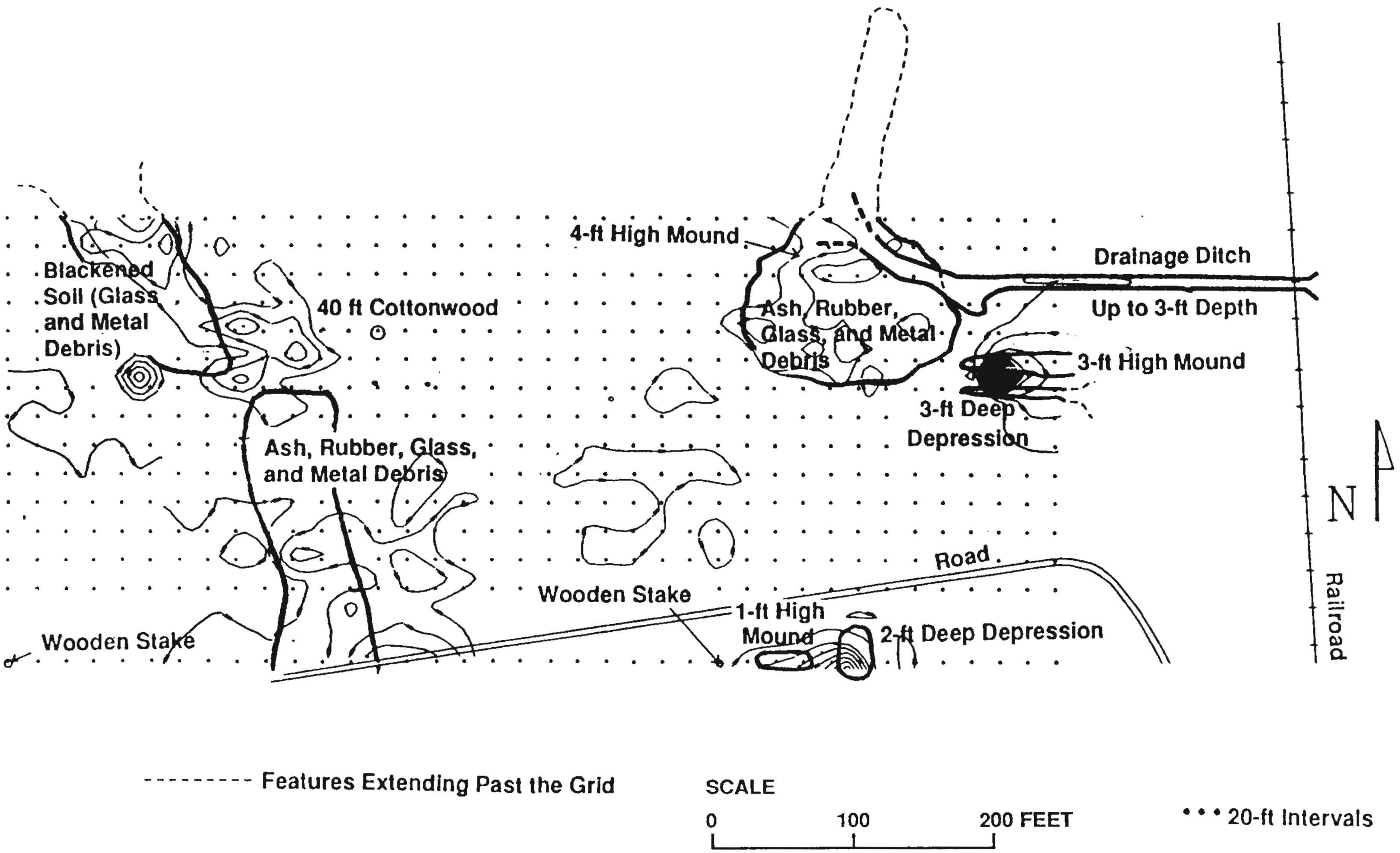

Figure 2.4-12
IN-PHASE EM CONTOURS SUPERIMPOSED OVER EXISTING SURFACE FEATURES

SOURCE: ESE.

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The GPR survey was based of the field plots of the EM anomalies. The GPR survey map is presented in Figure 2.4-13. Due to wet, soft soil conditions in the northwestern portion of the survey area, the geophysics team was unable to maneuver the survey van close enough to this area to allow hand-pulling of the GPR antenna over the area previously shown to have EM anomalies. In the remainder of the areas where the EM showed anomalous values, GPR also showed evidence of disrupted earth and/or the presence of metals. GPR was operating with a 120 megahertz (MHz) antenna, rendering it functionally blinded by the transmit/receive pulse at the start of each scan. Consequently, the data do not show the conditions in the upper 3 ft of the subsurface. Because of this blind zone, GPR is unable to distinguish a shallow burial from a surface dumping.

As reported by Detection Sciences, Inc. (1990), the GPR signatures within the burial/debris areas were remarkably homogeneous, indicating that the various anomalies contained relatively similar mixes of metals and nonmetals. In general, a busy radar signature indicates the burial of solid waste materials. No radar signatures indicating the presence of intact drums were observed. The ability of GPR to identify drums is based on buried targets having the size, shape, and characteristics of a buried drum (Detection Sciences, Inc., 1990). To the radar, a crushed drum is simply a piece of scrap metal and is not identifiable as a drum.

In general, the radar (GPR) contour map (see Figure 2.4-13) indicates what appears to be normal soil horizons, or background conditions, over the majority

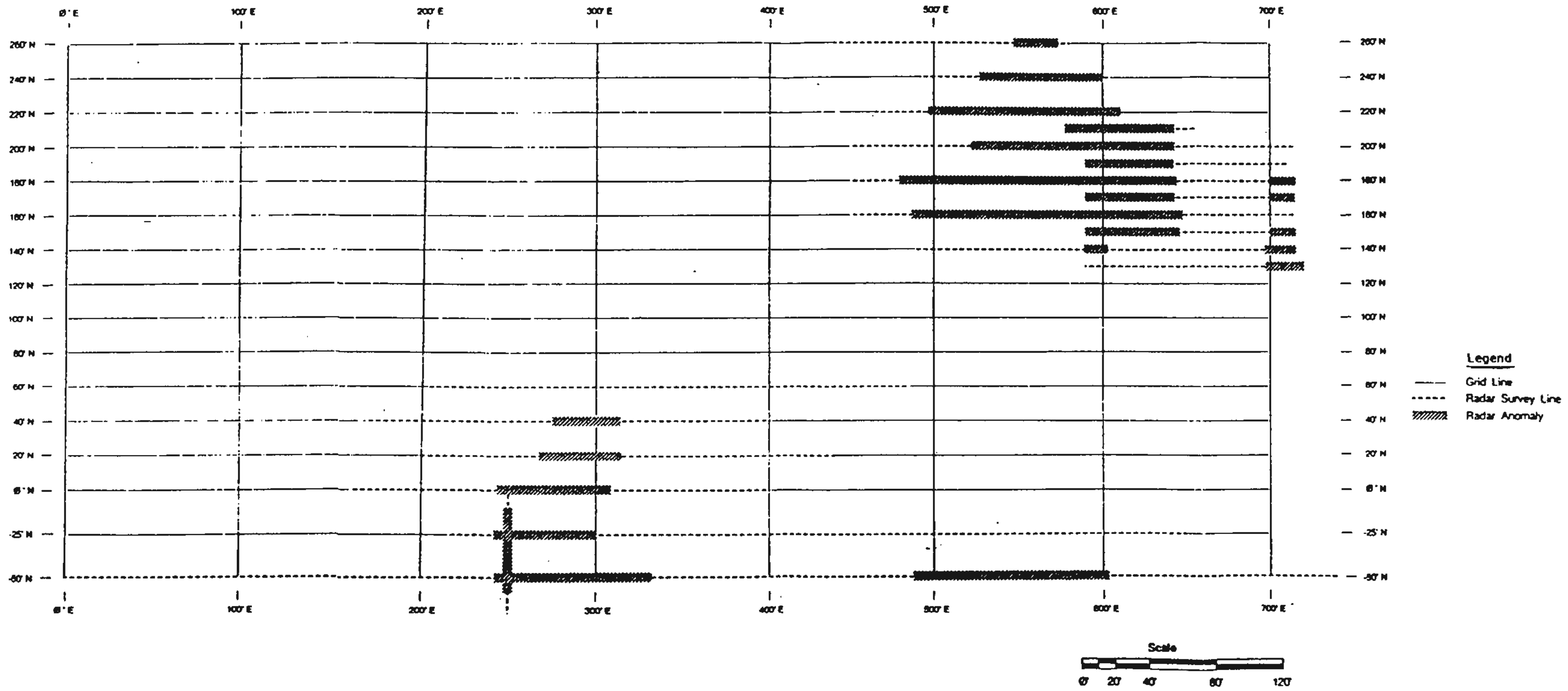

Figure 2.4-13
RADAR SURVEY MAP

SOURCE: ESE.

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of the survey lines. The ash mound features as previously presented in Figure 2.4-10 were interpreted to be surface piles with no debris burial.

2.4.6 ICF SOIL GAS SURVEY

Target Environmental Services, Inc. (TES), under supervision of ICF, conducted a soil gas survey at SEAD in October and November 1988 (ICF, 1989). The primary objective of the soil gas survey was for screening to provide indications of likely source locations within the landfill area for correlation with the geophysical survey data and for determining the best locations for subsequent sampling. Secondary objectives of the survey were to investigate downgradient contaminant migration patterns in relation to existing monitor well locations and to determine whether the underground diesel fuel tank adjacent to the incinerator building is leaking.

Soil gas sampling was performed across the survey grid established at the onset of the field investigation. Initially, approximately 80 samples were collected from points spanning the entire grid, with greater focus on the suspected areas of the landfill. Samples were collected from the following areas:

1. The underground diesel fuel tank and in the vicinity of boring hole BH-29 (see Figure 2.4-3), where free-floating material had been reported (USAEHA Geohydrologic Study No. 38-26-0313-88);
2. The grease pits east of the landfill area; and
3. Within the former sludge pond.

The soil gas grid and sampling locations were extended farther to the north than originally planned because the geophysical survey detected buried metal in that direction and because of positive soil gas results along the north side of the landfill. The grid was also expanded to the west because volatile constituents were previously detected in groundwater samples taken near the western SEAD boundary. Soil gas would provide a screening technique to determine whether the apparent contamination was localized or was associated with groundwater contamination from the landfill. The density of sampling in the downgradient (western) direction was increased to encompass all 100-ft grid points west of the landfill.

Soil gas sample analysis on a portable gas chromatograph revealed elevated hydrocarbon concentrations primarily in the central portion of the survey area as illustrated in Figure 2.4-14. The highest total volatiles levels were detected north of the incinerator building, at station K-6. A compound with an elution time near that of toluene accounts for essentially all of the remaining volatiles measured on the site, outside of the K-6 area. The local anomaly at K-6 reflects the occurrence of a nonstandardized light (volatile) hydrocarbon. Low concentrations of TRCLE and T12DCLE were measured on the western half of the site, coinciding with the points of highest total volatiles concentrations. During removal of the steel probe used in the soil gas technique, a liquid substance was observed. Soil gas samples from this location (K-6 and K-8), were sent to the TES laboratory for overnight analysis. Gas chromatography (GC) analysis indicated the presence of typical diesel fuel or kerosene constituents and a wide variety of volatile chlorinated species in these samples. Eight other locations directly surrounding this area were then sampled. These samples showed significantly reduced photoionization detector (PID) readings and levels of volatiles in the field GC analysis, indicating that the incident involved a localized source of contaminants.

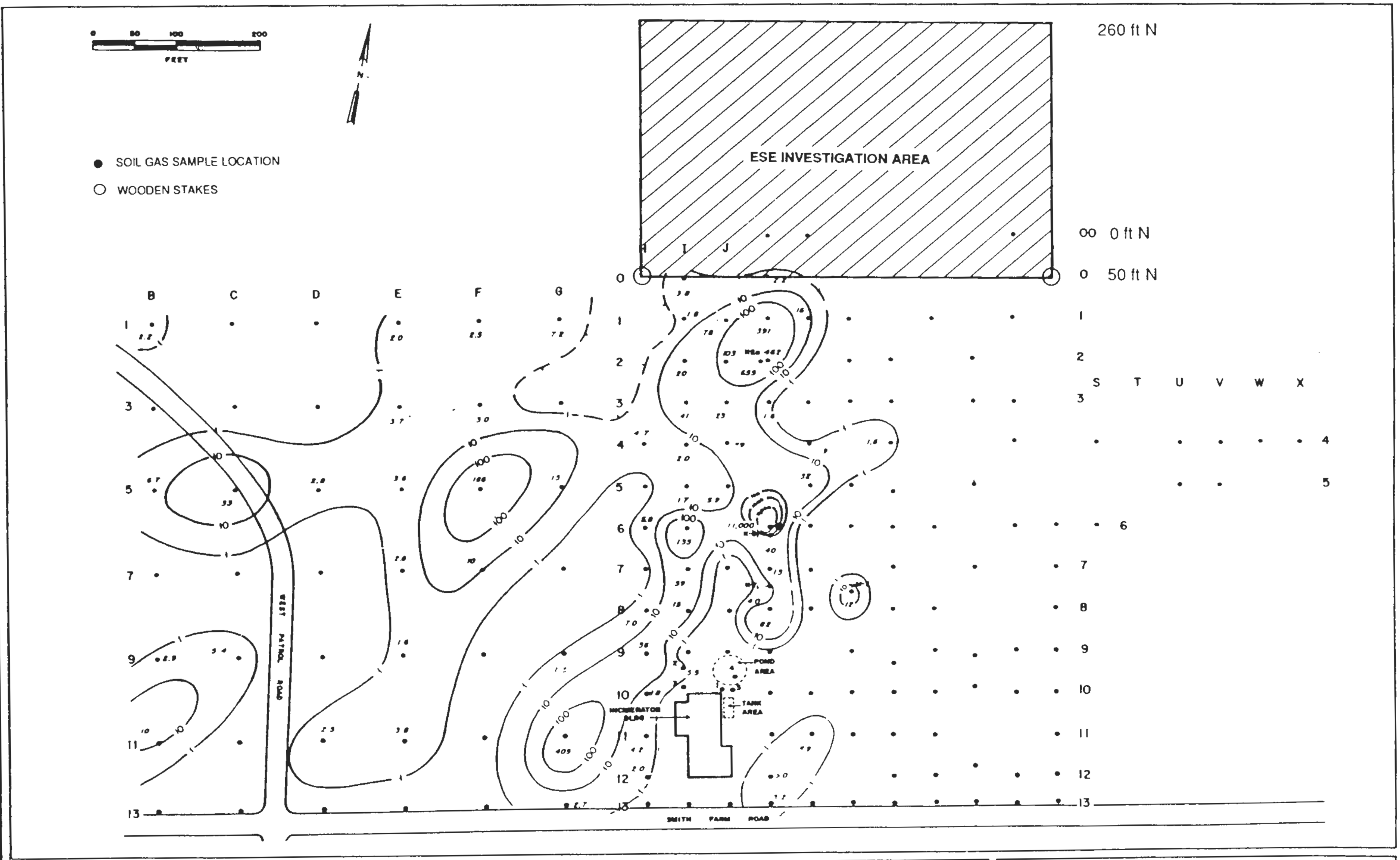

Figure 2.4-14
SOIL GAS RESULTS

SOURCES: TARGET ENVIRONMENTAL SERVICES, INC., 1989; ESE.

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3.0 SCOPING OF THE RI/FS

The area at SEAD under consideration for scoping of the RI/FS consists of an abandoned incinerator facility that was in operation from 1974 to 1979; a former cooling water pond, used to cool incinerator ashes; ash landfill area, used for ash disposal and temporary storage during the incinerator operation period; burning pits, located in the landfill area and used for burning uncontaminated trash; construction debris disposal area; and unlined kitchen grease pits. In addition, ESE personnel identified the following potentially contaminated areas during a site visit: a limited swampy area northwest of the incinerator facility, suspected buried debris piles north of the ash landfill area, and an underground storage tank (UST) adjacent to the incinerator building. The overall site conditions are also taken into consideration for conceptual site model development.

The scoping process includes the following:

1. Collection and evaluation of the existing data.
2. Development of a conceptual site model based on the available data to identify the potential human health and environmental risks and the need for the additional data collection.
3. Planning and execution of studies once data needs are identified.
4. This information leads to the initial identification of the chemical- and location-specific applicable or relevant and appropriate requirements (ARARs).
5. Once ARARs are identified, human health and ecological assessments and preliminary remedial alternatives should be identified and the FS and action-specific ARARs developed.

6. Data evaluation should be emphasized, followed by the RI and FS tasks.
7. A simultaneous community involvement program should be developed.

With input from all the aforementioned tasks, this RI/FS work plan was developed for site characterization and remedial alternatives development.

The existing data evaluation and site visit by ESE personnel (September 25, 1990) provides an overview of site conditions at the ash landfill area of SEAD. The following is an overview of the potential and identified contaminated areas and migration pathways of contaminants at the site.

3.1 CONCEPTUAL SITE MODEL

This section includes identification of waste sources, exposure pathways, and receptors at the SEAD site. Known and suspected sources of contamination, types of contaminants and affected media, known and potential routes of migration, and known and potential human and environmental receptors will be identified. This information will be used to develop a conceptual understanding of the potential risks to human health and ecological constituents due to the presence of contaminants at the ash landfill area.

3.1.1 CONTAMINATION SOURCES

The waste or contamination sources include the following:

1. A possible solvent dump located west of the former ash landfill, based on a soil gas survey (ICF, 1989);
2. Suspected buried debris piles north of the ash landfill area;

3. Grease pits, on the northeast edge of the landfill, used for the disposal of used kitchen grease;
4. A landfill extending north and east of the incinerator building, used for disposing of incinerator ash between 1974 and 1979 (SWMU No. SEAD-6);
5. An abandoned construction debris disposal area south of the incinerator/ash landfill area on the south side of South Smith Farm Road (SWMU No. SEAD-8);
6. Burning pits west of the incinerator building, and within the landfill area, that were used to burn uncontaminated trash from 1941 to 1974 (SWMU No. SEAD-14);
7. A cooling pond, adjacent to the incinerator building, used for cooling the incinerator (SWMU No. SEAD-3);
8. A UST, used to store diesel fuel, located adjacent to the incinerator building; and
9. A former incinerator (Building 2207), used to incinerate trash between 1974 and 1979 (SWMU No. SEAD-15).

3.1.2 MIGRATION PATHWAYS

Within the landfill area, contamination sources are within or near the more permeable weathered zone of shale bedrock, at approximately 3 to 10 ft below existing gradient. Contaminant migration in the shallow aquifer should occur, although at a low velocity. Soils disturbed by landfill activity would render the site more permeable to the contaminants, thus accelerating the downgradient migration. Horizontal groundwater migration is to the west or southwest, with local flow direction controlled by bedrock interfaces. There is no evidence of a significant connection between the shallow groundwater and the deeper aquifers. The surface water runoff from the landfill area is toward the west boundary of SEAD via a system of ditches and culverts that eventually connects to Seneca Lake.

The following are the essential plausible migration pathways to be considered:

1. Soil contamination onsite resulting from the releases from likely contaminated sources.
2. Air contamination from volatilization of the contaminants from soil and surface water. Dust may also be generated during some site investigation and remedial activities.
3. Groundwater contamination due to contaminant migration from subsurface and surface sources.
4. Surface water contamination might be due to the potential surface runoff from the contaminated soils and contaminated ditches, culverts (surface waterbodies), etc.

As shown in Figure 3.1-1, the most heavily contaminated zone within the landfill encompasses an area of approximately 250 ft extending east-west and 800 ft extending north-south, if both organic and inorganic contaminant sources are to be considered (ICF, 1989). If only volatile organic sources are to be considered, an area of about 100 by 300 ft has been identified as contaminated (ICF, 1989). Soils contaminated with metals extend from surface to a depth of approximately 7 ft. Existing monitor well sampling data indicate groundwater contamination from the possible subsurface or surface contamination sources. A contaminant plume from one or more sources in the landfill area has migrated to, and likely extends beyond, the western boundary of the site. There is a considerable variation in the relative concentrations of various

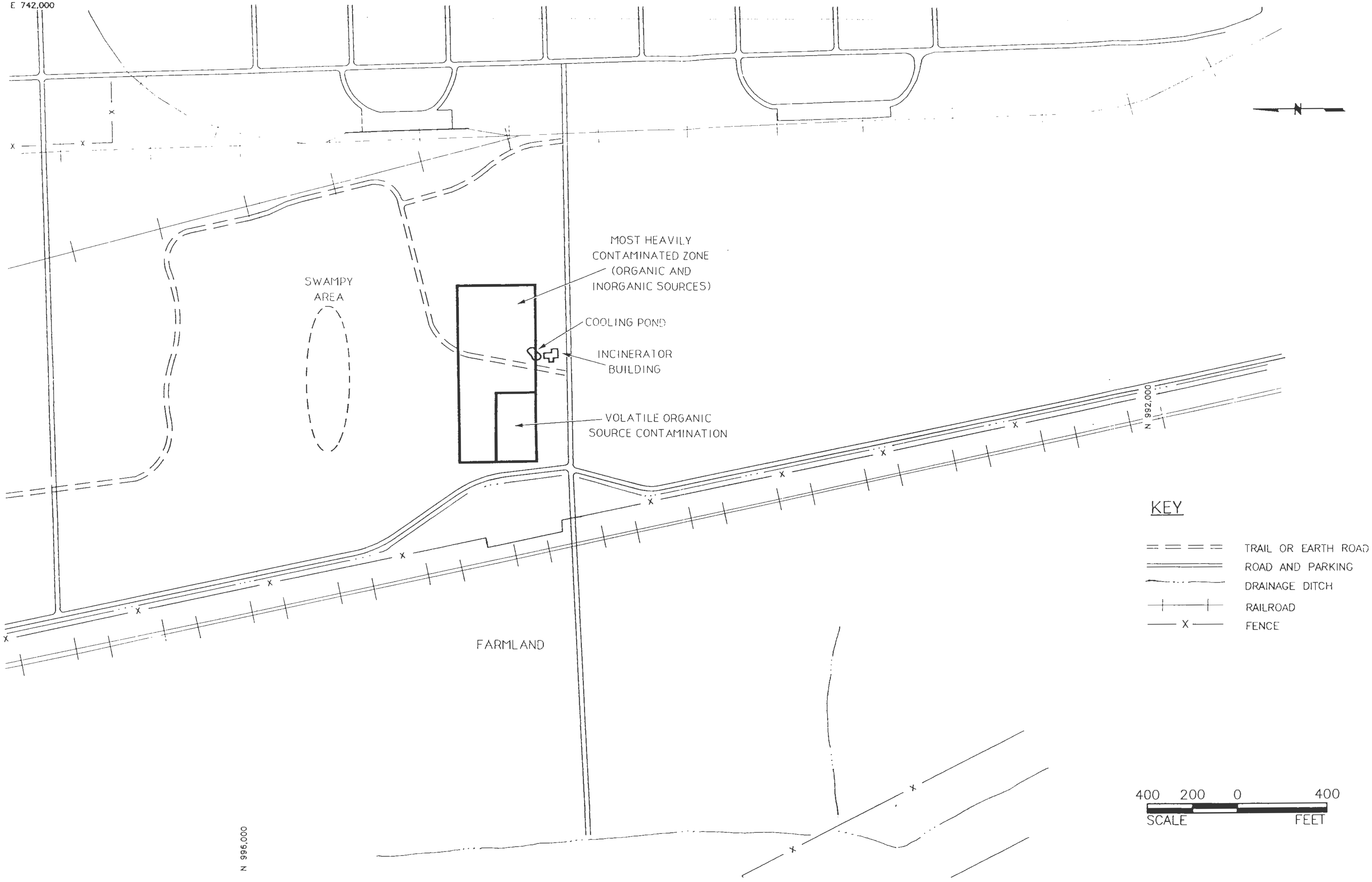

Figure 3.1-1
CONTAMINATED ZONES WITHIN SEAD ASH LANDFILL AREA

SOURCE: ICF, 1989; ESE.

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contaminants found in different monitor wells. The overall groundwater migration is in a west-southwest direction, as indicated by the contaminant plume and a potentiometric map developed from water-level measurements obtained on October 24, 1988 (see Figure 2.3-2).

In the groundwater, the VOCs exceeding state and federal standards are T12DCLE, TRCLE, 12DCLE, C2H3CL, and CHCL3. A floating product that appeared to be diesel fuel (USAEHA, 1987) was also observed. The only inorganic contaminants identified in the groundwater are magnesium, zinc, calcium, sodium, and potassium.

The soil gas survey (ICF, 1989) indicated the presence of a VOC similar to toluene (an intermediate structure to T12DCLE and TRCLE). This VOC was present in the west-central portion of the landfill and near the northwest corner of the suspected landfill area. The subsurface soils were contaminated with CH2CL2 at modest levels. The absence of high concentrations of VOCs in the surface and uppermost layers of soil boring samples is consistent with the principal source being located below the soil sampling depths. The moderate or low levels of VOCs in the surficial and subsurficial samples were due to volatilization and readsorption onto the soil matrix or entrainment in the soil gas phase. The results of the soil gas survey indicate that the sources of VOC contamination are primarily located in the west side of the total landfill area.

During the IIA study, ESE (1988) installed monitor wells around the landfill area due to the presence of indicator parameters such as sulfate and chloride and specific conductance of water in the groundwater in the landfill area, indicating the possibility of leaching from the closed landfill area (USAEHA, 1981).

Surface runoff of the contaminants from the SEAD site to the adjacent surface water bodies is highly probable due to the site's physiographic location. Surface water sampling (e.g., Kendaia Creek northwest of the site) is needed to identify the suspected surficial contaminant migration from the incinerator and surrounding areas.

Fungal growth and dust similar to incinerator ash are in the incinerator building (ICF, 1989), and sampling for potential contaminants at the incinerator building should be performed.

3.1.3 POTENTIAL RECEPTORS AT THE SITE

The potential receptor populations at the SEAD site include the human population living and working in the area; occasional visitors; ecological organisms, including the terrestrial and aquatic animals living in the area; and the aquatic and terrestrial plant species growing in this area.

The onsite two human populations identified as the potential receptors of the contaminants at the SEAD landfill site are onsite remediation workers and military personnel visitors who frequent the affected offpost areas west of the site. Contaminants can potentially migrate offpost via surface water and shallow groundwater runoff.

Onsite workers and military personnel could be exposed to contaminants in the air (wind), soil, groundwater, and surface water. Exposure to the contaminants in the air could be through inhalation of contaminated air, direct dermal contact, and consumption of biota (i.e., local animals and plants that might bioaccumulate the contaminant) that grow in contaminated air.

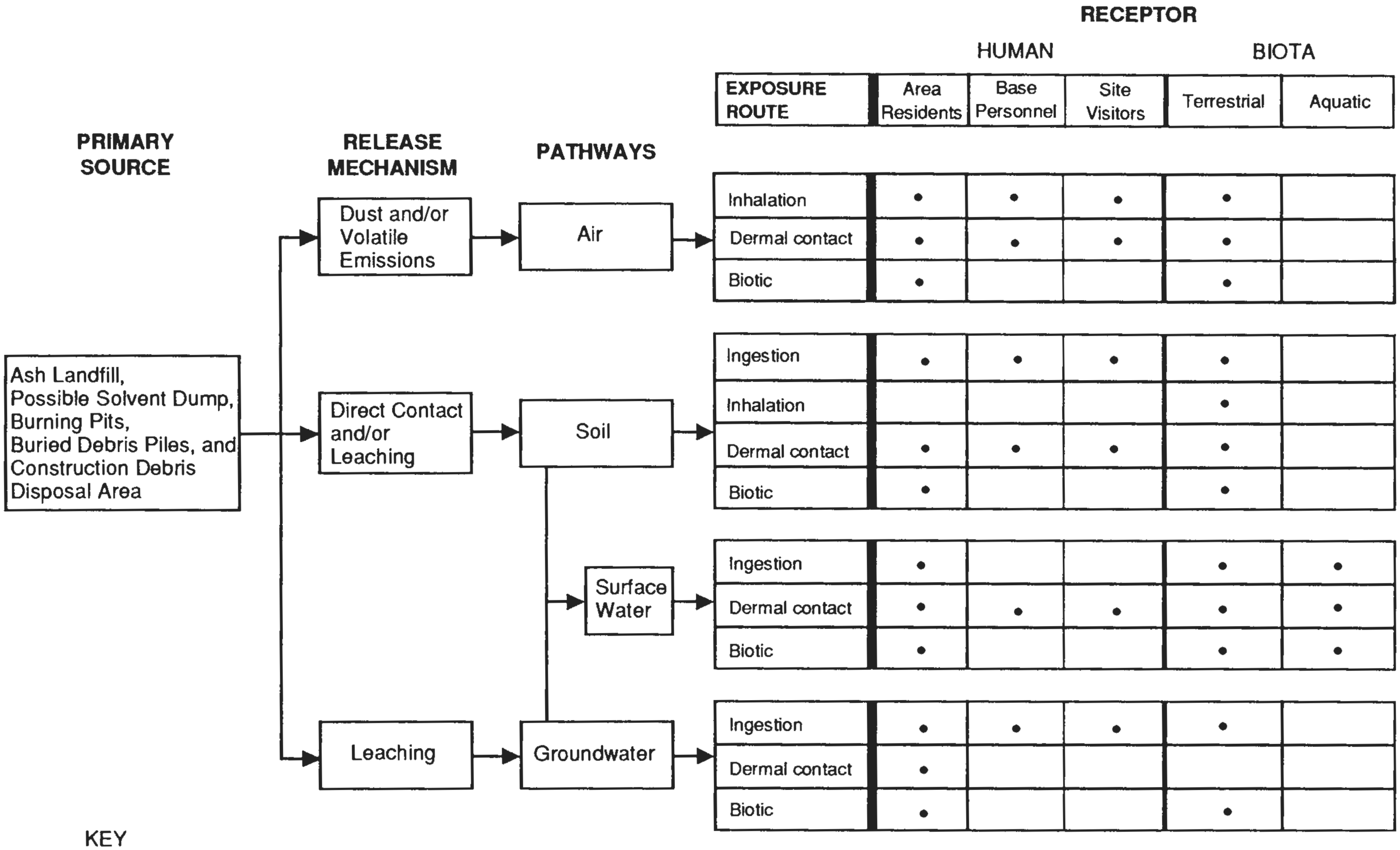
Exposure to contaminants in the soil could occur directly by incidental ingestion and dermal contact. Indirect pathways include exposure via soil contaminants in surface water runoff from washing and irrigation purposes and consumption of biota grown in contaminated surface water. Potential exposure to contaminants in groundwater could occur through ingestion of groundwater from potable wells, direct dermal contact through showering and washing activities, and exposure to the biota grown in contaminated groundwater. Indirect exposure pathways to contaminants in the groundwater seep/swampy area include direct dermal contact, ingestion, and consumption of biota grown in the contaminated groundwater.

The offsite human receptor population includes residents living in the surrounding offpost area, individuals visiting and working at Sampson State Park, and individuals using the surface water for recreational purposes such as swimming, wading, and fishing. Contaminated groundwater and surface water from SEAD could potentially migrate to areas west of the SEAD boundary. Exposure to the offsite population could occur through direct dermal contact with surface water, incidental ingestion during swimming, and consumption of fish from contaminated surface water.

The terrestrial animals that may frequent contaminated areas of the operable unit at SEAD have the same potential for exposure as the onsite workers. In addition, consumption of contaminated vegetation, biota (prey), contaminated surface water, as well as burrowing in the contaminated soils also could contribute to the contaminant uptake in these animals. Aquatic organisms are considered to be relatively minor receptor populations for the SEAD site because the site contains no identified stable surface water bodies. Amphibians and other seasonal animal populations may use vernal pools (such as the cooling pond) during springtime. However, surface water runoff potentially could influence the aquatic populations of the regional lakes. The potential exposure routes could be through ingestion of contaminated water or sediments and biota growing in the contaminated water.

3.1.4 EXPOSURE PATHWAY ANALYSIS

The exposure pathways for each contamination source at SEAD can be identified based on the available information. The exposure pathways for the ash landfill, possible solvent dump, burning pits, buried debris piles, and construction debris disposal area are similar because the contamination media and exposed population are also identical. In Figure 3.1-2, the different potential source release mechanisms, pathways, exposure routes, and receptor populations for contamination from the ash landfill, possible solvent dump, burning pits, buried debris piles, and construction debris disposal area are conceptualized. Figure 3.1-3 illustrates the potential contaminant release and exposure pathway analysis from the cooling water pond and any other similar surface water bodies that might be onsite. Figure 3.1-4 depicts the exposure pathway analysis for the UST. The potential exposure pathway analysis for the kitchen grease pits at SEAD is presented in Figure 3.1-5. Finally, the potential exposure pathway analysis for the incinerator building at SEAD is presented in Figure 3.1-6.



Pathway	EXPOSURE ROUTE	Area Residents	Base Personnel	Site Visitors	Terrestrial	Aquatic
Air	Inhalation	•	•	•	•	
	Dermal contact	•	•	•	•	
	Biotic	•			•	
Soil	Ingestion	•	•	•	•	
	Inhalation				•	
	Dermal contact	•	•	•	•	
	Biotic	•			•	
Surface Water	Ingestion	•			•	•
	Dermal contact	•	•	•	•	•
	Biotic	•			•	•
Groundwater	Ingestion	•	•	•	•	
	Dermal contact	•				
	Biotic	•			•	

KEY
• COMPLETED EXPOSURE PATHWAY

Figure 3.1-2
CONCEPTUAL SITE MODEL
ASH LANDFILL EXPOSURE PATHWAY ANALYSIS

SOURCE: ESE.

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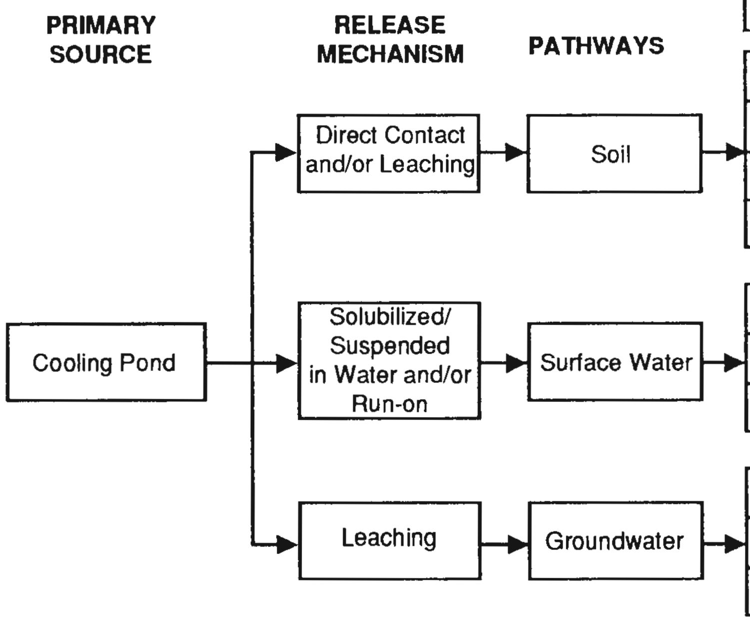
SEAD RI/FS WP 4/91 BL

U6/SENECA pathway 2

SEAD RI/FS WP 4/91 BL



		RECEPTOR				
		HUMAN			BIOTA	
PATHWAYS	EXPOSURE ROUTE	Area Residents	Base Personnel	Site Visitors	Terrestrial	Aquatic
Soil	Ingestion		●			
	Inhalation				●	
	Dermal contact		●	●		
	Biotic					
Surface Water	Ingestion				●	●
	Dermal contact		●		●	●
	Biotic				●	●
Groundwater	Ingestion		●	●		
	Dermal contact		●			
	Biotic				●	

KEY
- ● COMPLETED EXPOSURE PATHWAY

Figure 3.1-3
CONCEPTUAL SITE MODEL
COOLING POND EXPOSURE PATHWAY ANALYSIS

SOURCE: ESE.

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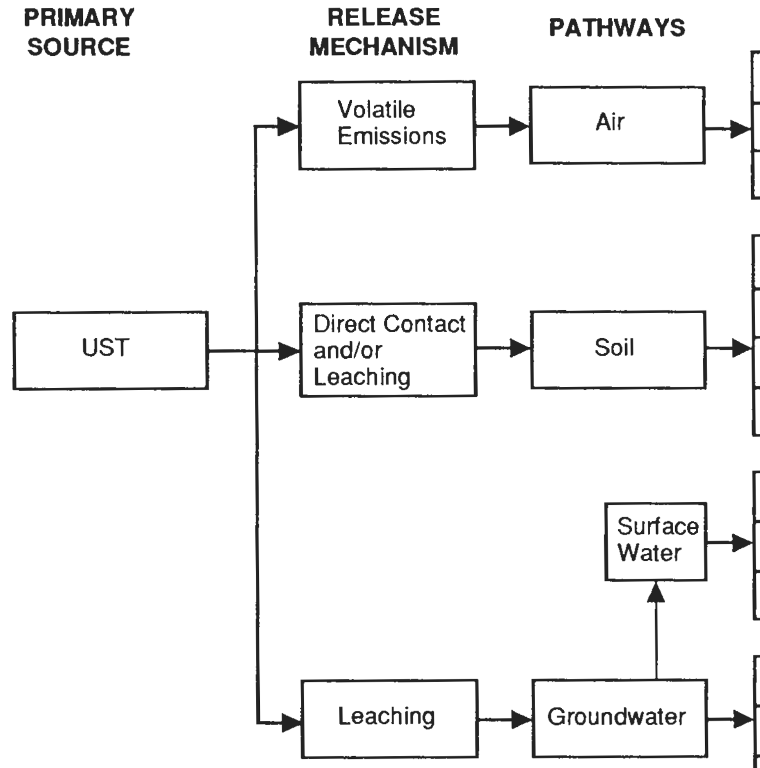
U6/SENECA pathway 3



			RECEPTOR			
		HUMAN			BIOTA	
	EXPOSURE ROUTE	Area Residents	Base Personnel	Site Visitors	Terrestrial	Aquatic
Air	Inhalation		•	•	•	
	Dermal contact	•	•	•	•	
	Biotic	•			•	
Soil	Ingestion				•	
	Inhalation				•	
	Dermal contact	•	•		•	
	Biotic	•			•	
Surface Water	Ingestion	•	•		•	•
	Dermal contact	•	•	•	•	•
	Biotic	•			•	•
Groundwater	Ingestion	•	•	•		
	Dermal contact	•	•			
	Biotic	•			•	

KEY
- • COMPLETED EXPOSURE PATHWAY

Figure 3.1-4
CONCEPTUAL SITE MODEL
EXPOSURE PATHWAY ANALYSIS

SOURCE: ESE.

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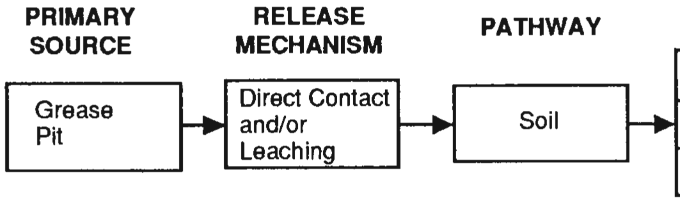
U6/SENECA pathway 4

SEAD RI/FS WP 4/91 BL



	RECEPTOR				
	HUMAN			BIOTA	
EXPOSURE ROUTE	Area Residents	Base Personnel	Site Visitors	Terrestrial	Aquatic
Inhalation		•		•	
Dermal contact		•	•	•	
Biotic				•	

KEY
- COMPLETED EXPOSURE PATHWAY

Figure 3.1-5
CONCEPTUAL SITE MODEL
COOKING GREASE PITS EXPOSURE PATHWAY ANALYSIS

SOURCE: ESE.

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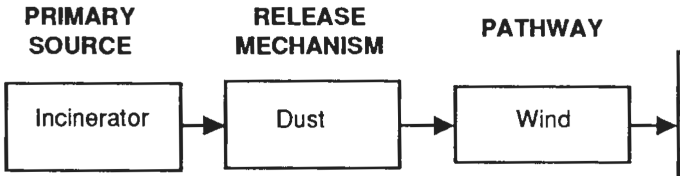
U6/SENECA pathway 5



RECEPTOR

EXPOSURE ROUTE	HUMAN Area Residents	 Base Personnel	 Site Visitors	BIOTA Terrestrial	 Aquatic
Ingestion				●	
Inhalation		●	●	●	
Dermal Contact		●	●	●	

KEY
- ● COMPLETED EXPOSURE PATHWAY

Figure 3.1-6
CONCEPTUAL SITE MODEL
INCINERATOR BUILDING EXPOSURE PATHWAY ANALYSIS

SOURCE: ESE.

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U6/SENECA pathway 6

3.1.5 SAMPLING REQUIREMENTS FOR THE SEAD LANDFILL/BURNING PITS SITE

Additional sampling requirements are needed for an accurate assessment of the extent of contamination at the SEAD ash landfill site. Surface soil sampling needs to be conducted over the entire site. The full scope of the subsurface soil sampling will be based on the geophysical and soil gas investigation results. The areas of interest for soil sampling include different suspected and identified source areas, such as the UST.

Air sampling is not identified as an important task during the site characterization and early RI phases. However, some dust sampling of the incinerator building for analysis of incinerator-operation-related contaminants should be performed.

Surface water sampling (e.g., Kendaia Creek northwest of the site) is needed to identify the suspected surficial contaminant migration from the incinerator and railway unloading operations and spills around the burning pits area. Sediment and/or water sampling is required at the cooling water pond, identifiable swampy areas, and surface water bodies and ditches onpost as well as offpost.

Installation of new monitor wells and additional groundwater sampling requirements should be determined based on the hydrogeological survey results.

3.2 SCOPING OF POTENTIAL REMEDIAL ACTION ALTERNATIVES

The primary focus of the supplemental RI will be to provide the requisite data to complete the FS and select a cost-effective remedial alternative. Contamination has been observed in soils and groundwater at the site; the risks associated with these contamination pathways and the possible contamination of surface water and sediments will be addressed in the final risk assessment (RA). If the risks are unacceptable, the no-action alternative will be excluded from consideration, and specific remedial actions will be considered. Such remedial actions will be required to minimize the possible release of contaminants from each of the primary contamination source areas and control the migration of contaminated surface water, groundwater, and sediments. Thus, to be effective for the site, remediation schemes will require implementation of source and migration control measures.

Based on the previous site data, preliminary remedial action objectives have been developed for human health and environmental protection (see Table 3.2-1). As shown in Table 3.2-1, general response actions were developed for all remedial action objectives. They include treatment (physical, chemical, biological, or thermal), diversion, containment, removal, and onsite or offsite disposal. Potential remedial technologies associated with each response action are also listed in Table 3.2-1. A detail of the process options of the initial screening process is listed in the following paragraphs. The preliminary elimination of infeasible remedial technologies was based on the applicability of the technology to the current site conditions and waste characteristics. The final selection will be based on the final RA. The following are the groundwater and surface water remedial process options that could be applicable:

- Treatment
  - Physical
    - Sedimentation
    - Flocculation
    - Air Stripping
    - Filtration

Table 3.2-1. Preliminary Remedial Action Objectives (RAOs), General Response Actions, and Technology Types for the Ash Landfill Area Operable Unit

Environmental Media	RAOs (from past field data)	General Response Actions (for all RAOs)	Remedial Technology Types (for General Response Actions)
Groundwater	For Human Health Prevent ingestion of water having the human carcinogen vinyl chloride and suspected human carcinogens TRCLE; 12DCLE; and CHCL3 in excess of SDWA MCLs. Prevent ingestion of water having 12DCE and T12DCLE in excess of SDWA MCLs For Environmental Protection Restore surficial groundwater aquifer to SDWA MCLs.	No Action/ Institutional Actions: No action Use restrictions Monitoring only Containment Actions: Containment Removal/Treatment/ Disposal Actions: Collection/removal Onsite treatment In situ treatment Onsite or offsite disposal	No Action/Institutional Options: Fencing Limit use Containment Technologies: Capping Subsurface barriers Removal/Collection Technologies: Physical treatment Chemical treatment Biological treatment Thermal treatment Innovative Technologies: In situ treatment Disposal Technologies: POTWs Surface water discharge
Soil	For Human Health Prevent ingestion/direct contact with soil having human carcinogen chromium and suspected human carcinogen TRCLE in excess of the proposed RCRA Corrective Action Levels. For Environmental Protection Prevent migration of contaminants listed previously that would result in groundwater contamination in excess of SDWA MCLs.	No Action/ Institutional Actions: No action Use restrictions Containment Actions: Containment Excavation/Treatment Actions: Excavation Treatment In situ treatment Disposal	No Action/Institutional Options: Fencing Limit use Containment Technologies: Capping Subsurface barriers Surface controls Removal Technologies: Excavation Treatment Technologies: Physical treatment Chemical treatment Biological treatment Thermal treatment Innovative Technologies: In situ treatment

Table 3.2-1. Preliminary Remedial Action Objectives (RAOs), General Response Actions, and Technology Types for the Ash Landfill Area Operable Unit (Continued, Page 2 of 3)

Environmental Media	RAOs (from past field data)	General Response Actions (for all RAOs)	Remedial Technology Types (for General Response Actions)
Surface Water	<u>For Human Health</u> Prevent ingestion of water having the suspected human carcinogens TRCLE; 12DCLE; and lead in excess of SDWA MCLs. Prevent ingestion of water having barium; cadmium; copper; and T12DCLE in excess of SDWA MCLs. <u>For Environmental Protection</u> Restore surface water to MCLs for contaminants listed previously.	No Action/ Institutional Actions: No action Use restrictions Monitoring only Collection/Treatment Actions: Surface water runoff interception Treatment/discharge	No Action/Institutional Options: Fencing Limit use Collection Technologies: Surface controls Treatment Technologies: Physical treatment Chemical treatment Biological treatment Disposal Technologies: POTWs
Sediment	No RAOs can be developed from the existing site data on the site sediments. RAOs will be developed after the RI, if contaminants are detected in excess of applicable ARARs.		
Air	No RAOs can be developed from the existing site data on air. RAOs will be developed after the RI, if contaminants are detected in excess of applicable ARARs.		

Table 3.2-1. Preliminary Remedial Action Objectives (RAOs), General Response Actions, and Technology Types for the Ash Landfill Area Operable Unit (Continued, Page 3 of 3)

Environmental Media	RAOs (from past field data)	General Response Actions (for all RAOs)	Remedial Technology Types (for General Response Actions)
Structure	No RAOs can be developed from the existing site data on the incinerator. RAOs will be developed after the RI, if contaminants are detected in excess of applicable ARARs.		

Source: EPA, 1988.

        - Carbon Adsorption
        - Reverse Osmosis
        - Ion Exchange

    - Chemical
        - Chemical Precipitation
        - Chemical Oxidation/Reduction
        - Oxidation by Hydrogen Peroxide
        - Ozonation
        - Electrolytic Oxidation/Reduction

    - Biological
        - Activated Sludge
        - Rotating Biological Contactors
        - Anaerobic Digestion
        - Powdered Activated Carbon (PAC)
        - Sequencing Batch Reactor (SBR)
        - PAC-Enhanced SBR
        - Trickling Filter
        - Biological Towers
        - Fluidized-Bed Biological Reactor

    - Thermal
        - Liquid Injection Incinerator
        - Wet-Air Oxidation
        - Steam Stripping

    - Innovative Technologies
        - Supercritical Water Oxidation
        - *In Situ* Biodegradation

- Diversion

    - Dikes and Berms
    - Ditches and Trenches

- Containment

    - Subsurface Barriers
    - Capping

- Removal and Disposal
    - Extraction Wells/Trenches
    - Injection Wells/Trenches
    - Surface Water Discharge
    - Spray Irrigation
    - Publicly Owned Treatment Works (POTWs)

The following remedial process options could be applicable technologies pertaining to the soil contamination at the site:

- Treatment
    - Physical
        - Soil Flushing/Soil Washing
        - Chelation
        - Solidification/Stabilization
        - Soil Aeration
    - Thermal
        - Rotary Kiln Incinerator
        - Circulating Bed Combuster
    - Innovative Technologies
        - In Situ Vitrification
        - Low-Temperature Decomposition
- Containment
    - Capping
- Removal and Disposal
    - Excavation
    - Dredging
    - Landfilling
    - Dewatering

Based on the final RA, these technologies can be combined into preliminary alternatives for the remediation of contaminated soils, sediments, surface water, and groundwater found at the site during the RI. These preliminary remedial alternatives, presented in Table 3.2-2, offer general methods for remediation of the contaminated media identified in the conceptual site model.

3.3 PRELIMINARY IDENTIFICATION OF ARARs

Section 121(d) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) requires that remedial actions attain a degree of contaminant cleanup that ensures protection of public health and the environment. SARA also requires compliance with criteria and standards promulgated under federal environmental statutes or with state standards and criteria that are more stringent than federal standards [SARA, Sec. 121(d)(2)(a)]. Furthermore, the National Oil and Hazardous Substances Contingency Plan (NCP) requires the determination of the extent to which federal or state public health and environmental standards are applicable or relevant and appropriate to the contaminants identified at a site under investigation. In addition, other federal or state advisories, criteria, and guidance must be examined to determine if they are relevant and appropriate for the development of remedial actions for the site. Applicable requirements are defined as those federal or state standards that would be legally binding by the circumstances at a site, if a response were not being undertaken pursuant to CERCLA of 1980. Relevant and appropriate requirements are defined as those federal or state standards designed to apply to circumstances similar to those encountered at CERCLA sites, such that their application is appropriate even though clear jurisdictional application has not been established. Although SARA mandates that remediation meet federal and state ARARs, compliance with ARARs is not the only factor that determines which remedial alternative is selected. Remediation must be protective of human health and the

Table 3.2-2. Preliminary Remedial Alternatives

SOIL ALTERNATIVES

S-1: Removal, Onsite Treatment (Physical, Thermal, and/or Innovative Technology), Disposal

S-2: *In Situ* Treatment

S-3: Containment

S-4: Removal and Offsite Disposal

S-5: No Action

SEDIMENT ALTERNATIVES

SED-1: Removal, Soil Alternative S-1 or S-4

SED-2: Soil Alternative S-3

SED-3: No Action

GROUNDWATER ALTERNATIVES

GW-1: Removal, Onsite Treatment (Physical, Chemical, Biological, Thermal, and/or Innovative Technology), Disposal

GW-2: *In Situ* Biodegradation

GW-3: Containment

GW-4: No Action

SURFACE WATER ALTERNATIVES

SW-1: Removal, Onsite Treatment (Physical, Chemical, Biological, Thermal, and/or Innovative Technology), Disposal

SW-2: Diversion, Surface Water Alternative SW-1

SW-3: No Action

Source: ESE.

environment, be cost effective, and use permanent solutions and treatment technologies to the maximum extent practicable.

ARARs typically fall into three categories:

1. Chemical-specific requirements place a health-based or risk-based limit on the amount of a given chemical that can be discharged into, or be present in, the environment. Examples of chemical-specific ARARs include maximum contaminant levels (MCLs), federal ambient water quality criteria (AWQC), state water quality standards, and National Ambient Air Quality Standards (NAAQS).
2. Location-specific requirements restrict activities, depending on characteristics of the site or surrounding areas. For example, regulations on floodplains and wetlands place specific limits on federal activities in floodplains and wetlands.
3. Action-specific requirements are generally technology based and either place restrictions on, or establish directives to, undertaking specific types of remedial activities at a hazardous substance release or cleanup. An example of an action-specific ARAR would be the Resource Conservation and Recovery Act (RCRA) closure regulations codified at 40 Code of Federal Regulations (CFR) Part 264 Subparts G, K, and N.

During this preliminary identification of ARARs for SEAD, the primary focus will be on chemical-specific requirements, with limited description of location- and action-specific requirements. In the initial selection of chemical-specific ARARs, attention will be focused on those contaminants identified during preliminary site investigations.

3.3.1 CHEMICAL-SPECIFIC ARARs

A preliminary evaluation of site conditions indicates that the media of potential concern are soil, groundwater, surface water, and air. Chemical-specific ARARs will be described for each of these in turn. Intermittent surface water on the site with potential discharge to Seneca Lake might be affected by site contaminants. The results of an RA will be used to select a level of exposure to site contaminants that effectively protects public health and the environment. In that assessment, if ARARs are determined not to be sufficiently protective of public health and the environment, chemical-specific advisory levels, which are not ARARs, will have to be considered in the derivation of site-specific, risk-based target cleanup levels.

3.3.1.1 Federal and State of New York ARARs

Groundwater

The U.S. Environmental Protection Agency (EPA) has proposed that MCLs promulgated under the Safe Drinking Water Act (SDWA) generally will be the relevant and appropriate cleanup standard for groundwater that is or may be used for drinking water [EPA, 52 Federal Register (FR) 32496]. Although SDWA deals most directly with standards for drinking water quality, technically it regulates water as a delivered product rather than as an environmental medium. SARA is also ambiguous on this issue: Section 121 cites both SDWA and RCRA SDWA, among other federal laws, as sources of potential ARARs. It also mandates compliance with the nonenforceable maximum contaminant level goals (MCLGs) and federal AWQC where they are relevant and appropriate to the circumstances of the release. The overriding EPA philosophy on this issue is the restoration of contaminated groundwater to its highest beneficial use.

Table 3.3-1 lists the potential groundwater ARARs for possible contaminants at SEAD. Federal MCLs or proposed MCLs exist for all of these contaminants, and because the groundwater might at some time in the future be used as a drinking water source, they should be considered as ARARs. State of New York water quality criteria also exist for all the contaminants, and in a number of cases (T12DCLE and copper), the state criteria are more stringent than the federal criteria. State of New York standards and guidance values are contained in the New York State Department of Environmental Conservation (NYSDEC), Division of Water (DOW), Technical and Operations Guidance Series (TOGS) 1.1.1 (see Appendix G).

Surface Water

Table 3.3-1 lists the potential surface water ARARs for possible contaminants that have been identified at SEAD. These ARARs deal with the protection of freshwater aquatic organisms rather than human health. With the exception of zinc, the state criteria are patterned on the federal criteria. State of New York standards and guidance values are contained in the NYSDEC, DOW, TOGS 1.1.1. In addition, the New York State Environmental Conservation Law Article 15 (Water Resources Law) needs to be identified when surface ARARs are described.

Soil

Generally, federal criteria for acceptable contaminant levels in soil have not been established. However, the EPA Office of Solid Waste and Emergency Response (OSWER) recently issued a directive setting forth an interim soil cleanup level for total lead at CERCLA sites [OSWER Directive #9355.4-02

Table 3.3-1. ARARs for the Protection of Human and Environmental Health for Constituents Identified in Groundwater and/or Surface Water at SEAD

25 Oct 1990

Analytes/Parameters	PP	EPA Oral WoE	Analytical Method	MDL	PQL	SDWA			New York DWQS		10-6 Risk Level	DWEL	Health Advisories				AWQC to Protect Human Health		AWQC to Protect Aquatic Life				New York AWQC	
						MCL	MCLG	SMCL*	Primary#	2ndary*			1-day	10-day	Long.	Life.	W & F	F	Freshwater		Marine		Freshwater	Marine
																			Acute	Chronic	Acute	Chronic		
CONDUCTIVITY (umho/cm)	N	--																						
pH (standard units)	N	--						6.5-8.5 p		6.5-8.5										6.5-9		6.5-8.5	6.5-8.5	
ALKALINITY (mg/L as CaCO3)	N	--	A403	1	5																			
TOTAL DISSOLVED SOLIDS (mg/L)	N	--	E160.1	10	50			500 p									250						500	
COMMON ANIONS (mg/L)	N	--																						
Bromide	N	D	A429	0.5	2.5																			
Chloride	N	D	A429	0.5	2.5			250 p		250														
Fluoride	N	D	A429	0.5	2.5	4	4		1.5														0.23 h	
Nitrate (as nitrogen)	N	D	353.2	0.01	0.05	10 p	10 p		10					1			10							
Nitrite (as nitrogen)	N	D	353.2	0.01	0.05	1 p	1 p							1										
Sulfate	N	D	A429	0.5	2.5	400 p	400 p	250 p		250														
DISSOLVED OXYGEN (mg/L)	N	--																	4/3 a,b	6.5/5.5 a,c			6/5 d	
METALS/METALLOIDS (mg/L)																								
Aluminum	N	-	SW3005/SW6010	0.0275	0.1375			0.05 p											0.95	0.15			0.1	
Antimony	Y	D	SW3005/SW6010	0.0451	0.2255	0.01 p	0.003 p					0.014					0.146	45	9 e	1.6 e				
Arsenic	Y	A	SW7060	0.0023	0.012	0.05	0.05 p		0.025		0.00002	0.035					0.0000022 f	0.0000175 f	0.36 g	0.19 g	0.069 g	0.036 g	0.19	0.063
Barium	N	D	SW3005/SW6010	0.0011	0.0055	1	5 p		1			1.75	5	5	5	5	1							
Beryllium	Y	B2	SW3005/SW6010	0.0019	0.0095	0.001 p	0 p				0.000008	0.175					0.0000068 f	0.000117 f	0.13 e	0.005 e			0.011/1100 i	
Cadmium	Y	D	SW3005/SW6010	0.0040	0.0020	0.01	0.005 p		0.01			0.018	0.04	0.04	0.005	0.005	0.01		0.0039 h	0.001 h	0.043	0.0093	0.0011 h	
Calcium	N	-	SW3005/SW6010	0.0141	0.0705																			
Chromium (VI)	Y	D	SW3005/SW7191	0.0023	0.012	0.05 j	0.12 p		0.05			0.171	1.4	1.4	0.24	0.12	0.05		0.016	0.011 h	1.1	0.05	0.011	0.054
Chromium (III)	Y	D	SW3005/SW7191	0.0023	0.012	0.05 j	0.12 p					0.171	1.4	1.4	0.24	0.12	170	3433	1.7 h	0.21 h	10.3 e		0.21 h	
Copper	Y	D	SW3005/SW6010	0.0036	0.0180	1.3	1.3	1 p		1		1.3							0.018 h	0.012 h	0.003	0.003	0.012 h	0.002
Iron	N	-	SW3005/SW6010	0.0109	0.0545			0.3 p		0.3							0.3			1			0.3	
Lead	Y	B2	SW3005/SW7421	0.0014	0.007	0.005/0.01 p,k	0.02		0.025			0.005					0.05		0.082 h	0.003 h	0.14	0.0056	0.0032 h	0.0086
Magnesium	N	-	SW3005/SW6010	0.0330	0.1650																			
Manganese	N	-	SW3005/SW6010	0.0010	0.0050			0.05 p		0.3		7					0.05	0.1						
Mercury	Y	D	SW3005/SW6010	0.0002	0.001	0.002	0.002 p		0.002							0.002	0.000144	0.000146	0.002 h	0.00001	0.002	0.000025		
Nickel	Y	D	SW3005/SW6010	0.0260	0.1300	0.1 p	0.1 p					0.7	1	1	0.1	0.1	0.0134	0.1	1.4 h	0.16 h	0.075	0.0083	0.16 h	0.0071
Phosphorus	N	-																				0.0001		
Potassium	N	-	SW3005/SW6010	0.563	2.815																			
Selenium	Y	D	SW7740	0.0018	0.009	0.01	0.05 p		0.01								0.1		0.26	0.035	0.41	0.054	0.001	
Silver	Y	D	SW3005/SW6010	0.0068	0.0340	0.05		0.09 p	0.05			0.105					0.05		0.004 h	0.00012	0.0023		0.0001	
Sodium	N	-	SW3005/SW6010	0.133	0.665					20/270 l														
Thallium	Y	D	SW3005/SW6010	0.161	0.805	0.002 p	0.0005 p					0.0028											0.008	
Vanadium	N	D	SW3005/SW6010	0.0060	0.0300							0.245											0.014	
Zinc	Y	D	SW3005/SW6010	0.0042	0.0210			5 p		5		7											0.03	0.058
PETROLEUM HYDROCARBONS (mg/L)	N	--	E418.1	0.1	0.5																			
VOLATILE ORGANICS (ug/L)																								
Acetone	Y	D	SW8240	9.0	45.0							3500												
Benzene	Y	A	SW5030/SW8020	0.20	1.0	5	0		5 m		1		200	200			0.66	40	5300 e		5100 e	700 e		
Bromodichloromethane	Y	B2	SW5030/SW8010	0.500	2.50	100 n			100 n		0.27	700					0.19 f,o	15.7 f,o	11000 e,o		12000 e,o	6400 e,o		
Bromoform	Y	B2	SW5030/SW8010	1.00	5.00	100 n			100 n		4.4	700					0.19 f,o	15.7 f,o	11000 e,o		12000 e,o	6400 e,o		
Carbon tetrachloride	Y	B2	SW5030/SW8010	0.600	3.000	5	0		5 m		0.27	24.5	4000	200	70		0.4 f	6.94 f	35200 e		50000 e			
Carbon disulfide	Y	D	SW8240	2.5	12.5							3500												
Chlorobenzene	Y	D	SW5030/SW8020	0.340	1.70	100 p	100 p		5 m			700	4300	4300	4300	300			250 e,q	50 e,q	160 e,q	129 e,q	5	
Chloroform	Y	B2	SW5030/SW8010	0.500	2.50	100 n			100 n		5.7	350					0.19 f,o	15.7 f,o	28900 e	1240 e				
Chloroethane	Y	D	SW5030/SW8010	0.770	3.85				5 m															
Chloromethane	Y	C	SW5030/SW8010	0.400	2.00				5 m		3	13												
Dibromochloromethane	Y	C	SW5030/SW8010	0.500	2.50	100 n			100 n		0.42	700					0.19 f,o	15.7 f,o	11000 e,o		12000 e,o	6400 e,o		
Dichlorodifluoromethane	Y	D	SW5030/SW8010	0.600	3.00				5 m			5300	43000	43000	9000	1050	0.19 f,o	15.7 f,o	11000 e,o		12000 e,o	6400 e,o		
1,1-Dichloroethane	Y	C	SW5030/SW8010	0.400	2.00				5 m		0.4	315												
1,2-Dichloroethane	Y	B2	SW5030/SW8010	0.500	2.50	5	0		5 m		0.4		740	740	740		0.94 f	243 f	118000 e	20000 e	113000 e			
1,1-Dichloroethene	Y	C	SW5030/SW8010	0.400	2.00	7 p	7 p		5 m		0.06	350	2000	1000	1000	7	0.033 f,r	1.85 f,r	11600 e,r		224000 e,r			
cis-1,2-Dichloroethene	Y	D	SW5030/SW8010	0.200	1.00	70 p	70 p		5 m			350	4000	1000	1000	70	0.033 f,r	1.85 f,r	11600 e,r		224000 e,r			
trans-1,2-Dichloroethene	Y	D	SW5030/SW8010	0.200	1.00	100 p	100 p		5 m			700	20000	2000	2000	100	0.033 f,r	1.85 f,r	11600 e,r		224000 e,r			
1,2-Dichloropropane	Y	B2	SW5030/SW8010	0.200	1.00	5 p	0 p		5 m		0.5			90					23000 e	5700 e	10300 e	3040 e		
cis-1,3-Dichloropropene	N	D	SW5030/SW8010	0.400	2.00				5 m								87 s	14100 s	6060 e,s	244 e,s	790 e,s			
trans-1,3-Dichloropropene	N	B2	SW5030/SW8010	0.700	3.50				5 m				30	30	30		87 s	14100 s	6060 e,s	244 e,s	790 e,s			
Diethylether	Y	D	SW8240	2	10																			
Ethylbenzene	Y	D	SW5030/SW8020	0.50	2.50	700 p	700 p	30 p	5 m			3400	32000	3200	1000	680	1400	3280	32000 e		430 e			
Methylene chloride	Y	B2	SW5030/SW8010	1.40	7.00	5 p	0 p		5 m		5	1750	13300	1500	500		0.19 f,o	15.7 f,o	11000 e,o		12000 e,o	6400 e,o		
Methylethylketone	Y	D	SW8240	5.3	26.5							1750	75000	7500	2500	170								
Methylisobutylketone	Y	D	SW8240	4.0	20.0							1750												
1,1,2,2-Tetrachloroethane	Y	C	SW5030/SW8010	0.200	1.00				5 m		0.2						0.17	10.7	2400 e		9020 e			
Tetrachloroethene	Y	B2	SW5030/SW8010	0.200	1.00	5 p	0 p		5 m		0.7	500	2000	2000	1400	10	0.8 f	8.85 f	5280 e	840 e	10200 e	450 e		
Toluene	Y	D	SW5030/SW8020	0.30	1.5	2000 p	2000 p	40 p	5 m			10100	21000	3500	3500	2400	14300	424000	17500 e		6300 e	5000 e		
1,1,1-Trichloroethane	Y	D	SW5030/SW8010	0.200	1.00	200	200		5 m			1000	140000	35000	35000	200	18400	1030000			31200 e			
Trichloroethene	Y	B2	SW5030/SW8010	0.250	1.25	5	0 p		5 m		3.2						2.7 f	80.7 f	45000 e	21900 e	2000 e			
Trichlorofluoromethane	Y	D	SW5030/SW8010	0.400	2.00				5 m			12200	374000	7100	3500	2440	0.19 f,o	15.7 f,o	11000 e,o		12000 e,o	6400 e,o		
Vinyl chloride	Y	A	SW5030/SW8010	0.250	1.25	2	0		2		0.015		3000	3000	10		2 f	525 f						
Xylenes (total)	Y	D	SW5030/SW8020	0.90	4.5	10000 p	10000 p	20 p	5 m			70000	40000	40000	40000	10000								
SEMIVOLATILE ORGANICS (ug/L)																								
Phenol	Y	D	SW3510/SW8270	2.0	10				1 t			21000					3000		10200 e	2560 e	5800 e		5 u	
2,4-Dimethylphenol	Y	D	SW3510/SW8270	2.0	10				1 t										2120 e				5 u	
4,6-Dinitro-2-methylphenol	Y	D	SW3510/SW8270	20.0	100				1 t														5 u	
4-Chloroaniline	Y	D	SW3510/SW8270	2.0	10							140												
4-Nitroaniline	Y	D	SW3510/SW8270	2.0	10																			
1,2-Dichlorobenzene	Y	D	SW5030/SW8020	0.500	2.50	600 p	600 p	10 p	5 m			3150	8900	8900	8900	620	400	2600	1120 e	760 e	1970 e		5 v	
1,3-Dichlorobenzene	Y	D	SW3510/SW8270	1.0	5.0				5 m				8900	8900	8900	620	400	2600	1120 e	760 e	1970 e		5 v	
1,4-Dichlorobenzene	Y	B2	SW3510/SW8270	1.0	5.0	75	75	5 p	5 m		1.4		10700	10700	10700	75	400	2600	1120 e	760 e	1970 e		5 v	
1,2,4-Trichlorobenzene	Y	D	SW3510/SW8270	1.0	5.0	9 p	9 p					45	130	130	130	9			250 e,q	50 e,q	160 e,q	129 e,q	5 w	
2,4,6-Trinitrotoluene	Y	C	USATHAMA UW14	0.588	2.940						1.2	17.5	20	20	20	2								
Acenaphthene	Y	D	SW3510/SW8270	1.0	5.0							2100							1700 e	520 e	970 e	710 e		
Anthracene	Y	D	SW3510/SW8270	1.0	5.0							10500									300 e,y			
Benz(a)anthracene	Y	B2	SW3510/SW8270	1.0	5.0	5 x	0 x				0.003						0.0028 f	0.0311 f			300 e,y			
Benzo(b)fluoranthene	Y	B2	SW3510/SW8270	1.5	7.5	7.5 x	0 x				0.003						0.0028 f	0.0311 f			300 e,y			
Benzo(k)fluoranthene	Y	B2	SW3510/SW8270	1.5	7.5	7.5 x	0 x				0.003						0.0028 f	0.0311 f			300 e,y			
Benzo(g,h,i)perylene	Y	D	SW3510/SW8270	2.5	13																300 e,y			
Benzo(a)pyrene	Y	B2	SW3510/SW8270	2.0	10	0.2 p	0 p				0.003						0.0028 f	0.0311 f			300 e,y			
Chrysene	Y	B2	SW3510/SW8270	1.0	5.0	5 x	0 x				0.003						0.0028 f	0.0311 f			300 e,y			
Dibenz(a,h)anthracene	Y	B2	SW3510/SW8270	2.5	13	13 x	0 x				0.003	1400					0.0028 f	0.0311 f			300 e,y			

Table 3.3-1. ARARs for the Protection of Human and Environmental Health for Constituents Identified in Groundwater and/or Surface Water at SEAD (Continued, Page 2 of 2)

Analytes/Parameters	PP	EPA Oral WoE	Analytical Method	MDL	PQL	SDWA			New York DWQS		10-6 Risk Level	DWEL	Health Advisories				AWQC to Protect Human Health		AWQC to Protect Aquatic Life				New York AWQC	
																			Freshwater		Marine			
						MCL	MCLG	SMCL*	Primary#	2ndary*			1-day	10-day	Long.	Life.	W & F	F	Acute	Chronic	Acute	Chronic	Freshwater	Marine
SEMIVOLATILE ORGANICS (ug/L)																								
Dibenzofuran	Y	D	SW3510/SW8270	1.0	5.0							350									300 e,y			
Fluoranthene	Y	D	SW3510/SW8270	1.0	5.0							1400									300 e,y			
Fluorene	Y	D	SW3510/SW8270	1.0	5.0							1400									300 e,y			
Indeno(1,2,3-c,d)pyrene	Y	B2	SW3510/SW8270	2.5	13	13 x	0 x				0.003						0.0028 f	0.0311 f			300 e,y			
2-Methylnaphthalene	Y	D	SW3510/SW8270	1.0	5.0																300 e,y			
Naphthalene	Y	D	SW3510/SW8270	1.0	5.0							120	500	500	400	20			2300 e	620 e	2350 e			
Phenanthrene	Y	D	SW3510/SW8270	1.0	5.0																300 e,y			
Pyrene	Y	D	SW3510/SW8270	1.0	5.0							1050									300 e,y			
Dibutylphthalate	Y	D	SW3510/SW8270	1.0	5.0				770			3500					34000	154000	942 e,z	3 e,z	2944 e,z	3.4 e,z		
bis(2-Ethylhexyl)phthalate	Y	B2	SW3510/SW8270	2.0	10	4 p	0 p		4		2.5	1250	4000	4000	4000	250	15000	50000	942 e,z	3 e,z	2944 e,z	3.4 e,z	0.6	
PCBs/PESTICIDES																								
PCBs	Y	B2	SW3510/SW8080	0.100	0.5	0.5 p	0 p		0.1						1		0.000079 f	0.000079 f	2	0.014	10	0.3	0.001	0.001
Aldrin	Y	B2	SW3510/SW8080	0.006	0.03						0.002	1					0.000074 f	0.000079 f	3		1.3		0.001 A	0.001 A
Bromacil	N	C	SW3510/SW8080	0.006	0.03				4.4				5000	5000	3000	90								
Chlordane	Y	B2	SW3510/SW8080	0.025	0.125	2 p	0 p				0.03	1.7	60	60	0.5		0.00046 f	0.00048 f	2.4	0.0043	0.09	0.004		
p,p'-DDD	Y	B2	SW3510/SW8080	0.006	0.03						0.14	17.5 B											0.001	0.001
p,p'-DDE	Y	B2	SW3510/SW8080	0.006	0.03						0.1	17.5 B							1050 e		14 e		0.001	0.001
p,p'-DDT	Y	B2	SW3510/SW8080	0.006	0.03						0.1	17.5					0.000024 f	0.000024 f	1.1	0.001	0.13	0.001	0.001	0.001
Dieldrin	Y	B2	SW3510/SW8080	0.006	0.03						0.002	1.75					0.000071 f	0.000076 f	2.5	0.0019	0.71	0.0019	0.001 A	0.001 A
Endosulfan B	Y	D	SW3510/SW8080	0.006	0.03							1.75					74	159	0.22	0.056	0.034	0.009	0.009	0.001
Endrin	Y	D	SW3510/SW8080	0.006	0.03	2 p	2 p		0.2			140	20	20	3	2	1		0.18	0.0023	0.037	0.0023	0.002	0.002
Heptachlor	Y	B2	SW3510/SW8080	0.006	0.03	0.4 p	0 p				0.008	17.5	10	10	5		0.00028 f	0.00029 f	0.52	0.0038	0.053	0.0036	0.001 -	0.001
Heptachlor epoxide	Y	B2	SW3510/SW8080	0.006	0.03	0.2 p	0 p				0.004	0.44	10		0.13		0.00028 f	0.00029 f	0.52	0.0038	0.053	0.0036	0.001	0.001

Note: PP = priority pollutant.
Y = Yes.
N = No.
WoE = EPA weight-of-evidence of oral carcinogenicity for classifying compounds as a human carcinogen via ingestion.
A = human carcinogen (sufficient evidence from epidemiologic studies).
B1 = suspect human carcinogen (limited evidence of carcinogenicity in humans).
B2 = suspect human carcinogen (sufficient evidence of carcinogenicity in animal studies and inadequate data for humans).
C = possible human carcinogen (limited evidence of carcinogenicity in animals in the absence of human data).
D = not classified due to inadequate evidence of carcinogenicity in animals.
MDL = method detection limit; the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the reported value is greater than zero.
PQL = practical quantitation limit; the lowest concentration that can be reliably achieved by well-operated laboratories within specified limits of precision and accuracy during routine laboratory operating conditions.
SDWA = Safe Drinking Water Act.
MCL = Maximum Contaminant Level; based on health, cost, and technology; enforceable for public water supplies.
MCLG = Maximum Contaminant Level Goal; based on health; nonenforceable.
SMCL = Secondary Maximum Contaminant Level; proposed value based on aesthetic considerations; nonenforceable.
Primary DWQS = New York Primary Drinking Water Quality Standard; based on health.
2ndary DWQS = New York Secondary Drinking Water Quality Standard; proposed value based on aesthetic considerations.
DWEL = drinking water equivalent level; for noncarcinogens: RfD x 70 kg / 2 L/day; for carcinogens: 10E-6 / CPF x 70 kg / 2 L/day.
Long. = long-term.
Life. = lifetime.
AWQC = EPA or New York ambient water quality criteria.
W & F = AWQC for the protection of human health from the ingestion of water and aquatic organisms.
F = AWQC for the protection of human health from the ingestion of aquatic organisms, only.
LOEL = lowest observed effect level.
PAH = polyaromatic hydrocarbon.
PCB = polychlorinated biphenyl.
p,p'-DDD = 1,1-dichloro-2,2-bis-(p-chlorophenyl)ethane.
p,p'-DDE = 1,1-dichloro-2,2-bis-(p-chlorophenyl)ethene.
p,p'-DDT = 1,1,1-trichloro-2,2-bis-(p-chlorophenyl)ethane.
$CaCO_3$ = calcium carbonate.
mg/L = milligrams per liter.
ug/L = micrograms per liter.
umho/cm = micromhos per centimeter.

(a) Values for coldwater/warmwater fish.
(b) Acute value represents a 1-day minimum.
(c) Chronic value represents a 30-day mean.
(d) Minimum daily averages for trout and nontrout waters.
(e) Insufficient data are available to determine an AWQC; reported value is the LOEL.
(f) Value displays 10-6 risk level and assumes that a healthy 70-kilogram adult consumes 2 L/day water.
(g) Value for trivalent arsenic.
(h) Hardness-dependent criteria assumes water hardness of 100 mg/L calcium carbonate.
(i) Hardness dependent criterion; below or above 75 mg/L as $CaCO_3$.
(j) Value for total chromium.
(k) EPA is proposing regulating lead at the source (0.005 mg/L) and at the tap (0.01 mg/L).
(l) Not an officially proposed value; values are recommended for persons on a severely or moderately sodium restricted diet, respectively.
(m) Value for listed principle organic compounds; total may not exceed 100 ug/L.
(n) Value for total trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane, and bromoform).
(o) Value for total halomethanes; includes chloromethane, bromomethane, dichloromethane, bromodichloromethane, tribromomethane, dichlorodifluoromethane, and trichlorofluoromethane.
(p) Proposed value.
(q) Value for total chlorinated benzenes.
(r) Value for total dichloroethenes.
(s) Value for total 1,3-dichloropropenes.
(t) Value for total phenolic compounds.
(u) Value for total nonchlorinated phenols.
(v) Value for total dichlorobenzenes.
(w) Value for total trichlorobenzenes.
(x) Not an official proposed value; EPA is considering proposing this value as an option for public comment.
(y) Value for total PAHs, excluding acenaphthene and naphthalene.
(z) Value for total phthalate esters.
(A) Value for total aldrin + dieldrin.
(B) No RfD available to calculate DWEL; value for DDT used for comparison, only.

*Federal and New York Secondary MCLs are not potential ARARs but are To Be Considered (TBCs) and have been included for comparison purposes, only.
#DWQS are more stringent values between New York State Water Quality Regulations (Title 6, Chapter X) and New York State Sanitary Code (part 5) MCLs.

Source: ESE, 1990.

(EPA, 1989c)]. According to the directive, an interim soil cleanup level [500 to 1,000 parts per million (ppm) total lead] is to be applied when the current or predicted land use is residential. Sediment evaluations will follow the methodologies presented in the NYSDEC, Division of Fish and Wildlife, Sediment Criteria, December 1989 document (Appendix H).

Air

NAAQS were established under the Clean Air Act as the criteria that state and local governments must plan to achieve; thus, NAAQS are not directly enforceable. Under Section 110 of the Clean Air Act, states are required to implement regulations to achieve NAAQS, and therefore state NAAQS must be considered ARARs. Lead is the only contaminant detected at the SEAD area for which a federal primary NAAQS exists. The standard for lead is 1.5 micrograms per cubic meter ($\mu g/m^3$) as a maximum arithmetic mean averaged over a calendar quarter (40 CFR Part 50.12).

3.3.1.2 Other Guidance to be Considered

Health-based guidance values are available for those contaminants for which no ARAR exists or if the ARAR is not considered sufficiently stringent to protect public health. The guidance values most commonly used are the cancer potency factor (CPF) for carcinogenic contaminants and the reference dose (RfD) for noncarcinogenic contaminants. From these values, it is possible to estimate an acceptable concentration for a given contaminant in soil, groundwater, surface water, or air that will result in no adverse public health effects.

In addition, the health-based criteria for carcinogens and systemic toxicants is available in Volume I of the RCRA Facility Investigation (RFI) Guidance Manual (EPA 530/SW-89-031) (EPA, 1989d). The criteria in this manual specify the environmental concentrations for soils and can be used as target levels for the cleanup of releases from regulated waste management units under RCRA.

3.3.2 LOCATION-SPECIFIC ARARs

3.3.2.1 Historic Sites and Archaeological Findings

There are no registered historical buildings, nor have there been any significant archeological findings within the SEAD area.

3.3.2.2 Rare, Threatened, or Endangered Species

No endangered or threatened species are known to inhabit the SEAD area. However, additional characterization of SEAD and adjacent offpost areas is required, particularly since the area is covered with grasses and brush thickets and is situated adjacent to Seneca Lake.

A habitat-based assessment will be performed during the RI. This assessment will be used to evaluate the existing ecological values of the site and adjacent areas. The NYSDEC, Division of Fish and Wildlife, Technical and Administrative Guidance Memorandum (TAGM), Habitat-Based Assessment, Steps 1 and 3 will be followed during the assessment.

In addition, since the site is near offpost farmland areas, the requirements of the Farmland Protection Policy Act of 1981 (addressed in TCFR 658) should be examined.

3.3.2.3 Wetlands

USACE defines wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances support, a prevalence of vegetation typically adapted for existence in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The landfill area at SEAD is known to contain several groundwater seep areas that may be considered wetlands by definition. Therefore, the following location-specific ARARs may apply:

1. Executive Order (EO) 11990 (40 CFR 6)--Protection of Wetlands;
2. Clean Water Act, Section 404 (40 CFR 230)--Prohibition of Wetland Filling;
3. EO 11988 (40 CFR 6)--Flood Plains Management;
4. RCRA (4 USC 6901)--Waste Facility Management Rules; and
5. New York State Environmental Conservation Law Article 24--Freshwater Wetland Act.

3.3.3 ACTION-SPECIFIC ARARs

Action-specific requirements set performance, design, or other controls or activities related to hazardous waste management. These requirements are triggered by specific remedial actions selected for a particular remedy. Shallow groundwater contamination is known to exist at SEAD. However, the extent, if any, of contamination of the deeper groundwater remains to be established. Insufficient data are available to characterize the discharge of contaminated groundwater to surface water bodies or to evaluate the extent of runoff of contaminated surface water.

The preliminary alternatives presented in Table 3.2-1 have been selected for remediation of the possible contaminated media at the SEAD site. These preliminary remedial alternatives have been developed to support the following general response actions: treatment, diversion, containment, removal, and disposal. The major action-specific ARARs that are likely to apply to the SEAD site, based on the general response actions, are covered in the following regulations:

1. Occupational Safety and Health Administration (OSHA) (29 CFR 1910)--Requirements for hazardous waste site worker protection.
2. RCRA (40 CFR 264.10-.77)--Requirements for the management of the treatment, storage, and disposal of hazardous wastes.
3. RCRA (40 CFR 268)--Prohibitions on land disposal and maximum concentration limits of contaminants in wastes after treatment for land disposal to be viable as a remedy.
4. RCRA (40 CFR 264.90-.351)--Requirements for groundwater monitoring of landfills, corrective action, establishment of points of compliance, closure/post-closure, and specifications for incinerators.
5. Clean Air Act (40 CFR 50.61)--NAAQS for particulate (applicable to incineration. New Source Performance Standards (NSPS) require use of Best Available Control Technology (BACT) for new air pollution sources. National Emissions Standards for Hazardous Air Pollutants (NESHAPS) establish emission limits for hazardous pollutants.
6. Clean Water Act (40 CFR 401)--Establishes effluent limitations for discharges to surface water, requires use of BACT, establishes National Pollutant Discharge Elimination System (NPDES) permitting requirements.

3.4 DATA NEEDS AND DATA QUALITY OBJECTIVES (DQOs)

The overall objective of the RI is to determine the nature and extent of chemical releases in the SEAD landfill area and to evaluate the threat to public health and the environment posed by the release. If a condition is identified that indicates that adverse exposure to hazardous constituents is occurring or is imminent, interim corrective measures may be warranted. In that case, the data generated during the RI will provide the basis for decisions on corrective measures. Therefore, the data must provide a valid characterization of the situation in the SEAD landfill area.

Previous investigations have only identified two different classes of contamination (metals and chlorinated solvents) in soil, surface water, and groundwater at SEAD. Therefore, the specific objectives (or data needs) to be achieved during the RI will be to determine/confirm the following:

1. Presence or absence of all target compound list (TCL) and target analyte list (TAL) contaminants (including herbicides),
2. Types of contaminants present,
3. Concentrations of these contaminants,
4. Mechanism of contaminant release to pathways,
5. Direction of contaminant transport,
6. Source boundaries and pathways,
7. Public health and environmental risks, and
8. Physical conditions of site to support the development and analysis of treatment or containment actions.

The data referenced in the conceptual site model indicate several possible contamination sources within the SEAD landfill area. Some of these are

relatively close to the facility boundary, raising a potential for offsite contaminant migration. These source areas must be characterized more fully to assess potential risks to offsite receptors and also to design successful remedial strategies. The shallow aquifer in the SEAD area has some special problems that need to be addressed. The proximity of groundwater to the ground surface and to contaminated soil favors the transport of contaminants from any discrete source areas that may exist. Characterization of such transport, including groundwater flow information, is essential for a clear understanding of contaminant migration. This is particularly important given the possibility of contamination reaching Seneca Lake to the west. Contamination could reach Seneca Lake as a consequence of contaminated groundwater recharge of surface water that could then discharge to the lake or as a consequence of direct discharge of contaminated groundwater to the lake.

The RA is a major component of the RI at SEAD. Data collected for the RA are used to evaluate the threat posed by the site to public health and the environment. The data must be qualitative so that chemical/physical properties, toxicity, and persistence of contaminants can be factored into the RA. The data must also be quantitative to the degree that they may be compared with quantitative statements of health risk criteria. Therefore, a high level of data certainty is necessary. RA data are generated through the sampling and analysis of biological and environmental media, particularly where the potential for human exposure is judged to be significant.

Based on the information presented in Table 3.2-1, the SDWA MCLs will be incorporated as the preliminary DQOs for the RI groundwater and surface water sampling. The analytical requirements and quantitation limits proposed for the

RI will be based on the SW-846 analytical methods identified in Table 3.3-1. Subsequent confirmation rounds will use methods determined to be appropriate after the first round. Soil sampling will be analyzed by the same analytical methods used for water samples.

3.5 DATA GAPS

In general, the data gaps include quantification of contaminant source strength and migration extent in several media. The specific data gaps, by media, are as follows:

1. Groundwater
    a. Determination of nature and extent of contamination within the shallow and lower aquifers,
    b. Determination of background concentrations, and
    c. Identification of potable wells within 1-mile radius of the site.
2. Surface Water
    a. Determination of nature and extent of contamination within onsite and offsite surface waters, including drainage ditches, identifiable wetland areas, and Kendaia Creek;
    b. Determination of background concentrations; and
    c. Identification of springs within a 1-mile radius of the site.
3. Soils
    a. Determination of nature and extent of contamination within the landfill area,
    b. Evaluation of potential source areas adjacent to the landfill/incinerator area, and
    c. Determination of background concentrations.
4. Sediments

   a. Analysis of sediments for possible contamination routes, including onsite and offsite drainage ditches, identifiable wetland areas, and Kendaia Creek;
   b. Evaluation of additional potential source areas adjacent to landfill/incinerator area; and
   c. Determination of background concentrations.

5. Dust--Analysis of dust within incinerator building.
6. Hydrogeologic--Evaluation of geophysical and hydrologic conditions of the landfill area, including the permeability and transmissivity of the shallow and lower aquifers.
7. Additional parameters--Evaluation of additional parameters that may be useful in identifying future treatment technologies [e.g., total alkalinity, chloride, sulfate, TOC, hardness, total residue, dissolved residue, suspended residue, 5-day biochemical oxygen demand (BOD_5), and chemical oxygen demand (COD)].

4.0 TASK PLAN FOR THE RI

This section presents a description of the tasks to be performed during the RI at the SEAD ash landfill site. The following tasks are included in this WP:

1. Prefield activities,
2. Field investigations,
3. Sample analysis/validation,
4. Data evaluation,
5. RA, and
6. RI summary report.

All field activities will be performed in accordance with the project SHERP and QAPP, which are attached as Appendices B and C, respectively. Section 5.0 describes the tasks associated with the FS, which together with the RI tasks comprise the overall RI/FS program.

4.1 PREFIELD ACTIVITIES

The prefield activities include the following:

1. A review of all existing data;
2. A meeting with the USACE project team to collect additional site data and discuss the proposed scope of work;
3. A site inspection to familiarize key project personnel with the site conditions, collect additional data, and finalize direction and scope of field activities; and
4. The review of this WP, SHERP, and QAPP.

4.2 FIELD INVESTIGATIONS

The field investigation task of the RI consists of five major subtasks:

1. Groundwater investigation,
2. Soils investigation,
3. Surface water and sediment investigation,
4. Sampling the incinerator dust, and
5. Hydrogeologic characterization of the surficial and first confined (lower) aquifer.

The following sections describe the general scope of the field investigations intended to characterize each sampled media. A detailed description of proposed sampling procedures is contained in the Field Sampling and Analysis Plan (Appendix A).

4.2.1 GROUNDWATER INVESTIGATION

The groundwater investigation is designed to provide additional information on the contaminant concentrations and distributions and to determine general groundwater flow conditions. The investigation consists of the following subtasks:

1. Well inventory;
2. Installation of nine new monitor wells;
3. Sampling and chemical analysis of the nine new wells and all existing wells at the ash landfill area, including the offpost wells; and
4. Characterization of the surficial and lower aquifers.

4.2.1.1 Well Inventory

A well inventory will be performed to locate domestic, commercial, and industrial wells within a 1-mile radius of the site. The inventory will include a review of state and municipal records, along with a door-to-door survey to identify potential groundwater users in the area. Information on such wells, in combination with the results of the groundwater field investigation, will be critical in assessing human health risks related to site contamination.

One privately owned deep well and two privately owned shallow wells have been identified approximately 1,000 ft west of SEAD (see Figure 2.3-2). These wells have been sampled and found to be free from any of the contaminants identified at the ash landfill area. The exact location of these wells, in addition to wells identified from the inventory, will be determined; records on installation depth, water level, and water quality will be reviewed, where available. All wells identified will be plotted on a site map for inclusion in the summary RI report. In addition, privately owned wells will be sampled and analyzed for the same parameters as the proposed and existing monitor wells at the SEAD ash landfill area during the RI (see Section 4.2.1.3).

4.2.1.2 New Monitor Well Installation

Nine new monitor wells are proposed for installation at the SEAD ash landfill area during the RI. The proposed locations for these wells are presented in Figure 4.2-1, and the location rationale is presented in Table 4.2-1. Five new wells will be constructed to monitor the surficial unconfined aquifer, and four new wells will be constructed to monitor the first confined aquifer (lower aquifer). The water table is expected to vary between 5 and 8 ft-bls in the surficial aquifer. It is anticipated that the shallow wells will be installed to

Table 4.2-1. Location Rationale for Proposed Monitor Wells

Location	Rationale
MW-34	Shallow monitor well downgradient of the area south of the incinerator to evaluate potential offpost contaminant migration.
MW-35D/ MW-36	Deep/shallow monitor wells downgradient of the ash landfill area to evaluate the offpost groundwater quality in the shallow and deep zones. Additionally, this pair of nested wells will be used in aquifer characterization in evaluating the potential vertical connection between the shallow and deep groundwater zones.
MW-37	Shallow monitor well downgradient of the burning pits and proposed geophysical/soil gas surveys north of the ash landfill to evaluate potential offpost migration. Water quality data from this well will be used to evaluate potential offpost contamination further.
MW-38D	Deep monitor well, nested with existing shallow monitor well PT-16, to evaluate water quality in the deep zone. Additionally, this pair of nested wells will be used to further evaluate potential vertical connection between the shallow and deep groundwater zones.
MW-39	Shallow monitor well downgradient of the anomalies detected from previous geophysical/soil gas surveys to evaluate downgradient water quality from these anomalous areas.
MW-40	Shallow monitor well northeast of the contaminant plume identified from the previous soil gas survey and groundwater analytical data, particularly from well PT-18. This well will be used to help determine the northeastern (upgradient) extent of contamination in this area.
MW-41D	Deep monitor well northeast of the ash landfill area to evaluate further the water quality conditions in the deep zone.
MW-42D	Deep monitor well southeast of the ash landfill to evaluate further the water quality conditions in the deep zone.

Source: ESE.

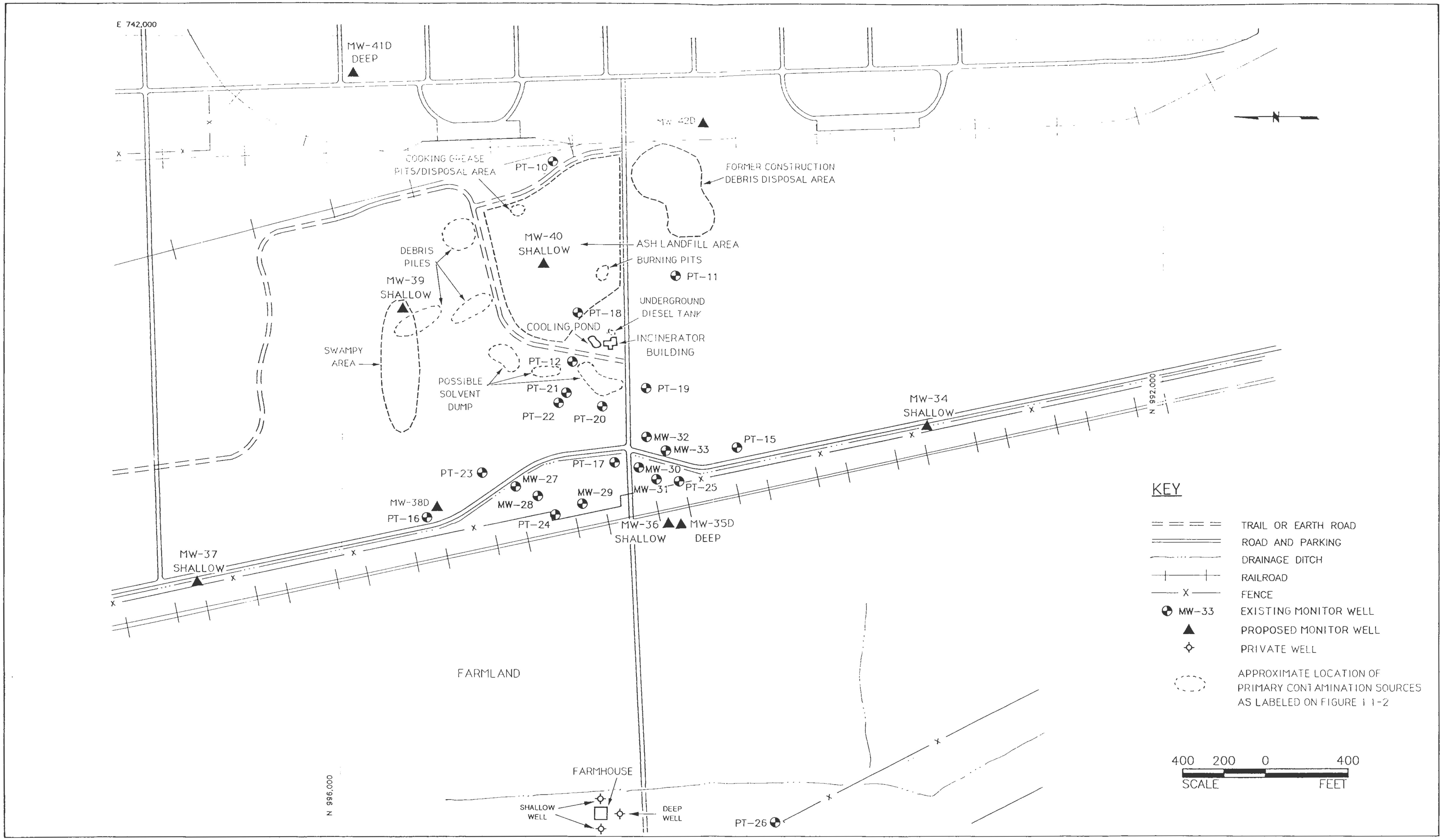

Figure 4.2-1
PROPOSED MONITOR WELL LOCATIONS
SEAD ASH LANDFILL AREA

SOURCE: ESE.

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approximately 15 ft-bls. The depth to water in the lower aquifer, as determined from nearby wells in this portion of Seneca County (Mozola, 1951), is approximately 48 ft-bls. The deep well at the farmhouse west of SEAD has a reported depth of approximately 120 ft-bls. The deep wells will be installed to a maximum depth of 200 ft-bls or the first water zone encountered, once having penetrated at least 20 ft into the bedrock. If no water is encountered to a depth of 200 ft-bls, the boring will be grouted to the surface and a new location chosen. The new wells will be installed in accordance with the methodology presented in Appendix A.

The bedrock topography at the site dips to the west-southwest at approximately 150 ft/mile (Mozola, 1951) toward Seneca Lake. Hence, groundwater flow direction in the deep zone is anticipated to be to the west-southwest. However, as previously discussed in Section 2.3 (Hydrogeology), water in the unweathered bedrock is chiefly found within the joints, fractures, and other secondary openings. Therefore, determining the groundwater flow within the bedrock underlying the site may be difficult to impossible. Hence, the four deep wells have been located such that all sides of the ash landfill area will be monitored. The deep wells have been located in areas of the site that are believed to be free from groundwater contamination in the shallow zone, based on the results of previous investigations. This was done to eliminate the possibility of introducing contamination to the deep zone (from the shallow zone) during well construction.

Of the four deep wells proposed, MW-41D will be installed northeast of the ash landfill area, MW-42D will be installed southeast of the ash landfill area, MW-38D will be installed northwest of the ash landfill area (nested with

PT-16), and MW-35D will be installed southwest of the ash landfill area. In addition to nested wells PT-22 and MW-38D, proposed shallow well MW-36 will be installed adjacent to proposed deep well MW-35D, downgradient of the ash landfill area. These two pairs of nested wells will aid in determining the potential existence of a hydraulic connection between the surficial and lower aquifers.

Information from split-spoon samples, standard penetration testing, observations regarding the moisture content of recovered soil samples, and direct measurement with a water-level tape of the water table in each boring will be used to screen the shallow wells from the top of the bedrock to greater than 3 ft above the water table. Bedrock wells will be screened from approximately 3 ft above the lower water table to 17 ft below the lower water table.

4.2.1.3 Well Sampling and Analysis

Upon completion of monitor well installation and development, groundwater samples will be collected from the nine new wells and all of the previously installed wells at the ash landfill area, including PT-26. All wells, including private wells downgradient of the ash landfill area as determined from the well inventory, will be sampled in accordance with the methodology presented in Appendix A. The New York State Department of Health (NYSDOH) and Seneca County Health Department (SCHD) staff will collect samples from the private wells of houses downgradient of the site at the same time that the RI contractor conducts the well sampling and analysis. DOH and SCHD will require a 2-week notice prior to groundwater sample collection. All samples will be analyzed for TCL organic compounds (volatiles, semivolatiles, pesticides/PCBs), TAL metals, and herbicides.

4.2.1.4 Aquifer Characterization

As previously presented in Table 2.4-4, slug tests were conducted on shallow wells PT-11, PT-12, PT-15, and PT-23. The average hydraulic conductivity as determined from these tests was 0.587 ft/day. Based on this data, it is likely that few, if any, of the shallow wells will have enough recharge to sustain pumping. To assess the hydraulic properties of the shallow aquifer further, slug tests will be performed on the five newly constructed shallow wells.

In accessing the hydraulic properties of the lower aquifer, as well as possible vertical connection between the surficial and the lower aquifers, nested wells will be used. These will include existing shallow well PT-16, nested with proposed deep well MW-38D, as previously presented in Figure 4.2-1, and proposed shallow well MW-36 nested with proposed deep well MW-35D. To assess the possible vertical connection between the shallow and lower aquifer, the static water level of the nested shallow wells will be measured and recorded prior to, during, and after the purging of the nested deep wells during sampling of the deep wells. Slug tests will be performed on the four newly constructed deep wells to assess the hydraulic properties of the lower aquifer.

Water levels measured from all new and existing monitor wells will be used to construct water-level or potentiometric surface maps of the shallow and lower groundwater zones. Groundwater flow rates and directions and hydraulic parameters will be estimated. At least two complete rounds of water-level measurements will be collected during the investigation; a round of water-level measurements consists of all wells being measured within a 10-hour period.

4.2.2 SOIL INVESTIGATION

The primary data gap associated with the soils in the landfill area is the absence of specific source definition. The soil investigation will include the following:

1. Geophysical survey,
2. Soil gas survey, and
3. Soil boring sampling and analysis.

A general description of the SOW for each of the individual tasks is presented in the following subsections. Unidentifiable anomalies will be investigated using test pits for visual inspection as needed. If an obvious point contributor is encountered while the test pit is dug, analytical sampling will be performed for confirmation. Soil from the test pit will be returned to the excavation. The RI contractor will provide the criteria necessary for test pit excavations.

4.2.2.1 Geophysical Survey

The results of the geophysical surveys conducted by ICF (1989) and Hunter/ESE (1989) have been described in Section 2.4.5. These surveys delineated additional possible source areas of contamination.

The proposed geophysical survey area, including the areas north of the completed surveys and at the former construction debris landfill, is presented in Figure 4.2-2. The survey will first be performed using EM induction techniques. The EM survey will be completed with the Geonics EM 31 Terrain Conductivity Meter. Field measurements will be taken along a survey grid having 100-ft centers. Specific anomalies detected during the EM survey will then be investigated using GPR to characterize these areas further.

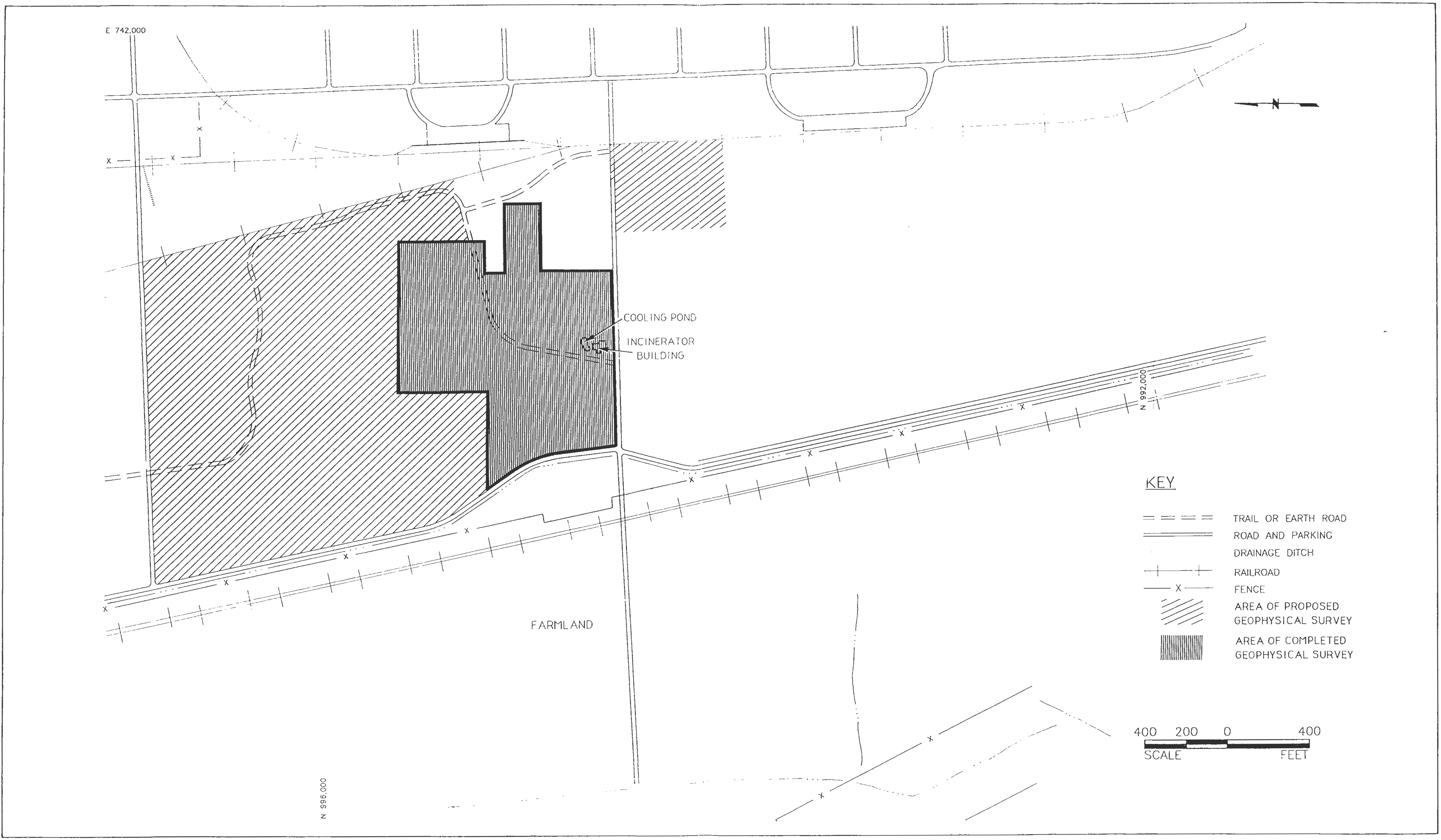

Figure 4.2-2
PROPOSED GEOPHYSICAL SURVEY AT THE SEAD ASH LANDFILL AREA

SOURCE: ESE.

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Geophysical procedures for the EM induction and GPR techniques will be provided by the RI contractor.

4.2.2.2 Soil Gas Survey

Information obtained by the proposed geophysical survey will be used to identify possible source areas of subsurface contamination. A soil gas/soil headspace survey will be performed to further evaluate specific anomalies inferred in the area of the proposed geophysical survey. The soil gas/soil headspace survey will allow a better delineation of the groundwater quality as it migrates downgradient from these source areas. The exact number of sampling locations will be determined based on the results of the geophysical survey. Sample point locations having groundwater near the surface will be sampled using soil headspace methods, as these conditions are not conducive to soil gas methods. The RI contractor will provide soil gas procedures.

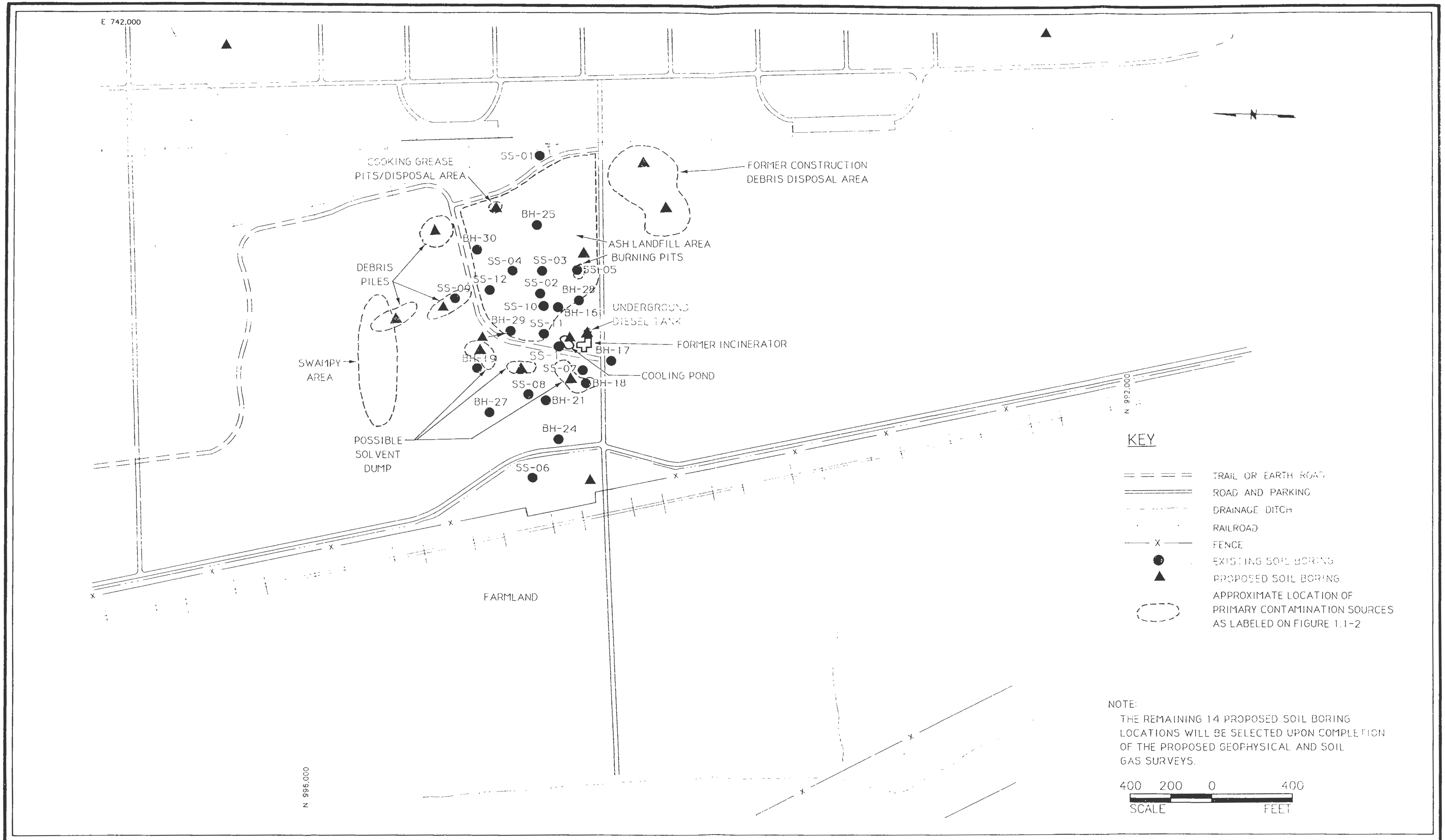
4.2.2.3 Soil Boring Sampling and Analysis

The drilling, logging, and sampling of 30 soil borings will be performed: (1) within the potential source areas of the landfill area as previously identified in Figure 1.1-2, and (2) at potential source areas identified during the proposed geophysical and soil gas surveys. The soil borings will be performed to determine the nature and concentrations of contaminants in the overburden materials (soil and fill).

The ICF (1989) report indicates that significant sources of groundwater contamination may exist below the water table at several locations. The soil borings will be drilled with a truck-mounted rig equipped with hollow-stem augers and will be advanced to the top of bedrock, which is anticipated to be at an average depth of approximately 15 ft-bls. Therefore, the soil borings will be helpful in assessing deeper contamination that may exist below the water table, including semivolatiles and metals.

The ICF (1989) report indicates that metals contamination is widespread throughout the landfill area, and VOC compounds are prevalent in the western landfill area. The field team leader will use this information, in conjunction with the proposed geophysical and soil gas surveys, to locate soil borings to determine maximum, average, and background concentrations of metals and VOCs at the site and to investigate suspected additional source areas. Figure 4.2-3 illustrates the proposed soil borings as determined from the site investigation to date. Thirty additional soil borings are proposed. With the exception of the former incinerator building, soil borings have been proposed for each of the primary contamination sources as previously identified in Figure 1.1-2. The following soil boring locations are proposed:

1. One within each of the three possible solvent dumps west of the former ash landfill,
2. One within each of the three debris piles north of the former ash landfill,
3. One within the cooking grease pit/disposal area in the northeast portion of the former ash landfill,
4. Two within the former construction debris disposal area southeast of the former ash landfill area,
5. One within the burning pits in the southern portion of the former ash landfill area,
6. One within the former cooling pond on the northeast corner of the former incinerator building, and



NOTE:
THE REMAINING 14 PROPOSED SOIL BORING LOCATIONS WILL BE SELECTED UPON COMPLETION OF THE PROPOSED GEOPHYSICAL AND SOIL GAS SURVEYS.

Figure 4.2-3
PROPOSED SOIL BORING LOCATIONS IN SEAD ASH LANDFILL AREA

SOURCE: ESE.

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7. One directly downgradient of the underground diesel storage tank on the northeast side of the former incinerator building.

In addition, the following soil boring locations are proposed:

1. One at existing soil boring BH-29 to investigate further the diesel-like material reportedly encountered at this location (ICF, 1989),
2. One located south of existing soil boring SS-06, and
3. Two background soil borings northeast and southeast of the site.

The remaining 14 proposed soil boring locations will be selected based on results of the initial phase of the proposed RI and will be used to delineate the lateral and vertical extent of any areas where contamination appears to exist, including that identified within the ash landfill area.

Four samples for laboratory analysis will be obtained from each soil boring using a split-spoon sampler. In each boring, discrete samples will be collected from the surface (0 to 2 ft-bls), at an intermediate zone (3 to 4 ft-bls), from the top of the water table to 1 ft above the water table, and from the weathered shale zone at the interval from the competent shale unit to 2 ft above the competent shale unit. Samples obtained from the soil borings will be sent to the USACE Missouri River Division-approved laboratory to be analyzed for TCL organic compounds (volatiles, semivolatiles, pesticides/PCBs), TAL metals, and herbicides.

All four of the samples from the soil boring located adjacent to the diesel tank will be analyzed for total recoverable petroleum hydrocarbons (TRPHs). All borings will be drilled, logged, and sampled in accordance with the methodology presented in Appendix A.

4.2.3 SURFACE/SPRING WATER AND SEDIMENT INVESTIGATION

To define the nature and extent of contamination within the site's drainage system, surface water and sediment samples will be obtained from the 10 locations as presented in Figure 4.2-4. Where surface water is present for sampling, a sediment sample, in addition to the surface water sample, will be collected. If no surface water is present (e.g., a seep with very moist sediments), only a sediment sample will be collected. The following surface water/sediment sample locations have been proposed: two locations in the swampy (possible wetland) area northwest of the ash landfill area, three locations in onsite drainage ditches within the landfill area, three offsite locations west of the landfill area (seepage area and drainage ditch), and one offsite location southwest of the landfill area. The surface water and sediment where Kendaia Creek flows under the SEAD boundary road, located in the northwest portion of the site, will also be sampled. Additional surface water locations identified during the RI spring survey will be sampled as part of this effort.

A survey will be performed to define the presence of any springs within a 1-mile radius of the ash landfill. The inventory will include a review of available topographic maps to locate existing springs and areas of potential spring formation. A field inspection of the study area will be conducted for verification of identified areas. The exact location of each spring will be referenced, along with a brief description that will include depth, areal extent,

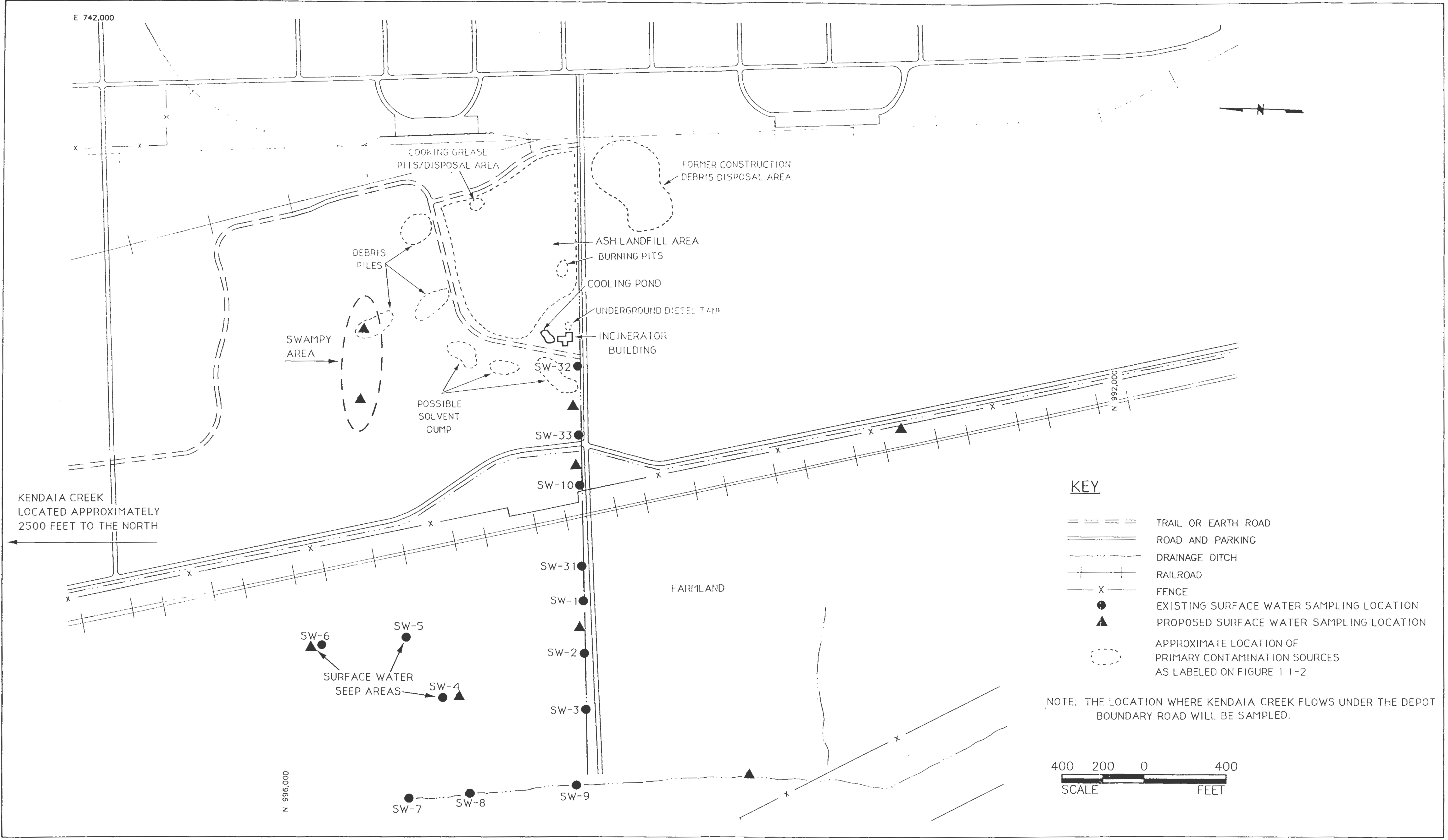

Figure 4.2-4
PROPOSED SURFACE/SPRING WATER AND SEDIMENT SAMPLING LOCATIONS IN SEAD ASH LANDFILL AREA

SOURCE: ESE.

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flow rate, clarity, and drainage. Springs identified during this survey will be sampled as part of the surface water/sediment sampling effort.

Surface/spring water and sediment samples will be analyzed for TCL organic compounds (volatiles semivolatiles, pesticides/PCBs), TAL metals, and herbicides. Samples will be collected in accordance with the methodology outlined in Appendix A.

4.2.4 INCINERATOR DUST SAMPLING

The incinerator dust will be sampled using a cotton swab technique at locations in the top reaches and low spots within the flumes and piping. This will consist of two samples that will be analyzed for TCL, excluding volatiles. Samples will be obtained in accordance with the methodology outlined in Appendix A.

4.2.5 AIR MONITORING

This air monitoring section describes the type of equipment, location, and frequency of measurements to be performed during the soil boring, monitor well installation, and surface water/sediment sampling programs. The contaminants of concern during these field activities include 12DCE, T12DCLE, TRCLE, C2H3CL, and CHCL3. The proposed location and frequency of measurement is shown in Table 4.2-2.

Due to the ionization potential (IP) [expressed in electron volts (eV)], of the primary site contaminants of concern [12DCE (IP = 9.64eV), T12DCLE (IP = 9.65eV), TRCLE (IP = 9.47eV), C2H3CL (IP = 9.99eV), and CHCL3 (IP = 11.42eV)], and HNU photoionizer equipped with an 11.7-eV lamp will be

Table 4.2-2. Air Monitoring Requirements Using the HNU Photoionizer

Location	Frequency*
A. Monitor Well Installation and Soil Boring Sampling	1. Continuously during the penetration and removal of the standard penetration test (SPT) sampler. 2. Continuously during the cleaning of equipment. 3. During 5-minute intervals when the borehole is open.
B. Surface Water/ Sediment Sampling	1. Continuously upon approach. 2. Continuously upon sampling.

*Measurements will be made within 1 ft of the source and in the breathing zone levels. Breathing zone refers to the area from the top of the shoulders to the top of the head. Consult the SHERP for personal protective equipment and health precautions.

Source: ESE.

used for screening the air to determine the total concentration of organic vapors and gases with an IP of less than 11.7eV in the air. This instrument cannot respond to methane or hydrogen cyanide, cannot be immersed in water, and can be used as a real-time screening device only.

The HNU analyzer functions upon the principle of photoionization for the detection of volatile compounds in air. The sensing device consists of a sealed ultraviolet (UV) light source that emits photons energetic enough to ionize many trace compounds (particularly organics). However, the sensing device does not ionize major components of air. When a positive potential is applied to one electrode in the chamber adjacent to the UV lamp, a field is created that drives any ions formed by absorption of the UV light to the collector electrode where the current (proportional to concentration) is measured. The useful range for sensitivity is 0.1 to 2,000 ppm.

After the instrument is zeroed with clean or zero-grade air, an HNU calibration gas standard is connected and the span adjustment made according to standard specifications. Typical span settings for chlorinated hydrocarbons are between 5 and 9. Calibration checks will be performed at the start of each work period, at the end of the day, and if erratic readings occur.

If ambient levels exceed 50 ppm on the HNU analyzer, perimeter air samples must be collected. This action level is based upon a protection factor of 100 (supplied air respirator) times the action level of the compound with the lowest permissible exposure limit (PEL), which is 12DCE (PEL = 1.0 ppm). Perimeter measurements will be at locations identified by the site safety officer. Methodology for the collection of halogenated hydrocarbons [National Institute for Occupational Safety and Health (NIOSH) Method 1003] uses a coconut shell charcoal tube [100 milligrams (mg)/50 mg] for maximum air volume of 15 liters (L) at a sampling rate of 0.03 liter per minute (L/min) for an 8-hour time-weighted average (TWA) sample. The collection tubes will be submitted to an American Industrial Hygiene Association (AIHA)-accredited laboratory for analysis.

4.2.6 SURVEYING

The location and elevation of each new monitor well, soil boring, and surface water/sediment sample will be surveyed by a New York State Registered Land Surveyor. The coordinates will be to the closest 1 ft and referenced to the state planar coordinate system. Elevations will be to the closest 0.01 ft and referenced to the National Geodetic Vertical Datum (NGVD) survey of 1929. The results of this survey will be used to develop an additional cross section of the area west of the ash landfill by using geologic logs created during the soil boring and monitor well installation programs.

In addition, three permanent concrete monuments will be established on the site. The monuments will be located within the study area boundaries and set 50 ft from the edge of any existing roads and a minimum of 1,000 ft apart. Horizontal control (1:10,000) and vertical control (1:5,000) of third order or better will be maintained. Each monument will be labeled with a 3.25-inch domed brass or aluminum alloy survey marker (cap). Each cap will be marked in a consecutively numbered sequence as follows:

SEAD-1-1990
USAED-HUNTSVILLE

The lettering dyes will be 3/16-inch size. All coordinates will be referenced to the state planar system, and all elevations will be referenced to the 1929 NGVD.

4.2.7 DECONTAMINATION

The following decontamination procedures will be used for field equipment that comes in contact with sample matrices:

1. Organic compounds and trace metals analyses:
    a. Clean with Liquinox® and tap water (a higher grade of water may always be substituted for tap water), using a brush, if necessary, to remove particulate matter and surface films;
    b. Rinse thoroughly with tap water;
    c. Rinse with 10 percent HNO_3 ultrapure (rinse with 1 percent HNO_3 if the equipment being decontaminated is constructed of carbon steel);
    d. Rinse with tap water;
    e. Rinse with acetone only, or a methanol rinse followed by a hexane rinse (solvents must be pesticide grade or better);
    f. Apply thorough rinse with deionized demonstrated analyte-free water.
    g. Allow to air dry; and
    h. For overnight storage, wrap in aluminum foil, if appropriate, to prevent contamination.
2. Groundwater purging and monitoring equipment:
    a. Rinse elevation tapes and slugs (for slug testing) with tap water followed by deionized water, and place in a polyethylene bag to prevent contamination during storage or transit; and

   b. Rinse the downhole well tubing, hoses, and submersible pumps with copious amounts of tap water followed by deionized water.

3. Drilling tools and excavation equipment:
   a. Before personnel begin drilling activities and entering or leaving the site, large equipment not directly used for sampling will be decontaminated by steam cleaning at a designated area. This includes drilling rigs, augers, backhoes, and drilling tools. The steam cleaning area will be designated to contain decontamination wastes and waste water.
   b. Downhole sampling tools will be rinsed with deionized water and air dried.

Demonstrated analyte-free water will be used for decontamination procedures. EPA must be supplied with the test results from TCL/TAL analysis (analyzed for the detection levels of interest).

Tap water used for decontamination purposes will be obtained from SEAD. SEAD obtains the potable water source from Seneca Lake. A sample of the water will be collected and analyzed for the TCL scan prior to the field effort.

Runoff from decontamination/rinse waters and drilling operations will be collected onsite and placed in suitable containers. The contractor will be responsible for the subsequent management and disposal of the decontamination rinse waters.

4.2.8 SAMPLING, HANDLING, PACKAGING, AND SHIPPING

All analytical samples will be placed in the appropriate sample containers as specified in EPA's Standard Operating Procedures and Quality Assurance Manual, Appendix A (April 1, 1986). The holding time criteria identified in the QAPP (see Appendix C) will be followed.

Before samples are packaged for shipment, the sample container will be checked for proper identification and compared to the site logbook for accuracy. The sample then will be wrapped with a cushioning material and placed in a plastic Ziploc® bag before being put into the plastic cooler. A sufficient amount of bagged ice will be placed in the cooler to keep the samples at 4 degrees Celsius (°C) until arrival at the laboratory.

All necessary documentation (see Appendix D) required to accompany the samples during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler then will be sealed with fiber tape, and custody seals will be placed so any opening of the cooler prior to arrival at the laboratory can be detected. Sample volume requirements, sample container requirements, holding times, and preservation requirements are specified in the QAPP.

All samples requiring chemical analysis will be transported at the close of each day to the contractors and USACE quality assurance (QA) laboratories by overnight courier. Samples being sent to the USACE QA laboratory will be packaged and shipped in accordance with USACE Sample Handling Protocol, Medium Concentration Sample. The USACE QA laboratory will be notified

5 working days prior to sending samples. The protocol is contained in Appendix D.

4.2.9 WASTE CONTAINERIZATION

All drill cuttings, well development water, and rinsate will be contained in approved 55-gal drums. RI-generated waste disposal will be conducted in accordance with all applicable RCRA requirements. All drums shall be labeled as to contents and origins. At the end of each phase of drilling, documentation (based on results of the required chemical analyses, evaluation of site conditions, and knowledge of regulatory requirements) will be provided that recommends the disposition for each drum. For each drum considered to contain contaminated material, the RI contractor will recommend a specific, optimum method and price of disposal. Actual disposal will be the responsibility of the RI contractor.

4.3 SAMPLE ANALYSIS AND VALIDATION

A summary of the number and type of samples to be collected, along with parameters for analysis, is presented in Table 4.3-1. All laboratory analysis will be performed in accordance with the methodology presented in the QAPP (Appendix C).

Contractor QA personnel will validate data received from the contractor's laboratory in accordance with the Region II SOPs for evaluating organic and inorganic analysis. Factors to be considered include sample holding times, instrument time and performance, instrument calibration, blanks, surrogate recoveries, matrix spike/duplicates, and other quality control (QC) parameters.

Table 4.3-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Incinerator Ash Landfill

				Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks+	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks+
Groundwater									
Volatile Organics	SW8240	2	32	3	*	2	3	*	2
Mercury, Total	SW7471	2	32	3	*	0	3	*	0
Arsenic, Total	SW7060	2	32	3	*	0	3	*	0
Selenium, Total	SW7740	2	32	3	*	0	3	*	0
ICAP: Metals, Total	SW6010	2	32	3	*	0	3	*	0
Semivolatiles	SW8270	2	32	3	*	0	3	*	0
Herbicides	SW8150	2	32	3	*	0	3	*	0
Pesticides/PCBs	SW8080	2	32	3	*	0	3	*	0
Alkalinity	EPA 310.1	0	3	0	0	0	0	0	0
COD	HACH 8000	0	3	0	0	0	0	0	0
BOD	EPA 405.1	0	3	0	0	0	0	0	0
Chloride	EPA 325.3	0	3	0	0	0	0	0	0
Sulfate	EPA 375.4	0	3	0	0	0	0	0	0
TOC	EPA 9060	0	3	0	0	0	0	0	0
Hardness	EPA 130.2	0	3	0	0	0	0	0	0
Residue, Total	EPA 160.3	0	3	0	0	0	0	0	0
Residue, Dissolved	EPA 160.1	0	3	0	0	0	0	0	0
Residue, Suspended	EPA 160.2	0	3	0	0	0	0	0	0

Table 4.3-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Incinerator Ash Landfill (Continued, Page 2 of 4)

Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
				Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks^{+}	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks^{+}
Surface/Spring Water									
Volatile Organics	SW8240	1	9	1	*	1	1	*	1
Mercury, Total	SW7471	1	9	1	*	0	1	*	0
Arsenic, Total	SW7060	1	9	1	*	0	1	*	0
Selenium, Total	SW7740	1	9	1	*	0	1	*	0
ICAP: Metals, Total	SW6010	1	9	1	*	0	1	*	0
Semivolatiles	SW8270	1	9	1	*	0	1	*	0
Herbicides	SW8150	1	9	1	*	0	1	*	0
Pesticides/PCBs	SW8080	1	9	1	*	0	1	*	0
Sediments									
Volatile Organics	SW8240	1	9	1	*	0	1	*	0
Mercury, Total	SW7471	1	9	1	*	0	1	*	0
Arsenic, Total	SW7060	1	9	1	*	0	1	*	0
Selenium, Total	SW7740	1	9	1	*	0	1	*	0
ICAP: Metals, Total	SW6010	1	9	1	*	0	1	*	0
Semivolatiles	SW8270	1	9	1	*	0	1	*	0
Herbicides	SW8150	1	9	1	*	0	1	*	0
Pesticides/PCBs	SW8080	1	9	1	*	0	1	*	0

Table 4.3-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Incinerator Ash Landfill (Continued, Page 3 of 4)

				Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks^{+}	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks^{+}
<u>Soils Borings</u>									
1) Surficial and Intermediate Samples									
Volatile Organics	SW8240	4	56	5	*	0	5	*	0
ICAP: Metals, Total	SW6010	4	56	5	*	0	5	*	0
Semivolatiles	SW8270	4	56	5	*	0	5	*	0
Herbicides	SW8150	4	56	5	*	0	5	*	0
Pesticides/PCBs	SW8080	4	56	5	*	0	5	*	0
Mercury	SW7471	4	56	5	*	0	5	*	0
Arsenic	SW7060	4	56	5	*	0	5	*	0
Selenium	SW7740	4	56	5	*	0	5	*	0
2) Above Water Table and Deep Samples									
Volatile Organics	SW8240	4	56	5	*	0	5	*	0
ICAP: Metals, Total	SW6010	4	56	5	*	0	5	*	0
Semivolatiles	SW8270	4	56	5	*	0	5	*	0
Pesticides/PCBs	SW8080	4	56	5	*	0	5	*	0
Herbicides	SW8150	4	56	5	*	0	5	*	0

Table 4.3-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Incinerator Ash Landfill (Continued, Page 4 of 4)

				Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks+	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks+
Soil Borings (Continued)									
2) Above Water Table and Deep Samples (Continued)									
Mercury	SW7471	4	56	5	*	0	5	*	0
Arsenic	SW7060	4	56	5	*	0	5	*	0
Selenium	SW7740	4	56	5	*	0	5	*	0
3) Diesel Underground Storage Tank									
TRPH	SW9071	0	4	1	*	0	1	*	0
Dust/Wipe									
Semivolatiles	SW8270	0	2	0	*	0	0	*	0
Pesticides/PCBs	SW8080	0	2	0	*	0	0	*	0

*One rinsate sample will be collected per decontamination event, not to exceed one sample per day.

+The actual number of field QC blanks shipped will depend on the duration of field activity.

Source: ESE.

The specifications provided in the guidelines and/or acceptance criteria given by EPA will be followed when the validation is performed.

The field analysis has its own QA program, including instrument calibration, duplicates, and blanks. Details on the field QA program are provided in Appendix C.

4.4 DATA EVALUATION

Data evaluation will be completed upon receipt of data from the field investigation. Data will be compared to project objectives and summarized into a usable format for manipulation. The data will be assembled in a format compatible with USATHAMA database structure requirements. Tables will be created to exhibit new and existing data, contaminant levels will be plotted on site maps, and groundwater contour maps and geologic cross sections will be developed.

Contaminant receptors will be identified and contaminant migration pathways refined. The results of this task will be used in the RA and in the evaluation of remedial alternatives.

4.5 RISK ASSESSMENT

Following the data evaluation, an RA will be performed using methods described in the EPA Risk Assessment Guidance for Superfund (RAGS) (1989a) Volume I (Human Health Evaluation Manual) and Volume II [Environmental Evaluation Manual (1989b)]. The objective of the RA is to characterize the current and potential public health and environmental risks that would exist under the no-action alternative. The RA will be an evaluation of available demographic, geographic, physical, chemical, and biological factors that describe the impacts of hazardous waste releases from the site. The RA will evaluate the types and concentrations of hazardous chemicals at the site, the migration potential of contaminants through various media, their toxicology, and the degree of exposure to the environment and public health. The results of an exposure assessment will be coupled with a toxicological evaluation to determine the degree of endangerment posed by exposure.

The RA process will include the following basic steps:

1. Estimation of exposure point concentrations,
2. Estimation of chemical intakes,
3. Toxicity assessment, and
4. Risk characterization.

Exposure-point concentrations of chemicals of concern will be estimated by identifying all relevant exposure pathways and estimating chemical concentrations at potential receptor locations by a fate and transport analysis. The exposure pathways of primary concern at the site are migration of wastes into groundwater that may potentially serve as water supply for nearby residents and discharge of groundwater to surface water. The potential for sensitive human and environmental receptors to be exposed to contaminated surface water and soil will be fully evaluated. The projected concentrations of indicator chemicals in environmental media at exposure points will be estimated from the database, using semiquantitative environmental fate and transport analyses. Predicted contaminant concentrations will be compared to a list of ARARs refined to reflect the contaminants of concern. The full array of chemical contaminants will be included in the development of the RA. The RA will not report the minor constituents.

4.5.1 HUMAN RA

For those critical contaminants that have no federal or state standards, acceptable concentrations in environmental media will be estimated based on RfD values (for noncarcinogens) and CPFs (for carcinogens). The primary source of toxicological data used in the analysis will be the EPA computer database, Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), and the EPA AWQC documents. Target risk levels will be determined for carcinogens in consultation with State of New York and EPA representatives.

Information from previous steps will be integrated in the risk characterization step to determine the degree of endangerment posed by site contaminants under the no-action alternative.

4.5.2 ECOLOGICAL RA

The objectives of the ecological RA for the site are to:

1. Identify potential terrestrial and aquatic receptors, including the potential for rare or endangered species at the site.
2. Identify and delineate (where necessary) wetlands and floodplains within the extent of contamination in accordance with EOs 11990 and 11988.
3. Identify and describe exposure pathways.
4. Evaluate the potential for adverse effects due to exposure to site contaminants to selected nonhuman receptors.

5. Evaluate the potential for indicator chemicals to bioaccumulate through the food chain. The current understanding of the nature of the contaminants at the site suggests that this potential is low.

Potential aquatic and terrestrial receptors will be identified for each habitat type at the site using field investigations and available data. Potential aquatic receptors include flora and fauna exposed to contaminated surface water and bank and bottom sediments. Plankton, macrophytes, macroinvertebrates, fish (resident and stocked), amphibians, and riparian birds/waterfowl could be expected as aquatic receptors.

Potential terrestrial receptors at the site include vegetation, reptiles, amphibians, birds, small mammals (e.g., rabbit, woodchuck, meadow vole), fox, and deer. Potential terrestrial receptors can comprise obligate or facultative residents in any of the habitat types available within this site. Nonresident animals may migrate from outside the confines of the site for food, water, or nesting/breeding. Habitat types for the site will be described for terrestrial and aquatic areas based on field investigations conducted under this task and for previous work.

During hazard identification, the potential receptors and characteristics of the environmental contaminants are reviewed to identify a subset of representative receptors for further evaluation. Evaluation of all onsite organisms to determine the effects of contamination is not feasible. Representative species for study will be determined based on criteria such as status (rare, threatened, or endangered), economic value (hunting and fishing), and structural and functional importance in the ecosystem. Representative species will include major phyla and trophic levels (producers and consumers). Selection of species to be studied will be based on factors such as contaminant concentration, sensitivity of an organism to that contaminant, and availability of toxicological data.

The ecotoxicity of the chosen indicator chemicals will be reviewed to summarize the potential for acute and chronic effects and bioaccumulation potential for representative receptors (or closely related species). Acute and chronic effects to representative organisms, as well as response to bioaccumulation of specific contaminants, will be reported using literature relevant to conditions at this site. Physical-chemical properties of each contaminant and toxicity and bioaccumulation data will be reported for aquatic and terrestrial species, respectively. Ecotoxicity benchmarks will be chosen from these summaries to provide points of comparison relative to the exposure concentrations and conditions and organisms representing the ecotypes at the site.

Data available from this and previous site investigations will be used to develop exposure concentrations at potential receptors in conjunction with the human health evaluation. Based on the results of this sampling, it may be necessary to estimate the extent of bioaccumulation of some site contaminants via food chain modeling or tissue residue analysis. If necessary, this may be accomplished using simple algorithms, initially, to screen for potentially harmful concentrations. If this screening indicates the potential for significant bioaccumulation, tissue sampling and/or more rigorous modeling could be necessary. Review of current data does not indicate a need for this sampling.

Potential exposure pathways will be identified for the site based upon site visits and available data. Examples of potential exposure pathways include:

1. Surface Water
    a. Dermal exposure to aquatic animals immersed in medium with contaminants in solution and/or suspension;
    b. Dermal exposure to terrestrial animals washing, wading, or swimming in contaminated medium;
    c. Ingestion of contaminants in solution and/or suspension by aquatic and terrestrial organisms; and
    d. Ingestion of contaminants retained on skin, fur, or feathers via preening.
2. Sediments
    a. Dermal exposure to benthic organisms and benthic feeders, wading animals, and inhabitants of bank habitat;
    b. Ingestion by benthic organisms and benthic feeders; and
    c. Ingestion of contaminants retained on skin, fur, or feathers via preening; and
    d. Consumption of benthic invertebrates and macrophytes by resident and nonresident animals.
3. Soil
    a. Dermal contact by burrowing animals;
    b. Ingestion by invertebrates;
    c. Inhalation of wind-born dusts;
    d. Dermal exposure from contaminated soil particles adhering to skin, fur, or feathers via behavior including, but not limited to, scraping or digging for food, bathing or rolling in soil or dust, and burrowing to excavate dwellings; and

   e. Ingestion of animals or plants on which contaminated soil particles adhere and inadvertent consumption via digging and burrowing activities.

4. Air--Inhalation of volatilized compounds.
5. Food--Consumption of aquatic or terrestrial vertebrates, invertebrates, and plants by resident and nonresident consumers.

Pathway screening will be conducted to determine which pathways require further evaluation. In some cases, the exposure concentration is compared directly with an ecotoxicity benchmark to screen for potential adverse effects. However, most organisms are not continually exposed to contaminants, and exposure concentrations should be converted to exposure doses. In addition to site observations, behavioral and physiological information concerning representative receptors will be used to estimate exposure encounters and subsequent doses from relevant media. Examples of potentially relevant information are home ranges, consumption rates, and foraging/grooming behaviors. The assumptions used to develop the exposure scenarios and doses will be included in the final report.

The ecological RA is being conducted, in part, to estimate the potential for adverse effects to one or more populations, based on the ecotoxicity of contaminants to individual organisms. Initial review of the data and observations from a recent site visit suggest that effects due to contamination may be subtle or limited in scope. If initial screening shows the potential for adverse effects, the populations that are most directly and continuously exposed may be the most likely to show adverse effects. For terrestrial animals, these are likely to be soil invertebrates (e.g., earthworms) and small mammals. For aquatic organisms, benthic invertebrates and benthic feeders for sediment-associated contaminants and pelagic organisms for surface water contaminants are the most likely to show adverse effects. Determination of species richness and evenness in selected areas would be useful endpoints for comparison with uncontaminated areas, and these surveys can be conducted easily for invertebrate communities.

To accomplish the objectives of the ecological RA, some field investigations must be undertaken. The fieldwork will include the following:

1. Surveys of exposure encounters or site utilization and activity by selected receptors to provide data for construction of exposure scenarios and dose estimation. Based upon preliminary evaluation, these surveys are likely to be avian observations, small mammal trapping, and vegetation analysis in habitat adjacent to identified sites.
2. Identification of appropriate reference sampling areas (terrestrial and/or aquatic, dependent upon the results of initial screening) and subsequent sampling sufficient for comparisons of species richness and evenness.
3. Wetlands assessment for any wetlands that may be affected by contamination or remedial actions.
4. Survey for critical or sensitive habitat and potential presence of rare or endangered species (if necessary).

As a first step in the evaluation of the potential for adverse effects to nonhuman receptors, the benchmarks of ecotoxicity for selected contaminants will be compared with exposure concentrations or conservative doses to generate ecotoxicity quotients. The necessity for additional comparisons and evaluation will be based upon the results of this screening. The potential for bioaccumulation will be assessed, and body burdens will be estimated as necessary. When indicated, results for individuals will be extrapolated to populations, and potential for adverse effect to the ecosystem (structural and/or functional) will be addressed. Results of these analyses will be compared with field-based species richness and evenness data. Assumptions and data limitations will be addressed, as well as the uncertainties associated with the assessment.

4.6 RI REPORTING

4.6.1 LETTER REPORT

At the completion of the first round of field work sampling, a letter report characterizing the site will be furnished to the Army Project Manager. This letter report will at a minimum list the locations and quantities of contaminants at the site. Should a second and even a third round of confirmatory sampling be required, additional letter reports will be prepared upon analytical completion of each of these rounds.

4.6.2 PRELIMINARY SITE CHARACTERIZATION SUMMARY

At the conclusion of field work, a Preliminary Site Characterization Summary in the format of the first four chapters of an RI report will be prepared. This document shall form the basis of discussion at a Project Managers progress meeting.

4.6.3 RI REPORT

A draft RI report will be prepared at completion of the site investigation and data evaluation. The report will summarize the results of the field investigation and records searches and present the data and conclusions in a clear and concise record. The RI report will also present the results of the data evaluation and RA. This task is complete upon review, comment, and revision of the draft RI report document, as governed by the IAG.

5.0 TASK PLAN FOR THE FS

In accordance with the current EPA RI/FS guidance manual (EPA, 1988), an FS for the site will be conducted based on the results of previous investigations and the proposed RI and RA. The following three tasks comprise the FS process:

1. Remedial alternative development and screening,
2. Remedial alternative evaluation, and
3. FS report.

5.1 REMEDIAL ALTERNATIVE DEVELOPMENT AND SCREENING

The first task of the FS process is to review the data collected during the RI and results of the completed RA. The subtasks comprising this step will accomplish the following objectives:

1. Identification of ARARs,
2. Development of remedial response objectives,
3. Identification of applicable technologies by operable unit and media,
4. Identification of volumes or areas of media,
5. Screening of technologies,
6. Development of alternatives, and
7. Screening of alternatives.

5.1.1 IDENTIFICATION OF ARARs

Contaminant-specific ARARs will be developed for the contaminants at the site. The chemical-specific concentration limits established by either federal or state environmental laws will be compiled for each applicable environmental medium.

Location-specific ARARs are those requirements that establish restrictions on remedial activities or limitations on contaminant levels on the basis of site characteristics or the physical characteristics of the surrounding area. Currently, there are no known location-specific ARARs for the general site area. As part of this project, location-specific ARARs will be further researched to ensure compliance.

Activity-specific ARARs are standards that establish restrictions or controls on particular kinds of remedial activities related to management of hazardous substances or pollutants. Specific remedial activities will be evaluated as opposed to the specific chemicals present at the site. Examples of activity-specific ARARs include closure regulations, incineration standards, and pretreatment standards for discharges to POTWs. Because different types of remedial actions will be evaluated, different activity-specific ARARs will apply to the various alternatives.

5.1.2 DEVELOPMENT OF REMEDIAL RESPONSE OBJECTIVES

Based on the existing data, data collected in the RI, and the contaminant migration pathways defined in the RA, the remedial response objectives will be developed. Site-specific response objectives will be developed using a risk-based methodology to define cleanup levels that would eliminate or minimize risks to public health and the environment. Potential contaminant migration and exposure pathways identified in the RA will be examined further as a basis for estimating acceptable onsite residual contamination levels. Acceptable exposure levels for potential receptors will be identified (from the RA), and onsite cleanup levels will then be estimated by extrapolating from receptor points back to source areas along critical migration pathways. Development of response objectives will also include refinement of ARARs specific to the site.

5.1.3 IDENTIFICATION OF APPLICABLE TECHNOLOGIES

Based on the remedial response objectives developed after the RI and RA, a list of applicable technologies will be identified. Table 5.1-1 shows the universe of potential and viable technologies that may be identified for site remediation, based on the results of the RI and RA. This list contains technologies for several types of general response actions, including treatment (physical, chemical, biological, and thermal), diversion, removal and disposal, innovative technologies, containment, and no action.

The site will be handled as one operable unit, with the possibility of identifying several suboperable units after the RI and RA. If suboperable units are identified, potential remedial technologies will be defined for each site condition requiring remediation. Each suboperable unit should meet at least one response objective.

5.1.4 IDENTIFICATION OF VOLUMES OR AREAS OF MEDIA

During identification and development of applicable technologies, an initial determination will be made of the areas or volumes of media to which the technologies of the several types of general response actions might be applied. This initial determination will be made for each media of interest at the site. The identification of the area or volumes of media will include a consideration of not only acceptable exposure levels and potential exposure routes, but also site conditions and the nature and extent of contamination.

Table 5.1-1. Identification of Technologies for Remedial Response Actions

Remedial Response Action	Remedial Technology
TREATMENT	
Physical	Sedimentation
	Flocculation
	Oil/Water Separation
	Dissolved-Air Flotation
	Evaporation
	Air Stripping
	Distillation
	Soil Flushing/Soil Washing
	Chelation
	Liquid/Liquid Extraction
	Supercritical Extraction
	Filtration
	Carbon Adsorption
	Reverse Osmosis
	Ion Exchange
	Electrodialysis
	Solidification/Stabilization
	Soil Aeration
Chemical	Neutralization
	Chemical Precipitation
	Chemical Hydrolysis
	Chemical Oxidation/Reduction
	Oxidation by Hydrogen Peroxide (H_2O_2)
	Ozonation
	Alkaline Chlorination
	Oxidation by Hypochlorite
	Electrolytic Oxidation/Reduction
Biological	Activated Sludge
	Rotating Biological Contactors
	Anaerobic Digestion
	PAC
	SBR

Table 5.1-1. Identification of Technologies for Remedial Response Actions (Continued, Page 2 of 3)

Remedial Response Action	Remedial Technology
<u>TREATMENT</u> (Cont'd)	PAC-Enhanced SBR
	Trickling Filter
	Biological Towers
	Waste Stabilization Ponds/Lagoons
	Fluidized-Bed Biological Reactor
	Composting
	Land Application/Land Farming
Thermal	Liquid Injection Incinerator
	Rotary Kiln Incinerator
	Wet-Air Oxidation
	Industrial Boilers
	Liquid Industrial Kilns (Cement, Lime, Aggregate, Clay)
	Infrared Incineration
	Circulating Bed Combuster
	Steam Stripping
	Flaming/Flashing
<u>INNOVATIVE TECHNOLOGIES</u>	Microwave Plasma
	Sodium Fluxing
	UV Photolysis
	Electron Beam Treatment
	Gamma Irradiation
	Thermal Decomposition by Hot Gases
	Radiant (Infrared) Heating
	Supercritical Water Oxidation
	<u>In</u> <u>Situ</u> Biodegradation
	<u>In</u> <u>Situ</u> Volatilization
	<u>In</u> <u>Situ</u> Vitrification
	Low-Temperature Thermal Decomposition
	Permeable Treatment Bed
	<u>In</u> <u>Situ</u> Radio Frequency Decontamination

Table 5.1-1. Identification of Technologies for Remedial Response Actions (Continued, Page 3 of 3)

Remedial Response Action	Remedial Technology
DIVERSION	Dikes and Berms
	Ditches and Trenches
	Terraces and Benches
	Culverts
	Levees and Floodwalls
	Cofferdams
	Channels and Waterways
CONTAINMENT	
Subsurface Barriers	Slurry Walls
	Grout Curtains
	Sheet Pilings
Capping	Single-Layered Soil Cover
	Multimedia Cap
	Clay Cap
	Synthetic Membrane Liners
	Asphalt Cap
REMOVAL AND DISPOSAL	Extraction Wells/Trenches
	Injection Wells/Trenches
	Surface Water Discharge
	Spray Irrigation
	POTWs
	Excavation
	Dredging
	Landfilling
	Landfarming
	Dewatering
NO ACTION	Limit Access/Use Restrictions
	Monitoring Only

Source: ESE.

5.1.5 TECHNOLOGY SCREENING

The methodology to evaluate the various remedial technologies will employ screenings conducted in accordance with NCP and SARA. The screening will prevent infeasible, unacceptable, or costly technologies that do not meet ARARs or that prohibit goals defined by the RA from being carried forward to the next evaluation step. Each candidate technology will be screened by an evaluation of technical factors that relate to the technology as applied to the contamination within the site. The following technical factors will be considered for each technology in the screening process:

1. Technical implementability; and
2. Effectiveness, implementability, and cost.

The first step of the technology screening process is to evaluate the universe of potential and viable technologies with respect to technical implementability. This will be accomplished by using information gathered during the RI and previous field studies on contaminant types/concentrations and information of onsite characteristics. Technologies that cannot be effectively implemented at the site will be screened out.

The second step of the technology screening is an evaluation of the following technology limitations:

1. Effectiveness relative to other processes within the same technology type;
2. Implementability of technology to eliminate those technologies that are clearly ineffective or unworkable at the site; and
3. High, low, or medium cost relative to other process options in the same technology type.

Justification will be given for every technology deleted from the list. Technologies remaining after the screening will be used to assemble remedial alternatives.

5.1.6 DEVELOPMENT OF ALTERNATIVES

Remedial alternatives to be identified for all applicable response actions will be a suboperable part of the overall site remedy. The no-action alternative will be considered as a baseline against which the other alternatives can be evaluated. Alternatives will be identified in each of the classes of alternatives required by NCP. The assembled alternatives will include at least one option in each of the general technologies, including treatment, removal and disposal, innovative technologies, containment, and no action.

5.1.7 ALTERNATIVES SCREENING

The lists of alternatives described previously will be screened. The objective of this effort is to eliminate from further consideration any technologies and alternatives that have undesirable results regarding cost, acceptable engineering practices, and effectiveness as described in the NCP Section 300.68(g). The evaluation criteria are effectiveness, implementability, and order-of-magnitude costs. This screening will allow an initial assessment of the applicability of each alternative relative to the others for each area of concern. This process will eliminate alternatives that are not effective, difficult to implement, or significantly more costly than others of the same level of treatment without providing significantly greater protection to human health or the environment. Reasons for elimination of any alternatives at this stage will be documented in the FS report.

5.2 REMEDIAL ALTERNATIVES EVALUATION

The remedial alternatives that pass the initial screening process will be further evaluated and compared in the NCP, Sec. 300.68(h), Subpart F. This evaluation will be based on the following factors:

1. Short-term effectiveness:
    a. Protection of the community during remediation,
    b. Protection of workers during remediation,
    c. Environmental impacts, and
    d. Time to achieve remedial response objectives.
2. Long-term effectiveness:
    a. Magnitude of remaining risk,
    b. Adequacy of controls, and
    c. Reliability of controls.
3. Reduction of mobility, toxicity, and volume (MTV):
    a. Treatment process and remedy,
    b. Amount of hazardous material destroyed or treated,
    c. Reduction in MTV,
    d. Irreversibility of the treatment, and
    e. Type and quantity of treatment residual.
4. Implementability:
    a. Technical feasibility:
        (1) Ability to construct technology,
        (2) Reliability of technology,
        (3) Ease of undertaking additional remedial action, and
        (4) Monitoring considerations.

   - b. Administrative feasibility (coordination with other offices/agencies), and
   - c. Availability of services and materials:
     - (1) Availability of treatment/storage capacity and disposal services,
     - (2) Availability of necessary equipment and specialists, and
     - (3) Availability of prospective technologies.
5. Costs:
   - a. Capital costs,
   - b. Annual operation and maintenance (O&M) costs,
   - c. Accuracy of cost estimates,
   - d. Present-worth analysis, and
   - e. Cost sensitivity analysis.
6. Compliance with ARARs:
   - a. Chemical-specific ARARs;
   - b. Action-specific ARARs;
   - c. Location-specific ARARs; and
   - d. Other criteria, advisories, and guidances.
7. Overall protection of human health and the environment (how risks are eliminated, reduced, or controlled).
8. State acceptance.
9. Community acceptance.

An evaluation will be made of whether recycle/reuse, waste minimization, in situ degradation, or destruction of wastes is appropriate to reliably minimize present or future threats to public health, welfare, or the environment. Preference will be given to alternatives that result in a permanent solution, pursuant to Section 121 of SARA.

5.3 FS REPORT

The FS report will include an executive summary, introduction, identification of ARARs, development of remedial response objectives, and a description of the alternative screening and evaluation processes. The FS report will also include a summary of the detailed technical and cost evaluations and a comparative evaluation of the remedial alternatives as table matrices. Backup cost information and calculations will be included as appendices.

Calculations for quantification of target cleanup levels will be included in the FS. Cleanup levels for the contaminants of concern will address protection of human health in terms of exposure through ingestion, inhalation, and dermal contact and will provide for the adequate mitigation of groundwater contaminant sources. The environmental impact to surface water will also be considered.

The report will also describe the recommended work to be performed during the follow-on RI and provide specific recommendations and justification for sampling locations and analytes proposed for follow-on RI work. Recommendations will be provided for any required interim or expedited remedial action.

Treatability study requirements will be provided. These requirements will be based on the results of the technology screening performed during the FS. The preferred remedial action technologies will be evaluated, and a determination will be made if specific treatability studies will be necessary. If required, a conceptual treatability study plan will be provided.

6.0 PLANS AND MANAGEMENT

The purpose of this WP is to present the activities that will be required for the development of the RI/FS. The following subsections describe the project staffing, future schedule, health and safety, quality management, and engineering QC developed for this WP.

6.1 STAFFING

This section lists WP project staff and describes the functional relationships of the organizational structure and responsibilities of the support functions (see Figure 6.1-1). The ESE personnel who served in a supervisory role are indicated by the boxes connected by solid lines of authority. These personnel provided overview and guidance to the project team and assisted the project manager in the resolution of any technical difficulties.

The project director, Mr. Gary R. Horwitch, P.E., was responsible for appointing the project manager and providing overall direction, coordination, and corporate support as needed over the project duration.

The project manager, Mr. Jose Morales, P.E., was responsible for the effective day-to-day management of the project staff; direct communication and liaison with the client; technical approach and review of deliverables, management of resources, schedules, and budgets; and coordination among the general and technical support functions.

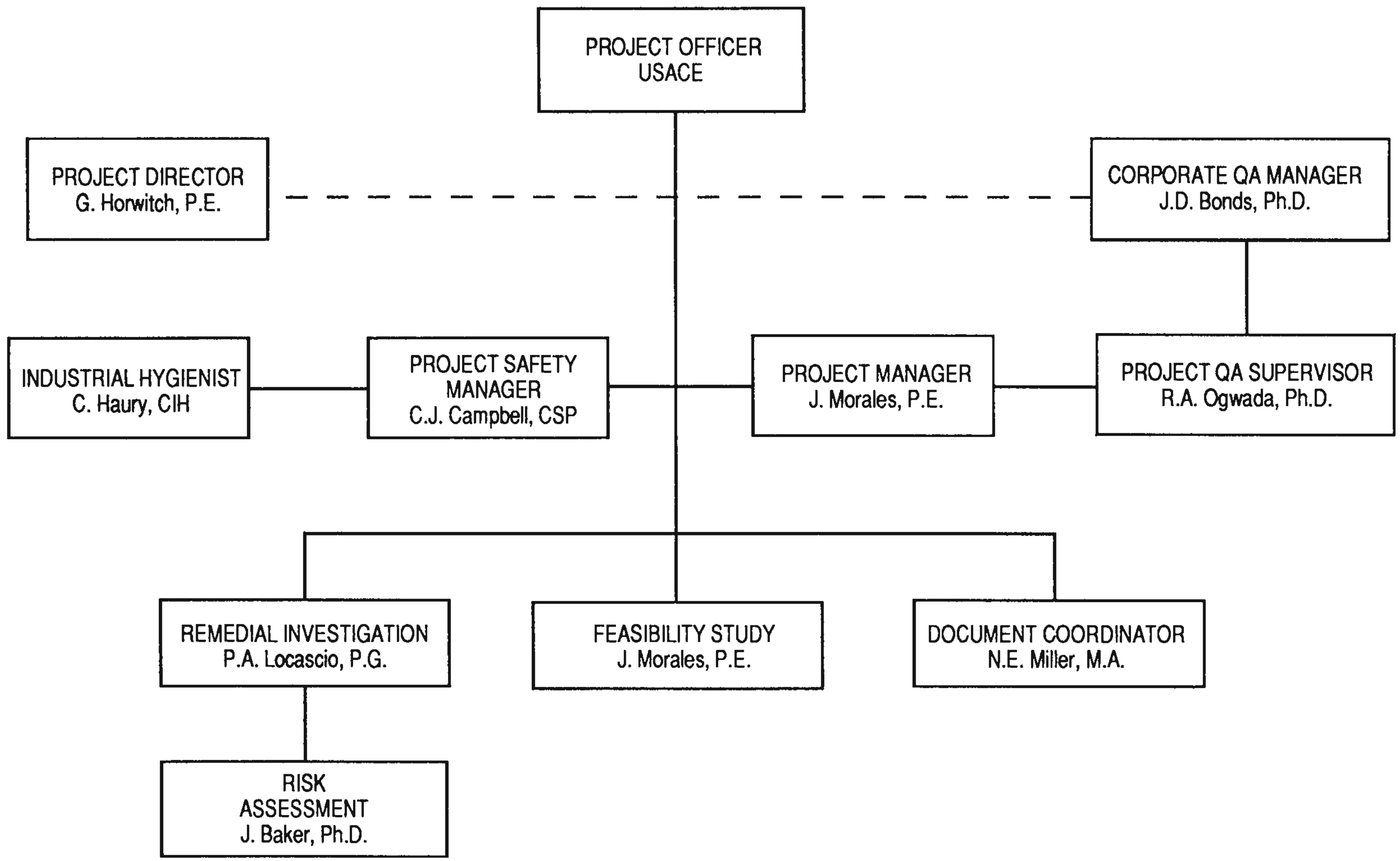

Figure 6.1-1
PROJECT ORGANIZATION
(RI/FS SCOPING DOCUMENT AND WORK PLAN)

SOURCE: ESE.

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

SEAD RI/FS WP 4/91BL

U6/SEAD RI/FS WP ORG 2

The engineering QC reviewer (Mr. Gary R. Horwitch, P.E.) was responsible for senior technical review of all deliverables based on his previous experience with the site and/or with similar projects.

The general support functions include the QA supervisor and safety manager. The QA supervisor was responsible for developing the QC procedures identified in the QAPP. The project safety manager was responsible for assisting the project manager in preparation of the SHERP for required site activities.

6.2 PROJECT SCHEDULE

The proposed implementation schedule for the SEAD RI/FS is shown in Table 6.2-1. This schedule will be updated as required during the field effort to indicate any delays and potential impacts on future deliverables.

6.3 SHERP

To provide an Occupational Safety and Health Administration (OSHA)-compliant working environment for the RI field team members and subcontractor personnel performing the fieldwork, the SHERP has been prepared and is presented in Appendix B.

6.4 QAPP

To achieve the data quality goals of the fieldwork at the SEAD site, the QAPP has been prepared and is presented in Appendix C.

Table 6.2-1 SEAD RI/FS Schedule

	WEEKS																									
TASKS	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52
NYDEC and EPA WP Approval																										
I. Prefield Activities																										
A. Review SHERP	▬																									
B. Obtain All Field Equipment	▬	▬																								
C. Establish Field Laboratory	▬																									
D. Health and Safety Meeting with Field Team	▬																									
II. Field and Analytical Data																										
A. Geophysical Investigation			▬	▬																						
B. Soil Gas Investigation				▬	▬																					
C. Soil Boring and Sampling				▬	▬	▬	▬	▬																		
D. Groundwater Investigation																										
Install New Wells							▬	▬	▬																	
Well Development								▬																		
Sample Wells								▬	▬																	
Sample Wells Offsite, Background									▬																	
E. Ecological Assessment				▬	▬																					
F. Surface/Spring Water and Sediment Investigation																										
Drainage Areas/Kendaia Creek				▬																						
Swampy Areas					▬																					
G. Surveying										▬	▬	▬														
H. Sample Analyses/Laboratory Report				▬	▬	▬	▬	▬	▬	▬	▬															
III. Data Reduction Assessment and Interpretation																										
A. Geophysical Data Evaluation			▬	▬	▬	▬	▬																			
B. Soil Data Evaluation					▬	▬	▬	▬	▬																	
C. Groundwater Data Evaluation									▬	▬	▬															
D. Surface/Spring Water and Sediment Data Evaluation					▬	▬																				
E. Ecological Assessment Evaluation					▬	▬																				
F. Survey Evaluation											▬	▬	▬													
G. Risk Assessment																										
Identify Contaminants of Concern													▬													
Exposure Assessment																▬	▬									
Spring Survey														▬	▬											
Water Well Survey															▬	▬										
Toxicity Evaluation																	▬	▬								
Risk Characterization																		▬	▬							
Identification of ARARs																			▬	▬						
IV. FS																										
A. Develop Remedial Action Goals																				▬	▬					
B. Develop Remedial Response Alternatives																					▬	▬	▬	▬		
C. Screening of Remedial Action Alternatives																						▬	▬	▬		
D. Detailed Evaluation of Remedial Action Alternatives																								▬	▬	▬
V. Report Preparation																										
A. Develop Draft Report--6 Weeks (After FS)																										
B. Client Review and Revisions--6 weeks (After FS)																										

6.5 ENGINEERING QC

The engineering QC provided a process for senior technical review of all deliverables based on the reviewers' technical expertise and previous experience with similar projects. Technical review comments were incorporated into the deliverables before submission of the review drafts to USACE, EPA, and NYSDEC.

REFERENCES

American Society for Testing and Materials (ASTM). 1984. Methods for Penetration Test and Split-Barrel Sampling of Soils: D-1586-84. Vol. 04.08

American Society for Testing and Materials (ASTM). 1986. Specification for Portland Cement: C-150-86. Vol. 04.01.

Ground Water Quality. 1985. C.H. Ward, W. Giger, P.L. McCarty, editors, John Wiley and Sons, 547 pages.

Bouwer, H. 1989. The Bouwer and Rice Slug Test--An Update. Journal of Ground Water, Vol. 27, No. 3. National Water Well Assoication, Dublin, OH.

Bouwer, H. and Rice, R.C. 1976. A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. Water Resources Research, 12(3):423-428.

Detection Sciences, Inc. 1990. Terrain Conductivity and GPR Surveys, Incinerator Ash Disposal Area, Seneca Army Depot. Carlisle, MA.

Environmental Science and Engineering, Inc. (ESE). 1988. Update of the Initial Installation Assessment of Seneca Army Depot. Prepared for U.S. Army Toxic and Hazardous Materials Agency. Gainesville, FL.

Freeze, R.A. and Cherry, J.A. 1979. Groundwater. Prentice Hall, Inc. Englewood Cliffs, NJ.

Hunter/ESE. 1989. Geophysical Investigation Work Plan, Seneca Army Depot. Remedial Investigation/Feasibility Study.

ICF Technology, Inc. (ICF). 1989. Seneca Army Depot Burning Pit/Landfill Site Investigation. ICF Technology, Inc., Fairfax, VA.

Mozola, A.J. 1951. The Ground Water Resources of Seneca County, N.Y., Bulletin CW-26, Water Power and Control Commission, Department of Conservation, State of New York, Albany, NY.

U.S. Army Environmental Hygiene Agency (USAEHA). 1975. Solid Waste Survey No. 26-006.76.

U.S. Army Environmental Hygiene Agency (USAEHA). 1981. Final Report. Army Pollution Abatement Program Study No. D-1031-W, Landfill Leachate Study, Seneca Army Depot, Romulus, NY. Aberdeen Proving Ground, MD.

U.S. Army Environmental Hygiene Agency (USAEHA). 1987. Geohydrologic Study No. 38-26-0313-88, Seneca Army Depot, NY. U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA). 1980. Installation Assessment of Seneca Army Depot, NY. Report No. 157, Aberdeen Proving Ground, MD.

U.S. Environmental Protection Agency (EPA). 1985. The Endangerment Assessment Handbook. Prepared by Life Systems, Inc., for the Office of Waste Programs Enforcement, Washington, DC.

U.S. Environmental Protection Agency (EPA). 1988. Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Office of Emergency and Remedial Response. OSWER Directive 9355.3-01. Washington, DC.

U.S. Environmental Protection Agency (EPA). 1989a. Risk Assessment Guidance for Superfund. Volume I, Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response, Washington, DC.

U.S. Environmental Protection Agency (EPA). 1989b. Risk Assessment Guidance for Superfund. Volume II, Environmental Evaluation Manual. Interim Final. Office of Emergency and Remedial Response. Washington, DC.

U.S. Environmental Protection Agency (EPA). 1989c. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. Office of Emergency and Remedial Response. OSWER Directive 9355.4-02. Washington, DC.

U.S. Environmental Protection Agency (EPA). 1989d. RCRA Facility Investigation Guidance Manual. Washington, DC.

APPENDIX A

FIELD SAMPLING AND ANALYSIS PLAN

APPENDIX A

FIELD SAMPLING AND ANALYSIS PLAN

The proposed field operations for the Seneca Army Depot (SEAD) burning pits/incinerator ash landfill area site will consist of the following major tasks:

1. Soil sampling,
2. Monitor well installation and sampling,
3. Surface water/sediment sampling, and
4. Incinerator dust sampling.

The following sections describe the objectives and techniques associated with the previously mentioned tasks.

A.1 SOIL SAMPLING

A.1.1 OBJECTIVES

A series of soil borings will be drilled in the landfill area to evaluate the extent of soil contamination. The final locations for the borings will be determined following completion of the proposed geophysical and soil gas surveys. The USACE project manager will be consulted for approval prior to the initiation of soil sampling operations.

A.1.2 BORING TECHNIQUES

The borings will be drilled to bedrock, which has an anticipated average depth of 15 feet below land surface (ft-bls). Samples will be collected continuously using a split-spoon sampler. Soil samples will be collected from each boring using a split-spoon sampler (ASTM-D 1586-84) and will be taken continuously to the top of the unweathered shale unit, at 2-foot (ft) intervals.

Borings will be terminated at the top of competent bedrock. Four samples for laboratory analysis will be obtained from each soil boring using a split-spoon sampler. In each boring, discrete samples will be collected from the surface (0 to 2 ft-bls), at an intermediate zone (3 to 4 ft-bls), from the top of the water table to 1 ft above the water table, and from the weathered shale zone at the interval from the competent shale unit to 2 ft above the competent shale unit. Samples obtained from the soil borings will be sent to the USACE Missouri River Division-approved laboratory for analysis.

Soil sampling techniques will involve the use of a truck-mounted drill rig to advance hollow-stem augers and to drive split-spoon samplers. The surface samples at the burning pits will be collected using a stainless steel bucket auger.

The continuous hollow-stem augering technique entails rotary advancement of a hollow-stem auger equipped with an auger plug, which is removed prior to split-spoon collection. A split-spoon sampler will be employed for collecting soil samples [American Society for Testing and Materials (ASTM)-D 1586-84]. This technique involves driving a 2-ft-long, split-spoon sampler into undisturbed soil with a rig-mounted hammer. Following removal of the split-spoon sampler, the hollow-stem auger is advanced to the top of the next sample interval. If cobbles or boulders are encountered impeding split-spoon sampler advancement, an attempt will be made to auger past this interval of the borehole. If advancement is still not possible, the borehole will be backfilled and a new location chosen.

Between soil borings, the augers and split-spoons will be decontaminated using a high-pressure steam cleaner. The water for the steam cleaner will be obtained from a pre-approved source at SEAD.

All borings will be logged by the site geologist using a standardized boring log form (Figure A-1). Soil samples will be classified according to USCS. Each boring log will record:

1. Boring identification and location,
2. Type and manufacturer's name of drilling equipment,
3. Type and size of sampling and drilling equipment,
4. Starting and ending dates of drilling,
5. Length and depth of each sampled interval,
6. Length of each recovered sample,
7. Blow counts of the split-spoon samples,
8. Depth of all stratigraphic changes,
9. Lithologic description according to standard rock nomenclature,
10. Depth at which groundwater is first encountered,
11. Depths and rates of any water losses,
12. Depth to static water level,
13. Depths at which drilling problems occur and how the problems are solved,
14. Total boring depth,
15. Reason for terminating borehole, and
16. Surface elevation.

Upon completion of sampling, all borings will be grouted to the surface and the soil containerized as described in Section A.6.

Job No.____________________

Client____________________

Project____________________

Location of Boring:

Water Level	
Time	
Date	

Boring No._____ Date__________ Sheet____ of____

Type of Boring__________ Rig__________

Casing used_____ Size_____ Drilling mud used_____

Boring begun________ Boring completed________

Ground Elevation________ referred to________

____________________ Datum

Field Party:____________________

Depth of Casing, ft.	Sample No.	Sample depth from-to (in feet)	Blows/foot on Sampler	ID of Sampler (inches)	Tot. length of recov. sample	Length of Lab. sample	DEPTH IN FEET	SOIL GRAPH	DESCRIPTION Soil type, color, texture, consistency, sampler driving notes, blows per foot on casing, depths wash water lost, observed fluctuations in water level, notes on drilling ease, etc.
								Geologist__________

Figure A-1
FIELD BORING LOG

SOURCE: ESE

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A.1.3 SAMPLING TECHNIQUES

At each of the four selected intervals to be sampled from each borehole, before the soil samples are screened, a volatile organic compound (VOC) grab sample from each sampling interval will be collected using a stainless steel spatula and containerized. The remaining material will be placed into a stainless-steel bowl, homogenized with a stainless steel spoon prior to being placed into the sample containers and thoroughly mixed with a stainless-steel trowel. A portion of the mixture then will be transferred to laboratory-prepared amber-glass containers with Teflon®-lined lids. All soil sample containers will be labeled with a preprinted label, chilled to 4 degrees Celsius (°C), and shipped to an EPA-approved analytical laboratory. All sampling equipment will be decontaminated between samples, as specified in the Quality Assurance Project Plan (QAPP).

A.2 MONITOR WELL INSTALLATION AND SAMPLING

A.2.1 OBJECTIVES

This task involves the evaluation of groundwater contamination within the uppermost permanent water-bearing stratum through the installation of five shallow wells and four deep wells. The nine newly installed wells and existing monitor wells in the ash landfill area (including PT-26) will then be sampled.

A.2.2 MONITOR WELL INSTALLATION

The shallow monitor wells will be installed using rotary-drill rig techniques with hollow-stem augers. The deep monitor wells will be installed using air rotary techniques.

Soil samples will be collected from each boring using a split-spoon sampler (ASTM-D 1586-84). Soil samples will be taken continuously to the top of the unweathered shale unit, at 2-ft intervals, and classified by the USCS system.

Monitor wells will be constructed in accordance with the general details presented in Figure A-2. All monitor wells will be installed in boreholes having a minimum 6-inch diameter. Well risers and screens will consist of new, threaded, flush-joint, 2-inch-diameter, Schedule 40 PVC. The PVC wells will be used for the current investigatory phase. If long-term monitoring is proposed as part of the ROD, then EPA will make a decision at that time as to the construction material of the wells. It is anticipated that the well screens will be 10 ft long for the shallow wells and 20 ft long for the deep wells and will be factory slotted (0.010 inch).

Information from split-spoon samples, standard penetration testing, observations regarding the moisture content of recovered soil samples, and direct measurement with a water-level tape of the water table in each boring will be used to screen the shallow wells from the top of bedrock to greater than 3 ft above the water table. Bedrock wells will be screened from approximately 3 ft above the lower water table to 17 ft below the lower water table. The deep wells will be installed to a maximum depth of 200 ft-bls or the first water zone encountered, once having penetrated at least 20 ft into the bedrock (unweathered shale). If no water is encountered to a depth of 200 ft-bls, the boring will be grouted to the surface and a new location chosen. The 0.010-inch slot size has been selected based on the known lithology at the site (i.e., poorly sorted glacial till). Well casings and screens will be set plumb by using a level on the drill-rig prior to drilling. In constructing the deep wells, a

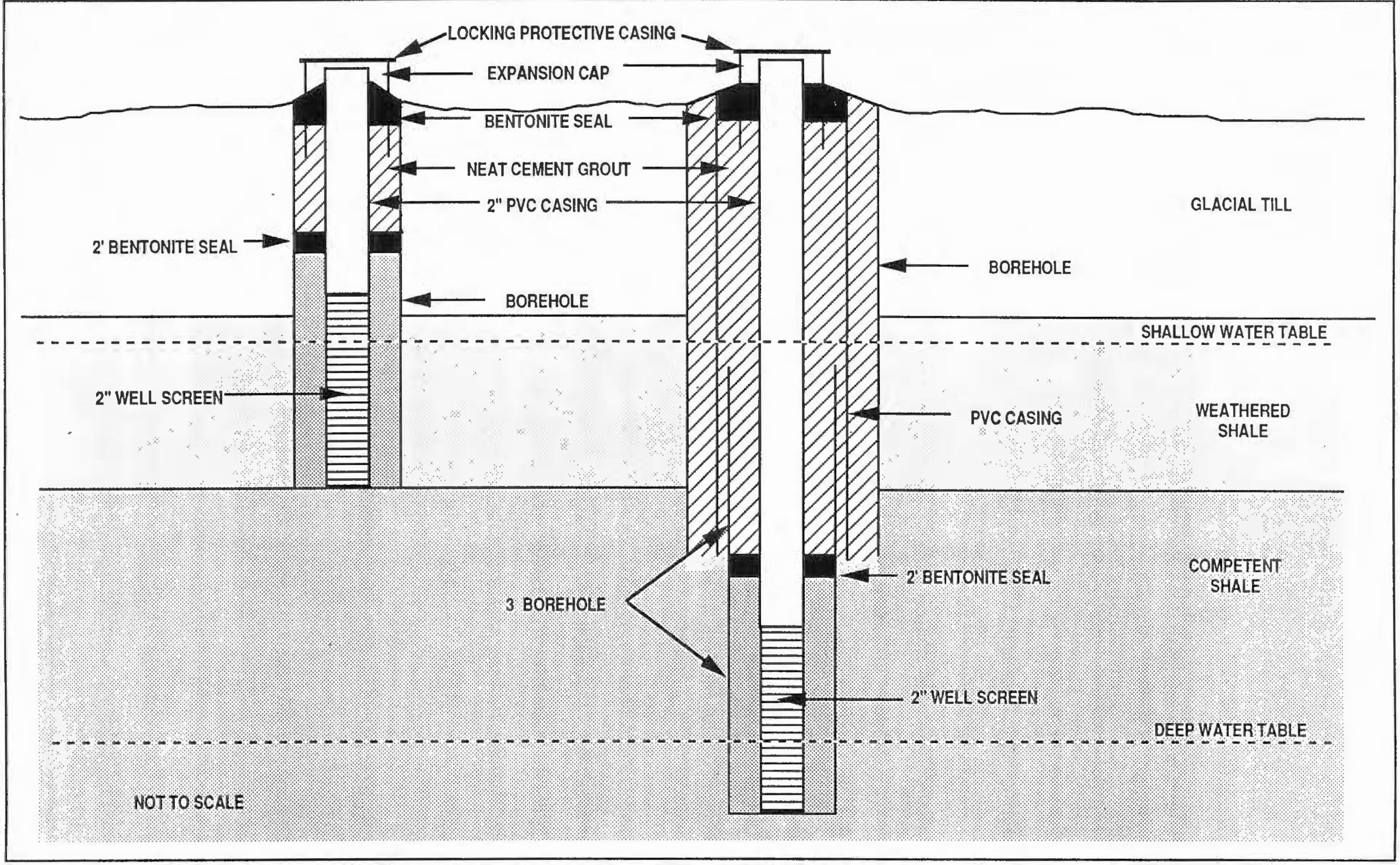

Figure A-2
MONITOR WELL CONSTRUCTION DETAIL

SOURCE: ESE, 1990.

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stainless steel centralizer will be used at the top of the screened interval to ensure that the monitor well remains in the center of the borehole.
For installing the deep monitor wells, a PVC surface casing will be set approximately 5 ft into the unweathered shale unit. The annular space between the casing and the borehole will then be grouted and allowed to set for a minimum of 48 hours before drilling is resumed.

The filter pack will consist of clean 20/30 silica sand pack. During installation of the deep wells, a tremie pipe will be used to introduce the filter pack material into the annular space around the well screen. During installation of the shallow wells, the augers will be raised gradually as the sand builds up around the well screen. The filter pack will extend a minimum of 2 ft above the well screen.

A minimum 2-ft-thick bentonite seal will be installed above the sand filter pack. The bentonite seal, consisting of bentonite pellets, will be wetted and allowed to hydrate in accordance with the manufacturer's recommendations before the remaining annular space is grouted. A cement/bentonite grout seal will be placed from the top of the bentonite seal to approximately 3 ft-bls by means of a tremie pipe. The grout mixture will consist of Portland® cement (ASTM C 150-86) and water in the proportion of not more than 7.0 to 8.0 gallons (gal) of clean water per bag of cement [1 cubic foot (ft^3) or 94 pounds (lb)]. Additionally, 3 percent by weight of bentonite powder will be added to help reduce shrinkage of the grout mixture. The grout will be allowed to set a minimum of 48 hours. A bentonite backfill consisting of bentonite pellets will be placed from the top of the cement/bentonite grout seal to the ground surface and allowed to hydrate. The purpose of the pure bentonite backfill is to protect the well from damage associated with frost heaving. A 2- by 2-ft concrete pad will then be constructed, followed by development of the well. This pad will not be attached to the casing. All monitor wells will be provided with a locking protective casing as shown in Figure A-2.

A qualified site geologist will oversee all drilling, well installation, well development, and sampling/testing operations. Drilling data will be recorded on boring log forms as shown in Figure A-1. A graphic log showing monitor well construction details will be provided. Well construction logs will include:

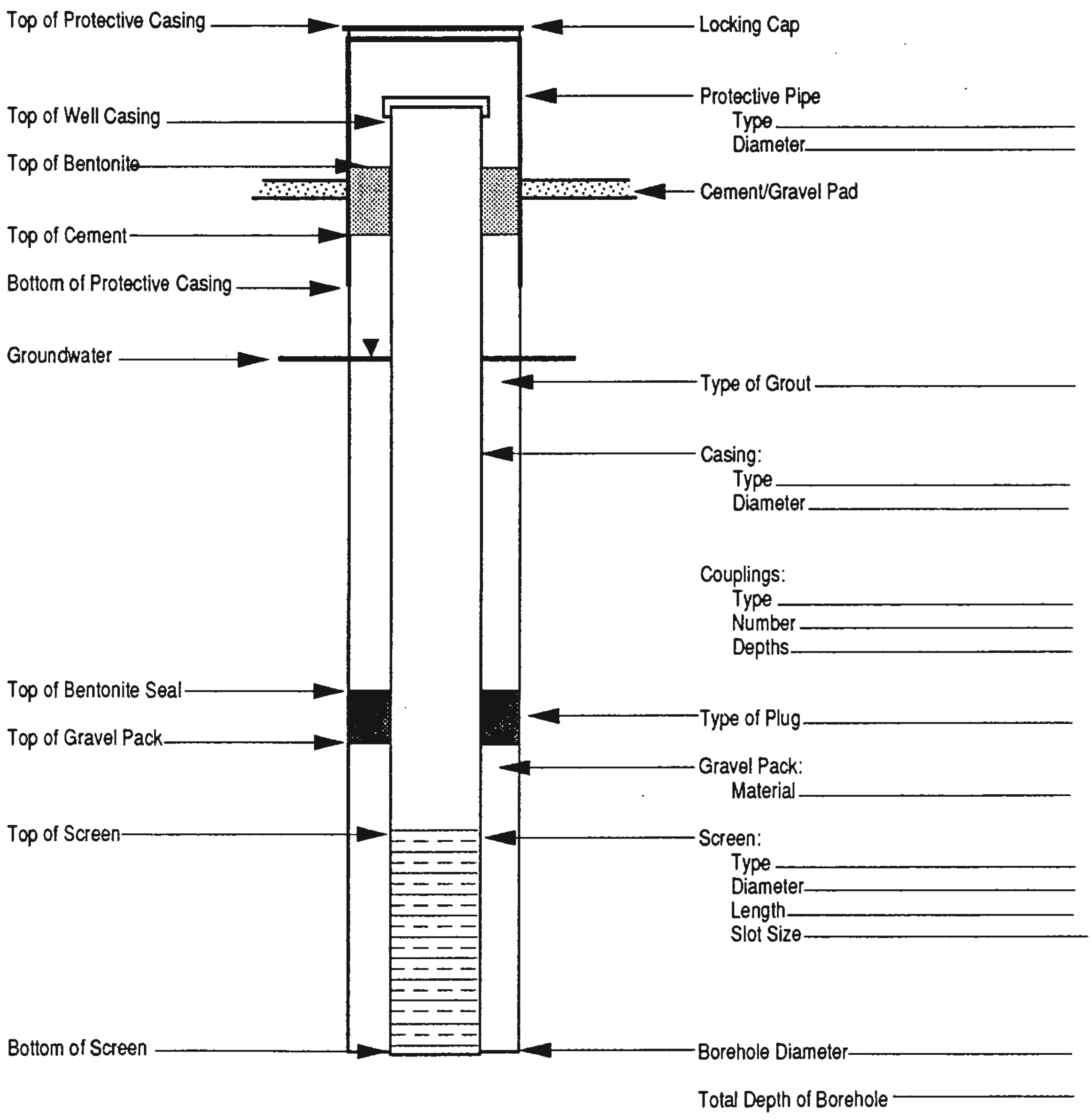
1. Boring preparation prior to well installation;
2. Depth of completed well;
3. Change in lithology;
4. Type and diameter of well casing;
5. Filter pack gradation, depth, and method of emplacement;
6. Type of seal and manufacturer's name and product name;
7. Amount, formula, and method of grout emplacement;
8. Elapsed time between grouting and well development initiation;
9. Method of development;
10. Quantity of water extracted during development;
11. Criteria used in determining completion of development;
12. Depth of the protective cover below ground;
13. Amount of stickup of protective cover; and
14. Height of cement protective pad.

Figure A-3 contains a monitor well installation form. The original and one copy of the boring log and well construction form will be submitted to USACE no later than 10 calendar days after the well is completed.

D17/MWC.1
9/89s

MONITOR WELL CONSTRUCTION

Logged By: ______ Client: ______
Drilling Contractor: ______ Location: ______
Driller's Name: ______ Job Number: ______
Well Number: ______ Date/Time: Start ______ Finish ______
Comments: (Lost circulation interval, water level changes, hole collapse interval, etc.) ______



NOT TO SCALE

Figure A-3
MONITOR WELL INSTALLATION SHEET

SOURCE: ESE,

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All monitor well locations and elevations at the top of well casings will be surveyed by a New York registered land surveyor. The coordinates will be to the closest 1 ft and referenced to the state planar coordinate system. If the state planar coordinate system is not readily available, an existing local grid system will be established. Monument elevations and the top of the PVC casing to the closest 0.01 ft will be determined for each well. Elevations will be referenced to the NGVD of 1929. If the 1929 datum is not readily available, the existing local vertical datum will be used. A permanent tag or marking that clearly identifies the well number, USACE, and top-of-casing elevation will be affixed to the outer steel casing of each well.

The well development will be performed as soon as practical after well installation, but no sooner than 48 hours after placement of the internal grout collar. Well development will be documented on a standard form as shown in Figure A-4.

Shallow well development will be accomplished by pumping with a gasoline-powered centrifugal pump connected to decontaminated stainless steel drop pipe; or they will be developed using a Teflon® bailer. The deep wells will be developed using a submersible stainless steel pump or a Teflon® bailer. Development will continue until the water is clear and the well as free of sediment as practical. If well yields cannot sustain the flow rate of the submersible or centrifugal pump, a Teflon® bailer will be used. Water will not be added to the well to aid in development. All development equipment will be decontaminated as outlined in the QAPP prior to use in the first well and between use in each well.

D17/MWD
1/90 mk

MONITOR WELL DEVELOPMENT

Sheet ____ of ____

Site: ____ Well designation: ____ Installation date: ____

Well construction details from boring log:

Total depth (top of casing): ____ Screened interval: ____ Borehole diameter: ____

Water losses during drilling: ____ Fluid Purging ____

Height of well casing (ground surface): ____ Well diameter: ____

Standing water: Well casing/screen: ____

(From Chart) Annulus (volume x 30%): ____

Date and time of development: ____

Method of development (pump/bailer): ____ Pumping rate: ____

Depth(s) of pumping and elapsed time at each depth: ____

Water level: Before development: ____ During: ____

Well depth (sounded) Before: ____ After: ____

Physical appearance of water (clarity, color, particulates, odor) :

Initial: ____

During development: ____

Final: ____

Field analysis:	Initial	During (2)		Final
Time				
Conductivity				
pH				
Temperature				

Quantity of water removed/time for removal (both incremental and total) :

Collect a 1-pint sample of last water removed: ____

Comments: ____

Figure A-4
MONITOR WELL DEVELOPMENT

SOURCE: ESE

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Development operations shall be performed until the following conditions are met:

1. The turbidity of the well water is below 50 nephelometric turbidity units (NTUs). This will be a goal of the development operations.
2. The sediment thickness remaining in the well is less than 5 percent of the screen length.
3. At least five well volumes (including the saturated filter material in the annulus) have been removed from the well.
4. The temperature, specific conductivity, and pH of the well water have stabilized (two consecutive readings are within 10 percent of each other).
5. The cap and all internal components of the well casing above the water table are rinsed with well water to remove all traces of soil/sediment/cuttings. This washing will be conducted before and/or during development.

Because the wells may be slow to recharge due to the low permeability of the formation, surging and overpumping may need to be performed numerous times on each well, with complete recharge between each episode. Every attempt will be made to remove excessive turbidity from the wells, because high turbidity is believed to be responsible for elevated metal concentrations detected in the groundwater at the site during previous sampling events. The shallow wells will be developed using a decontaminated stainless steel drop pipe attached to a centrifugal pump or a decontaminated Teflon® bailer. The deep wells will be developed using a decontaminated stainless steel pump or a decontaminated Teflon® bailer. Any proposed changes to the approved drilling methods and well installation plan will be submitted to USACE for approval.

A.2.3 GROUNDWATER SAMPLING

The nine new monitor wells, existing monitor wells, and privately owned wells as determined from the well inventory will be sampled during this investigation. Groundwater samples will be analyzed for TCL organic compounds (volatiles, semivolatiles, pesticides/PCBs), TAL metals, and herbicides. Ten percent of the site wells (at the discretion of the RI contractors) will be analyzed for the following parameters: alkalinity, chloride, sulfate, TOC, hardness, residual (total), residual (dissolved), and residual (suspended). Additionally, all wells will be analyzed for BOD_5 and COD. These parameters will aid in evaluating potential remediation alternatives at the site.

Prior to groundwater sample collection, water levels in all monitor wells will be measured relative to the top of the well casing. Measurement will obtained using the U.S. Geological Survey (USGS) wetted-tape method (using a decontaminated steel tape).

A plastic ground cloth will be placed beneath all sampling equipment during well purging and sampling to prevent contamination. Well purging will consist of pumping or bailing three to five submerged well volumes and will continue until the pH, temperature, and specific conductivity are observed to vary less than 5 percent over 2 successive readings. Evacuation of at least 3 to 5 well volumes is required for high yielding wells; however, in wells with low recoveries, this may not be practical. In this case, the well will be purged to near dryness (not completely dry) once and allowed to recharge sufficiently (about 75 percent of its static level) for samples to be collected. Purging may be accomplished by manual bailing, drop pipe and centrifugal pump, or a submersible pump. The well will be sampled within 3 hours of purging, if it has recovered sufficiently to yield a sample. If a well is allowed to sit longer than 3 hours after evacuation, it will be re-purged because the water in the casing may no longer be representative of the aquifer conditions. Low-yield wells will be sampled for each parameter as soon as water is available for that parameter. All purge water will be containerized in DOT-approved 55-gal drums. Each drum of material will be labeled as hazardous materials until the RI contractor has completed analyses and provided documentation to USACE, as well as submitted recommendations for disposal based on chemical analyses, evaluation of site conditions, and appropriate regulations.

After purging the well, the sampling team will change to new PVC gloves for sample collection. Samples will be obtained using a decontaminated Teflon® bailer. Groundwater samples collected for volatile analyses will be obtained in a manner that will minimize the loss of volatile compounds. Well samples will be collected with the required quality assurance/quality control (QA/QC) samples being transmitted to the laboratory for chemical analysis in accordance with the QAPP.

Groundwater samples collected for VOC analysis will be the first fractions collected at each well. The VOC samples will be placed in 40-mL glass bottles with Teflon® septum caps. Each vial will be filled carefully until a positive water meniscus is achieved, and then each vial will be capped. Each vial will then be checked for air bubbles. If a bubble is discovered, the cap should be removed and the sample discarded. The sample must then be retaken and new preservatives added. Then, the sample is resealed, and the bubble must not be evident.

Samples will be preserved and packed in ice for shipment to the laboratory. Field groundwater sampling logs (Figure A-5) will include onsite measurements of water quality (pH, specific conductance, and temperature), volume purged, method of purging, static water level, sample time and date, and fraction sampled. Chain-of-custody records will be maintained.

A.3 SURFACE/SPRING WATER AND SEDIMENT SAMPLING

A.3.1 OBJECTIVES

As described in the WP, surface/spring water and sediment sampling at the site will be performed to determine the nature and areal extent of contamination in the site area drainage system, seeps, and springs.

Samples will be collected using the procedures described in the following subsections. Data generated in the field during the surface/spring water and sediment sampling will be recorded both in the site logbook and on the sample data sheets (Figure A-6).

A.3.2 TECHNIQUES

Surface/spring water and sediment sampling equipment will be decontaminated prior to use in accordance with the procedures outlined in the QAPP. Volatile organic monitoring equipment will be calibrated prior to each day's activities in accordance with the manufacturer's recommended procedures. Instrument calibration data will be recorded on the appropriate log sheets. Surface/spring

D17/WSDF
12/14 mk

WELL SAMPLING DATA FORM

Well Number: __________ Date: __________ Time: __________

Boring Diameter: __________ Well Casing Diameter: __________

Annular Space Length: __________ Stickup: __________

WATER LEVEL

Hold: __________

Cut: __________

DTW: __________ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: __________

DTW Top of Casing: __________

Column of Water in Well: __________

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart) = __________

Column of Water or Length of A.S. (whichever is less) x __________

Volume of Annular Space = __________

Gallons per foot of Casing = __________

Column of Water x __________

Volume of Casing = __________

Total Volume (Volume of A.S. + Volume of Casing) = __________

Number of Volumes to be Evacuated x __________

Total Volume to be Evacuated = __________

Method of Purging (pump, bailer, etc.): __________

FIELD ANALYSES	START	MID	END
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: __________ gallons

Sample time: __________ Sample Number: __________

FRACTIONS

B C CF CL F H M N NF

O P R RP RS S T UP Z

NOTES

____

____

____

Signed/Sampler: __________ Date: __________

Signed/Reviewer: __________ Date: __________

Figure A-5
WELL SAMPLING DATA FORM

SOURCE: ESE,

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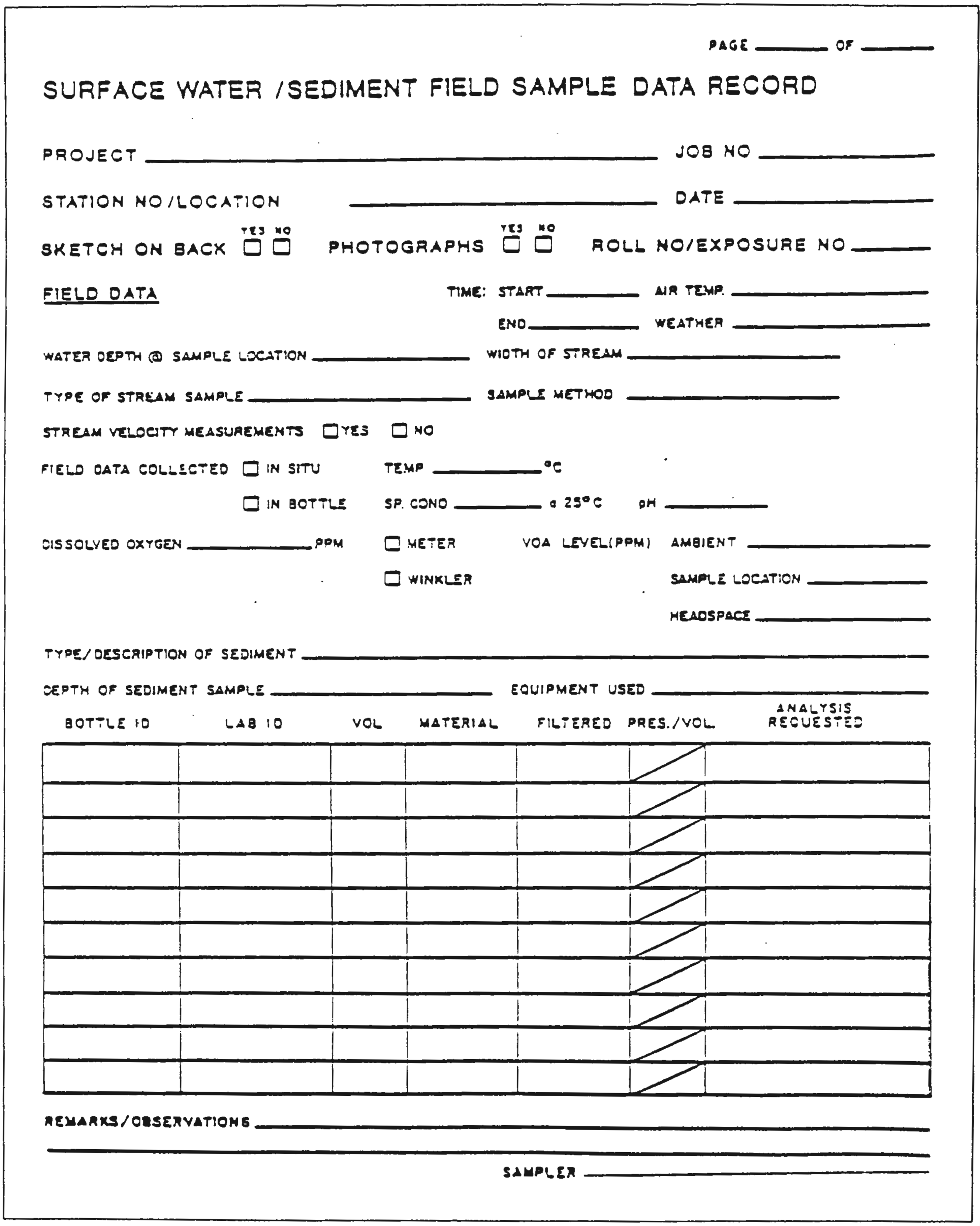

PAGE ______ OF ______

SURFACE WATER /SEDIMENT FIELD SAMPLE DATA RECORD

PROJECT ______________________ JOB NO ______

STATION NO / LOCATION ______________________ DATE ______

SKETCH ON BACK YES ☐ NO ☐ PHOTOGRAPHS YES ☐ NO ☐ ROLL NO/EXPOSURE NO ______

FIELD DATA

TIME: START ______ AIR TEMP. ______

END ______ WEATHER ______

WATER DEPTH @ SAMPLE LOCATION ______ WIDTH OF STREAM ______

TYPE OF STREAM SAMPLE ______ SAMPLE METHOD ______

STREAM VELOCITY MEASUREMENTS ☐ YES ☐ NO

FIELD DATA COLLECTED ☐ IN SITU TEMP ______ °C

☐ IN BOTTLE SP. COND ______ @ 25°C pH ______

DISSOLVED OXYGEN ______ PPM ☐ METER VOA LEVEL(PPM) AMBIENT ______

☐ WINKLER SAMPLE LOCATION ______

HEADSPACE ______

TYPE/DESCRIPTION OF SEDIMENT ______________________

DEPTH OF SEDIMENT SAMPLE ______ EQUIPMENT USED ______

BOTTLE ID	LAB ID	VOL	MATERIAL	FILTERED	PRES./VOL.	ANALYSIS REQUESTED

REMARKS/OBSERVATIONS ______________________

____

SAMPLER ______

Figure A-6
SURFACE WATER/SEDIMENT FIELD SAMPLE DATA RECORD

SOURCE: ESE.

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water and sediment sampling will be obtained from the previously designated locations. The sampling will be accomplished by using the following procedure:

1. Establish the exact location of each sampling station in the field. The sample site will be noted on a site plan and marked in the field with flagging and a 4-ft wooden stake. The stake will be labeled with the sample site number.
2. Measure the volatile organic vapors in the atmosphere above the water body with the HNU. If the concentration at breathing level is steadily elevated above background levels, use appropriate health and safety equipment as described in the Safety, Health, and Emergency Response Plan (SHERP) (Appendix B).
3. Collect the sample from the surface/spring water body by immersing a clean beaker or the sample bottle. The sample bottle should be completely submerged in an inverted position and then turned in an upstream direction and allowed to fill without collecting any surface debris. If the sample is collected by sampling personnel wading into the waterbody, the downstream samples will be collected first. Also, all parts of the sampler's body should remain downstream of the sample container during sample collection (however, wading will be avoided if possible). The sediment sample will be collected from the same location as the surface water was collected from. This will be accomplished using a stainless steel trowel to collect the sample and transfer it to the sample container.
4. Fill all appropriate sample containers (listed in Appendix C) directly or from the intermediate sample collection container, if necessary.
5. Measure the following parameters by direct immersion of instrument probes into the waterbody, if possible:

a. Temperature,
b. pH, and
c. Specific conductance.

If direct measurement is not possible, measure these parameters from water obtained from a field sample container separate from the analytical sample container.

6. Complete the Surface/Spring Water and Sediment Field Sample Data Record and initiate chain-of-custody records.

A.4 INCINERATOR DUST SAMPLING

The following standard operating procedure (SOP) has been developed by Region II for use in taking wipe samples.

1. Materials needed:
    a. Cotton swabs, solvent rinsed and completely air dried; (use of synthetic materials requires checking for compatibility with solvents)
    b. Acetone, pesticide grade;
    c. Hexane, pesticide grade;
    d. Deionized water;
    e. HCl or HNO3, redistilled
    f. Stainless steel clamps or plastic clamps (only for taking metals samples); and
    g. Appropriate sample bottles.
2. A square area, of a size sufficient to give the required amount of sample for each fraction as provided in the analytical methodology to be used, should be marked off. This may require taking cotton swabs and a balance into the field, wiping a certain area, and weighing the

swab before and after to determine how much area should be wiped to give the required weight of sample.

3. Swabs for semivolatile, pesticide, and PCB samples should be moistened in a 1:4 acetone/hexane mixture. While holding the swab in a clean, metal clamp, moisten the cotton swab with the appropriate solution.
4. While still holding the cotton swab in the clamp, wipe the sampling area back and forth repeatedly, applying moderate pressure. Wipe the entire area so that all the sample material is picked up.
5. Place the used swab in the appropriate sample container and seal.
6. Clean the clamps between each sample with both solvent and 10 percent HCl or HNO3.
7. As a blank, moisten a clean swab with the solvent or water (for each collection medium), place it in a separate jar, and submit it with the other samples.
8. When samples are submitted for analysis, the laboratory should be told to rinse the sample jars with solvent or 10 percent HCl or HNO3, depending on the analysis to be performed, when transferring sample to the extraction glassware.

The samples should be analyzed with the appropriate methodology for a soil/sediment matrix, and a sufficient quantity of material must be collected as called for in the analytical methodology in order for method detection limits to be achieved.

A.5 SAMPLING CONTAINERS, PRESERVATION TECHNIQUES, HOLDING TIMES, SHIPPING, AND HANDLING

The field team leader is responsible for proper sampling, sample labeling, preservation, and shipment of samples to the laboratory to meet required holding times. Table A-1 identifies the proper containers, preservation techniques, and maximum holding times established by EPA [40 Code of Federal Regulations (CFR), Part 136]. The maximum holding times in Table A-1 apply to water and soils. Any analyses that have exceeded holding times will be noted in the final deliverable.

Trial preservation may be necessary for concentrated hazardous/industrial wastes to ensure adequate preservation, and if reactions are suspected, the volume of preservative added should be recorded in the field notes. For example, acidification of some wastes may liberate toxic gases (e.g., cyanide gas) or result in foaming. In such cases, preservation should be omitted, samples should be shipped to the laboratory as soon as possible, and appropriate comments must be included on the sample logsheet. The volume of preservative added to extreme pH or highly buffered samples should not exceed 5 percent of the original sample volume.

Water samples submitted for volatile analysis should be preserved with HCl to a pH of <2. VOC samples should be preserved by adjusting the pH of the sample to <2 by carefully adding 1:1 HCl, drop by drop, to the required two [40 milliliter (mL)] volatile organic analysis (VOA) sample vials. The number of drops of 1:1 HCl required should be determined on a fourth VOA sample vial of equal volume (prior to filling the three vials for laboratory analyses). If

Table A-1. Summary of Analytical Methods, Preservation, and Holding Times

Matrix	Sampling Device	Analysis	Sample Container	Sample Preservation	Holding Time from Collection	Analytical Method
Groundwater/ surface water/ blanks	Stainless steel or Teflon® bailer	TCL VOCs	3 40-mL glass vials with Teflon® septum	HCl to pH<2 Cool to 4°C	14 days analyze	SW8240
	Stainless steel or Teflon® bailer	TCL BNAs, pesticides, PCBs, and herbicides	4 1-L amber glass, Teflon®-lined cap	Cool to 4°C	7 days extract 40 days analyze	SW8270, 8080
	Stainless steel or Teflon® bailer	TAL metals	1 1-L polyethylene	HNO_3 to pH<2 Cool to 4°C	6 months (Hg - 28 days)	SW6010, 7060, 7420, 7740 SW7471
	Stainless steel or Teflon® bailer	Cyanide	1 1-L polyethylene	NaOH to pH>12 Cool to 4°C	14 days analyze	SW9010
	Stainless steel or Teflon® bailer	Alkalinity	1 1-L polyethylene	Cool, 4°C	14 days	EPA 310.1
		COD	1 1-L polyethylene	Cool, 4°C H_2SO_4 to pH<2	28 days	HACH 8000
		BOD	1 1-L polyethylene	Cool, 4°C	48 days	EPA 405.1
		Chloride	1 1-L polyethylene	none required	28 days	EPA 325.3
		Sulfate	1 1-L polyethylene	Cool, 4°C	28 days	EPA 375.4
		TOC	1 1-L polyethylene	Cool, 4°C HCL <2	28 days	EPA 9060
		Hardness	1 1-L polyethylene	HNO_3 to pH<2	6 months	EPA 130.2
		Residue (total, dissolved, suspended)	1 1-L polyethylene	Cool, 4°C	7 days	EPA (160.3, 160.1, 160.2)

Table A-1. Summary of Analytical Methods, Preservation, and Holding Times (Continued, Page 2 of 3)

Matrix	Sampling Device	Analysis	Sample Container	Sample Preservation	Holding Time from Collection	Analytical Method
Soil	Split-spoon	TCL VOCs	2 40-mL glass vial with Teflon®-lined cap	Cool to 4°C	10 days analyze	SW8240
	Split-spoon	TCL BNAs, pesticides, PCBs, and herbicides	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	7 days extract 40 days analyze	SW8270, 8080
	Split-spoon	TAL metals	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	6 months	SW6010, 7060, 7420, 7740
		Mercury	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	28 days	SW7471
	Split-spoon	Cyanide	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	14 days analyze	SW9010
Sediment	Stainless steel spatula	TCL VOCs	2 40-mL glass vial with Teflon®-lined cap	Cool to 4°C	14 days analyze	SW8240
	Stainless steel scoop	TCL BNAs, pesticides, PCBs, and herbicides	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	14 days extract 40 days analyze	SW8270, 8080
	Stainless steel scoop	TCL metals	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	6 months	SW6010, 7060, 7420, 7740

Table A-1. Summary of Analytical Methods, Preservation, and Holding Times (Continued, Page 3 of 3)

Matrix	Sampling Device	Analysis	Sample Container	Sample Preservation	Holding Time from Collection	Analytical Method
Sediment (Continued)	Stainless steel scoop	Mercury	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	28 days	SW7471
	Stainless steel scoop	Cyanide	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	14 days analyze	SW9010

Note: BNA = base/neutral/acid.
°C = degrees Celsius.
g = gram.
HCl = hydrochloric acid.
HNO_3 = nitric acid.
Hg = mercury.
mL = milliliter.
NaOH = sodium hydroxide.
oz = ounce.
PCB = polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
TAL = target analyte list.
TCL = target compound list.

Source: ESE.

acidification of the sample causes effervescence, the sample should be submitted without preservation except for cooling to 4 degrees Celsius (°C).

With hazardous samples, it may be necessary to rinse the outer portion of sample containers with deionized (DI) water prior to packaging for shipment. The latest DOT procedures for shipment of environmental samples will be used in all cases. The quantity of acids or bases added as preservatives generally should not exceed 15 percent by weight, or the samples must be shipped as corrosives.

Before samples are packaged for shipment, the sample container will be checked for proper identification and compared to the site logbook for accuracy. The samples then will be wrapped with a cushioning material and placed in a plastic Ziploc® bag before being put into the plastic cooler. A sufficient amount of bagged ice will be placed in the cooler to keep the samples at 4°C until arrival at the laboratory.

All necessary documentation required to accompany the samples during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler then will be sealed with fiber tape, and custody seals will be placed so any opening of the cooler prior to arrival at the laboratory can be detected.

Samples being sent to the USACE QA laboratory will be packaged and shipped in accordance with USACE Sample Handling Protocol, Medium Concentration Sample (Appendix D). The USACE QA laboratory will be notified 5 working days prior to samples being sent.

A.6 WASTE CONTAINERIZATION

All drill cuttings, well development water and rinsate will be contained in approved 55-gal drums. All RI-generated waste handling/disposal will be conducted in accordance with all applicable RCRA requirements. All drums will be labeled as to contents and origins. At the end of each phase of drilling, documentation (based on results of the required chemical analyses, evaluation of site conditions, and knowledge of regulatory requirements) will be provided that recommends the disposition of each drum. For each drum considered to contain contaminated material, a specific, optimum method of disposal, along with a price for disposal, will be recommended. Actual disposal shall be the responsibility of the RI contractor.

APPENDIX B

SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN

SAFETY, HEALTH, AND EMERGENCY RESPONSE PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
AT SENECA ARMY DEPOT
Romulus, New York

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
Huntsville, Alabama

Prepared by:

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
Gainesville, Florida

ESE No. 3-90-2034

May 1991

SAFETY, HEALTH, AND ENVIRONMENTAL RESPONSE PLAN

FOREWORD

This plan has been prepared to provide site-specific safety information related to activities to be performed at Seneca Army Depot (SEAD), Romulus, New York, for the U.S. Army Corps of Engineers (USACE). Any additional safety information developed during the project should be noted and used to revise the plan prior to future activities. The plan has been reviewed and approved for this project by the personnel indicated below.

Corporate Health and Safety Officer	Date
Project Safety Manager	Date
Project Manager	Date
Project Field Team Leader	Date

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LIST OF ACRONYMS AND ABBREVIATIONS

BP	boiling point
BUN	blood, urea, nitrogen
CFR	Code of Federal Regulations
C2H3CL	vinyl chloride
CHCL3	chloroform
CO	commanding officer
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
CSP	Certified Safety Professional
12DCLE	1,2-dichloroethane
EKG	electrocardiogram
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science & Engineering, Inc.
eV	electron volt
EZ	exclusion zone
°F	degrees Fahrenheit
ft	feet
gal	gallon
IDLH	immediately dangerous to life and health
kV	kilovolts
LEL	lower explosive limit
mmHg	millimeters of mercury
mph	miles per hour
MSHA	Mine Safety and Health Administration
NIOSH	National Institute for Occupational Safety and Health

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 2 of 2)

NPL	National Priority List
OSHA	Occupational Safety and Health Administration
oz	ounce
PEL	permissible exposure limit
PID	photoionization detector
ppm	parts per million
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SARA	Superfund Amendment and Reauthorization Act
SCBA	self-contained breathing apparatus
SHERP	Safety, Health, and Emergency Response Plan
SWMU	solid waste management unit
T12DCE	trans-1,2-dichloroethene
TCE	trichloroethene
TOV	total organic vapor
TRCLE	trichloroethene
TWA	time-weighted average
USACE	U.S. Army Corps of Engineers
USAMC	U.S. Army Materiel Command
USCG	U.S. Coast Guard
UXO	unexploded ordnance
VOC	volatile organic compound
VP	vapor pressure
WP	work plan

1.0 GENERAL INFORMATION

Site:	Seneca Army Depot--Ash Landfill Area
Location:	Seneca Army Depot, Romulus, New York
Prepared:	December 1989 by Christopher J. Campbell, Certified Safety Professional (CSP), Environmental Science & Engineering, Inc. (ESE), from information obtained from a previous site visit provided by previous project manager James F. Zitnik.
Site objective:	Remedial investigation (RI) to determine possible contamination sources and extent of contamination at the ash landfill area.
Proposed dates of site activity:	Will be decided after approval of the WP.
Site history:	A previous site investigation of solid waste management units (SWMUs) located at the abandoned incinerator ash landfill area confirmed the existence of a plume of groundwater contaminated with chlorinated volatile organic compounds (VOCs). The site has been included on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL), July 13, 1989.

Regulatory requirements: Occupational Safety and Health Administration (OSHA) standards 29 Code of Federal Regulations (CFR) 1910 and 1926 apply to work performed under this Safety, Health, and Emergency Response Plan (SHERP). Specific sections of 29 CFR 1910 that apply include 1910.120, Final Rule for Hazardous Waste Site Operations and Emergency Response; 1910.134, Respiratory Protection; 1910.100, Air Contaminants; 1926.602, Material Handling Equipment; and 1926.652, Specific Trenching Requirements. Additional U.S. Army requirements governing this work are included in the U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual (EM 385-1-1) and the U.S. Army Material Command (USAMC) Safety Manual, AMC-R 385-100.

2.0 PERSONNEL

2.1 SAFETY AND HEALTH POLICY

The purpose of this SHERP is to protect workers and other onsite personnel, the public, and the environment from hazards associated with site activities and potential site contaminants. This SHERP includes preventive and protective measures against health, physical, fire, and explosion hazards that may exist or occur during field and laboratory activities.

It is a contract requirement that all work be performed according to this SHERP. All contractor personnel and subcontractors should be familiar with the SHERP and adhere to the SHERP at all times. Personnel associated with this project will sign the Declaration of Understanding (Attachment A) to document that this SHERP has been read and understood.

2.2 ORGANIZATION AND RESPONSIBILITIES

Overall typical project organization is shown in Figure 2-1. Responsibilities of the project manager, project safety manager, site safety officer, field team leader, and field team members will be in accordance with contractor standard practices. Subcontractors for this project are subject to the same requirements and responsibilities as field team members.

2.2.1 PROJECT MANAGER

The ultimate responsibility for health and safety on a project lies with the project manager. The project manager must ensure that:

1. An effective and comprehensive SHERP has been prepared for the project,

SEAD RE-FS WP 11/90 BL

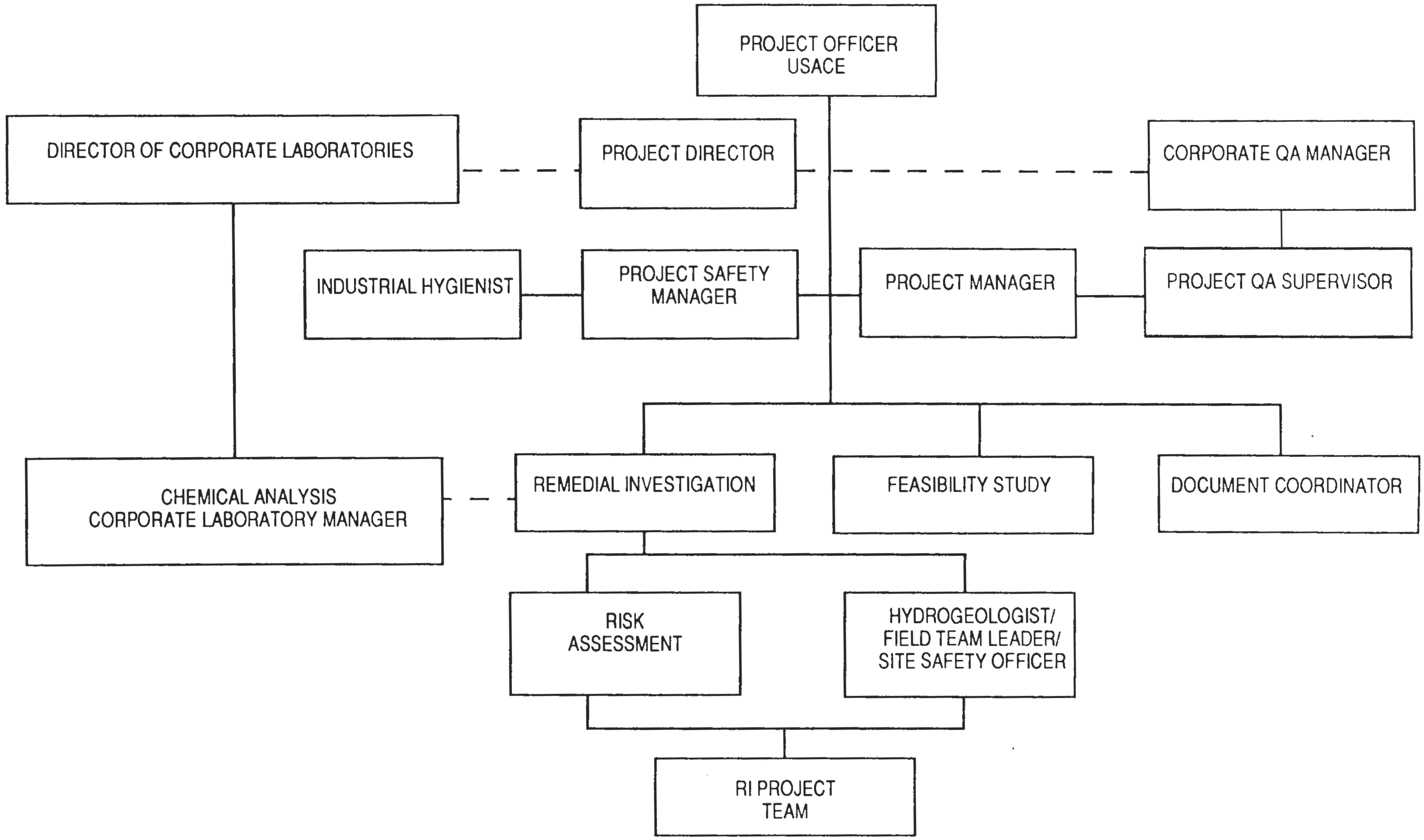

Figure 2-1
PROJECT ORGANIZATION

SOURCE: ESE.

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.

D26:SEAD RE/FS WP ORG 3

2. Adequate and appropriate safety training and equipment are available for project personnel, and
3. Project personnel are medically monitored and qualified for their involvement in the project.

2.2.2 PROJECT SAFETY MANAGER

The project safety manager is responsible to the project manager for overall project safety. The responsibilities of the project safety manager include:

1. Reviewing the project SHERP, making necessary changes, and giving final approval only when the SHERP is satisfactory;
2. Categorizing and identifying the hazards and associated risks for the conditions and activities to be encountered onsite; and
3. Reviewing reports of incidents related to project activities.

2.2.3 SITE SAFETY OFFICER

The site safety officer is responsible to the project manager for the health and safety of personnel during site activities. Responsibilities of the site safety officer include:

1. Implementing all safety procedures and operations onsite;
2. Updating equipment or procedures based upon new information gathered during the site inspection;
3. Upgrading or downgrading the levels of personal protection based upon site observations;
4. Determining and posting locations and routes to medical facilities (including poison control centers) and arranging emergency transportation to medical facilities (as required);

5. Notifying (as required) local public emergency officers (i.e., police and fire departments) of the nature of the team's operations and making emergency telephone numbers available to all team members;
6. Ensuring that at least one member of the field team is available to stay behind and notify emergency services if the site safety manager must enter an area of maximum hazard, or entering this area only after notifying emergency services (police department);
7. Observing work party members for symptoms of onsite exposure or stress; and
8. Arranging for the availability of onsite emergency medical care and first aid, as necessary.

The site safety officer has the ultimate responsibility to stop any operation that threatens the health or safety of the team or surrounding populace or causes significant adverse impact to the environment.

The site safety officer should have over 3 years' experience supervising personnel and functioning as site safety officer at hazardous waste sites. He/she must complete the site supervisor training required under 29 Code of Federal Regulations (CFR) 1910.120.

The site safety officer also must have over 3 years' experience using field monitoring equipment and will perform, or directly supervise the individuals performing, air monitoring.

2.2.4 FIELD TEAM LEADER

The field team leader is responsible to the project manager for all operational activities onsite, as well as for all safety and health practices by site personnel. The responsibilities of the field team leader include:

1. Ensuring and enforcing compliance with the SHERP,
2. Controlling site entry of unauthorized personnel or coordinating with local law enforcement agencies or state authorities to limit site access,
3. Coordinating site activities such that they may be performed in an efficient and safe manner consistent with the SHERP,
4. Enforcing the buddy system onsite, and
5. Ensuring the ready access and availability of all safety equipment.

2.2.5 FIELD TEAM MEMBERS

Contractor field employees and subcontractors are responsible to the field team leader and the site safety officer for all activities onsite. The responsibilities of field team members include:

1. Complying with all aspects of the SHERP, including strict adherence to the buddy system;
2. Obeying the orders of the field team leader and the site safety officer; and
3. Notifying the field team leader or site safety officer of hazardous or potentially hazardous incidents or working situations.

2.2.6 SITE VISITORS

Visitors and client and governmental agency representatives are required to comply with all provisions of the SHERP and may be responsible to the field team leader or site safety officer. The responsibilities of site visitors include:

1. Complying with all aspects of the SHERP, including strict adherence to the buddy system; and
2. Obeying the orders of the field team leader and the site safety officer.

2.2.7 CLIENT CONTACT--Kevin Healy [telephone (205) 895-5170]
The client contact is the individual serving as the primary liaison between the client and the project manager and field team leader. All contractor project personnel and subcontractors are directly or indirectly responsible to the client. However, the client contact must comply with all applicable portions of the SHERP when in areas covered by its provisions. In case of immediate, onsite difficulties, Randall Battaglia [telephone (607) 869-1450] should be contacted.

2.3 TRAINING

All contractor site personnel will have completed training required by 29 CFR 1910.120. Subcontractors will have had equivalent training. Attachment B lists onsite personnel and their training dates.

The course will be designed to meet training requirements of 29 CFR 1910.120. The training course should consist of an initial 40-hour session and annual refresher courses of 8 hours. The field team leader will have completed an additional 8 hours of waste site management training. The following topics should be covered in the training courses:

Hazardous Waste/Materials Site Investigations Training Course

- Safety plans
- Fundamentals of industrial hygiene
- Properties of hazardous materials/compatibility testing, shipping, and handling of samples/chain of custody
- Levels of personal protection
- Air characterization (includes hands-on session)
- Hotline systems
- Decontamination operation
- Emergency response
- Air-purifying respirators and fit-testing air-supplying respirators
- Field exercise, air-purifying respirators, and self-contained breathing apparatus (SCBA), levels A, B, and C
- Field exercises (site zones and sampling operations)
- Confined space entry
- Review of regulations
- Engineering controls

Annual Refresher

- Regulations review
- Properties of hazardous materials
- Safety plans
- Levels of protection
- Review of instruments
- Transportation
- Respiratory protection
- Site control/decontamination
- Emergency preparedness/prevention
- Review and quiz

Supervisor Training Course

- Site safety requirements and responsibility
- Medical monitoring program
- Respiratory protection program
- Air monitoring
- Regulations--OSHA/Resource Conservation and Recovery Act (RCRA)/Superfund Amendments and Reauthorization Act (SARA), and Hazard communication
- Shipping and handling
- Costs of hazardous site work
- Problems encountered during site work

Site-specific training will be given by the field team leader or site safety officer to inform field team members of site-specific hazards and hazardous activities. Training will be provided prior to site entry, each morning before work begins, and after all project field activity has been completed. A record will be prepared by the site safety officer detailing each training session, including topics discussed, individuals present, date, and time of the training.

Prior to site entry, subcontractors and visitors must verify to the satisfaction of the site safety officer that they have met the formal training requirements for work on a hazardous waste site in accordance with 29 CFR 1910.120.

2.4 MEDICAL SURVEILLANCE

All contractor site personnel will be subject to a medical surveillance program for hazardous waste site workers. This program should be designed in accordance with the recommendations found in the National Institute for Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Operations, and meets the requirements of 29 CFR 1910.120. Attachment B lists onsite personnel and their medical surveillance dates. Medical records for onsite personnel will be reviewed by a board-certified occupational physician as required under this contract. Physician statements of findings will be kept in employees' personnel files and will be available for review. The following examinations will be covered in the Medical Examination and Monitoring Program.

1. Basic physical exam
2. Heart status and functions [electrocardiogram (EKG)]
3. Chest X-ray (Roentgenogram posterior-anterior)

4. Pulmonary function--forced vital capacity, forced expiratory volume at 1 second and reserve volume
5. Blood--full SMAC Series
   a. Hemoglobin--cell counts, protein levels
   b. Acetylcholinesterase activity
   c. Heavy metals
   d. PCB in serum
6. Liver function--full enzyme profile
7. Renal function--blood, urea, nitrogen (BUN), creatinine, creatine/Creatinine ratio, lipoprotein count and differential, uric acid
8. Urinalysis
9. Audiometry--audio spectrum response of ear
10. Eye--physical condition, visual acuity.

2.5 DOCUMENTATION

Personnel and environmental monitoring will be made part of the permanent project record. Monitoring records will be kept in accordance with 29 CFR 1910.20. Training and medical records for contractor personnel will be available for inspection as required. Subcontractors are required to have training and medical records available for inspection as required by contractor and client representatives.

3.0 HAZARD EVALUATION AND CONTROL

3.1 CHEMICAL CONTAMINANTS

The primary chemical contaminants of concern are:

trans-1,2-dichloroethene (T12DCE),
trichloroethene (TRCLE),
1,2-dichloroethane (12DCLE),
vinyl chloride (C2H3CL), and
chloroform (CHCL3).

3.1.1 T12DCE

T12DCE is a colorless liquid with an ether-like and slightly acid odor. It has a boiling point (BP) of 113 to 140 degrees Fahrenheit (°F) and a vapor pressure (VP) of 180 to 265 millimeters of mercury (mmHg). Symptoms of exposure include eye and respiratory system irritation and central nervous system depression. Target organs include the respiratory system, eyes, and central nervous system. First-aid procedures include immediate irrigation of eyes and prompt soap-and-water wash for skin contact. Exposure limit for T12DCE is 200 parts per million (ppm). NIOSH has set an immediately dangerous to life and health (IDLH) level of 4,000 ppm.

3.1.2 TRCLE

TRCLE is a colorless liquid with a sweet odor. It has a BP of 188°F and a VP of 58 mmHg. Symptoms of exposure include headache, vertigo, nausea, eye irritation, and dermatitis. First-aid procedures include flushing eyes immediately with water, using soap to wash the skin promptly, and seeking medical attention. Target organs include the respiratory system, heart, liver, and kidneys. The exposure limit for TRCLE is 50 ppm. NIOSH recommends supplied air respiratory protection at any detectable concentration.

3.1.3 12DCLE

The compound 12DCLE is a volatile liquid that is harmful if swallowed or absorbed through the skin. Its vapors and mists are irritating to the skin, eyes, mucous membranes, and upper respiratory tract. Prolonged exposure can cause nausea; headache; vomiting; and damage to the liver, kidneys, and gastrointestinal system. Contact is minimized by wearing protective clothing and, when necessary, organic vapor cartridge or air-supplied respirator. If skin contact occurs, the affected area should be flushed with copious amounts of water for 15 minutes while contaminated clothing is removed. If 12DCLE is inhaled, the victim should be moved to fresh air, with artificial respiration provided if not breathing or oxygen if breathing is difficult.

The compound 12DCLE is considered a carcinogen. NIOSH recommends supplied air respiratory protection at any detectable concentration. The OSHA exposure limit is 1 ppm for an 8-hour time-weighted average (TWA), with a ceiling limit of 4 ppm. 12DCLE is flammable with a flash point of 60°F. Since water may be ineffective for fire fighting, extinguishing agents suitable for flammable liquids (Class B) should be used.

3.1.4 C2H3CL

The compound C2H3CL is a colorless liquid or gas (when inhibited) with a faintly sweet odor. Exposure to this chemical is usually through inhalation or contact with skin or eyes. Symptoms of exposure include severe irritation of the skin, eyes, and mucous membranes. Target organs include the liver and central nervous system.

If eye contact occurs, flush the affected area immediately with water. If skin contact occurs, wash affected area with soap and water. If inhaled, move victim to fresh air and seek medical attention. Permissible exposure limit (PEL) is 1 part per million (ppm) TWA. C2H3CL is a known human carcinogen. NIOSH recommends supplied air respiratory protection at any detectable concentration. The compound is classified as flammable.

3.1.5 CHCL3

The compound CHCL3 is a clear, colorless liquid with a characteristic odor. It is not flammable, but it does decompose in the presence of flame to form hydrochloric acid, phosgene, and chlorine. It is a suspect carcinogen, and OSHA has set a PEL of 2 ppm. NIOSH recommends supplied air respiratory protection at any detectable concentration. When inhaled in large concentrations, CHCL3 can act as a potent anesthetic. The primary entry route of CHCL3 into the body is through inhalation. It may also be harmful to the skin, producing burns on prolonged contact. Preventive measures include using supplied air respirators and wearing protective clothing, eye and face protection, and gloves. If CHCL3 is inhaled, the individual should be removed to fresh air and seek medical attention. For skin contact, a soap-and-water wash is recommended; for eye contact, eyes should be rinsed with clear water for 15 minutes and medical attention should be sought.

3.2 PHYSICAL AND MECHANICAL HAZARDS

Activities onsite will include:

1. Site visits;
2. Monitor well installation and sampling; and
3. Monitoring and sampling of soils, groundwater, surface water, and sediments.

Hazards associated with these activities are varied and include vehicle/ pedestrian collisions; fire; contact or crushing injuries resulting from materials handling and equipment operations; abrasions, contusions, lacerations, etc. resulting from use of power tools; and elevated noise levels. The potential for such hazards necessitates that all onsite personnel wear personal protective clothing, including coveralls, gloves, eye and face protection, safety boots, and hard hats. Noise and air will also be monitored.

3.2.1 MOTOR VEHICLES AND MOTORIZED EQUIPMENT

All motor vehicles will be maintained in a safe operating condition and in accordance with local and state safety requirements. All vehicles and moving equipment will be operated on sites and en route to and from sites in accordance with state and local motor vehicle regulations for speed, lights and warnings, passenger carrying, and operation. If any equipment is left unattended at night adjacent to a highway in use, it will be provided with suitable barricading, lighting, reflectors, or other suitable visual warnings to identify its location.

Any mobile equipment, including drilling rigs, earth-moving machinery, or other similar types of equipment, will be operated in strict compliance with the manufacturer's instructions, specifications, and limitations, as well as any applicable regulations. The operator is responsible for inspecting the equipment daily to assure that it is functioning properly and safely. This inspection will include all parts subject to faster than normal wear and all lubrication points.

Hand and audible (horn) signals to equipment operators will be the commonly accepted industry standard signals for the type of equipment being used. All signals will be reviewed by the operator and signaller before work begins. Only one person will signal the equipment operator at any given time.

When equipment with moving booms, arms, or masts is operated near overhead hazards, the operator, with assistance from the designated signaling person, will assure that the moving parts of the equipment maintain safe vertical and horizontal clearances to the hazards. Moving booms, arms, or masts will be lowered and secured prior to being moved from one location to another, even on the same site. Equipment will be kept at least 10 feet (ft) away from energized electrical lines rated up to 50 kilovolts (kV) and 16 ft away from lines rated over 50 and up to 750 kV.

Drill rigs and other equipment not specifically designed to move with the boom, mast, or arm elevated will be returned to traveling position and condition before being moved.

3.2.2 PORTABLE EQUIPMENT AND TOOLS

All equipment and tools will be inspected prior to each day's use and as often as necessary to ensure that they are in safe operating condition. Defective equipment and tools will be removed from service immediately. Examples of defective tools include: hooks and chains stretched beyond allowable deformations; cables and ropes with more than the allowable number of broken strands; missing grounding prongs on power tools; defective on/off switches; mushroomed heads of impact tools; sprung wrench jaws; missing or broken handles or guards; and wooden handles that are cracked, splintered, or loose. All equipment and tools will be used within their rated capacities and capabilities.

Whenever possible, equipment should not be driven into the ground, but should be placed into an augured hole. All onsite personnel will exercise due care when working with drilling equipment to not become entangled, crushed, or otherwise injured. No loose clothing or unconfined long hair will be permitted in the immediate area of any operating drilling tools or equipment. Probes and other pieces of equipment that are driven into the ground will be placed using a slide hammer to minimize potential for crushing injury.

3.2.3 UNEXPLODED ORDNANCE (UXO)

The incinerator ash landfill was not used for the disposal of ammunition and/or explosive materials. Therefore, UXO is not expected to be in the area. However, this does not preclude the possibility that some UXO may exist at this site. If explosive contamination or UXO is discovered at any time during site activities, the location will be marked, operations halted, and the commanding officer (CO) notified. The government will make appropriate arrangements with the regional Explosive Ordnance Disposal Command Center for disposal of the explosive material.

3.3 PERSONAL PROTECTIVE EQUIPMENT

Drilling, well development, and sampling will be performed initially in Level B personal protective equipment. Level B protective equipment includes the following:

LEVEL B

1. Positive-pressure, self-contained breathing apparatus (SCBA) with full face mask,
2. Chemical protective Tyvek® coveralls,
3. Inner chemical resistant latex gloves,
4. Outer chemical resistant Solvex® gloves,
5. Chemical-protective Nitrile or NBR steel-toe and shank boots,
6. Chemical protective latex boot covers,
7. Hard hat, and
8. Sealed tape over joints between coveralls and boot covers or gloves.

Modifications

1. Air line respirator with escape SCBA may be used in lieu of SCBA.
2. Work gloves over chemical-resistant gloves must be used for specific activities that require such protection. Specific activities include drill rig operation, in-trench work, and other similar manual labor.

A gas chromatograph, portable infrared spectrophotometer, or other laboratory analysis may be used to determine positively the absence of TRCLE, 1,2-dichloroethane, vinyl chloride, and chloroform. Following the demonstrated absence of these chemicals, Level C personal protective equipment will be permitted. Level C protective equipment includes the following:

LEVEL C

1. Air-purifying respirator with full face mask and organic vapor/high efficiency cartridges;
2. Chemical protective Tyvek® coveralls;
3. Inner chemical resistant latex gloves;
4. Outer chemical resistant Solvex® gloves;
5. Chemical-protective, steel-toe and shank, Nitrile or NBR boots;
6. Chemical protective latex boot covers;
7. Hard hat; and
8. Sealed tape over joints between coveralls and boot covers or gloves.

Modification

1. Work gloves are to be worn over chemical-resistant gloves as necessary for the particular activity.

Other onsite work outside the Exclusion Zone (EZ) (described in section 3.4) where ionization detector measurements verify that total organic vapor (TOV) levels do not exceed background may be performed in Level D personal protective equipment. Level D protective equipment includes the following:

LEVEL D

1. Coveralls;
2. Chemical-resistant, steel toe and shank, Nitrile or NBR boots;
3. Eye and face protection;
4. Hard hat, and;
5. Work gloves.

The contractor will maintain two sets of Level C personal protective equipment onsite for official visitors and government personnel. Visitors will not be allowed in areas requiring Level B protection. The site safety officer will assure that all personal protective equipment, regardless of ownership, is in proper working order and is maintained in accordance with the manufacturer's instructions. All respiratory equipment will be used in accordance with its NIOSH/Mine Safety and Health Administration (MSHA) approval conditions, and with OSHA (29 CFR 1910.134) requirements.

3.4 SITE ACCESS, PERIMETER, AND WORK ZONES

The site is on an access-controlled military installation. Site access will be through public access points onto the installation. The field team leader will coordinate with the client contact for field personnel access.

As this site is on an access-controlled military installation, perimeters around the EZ and Contamination Reduction Zone (CRZ) may be established using barriers consisting of barrier tape and/or A-frame barricades for the duration of site work.

Site work zones will be established and suitably marked in accordance with site conditions and needs, using Attachment C for guidance. The extent of the EZs will be established in accordance with the proposed trench location. Separate EZs will be permitted for trenching and drilling operations as site conditions may indicate. Only personnel properly dressed in Level B equipment will be permitted within the EZ(s). The CRZ will be established and enlarged as necessary so that ionization detector measurements taken at multiple representative points along the upwind, downwind, and crosswind sides of the CRZ do not exceed background TOV levels.

3.5 PERSONNEL DECONTAMINATION

Personnel decontamination stations will be established and supplied in accordance with the procedures listed in Attachment D.

3.6 EQUIPMENT DECONTAMINATION

Equipment decontamination will be performed as necessary in accordance with procedures set forth in the Quality Assurance Project Plan (QAPP).

4.0 FIELD STANDARD OPERATING PROCEDURES

4.1 GENERAL SAFE WORK PRACTICES

In addition to the specific requirements of this project safety plan, common sense should prevail at all times. The following general safety rules and practices will be in effect at the site.

1. The site will be suitably marked or barricaded as necessary to prevent unauthorized visitors but not hinder emergency services if needed.
2. All open holes and obstacles will be properly barricaded in accordance with local site needs. These needs will be determined by proximity to traffic ways, both pedestrian and vehicular, and site of the hole, trench, or obstacle. If holes are required to be left open during nonworking hours, they will be adequately decked over or barricaded and sufficiently lighted.
3. Before any digging or boring operations are conducted, underground utility locations will be identified. The client contact will provide locations of underground utility lines and piping. All boring and other site work will be planned and performed with consideration for underground lines.
4. Smoking and ignition sources in the vicinity of potentially flammable or contaminated material are prohibited.
5. Drilling; boring; and movement and use of earth-moving equipment, cranes and drilling rigs; erection of towers; movement of vehicles and equipment; and other activities will be planned and performed with consideration for the location, height, and relative position of aboveground utilities and fixtures, including signs; lights; canopies;

buildings and other structures and construction; and natural features such as trees, boulders, waterbodies, and terrain.

6. When working in areas where flammable vapors may be present, particular care must be exercised with tools and equipment that may be sources of ignition. All tools and equipment so provided must be properly bonded and/or grounded.
7. Approved and appropriate safety equipment (as specified in this SHERP), such as eye protection, hard hats, foot protection, and respirators, must be worn in areas where required by the SHERP. In addition, eye protection must be worn when sampling soil or water that may be contaminated is handled.
8. Beards that interfere with respirator fit are not allowed within the site boundaries because all site personnel may be called upon to use respirator protection in some situations, and beards do not allow for proper respirator fit.
9. No smoking, eating, or drinking will be allowed in the contaminated areas.
10. Tools and hands must be kept away from the face.
11. Personnel must shower at the end of the shift or as soon as possible after leaving the site.
12. Each sample must be treated and handled as though it were extremely toxic.
13. Persons with long hair and/or loose-fitting clothing that could become entangled in power equipment are not permitted in the work area.
14. Horseplay is prohibited in the work area.
15. Work while under the influence of intoxicants, narcotics, or controlled substances is prohibited.

4.2 AIR MONITORING

An air monitoring program is fundamental to the safety of onsite and offsite personnel. TOV levels associated with onsite activities will be monitored with a photoionization detection (PID) instrument (HNU PI-101) equipped with an 11.7 electron volt (eV) lamp. This instrument will provide information for upgrading or downgrading personal protection. Calibration and maintenance of monitoring equipment will be in accordance with manufacturer recommendations. The absence or presence of TRCLE, 1,2-dichloroethane, vinyl chloride and chloroform will be demonstrated by a suitable laboratory method, such as gas chrometography, performed by trained personnel. Samples may be taken during the field effort or within two weeks prior to the field effort.

Contractor personnel will establish a daily background TOV prior to initiating onsite activities. Under most circumstances, this level can be determined by taking multiple readings at representative locations about the site before work has begun and averaging the results of sustained measurements. Daily TOV background levels may vary in accordance with local conditions, including any industrial, retail/wholesale, or natural features, but should not exceed 5 ppm. If, due to site conditions, it appears that perimeter readings will not yield a truly representative background level, the site safety officer or contractor corporate health and safety officer will be consulted for guidance.

Contractor personnel will monitor TOV at the frequencies given in Section 4.2.4 (Air Monitoring) of the work plan (WP). Decisions to upgrade personal protection will be based on sustained breathing zone TOV that exceeds background levels. Breathing zone refers to the area from the top of the shoulders to the top of the head. Specific criteria for upgrading personal protection based on TOV is presented in Table 4-1. Attachment E contains a sample logsheet for recording TOV measurements. If TOV levels exceed background, gas chromatograph analysis may be made of the air in the breathing zone. In the absence of documented evidence that TRCLE, 12DCLE, C2H3CL, and CHCL3 are not present in the breathing zone, work will be performed in Level B personal protective equipment. Further air-monitoring information is given in the Air Monitoring section of the WP.

A radioactive survey using a Geiger counter will be conducted during drilling and sampling operations. If any radioactive material is detected, the site will be evacuated and the RI/FS will be re-scoped to handle this issue.

4.3 WORK LIMITATIONS

Work will be limited to daylight hours and during normal weather conditions. If work is to be performed at times of reduced illumination, such as late evening hours, artificial flood lighting will be provided. Extremes in temperature and weather conditions (i.e., wind and lightning) will restrict working hours. All work onsite will be suspended when lightning occurs in the vicinity.

4.3.1 HEAT STRESS

During warm weather, especially when personnel are wearing protective clothing, drinking water will be made available. Noncarbonated, noncaffeinated, and nonalcoholic beverages are acceptable as a substitute to water. Drinks are to be located so that personnel are encouraged to drink small quantities frequently [i.e., 8 fluid ounces (oz) 3 to 4 times per hour].

Table 4-1. Organic Vapor Measurements and Corresponding Personal Protection Levels/Actions

Total Organic Vapor	Personal Protection Level or Action*
Background	D
In excess of background, <u>with</u> demonstrated absence of trichloroethene, 1,2-dichloroethane, vinyl chloride, and chloroform	C
In excess of background, <u>without</u> demonstrated absence of trichloroethene, 1,2-dichloroethane vinyl chloride, and chloroform	B
In excess of background + 50 ppm, <u>without</u> demonstrated absence of trichloroethene, 1,2-dichloroethane, vinyl chloride, and chloroform	Evacuate site and resample after 1 hour. If sampling after 1 hour results in a level in excess of 50 ppm above background, contact the project safety manager for specific instructions.

*See Section 3.3 for personal protective equipment level descriptions.

Source: ESE.

Drinks should be kept as close to the work area as practicable and should be kept reasonably cool (50 to 60°F).

For monitoring the body's recuperative ability toward excess heat, the following techniques will be used as a screening mechanism. Monitoring of personnel wearing protective clothing will commence when the ambient temperature is 70°F or above. When temperatures exceed 85°F, workers will be monitored after every work period. Monitoring will include visual observations for signs of heat stress and measurement of radial pulse rate for 30 seconds at the beginning of each rest period. If the heart rate exceeds 110 beats per minute, the oral body temperature will be measured. If the body temperature is more than 98.6°F but less than 100.5°F, the next work period will be shortened by 10 minutes, with no reduction in rest period. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle will be shortened another 10 minutes.

If the body temperature exceeds 100.5°F, the worker will be monitored again at the end of the rest period and will not be allowed to return to work until the body temperature falls below 100.5°F. If the body temperature is still in excess of 100.5°F ten minutes after the second monitoring during a single rest period, the worker will be treated for heat stress, and medical attention will be sought for the worker.

4.3.2 COLD STRESS

The human body senses cold as a result of two factors, air temperature and wind velocity. Cooling of the flesh increases rapidly as wind velocity goes up. Frostbite can occur at relatively mild temperatures if wind penetrates the body insulation. For example, when the air temperature is 40°F and the wind velocity is 30 miles per hour (mph), the exposed skin would perceive an equivalent still air temperature of 13°F. Table 4-2 illustrates windchill indices and the associated hazards to exposed flesh. Precautions will be taken to minimize exposed flesh, and layered clothing will be provided, as appropriate.

If a worker shows signs of cold stress, such as excessive shivering, the worker's oral body temperature will be monitored. If the temperature is less than 96.8°F, the worker will be allowed to warm up in a heated rest area. If, at the end of the scheduled rest period, the worker's temperature is still below 96.8°F, the worker will not be allowed to return to work until the body temperature rises to above 96.8°F. If the body temperature is still below 96.8°F ten minutes after the second monitoring during a single rest period, the worker will be treated for cold stress, and medical attention will be sought for the worker.

Also, good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. If skin problems occur, medical personnel should be consulted.

4.4 LABORATORY SAFETY

Certain samples collected from the site and shipped to a laboratory for analysis may present a potential for exposure of laboratory personnel to dangerous levels of hazardous materials. The laboratory has implemented an effective safety plan for handling these materials.

The system designed for laboratory personnel protection prevents skin contact with hazardous chemicals and respiratory protection from dangerous levels of

Table 4-2. Windchill Index

Windspeed Miles per Hour	Actual Thermometer Reading (°F)									
	50	40	30	20	10	0	-10	-20	-30	-40
calm	50	40	30	20	10	0	-10	-20	-30	-40
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-21	-33	-46	-58	-70
15	36	22	9	-5	-18	-36	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-74	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Over 40	LITTLE DANGER (little added effect)			INCREASING DANGER (for properly clothed person)				GREAT DANGER (danger from freezing of exposed flesh)		

Source: National Safety Council, 1982.

hazardous vapors. At a minimum, all laboratory personnel having direct contact with the hazardous samples will be equipped with the following equipment:

1. Safety glasses or face shield to protect from splashes,
2. Inner latex and outer Solvex® gloves, and
3. Rubberized apron or other chemical protective garment.

Respiratory protection in the form of organic vapor cartridge respirators may be required by the laboratory safety manager if exposure to hazardous vapors is likely. All operations conducted with the raw hazardous waste samples will be performed in an adequate fume hood. Once the samples have been extracted or processed and are present in sealed bottles and vials, respiratory protection may be discontinued; however, the following safety precautions should continue to be observed:

1. Use of safety glasses, and
2. Use of latex and/or rubber gloves.

4.5 ACCIDENT PREVENTION PLAN/ACCIDENT REPORTING

The purpose of the SHERP is to prevent accidents and minimize the impact of an accident if one should occur (i.e., the SHERP is the accident prevention plan).

4.5.1 ACCIDENT PREVENTION

The site safety officer will conduct periodic inspections of the work areas to ensure that safe working practices are being followed. These inspections will be made prior to the start of any new activity and during the performance of activities as necessary. The purpose of these inspections will be to determine if site conditions and operations are in accordance with this SHERP and safe working conditions and practices. Site personnel will, under the direction of the site safety officer, immediately correct any deficiencies, stopping all work if necessary to do so. The site safety officer will prepare a report for the project file indicating the date, time, location of each inspection, unsafe conditions and practices, and remedial action taken.

4.5.2 ACCIDENT REPORTING

All accidents must be reported to the site safety officer immediately. Prompt reporting is essential to the prevention of future incidents in addition to the well-being of the affected individual or individuals. The site safety officer will notify the project manager and the client contact of any serious accidents. The site safety officer or other key members of the field team will be trained in first aid and cardiopulmonary resuscitation (CPR). First aid will be administered to affected personnel under the direction of the site safety officer. For serious accidents, the nearest ambulance service will be contacted for transport of injured personnel to the nearest medical facility (Section 5.0). The site safety officer will have established contact and liaison with medical authorities (Section 5.0) who will be knowledgeable of the activities of the field team. Telephone numbers and addresses of ambulance and medical services will be posted onsite.

A formal report of all accidents and any OSHA-recordable accident will be filed with the contractor corporate health and safety officer and with the client contact on ENG Form 3394 in accordance with Army requirements. All reports must be received within 2 working days.

5.0 EMERGENCY INFORMATION

5.1 CONTINGENCY PLANS

In the event of any site emergency, the site safety officer will notify the post environmental coordinator.

5.1.1 FIRE CONTROL

No smoking will be allowed during drilling or sampling activities. Fire extinguishers, suitable for Class A, B, and C fires (rated at least 1A, 10BC), will be available at sampling sites for use on small fires. All samples must be treated as flammable or explosive. The site safety officer will have available the telephone number of the nearest fire station and local law enforcement agencies in case of a major fire emergency.

5.1.2 SPILL CONTROL

In the event of a spill, the site safety officer will be notified immediately. The important factors are that no personnel are overexposed to vapors, gases, or mists and that the liquid does not ignite. Waste spillage must not be allowed to contaminate any local water source. Small dikes will be erected to contain spills, if necessary, until proper disposal can be completed. Subsequent to cleanup activities, the site safety officer will survey the area to ensure that no toxic or explosive vapors remain.

5.2 LOCAL RESOURCES

All emergency numbers and routes will be posted onsite.

Seneca Army Depot:	(607) 869-0448 (Police)	(607) 869-1436 (Ambulance)	(607) 869-1316 (Fire)
Hospitals:	Seneca Army Depot Clinic Romulus, New York		(607) 869-1243
	Geneva General Hospital 196-198 North Street Geneva, New York		(315) 798-4222

5.3 SITE RESOURCES

Support vehicle

Safety and first-aid equipment accessible in the support vehicle:

1. One fire extinguisher, rated at least 1A, 10BC;
2. One Standard Industrial First Aid Kit, fully stocked; and
3. One Portable Emergency Eyewash Shower Unit, providing 0.4 gallon (gal) clean water per minute for 15 minutes.

5.4 EMERGENCY CONTACTS

1. Mr. Randy Battaglia, environmental contact, Seneca Army Depot, (607) 869-1450.
2. Project manager.
3. Corporate health and safety officer.
4. Project safety manager.

5.5 HOSPITAL ROUTES

Seneca Army Depot Clinic

Located onpost near the south (main) gate (Figure 5-1).

Geneva General Hospital (Figure 5-2)

Exit the north gate from the depot onto State Road 96A. North on State Road 96A to Geneva. In Geneva turn right on State Roads 5 and 20 to North Street. Turn left on North Street to hospital.

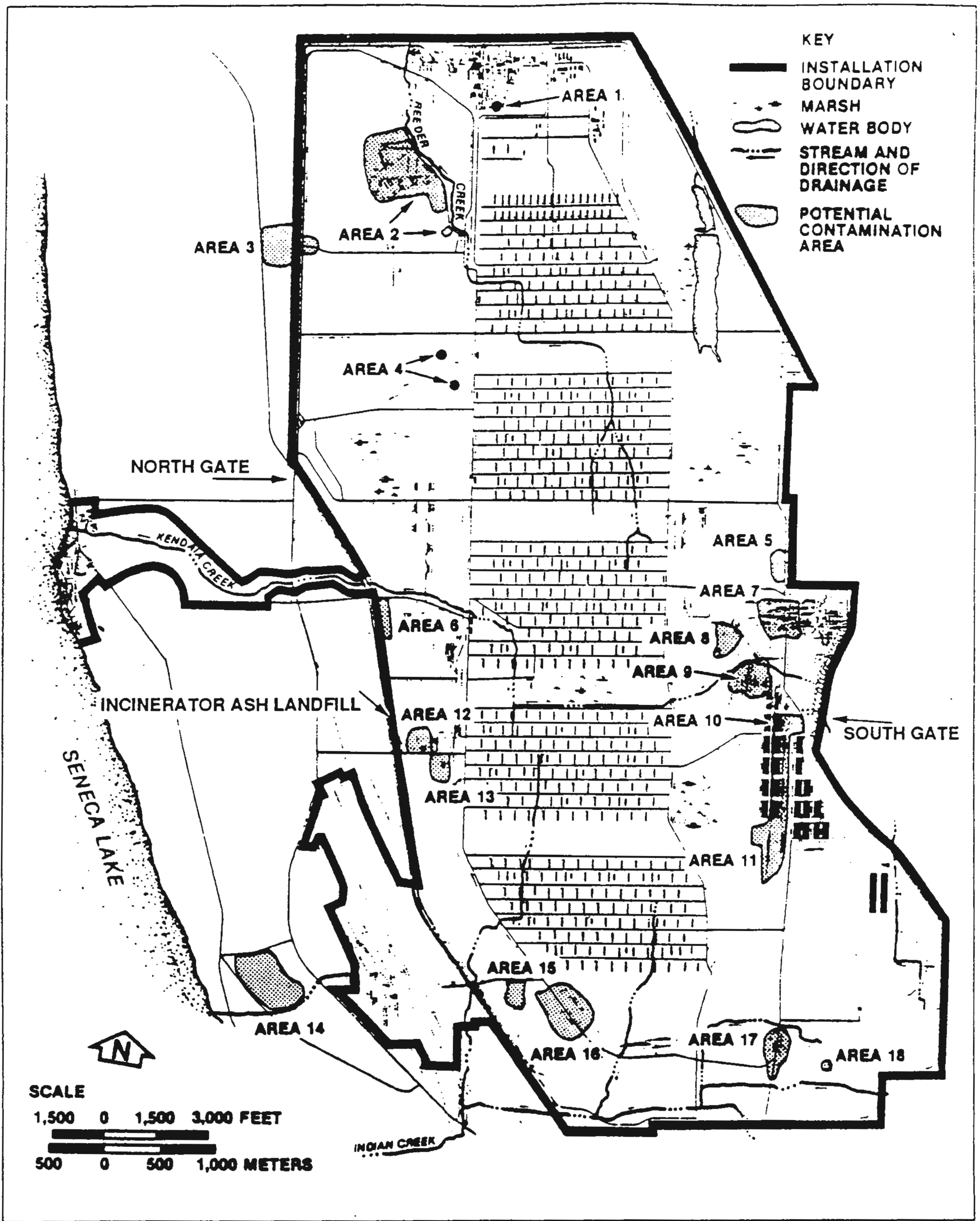

Figure 5-1
SITE MAP

SOURCE: ESE.

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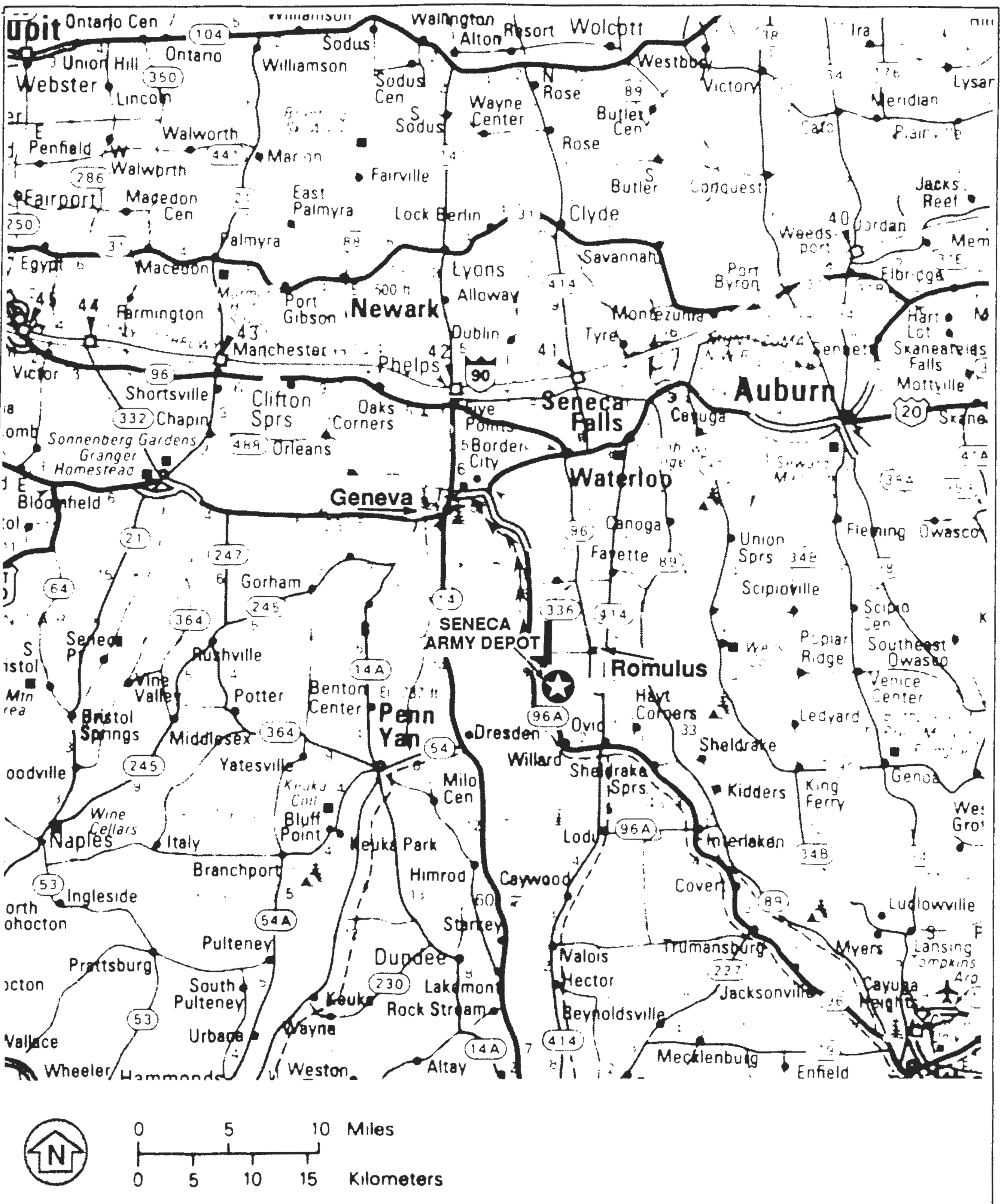

Figure 5-2
HOSPITAL ROUTE TO
GENEVA GENERAL HOSPITAL

SOURCE: ESE.

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ATTACHMENT A--DECLARATION OF UNDERSTANDING

PROJECT SPECIFIC HEALTH AND SAFETY PLAN

PROJECT NAME: ______________________________

PROJECT NUMBER: ______________________________

PROJECT MANAGER: ______________________________

CORPORATE SAFETY OFFICER: ______________________________

Check if Designee ☐

DECLARATION OF UNDERSTANDING

I have read and understand this Health and Safety Plan (HASP), and agree to abide by the procedures and limitations specified. I also certify that all medical monitoring and health and safety training requirements which may be applicable to my employment at this site are current and will not expire during onsite activities.

NAME	EMPLOYEE NO.	SS NO.	DATE

NOTE: All subcontractors must abide by the specifications and limitations contained in this HASP.

D12/PPG 10/90S

ATTACHMENT B--PERSONNEL TRAINING AND MEDICAL SURVEILLANCE

PERSONNEL TRAINING AND MEDICAL SURVEILLANCE

Project:________________________ Site:______________________________

The following personnel are expected to perform activities at this site. Training and medical surveillance, in accordance with 29 CFR 1910.120 and ESE standard practices, has been provided on the dates indicated.

NAME	HAZARDOUS WASTE SITE	SITE SUPVSR	FIRST AID	CPR	MEDICAL EXAM

ATTACHMENT C--DIAGRAM OF SITE WORK ZONES

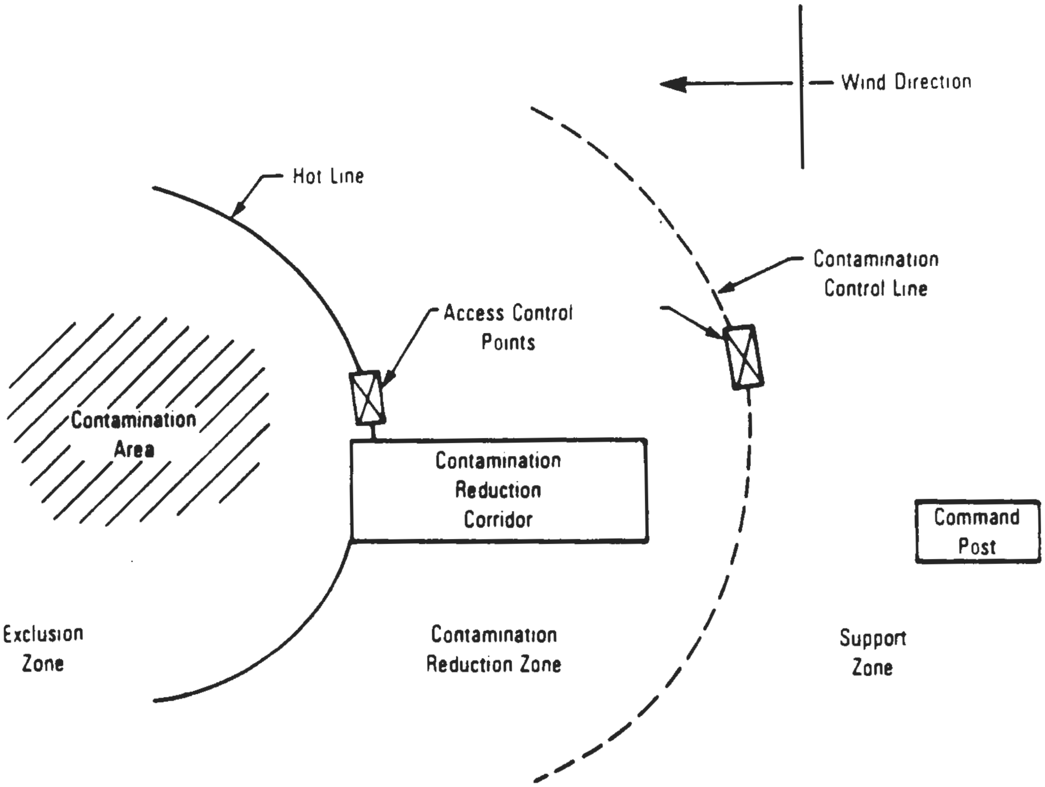

Figure C-1
DIAGRAM OF SITE WORK ZONES

SOURCES: NUS, 1983; ESE, 1990.

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ATTACHMENT D--DECONTAMINATION PROCEDURES

Level B Decontamination

Equipment Worn

The full decontamination procedure outlined is for workers wearing Level B protection (with taped joints between gloves, boots, and suit). Such protection consists of:

1. One-piece, hooded, chemical-resistant splash suit
2. Self-contained breathing apparatus
3. Hard hat
4. Chemical-resistant boots with steel toe and shank
5. Boot covers
6. Inner and outer gloves

Procedure for Full Decontamination

Station 1: Segregated Equipment Drop

Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Equipment necessary is:

1. Containers of various sizes
2. Plastic liners
3. Plastic drop cloths

Station 2: Boot Cover and Glove Wash

Scrub outer boot covers and gloves with decontamination solution or detergent/water solution.

Equipment necessary is:

1. Container (20 to 30 gallons)
2. Decontamination solution
   or
3. Detergent/water solution
4. Two or three long-handle, soft-bristle scrub brushes

Station 3: Boot Cover and Glove Rinse

Rinse off decontamination solution from Station 2 using copious amounts of water. Repeat as many times as necessary.

Equipment necessary is:

1. Container (30 to 50 gallons)
   or
2. High-pressure spray unit
3. Water
4. Two or three long-handle, soft-bristle scrub brushes

Figure D-1
LEVEL B DECONTAMINATION PROCEDURES
(PAGE 1 OF 5)

SOURCES: NUS, 1983; ESE, 1990.

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Station 4: Tape Removal

Remove tape around boots and gloves and deposit in container with plastic liner.

Equipment necessary is:

1. Container (20 to 30 gallons)
2. Plastic liners

Station 5: Boot Cover Removal

Remove boot covers and deposit in container with plastic liner.

Equipment necessary is:

1. Container (30 to 50 gallons)
2. Plastic liners
3. Bench or stool

Station 6: Outer Glove Removal

Remove outer gloves and deposit in container with plastic liner.

Equipment necessary is:

1. Container (20 to 30 gallons)
2. Plastic liners

Station 7: Suit/Safety Boot Wash

Thoroughly wash chemical-resistant splash suit, self-contained breathing apparatus, gloves, and safety boots. Scrub with long-handle, soft-bristle scrub brush and copious amounts of decontamination solution or detergent/water solution. Wrap self-contained breathing apparatus regulator (if belt-mounted type) with plastic to keep out water. Wash backpack assembly with sponges or cloths.

Equipment necessary is:

1. Container (30 to 50 gallons)
2. Decontamination solution
   or
3. Detergent/water solution
4. Two or three long-handle, soft-bristle scrub brushes
5. Small buckets
6. Sponges or cloths

Figure D-1
LEVEL B DECONTAMINATION PROCEDURES
(CONTINUED, PAGE 2 OF 5)

SOURCES: NUS, 1983; ESE, 1990.

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Station 8: Suit/Self-Contained Breathing Apparatus/Boot/Glove Rinse

Rinse off decontamination solution or detergent/water solution using copious amounts of water. Repeat as many times as necessary.

Equipment necessary is:

1. Container (30 to 50 gallons)
   or
2. High-pressure spray unit
3. Water
4. Small buckets
5. Two or three long-handle, soft-bristle scrub brushes
6. Sponges or cloths

Station 9: Tank Change

If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged; new outer glove and boot covers donned, and joints taped. Worker then returns to duty.

Equipment necessary is:

1. Air tanks
2. Tape
3. Boot covers
4. Gloves

Station 10: Safety Boot Removal

Remove safety boots and deposit in container with plastic liner.

Equipment necessary is:

1. Container (30 to 50 gallons)
2. Plastic liners
3. Bench or stool
4. Boot jack

Station 11: Self-Contained Breathing Apparatus Removal

While still wearing facepiece, remove backpack and place on table. Disconnect hose from regulator valve and proceed to next station.

Equipment necessary is:

1. Table

Figure D-1
LEVEL B DECONTAMINATION PROCEDURES
(CONTINUED, PAGE 3 OF 5)

SOURCES: NUS, 1983; ESE, 1990.

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Station 12: Splash Suit Removal

With assistance of helper, remove splash suit. Deposit in container with plastic liner.

Equipment necessary is:

1. Container (30 to 50 gallons)
2. Plastic liners
3. Bench or stool

Station 13: Inner Glove Wash

Wash with decontamination solution or detergent/water solution that will not harm skin. Repeat as many times as necessary.

Equipment necessary is:

1. Decontamination solution
   or
2. Detergent/water solution
3. Basin or bucket
4. Small table

Station 14: Inner Glove Rinse

Rinse with water. Repeat as many times as necessary.

Equipment necessary is:

1. Water
2. Basin or bucket
3. Small table

Station 15: Facepiece Removal

Remove facepiece. Deposit in container with plastic liner. Avoid touching face with fingers.

Equipment necessary is:

1. Container (30 to 50 gallons)
2. Plastic liners

Station 16: Inner Glove Removal

Remove inner gloves and deposit in container with plastic liner.

Equipment necessary is:

1. Container (20 to 30 gallons)
2. Plastic liners

Figure D-1
LEVEL B DECONTAMINATION PROCEDURES
(CONTINUED, PAGE 4 OF 5)

SOURCES: NUS, 1983; ESE, 1990.

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Station 17: Inner Clothing Removal

Remove clothing soaked with perspiration. Place in container with plastic liner. Do not wear inner clothing offsite since there is a possibility that small amounts of contaminants might have been transferred in removing fully encapsulating suit.

Equipment necessary is:

1. Container (30 to 50 gallons)
2. Plastic liners

Station 18: Field Wash

Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.

Equipment necessary is:

1. Water
2. Soap
3. Small table
4. Basin or bucket
5. Field showers

Station 19: Redress

Put on clean clothes. A dressing trailer is needed in inclement weather.

Equipment necessary is:

1. Tables
2. Chairs
3. Lockers
4. Clothes

Figure D-1
LEVEL B DECONTAMINATION PROCEDURES
(CONTINUED, PAGE 5 OF 5)

SOURCES: NUS, 1983; ESE, 1990.

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9A.3 Level C Decontamination

Equipment Worn

The full decontamination procedure outlined is for workers wearing Level C protection (with taped joints between gloves, boots, and suit). Such protection consists of

1. One-piece, hooded, chemical-resistant splash suit
2. Canister-equipped full-face mask
3. Hard hat
4. Chemical-resistant boots with steel toe and shank
5. Boot covers
6. Inner and outer gloves

Procedure for Full Decontamination

Station 1: Segregated Equipment Drop

Deposit equipment used on the site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Equipment necessary is

1. Containers of various sizes
2. Plastic liners
3. Plastic drop cloths

Station 2: Boot Cover and Glove Wash

Scrub outer boot covers and gloves with decon solution or detergent/water solution.

Equipment necessary is

1. Container (20 to 30 gal)
2. Decon solution
3. Detergent/water solution
4. Two or three long-handle, soft-bristle scrub brushes

Station 3: Boot Cover and Glove Rinse

Rinse off decon solution from Station 2 using copious amounts of water. Repeat as many times as necessary.

Figure D-2
LEVEL C DECONTAMINATION PROCEDURES
(PAGE 1 OF 5)

SOURCES: NUS, 1983; ESE, 1990.

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Equipment necessary is

1. Container (30 to 50 gal)
2. High-pressure spray unit
3. Water
4. Two or three long-handle, soft-bristle scrub brushes

Station 4: Tape Removal

Remove tape around boots and gloves and deposit in container with plastic liner.

Equipment necessary is

1. Container (20 to 30 gal)
2. Plastic liners

Station 5: Boot Cover Removal

Remove boot covers and deposit in container with plastic liner.

Equipment necessary is

1. Container (30 to 50 gal)
2. Plastic liners
3. Bench or stool

Station 6: Outer-Glove Removal

Remove outer gloves and deposit in container with plastic liner.

Equipment necessary is

1. Container (20 to 30 gal)
2. Plastic liners

Station 7: Suit/Safety Boot Wash

Thoroughly wash splash suit and safety boots. Scrub with long-handle, soft-bristle scrub brush and copious amounts of decon solution or detergent/water solution. Repeat as many times as necessary.

Equipment necessary is

1. Container (30 to 50 gal)
2. Decon solution
3. Detergent/water solution
4. Two or three long-handle, soft-bristle scrub brushes

Figure D-2
LEVEL C DECONTAMINATION PROCEDURES
(CONTINUED, PAGE 2 OF 5)

SOURCES: NUS, 1983; ESE, 1990.

Station 8: Suit/Safety Boot Rinse

Rinse off decon solution or detergent/water solution using copious amounts of water. Repeat as many times as necessary.

Equipment necessary is

1. Container (30 to 50 gal)
2. High-pressure spray unit
3. Water
4. Two or three long-handle, soft-bristle scrub brushes

Station 9: Canister or Mask Change

If worker leaves Exclusion Zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer glove and boot covers donned, and joints taped. Worker returns to duty.

Equipment necessary is

1. Canister (or mask)
2. Tape
3. Boot covers
4. Gloves

Station 10: Safety Boot Removal

Remove safety boots and deposit in container with plastic liner.

Equipment necessary is

1. Container (30 to 50 gal)
2. Plastic liners
3. Bench or stool
4. Boot jack

Station 11: Splash Suit Removal

With assistance of helper, remove splash suit. Deposit in container with plastic liner.

Equipment necessary is

1. Container (30 to 50 gal)
2. Bench or stool
3. Plastic liner

Figure D-2
LEVEL C DECONTAMINATION PROCEDURES
(CONTINUED, PAGE 3 OF 5)
SOURCES: NUS, 1983; ESE, 1990.

Station 12: Inner-Glove Wash

Wash inner gloves with decon solution or detergent/water solution that will not harm skin. Repeat as many times as necessary.

Equipment necessary is

1. Decon solution
2. Detergent/water solution
3. Basin or bucket

Station 13: Inner-Glove Rinse

Rinse inner gloves with water. Repeat as many times as necessary.

Equipment necessary is

1. Water
2. Basin or bucket
3. Small table

Station 14: Facepiece Removal

Remove facepiece. Avoid touching face with gloves. Deposit facepiece in container with plastic liner.

Equipment necessary is

1. Container (30 to 50 gal)
2. Plastic liners

Station 15: Inner-Glove Removal

Remove inner gloves and deposit in container with plastic liner.

Equipment necessary is

1. Container (20 to 30 gal)
2. Plastic liners

Station 16: Inner-Clothing Removal

Remove clothing soaked with perspiration. Place in container with plastic liner. Do not wear inner clothing off the site since there is a possibility small amounts of contaminants have been transferred in removing fully encapsulating suit.

Figure D-2
LEVEL C DECONTAMINATION PROCEDURES
(Continued, Page 4 of 5)

SOURCES: NUS, 1983; ESE, 1990.

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Equipment necessary is

1. Container (30 to 50 gal)
2. Plastic liners

Station 17: Field Wash

Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.

Equipment necessary is

1. Water
2. Soap
3. Tables
4. Wash basins or buckets
5. Field showers

Station 18: Redress

Put on clean clothes. A dressing trailer is needed in inclement weather.

Equipment necessary is

1. Tables
2. Chairs
3. Lockers
4. Clothes

Full Decontamination (Situation 1) and Three Modifications

The preceding description outlines each station that is included in a complete worst-case decontamination protocol. It is obvious that different sites will present different hazard levels and thus that site-specific modifications of this protocol will be required. The following table illustrates the modifications that can be made in response to a variety of conditions.

	STATION NUMBER																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X										
3	X						X	X		X	X				X	X	X		
4	X						X	X	X										

Figure D-2
LEVEL C DECONTAMINATION PROCEDURES
(Continued, Page 5 of 5)

SOURCES: NUS, 1983; ESE, 1990.

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ATTACHMENT E--SAMPLE LOGSHEET

CALIBRATION DATA

INSTRUMENT SERIAL NUMBER	DATE	SPAN GAS CONCENTRATION (FOR TIP OR HNU ONLY)	CALIBRATION (ppm)		
			INITIAL	FINAL	

FORMS 3 /86275a-A

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
AT SENECA ARMY DEPOT
Romulus, New York

Prepared for:

U.S. ARMY CORPS OF ENGINEERS
Huntsville, Alabama

Prepared by:

ENVIRONMENTAL SCIENCE & ENGINEERING, INC.
Gainesville, Florida

ESE No. 3-90-2034

May 1991

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LIST OF ACRONYMS AND ABBREVIATIONS

AAS	atomic absorption spectrophotometer
AIHA	American Industrial Hygiene Association
ASP	American Scientific Products
ASTM	American Society for Testing and Materials
BFB	bromofluorobenzene
B/N/A	base/neutral/acid
BOD	biological oxygen demand
BOD_5	5-day biological oxygen demand
°C	degrees Celsius
CCC	calibration check compound
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CETHAMA	Corps of Engineers Toxic and Hazardous Materials Agency
CFR	Code of Federal Regulations
C2H3CL	vinyl chloride
CLASS	Chemical Laboratory Analysis and Scheduling System
CLP	Contract Laboratory Program
COD	chemical oxygen demand
CRDL	contract-required detection limit
12DCLE	1,2-dichloroethane
DF	dilution factor
DFTPP	decafluorotriphenylphosphine
DI	deionized
DO	dissolved oxygen

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 2 of 6)

DOD	U.S. Department of Defense
DOT	U.S. Department of Transportation
DQO	data quality objective
ECD	electron-capture detector
EI/CI	electron ionization/chemical ionization
EM	electromagnetic
ELAP	Environmental Laboratory Approval Program
EP	extraction procedure
EPA	U.S. Environmental Protection Agency
EPA/NIST	U.S. Environmental Protection Agency/National Institute of Standards and Technology
ESE	Environmental Science & Engineering, Inc.
eV	electronvolt
FDER	Florida Department of Environmental Regulation
FE	fraction extract
FID	flame ionization detector
FPD	flame photometric detector
FRN	frame reference number
ft	foot
ft^2	square foot
ft-bls	feet below land surface
gal	gallon
GAC	granular activated carbon

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 3 of 6)

GC	gas chromatography
GC/MS	gas chromatography/mass spectrometry
GC/MS/DS	gas chromatography/mass spectrometry/data systems
GPR	ground-penetrating radar
GSA	Government Services Administration
HCl	hydrochloric acid
HECD	Hall electrolytic conductivity detector
HNO3	nitric acid
HPLC	high-pressure liquid chromatography
HRS	Department of Health and Rehabilitative Services
IBM	International Business Machines
ICAP	inductively coupled argon plasma
ICF	ICF Technologies, Inc.
ICP	inductively coupled plasma
ICS	interference check standard
ID	identification
IDL	instrument detection limit
IIA	Initial Installation Assessment
IRDMS	Installation Restoration Data Management System
ITU	Individual Treatment Unit
KCl	potassium chloride
kg	kilogram
KOH	potassium hydroxide

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 4 of 6)

L	liter
LCS	laboratory control sample
LRCS	linear range check sample
m	meter
MB	method blank
MCL	maximum contaminant level
MDL	method detection limit
mg	milligram
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mL	milliliter
MRDL	Missouri River Division Laboratory
N	normal
ng	nanogram
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NPL	National Priorities List
NPD	nitrogen-phosphorus detector
NVLAP	National Voluntary Laboratory Accreditation Program
NYSDEC	Ney York State Department of Environmental Conservation
PAT	Proficiency Analytical Testing
PBM	probability-based matching
PC	personal computer

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 5 of 6)

PCB	polychlorinated biphenyl
PFS	prefield setup
PID	photoionization detector
PNA	polynuclear aromatics
ppb	parts per billion
ppm	parts per million
psi	pounds per square inch
QA	quality assurance
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
QC	quality control
R	percent recovery
RA	risk assessment
RCRA	Resource Conservation and Recovery Act
RF	response factor
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
RPD	relative percent difference
RSD	relative standard deviation
SD	serial dilution
SDWA	Safe Drinking Water Act
SEAD	Seneca Army Depot
SHERP	Safety, Health, and Emergency Response Plan

LIST OF ACRONYMS AND ABBREVIATIONS
(Continued, Page 6 of 6)

SOP	standard operating procedure
SOW	scope of work
STORET	storage and retrieval
TAL	target analyte list
T12DCLE	trans-1,2-dichloroethene
TCD	thermal conductivity detector
TCL	target compound list
TEU	U.S. Army Technical Escort Unit
TOX	total organic halogens
TRCLE	trichloroethene
TWA	time-weighted average
μg/L	micrograms per liter
μL	microliter
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USCS	United Soil Classification System
USGS	U.S. Geological Survey
μmho/cm	micromhos per centimeter
UV	ultraviolet
VOA	volatile organic analysis
VOC	volatile organic compound
WP	work plan
YSI	Yellow Springs Instruments

QUALITY ASSURANCE PROJECT PLAN

FOREWORD

This Quality Assurance Plan (QAPP) encompasses all environmental sampling, monitoring, and analyses to be performed during the remedial investigation/feasibility study (RI/FS) at Seneca Army Depot (SEAD) to ensure that all data generated are scientifically valid, defensible, and of known and acceptable precision and accuracy.

1. Contractor Project Manager ______________________________
   Signature ______________________ Date ________________

2. Contractor Project Quality Assurance (QA) Officer

   ____

   Signature ______________________ Date ________________

3. U.S. Army Corps of Engineers (USACE) Project Officer

   ____

   Signature ______________________ Date ________________

4. EPA QA Officer ____________________________
   Signature ______________________ Date ________________

DOCUMENT AND SUBMITTAL LIST

	RI/FS Work Plans Final
CEHND-ED-PM	6
USAMC	1
DESCOM	2
CETHA-IR-S	2
CEMRD-ED-EA	3
CEMRD-EA-GL	1
SDSSE-HE	23
CENAD-CO-EP	1
USAEHA	1
Total	40

1.0 PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared to support the work plan for the remedial investigation/feasibility study (RI/FS) at the Seneca Army Depot (SEAD) ash landfill area. All environmental monitoring and laboratory analyses conducted for this project will be performed in accordance with this QAPP.

This QAPP specifies the requirements for sampling, analytical procedures, and quality assurance (QA). The elements of the QAPP further ensure that legally defensible data will be generated meeting U.S. Environmental Protection Agency (EPA) criteria (Region II). Other elements of this plan define in more precise terms requirements for field and custody records and quality assurance/quality control (QA/QC) nonreportables to facilitate review and audit of the data generated. The analytical laboratory data required by the subject investigation must meet the QA/QC criteria recommended in method SW-846.

1.2 SITE BACKGROUND

SEAD is located in the Finger Lakes region of central New York, on the west side of the highland separating Seneca Lake and Cayuga Lake (see Figure 1.1-1). The depot covers approximately 10,600 acres and currently employs approximately 1,000 civilian and military personnel.

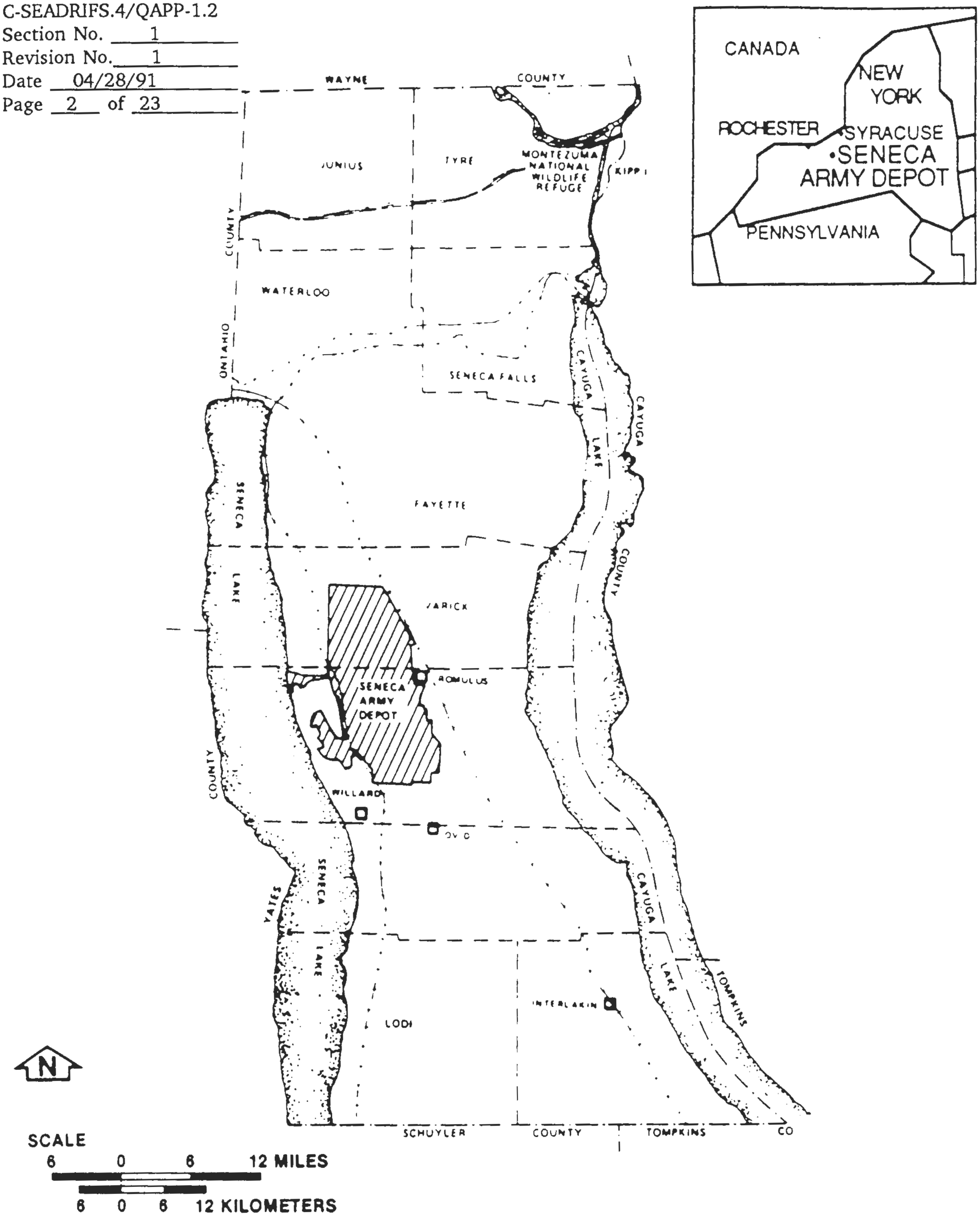

Figure 1.1-1
LOCATION OF SENECA ARMY DEPOT

SOURCE: USATHAMA, 1980; ESE.

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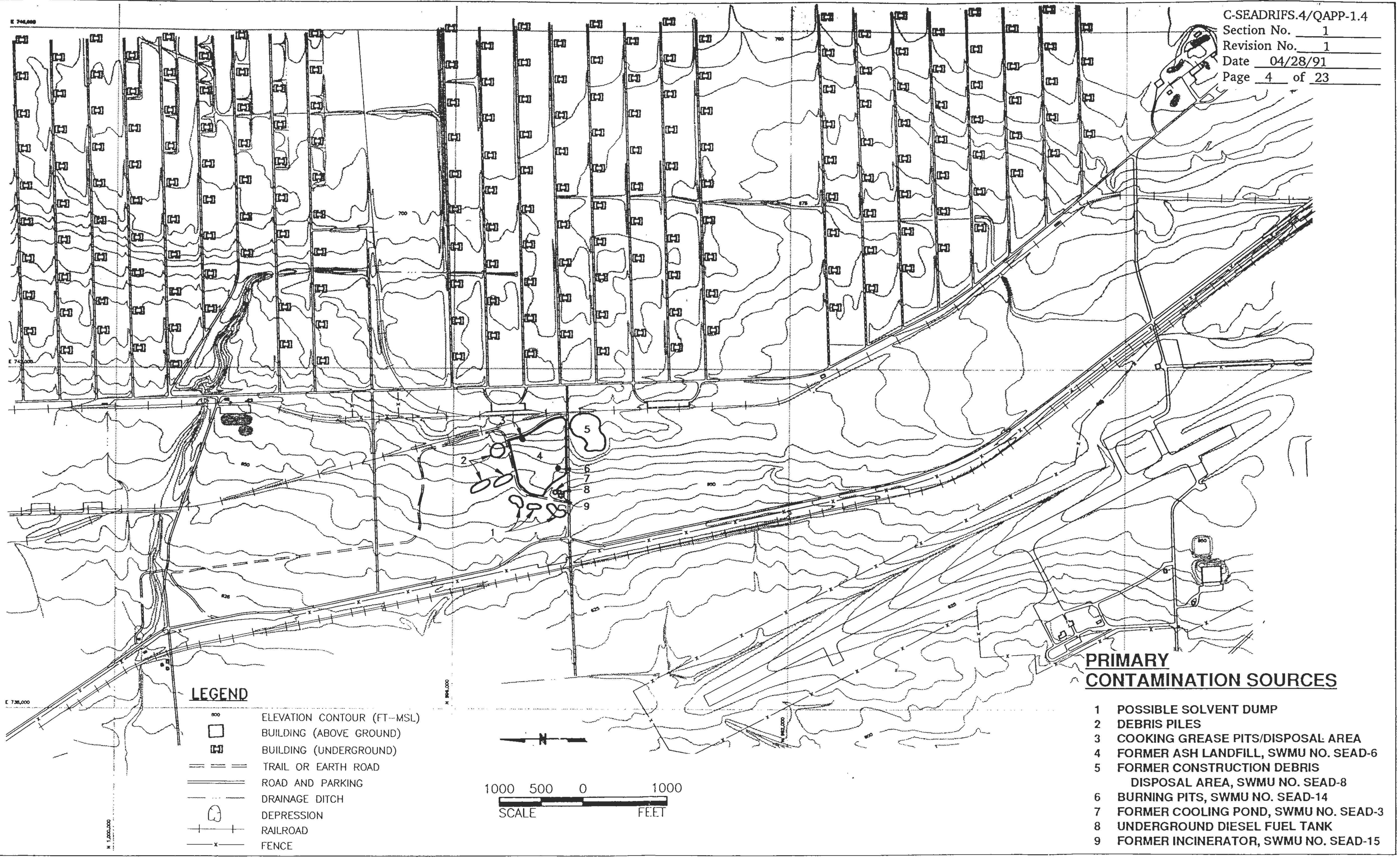
Construction activities at SEAD were initiated in 1941. The site originally encompassed 11,000 acres. Subsequent expansion included a 1,524-meter (m) airstrip from the former Sampson Air Force Base. Currently, SEAD's mission includes receiving, storing, and distributing ammunition and explosives, General Services Administration strategic and critical materials, and the Office of Civil Defense engineering equipment; providing receipt, storage, and issue of items that support special weapons activity; and performing depot-level maintenance, demilitarization, and surveillance on conventional ammunition and special weapons.

The general layout of the site and the primary contamination sources are shown in Figure 1.1-2. The landfill area is located midway along the western boundary of SEAD. This area has several potential contamination sources. From 1941 to 1974, uncontaminated trash was burned in a series of burn pits east of the existing incinerator building (Building 2207). According to the U.S. Army Environmental Hygiene Agency (USAEHA) Solid Waste Survey (1975), a former incinerator operator stated that the burning pits were used for refuse that occasionally contained possible hazardous items.

Between 1974 and 1977, materials intended for disposal were transported to the incinerator. Ashes and other residues from the incinerator were temporarily disposed of in an unlined cooling pond northeast of the incinerator building. When the pond was filled, the ashes and residues were removed, transported, and buried in the adjacent landfill. The incinerator was destroyed by a fire in 1979, and the landfill has subsequently been closed. In the past, the landfill



PRIMARY CONTAMINATION SOURCES

1. POSSIBLE SOLVENT DUMP
2. DEBRIS PILES
3. COOKING GREASE PITS/DISPOSAL AREA
4. FORMER ASH LANDFILL, SWMU NO. SEAD-6
5. FORMER CONSTRUCTION DEBRIS DISPOSAL AREA, SWMU NO. SEAD-8
6. BURNING PITS, SWMU NO. SEAD-14
7. FORMER COOLING POND, SWMU NO. SEAD-3
8. UNDERGROUND DIESEL FUEL TANK
9. FORMER INCINERATOR, SWMU NO. SEAD-15

Figure 1.1-2
GENERAL SITE MAP: EXISTING SITE CONDITIONS

SOURCE: ESE.

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was misconstrued as having been capped, which is not the case. The landfill was covered with native soils of undetermined thickness but has not been closed with an engineered cover or cap.

Due to the possibility of leachate entering the groundwater, five monitor wells were installed to assess groundwater quality. Several indicator parameters (sulfate, chloride, and specific conductance) were found in the subsequent analysis of groundwater samples from these wells. In October 1987, USAEHA installed an additional nine monitor wells in the area to define the contaminant plume. Seven additional monitor wells were installed in November 1989 to further delineate the groundwater contamination at the site.

The area under investigation includes an underground diesel tank located along the east side of the incinerator. Although no visual or olfactory evidence of tank leakage or of major spills has been noticed, a fuel odor was reported in the site investigation [ICF Technology, Inc. (ICF), 1989].

The area under investigation also includes the construction debris disposal area southeast of the incinerator. This area was used as a disposal site for uncombustible rubble from 1969 until 1977. Several buried debris piles north of the ash landfill were discovered during the geophysical survey performed in October 1989. A grease pit/disposal area (within the northeast edge of the landfill) where cooking grease was disposed of and a possible solvent dump, discovered during a soil gas survey conducted in 1989 (ICF, 1989), will also be included in the investigation.

During the remedial investigation (RI), this WP will be used to investigate the ash landfill area, which contains several potential contamination sources, including:

1. A possible solvent dump located west of the former ash landfill, based on the ICF (1989) soil gas survey;
2. Buried debris piles north of the ash landfill area;
3. A cooking grease pit/disposal area located within the northeastern edge of the landfill area used to dispose of cooking grease;
4. An adjacent former landfill area, used for ash disposal between 1974 and 1979, extending to the north and east of the incinerator [Solid Waste Management Unit (SWMU) No. SEAD-6];
5. A former construction debris disposal area southeast of the incinerator used before 1969 and until 1977 (SWMU No. SEAD-8);
6. Former burn pits used to burn uncontaminated trash from 1941 to 1974 and located within the landfill area immediately west of the incinerator building (SWMU No. SEAD-14);
7. The former cooling pond associated with the incinerator facility, located north of the incinerator building (SWMU No. SEAD-3);
8. The former underground diesel fuel tank associated with the incinerator facility, located along the east side of the incinerator building;

9. A former incinerator (Building 2207; SWMU No. SEAD-15) used to incinerate trash between 1974 and 1979;

The ash landfill area has been included on the federal facilities National Priorities List (NPL) as of July 13, 1989. The recently completed site investigation (ICF, 1989) of the landfill area has documented the existence of a narrow plume of groundwater contamination that is believed to extend to, and possibly beyond, SEAD's western boundary. The contaminants of concern are chlorinated volatile organic compounds (VOCs): trans-1,2-dichloroethene (T12DCLE); trichloroethene (TRCLE); and to a lesser extent, 1,2-dichloroethane (12DCLE), vinyl chloride (C2H3CL), and chloroform (CHCL3). Additionally, some heavy metals were found at or above background conditions.

1.3 RESULTS OF PREVIOUS INVESTIGATIONS

Numerous areas of known or suspected waste disposal at SEAD were delineated in the USATHAMA (1980) Initial Installation Assessment (IIA). This investigation consisted of a records search and interviews conducted with current and former SEAD employees. As a result of this investigation, the former incinerator and landfill area was initially recognized as having a potential for groundwater contamination.

After this initial report, USAEHA conducted a monitoring program including monitor well installation in the landfill vicinity. From 1980 to 1987, USAEHA installed 15 wells in the area and collected samples for VOC analysis. The most recent analytical results from the program are presented in the USAEHA

Geohydrologic Study No. 38-26-0313-88 (1987). The study concluded that a definite contamination plume with two main constituents, TRCLE and T12DCLE, could be delineated. CHCL3, 12DCLE, C2H3CL, and a floating product that appeared to be diesel fuel were also detected.

SEAD instituted a sampling program for surface water and privately owned offpost deep wells west of the landfill area. No groundwater contamination was detected in the sampled offpost wells. However, surface water sampling indicated that volatile contamination may extend to surface water and may have migrated offpost. It was suggested that the offpost surface water contamination may be due to contaminated groundwater seeping to the surface.

In August 1988, Environmental Science & Engineering, Inc. (ESE) prepared an update of the IIA for USATHAMA and recommended that a site investigation be conducted at the former landfill, burning pits, and incinerator.

ICF (1989) undertook a site investigation of the landfill area from September 1988 to February 1989. The scope of the site investigation included:

1. A soil-gas investigation,
2. Terrain conductivity surveys using low-frequency electromagnetic (EM) induction and ground-penetrating radar (GPR),
3. Soil sample collections within the landfill area for volatile and metals analyses,
4. Collection of ten groundwater samples from the existing wells for volatile and metals analyses, and
5. Performance of slug tests on several of the existing wells.

The results of the investigation indicated that the landfill contained contaminated fill materials and numerous buried metal objects. Relatively high levels of volatile chlorinated solvent chemicals such as TRCLE, T12DCLE, and CHCL3 were detected in the soils. Low to moderate metals concentrations were also detected in the soils. Groundwater within the landfill is contaminated with volatile chlorinated hydrocarbons at levels that have caused the formation of a downgradient plume extending at least to the western limits of SEAD property. The contaminated groundwater was known to exist only in the shallow aquifer that extends down to competent bedrock at a depth of approximately 10 feet below land surface (ft-bls). The results of the investigation also indicated the potential presence of additional contaminant source areas north of the projected limits of the landfill.

Analytical results for groundwater, soil boring, and surface waters from 1988 and January 1990 sampling events are summarized in the work plan (Tables 2.4-1, 2.4-2, and 2.4-3).

1.4 SCOPING OF THE RI/FS

The area at SEAD under consideration for scoping of the RI/FS consists of an abandoned incinerator facility that was in operation from 1974 to 1979; a former cooling water pond, used to cool incinerator ashes; the ash landfill area, used for ash disposal and temporary storage during the incinerator operation period; burning pits, located in the landfill area and used for burning uncontaminated trash; construction debris disposal area; and unlined kitchen grease pits. In addition, ESE personnel identified the following potentially contaminated areas during a site visit: a limited swampy area northwest of the incinerator facility and an underground storage tank (UST) adjacent to the incinerator building. The overall site conditions are also taken into consideration for conceptual site model development.

The scoping process includes the following:

1. Collection and evaluation of the existing data;
2. Development of a conceptual site model based on the available data to identify the potential human health and environmental risks and the need for the additional data collection;
3. Planning and execution of studies once data needs are identified;
4. Initial identification of the chemical- and location-specific applicable or relevant and appropriate requirements (ARARs);
5. Once ARARs are identified, human health and ecological assessments, preliminary remedial alternatives, the feasibility study (FS), and action-specific ARARs should be developed;
6. Emphasis on data evaluation, followed by the RI and FS tasks; and
7. A simultaneous community involvement program should be developed.

With input from all the aforementioned tasks, this RI/FS work plan was developed to result in site characterization and remedial alternatives development.

The existing data evaluation and site visit by ESE personnel (September 25, 1990) provided an overview of site conditions at the ash landfill area of SEAD. The following is an overview of the potential and identified contaminated areas and contaminant migration pathways at the site.

1.5 CONCEPTUAL SITE MODEL

This section includes identification of waste sources, exposure pathways, and receptors at the SEAD site. Known and suspected sources of contamination, types of contaminants and affected media, known and potential routes of migration, and known and potential human and environmental receptors will be identified. This information will be used to develop a conceptual understanding of the potential risks to human health and ecological constituents due to the presence of contaminants at the ash landfill/burning pit area.

1.6 CONTAMINATION SOURCES

The waste or contamination sources include the following:

1. A possible solvent dump located west of the former ash landfill, based on a soil gas survey (ICF, 1989);
2. Suspected buried debris piles north of the ash landfill area;
3. Grease pits, on the northeast edge of the landfill, used for the disposal of used kitchen grease;
4. A landfill extending north and east of the incinerator building, used for disposing of incinerator ash between 1974 and 1979 (SWMU No. SEAD-6);

5. An abandoned construction debris disposal area south of the incinerator/ash landfill area on the south side of South Smith Farm Road (SWMU No. SEAD-8);
6. Burning pits west of the incinerator building, and within the landfill area, that were used to burn uncontaminated trash from 1941 to 1974 (SWMU No. SEAD-14);
7. A cooling pond, adjacent to the incinerator building (SWMU No. SEAD-3), used for cooling the incinerator;
8. A UST, used to store diesel fuel, located adjacent to the incinerator building; and
9. A former incinerator (Building 2207), used to incinerate trash between 1974 and 1979 (SWMU No. SEAD-15).

1.7 MIGRATION PATHWAYS

Within the landfill area, contamination sources are within or near the more permeable weathered zone of shale bedrock, at approximately 3 to 10 ft below existing gradient. Contaminant migration in the shallow aquifer should occur, although at a low velocity. Soils disturbed by landfill activity would render the site more permeable to the contaminants, thus accelerating the downgradient migration. Horizontal groundwater migration is to the west or southwest, with local flow direction controlled by bedrock interfaces. There is no evidence of a significant connection between the shallow groundwater and the deeper aquifers. The surface water runoff from the landfill area is toward the west boundary of SEAD via a system of ditches and culverts that eventually connects to Seneca Lake.

The following are the essential plausible migration pathways to be considered:

1. Soil contamination onsite resulting from the releases from likely contaminated sources.
2. Air contamination from volatilization of the contaminants from soil and surface water. Dust may also be generated during some site investigation and remedial activities.
3. Groundwater contamination due to contaminant migration from subsurface and surface sources.
4. Surface water contamination might be due to the potential surface runoff from the contaminated soils and contaminated ditches, culverts (surface waterbodies), etc.

The most heavily contaminated zone within the landfill encompasses an area of approximately 250 ft extending east-west and 800 ft extending north-south, if both organic and inorganic contaminant sources are to be considered (ICF, 1989). If only volatile organic sources are to be considered, an area of about 100 by 300 ft has been identified as contaminated (ICF, 1989). Soils contaminated with metals extend from surface to a depth of approximately 7 ft. Existing monitor well sampling data indicate groundwater contamination from the possible subsurface or surface contamination sources. A contaminant plume from one or more sources in the landfill area has migrated to, and likely extends beyond, the western boundary of the site. There is a considerable variation in the relative concentrations of various contaminants found in different monitor wells. The overall groundwater migration is in a west-southwest direction, as indicated by the contaminant plume and a potentiometric map developed from water-level measurements obtained on October 24, 1988 (see Figure 2.3-2 of the work plan).

In the groundwater, the VOCs exceeding state and federal standards are T12DCLE, TRCLE, 12DCLE, C2H3CL, and CHCL3. A floating product that appeared to be diesel fuel (USAEHA, 1987) was also observed. The only inorganic contaminants identified in the groundwater are magnesium, zinc, calcium, sodium, and potassium.

The soil gas survey (ICF, 1989) indicated the presence of a VOC similar to toluene (an intermediate structure to T12DCLE and TRCLE). This VOC was present in the west-central portion of the landfill and near the northwest corner of the suspected landfill area. The subsurface soils were contaminated with methylene chloride at modest levels. The absence of high concentrations of VOCs in the surface and uppermost layers of soil boring samples is consistent with the principal source being located below the soil sampling depths. The moderate or low levels of VOCs in the surficial and subsurficial samples were due to volatilization and readsorption onto the soil matrix or entrainment in the soil gas phase. The results of the soil gas survey indicate that the sources of VOC contamination are primarily located in the west side of the total landfill area.

During the IIA study, ESE (1988) installed monitor wells around the landfill area due to the presence of indicator parameters such as sulfate and chloride and specific conductance of water in the groundwater in the landfill area, indicating the possibility of leaching from the closed landfill area (USAEHA, 1981).

Surface runoff of the contaminants from the SEAD site to the adjacent surface water bodies is highly probable due to the site's physiographic location. Surface water sampling (e.g., Kendaia Creek northwest of the site) is needed to identify the suspected surficial contaminant migration from the incinerator and surrounding areas.

Fungal growth and dust similar to incinerator ash are in the incinerator building (ICF, 1989), and sampling for potential contaminants at the incinerator building should be performed.

1.8 POTENTIAL SITE RECEPTORS

The potential receptor populations at the SEAD site include the human population living and working in the area; occasional visitors; ecological organisms, including the terrestrial and aquatic animals living in the area; and the aquatic and terrestrial plant species growing in this area.

The two human populations identified as the potential receptors of the contaminants at the SEAD incinerator/landfill site are onsite remediation workers and military personnel and visitors who frequent the affected offpost areas west of the site. Contaminants can potentially migrate offpost via surface water and shallow groundwater runoff.

Onsite workers and military personnel could be exposed to contaminants in the air (wind), soil, groundwater, and surface water. Exposure to the contaminants in the air could be through inhalation of contaminated air, direct dermal contact, and consumption of biota (i.e., local animals and plants that might bioaccumulate the contaminant) that grow in contaminated air.

Exposure to contaminants in the soil could occur directly by incidental ingestion and dermal contact. Indirect pathways include exposure via soil contaminants in surface water runoff from washing and irrigation purposes and consumption of biota grown in contaminated surface water. Potential exposure to contaminants in groundwater could occur through ingestion of groundwater from potable wells, direct dermal contact through showering and washing activities, and exposure to the biota grown in contaminated groundwater. Indirect exposure pathways to contaminants in the groundwater seep/swampy area include direct dermal contact, ingestion, and consumption of biota grown in the contaminated groundwater.

The offsite human receptor population includes residents living in the surrounding offpost area, individuals visiting and working at Sampson State Park, and individuals using the surface water for recreational purposes such as swimming, wading, and fishing. Contaminated groundwater and surface water from SEAD could potentially migrate to areas west of the SEAD boundary. Exposure to the offsite population could occur through direct dermal contact with surface water, incidental ingestion during swimming, and consumption of fish from contaminated surface water.

The terrestrial animals that may frequent contaminated areas of the operable unit at SEAD have the same potential for exposure as the onsite workers. In addition, consumption of contaminated vegetation, biota (prey), contaminated surface water, as well as burrowing in the contaminated soils also could contribute to the contaminant uptake in these animals. Aquatic organisms are considered to be relatively minor receptor populations for the SEAD site because the site contains no identified stable surface water bodies. Amphibians and other seasonal animal populations may use vernal pools (such as the cooling pond) during springtime. However, surface water runoff potentially could influence the aquatic populations of the regional lakes. The potential exposure routes could be through ingestion of contaminated water or sediments and biota growing in the contaminated water.

1.9 EXPOSURE PATHWAY ANALYSIS

The exposure pathways for each contamination source at SEAD can be identified based on the available information. The exposure pathways for the ash landfill, possible solvent dump, burning pits, buried debris piles, and construction debris disposal area are similar because the contamination media and exposed population are also identical. In Figure 3.1-2 of the work plan, the different potential source release pathways, exposure routes, and receptor populations for contamination from the ash landfill, possible solvent dump, burning pits, buried debris piles, and construction debris disposal area are conceptualized. Figure 3.1-3 of the work plan illustrates the potential contaminant release and exposure pathway analysis from the cooling water pond and any other similar surface water bodies that might be onsite. Figure 3.1-4 of the work plan depicts the exposure pathway analysis for the UST. The potential exposure pathway analysis for the kitchen grease pits at SEAD is presented in Figure 3.1-5 of the work plan. Finally, the potential exposure pathway analysis for the incinerator building at SEAD is presented in Figure 3.1-6 of the work plan.

1.10 SAMPLING REQUIREMENTS FOR THE SEAD ASH LANDFILL/BURNING PITS SITE

Additional sampling requirements are needed for an accurate assessment of the extent of contamination at the SEAD ash landfill site. Surface soil sampling needs to be conducted over the entire site. The full scope of the subsurface soil sampling will be based on the geophysical and soil gas investigation results. The areas of interest for soil sampling include different suspected and identified source areas, such as the UST.

Air sampling is not identified as an important task during the site characterization and early RI phases. However, some dust sampling of the incinerator building for analysis of incinerator-operation-related contaminants should be performed.

Surface water sampling (e.g., Kendaia Creek northwest of the site) is needed to identify the suspected surficial contaminant migration from the incinerator and railway unloading operations and spills around the burning pits area. Sediment and/or water sampling is required at the cooling water pond, identifiable swampy areas, and surface water bodies and ditches onpost as well as offpost.

Installation of new monitor wells and additional groundwater sampling requirements should be determined based on the hydrogeological survey results.

1.11 DATA NEEDS AND DATA QUALITY OBJECTIVES (DQOs)

The overall objective of the RI is to determine the nature and extent of chemical releases in the SEAD landfill area and to evaluate the threat to public health and the environment posed by the release. If a condition is identified that indicates that adverse exposure to hazardous constituents is occurring or is imminent, interim corrective measures may be warranted. In that case, the data generated during the RI will provide the basis for decisions on corrective measures. Therefore, the data must provide a valid characterization of the situation in the SEAD landfill area.

Previous investigations have only identified two different classes of contamination (metals and chlorinated solvents) in soil, surface water, and groundwater at SEAD. Therefore, the specific objectives (or data needs) to be achieved during the RI will be to determine/confirm the following:

1. Presence or absence of all target compound list (TCL) and target analyte list (TAL) contaminants (including herbicides),
2. Types of contaminants present,
3. Concentrations of these contaminants,
4. Mechanism of contaminant release to pathways,
5. Direction of contaminant transport,
6. Source boundaries and pathways,

7. Public health and environmental risks, and
8. Physical conditions of site to support the development and analysis of treatment or containment actions.

The data referenced in the conceptual site model indicate several possible contamination sources within the SEAD landfill area. Some of these are relatively close to the facility boundary, raising a potential for offsite contaminant migration. These source areas must be characterized more fully to assess potential risks to offsite receptors and also to design successful remedial strategies. The shallow aquifer in the SEAD area has some special problems that need to be addressed. The proximity of groundwater to the ground surface and to contaminated soil favors the transport of contaminants from any discrete source areas that may exist. Characterization of such transport, including groundwater flow information, is essential for a clear understanding of contaminant migration. This is particularly important given the possibility of contamination reaching Seneca Lake to the west. Contamination could reach Seneca Lake as a consequence of contaminated groundwater recharge of surface water that could then discharge to the lake or as a consequence of direct discharge of contaminated groundwater to the lake.

The RA is a major component of the RI at SEAD. Data collected for the RA are used to evaluate the threat posed by the site to public health and the environment. The data must be qualitative so that chemical/physical properties, toxicity, and persistence of contaminants can be factored into the RA. The data must also be quantitative to the degree that they may be compared with quantitative statements of health risk criteria. Therefore, a high level of data certainty is necessary. RA data are generated through the sampling and analysis of biological and environmental media, particularly where the potential for human exposure is judged to be significant.

Based on the information presented in Table 3.2-1 of the work plan, the Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs) will be incorporated as the preliminary DQOs for the RI groundwater and surface water sampling. The analytical requirements and quantitation limits proposed for the RI will be based on the SW-846 analytical methods identified in Table 3.3-1 of the work plan. Subsequent confirmation rounds will use methods determined to be appropriate after the first round. Soil sampling will be analyzed by the same analytical methods used for water samples.

1.12 DATA GAPS

In general, the data gaps include quantification of contaminant source strength and migration extent in several media. The specific data gaps, by media, are as follows:

1. Groundwater
    a. Determination of nature and extent of contamination within the shallow and lower aquifers,
    b. Determination of background concentrations, and
    c. Identification of potable wells within 1-mile radius of the site.
2. Surface Water

   a. Determination of nature and extent of contamination within onsite and offsite surface waters, including drainage ditches, identifiable wetland areas, and Kendaia Creek;
   b. Determination of background concentrations; and
   c. Identification of springs within a 1-mile radius of the site.
3. Soils
   a. Determination of nature and extent of contamination within the landfill area,
   b. Evaluation of potential source areas adjacent to the landfill/incinerator area, and
   c. Determination of background concentrations.
4. Sediments
   a. Analysis of sediments for possible contamination routes, including onsite and offsite drainage ditches, identifiable wetland areas, and Kendaia Creek;
   b. Evaluation of additional potential source areas adjacent to landfill/incinerator area; and
   c. Determination of background concentrations.
5. Dust--Analysis of dust within incinerator building.
6. Hydrogeologic--Evaluation of geophysical and hydrologic conditions of the landfill area, including the permeability and transmissivity of the shallow and lower aquifers.
7. Additional parameters--Evaluation of additional parameters that may be useful in identifying future treatment technologies [e.g., total alkalinity, chloride, sulfate, TOC, hardness, total residue, dissolved residue,

suspended residue, 5-day biochemical oxygen demand (BOD_5), and chemical oxygen demand (COD)].

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

An organization chart showing the discipline leaders and analytical and field team personnel for this project is presented in Figure 2.1-1.

The contractor project director is responsible for appointing the principal engineer (project manager), supervising the engineer in performance of project duties, and providing corporate support as needed. The contractor project manager is responsible for effective day-to-day management of the project staff as well as direct communication and liaison with the client. The project manager's responsibility to QA is to ensure that all project quality control (QC) procedures are followed and to provide additional authority, when required, to support the contractor project QA officer.

The Chemistry Division manager is responsible for the overall management of the analytical laboratory, including the appointment and supervision of departmental managers within the division. This manager is responsible for approving all analytical procedures and associated QC procedures.

The laboratory coordinator acts as liaison between field team and laboratory operations and is responsible for the following:

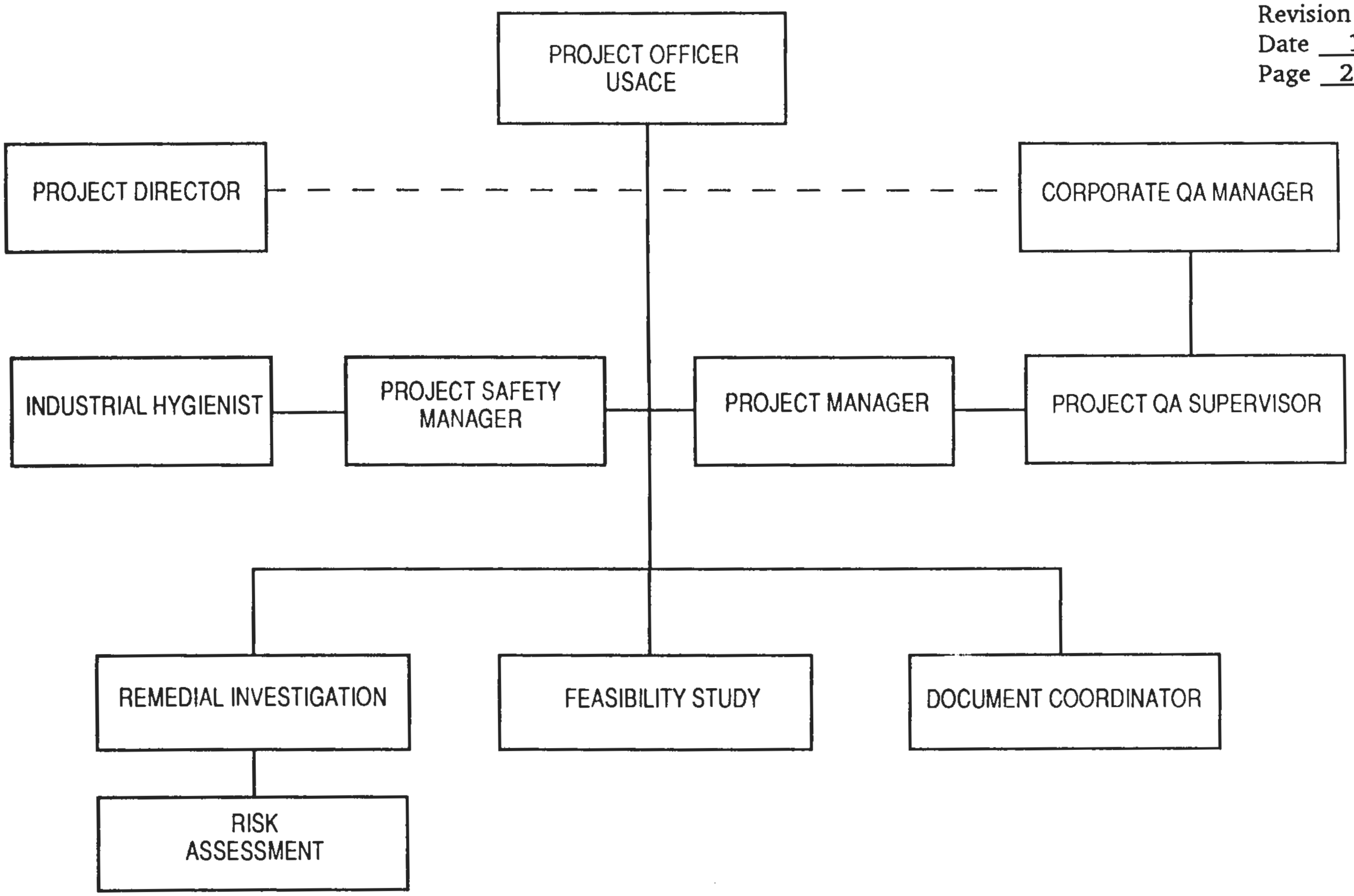

Figure 2.1-1
PROJECT ORGANIZATION

SOURCE: ESE, 1990.

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1. Sample custody receipt from field members, sample integrity verification, and sample fraction transfer to appropriate analytical departments;
2. Sample analyses coordination to meet project objectives;
3. Analytical report preparation, including coordination with the project QA supervisor to ensure that the data are validated prior to release to clients;
4. Laboratory data review for compliance with precision, accuracy, and completeness objectives;
5. Review of any QC deficiencies reported by the Analytical Department manager; and
6. Coordination of any data changes resulting from review by the QA supervisor and/or project manager.

The project manager and analytical departmental managers are responsible for providing consistent and accurate field or laboratory data and technical reports produced by analysts, project scientists or engineers, and sampling personnel under their supervision. These individuals are responsible to the project manager for ensuring that all personnel under their direction are knowledgeable of the QA/QC requirements of the project, that all QC and technical review procedures are followed, and that documentation is provided.

The contractor QA manager appoints the project QA officer and is responsible for supervising the project QA officer in performance of project duties. The QA manager maintains the overall corporate QA program and interacts with the corporate officers, division managers, and client QA/QC personnel to correct problem situations as necessary. He reviews all QA/QC reports to the principal engineer and the client.

The project QA officer ensures that specific QA and primary technical operations are coordinated efficiently for a specific project. The project QA officer is independent of the project team and is responsible for the following:

1. Approval of all QA/QC procedures used on the project;
2. Performance and/or system audits of laboratory, field, and engineering operations to ensure compliance with the project QA plan;
3. Introduction of performance evaluation samples into the analytical flow scheme, as needed;
4. Notification of the project manager of any QC deficiencies discovered during audits;
5. Provision of guidance and coordination to rapidly resolve any QA/QC problems;
6. Maintenance of all project QA records and assembly of project QA data for inspection by project management;
7. Independent review of QA/QC information to ensure the quality of all deliverables or outputs from the project team to the client; and
8. Interaction and communication with client QA personnel to resolve QA/QC problems specific to the project.

It is the responsibility of all project personnel, as well as the laboratory analysts, project scientists, and field team members, to perform and document the required QA/QC procedures.

It is the responsibility of laboratory analysts to perform preliminary QC checks to ensure that each batch of data being generated passes all required QC criteria. Field team members must bring any unusual observation or analytical problems to the immediate attention of the project manager.

3.0 QA OBJECTIVES FOR DATA MEASUREMENT

Data generated from this project will ultimately be used in decisionmaking and, therefore, it should be of sufficient quality to meet the QA/QC objectives. To meet the QC objectives, both qualitative and quantitative QA parameters will be used.

3.1 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. To ensure that the sample delivered to the laboratory for analysis is representative of the site conditions, QA measures will be associated with each sampling and analysis event. For example, the sampling procedure (see Section 4.0) outlines the procedures to be followed by the field team. These procedures include, but are not limited to, prefield briefing, sample bottles preparation and labeling, equipment decontamination, field QC blanks, duplicates, sample preservation and handling, sample coolers, chain-of-custody forms, labels, and labeling instructions. In the laboratory, proper temperature, extraction, and sample holding times will be observed. These QA measures will ensure that sampling requirements are met and sample integrity is preserved in the field and laboratory.

3.2 PRECISION

Precision is a measure of mutual agreement among individuals of the same property, usually under prescribed similar conditions. It is expressed in terms of standard deviation and evaluated based on the percent difference of daily sample duplicate standard matrix control spikes or duplicate sample matrix control spikes. Precision evaluation for this project will be based on the percentage difference between sample replicates for percent moisture, duplicate standard matrix control spikes, and duplicate sample matrix control spikes for metals and organics. Precision criteria to be used in this project are given in Tables 3.3-1 and 3.3-2.

3.3 ACCURACY

Accuracy is the difference between measured and referenced values, and the difference is expected to be within the precision interval for the measurement to be deemed accurate. For this project, accuracy will be measured based on the average percent recovery of standard matrix control spikes described in Section 12.0 of this plan. Accuracy criteria to be used in this project are given in Tables 3.3-1 and 3.3-2.

3.4 COMPARABILITY

Comparability is the confidence with which one data set can be compared with another. All data will be calculated and reported in units consistent with standard procedures so that the results of the analyses can be compared with those of other laboratories. The objectives for this project for comparability are as follows:

Table 3.3-1. Summary of Precision and Accuracy for Metals, Inorganics, and Radiation

			Aqueous Matrix		Solid Matrix	
Method*	Parameter	Spike Type	Precision (Max RPD)$^+$	Accuracy (% Recovery)$^+$	Precision (Max RPD)	Accuracy (% Recovery)$^+$
ASTM 2216	Moisture	--	--	--	23$^+$	--
SW6010	Antimony	SC	15	79 to 109	15	79 to 109
	Barium	SC	10	86 to 106	10	86 to 106
	Beryllium	SC	15	78 to 108	15	78 to 108
	Cadmium	SC	14	80 to 108	14	80 to 108
	Chromium	SC	15	79 to 109	15	79 to 109
	Copper	SC	12	84 to 108	12	84 to 108
	Lead	SC	--	--	15	79 to 109
	Nickel	SC	14	78 to 106	14	78 to 106
	Silver	SC	17	73 to 107	17	73 to 107
	Thallium	SC	25	75 to 125	25	75 to 125
	Zinc	SC	18	76 to 112	18	76 to 112
SW7060	Arsenic	SC	24	72 to 120	24	72 to 120
SW7420	Lead	SC	27	71 to 125	--	--
SW7471	Mercury	SC	21	83 to 125	21	83 to 125
SW7740	Selenium	SC	29	71 to 129	29	71 to 129
SW9010	Cyanide	SC	18	81 to 117	18	81 to 117
	Alkalinity, total	EPA 310.1	11	87 to 109	--	--
	COD	HACH 8000	15	85 to 115	--	--
	BOD$_5$	EPA 405.1	--	--	--	--
	Chloride	EPA 325.3	5	95 to 105	--	--
	Sulfate	EPA 375.4	5	92 to 108	--	--
	Carbon (TOC)	EPA 9060	15	85 to 115	--	--
	Hardness	EPA 130.2	25	85 to 115	--	--
	Residue, total	EPA 160.3	23	--	--	--
	Residue, dissolved	EPA 160.1	20	--	--	--
	Residue, suspended	EPA 160.2	20	--	--	--

Table 3.3-1. Summary of Precision and Accuracy for Metals, Inorganics, and Radiation (Continued, Page 2 of 2)

Note: mg/kg = milligrams per kilogram.
mg/L = milligrams per liter.
RPD = relative percent difference.
SC = spike compound. This represents a spike into a sample matrix, its duplicate, and into standard (blank) water.
SSC = standard spike compound. This represents a spike into standard water/soil and its duplicate.
-- = not applicable.

*The methods cited are from the following sources:

A = Standard Method for the Examination of Water and Wastewater, 16th Edition, 1985.
E = Methods for Chemical Analysis of Water and Wastes, EPA Manual, 600/4-79-020 (EPA, 1983 with additions).
SW = Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (EPA, 1986).

+The precision and accuracy criteria are based on contractor's laboratory historical data.

Source: ESE.

Table 3.3-2. Summary of Precision and Accuracy for Matrix Spike Compounds and Surrogates for Organic Analysis

			Aqueous Matrix		Solid Matrix	
Method*	Parameter	Spike Type	Precision (Max RPD)	Accuracy (% Recovery)	Precision (Max RPD)	Accuracy (% Recovery)
SW8240	1,1-Dichloroethene	SC	25	61 to 145	22	59 to 172
	Trichloroethene	SC	22	71 to 120	24	62 to 137
	Benzene	SC	33	76 to 127	21	66 to 142
	Toluene	SC	28	76 to 125	21	59 to 139
	Chlorobenzene	SC	32	75 to 130	21	60 to 133
	Toluene-d_8	S	--	88 to 110	--	81 to 117
	4-Bromofluorobenzene	S	--	86 to 115	--	74 to 121
	1,2-Dichloroethane-d_4	S	--	76 to 114	--	70 to 121
SW8270	Phenol**	SC	42	12 to 89	35	26 to 190
	2-Chlorophenol**	SC	40	27 to 123	50	25 to 102
	1,4-Dichlorobenzene	SC	28	36 to 97	27	28 to 104
	N-Nitroso-di-n-propylamine	SC	38	41 to 116	38	41 to 126
	1,2,4-Trichlorobenzene	SC	28	39 to 98	23	38 to 107
	4-Chloro-3-methyl-** phenol	SC	42	23 to 97	33	26 to 103
	Acenaphthene	SC	31	46 to 118	19	31 to 137
	4-Nitrophenol**	SC	50	10 to 80	50	11 to 114
	2,4-Dinitrotoluene	SC	38	24 to 96	47	28 to 89
	Pentachlorophenol**	SC	50	9 to 103	47	17 to 109
	Pyrene	SC	31	26 to 127	36	35 to 142
	Nitrobenzene-d_5	S	--	35 to 114	--	23 to 120
	2-Fluorobiphenyl	S	--	43 to 116	--	30 to 115

Table 3.3-2. Summary of Precision and Accuracy for Matrix Spike Compounds and Surrogates for Organic Analysis (Continued, Page 2 of 3)

			Aqueous Matrix		Solid Matrix	
Method*	Parameter	Spike Type	Precision (Max RPD)	Accuracy (% Recovery)	Precision (Max RPD)	Accuracy (% Recovery)
SW8270	p-Terphenyl-d_{14}	S	--	33 to 141	--	18 to 137
	Phenol-d_5**	S	--	10 to 94	--	24 to 113
	2-Fluorophenol**	S	--	21 to 100	--	25 to 121
	2,4,6-Tribromophenol**	S	--	10 to 123	--	19 to 122
SW8080	Lindane	SC	51^{++}	43 to 145^{++}	42^{++}	45 to 129^{++}
	Heptachlor	SC	38^{++}	48 to 124^{++}	59^{++}	30 to 148^{++}
	Aldrin	SC	45^{++}	37 to 127^{++}	40^{++}	53 to 133^{++}
	Dieldrin	SC	43^{++}	56 to 142^{++}	47^{++}	46 to 140^{++}
	Endrin	SC	60^{++}	35 to 155^{++}	37^{++}	52 to 126^{++}
	4,4-DDT	SC	53^{++}	46 to 152^{++}	59^{++}	37 to 155^{++}
	Dibutylchlorendate	SC	--	46 to 146^{++}	--	32 to 156^{++}
SW 8150	2,4-D*	SC	30	63 to 87	50	63 to 87
	2,4-DB	SC	30	84 to 102	50	84 to 102
	2,4,5-T	SC	30	67 to 103	50	67 to 103
	2,4,5-TP/Silvex+der.*	SC	30	73 to 103	50	73 to 103
	Dicamba(banvel)*	SC	30	58 to 100	50	58 to 100
	Dalapon	SC	30	42 to 90	50	42 to 90
	Dichlorprop	SC	30	91 to 103	50	91 to 103
	Dinoseb	SC	30	74 to 100	50	74 to 100
	MCPA	SC	30	86 to 110	50	86 to 110
	MCPP	SC	30	82 to 106	50	82 to 106

Table 3.3-2. Summary of Precision and Accuracy for Matrix Spike Compounds and Surrogates for Organic Analysis (Continued, Page 3 of 3)

Note: -- = not applicable.
S = surrogate.
SC = spike compound. This represents a spike into a sample matrix, its duplicate, and into standard (blank) water.

*The methods cited are from Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition (EPA, 1986). Precision: Contractor QC criteria meets or exceeds the RPD criteria that can be calculated from the spiking and recovery information presented in the method.
+Matrix spike and QC check sample compound.
**Not applicable to BNEs (only) by SW8270.
++These precision and accuracy data are based on Contractor's laboratory historical data.

Source: ESE.

1. Demonstrate traceability of standards to National Institute of Standards and Technology (NIST) or EPA sources,
2. Use standard methodology,
3. Report results from similar matrices in standard units,
4. Apply appropriate levels of QC within the context of the laboratory QA program, and
5. Participate in interlaboratory studies to document laboratory performance.

When traceable standards and standard methodology are used, the analytical results can be compared to other similarly operating laboratories.

3.5 COMPLETENESS

Completeness is a measure of the amount of the data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions. The minimum level of completeness expected for this project will be 95 percent for each analytical parameter (see Section 12.0). This is expected to be achieved by ensuring proper sample packaging and extraction procedures. Also, for each sample received by the contractor laboratory, especially those shipped in fragile containers, a backup sample will be made available in case breakages occur or in case the analyses criteria are not met. The project manager has the responsibility of deciding whether resampling and reanalysis are required to meet the data quality objectives. The project manager will then inform the laboratory coordinator and the project QA officer of the decision.

4.0 SITE SELECTION AND SAMPLING PROCEDURES

4.1 GENERAL CONSIDERATIONS

The sampling procedures described in this document are considered to be the contractor's field sampling standard operating procedures (SOPs). The procedures are based on the following sources:

1. EPA's SOP and QA Manual for Region IV (EPA, 1986) and Region II Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) QA Manual (EPA, 1989); and
2. EPA's Procedures for Handling and Chemical Analysis of Sediment and Water Samples (EPA, 1981).

Critical objectives for each field team member are to:

1. Collect a sample that is representative of the matrix being sampled, and
2. Maintain sample integrity from the time of sample collection to receipt by the laboratory.

All field notes will be recorded in indelible ink on standard forms that will be covered and bound. A sufficient supply of blank paper also will be added to record notes not included in the forms. All forms must provide a place for the field team member to sign and date the entries.

All field notes must be reviewed by the field team leader, and approval must be documented by either signing each page of a completed daily field trip log (see

Figure 4.1-1) or stating that the notes were reviewed. The review must be completed during the SEAD site visit, preferably daily, to ensure that timely corrective actions can be implemented, if necessary. As a minimum, documentation and validity of the following items should be verified:

1. Proper recording of correct site designation and sample numbers,
2. Date and time (24-hour system recordings), and
3. Complete entries on each form (no blank spaces).

Prefield briefing meetings/conference calls will be held prior to SEAD field investigations. The meetings are intended to ensure that all necessary departments are aware of the field activity and can plan accordingly.

The project manager and/or field team leader must schedule a meeting with at least the laboratory coordinator and project QA officer. Regional office personnel must initiate a conference call with the appropriate laboratory coordinator and project QA officer.

A field trip plan approval form (see Figure 4.1-2) is filled out, and approval is documented by the signatures of the personnel on the form. For regional offices, the date of the conference call is placed on the signature line.

4.2 SPECIAL SAMPLING REQUIREMENTS

The following precautions will be taken when sampling for all contaminants:

1. A clean pair of new, disposable gloves is worn for each new sampling station;

DAILY FIELD TRIP LOG

Sub/Project Number and Title: ______

Date: ______ Page ______ of ______
Day of Wk. Mo. Day Yr.

Purpose of Trip: ______

Field Team Members: ______ ______
(Names and Initials) ______ ______
______ ______

Contacts: ______

Work Completed This Date: ______

Work Remaining To Be Done: ______

Team Leader Signature: ______ Date: ______

Route To (in order listed): 1) Group Leader ______, 2) Dept. Manager ______

3) Other ______, 2) Dept. File ______

cc: Sub/Project Manager, Author (Team Leader), Project File

Figure 4.1-1
DAILY LOG FORM

SOURCE: ESE.

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FIELD TRIP PLAN APPROVAL FORM

Project Name: __________
Field Trip Site: __________
Field Trip Responsibility(Subproj.or Proj.Mngr.) __________
Field Team Leader: __________
Laboratory Coordinator: __________
Field Team Members:

SCHEDULING INFORMATION:

Field Trip Briefing Mtg __________ (Date) __________ (Time)
Departure ESE __________ (Date) __________ (Time)
Site Arrival __________ (Date) __________ (Time)
Site Departure __________ (Date) __________ (Time)
Arrive ESE __________ (Date) __________ (Time)

PLANNING INFORMATION:

The following information must be attached (check to indicate):

__________ Sampling and Shipping Schedule; Lab/Field Contacts Established
__________ Sampling Location Layout
__________ Samples to be Collected and Fraction
__________ List of all Parameters to be Measured On-Site
__________ List of Field Equipment Requested

APPROVALS:

Laboratory Coordinator	(Date)	Proj.or Subproj. Manager	(Date)
Field Team Leader	(Date)	QA Manager	(Date)

REMARKS: __________

cc:Project Director / Project Manager

Signature __________ Date __________

Figure 4.1-2
FIELD TRIP PLAN APPROVAL FORM

SOURCE: ESE.

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HUNTSVILLE, ALABAMA

2. Sampling must be performed in such a manner that any material or liquid being collected that contacts the gloves (and/or any external surface of the sample container) does not contaminate the sample;
3. When possible, samples should be collected from stations that are least contaminated (i.e., background) followed by stations in increasing order of contamination; and
4. When possible, in sampling surface waters, the water sample should be taken before sediment samples are collected or flow measurements are performed, working from downstream to upstream.

When sampling for the presence of organic parameters, the following additional precautions will be taken:

1. All sample bottles and equipment must be kept away from fuels and solvents. When possible, gasoline (used in generators) should be transported in a different vehicle from bailers, sample bottles, purging pumps, water sampling bottles, etc. If possible, one person should be designated to handle samples and another person to work generators and gas the truck. If this is not feasible, disposable gloves should be worn for each activity and then properly discarded. Care must be taken not to spill any fuels on clothing.
2. All sampling equipment should be made of Teflon®, glass, or stainless steel that is decontaminated according to procedures in Section 4.6.
3. Volatile water samples must be taken so that no air passes through the sample (to prevent volatiles from being stripped from the samples); the bottles should be filled by slowly running the sample

down the side of the bottle until there is a convex meniscus over the neck of the bottle; the Teflon® side of the septum (in cap) should be positioned against the meniscus and the cap screwed on tightly; the sample should be inverted and the bottle lightly tapped. The absence of an air bubble indicates a successful seal. If a bubble is discovered, the cap should be removed and the sample discarded. The sample must be retaken, new preservative added, the bottle resealed, and the bubble must not be evident. Simply topping off a vial with a bubble in it is not acceptable, as the bubble may have de-gassed a portion of the sample.

4. Extra Teflon® seals should be available because the seals are difficult to handle and might be dropped. Dropped seals should be considered contaminated and should not be reused. When seals are replaced or if seals become flipped, care must be taken to assure that the Teflon® seal faces down.
5. Volatile soil samples should be collected with as little air space as possible to prevent loss to the headspace. Appropriate sample containers are listed in Table 4.2-1.
6. Volatile compounds should not be composited due to the potential for loss when the sample is homogenized.

4.3 SAMPLING CONTAINERS, PRESERVATION TECHNIQUES, HOLDING TIMES, SHIPPING, AND HANDLING

The field team leader is responsible for proper sampling, sample labeling, preservation, and shipment of samples to the laboratory to meet required holding times. Table 4.2-1 identifies the proper containers, preservation

Table 4.2-1. Summary of Analytical Methods, Preservation, and Holding Times

Matrix	Sampling Device	Analysis	Sample Container	Sample Preservation	Holding Time from Collection	Analytical Method
Groundwater/ surface water/ blanks	Stainless steel or Teflon® bailer	TCL VOCs	3 40-mL glass vials with Teflon® septum	HCl to pH<2 Cool to 4°C	14 days analyze	SW8240
	Stainless steel or Teflon® bailer	TCL BNAs, pesticides, PCBs, and herbicides	4 1-L amber glass, Teflon®-lined cap	Cool to 4°C	7 days extract 40 days analyze	SW8270, 8080
	Stainless steel or Teflon® bailer	TAL metals	1 1-L polyethylene	HNO_3 to pH<2 Cool to 4°C	6 months (Hg - 28 days)	SW6010, 7060, 7420, 7740 SW7471
	Stainless steel or Teflon® bailer	Cyanide	1 1-L polyethylene	NaOH to pH>12 Cool to 4°C	14 days analyze	SW9010
	Stainless steel or Teflon® bailer	Alkalinity	1 1-L polyethylene	Cool, 4°C	14 days	EPA 310.1
		COD	1 1-L polyethylene	Cool, 4°C H_2SO_4 to pH<2	28 days	HACH 8000
		BOD	1 1-L polyethylene	Cool, 4°C	48 days	EPA 405.1
		Chloride	1 1-L polyethylene	none required	28 days	EPA 325.3
		Sulfate	1 1-L polyethylene	Cool, 4°C	28 days	EPA 375.4
		TOC	1 1-L polyethylene	Cool, 4°C HCL <2	28 days	EPA 9060
		Hardness	1 1-L polyethylene	HNO_3 to pH<2	6 months	EPA 130.2
		Residue (total, dissolved, suspended)	1 1-L polyethylene	Cool, 4°C	7 days	EPA (160.3, 160.1, 160.2)

Table 4.2-1. Summary of Analytical Methods, Preservation, and Holding Times (Continued, Page 2 of 3)

Matrix	Sampling Device	Analysis	Sample Container	Sample Preservation	Holding Time from Collection	Analytical Method
Soil	Split-spoon	TCL VOCs	2 40-mL glass vial with Teflon®-lined cap	Cool to 4°C	10 days analyze	SW8240
	Split-spoon	TCL BNAs, pesticides, PCBs, and herbicides	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	7 days extract 40 days analyze	SW8270, 8080
	Split-spoon	TAL metals	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	6 months	SW6010, 7060, 7420, 7740
		Mercury	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	28 days	SW7471
	Split-spoon	Cyanide	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	14 days analyze	SW9010
Sediment	Stainless steel spatula	TCL VOCs	2 40-mL glass vial with Teflon®-lined cap	Cool to 4°C	14 days analyze	SW8240
	Stainless steel scoop	TCL BNAs, pesticides, PCBs, and herbicides	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	14 days extract 40 days analyze	SW8270, 8080
	Stainless steel scoop	TCL metals	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	6 months	SW6010, 7060, 7420, 7740

Table 4.2-1. Summary of Analytical Methods, Preservation, and Holding Times (Continued, Page 3 of 3)

Matrix	Sampling Device	Analysis	Sample Container	Sample Preservation	Holding Time from Collection	Analytical Method
Sediment (Continued)	Stainless steel scoop	Mercury	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	28 days	SW7471
	Stainless steel scoop	Cyanide	1 8-oz glass with Teflon®-lined cap	Cool to 4°C	14 days analyze	SW9010

Note: BNA = base/neutral/acid.
°C = degrees Celsius.
g = gram.
HCl = hydrochloric acid.
HNO_3 = nitric acid.
Hg = mercury.
mL = milliliter.
NaOH = sodium hydroxide.
oz = ounce.
PCB = polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
TAL = target analyte list.
TCL = target compound list.

Source: ESE.

techniques, and maximum holding times established by EPA [40 Code of Federal Regulations (CFR), Part 136]. The maximum holding times in Table 4.2-1 apply to water and soils. Any analyses that have exceeded holding times will be noted in the final deliverable.

Trial preservation may be necessary for concentrated hazardous/industrial wastes to ensure adequate preservation, and if reactions are suspected, the volume of preservative added should be recorded in the field notes. For example, acidification of some wastes may liberate toxic gases (e.g., cyanide gas) or result in foaming. In such cases, preservation should be omitted, samples should be shipped to the laboratory as soon as possible, and appropriate comments must be included on the sample logsheet. The volume of preservative added to extreme pH or highly buffered samples should not exceed 5 percent of the original sample volume.

Water samples submitted for volatile analysis should be preserved with hydrochloric acid (HCl) to a pH of <2. VOC samples should be preserved by adjusting the pH of the sample to <2 by carefully adding 1:1 HCl, drop by drop, to the required two [40 milliliter (mL)] volatile organic analysis (VOA) sample vials. The number of drops of 1:1 HCl required should be determined on a fourth VOA sample vial of equal volume (prior to filling the three vials for laboratory analyses). If acidification of the sample causes effervescence, the sample should be submitted without preservation except for cooling to 4 degrees Celsius (°C).

With hazardous samples, it may be necessary to rinse the outer portion of sample containers with deionized (DI) water prior to packaging for shipment. The latest Department of Transportation (DOT) procedures for shipment of environmental samples will be used in all cases. The quantity of acids or bases added as preservatives generally should not exceed 15 percent by weight, or the samples must be shipped as corrosives.

Before samples are packaged for shipment, the sample container will be checked for proper identification and compared to the site logbook for accuracy. The samples then will be wrapped with a cushioning material and placed in a plastic Ziploc® bag before being put into the plastic cooler. A sufficient amount of bagged ice will be placed in the cooler to keep the samples at 4°C until arrival at the laboratory.

All necessary documentation required to accompany the samples during shipment will be placed in a sealed plastic bag and taped to the underside of the cooler lid. The cooler then will be sealed with fiber tape, and custody seals will be placed so any opening of the cooler prior to arrival at the laboratory can be detected.

Samples being sent to the USACE QA laboratory will be packaged and shipped in accordance with USACE Sample Handling Protocol, Medium Concentration Sample (see Appendix D). The USACE QA laboratory will be notified 5 working days prior to samples being sent.

4.4 FIELD QC SAMPLES

Two types of sample blanks will be processed: trip blanks and equipment blanks. The analytical data derived from these blanks are necessary to assess field operations: contaminant-free sample containers, preserving reagents, and equipment; potential onsite environmental contamination; personnel expertise in sample collection; and problems that may occur in sample storage and transport.

4.4.1 TRIP BLANKS

Trip blanks for purgeable compounds consist of sample bottles filled in the laboratory with organic-free water and any applicable preservatives or additives. They are sent to the sampling location with sampling kits and are returned unopened from the sampling location with the samples.

FREQUENCY: It should be taken at a minimum frequency of one trip blank per day when volatile organics in an aqueous matrix are being collected. It is not necessary to take an aqueous trip blank when a nonaqueous medium is being sampled. Trip blanks are used to determine if any onsite atmospheric contaminants are seeping into the sample vials, or if any cross contamination of samples is occurring during shipment or storage of sample containers. Trip blanks are only analyzed for volatile organics.

4.4.2 EQUIPMENT (RINSATE) BLANKS

Equipment blanks for water samples are processed after field decontamination by rinsing decontaminated sampling equipment (e.g., bailers, soil samplers) with target analyte-free water obtained from the laboratory. The rinse water is collected in sample bottles, preserved, and handled in the same manner as the samples.

FREQUENCY: One rinse blank will be collected each day a decontamination event is carried out, not to exceed one per day. For each rinsate blank collected, aliquots must be taken and properly preserved for each method group.

4.4.3 FIELD DUPLICATES

Environmental duplicate samples are collected to demonstrate the reproducibility of sampling technique. Environmental duplicate samples must be taken at a frequency of at least 5 percent (1 in 20), but should not exceed the number specified in the scope of work for this project. A field duplicate is separate from the duplicates the contractor laboratory must run and cannot be replaced by a laboratory-generated duplicate. Field duplicates (environmental duplicates) are representative of field sampling precision, whereas laboratory duplicates are a measure of analytical precision. Both pieces of information are essential to determining the quality of data generated for this project.

Each duplicate will be a blind sample, meaning the sample bottles will be labeled with a sample number but no site designation. Therefore, it is critical for the field team to record the sample number and site identification in the field notes. Great care must be taken in collecting duplicates to ensure that both samples represent the matrix being sampled.

4.4.4 RINSE BLANKS FOR NONAQUEOUS SAMPLES

Field-collected blanks for sediment, soil, and other types of nonaqueous samples are necessary. For these sample types, equipment blanks are required for each type of instrument cleaned in the field. Equipment blanks use the same criteria and frequency as those for water samples. It is required that equipment blanks be performed on bowls and pans used to homogenize samples. The collected blanks will be analyzed using appropriate water analysis methods.

4.4.5 SAMPLE SPLITTING

Sample splitting is performed when two or more parties want to have a portion of the same sample. Soil/sediment samples taken for volatile analysis cannot be split. In this case, samples must be taken as co-located grabs. Then, a large quantity of material can be collected, homogenized, split, and used to fill the remaining containers. Enough sample must be collected at one time to fill all the necessary sample containers. It may be necessary to co-locate or depth integrate collection so enough sample volume is available.

When aqueous samples are split, sample homogenization is only necessary if heterogeneity is suspected (e.g., when sampling a small lagoon or containerized liquid); however, VOA and total organic halogens (TOX) samples are never homogenized. It is not generally necessary to homogenize groundwater or surface water samples when splitting or to divide a bailer's contents among several bottles.

4.5 LABORATORY CLEANING PROCEDURES

The contractor will use commercially cleaned sample containers (i.e., from I-Chem). Any containers prepared in-house will conform with the cleaning procedures specified in Table 4.5-1. Sample-kit containers are stored in clean, dust-free areas segregated from the analytical laboratory and solvent/reagent storage areas. Occasional audits of containers to document freedom from contaminants will be performed to supplement the various blanks that are frequently and routinely analyzed to provide similar QC data.

Demonstrated analyte-free water will be used for trip blanks, equipment rinse blanks, and decontamination procedures. EPA must be supplied with the test results for TCL/TAL analyzed for the detection levels of interest. The water will then be analyzed monthly during field activities.

4.6 LABORATORY/FIELD DECONTAMINATION OF SAMPLING EQUIPMENT

4.6.1 GENERAL CONSIDERATIONS

Sampling equipment to be used by field sampling teams may be decontaminated prior to mobilization to the sampling site or in the field. When possible, field equipment should be decontaminated prior to mobilization. In either case, the decontamination procedures listed in this section will be used. Sampling equipment that cannot be efficiently decontaminated with these procedures, due to heavy organic contamination, will be discarded.

Table 4.5-1. Sample Container Cleaning Procedures Within the Laboratory

Analysis/Parameter	Container Type	Matrix	Fraction Code	Cleaning Protocol*
Volatile organics analyses	Glass septum vial with Teflon®-lined septum	Water	VP	B
	Wide-mouth glass jar with Teflon®-lined cap	Soil/ Sediment	SV	B
Metals	Linear polyethylene cubitainer with polyethylene cap	Water	N	C
Acid, Base-Neutral Extractables	Glass jar with Teflon®-lined cap	Water	MS	A
	Glass jar with Teflon®-lined cap	Soil/ Sediment	SS	A

Note: Glass = amber for all organic analyses.

*Cleaning Protocol A	B	C	Specifications
X	X	X	Wash with hot tap water using laboratory-grade, nonphosphate detergent.
X	X	X	Rinse 3 times with tap water.
X		X	Rinse with 1:1 nitric acid (reagent-grade nitric acid diluted with the American Society for Testing and Materials (ASTM) Type 1 deionized water).
X	X	X	Rinse 3 times with ASTM Type 1 deionized water.
X			Rinse with pesticide-grade hexane using 20 mL per 64-ounce (oz) bottle, 10 mL per 32- or 16-oz bottle, or 5 mL per 8- or 4-oz bottle. Hexane is used as organics rinse.
X	X		Oven dry, using a forced-air oven, at 105° to 125°C for 1 hour.
		X	Invert and air dry in contaminant-free environment. No cleaning required; use new cubitainers (only).

Source: ESE.

A major concern in decontamination of sampling equipment has been the choice of solvent. The standard decontamination solvent will be pesticide-grade isopropanol. Disposal of solvent rinses must be performed in an approved manner (evaporated onsite or containerized for disposal through a disposal contract, depending on the volume). The following sampling equipment decontamination procedures are for sampling equipment that contacts sample matrices.

4.6.2 DECONTAMINATION PROCEDURES

The required decontamination procedures for all sampling equipment are:

1. Clean with Liquinox® and tap water (a higher grade of water always may be substituted for tap water) using a brush, if necessary, to remove particulate matter and surface films.
2. Rinse thoroughly with tap water.
3. Rinse thoroughly with 10-percent nitric acid (HNO_3) ultrapure. For carbon-steel split spoons, this rinse is to be reduced to 1 percent HNO_3. If metals samples are not being collected, the 10 percent HNO_3 rinse may be omitted.
4. Rinse thoroughly with tap water.
5. Rinse with acetone only, or a methanol rinse followed by a hexane rinse (solvents must be pesticide grade or better).
6. Rinse thoroughly with DI water.
7. Allow to air-dry.
8. For overnight storage or transport, wrap in new aluminum foil to prevent contamination.

4.6.3 DECONTAMINATION OF PERIPHERAL EQUIPMENT

1. Groundwater purging and monitoring equipment:
   a. Rinse elevation tapes and slugs (slug testing) with tap water, followed by DI water. Place in a polyethylene bag to prevent contamination during storage or transit.
   b. Clean submersible pumps used for purging the deep wells prior to use and between wells by pumping copious amounts of tap water through the pumps and associated hoses, followed by rinsing with DI water. Clean the exterior of the submersible pumps and hoses that contact formation water by washing with Liquinox® solution, followed by tap water rinse, and a final DI water rinse. Dedicate all tubing to individual wells; i.e., do not reuse tubing. To prevent degradation of or damage to submersible pump seals, impellers, and electric motors, do not rinse with solvents and/or acids. Typically, do not collect analytical samples through submersible pumps. Clean the exterior of drop pipes and tubing used to purge the shallow wells prior to use and between wells by washing with Liquinox® solution, rinsing with tap water or potable water, followed by rinsing with analyte-free water, followed with a final rinse of analyte-free water. Rinse the interior of drop pipes and tubing with copious amounts of tap water. Dedicate all tubing to individual wells; i.e., do not reuse tubing. Typically, do not

collect analytical samples through centrifugal pumps and/or drop pipes.

   c. If bailers are used to evacuate wells, decontaminate the bailers as described in Section 4.6.2.

2. Drilling tools:
   a. Steam clean all drilling equipment prior to shipment to a site.
   b. Between borings, steam clean drilling tools using tap water to remove traces of soil, rock, or other contaminants. In addition, rinse downhole tools with DI water and air-dry.
   c. Steam clean well casings and screens prior to installation.
3. Well casings: Steam clean well casings prior to installation to ensure that oils, greases, and waxes have been removed. Place well casings on clean polyethylene sheeting to prevent contamination.
4. Field instrumentation: Clean instrumentation as per manufacturer's instructions. Rinse probes like those used in pH and conductivity meters after each use with DI water.

Tap water used for decontamination purposes will be obtained from SEAD. A sample of the water will be collected and analyzed for the TCL compounds prior to the field effort.

4.7 SAMPLING PROCEDURES

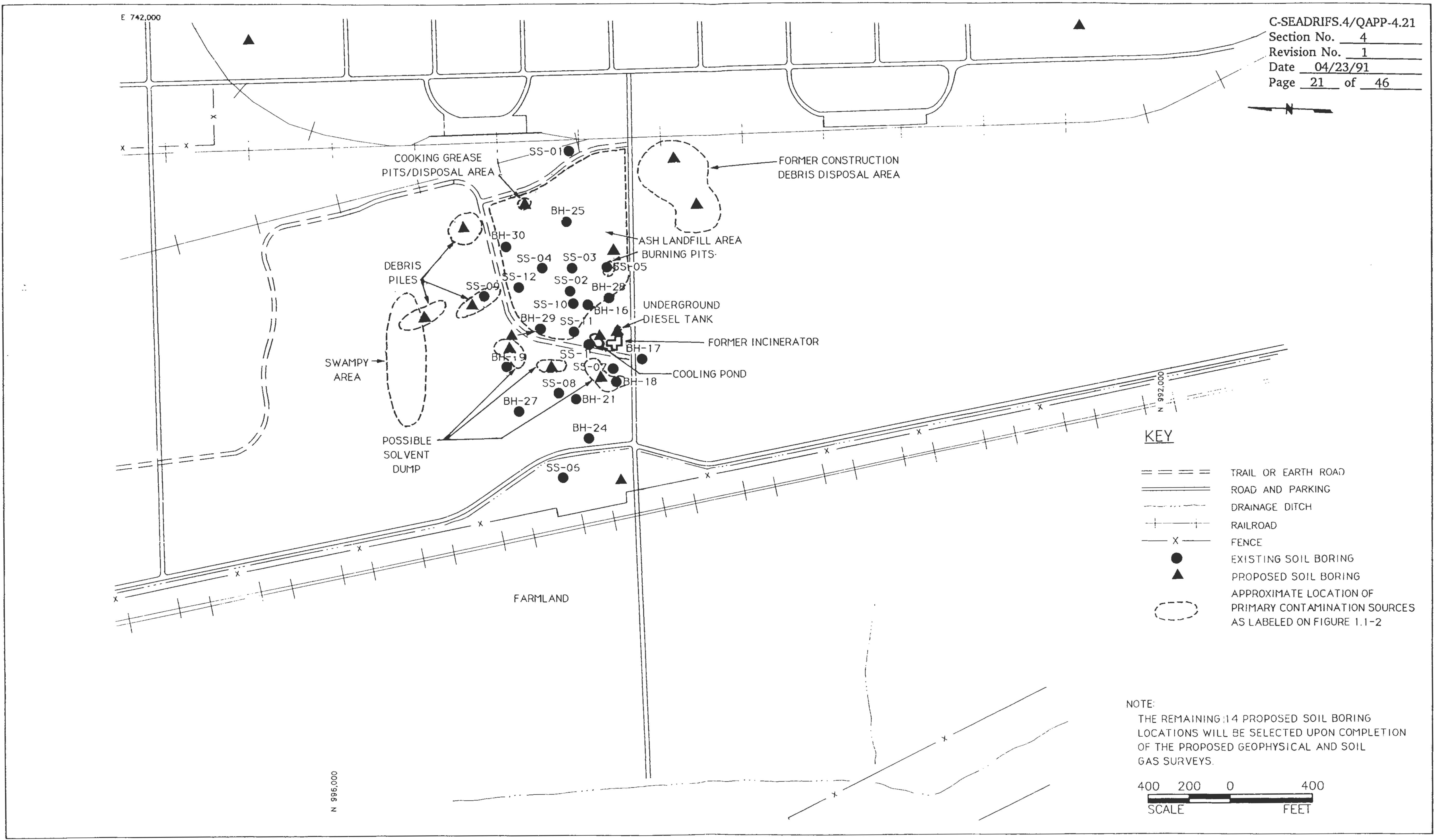
4.7.1 SOIL BORINGS

A series of soil borings will be drilled in the landfill area to evaluate the extent of soil contamination. The final locations for the borings will be determined following completion of the proposed geophysical and soil gas surveys. The USACE project manager, EPA, and New York State Department of Environmental Conservation (NYSDEC) will be consulted for approval prior to the initiation of soil sampling operations.

This information, in conjunction with the proposed geophysical and soil-gas surveys, will be used by the field team leader to locate soil borings to determine maximum, average, and background concentrations of metals and VOCs at the site. Figure 4.7-1 illustrates the proposed soil borings as determined from the site investigation to date. One soil boring will be located directly downgradient of the diesel tank located on the eastern side of the incinerator building. These samples will be analyzed for TRPH. Additional soil borings will be selected based on the proposed geophysical and soil gas surveys.

Four samples will be obtained from each soil profile using a split-spoon sampler. In each boring, discrete samples will be taken from the surface (0 to 2 ft-bls), at an intermediate zone (3 to 4 ft-bls), from the top of the water table to 1 ft above the water table, and from the zone of weathered shale (2-ft interval above the competent shale unit) (see Table 4.7-1). Samples obtained from the soil borings will be transferred to a laboratory for analysis. Samples will be analyzed for TCL organic compounds (volatiles, semivolatiles, pesticides/PCBs) herbicides, and TAL metals.

A VOC grab sample from each sampling interval will be collected using a stainless steel spatula and containerized as previously described. The remaining material will be placed into a stainless-steel bowl and homogenized in a



NOTE:
THE REMAINING 14 PROPOSED SOIL BORING LOCATIONS WILL BE SELECTED UPON COMPLETION OF THE PROPOSED GEOPHYSICAL AND SOIL GAS SURVEYS.

Figure 4.7-1
PROPOSED SOIL BORING LOCATIONS IN SEAD ASH LANDFILL AREA

SOURCE: ESE.

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HUNTSVILLE, ALABAMA**

Table 4.7-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Ash Landfill Area

				Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks⁺	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks⁺
Groundwater									
Volatile Organics	SW8240	2	32	3	*	2	3	*	2
Mercury, Total	SW7471	2	32	3	*	0	3	*	0
Arsenic, Total	SW7060	2	32	3	*	0	3	*	0
Selenium, Total	SW7740	2	32	3	*	0	3	*	0
ICAP: Metals, Total	SW6010	2	32	3	*	0	3	*	0
Semivolatiles	SW8270	2	32	3	*	0	3	*	0
Herbicides	SW8150	2	32	3	*	0	3	*	0
Pesticides/PCBs	SW8080	2	32	3	*	0	3	*	0
Alkalinity	EPA 310.1	0	3	0	0	0	0	0	0
COD	HACH 8000	0	3	0	0	0	0	0	0
BOD	EPA 405.1	0	3	0	0	0	0	0	0
Chloride	EPA 325.3	0	3	0	0	0	0	0	0
Sulfate	EPA 375.4	0	3	0	0	0	0	0	0
TOC	EPA 906.0	0	3	0	0	0	0	0	0
Hardness	EPA 130.2	0	3	0	0	0	0	0	0
Residue, Total	EPA 160.5	0	3	0	0	0	0	0	0
Residue, Dissolved	EPA 160.1	0	3	0	0	0	0	0	0

Table 4.7-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Ash Landfill Area (Continued, Page 2 of 4)

				Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks$^+$	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks$^+$
Groundwater (Continued)									
Residue, Suspended	EPA 160.2	0	3	0	0	0	0	0	0
Surface/Spring Water									
Volatile Organics	SW8240	1	9	1	*	1	1	*	1
Mercury, Total	SW7471	1	9	1	*	0	1	*	0
Arsenic, Total	SW7060	1	9	1	*	0	1	*	0
Selenium, Total	SW7740	1	9	1	*	0	1	*	0
ICAP: Metals, Total	SW6010	1	9	1	*	0	1	*	0
Semivolatiles	SW8270	1	9	1	*	0	1	*	0
Herbicides	SW8150	1	9	1	*	0	0	*	0
Pesticides/PCBs	SW8080	1	9	1	*	0	1	*	0
Sediments									
Volatile Organics	SW8240	1	9	1	*	0	0	*	0
Mercury, Total	SW7471	1	9	1	*	0	0	*	0
Arsenic, Total	SW7060	1	9	1	*	0	1	*	0
Selenium, Total	SW7740	1	9	1	*	0	1	*	0
ICAP: Metals, Total	SW6010	1	9	1	*	0	1	*	0

Table 4.7-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Ash Landfill Area (Continued, Page 3 of 4)

				Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks$^+$	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks$^+$
Sediments (Continued)									
Semivolatiles	SW8270	1	9	1	*	0	1	*	0
Herbicides	SW8150	1	9	1	*	0	0	*	0
Pesticides/PCBs	SW8080	1	9	1	*	0	1	*	0
Soil Borings									
1) Surficial and Intermediate Samples									
Volatile Organics	SW8240	4	56	5	*	0	5	*	0
ICAP: Metals, Total	SW6010	4	56	5	*	0	5	*	0
Semivolatiles	SW8270	4	56	5	*	0	5	*	0
Herbicides	SW8150	4	56	5	*	0	5	*	0
Pesticides/PCBs	SW8080	4	56	5	*	0	5	*	0
Mercury	SW7471	4	56	5	*	0	5	*	0
Arsenic	SW7060	4	56	5	*	0	5	*	0
Selenium	SW7740	4	56	5	*	0	5	*	0
2) Above Water Table and Deep Samples									
Volatile Organics	SW8240	4	56	5	*	0	5	*	0

Table 4.7-1. Sample Matrix and Analytical Requirements for SEAD Burning Pits/Ash Landfill Area (Continued, Page 4 of 4)

				Number of QC Samples Analyzed by RI Contractor			Number of QA Samples Analyzed by USACE		
Analyte	Analytical Method	Number of Background Samples	Number of Field Samples	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks+	Number of Replicate Samples	Number of Rinsate Samples	Number of Trip Blanks+
<u>Soil Borings</u> (Continued)									
2) Above Water Table and Deep Samples (Continued)									
ICAP: Metals, Total	SW6010	4	56	5	*	0	5	*	0
Semivolatiles	SW8270	4	56	5	*	0	5	*	0
Pesticides/PCBs	SW8080	4	56	5	*	0	5	*	0
Herbicides	SW8150	4	56	5	*	0	5	*	0
Mercury	SW7471	4	56	5	*	0	5	*	0
Arsenic	SW7060	4	56	5	*	0	5	*	0
Selenium	SW7740	4	56	5	*	0	5	*	0
3) Diesel Underground Storage Tank									
TRPH	SW9071	0	4	1	*	0	1	*	0
<u>Dust/Wipe</u>									
Semivolatiles	SW8270	0	2	0	*	0	0	*	0
Pesticides/PCBs	SW8080	0	2	0	*	0	0	*	0

*One rinsate sample will be collected per decontamination event, not to exceed one sample per day.
+The actual number of field QC blanks shipped will depend on the duration of field activity.

Source: ESE.

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stainless steel bowl with a stainless steel spoon prior to being placed into the sampler container. A portion of the mixture then will be transferred to laboratory-prepared amber-glass containers with Teflon®-lined lids. All soil sample containers will be labeled with a preprinted label, chilled to 4°C, and shipped to an EPA-approved analytical laboratory. All sampling equipment will be decontaminated between samples, as specified in Section 4.6. The split samples will be shipped to a USACE laboratory.

Soil sampling techniques will involve the use of a truck-mounted drill rig to advance hollow-stem augers and to drive split-spoon samplers. The continuous hollow-stem augering sampling technique entails rotary advancement of a hollow-stem auger equipped with an auger plug, which is removed prior to split-spoon collection. A split-spoon sampler will be employed for collecting soil samples [American Society for Testing and Materials (ASTM)-D 1586-84]. This technique involves driving a 2-ft-long, split-spoon sampler into undisturbed soil with a rig-mounted hammer. Following removal of the split-spoon sampler, the hollow-stem auger is advanced to the top of the next sample interval. If cobbles or boulders are encountered that will not allow for advancement of the split-spoon sampler, an attempt will be made to auger past this interval of the borehole. If advancement is still not possible, the borehole will be backfilled and a new location chosen.

To assure the integrity of the samples, the split-spoon sampler will be decontaminated between each use. All drilling equipment will be decontaminated between boreholes using a high-pressure steam cleaner.

Drilling equipment will be inspected daily for the presence of oil leaks that may impact the results of the testing.

All borings will be logged by the contractor's geologist using a standardized boring log form (see Figure 4.7-2). Soil samples will be classified according to the Unified Soil Classification System (USCS). Each boring log will record:

1. Boring identification and location,
2. Type of and manufacturer's name of drilling equipment,
3. Type and size of sampling and drilling equipment,
4. Starting and ending dates of drilling,
5. Length and depth of each sampled interval,
6. Length of each recovered sample,
7. Depth of all stratigraphic changes,
8. Lithologic description according to standard rock nomenclature,
9. Depth at which groundwater is first encountered,
10. Depths and rates of any water losses,
11. Depth to static water level,
12. Depths at which drilling problems occur and how the problems are solved,
13. Total boring depth,
14. Reason for terminating borehole, and
15. Surface elevation.

Upon completion of sampling, all borings will be backfilled to the surface.

Job No. ______________________

Client ______________________
Project ______________________

Location of Boring:	
Water Level	
Time	
Date	

Boring No. _____ Date ______________ Sheet ____ of __
Type of Boring __________ Rig ______________
Casing used ______ Size ______ Drilling mud used ______
Boring begun __________ Boring completed __________
Ground Elevation __________ referred to __________
______________________ Datum
Field Party: ______________________

Depth of Casing, ft.	Sample No.	Sample depth from-to (in feet)	Blows/foot on Sampler	ID of Sampler (inches)	Tot. length of recov. sample	Length of Lab. sample	DEPTH IN FEET	SOIL GRAPH	DESCRIPTION Soil type, color, texture, consistency, sampler driving notes, blows per foot on casing, depths wash water lost, observed fluctuations in water level, notes on drilling ease, etc.
									Geologist

Figure 4.7-2
FIELD BORING LOG

SOURCE: ESE.

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4.7.2 MONITOR WELL INSTALLATION

Monitor wells will be installed to evaluate groundwater quality at the sites and to determine the groundwater flow characteristics of the shallow and lower aquifers underlying the site. Nine new monitor wells are proposed for installation at the SEAD ash landfill area (Figure 4.7-3). Five of these wells will be constructed to monitor the first unconfined aquifer, and four new wells will be constructed to monitor the first confined aquifer (lower aquifer). Borehole construction will be conducted using hollow-stem augers for the shallow wells and air rotary for deep wells. The boreholes should be of sufficient diameter to permit at least 2 inches of annular space between the boring wall and all sides of the centered riser and screen (e.g., 6-inch-diameter boreholes for 2-inch-diameter monitor wells).

The water table is expected to vary between 5 and 8 ft-bls in the surficial aquifer. It is anticipated that the shallow wells will be installed to approximately 15 ft-bls. The depth to water in the lower aquifer, as determined from nearby wells, is approximately 48 ft-bls. It is anticipated that the deep wells will be installed to approximately 60 ft-bls.

The shallow wells will be constructed of 2-inch-diameter Schedule 40 polyvinyl chloride (PVC). The monitor wells to be completed in the deeper aquifer will also be constructed with Schedule 40 PVC and screened in the unweathered shale unit.

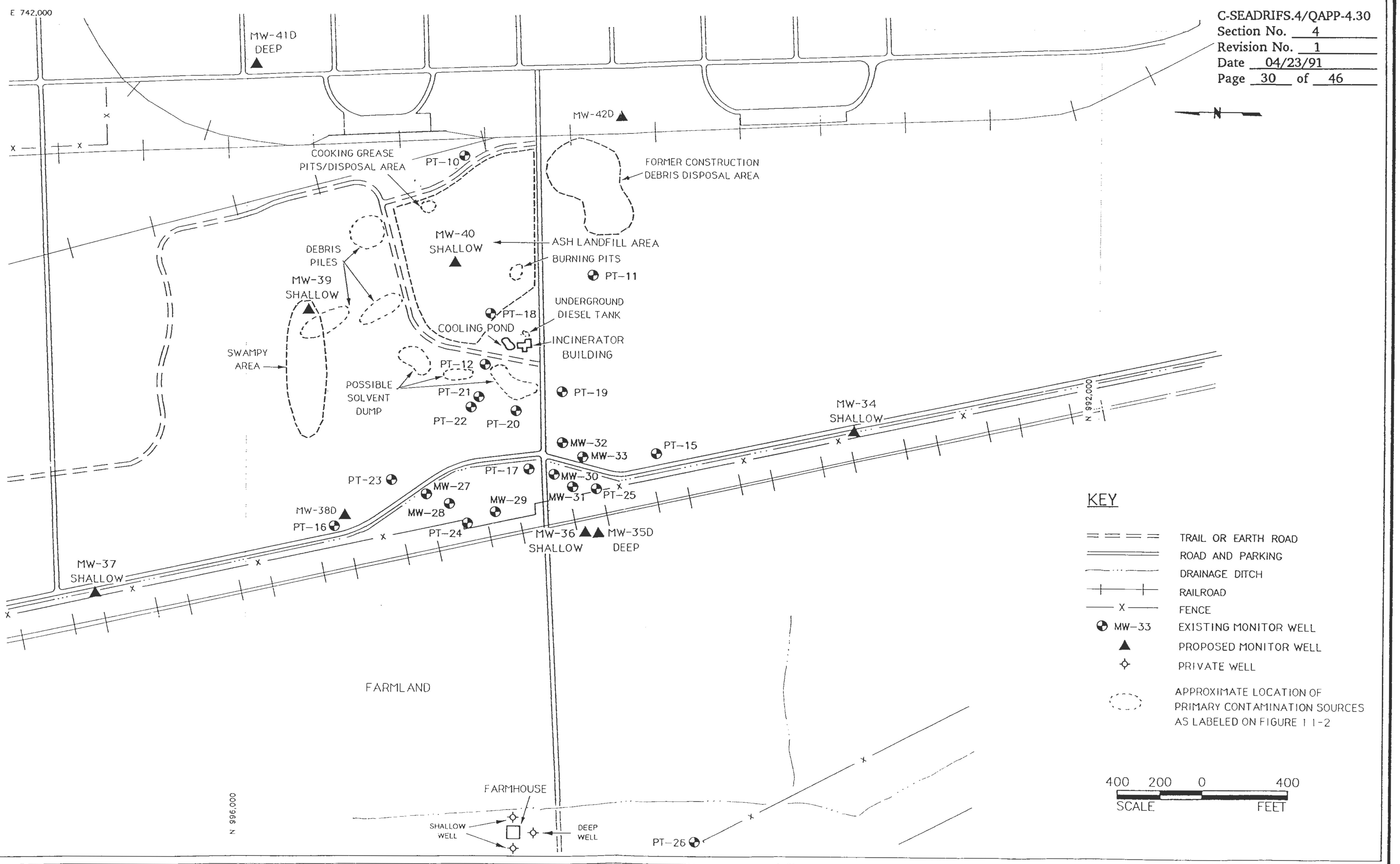

Figure 4.7-3
PROPOSED MONITOR WELL LOCATIONS SEAD ASH LANDFILL AREA

SOURCE: ESE.

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The contractor's standard forms for documenting the drilling and construction of monitor wells are presented as Figure 4.7-4. All monitor well borings will be logged by the contractor geologist. Installation procedures are as follows:

1. Before drilling and between each boring, the drilling rig, drilling rods, and auger flights will be decontaminated according to the procedure outlined in Section 4.6. Before well installation, all well casing materials will be steam cleaned and wrapped in plastic for transport from the decontamination site to the drilling site.
2. For the shallow wells, the boreholes will be drilled using hollow-stem augers. The boreholes for the deep wells will be drilled using air rotary techniques.
3. The borehole will be advanced to the unweathered shale unit.
4. Upon completion of the borehole, a 2-inch-diameter well will be constructed. A minimum 10 ft length of 2-inch-diameter threaded Schedule 40 PVC Tri Loc (or equivalent) well screen with 0.010-inch slots, equipped with an end cap, will be installed in the shallow monitor well boring. A 20-ft length of screen will be installed in the deep well borehole within the unweathered shale. No glue will be used. The annular material for the well will consist of a 20- to 30-silica sand pack from the base of the screened interval to a height of 2 ft above the screened interval. A minimum 2-ft bentonite seal will be installed using a tremmie pipe and the remainder of the borehole grouted to the surface with a neat cement/bentonite mixture.

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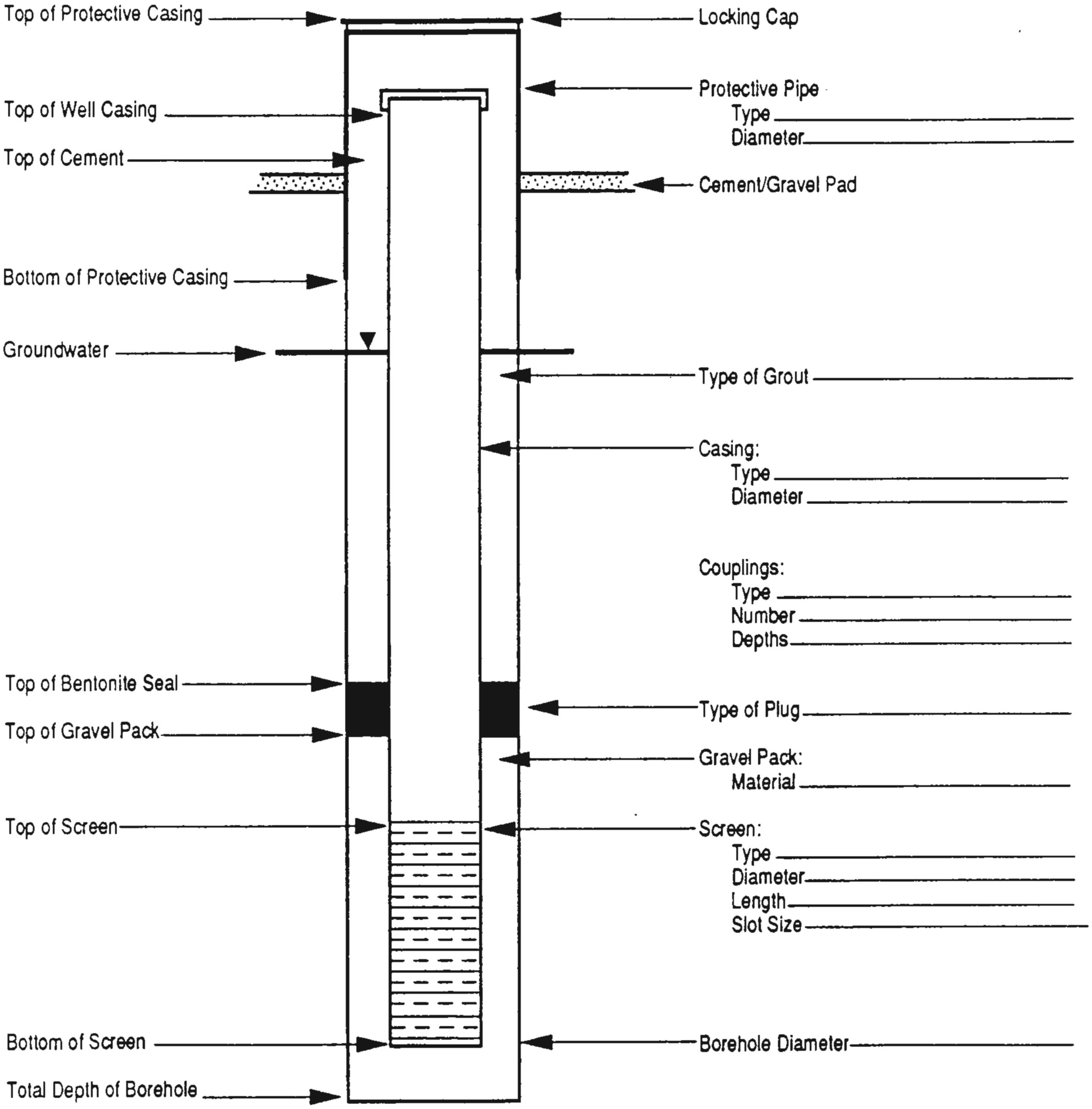
MONITOR WELL CONSTRUCTION

Logged By: ____________ Client: ____________
Drilling Contractor: ____________ Location: ____________
Driller's Name: ____________ Job Number: ____________
Well Number: ____________ Date/Time: Start ____________ Finish ____________
Comments: (Lost circulation interval, water level changes, hole collapse interval, etc.) ____________



NOT TO SCALE

Figure 4.7-4
MONITOR WELL INSTALLATION SHEET

SOURCE: ESE.

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5. The screen interval for the shallow wells will be from the top of bedrock to greater than 3 ft above the water table. Bedrock wells will be screened from approximately 3 ft above the lower water table to approximately 17 ft below the lower water table.
6. The wells will be finished using a protective casing. The protective casings will consist of a steel casing (at least 4 ft in length) with a hinged locking cap set into a 2-ft by 2-ft concrete pad. A locking watertight cap will be supplied by the driller to be mounted on the PVC well casing. Guard posts will be installed a sufficient distance from the wells to protect the wells from heavy equipment or traffic.
7. The newly installed wells will be developed following installation. The purpose of development is to repair damage done to the formation by the drilling operations so that the natural hydraulic properties are restored, and to alter the basic physical characteristics of the aquifer near the borehole so that water will flow more freely to the well. In addition, well development provides water free of suspended solids for sampling. Well development consists of two basic steps. Initially the water within the well screen will be moved at alternately high and low velocity to break down any mud pack that formed during the hollow-stem auger drilling and loosen fines. The second step will be to pump or bail (using a Teflon® bailer) the water out of the well screen and casing to remove the fines and construction materials from the well and immediate area outside the well screen. Pumping will continue until the water pumped from the well is visually free of suspended materials or sediments.

Development water will be containerized. Management and disposal of development water will be the responsibility of the contractor.

8. Drill cuttings will be drummed, labeled to denote the soil boring from which the cuttings were generated, and stored onsite pending receipt of analytical results. Ultimate management of the soils will be determined pending review of these analytical results. Drum cuttings will be managed by the contractor in accordance with all applicable federal and local regulations.
9. A qualified geologist will oversee all drilling, monitor well installation, well development, and sampling/testing operations. Drilling data will be recorded on boring log forms as listed:
   a. Boring identification and location,
   b. Type of and manufacturer's name of drilling equipment and well construction materials,
   c. Type and diameter of sampling and drilling equipment,
   d. Start and end dates of drilling,
   e. Length and depth of each sampled interval,
   f. Length of each recovered sample,
   g. Depth of all stratigraphic changes,
   h. Lithologic description according to standard nomenclature,
   i. Depth at which groundwater is first encountered,
   j. Depth to static water level,
   k. Depths and explanation at which any drilling problems occur,
   l. Total boring depth,

m. Reason for terminating borehole, and
n. Elevations of ground surface and top of the well.

4.7.3 GROUNDWATER SAMPLING

Prior to collecting a sample, the static water level will be measured and recorded according to USGS wetted-tape method. Field measurements to be recorded during measurement of static water levels include depth to water, and total depth of the well (as a check on filtration problems). All measurements will be accurate to within 0.01 ft and will be made from a permanent reference mark on the well casing. The elevation of this reference mark will be determined by a licensed surveyor.

Upon completion of the monitor well installation and development, groundwater samples will be collected from the nine new wells and all of the previously installed wells at the ash landfill area, including PT-26 (see Figure 4.7-3). All samples will be analyzed for TCL volatiles, semivolatiles, pesticides, TAL metals, and herbicides (see Table 4.7.1). Ten percent of the site wells (at the discretion of the RI contractor) will be analyzed for the following parameters: alkalinity, chloride, sulfate, TOC, hardness, residual (total), residual (dissolved), and residual (suspended). Additionally, all wells will be analyzed for BOD_5 and COD. These parameters will aid in evaluating remediation alternatives at the site.

Whenever feasible, wells expected to be uncontaminated or least contaminated will be sampled first and followed by wells with increasing levels of contamination. In order to obtain a representative sample of groundwater, the water that has stagnated in the well casing will be purged prior to sampling. Evacuating the well allows for fresh formation groundwater to enter the well. Water will be purged from the top of the water column resulting in upward movement of water within the well casing and the removal of all stagnant water within the well.

Purge water will be screened for VOAs [using a photoionization detector (PID) or FID] and pH, temperature, and specific conductance will be measured. When indicator parameters such as pH, temperature, and specific conductance are observed to vary less than 5 percent over two successive readings, the well is presumed to be adequately flushed for representative sampling. Evacuation of at least 3 to 5 well volumes is required for high yielding wells; however, in wells with very low recoveries this may not be practical. In this case, the well will be purged to near dryness (not completely dry) once and allowed to recharge sufficiently (about 75 percent of its static level) for samples to be collected. Purging may be accomplished by: manual bailing, use of a drop pipe and centrifugal pump, or a submersible pump. The well will be sampled within 3 hours of purging, if it has recovered sufficiently to yield a sample. If a well is allowed to sit longer than 3 hours after evacuation, it will be re-purged since the water contained in the casing may no longer be representative of the aquifer conditions. Low-yield wells will be sampled for each parameter as soon as water is available for that parameter. All purge water will be containerized in DOT-approved 55-gallon drums. Each drum of material will be labeled as hazardous materials until the contractor has completed analyses and provided documentation to USACE, as well as submitted recommendations for disposal based on chemical analyses, evaluation of site conditions, and appropriate regulations.

Any device used to purge the well will be decontaminated to ensure that cross contamination between wells does not occur.

Bailers used to purge and sample the wells will be constructed of Teflon® or stainless steel with cords made of Teflon®-coated wire, stainless-steel wire or polypropylene monofilament. Whenever possible, sampling equipment dedicated to a single monitor well will be utilized.

Prior to sampling, heavy gauge aluminum foil or polyethylene sheeting will be placed on the ground around the well to prevent contamination of sampling equipment in the event that equipment is dropped or otherwise comes in contact with the ground.

Samples for VOCs will be collected first followed by extractable organics and metals.

During the sampling of each monitor well, information regarding the sampling will be kept in a field notebook (see Figure 4.7-5). The following data will be collected:

1. Well number;
2. Date;

WELL SAMPLING DATA FORM

Well Number: ____________ Date: ____________ Time: ____________
Boring Diameter: ____________ Well Casing Diameter: ____________
Annular Space Length: ____________ Stickup: ____________

WATER LEVEL

Held: ____________
Cut: ____________
DTW: ____________ Top of Casing

COLUMN OF WATER IN WELL

Casing Length: ____________
DTW Top of Casing: ____________
Column of Water in Well: ____________

VOLUME TO BE REMOVED

Gallons per foot of A.S. (from chart) = ____________
Column of Water or Length of A.S. (whichever is less) X ____________
Volume of Annular Space = ____________
Gallons per foot of Casing = ____________
Column of Water X ____________
Volume of Casing = ____________
Total Volume (Volume of A.S. + Volume of Casing) = ____________
Number of Volumes to be Evacuated X ____________
Total Volume to be Evacuated = ____________

Method of Purging (pump, bailer, etc.): ____________

FIELD ANALYSES	Start	Mid	End
Time			
pH			
Conductivity			
Temperature			

Total Volume Purged: ____________ gallons

Sample Time: ____________ Sample Number: ____________

FRACTIONS

B	C	CF	CL	F	H	M	N	NF
O	P	R	RP	RS	S	T	UP	Z

NOTES

Signed/Sampler: ____________ Date: ____________
Signed/Reviewer: ____________ Date: ____________

Figure 4.7-5 (Page 1 of 2)
WELL SAMPLING DATA FORM

SOURCE: ESE.

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GALLONS PER FOOT OF SATURATED ANNULAR SPACE (A.S.) USING 30-PERCENT POROSITY

Well Casing Diameter (inches)	Bore-Hole Diameter (inches)				
	4	6	8	10	12
2	0.15	0.39	0.73	1.17	1.71
4	0	0.24	0.59	1.03	1.57
6	0	0	0.34	0.78	1.32

GALLONS PER LINEAR FOOT OF CASING

Casing Diameter (inches)	Gallons per Foot of Casing
2	0.1632
3	0.3672
4	0.6528
5	1.0200
6	1.4688

Figure 4.7-5 (Page 2 of 2)
WELL SAMPLING DATA FORM

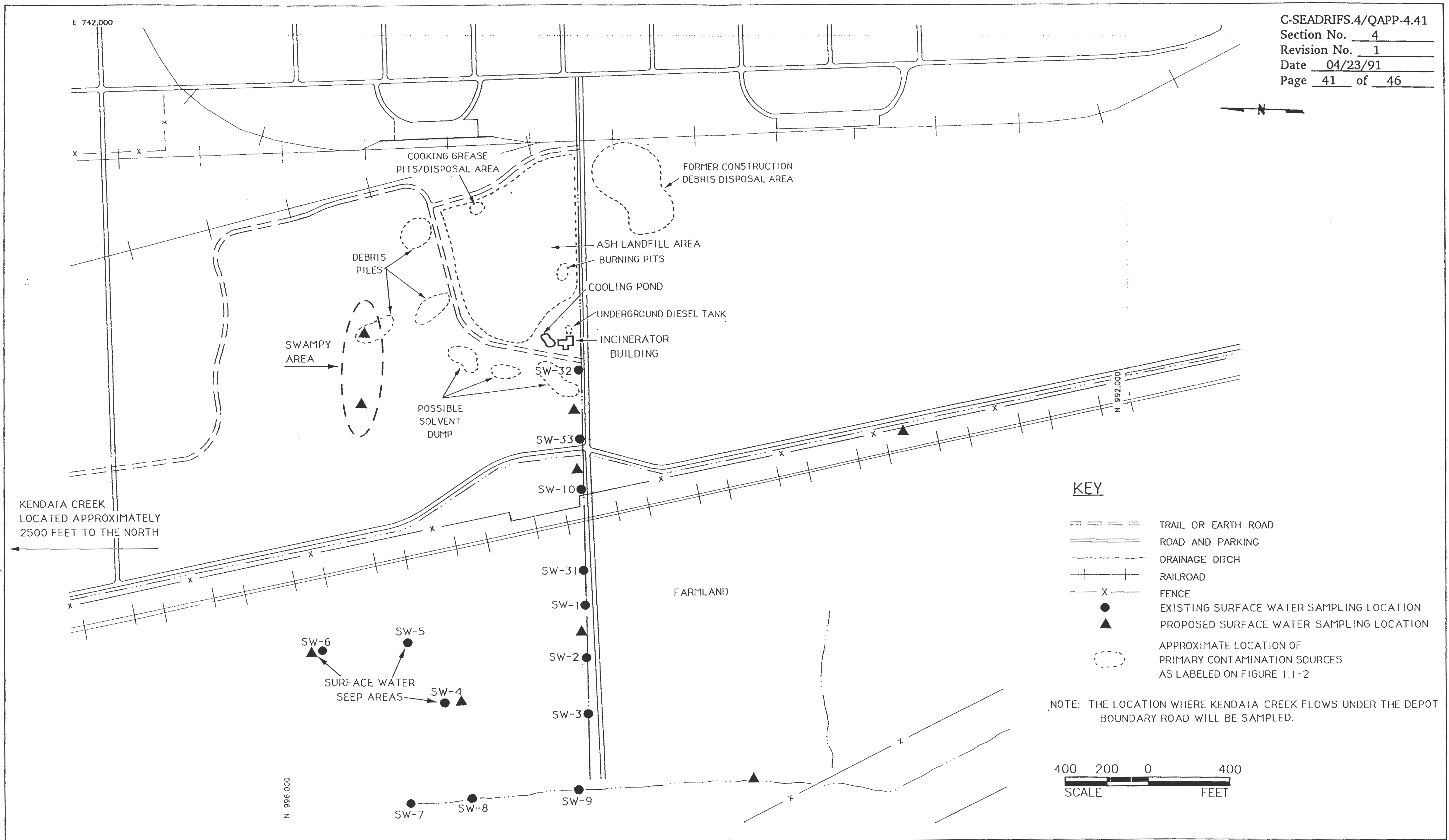
SOURCE: ESE.

U.S. ARMY CORPS
OF ENGINEERS
HUNTSVILLE, ALABAMA

3. Time;
4. Static water level (to ± 0.01 ft);
5. Depth of well;
6. Number of bailer volumes removed or pumping rate, if applicable;
7. Time of pumping, if applicable;
8. Total volume of water evacuated from well;
9. Water quality measurements of pH, specific conductance, and temperature;
10. Other pertinent observations of water samples (color, turbidity, odor, etc.);
11. Fractions sampled and preservation method;
12. Weather conditions and/or miscellaneous observations; and
13. Signature of sampler and date.

4.7.4 SURFACE/SPRING WATER AND SEDIMENT SAMPLING

To define the nature and extent of contamination within the site's drainage system, surface/spring water and sediment samples will be obtained from the 10 locations as presented in Figure 4.7-6. Where surface/spring water is present for sampling, a sediment sample, in addition to the surface water sample, will be collected. If no surface water is present (e.g., a seep with moist sediments), only a sediment sample will be collected. The following surface/spring water and sediment sample locations have been proposed: two locations in the swampy area northwest of the ash landfill area, five locations in onsite drainage ditches within the landfill area, one location west of the landfill area (seepage area), and one location southwest of the landfill area.



NOTE: THE LOCATION WHERE KENDAIA CREEK FLOWS UNDER THE DEPOT BOUNDARY ROAD WILL BE SAMPLED.

Figure 4.7-6
PROPOSED SURFACE/SPRING WATER AND SEDIMENT SAMPLING LOCATIONS IN SEAD ASH LANDFILL AREA

SOURCE: ESE.

U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

The surface water and sediment where Kendaia Creek flows under the SEAD boundary road, located in the northwest portion of the site, will also be sampled. Additional surface water locations identified during the RI will be sampled as part of this effort.

Surface/spring water and sediment samples will be analyzed for TCL organic compounds (volatiles, semivolatiles, pesticides/PCBs), TAL metals, and herbicides (see Table 4.7-1). Samples will be collected in accordance with the methodology outlined in this section.

Surface/spring water and sediment sampling equipment will be decontaminated prior to use in accordance with the procedures outlined in Section 4.6. Volatile organic monitoring equipment will be calibrated prior to each day's activities in accordance with the manufacturer's recommended procedures. Instrument calibration data will be recorded on the appropriate log sheets. Surface water sampling will be obtained from the previously designated locations. The sampling will be accomplished by using the following procedure:

1. Establish the exact location of each sampling station in the field. The sample site will be noted on a site plan and marked in the field with flagging and a 4-ft wooden stake. The stake will be labeled with the sample site number.
2. Measure the volatile organic vapors in the atmosphere above the water body with the HNU. If the concentration at breathing level is steadily elevated above background levels, use appropriate health and safety equipment as described in the project safety plan.

3. Collect the sample from the surface water body by immersing the sample bottle. The sample bottle should be completely submerged in an inverted position and then turned in an upstream direction and allowed to fill without collecting any surface debris. If the sample is collected by sampling personnel wading into the body of water, all parts of the sampler's body should remain downstream of the sample container during sample collection (however, wading will be avoided if possible). If wading is really necessary, downstream samples should be obtained first to prevent cross-contamination between down- and upstream samples. The sediment sample will be collected from the same location as the surface/spring water. A stainless-steel trowel will be used to collect the sample and transfer it to the sample container.
4. Fill all appropriate sample containers directly or from the intermediate sample collection container, if necessary.
5. Measure the following parameters by direct immersion of instrument probes into the water body, if possible:
    a. Temperature,
    b. pH, and
    c. Specific conductance.

    If direct measurement is not possible, measure these parameters from water obtained from a field sample container, separate from the analytical sample container.
6. Complete the Surface/Spring Water and Sediment Field Sample Data Record and initiate chain-of-custody records.

4.7.5 DUST-WIPE

The incinerator dust will be taken from the top reaches and lower ports within the fumes and piping. This will consist of two samples which will be analyzed for TCL compounds, excluding VOCs (see Table 4.7-1).

The following SOP has been developed from Region II QA manual (EPA, 1989) for use in taking wipe samples.

1. Materials needed:
    a. Cotton swabs, solvent rinsed and completely air-dried (use of synthetic materials requires checking for compatibility with solvents);
    b. Acetone, pesticide grade;
    c. Hexane, pesticide grade;
    d. DI water;
    e. HCl or HNO3, redistilled;
    f. Stainless-steel or plastic clamps (only for taking metals samples); and
    g. Appropriate sample bottles.
2. A square area, of a size sufficient to give the required amount of sample for each fraction as provided in the analytical methodology to be used, should be marked off. This may require taking cotton swabs and a balance into the field, wiping a certain area, and weighing the swab before and after to determine how much area should be wiped to give the required weight of sample.

3. Swabs for semivolatile, pesticide, and polychlorinated biphenyl (PCB) samples should be moistened in a 1:4 acetone/hexane mixture. While holding the swab in a clean, metal clamp, moisten the cotton swab with the appropriate solution.
4. While still holding the cotton swab in the clamp, wipe the sampling area back and forth repeatedly, applying moderate pressure. Wipe the entire area so that all the sample material is picked up.
5. Place the used swab in the appropriate sample container and seal.
6. Clean the clamps between each sample with both solvent and 10 percent HCl or HNO3.
7. As a blank, moisten a clean swab with the solvent or water (for each collection medium), place it in a separate jar, and submit it with the other samples.
8. When samples are submitted for analysis, the laboratory should be told to rinse the sample jars with solvent or 10 percent HCl or HNO3, depending on the analysis to be performed, when transferring sample to the extraction glassware.

The samples should be analyzed with the appropriate methodology for a soil/sediment matrix, and a sufficient quantity of material must be collected as called for in the analytical methodology for method detection limits to be achieved (see Figure 4.7-1).

4.7.6 SPLIT QC SAMPLES

The QA laboratory for this project will be the Missouri River Division Laboratory. The QA laboratory shall be notified of the beginning of the sampling activities by the contractor approximately 1 week prior to the arrival of the first QA sample shipment. Saturday sample arrival shall be cleared with the QA laboratory in advance. The QA sample shipping address is:

Commander
U.S. Army Engineering Division, Missouri River
ATTN: CEMRD-ED-GL (Dr. Joe Solsky)
420 South 18th Street
Omaha, NE 68102-2586

Telephone: (402) 444-4304

QA samples consist of dupes/splits and equipment blanks as outlined in Table 4.7-1.

QC samples will be gathered and analyzed by the contractor's laboratory. For water samples, one duplicate and at least one field blank will be taken in the field for every 10 field samples. Field blanks for water will be taken at the frequency specified in the work plan. Field blanks for water will consist of trip blanks (for volatiles) and sampling equipment blanks (rinsates). For soil samples, one duplicate/split will be taken in the field for every 10 field samples. Note the analytical sample breakdown in Table 4.7-1.

5.0 SAMPLE CUSTODY

A critical step in sample processing involves initial check-in and preparation for analysis. Proper chain of custody, efficient processing to meet holding times, and avoidance of cross contamination are vital to the integrity of the final data.

The contractor will maintain and document chain of custody as described by the National Enforcement Investigation Center (NEIC) of EPA, which defines sample chain of custody as follows:

1. The sample is in your actual possession;
2. The sample is in your view after being in your physical possession;
3. The sample was in your possession, and then you locked or sealed it to prevent tampering; or
4. The sample is in a secure area.

5.1 FIELD SAMPLE DOCUMENTATION

Field procedures will be designed to minimize sample handling and transfers. During sampling, the field crews will record the following information in field notebooks using indelible ink:

1. The unique sample number as obtained from the sample label,
2. Source of sample (including name, location, and sample type),
3. Date and time of sample collection,
4. Preservatives used,
5. Name(s) of collector(s), and
6. Field data (pH, temperature, and specific conductance).

Each sample is identified by affixing the pressure-sensitive gummed label. Each label will have a unique combination of field group name and sequence number, a standardized sample preservation code (e.g., C for chilled, N for nitric acid), and the station identification (ID). Each label must have spaces for the field team to write in the date and time of sample collection, sampler's signature, and a new station ID if different from the original station ID. A new station ID may be necessary due to changes in field and/or sampling conditions which require substitution of sampling stations. All changes in station ID are clearly noted in permanent ink on the sample label and logsheet and must be approved by the field team leader.

The sample container is then placed in a transportation case along with logsheets (see Appendix D). Each collected sample fraction contained in the transportation case is specified on the logsheet by circling the appropriate fraction code. Other field information such as sample type, sample collection time and date, new station code (if different from tentative station ID), and field analysis results (e.g., pH, temperature) also are entered onto the logsheet. The shipment method is entered on the bottom of the logsheet, and the sampler signs and dates the logsheet. The logsheet is placed in a waterproof container and sealed in the transportation case along with the samples to which it applies. The transportation seal or lock will not be opened until the samples arrive in the analytical laboratory and are checked in by the laboratory sample custodian. The field team leader will alert the laboratory coordinator to pertinent shipping information at the end of each sampling day.

5.2 LABORATORY SAMPLE DOCUMENTATION

Samples are received and checked into the coldroom (see Figure 5.2-1). Only the coldroom custodian replaces samples to the assigned shelves; all other employees replace samples to the return shelf. The coldroom door is always locked when no one is inside.

Samples are not stored in laboratories, but when samples are in a laboratory awaiting analysis, they will be secured by one of the four ways listed previously. In addition, the company buildings and laboratory areas are controlled-access areas requiring identification badges for employees and visitors.

Each sample or sample fraction removed from the coldroom will be recorded on a check-in/check-out form posted outside the coldroom door. The sample number, date of removal, and the person's initials will be clearly recorded.

Each sample or sample fraction returned to the coldroom will be recorded on the same logsheet. The sample number, date of return, and the person's initials will be clearly recorded. Samples and sample fractions will be returned to the return shelf only.

After the sample extraction is completed, at all times under secure custody as defined previously, the extraction technician completes an extract custody form

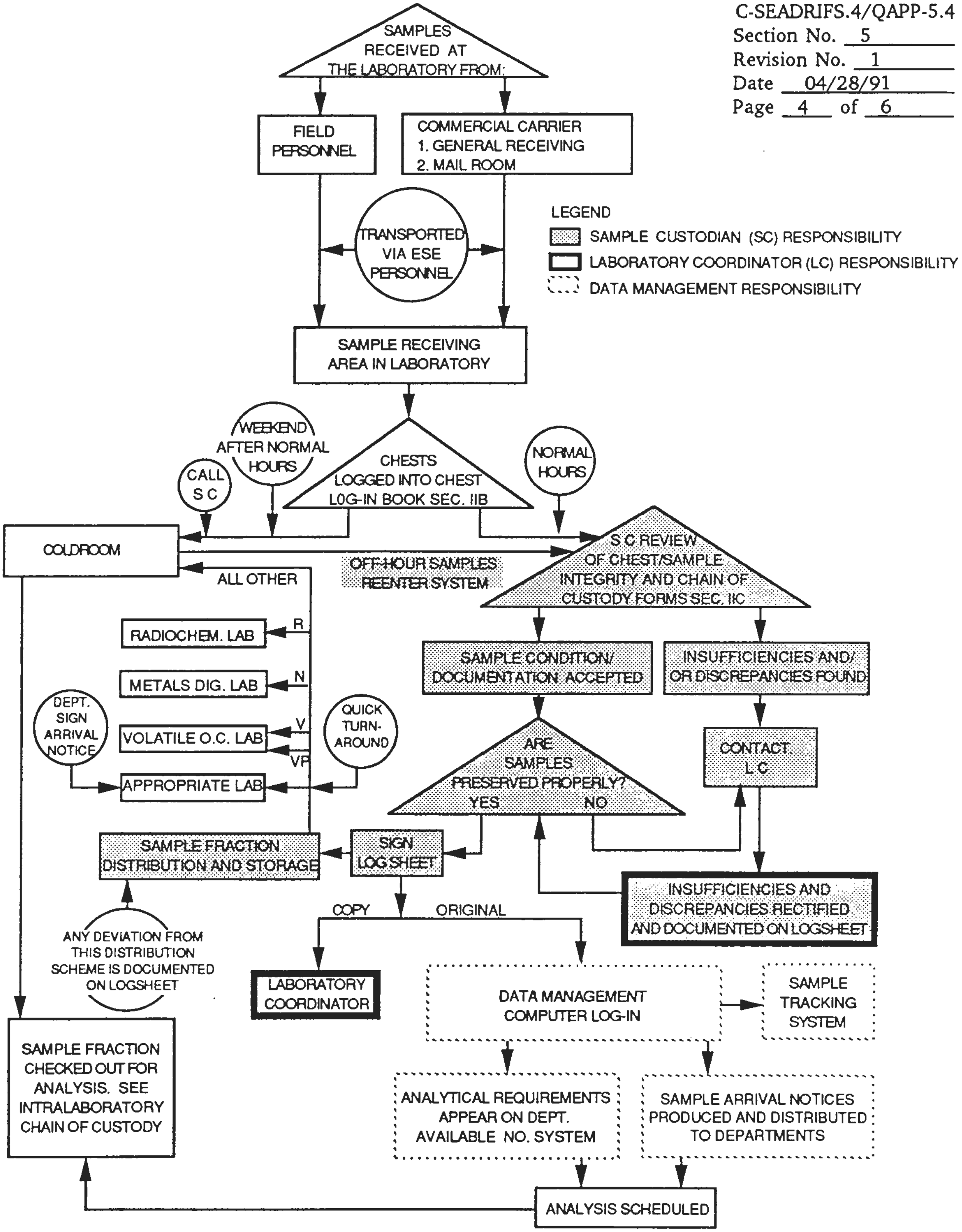


Figure 5.2-1
SAMPLE RECEIPT, LOG-IN, DISTRIBUTION FLOWCHART

SOURCE: ESE.

U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE, ALABAMA

and then transfers the extracts to the analyst. The analyst then stores the extracts in a secure area and places the extract custody form in the lot folder.

The extracts will be stored at all times in a secure area and will not be discarded until expiration of holding times or specific project authorization, as appropriate.

Sample chests are received by the chemistry sample custodian. The samples are unpacked, and the logsheets are compared with the contents. Samples are scheduled for processing, and the logsheets are given to the data management coordinator, who activates the sample numbers for analysis in Chemical Laboratory Analysis and Scheduling System (CLASS). Samples requiring immediate analysis to meet holding times are delivered directly to the appropriate analytical departments.

Sample log-in at the laboratory will be monitored by the project QA staff. The project QA staff will periodically check the computer logsheet for verification of complete conformance of the log to the sample set and verification of the information contained on the sample labels. Any inconsistencies or unusual circumstances, such as broken or leaking containers, improper preservation, or noncompliance with holding or shipping requirements, will be identified in writing to the project manager, the field team leader, and the project QA staff. Corrective action will be recommended and approved by the task manager and the project QA staff.

The following QA procedures are used to monitor sample management and handling:

1. The project QA officer or designate may make a trip to the site to observe the sampling. The project QA staff will audit the sampling procedures and ensure that procedures described in the scope of work (SOW) are followed.
2. The project QA staff will audit the labeling, preservation, storage, and transportation of samples according to the prescribed methods.
3. If the project QA staff determines that significant deviations from the sampling protocol have occurred, resulting in a compromise of the sample integrity, corrective action recommendations to the project manager will include resampling.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

6.1 FIELD INSTRUMENTS

All field geophysical and analytical equipment will be calibrated immediately prior to use in the field. The calibration procedures will follow standard manufacturers' instructions or routine company procedures to assure that the equipment is functioning within tolerances established by the manufacturer and required by the project. A copy of all the instrument manuals will be placed in a 3-ring notebook and brought to the field by the field team leader. A record of the instrument calibration will be maintained by the project manager, and these records will be subject to audit by the project QA officer. All calibration will be recorded in the field notebook on standard field calibration forms as represented in Figures 6.1-1 and 6.1-2.

6.1.1 pH METER

Calibration is performed at the start of each sampling day using two NIST-traceable standard buffer solutions that bracket the pH range expected in the samples. Calibration knobs are used to set the meter to read the value of the standard. The meter is then checked during the sampling period, using at least one standard, at a frequency that results in little or no calibration adjustment. If the reading varies more than one-tenth of a unit between calibration checks, the frequency of the checks must be increased.

C-SEADRIFS.4/QAPP-6.2
Section No. 6
Revision No. 1
Date 10/29/90
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Conductivity Meter Calibration Form

Project: ____________ Date: ____________

Meter: ____________ Standards Temp.: ____________

Is meter temperature compensated? ___ Yes ___ No

Manual Correction to 25°C

$$C_{25} = \frac{CK}{1 + .0191(t - 25)}$$ where,

C = meter reading (uncompensated)
t = solution temperature (°C)
K = Cell constant = 1 (most probes)

Time: ____________ Signature: ____________

	Standard (umhos/cm)	Meter Reading	Meter Reading @ 25°C	% Error* Std-Meter @ 25°C / Std (100)
1.)				
2.)				
3.)				

Time: ____________ Signature: ____________

	Standard (umhos/cm)	Meter Reading	Meter Reading @ 25°C	% Error* Std-Meter @ 25°C / Std (100)
1.)				
2.)				
3.)				

Time: ____________ Signature: ____________

	Standard (umhos/cm)	Meter Reading	Meter Reading @ 25°C	% Error* Std-Meter @ 25°C / Std (100)
1.)				
2.)				
3.)				

*Should be less than 10.

Signature: ____________
Field Team Leader

Figure 6.1-1
CONDUCTIVITY METER CALIBRATION FORM

SOURCE: ESE.

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pH Meter Calibration Form

Project: ____________________ Date: ____________________

Meter: ____________________

			Buffer Solution					
	Time (24 hour system)	Meter Reading	7			Buffer Temp. °C	% Slope	Operator
Initial		Unadjusted						
Calibration		Adjusted						
		Unadjusted						
		Adjusted						
Intermediate		Unadjusted						
Calibration		Adjusted						
		Unadjusted						
		Adjusted						
		Unadjusted						
		Adjusted						
		Unadjusted						
		Adjusted						
		Unadjusted						
		Adjusted						
		Unadjusted						
		Adjusted						
Final		Unadjusted						
Calibration		Adjusted						

Intermediate checks may be made with one buffer (unadjusted reading), if readings are within one unit of the standard no calibration adjustment is made, if greater than 0.1 a complete calibration is necessary (adjusted readings), if greater than 0.2 increase frequency of intrmediate checks.

Signature: ______________________________

Field Team Leader

Figure 6.1-2
pH METER CALIBRATION FORM

SOURCE: ESE.

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6.1.2 CONDUCTIVITY METER

Calibration is performed at the start of each sampling day using potassium chloride (KCl) standard solutions made in the laboratory prior to each field trip. The analyst preparing the solutions verifies the standard solution versus a laboratory conductivity bridge. The levels of the standards are selected to bracket the range of values expected in the samples. If the unit has a calibration adjustment (e.g., knobs, screws), the meter is calibrated in the same manner as the pH meter. Adjustments are generally not made on meters which lack a designated calibration knob. The meter must read within 10 percent of the standard to be considered in control and should read within 5 percent (7 percent is considered a warning level). If the calibration indicates the meter is out of control, a backup unit should be employed; if one is not available, the data will be flagged to note the percent difference between the meter and standard. Readings from conductivity meters lacking calibration adjustments are normally stable; thus, calibration checks are usually limited to checks at the beginning and end of the sampling day.

6.1.3 TEMPERATURE METER

Temperature is measured using a thermistor built into the conductivity meter. The readings will be checked at least once per field trip using a (NIST-traceable) thermometer.

The calibration frequencies noted previously are minimum. Additional checks should be performed if the unit experiences harsh conditions (e.g., shock, rain) or if readings become erratic.

6.1.4 HNU PHOTOIONIZATION METER AND OVA METER

Calibration of the meter will be performed at the start of each day of use using a standard calibration gas. Additional calibrations will be made if the unit experiences abnormal perturbations or readings become erratic. Results of the calibrations will be recorded in a calibration log that accompanies each instrument.

6.2 ANALYTICAL LABORATORY INSTRUMENTS

Calibration controls will be required for analytical operations of this project. Each instrument will be calibrated in a manner consistent with EPA calibration protocols and/or ESE standard practice. Calibration will be documented in a parameter notebook or the analyst's notebook.

Specific calibration requirements for major classes of analytical procedures are described in the following sections.

6.2.1 GC/HPLC

Standard Curve Calibration

Initial calibration standard solutions will be prepared by sequential dilution of a single stock standard solution to cover the analytical working range of the method. These may be either composite standards of more than one analyte or single-analyte solutions. The concentrations will be adjusted to take into account the instrument and method upper and lower limits of linearity, and the instrumental and method detection limit. A minimum of five initial calibration standards covering the working range concentrations will be prepared and analyzed. The initial calibration standards and the blank will be analyzed prior to an analytical run. At least one midlevel continuing calibration standard will be analyzed at the beginning of every analytical run and repeated at the end of the run. In addition, during extended runs covering more than a 12-hour period, this same continuing calibration standard must be analyzed midway through the sample run or at a maximum interval of every 10 samples to assure constant instrument response.

The initial calibration will be produced by plotting the standard response for each standard versus the concentration of each standard from the initial calibration run. The concentration of the standards may be expressed in units of mass injected, or in terms of the concentration of the standard solution, if the injection volume is constant for standards and samples. QC acceptance criteria for initial calibration, recalibration, and continuing calibrations are as follows:

1. The working curve possesses a minimum of five points including a blank.
2. The correlation coefficient of the curve is 0.995 or greater.
3. Continuing calibration standards are within 20 percent of the same initial calibration standard (detectors that normally show greater than 20-percent response drift during a normal run will require more frequent calibrations during the run).
4. The calibration curve brackets the response for all samples.

Failure to meet Criteria 1 and 2 will usually require rerunning the standard curve, with new standards if necessary, and reanalyzing the analytical batch. Failure to meet Criterion 3 may require rerunning the calibration curve and reanalysis of all samples with detectable levels of analytes or an explanation should be provided for acceptance of data.

The concentration (or amount) of the injected sample will be obtained by entering the response for the sample into the initial calibration curve equation and determining the sample concentration after all appropriate extract and sample dilution factors have been applied.

Single-Point Calibration

This procedure will utilize a single standard concentration to calculate a response factor which allows daily sample concentrations to be calculated. Single-point calibration should be used only with division manager approval and must be according to single-point calibration protocol SW 846 methods. It should be limited to selected chromatographic methods where the analysis of a complete standard curve for each analyte with each instrumental run is impractical due to run time or other technical considerations. Prior to use of this procedure, at least one initial standard curve for each analyte must be run to establish the retention time windows. Response factors for daily or single calibration standards must be within 35 percent of the equivalent standard response factor obtained during initial calibration.

6.2.2 GC/MS TUNING AND CALIBRATION

GC/MS Tuning

Daily instrument tuning will be practiced to assure that the instrument is calibrated and in proper working condition. The GC/MS will be tuned every 12 hours as per the method with decafluorotriphenylphosphine (DFTPP) for nonvolatiles analysis and bromofluorobenzene (BFB) for volatiles analysis. The mass intensity specifications for BFB and DFTPP are contained in Table 6.2-1.

GC/MS Calibration

Relative response factors for the individual compounds will be determined as follows:

$$RF = \frac{A_c/Q_c}{A_{is}/Q_{is}} = \frac{A_c \quad Q_{is}}{A_{is} \quad Q_c}$$

where: A = integrated area taken from the extracted ion current profile,
Q = quantity of material,
c = compound, and
is = internal standard.

Initial calibration, using a minimum of five levels of the compound, will be used to determine the instrument linearity. The average response factor (RF) will be calculated for each compound. The percent relative standard deviation (% RSD) will be calculated for each calibration check compound (CCC). The percent RSD of the CCCs in the initial calibration must be $\leq$35 percent.

Table 6.2-1. Mass Intensity Specifications for DFTPP and BFB

Key Ions	Ion Abundance Criteria
For DFTPP*	
51	30 to 60 percent of mass 198
68	Less than 2 percent of mass 69
70	Less than 2 percent of mass 69
127	40 to 60 percent of mass 198
197	Less than 1 percent of mass 198
198	Base peak, 100-percent relative abundance
199	5 to 9 percent of mass 198
275	10 to 30 percent of mass 198
365	Greater than 1 percent of mass 198
441	Present but less than mass 443
442	Greater than 40 percent of mass 198
443	17 to 23 percent of mass 442
For BFB*	
50	15 to 40 percent of mass 95
75	30 to 60 percent of mass 95
95	Base peak, 100-percent relative abundance
96	5 to 9 percent of mass 95
173	Less than 2 percent of mass 174
174	Greater than 50 percent of mass 95
175	5 to 9 percent of mass 174
176	Greater than 95 percent but less than 101 percent of mass 174
177	5 to 9 percent of mass 176

*Reference: Test Methods for Evaluating Solid Waste, EPA-SW-846, 3rd Edition, November 1986.

Source: ESE.

A 1-point calibration will be used daily for all subsequent analysis. The RFs of the calibration check compounds in this daily calibration standard should be ≤25 percent difference from the average RFs in the initial calibration. Failure to meet this criterion may require rerunning the calibration curve and re-analysis of samples with detectable levels of analytes, or an explanation should be provided for the acceptance of data. The RFs in the daily calibration standard will also be used for quantitation of samples.

6.2.3 TRACE METALS ANALYSIS CALIBRATION

Atomic Absorption Spectroscopy (AAS) Standard Curve Calibration

Working standard solutions will be prepared to cover the analytical working range of the method; these solutions may be either composite standards of more than one metal or single-metal solutions. The standard concentrations will be adjusted to take into account the instrument and method, upper and lower limits of linearity, and the instrumental detection limit. A minimum of three standard concentrations covering the working range and a blank will be prepared and analyzed. The working standards and the blank will be analyzed at the beginning of the analytical run, and at least one midlevel standard will be analyzed at the middle if there are more than 10 samples and at the end of the run or at a maximum interval of every 10 samples to check for constant instrument response.

The calibration is verified by the analysis of the initial calibration verification (ICV) solution. The ICV is an independent standard, prepared from different stock solutions other than those used to prepare the calibration standards. Typically an EPA or NIST reference is used as the ICV and is prepared according to the supplier's instructions.

The working curve will be produced by plotting the standard response for each standard versus the concentration of each standard from the initial calibration run. QC evaluation criteria for working curves are as follows:

1. The working curve possesses a minimum of three points and a blank,
2. The correlation coefficient of the line is 0.995 or greater,
3. The response for the midlevel standard analyzed at the middle of the run (for more than 10 samples) or every 10 samples and at the end of the run is within 20 percent of true value,
4. The ICV is within 10 percent of the element's true value, and
5. The calibration curve brackets the response for all samples.

Failure to meet Criteria 1, 2, and 4 may require rerunning the standard curve, with new standards if necessary, and reanalysis of the analytical batch. Failure to meet Criterion 3 may require reanalysis of all samples with detectable levels of analytes, or an explanation should be provided for acceptance of the data.

The concentration of the sample is obtained by entering the response for the sample into the working curve equation and determining the sample concentration after all appropriate digestate and sample dilution factors have been applied.

Inductively Coupled Argon Plasma (ICAP) Single-Point Calibration

This procedure utilizes a single standard concentration for each element to obtain an instrument response (emission counts). A second single point, emission counts obtained when aspirating a blank solution, is used in conjunction with the standard to calibrate the instrument in concentration units.

The calibration is verified by the analysis of an ICV solution, which is an independent standard prepared from different stock solutions than those used to prepare the calibration standards. The elemental concentrations of the calibration verification solution must be within the calibration range of the instrument and at concentrations other than those used for instrument calibration.

A multi-element interference check solution (ICS) and a method blank are analyzed each day prior to analyzing the samples. The ICS is used to verify the correction of spectroscopic interference caused by emissions adjacent to analyte emission lines.

The CCV solution is analyzed at the middle of the run, if there are more than 10 samples, and at the end of the run or at a maximum interval of every 10 samples to document constant instrument response. This solution contains one-half the concentration of each element present in the calibration standards. This solution may be prepared by dilution of an aliquot of the calibration standard or prepared as a separate solution in a manner analogous to the calibration standard preparation procedure.

QC evaluation criteria for the instrument calibration standard follow:

1. A calibration standard and a calibration blank are employed;
2. All the values for the ICV are within 10 percent of each element's true value;
3. Values for the ICS are 20 percent of each element's true value; and
4. The measured concentrations of the elements in the CCV solution, for which calibration was performed, are within 20 percent of their respective true values.

Failure to meet Criteria 1, 2, or 3 may require recalibration of the instrument, reverification of the calibration, and reanalysis of the samples. Failure to meet Criterion 4 may require reanalysis of the CCV. If the next CCV is still outside the criteria, it may require recalibration of the instrument, reverification of calibration, and reanalysis of the samples, or an explanation should be provided for the acceptance of the data.

6.2.4 GRAVIMETRIC METHODS CALIBRATION

The analytical balances are calibrated annually by the proper service personnel. The annually calibration is documented by a tag on the instrument. A set of NIST-certified weights is used to check the calibration daily. This check is performed by the designated technician. Results are recorded in the instrument notebook.

6.2.5 TITRIMETRIC METHODS CALIBRATION

In all cases, standard reference materials are used to calibrate the titrant and back titrant. Preparation of these materials is described in Standard Methods or other methods manuals. Known solutions of the parameter to be analyzed will be prepared and analyzed to verify titrant standardization and the analyst's ability to discern the endpoint.

6.3 GENERAL SOILS LABORATORY

6.3.1 DRYING OVEN

For all routine laboratory testing, the Blue M drying oven is maintained at a constant temperature of 110°C. Calibration to maintain the acceptable range of oven temperature (plus or minus 5°C) is performed by performing a daily check with a calibrated thermometer (accurate to 1°C) and readjusting the oven temperature, if necessary.

6.3.2 THERMOMETERS

All thermometers are calibrated annually against an NIST-certified thermometer. Results of the calibration are recorded in a laboratory notebook in the laboratory, and a temperature calibration curve is plotted for each thermometer. Thermometers are regularly inspected for signs of wear and are replaced as needed.

6.3.3 ANALYTICAL BALANCE

The American Scientific Products (ASP) Model Z 1800 electronic balance is inspected and calibrated semiannually by Mettler. Regular cleaning and preventative maintenance also is performed during the inspection. This electronic balance has a self-calibration feature that allows the instrument to be calibrated regularly between inspections.

7.0 ANALYTICAL PROCEDURES

7.1 STANDARD PROCEDURES

Analyses performed for this project will use standard EPA analytical procedures for analysis of water and soil/sediment. EPA precision and accuracy data and historic laboratory data have been used as the basis for developing acceptance criteria for assessing the precision and accuracy of the generated data. Criteria to be used in this project are given in Section 3.0. Precision and accuracy criteria are only given for selected analytes to be used in spiking for method control purposes. A minimum percent completeness (see Section 3.0) for each parameter is 95.

Chemistry department managers will ensure that only standard analytical methods are employed by the staff. Standard methods manuals are required for all departments, and development of the documents is ultimately the responsibility of the department managers. The methods cited in these documents will be the methods normally used. Any deviation from the standard method must be documented in the analyst notebook and approved by the department manager.

7.2 DETECTION LIMITS

The detection limit of the method is the lowest sample concentration which can be reliably recovered and measured in the sample matrix with a low background level. To determine absolute method detection limits (MDL), statistically based procedure are available from EPA methods. Tables 7.2-1 through 7.2-5 list the detection limits for each analytical method that will be used in this project.

Table 7.2-1. Limit of Detection for TRPH and Metals

Compound	Waters (μg/L)	Solids (mg/kg)
TRPH	0.165	21
<u>ICAP Method</u>		
Aluminum	117.5	12
Antimony	54.6	5.5
Arsenic	110.1*	11*
Barium	1.8	0.2
Beryllium	1.9	0.2
Boron	10.6*	1*
Cadmium	4.0	0.4
Calcium	23.7	2.4
Chromium	7.1	0.7
Cobalt	19.1	1.9
Copper	8.6	0.9
Iron	61.6	6.2
Lead	44.7*	4.5*
Magnesium	52.2	5.2
Manganese	2.1	0.2
Molybdenum	32.5*	3.3*
Nickel	26.0	2.6
Potassium	563.0	56
Selenium	159.0*	16*
Silver	8.8	0.9
Sodium	157.0	16
Thallium	160.0	16
Vanadium	13.4	1.3
Zinc	4.5	0.5
<u>GFAA Method</u>		
Arsenic	2.3	0.2
Lead	1.4	0.2
Selenium	1.8	0.2

Table 7.2-1. Limit of Detection for TRPH and Metals (Continued, Page 2 of 2)

Compound	Waters (μg/L)	Solids (mg/kg)
<u>CVAA Method</u>		
Mercury	0.2	0.02

*Detection limits determined using contractor's laboratory historical LOD, all others determined using EPA-CLP CRDL.

Source: ESE.

Table 7.2-2. **Method Detection Limits for VOCs**

Volatiles	CAS Number	Quantitation Limits** Water ug/L	Quantitation Limits** Low Soil/Sediment[a] ug/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl Chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene Chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethene	75-35-4	5	5
9. 1,1-Dichloroethane	75-34-3	5	5
10. 1,2-Dichloroethene (total)	540-59-0	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon Tetrachloride	56-23-5	5	5
16. Vinyl Acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,2-Dichloropropane	78-87-5	5	5
19. cis-1,3-Dichloropropene	10061-01-5	5	5
20. Trichloroethene	79-01-6	5	5
21. Dibromochloromethane	124-48-1	5	5
22. 1,1,2-Trichloroethane	79-00-5	5	5
23. Benzene	71-43-2	5	5
24. trans-1,3-Dichloropropene	10061-02-6	5	5
25. Bromoform	75-25-2	5	5
26. 4-Methyl-2-pentanone	108-10-1	10	10
27. 2-Hexanone	591-78-6	10	10
28. Tetrachloroethene	127-18-4	5	5
29. Toluene	108-88-3	5	5
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5

Table 7.2-2. Method Detection Limits for VOCs (Continued, Page 2 of 2)

		Quantitation Limits**	
Volatiles	CAS Number	Water ug/L	Low Soil/Sediment[a] ug/Kg
31. Chlorobenzene	108-90-7	5	5
32. Ethyl Benzene	100-41-4	5	5
33. Styrene	100-42-5	5	5
34. Xylenes (Total)	1330-20-7	5	5

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[a] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Table 7.2-3. Detection Limits for Semivolatile Organic Compounds

		Quantitation Limits**	
Semivolatiles	CAS Number	Water ug/L	Low Soil/Sediment[b] ug/Kg
35. Phenol	108-95-2	10	330
36. bis(2-Chloroethyl) ether	111-44-4	10	330
37. 2-Chlorophenol	95-57-8	10	330
38. 1,3-Dichlorobenzene	541-73-1	10	330
39. 1,4-Dichlorobenzene	106-46-7	10	330
40. Benzyl alcohol	100-51-6	10	330
41. 1,2-Dichlorobenzene	95-50-1	10	330
42. 2-Methylphenol	95-48-7	10	330
43. bis(2-Chloroisopropyl) ether	108-60-1	10	330
44. 4-Methylphenol	106-44-5	10	330
45. N-Nitroso-di-n-dipropylamine	621-64-7	10	330
46. Hexachloroethane	67-72-1	10	330
47. Nitrobenzene	98-95-3	10	330
48. Isophorone	78-59-1	10	330
49. 2-Nitrophenol	88-75-5	10	330
50. 2,4-Dimethylphenol	105-67-9	10	330
51. Benzoic acid	65-85-0	50	1600
52. bis(2-Chloroethoxy) methane	111-91-1	10	330
53 2,4-Dichlorophenol	120-83-2	10	330
54. 1,2,4-Trichlorobenzene	120-82-1	10	330
55. Naphthalene	91-20-3	10	330
56. 4-Chloroaniline	106-47-8	10	330
57. Hexachlorobutadiene	87-68-3	10	330
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59. 2-Methylnaphthalene	91-57-6	10	330
60. Hexachlorocyclopentadiene	77-47-4	10	330
61. 2,4,6-Trichlorophenol	88-06-2	10	330
62. 2,4,5-Trichlorophenol	95-95-4	50	1600
63. 2-Chloronaphthalene	91-58-7	10	330
64. 2-Nitroaniline	88-74-4	50	1600
65. Dimethylphthalate	131-11-3	10	330
66. Acenaphthylene	208-96-8	10	330
67. 2,6-Dinitrotoluene	606-20-2	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330

Table 7.2-3. Detection Limits for Semivolatile Organic Compounds (Continued, Page 2 of 2)

		Quantitation Limits**	
Semivolatiles	CAS Number	Water ug/L	Low Soil/Sediment[b] ug/Kg
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. Diethylphthalate	84-66-2	10	330
75. 4-Chlorophenyl-phenyl ether	7005-72-3	10	330
76. Fluorene	86-73-7	10	330
77. 4-Nitroaniline	100-01-6	50	1600
78. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79. N-nitrosodiphenylamine	86-30-6	10	330
80. 4-Bromophenyl-phenylether	101-55-3	10	330
81. Hexachlorobenzene	118-74-1	10	330
82. Pentachlorophenol	87-86-5	50	1600
83. Phenanthrene	85-01-8	10	330
84. Anthracene	120-12-7	10	330
85. Di-n-butylphthalate	84-74-2	10	330
86. Fluoranthene	206-44-0	10	330
87. Pyrene	129-00-0	10	330
88. Butylbenzylphthalate	85-68-7	10	330
89. 3,3'-Dichlorobenzidine	91-94-1	20	660
90. Benzo(a)anthracene	56-55-3	10	330
91. Chrysene	218-01-9	10	330
92. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
93. Di-n-octylphthalate	117-84-0	10	330
94. Benzo(b)fluoranthene	205-99-2	10	330
95. Benzo(k)fluoranthene	207-08-9	10	330
96. Benzo(a)pyrene	50-32-8	10	330
97. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
98. Dibenz(a,h)anthracene	53-70-3	10	330
99. Benzo(g,h,i)perylene	191-24-2	10	330

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[b] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for SemiVolatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Table 7.2-4. Detection Limits for Organochlorine Pesticides and PCBs

Pesticides/PCBs	CAS Number	Quantitation Limits** Water ug/L	Quantitation Limits** Low Soil/Sediment[c] ug/Kg
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptachlor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor epoxide	1024-57-3	0.05	8.0
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.0
109. 4,4'-DDE	72-55-9	0.10	16.0
110. Endrin	72-20-8	0.10	16.0
111. Endosulfan II	33213-65-9	0.10	16.0
112. 4,4'-DDD	72-54-8	0.10	16.0
113. Endosulfan sulfate	1031-07-8	0.10	16.0
114. 4,4'-DDT	50-29-3	0.10	16.0
115. Methoxychlor	72-43-5	0.5	80.0
116. Endrin ketone	53494-70-5	0.10	16.0
117. alpha-Chlordane	5103-71-9	0.5	80.0
118. gamma-Chlordane	5103-74-2	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. Aroclor-1016	12674-11-2	0.5	80.0
121. Aroclor-1221	11104-28-2	0.5	80.0
122. Aroclor-1232	11141-16-5	0.5	80.0
123. Aroclor-1242	53469-21-9	0.5	80.0
124. Aroclor-1248	12672-29-6	0.5	80.0
125. Aroclor-1254	11097-69-1	1.0	160.0
126. Aroclor-1260	11096-82-5	1.0	160.0

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[c] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticide/PCB TCL compounds are 15 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation Limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Table 7.2-5. Detection Limit Data for Chlorinated Herbicides (SW 8150)

	Detection Limits	
Parameter	Aqueous* (μg/L)	Solid⁺ (mg/kg)
2,4-D	0.029	0.003
2,4-DB	0.029	0.003
2,4,5-T	0.029	0.003
2,4,5-TP/Silvex+der.	0.029	0.003
Dicamba (banvel)	0.029	0.003
Dalapon	0.029	0.003
Dichlorprop	0.029	0.003
Dinoseb	0.029	0.003
MCPA	0.588	0.050
MCPP	0.588	0.050

Source: ESE.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

8.1 DATA REDUCTION AND REPORTING

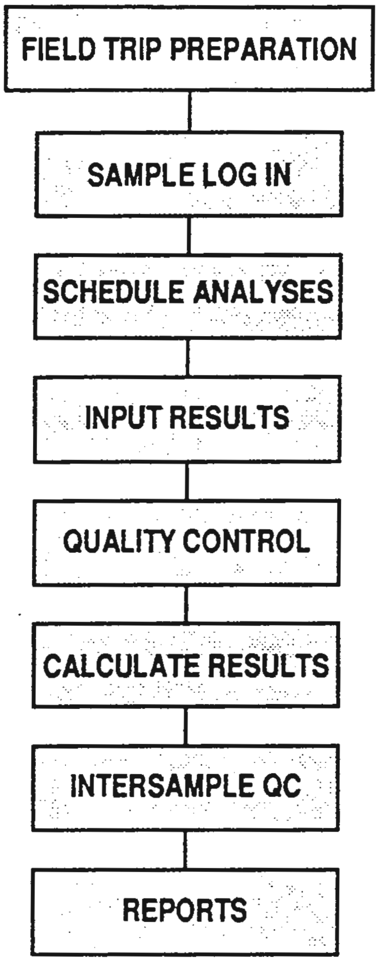
Data transfer and reduction are essential functions in summarizing information to support conclusions. It is essential that these processes are performed accurately and, in the case of data reduction, accepted statistical techniques are used. The contractor will use its in-house-developed computer system for data management.

Example calculations will be included with the analytical method, where appropriate, to facilitate review. The entry of input data and calculations should be checked and the signature/initials of the data technician and reviewer(s) should accompany all data transfers with and without reduction.

All QA/QC procedures recommended in the SW846 analytical method used will be mandatory. The data flow scheme is presented in Figure 8.1-1. Reporting will be in the form of contract laboratory program (CLP) deliverables. The deliverable forms are provided in Attachment A.

For routine analyses performed at the laboratory, sample response data information will be entered into the computer system by the analyst or other designated individual(s). The computer calculates the following:

1. Linear or quadratic regression line for standards,
2. Coefficients of variation for replicates,
3. Spiked recoveries,



— define parameters for analysis
— assign temporary station codes
— define sample fractions
— produce labels and logsheets

— activate samples
— set permanent station codes
— store collection time and date
— store field data

— list of samples available for each parameter sorted by due date

— reserve analysis
— input calibration, quality control and sample data

— calculate calibration curve, spike recovery, replicate and reference sample quality control

— calculate and store final sample concentrations

— check for data inconsistencies
— perform interparameter calculations

— produce reports of sample data, quality control, and statistical analyses

Figure 8.1-1
FLOWCHART OF THE CLASS PROGRAM

SOURCE: ESE.

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4. Reference sample concentrations, and
5. Sample concentrations.

Linear or quadratic equations will be used to calculate final data for laboratory analyses requiring a calibration curve:

$$\text{Concentration} = \text{Intercept} + \text{M (Response)} + \text{M2 (Response)}^2$$

The equation used to calculate final data is dependent on the linearity of the standard curve and method of analysis.

Purgeable organics by GC/MS are calculated as follows:

$$\text{Concentration } (\mu g/L) = \frac{(A_{sa})\ (Q_{is})}{(RF)(A_{is})(PV)}$$

where: A_{sa} = area from the extracted ion profile of the primary characteristics ion for the target analyte in the sample,

Q_{is} = quantity of the internal standard [nanograms (ng)],

RF = response factor (see Section 6.2.2),

A_{is} = area from the extracted ion profile of the primary characteristic ion of the internal standard in the sample, and

PV = purge volume (mL).

Acid and base/neutral extractables are calculated as follows:

$$\text{Concentration } (\mu g/L) = \frac{(A_{sa})(Q_{is})}{(A_{is})\ (RF)} \times \frac{1}{FE} \times \frac{1}{\text{volume}} \times DF$$

where: A_{sa} = area from the extracted ion profile of the primary characteristic ion for the target analyte in the sample;

A_{is} = area from the extracted ion profile of the primary characteristic ion of the internal standard in the sample;

Q_{is} = quantity of the internal standard (ng);

RF = response factor (see Section 5.2.2);

FE = fraction extract analyzed = $\frac{\text{Volume injected } (\mu L)}{\text{extract volume } (\mu L)}$,

volume = volume of extracted sample (mL); and

DF = dilution factor = $\frac{\text{final extract volume for injection (mL)}}{\text{extract volume prior to dilution (mL)}}$

QC acceptance criteria (see Section 4.3) for the relative percent difference of replicate spike recoveries and for the range of acceptable recoveries will be stored in the computer data management files for each storage and retrieval (STORET) number/method code combination. If the samples in a sample lot do not pass all the QC checks (see Section 9.0), then the results reported in all samples processed in the same sample set may be considered as suspect and the analyses may need to be repeated.

Completed batch folders will be stored in a central location arranged by departments and numerically by batch number. Strip charts and copies of parameter notebooks will be stored in the batch folders.

When the data set is complete for each sampling effort, the computer will be used to organize the information in the field group in a variety of formats. The final reports will be reviewed and approved by the laboratory coordinator.

8.2 DOCUMENTATION OF RAW DATA

8.2.1 GC/HPLC

Prior to analysis, the analyst must obtain a file folder and all applicable logsheets and data sheets.

8.2.2 EXTRACTION LOGSHEET

An extraction logsheet, filled out by the analyst performing the sample extraction, will accompany each lot of samples throughout analysis. This sheet will include at least the following data:

1. Project name and number,
2. Extractor's initials,
3. Type of sample matrix,
4. Field group name;
5. Sample numbers,
6. Date extracted,
7. Analyte group,
8. Initial volume or wet weight of sample extracted,

9. Initial/final pH (water sample),
10. Extracting solvent,
11. Final volume/solvent,
12. Date of cleanup (if required),
13. Notes and comments affecting the extraction procedure, and
14. Appearance of each sample.

After extraction is complete, extraction logsheets will be filed in the batch folder and will accompany the extracted samples to the instrumental analyst. Each extract vial will be properly labeled. Each label will contain the following information:

1. Project name,
2. Sample number,
3. Extraction concentration factor,
4. Date extracted,
5. Extractor's initials, and
6. Field group.

Instrument Logbooks

During analysis, the following information will be recorded in the instrument notebook:

1. A log of the types of analyses run on the instrument, to include:
    a. Column conditions and temperature zones,
    b. Sample numbers or other identification of samples,
    c. Reference to a method describing the analysis,

  d. Analysis date,
  e. Detector used [e.g., FID, PID, hall electrolytic conductivity detector (HDCD)], and
  f. Detector conditions.

2. Service records are kept in a separate maintenance log.

Chromatograms

At the time of analysis, the analyst will include on the chromatogram the following information:

1. Date and time of analysis,
2. Analyst's initials,
3. Instrument used,
4. Field group name,
5. Sample number and other identification for each chromatogram, and
6. Concentration/dilution factor for each sample.

The chromatograms, extraction logsheet, and copies of instrument logbooks will be placed in the batch file folder.

Chromatographic Logsheets

For each analysis, the analyst will record all pertinent information on a standard curve data sheet and chromatographic data logsheet. The standard curve data sheet lists the standards, their concentrations, and the respective responses. The chromatographic data sheet lists the samples in order of injection and the factors needed for calculating the concentrations. A sample calculation using calculated response factors will appear on the back of the chromatographic data sheet if responses are calculated manually.

After the analysis and data reduction are complete, the chromatograms and worksheets will be stored in the batch file folder and the data entered in the CLASS system. The folder will be turned in to Data Information Services to be stored in each department's designated filing location.

Standards

Prior to analysis, stock standard solutions and working solutions covering the working range of the method will be prepared. Procedures used in preparing the standards will be recorded in the standards preparation notebook. The following information must be recorded:

1. Reference standard source,
2. Lot number,
3. Date of preparation,
4. Analyst's name or initials,
5. Actual weight measured,
6. Volumetric flask volume,
7. Calculated concentration,
8. Solvent,
9. Dilutions, and
10. Expiration date.

Immediately after an analytical standard has been prepared, the standard will be transferred to an amber glass vial or bottle and properly labeled. Standards should be refrigerated when not in immediate use.

8.2.3 GC/MS

Prior to analysis, the extracting analyst must obtain a batch file folder and all applicable data sheets and logsheets.

Extraction Logsheet

Once a batch has been established, the sample extraction and analysis procedure begins. A GC/MS extraction logsheet, filled out by the analyst performing the sample extraction, will accompany the batch throughout analysis. This sheet will include at least the following data:

1. Project name and number,
2. Analyst's initials,
3. Type of sample matrix,
4. Field group name,
5. Sample numbers,
6. Date extracted,
7. Analyte group (i.e., acids, base/neutrals),
8. Initial volume or wet weight of sample extracted,
9. Initial/final pH,
10. Extract solvent,
11. Final volume/solvent,

12. Date of cleanup, and
13. Notes and comments affecting the extraction procedure.

After extraction, extraction logsheets will be filed in the batch file folder and will accompany the extracted samples to the instrument analyst. The extract vial will be properly labeled. The label will contain the following information:

1. Project name,
2. Sample number,
3. Extraction concentration factor and solvent used,
4. Date extracted,
5. Extractor's initials, and
6. Field group.

Sample Screening

Sample extracts may be screened by a gas chromatograph with flame ionization detection (GC/FID) prior to GC/MS analysis to permit dilution of extracts (as required) to concentration levels compatible with the GC/MS instrument and column capabilities.

Spectral Data and GC/MS Computer Quantitation Report

The quantitative sample and standard data generated by the GC/MS data system and all mass spectral information will be labeled according to standard procedures and placed in the batch file folder. Manual data reduction sheets also will be placed in this folder.

Standards

Prior to analysis, stock standard solutions and working solutions covering the working range of the instrument are prepared. Procedures used in preparing the standards must be recorded in the preparer's laboratory notebook. The following information will be recorded:

1. Reference standard source,
2. Lot number,
3. Date of preparation,
4. Analyst's name or initials,
5. Actual weight (or volume) measured,
6. Volumetric flask volume,
7. Calculated concentration,
8. Solvent, and
9. Dilutions.

The analytical standard will be transferred immediately to a properly labeled amber glass bottle or vial after preparation. Standards will be refrigerated when not in use.

GC/MS Instrument Logbooks

Whenever the GC/MS is used for sample analysis, the appropriate information will be recorded in an instrument logbook.

Compound Identification

Compound identification will be made in terms of the full-scan mass spectrum generally obtained in the electron impact mode at 70 electronvolts (eV). Compound identification will require the presence of all significant major ions at the appropriate relative abundance as obtained with an authentic compound or reference spectrum from a reputable literature source. The selection of significant ions is strongly compound dependent, and because of this and other considerations, the identification of compounds will entail considerable professional judgment and experience.

The most convincing evidence for compound identification is comparison of spectrum with that of an authentic compound obtained under identical operation conditions. When this is not possible due to compound availability, computer identification or manual library search will be used.

When no tentative matches are found in the library, identification will be based on application of known fragmentation patterns, empirical correlations, and isotope abundance data. All data reported as a result of library searches will be reported as tentatively identified compounds (TICs).

Compound Quantification

The technique of extracted ion current profiles will be employed for the preliminary qualitative searching and for quantification of individual compounds. Appropriate internal standards will be employed to permit quantification in terms of the relative response to these internal standards.

Spiking with Internal Standards

All samples will be spiked with quantitation standards just prior to the GC/MS analysis. Appropriate internal standards will be selected for the remaining categories.

GC/MS Instrumental Detection Limits

The instrumental detection limit refers to the least quantity of material required to provide a total mass spectrum of sufficient quantity to permit compound identification. The mass spectrum must contain all major ions with the appropriate relative abundance within 35 percent of either an authentic compound analyzed under identical conditions or an appropriate reference spectrum from the literature.

Data Management

Output from the GC/MS/DS is variable, depending on the project. However, all raw data such as mass chromatograms will be stored on magnetic tape. The final results are transmitted to the main computer system by project and sample number. The calculation results, which are the quantification reports, will be kept in the GC/MS room by these same identifiers. The frame reference number (FRN) is obtained from the quantification reports. All magnetic tapes are kept in sequential order with respect to the FRN. By following this sequence, it is possible to obtain all raw data for a particular sample number. The GC/MS computer generates a data file that is transmitted to the computer system. The data information center reads the transmitted data and generates a batch report. The batch is returned to the analyst for review. The batch folder, containing the quantification report, batch report, and copies of logsheets, is stored in the central filing location.

8.2.4 TRACE METALS

Strip Charts--At the time of analysis (currently only applicable to mercury by cold vapor), the following information will be recorded on the strip chart:

1. Analyst's name, initials, or employee number;
2. Date of analysis;
3. Instrument/method used;
4. Element of interest;
5. Instrument conditions;
6. Sample matrix; and
7. Comments.

During analysis, the analyst will indicate on the strip chart sample numbers, QC samples, blanks, and standards.

After the data have been reduced and recorded in the instrument notebook, the strip charts are placed in a batch file folder together with the copies of the digestion logsheet, copies of the instrument logbook, and reduction sheets. These data are entered manually or automatically uploaded to the computer system to generate a uniquely numbered batch. The analyst reviews the data and validates the correct transcription of data into the computer system. Then, the batch is signed and submitted to Data Information Services to be stored in the central filing system.

For ICAP, the ICAP computer produces a data file that is evaluated and transmitted to the computer system. The data information center reads the file and generates a batch. The batch is returned to the analyst for review. The batch, the data file, and copies of logsheets are placed in the batch folder and stored in the central filing location.

Laboratory Notebooks

Each instrument will have its own laboratory notebook. After each analysis, the analyst will record in the notebook the following information:

1. Problems encountered during the digestion/analysis,
2. Comments about the samples and/or analytical procedure,
3. Instrument used,
4. Method used [graphite furnace atomic absorption (GFAA), cold vapor atomic absorption (CVAA), ICAP],
5. Date of analysis,
6. Analyst(s),
7. Element,
8. Sample matrix,
9. Instrument conditions,
10. Sample numbers,
11. QC data,

12. Raw data, and
13. Blank subtracted responses.

Standards

Stock standard solutions are purchased from vendors. These stock solutions are certified by the vendor for purity and concentration.

Volumetric dilutions are made from the stock solution to obtain working solutions. Serial dilutions are then made from the working solutions to obtain working standards to be used to generate standard curves. Working standard solutions are stored in volumetric flasks and properly labeled with the following information:

1. Preparer's name or initials,
2. Date of preparation,
3. Element(s), and
4. Concentration.

8.3 DATA REVIEW/VALIDATION IN THE LABORATORY

The following procedures are used for review/validation of data. Data review is initiated by the bench analyst upon conversion of raw data into reportable data. The bench analyst reviews preliminary data, holding times and precision, accuracy, and calibration checks. The analyst provides explanation and/or corrective action for any method control parameters which are outside criteria and signs the analytical batch when satisfied with the data.

The analyst's supervisor or a designated reviewer also reviews the analytical batch and any explanations or corrective actions provided by the analyst. If the supervisor or designee is not satisfied with the explanations or corrective actions, an additional explanation or corrective action is provided in the batch. The supervisor or designee signs the analytical batch when satisfied with the data.

The laboratory coordinator reviews analytical data batches that have explanations and corrective actions and signs the analytical batch when satisfied with the data. The laboratory coordinator also reviews all final data reports for inconsistencies and completeness prior to releasing the reports to the client; qualification of data and/or QA/QC summaries are provided as appropriate.

All outliers will be handled as per the EPA validation SOPs (Attachment B).

8.4 DATA REVIEW BY PROJECT QA OFFICER

The project QA officer will review the data according to the guidelines provided in Region II SOPs. The goal is to ensure that the analytical data meet the general QA/QC criteria recommended in SW846. The CLP inorganic and organic results forms will be used (see Attachment A). This will enable the data to be validated by the Region II SOP (see Attachment B).

All field information must be recorded in sequentially numbered bound notebooks and be made using noneraseable, waterproof ink. The notebook pages must themselves be sequentially numbered from one through to the end.

The use of standardized forms (e.g., field trip approval form, field sampling request form, field data sheet, well sampling request form, field data sheet, well sampling data log, equipment calibration forms, etc.) is permitted, but these must be assembled into logbooks, sequentially numbered, and bound prior to field use. The field sample custody records (i.e., forms) must also be bound and kept in the project files along with the other notebooks and field documents.

Field team leaders are responsible for initial data validation including:

1. Use of properly calibrated instruments,
2. Following appropriate SOPs, and
3. Making careful and complete records of field activities.

Final validation of field data is conducted by the project manager (or task manager).

9.0 INTERNAL QC CHECKS

9.1 GENERAL QC REQUIREMENTS

Analytical QC procedures are those steps taken by the laboratory in day-to-day activities to achieve the desired accuracy, precision, reliability, and comparability of analytical data. Each analytical chemistry department manager and analyst is responsible for performing the analysis in accordance with the defined quality control practices outlined in this manual.

For all analyses performed by ESE, the QC checks described in this section are mandatory unless alternate procedures are given in the project QA plan or otherwise agreed upon by the laboratory coordinator and the project QA supervisor. Tables 9.1-1 and 9.1-2 summarize minimum QC sample requirements. The QC samples specified in Table 9.1-1 will be prepared and analyzed as stated in the analytical methods.

For analyses where no sample extraction or preparation is required, the number of samples that can be analyzed as one set during a 24-hour period will determine the number of samples per lot for QC purposes.

The QA supervisor may insert into the batch either a spiked sample or a duplicate of a previously analyzed sample for QC purposes. The QA supervisor will monitor the results of this sample to ensure that the analysis meets QA criteria for the project.

Table 9.1-1. Minimum QC Sample Requirements for Nonmetallic Inorganics Analysis

Sample Lot	Standard Matrix* (QC Check Sample) Spike	Standard Matrix* (QC Check Sample) Replicate Spike	Sample Matrix Spike+	Sample Replicate	Method Blank	Filter Blank (as required)
EACH LOT OF 5 TO 20 SAMPLES**						
Cyanide, chloride, sulfate	1	1	1	--	1	1
Alkalinity, COD, BOD, TOC, Hardness, Residue	--	--	--	1	1	--
EACH LOT OF 1 TO 4 SAMPLES						
Cyanide, chloride, sulfate	1	--	1	--	1	1
Alkalinity, COD, BOD, TOC, Hardness, Residue	--	--	--	1	1	--

Note: -- = not applicable for this analysis.

* Standard Matrix Spike is a spike into a blank matrix which is carried through sample preparation or extraction to sample analysis. The blank matrix is a reagent blank for aqueous samples and a standard soil for solid matrix, if available; if standard soil is not available, spiking is done on a reagent blank. This spike is also called a QC Check Sample because the standards used to prepare the spiking solution are from a different source than those used for the calibration standards.

\+ Sample Matrix Spike is a spike into a sample matrix which is carried through sample preparation or extraction to sample analysis.

** A sample lot containing 5 to 20 samples may be processed as several smaller analytical batches. An analytical batch should contain at a minimum a standard spike (QC check sample) and a method blank.

Source: ESE.

Table 9.1-2. Minimum QC Sample Requirements for Organics and Metals Analysis

Sample Lot	Sample Matrix*		Standard Matrix Spike$^+$ (QC Check Sample)	Surrogate	Method Blank	Filter Blank (as required)
	Spike	Replicate Spike				
EACH LOT OF 5 TO 20 SAMPLES**						
All analyses (except GC/MS, organochlorine pesticides, and PCBs)	1	1	1	--	1	1
GC/MS, organochlorine, pesticides, PCBs, and herbicides	1	1	1	All samples spiked	1	1
EACH LOT OF 1 TO 4 SAMPLES						
All analyses (except GC/MS, organochlorine, pesticides, and PCBs)	1^{++}	--	1	--	1	1

Table 9.1-2. Minimum QC Sample Requirements for Organics and Metals Analysis (Continued, Page 2 of 2)

Sample Lot	Sample Matrix* Spike	Sample Matrix* Replicate Spike	Standard Matrix Spike$^+$ (QC Check Sample)	Surrogate	Method Blank	Filter Blank (as required)
GC/MS, organochlorine, pesticides, PCBs, and herbicides	--	--	1	All samples spiked	1	1

Note: -- = not applicable for this analysis.

* Sample Matrix Spike is a spike into a sample matrix which is carried through sample digestion or extraction to sample analysis.

$^+$ Standard Matrix Spike is a spike into a blank matrix which is carried through sample digestion or extraction to sample analysis. The blank matrix is a reagent blank for aqueous samples and a standard soil for solid matrix, if available; if standard soil is not available, spiking is done on a reagent blank. This spike is also called a QC check sample because the standards used to prepare the spiking solution are from a different source from those used for the calibration standards.

** A sample lot containing 5 to 20 samples may be processed as several smaller analytical batches. An analytical batch should contain at a minimum a check sample and a method blank or filter blank. For GC/MS, pesticides, and PCBs, besides the QC check sample and method blank, the surrogates should also be included in a batch.

$^{++}$ The sample matrix spike QC requirement for each lot of 1 to 4 samples can be replaced by surrogate spiked into the samples.

Source: ESE.

Spikes will be placed into sample matrices for organics and metals analyses. Samples will be split into duplicates, spiked, and analyzed. The relative-percent difference between the spike and the replicate spike will be used to assess analytical precision. Selection of the sample to be split and spiked may be made by the client or by the laboratory.

For nonmetallic inorganic analysis, control spikes will be placed into standard matrices. Standard matrix spike duplicates will be prepared and analyzed. The relative-percent difference between the spike and the replicate spike will be used to assess analytical precision.

The contractor controls sample analyses on those QC criteria that are actually under the control of the technicians and analysts performing the analytical procedure; therefore, emphasis is placed on calibration, method blanks, and QC check sample (standard matrix spike) results. When these are within criteria, method performance is documented. Surrogates and sample matrix spikes will be reported and evaluated for precision and accuracy, but not necessarily used for method control. A surrogate or sample matrix spike that has recoveries outside of criteria limits will be evaluated against other available QC data within that batch in order to determine if the method is in control. Failure of a surrogate or sample matrix spike to achieve the acceptance criteria when a QC check sample in the same batch has acceptable recoveries often only documents that the method employed is not applicable to that particular matrix, not that the method is out of control.

In the following subsections, those criteria marked with an asterisk (*) will be used to control the sample analysis. Precision and spike recovery checks were presented in Section 4.0. In addition to the QC samples specified in the following subsections, field QC blanks will be prepared and analyzed.

9.2 GC/MS MINIMUM QC

For GC/MS analyses of 5 to 20 samples, the following minimum QC checks will apply:

1. All samples spiked with surrogates.
2. At least one spike in sample matrix with selected actual analytes and surrogates will be analyzed.
3. At least one duplicate spike in sample matrix with selected actual analytes and surrogates will be analyzed.

*4. At least one QC check sample spike in blank matrix will be analyzed (spiked with surrogates and selected analytes).

*5. At least one method blank will be analyzed (spiked with surrogates).

*6. One calibration standard will be run and a daily response factor within 25 percent of initial calibration response factor for selected calibration check compounds.

*7. Instrument tuning protocols will be performed and be within criteria prior to analysis.

Note: An MS and MSD may not be performed for every analytical batch but will be performed at a rate of one MS and one MSD per 20 environmental samples.

For GC/MS analyses of less than five samples, the following minimum QC will apply:

1. All samples will be spiked with surrogates.
*2. At least one QC check sample spike in blank matrix with selected actual analytes and surrogates will be analyzed.
*3. At least one method blank will be analyzed.
*4. One calibration standard will be run and a daily response factor will be within 25 percent of initial calibration response factor for selected calibration check compounds.
*5. Instrument tuning protocols will be performed and be within criteria prior to analysis.

9.3 GC/HPLC MINIMUM QC

For GC-nonvolatiles an high-pressure liquid chromatography (HPLC) analyses of 5 to 20 samples, the following minimum requirements will apply:

1. All samples spiked with surrogate (dibutyl-chlorendate) for organochlorine pesticides and PCBs analysis only.
2. At least one spike in sample matrix with selected analytes will be analyzed.
3. At least one duplicate spike in sample matrix with selected analytes will be analyzed.
*4. At least one QC check sample (a spike with selected analytes into a blank matrix) will be analyzed. (Note that a surrogate will be added for PCBs only).

*5. At least one method blank will be analyzed.

*6. At least five standards will be run for a standard curve.

*7. Correlation coefficient of the standard curve will be equal to or greater than 0.995.

*8. Samples will be within concentration range of standards.

9. Midlevel calibration standard repeated at the middle of run (if run covered more than a 12-hour period) and at the end of run, and response of the control analytes must be within 20 percent of initial response.

10. Detection limits for each parameter will be determined and checked to ensure they meet limits specified for the field group.

Note: An MS and MSD may not be performed for every analytical batch but will be performed at a rate of one MS and one MSD per 20 environmental samples.

For GC-nonvolatiles and HPLC analyses of less than 5 samples, the following minimum requirements will apply:

1. All samples spiked with surrogate (dibutyl-chlorendate) for organochlorine pesticides and PCBs only.

*2. At least one QC check sample (a spike with selected analytes into a blank matrix) will be analyzed. (Note that a surrogate will be added for organochlorine pesticides and PCBs only).

3. At least one spike in the sample matrix for methods with no surrogates.

*4. At least one method blank will be analyzed.

*5. At least five standards will be run for a standard curve.

*6. Correlation coefficient of the standard curve will be equal to or greater than 0.995.

*7. Samples will be within concentration range of standards.

8. Mid-level calibration standard repeated at the end of run and response of control analytes must be within 20 percent of initial response.

9. Detection limits for each parameter will be determined and checked to ensure they meet limits specified for the field group.

For GC-volatiles analyses of 5 to 20 samples, the following minimum requirements will apply:

1. At least one spike in sample matrix with selected analytes will be analyzed.
2. At least one duplicate spike in sample matrix with selected analytes will be analyzed.

*3. At least one QC check sample spike in blank matrix will be analyzed (spiked with selected analytes).

*4. At least one method blank will be analyzed.

*5. At least five standards will be run for a standard curve.

*6. Correlation coefficient of the standard curve will be equal to or greater than 0.995.

*7. Samples will be within concentration range of standards.

8. Midlevel calibration standard repeated during the run and response of control analytes must be within 20 percent of initial response.

9. Detection limits for each parameter will be determined and checked to ensure they meet limits specified for the field group.

Note: An MS and MSD may not be performed for every analytical batch but will be performed at a rate of one MS and one MSD per 20 environmental samples.

For GC-volatiles analyses of less than five samples, the following minimum requirements will apply:

*1. At least one QC check sample spike in blank matrix will be analyzed (spiked with selected analytes).
2. At least one sample matrix spike.
*3. At least one method blank will be analyzed.
*4. At least five standards will be run for a standard curve.
*5. Correlation coefficient will be equal to or greater than 0.995.
*6. Samples will be within concentration range of standards.
7. Midlevel calibration standard repeated during the run and response of control analytes must be within 20 percent of initial response.
8. Detection limits for each parameter will be determined and checked to ensure they meet limits specified for the field group.

9.4 TRACE METALS--ATOMIC ABSORPTION AND ICAP SPECTROSCOPY MINIMUM QC

For each lot of 5 to 20 samples analyzed by AAS, the following QC checks will apply:

1. At least one spike in sample matrix will be analyzed.
2. At least one duplicate spike in sample matrix will be analyzed.

*3. At least one QC check sample spike in blank matrix will be analyzed (spiked with all analytes).

*4. At least one method blank will be analyzed.

*5. At least five standards will be analyzed for a standard curve.

*6. Correlation coefficient of the standard curve will be equal to or greater than 0.995.

*7. Samples will be within concentration range of the standards.

8. A midlevel standard will be reanalyzed at the middle of the run (if there are more than 10 samples) and at the end of a run, and its response will be within 20 percent of true value.
9. At least one filter blank will be analyzed with all filtered samples.
10. Detection limits for analytes will be determined and checked to ensure they meet limits specified for the field group.

Note: An MS and MSD may not be performed for every analytical batch but will be performed at a rate of one MS and one MSD per 20 environmental samples.

For each lot of 5 to 20 samples analyzed by ICAP, the following QC checks will apply:

1. At least one spike in sample matrix with selected analytes will be analyzed.

2. At least one duplicate spike in sample matrix with selected analytes will be analyzed.
*3. At least one QC check sample spike in blank matrix will be analyzed (spiked with selected analytes).
*4. At least one method blank will be analyzed.
5. At least one interference check standard will be analyzed.
*6. At least one calibration standard will be analyzed.
*7. Samples will be within concentration range of the instrument.
8. A calibration standard will be reanalyzed at the middle of the run (if there are more than 10 samples) and at the end of a run, and the responses of the calibration check analytes will be within 20 percent of true values.
9. At least one filter blank will be analyzed with all filtered samples.
10. Detection limits for analytes will be determined and checked to ensure they meet limits specified for the field group.

Note: An MS and MSD may not be performed for every analytical batch but will be performed at a rate of one MS and one MSD per 20 environmental samples.

For less than five samples analyzed by AAS, the following QC checks will apply:

*1. At least one QC check sample spike in blank matrix will be analyzed (spiked with all analytes).
2. At least one sample matrix spike.
*3. At least one method blank will be analyzed.

*4. At least three standards will be analyzed for a standard curve.

*5. Correlation coefficient of the standard curve will be equal to or greater than 0.995.

*6. Samples will be within concentration range of the standards.

7. A midlevel standard reanalyzed at the end of a run and its response will be within 20 percent of true value.

8. At least one filter blank will be analyzed with all filtered samples.

9. Detection limits for analytes will be determined and checked to ensure they meet limits specified for the field group.

For each lot less than five samples analyzed by ICAP, the following QC checks will apply:

*1. At least one QC check sample spike in blank matrix will be analyzed (spiked with selected analytes).

2. At least one sample matrix spike.

*3. At least one method blank will be analyzed.

*4. At least one interference check standard will be analyzed.

*5. At least one calibration standard will be analyzed.

*6. Samples will be within concentration range of the instrument.

7. A standard will be reanalyzed at the end of a run, and the analytes will be within 20 percent of true value.

8. At least one filter blank will be analyzed with all filtered samples.

9. Detection limits for analytes will be determined and checked to ensure they meet limits specified for the field group.

9.5 QC OUTLIERS

QC data that exceed criteria (in either value or frequency) either result in reanalysis (when appropriate and/or possible) or will be summarized in a QC Outlier Summary as part of the data deliverable according to EPA validation SOPs. These will include MBs, RPs, blank spikes, and blank SPs, sample matrix spikes and SPMs, surrogates, and holding times as applicable to the methods.

10.0 PERFORMANCE AND SYSTEM AUDITS

Two types of audit procedures will be used to assess and document performance of project staff: system audits and performance audits. These are performed at frequent intervals under the direction of the project QA supervisor. These audits form one of the bases for corrective action requirements and constitute a permanent record of the conformance of measurement systems to QA requirements.

System audits are inspections of training status, records, QC data, calibrations, and conformance to SOPs without the analysis of check samples. System audits will be performed periodically on laboratory, office, and field operations.

The system audit protocol is summarized as follows:

1. Field Operations--The project QA officer will periodically check:
    a. Field notebooks, logsheets, bench sheets, tracking forms, and report any inconsistencies and/or omissions;
    b. Field sampling plans; and
    c. Sample site briefing package.
2. Laboratory Operations--The project QA officer will periodically check:
    a. Parameter and/or laboratory notebooks;
    b. Instrument logbooks;
    c. Sample log-in, dispensing, and labeling for analysis; and
    d. Updating of QC criteria for spike recoveries.

In addition, the project QA officer will monitor analyses to assure complete adherence to approved analytical methods.

3. Final Reports--The project QA officer will review all final reports and deliverables to the client.

Performance audits may include conductance of field audits (currently not scheduled for this project) and evaluation and analysis of check samples. Field audits may be performed on the project to ensure that sampling procedures are performed according to the QA plan. EPA will have an oversite contractor onsite during field activities. EPA personnel will be onsite to conduct field audits, as time allows.

Peer review of all deliverable reports and data supporting this project will be performed by technically qualified individuals from each major discipline represented in the deliverable. Figure 10.0-1 is a sample Deliverable Review Sheet to be used in this project.

The contractor laboratory is participating in the following proficiency programs:

1. National Institute of Occupational Safety and Health (NIOSH) through its Proficiency Analytical Testing Program (PAT),
2. NIST proficiency testing program under the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos,
3. EPA Water Pollution and Water Supply proficiency programs,
4. EPA Radiochemistry Intercomparison Study and Blind Performance Samples,

C-SEADRIFS.4/QAPP-10.3
Section No. 10
Revision No. 1
Date 04/29/91
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DELIVERABLE REVIEW SHEET

SHORT TITLE ______________________
PROPOSAL/PROJECT NUMBER ______________________
PROPOSAL/PROJECT MANAGER ______________________
AUTHOR(S) ______________________

CLIENT ______________________
DATE/TIME TO LEAVE ESE ______________________
CLIENT DUE DATE ______________________
DOCUMENT COORDINATOR ______________________

REVIEW CHECKLIST
REVIEWER SHOULD PLACE CHECK UNDER APPROPRIATE REVIEW CATEGORY
D—DRAFT F—FINAL

		REQUIRED REVIEW								OPTIONAL REVIEW BY AUTHOR OR OTHER QUALIFIED INDIVIDUAL							
		① Organization/ Presentation Reviewed		① Technical Approach and Conclusions Reviewed		② Proposal Costs Reviewed (If Applicable)		③ Laboratory Data Checked (If Applicable)		Tables Figures Text Data Checked		Critical Calculations Checked		Computer Models Programs Verified		Field Measurements Checked	
REVIEWER'S INITIALS	DOCUMENT/SECTION	D	F	D	F	D	F	D	F	D	F	D	F	D	F	D	F
	Document																
	[illegible]																

APPROVALS ______________ ______________ ______________ (as appropriate)

AUDITED BY ______________________ (QA Manager or designate)

REMARKS ______________________

① Required review by at least one reviewer other than author in these categories
② Required F & A review for proposals
③ Required check by laboratory coordinator or other individual for laboratory data reports

ORIGINAL TO PROJECT MANAGER—COPY TO QA

83/345-1M

Figure 10.0-1
DELIVERABLE REVIEW SHEET

SOURCE: ESE.

U.S. ARMY CORPS
OF ENGINEERS
HUNTSVILLE, ALABAMA

5. State of New York through its Environmental Laboratory Approval Program (ELAP) for public drinking water and environmental samples categories,
6. State of California Department of Health, and
7. USACE.

The licenses, accreditations, and certifications held by the analytical laboratory are the following:

1. American Industrial Hygiene Association (AIHA),
2. NIST for bulk asbestos,
3. State of Florida Department of Health and Rehabilitative Services (HRS) for environmental and drinking water analyses,
4. New York Department of Health,
5. New Jersey Department of Environmental Protection,
6. South Carolina Department of Health and Environmental Control,
7. EPA Contract Laboratory Program (CLP)--both organics and inorganics,
8. State of Florida DHRS for Radiochemistry,
9. USACE,
10. U.S. Navy,
11. State of California Department of Health, and
12. State of Tennessee Department of Health and Environment.

11.0 PREVENTIVE MAINTENANCE

To minimize the occurrence of instrument failure and other system malfunction, a preventive maintenance program for field and laboratory instruments was implemented. The preventive maintenance performed for each major piece of field and analytical equipment is listed in the following sections.

11.1 SALINITY/CONDUCTIVITY/TEMPERATURE METER AND PROBE

Preventive maintenance protocol for the Yellow Springs Instruments (YSI) meter and probe involves red-lining the meter to check the condition of the batteries. Probe preventive maintenance involves verification of temperature readings using a mercury thermometer and verifying that the probe does not need cleaning. A fouled probe is discovered by measuring a standard on the X100 and X10 ranges, then depressing the CELL TEST button. If the meter reading falls more than 2 percent, the probe is fouled and will be cleaned. Replacement membranes will be available.

11.2 pH METERS AND COMBINATION pH ELECTRODES

Preventive maintenance for the pH meter and electrodes primarily involves the proper care of the electrode. Electrodes are stored in a 1:1 solution of pH = 7 buffer and deionized water. The hole to add the internal filling solution must be plugged at all times to prevent evaporation of the solution when the electrode is not in use. When the internal filling solution has dried out, the chamber will be rinsed with deionized water before replacing the filling solution. This step prevents clogging of the probe and poor (<100 percent) slope adjustments when calibrating the electrode. Whenever slope readings are deteriorating or a low ionic strength sample gives erroneous readings, the electrode will be treated with 1 normal (N) potassium hydroxide (KOH) and 1N HCl.

Spare parts such as a replacement probe and fresh buffer solutions will be available for the system at all times.

11.3 CONDUCTIVITY BRIDGE AND CELL

Preventive maintenance for the Beckman conductivity bridge involves keeping the rechargeable battery fully charged. Care for the conductivity cell involves storage in deionized water. Replatinization of the conductivity cell is performed according to Standard Methods only when the cell response becomes erratic, a sharp endpoint cannot be obtained, or when inspection shows that any of the platinum black has flaked off.

11.4 GC/HPLC

GC septa will be replaced as needed. Frequent injections will require replacement daily. To prevent contaminants from reaching the detector or columns, carrier and detector gases will be changed when the supply of gas in the cylinder falls below 100 pounds per square inch (psi). Molecular sieves and oxygen traps used in the gas lines will be replaced regularly. GC detectors will be periodically removed and cleaned to remove accumulations which can affect instrument performance.

Instrument calibration curves will be monitored and compared to historical performance. Excessive noise, low response, and poor precision indicate a dirty detector; more frequent detector cleanings may be required. Spare columns, packing materials, instrument cables, and printed circuit boards will be available in case of breakage or malfunction to minimize instrument downtime.

11.5 ANALYTICAL BALANCE

Analytical balances will be cleaned and calibrated semiannually by manufacturers' representatives. The accuracy of analytical balances will be checked daily using standard weights. It is imperative that the balance logbooks be maintained daily.

11.6 ATOMIC ABSORPTION

Routine preventative maintenance on the atomic absorption systems primarily consists of keeping components clean (to prevent acid corrosion), replacing expendables, and monitoring instrument response. Instrumental response is compared to historical data and the manufacturers performance specifications to verify instrument sensitivity. Sample cells (e.g., graphite furnace, hydride cell, and burner/spray chamber) are cleaned periodically to prevent serious contamination. Sufficient stock of spare parts and expendables is maintained at all times to ensure continuous operation. Manufacturers' service representatives inspect instrument optics and other components at least once per year.

11.7 ICAP

Routine maintenance on the ICAP system by manufacturers' representatives is performed annually. In addition, a quarterly service contract is maintained on the minicomputer. Periodically, the analyst will dismantle, clean, and reassemble the torch and nebulizer to prevent serious sensitivity problems. Calibration with selected standards will be performed daily to ensure that the instrument performance has not deteriorated. Failure to achieve standardization could require cleaning, including changing the tubing of the sample delivery system.

Spare parts are available for the system components most likely to experience failure.

11.8 GC/MS

All routine preventive maintenance performed for gas chromatographs also will be performed for the GC/MS equipment. In addition, the ionizing source will be periodically dismantled, thoroughly cleaned, and reassembled to prevent serious sensitivity problems. Calibration with selected mass standards will be performed daily to ensure that instrument performance has not deteriorated. The failure to achieve calibration will require source cleaning. Spare parts and equipment will be available for the system components most likely to experience failure. Routine maintenance by the manufacturers' representatives will be performed annually.

12.0 CALCULATION OF DATA QUALITY INDICATORS

12.1 PRECISION

Precision is a measure of agreement among measurements performed using the same test procedure. Precision will be assessed for applicable parameters by calculating the RPD of two duplicate spike samples as follows:

$$RPD = \frac{R_1 - R_2}{(R_1 + R_2)/2} \times 100$$

where: R_1 and R_2 = concentration of Replicate Spikes 1 and 2, respectively.

This calculated RPD value is compared to the maximum value considered acceptable for this project (refer to Section 7.0). The values given in Section 7.0 are precision objectives for this project and are based on EPA criteria (for water samples) or historical laboratory data from replicate measurements. These maximum values represent the upper control limit for the analysis. Since an absolute value is used for the difference between R_1 and R_2, there is no lower control limit.

12.2 ACCURACY

Accuracy is the degree of agreement between a sample's target value (known concentration) and the actual measured value. Accuracy for this project is measured by calculating the percent recovery (R) of known levels of spike compounds into appropriate sample matrices. Percent recovery is calculated as follows:

$$R = \frac{100 \times [(\text{Spike Sample Con.})(\text{Sample + Spike Vol.}) - (\text{Sample Vol.})\ (\text{Sample Conc.})]}{(\text{Spike Conc.})\ (\text{Spike Volume})}$$

The following equation is an example of how R would be calculated:

1 mL of spike with concentration of 100 ppb
10 mL of sample with concentration of 10 ppb
spiked sample concentration of 20 ppb

$$R = 100 \times \frac{(20)(11) - (10)(10)}{(1)(100)} = 100 \times \frac{120}{100} = 120 \text{ percent}$$

Each calculated R value is compared to the accuracy criteria listed in Section 4.3. The accuracy ranges provided in Section 4.3 are based on the mean accuracy measured or expected (based on EPA data) for each parameter plus or minus 3 standard deviations of the mean.

If RPD or R values do not meet acceptance criteria as specified in Section 4.3, results reported in all samples processed as part of the same set must be labeled as suspect, and the samples may need to be repeated. The project QA supervisor will be notified, and the necessary corrective action implemented.

12.3 COMPLETENESS

Completeness is defined by EPA as "a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions" (EPA, 1980). A completeness of at least 90 percent for each parameter is the objective for this project. Following completion of the analytical testing, percent completeness will be calculated as follows:

$$\begin{array}{l}\text{Completeness (\%)}\\ \text{for parameter y}\end{array} = \frac{\text{\# of valid y values reported}}{\text{\# of samples collected for analysis of y}} \times 100$$

If completeness is less than 90 percent for any parameter(s), the principal engineer will be notified immediately. The principal engineer is responsible for determining if resampling will be necessary to meet project objectives and will inform the QA supervisor and analytical task manager of the decision.

12.4 DETECTION LIMITS

The detection limit of the method is the lowest sample concentration which can be reliably recovered and measured in the sample matrix with a low background level. To determine absolute method detection limits (MDL), statistically based procedures are available from EPA methods.

The detection limit is defined as follows for all measurements:

$$\text{MDL} = t_{(n-1,\ 1-\alpha\ =\ 0.99)} \times S$$

where: MDL = method detection limit

S = standard deviation of the replicate analyses

$t_{(n-1,1-\alpha\ =\ 0.99)}$ =Students' t-value appropriate to a 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom

13.0 CORRECTIVE ACTIONS

Corrective action is necessary when any measurement system fails to follow this QA plan. Items which may need corrective action range from a minor problem of a field team member failing to sign a field form to a major problem of an analyst using an improper analytical method. For this reason, corrective action protocols must be flexible.

In general, items needing corrective action fall into three correction categories: short-term, long-term, and QC; each requires different action.

13.1 SHORT-TERM CORRECTIVE ACTIONS

These actions consist of minor and major problems which can be corrected immediately. Examples include failure to date or sign a field form, incorrectly preserving sample, and errors in data entry. Corrective action is initiated by verbally calling attention to the problem and then followed by a written notification.

13.2 LONG-TERM CORRECTIVE ACTIONS

Actions consist of minor and major problems which require a series of actions to resolve the problem. The actions to be taken are coordinated by the QA supervisor, and a QA corrective action and routing form (see Figure 13.2-1) is used to track the action. An example of this type of corrective action is as follows:

QUALITY ASSURANCE CORRECTIVE ACTION REQUEST AND ROUTING FORM

1. IDENTIFICATION OF A PROBLEM:

CA# ______

Originator: ______ Date: ______

Nature of Problem: ______

2. DETERMINATION OF REQUIRED ACTION:

Responsibility Assigned to: ______ Due Date: ______

Recommended Action: ______

3. IMPLEMENTATION OF REQUIRED ACTION:

Responsibility Assigned to: ______ Due Date: ______

4. ASSURING EFFECTIVENESS OF ACTION:

Responsibility Assigned to: ______ Due Date: ______

Procedure to Assure Effectiveness: ______

Figure 13.2-1
QUALITY ASSURANCE CORRECTIVE ACTION REQUEST AND ROUTING FORM

SOURCE: ESE.

**U.S. ARMY CORPS
OF ENGINEERS
HUNTSVILLE, ALABAMA**

Problem--A field team member fails to calibrate an HNU meter in the field prior to use.

Corrective Action--The problem is identified by the person originating the corrective action, responsibility is assigned to an appropriate person (may be someone other than person failing to calibrate the meter), an appropriate standard gas is selected, the gas is ordered, receipt of the shipment gas is verified that the order is filled properly, training of field members in the use of the gas is required, and the HNU is calibrated in the field during the next field trip. The QA supervisor audits this process to ensure that it is completed in an expeditious manner.

13.3 QC CORRECTIVE ACTIONS

These actions consist of corrective action following a failure to meet QC criteria specified in this QA plan and the analytical methods. Actions taken consist of two types: (1) those resolved within each analytical department, and (2) those resolved outside the department. Examples outlining the differences between these two types of corrective action are as follows:

QC Failure	Department Action
WITHIN DEPARTMENT ACTION	
Standard curve correlation coefficient is less than 0.995	Analyst investigates problem and reruns curve and samples
Sample response fails outside calibration curve	Analyst dilutes sample into range of curve

OUTSIDE-DEPARTMENT ACTION

Holding times are exceeded	Notify project manager and QA supervisor; resampling may be necessary after discussion with QA, the project manager, and USACE

QC Failure	Department Action
OUTSIDE-DEPARTMENT ACTION, continued	
Percent recoveries fail criteria (refer to Section 4.0) and sample holding times have expired	Notify project manager and QA supervisor; resampling may be necessary after discussion with QA, the project manager, and USACE

Corrective actions may be initiated for each measurement system (individual disciplines) by subproject managers or other responsible individuals such as the department manager or division manager. The project QA officer, along with the Principal Engineer, will be responsible for approving the corrective action in the same fashion as if it had been initiated as a project QA function. The USACE Huntsville Division will be notified in writing within 48 hours of any significant QA/QC problem.

14.0 QA REPORTS TO MANAGEMENT

Activities and actions to be reported will include:

1. An assessment of the project's status in relation to the progress of proposed time table,
2. Results of ongoing performance and system audits, and
3. Data quality review and significant QA problems with proposed corrective action procedures.

The project QA officer reports the results of these activities to the project manager and the affected line managers.

ATTACHMENT A
DATA REPORTING FORMS

SECTION IV

DATA REPORTING FORMS

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ______________________ Contract: ___________

Lab Code: _______ Case No.: _____ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) _____ Lab Sample ID: ____________

Sample wt/vol: ______ (g/mL) _____ Lab File ID: ____________

Level: (low/med) _____ Date Received: __________

% Moisture: not dec. _____ Date Analyzed: __________

GC Column: ________ ID: _____ (mm) Dilution Factor: ________

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: _____ (uL)

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ______	Q
74-87-3	Chloromethane		
74-83-9	Bromomethane		
75-01-4	Vinyl Chloride		
75-00-3	Chloroethane		
75-09-2	Methylene Chloride		
67-64-1	Acetone		
75-15-0	Carbon Disulfide		
75-35-4	1,1-Dichloroethene		
75-34-3	1,1-Dichloroethane		
540-59-0	1,2-Dichloroethene (total)		
67-66-3	Chloroform		
107-06-2	1,2-Dichloroethane		
78-93-3	2-Butanone		
71-55-6	1,1,1-Trichloroethane		
56-23-5	Carbon Tetrachloride		
75-27-4	Bromodichloromethane		
78-87-5	1,2-Dichloropropane		
10061-01-5	cis-1,3-Dichloropropene		
79-01-6	Trichloroethene		
124-48-1	Dibromochloromethane		
79-00-5	1,1,2-Trichloroethane		
71-43-2	Benzene		
10061-02-6	trans-1,3-Dichloropropene		
75-25-2	Bromoform		
108-10-1	4-Methyl-2-Pentanone		
591-78-6	2-Hexanone		
127-18-4	Tetrachloroethene		
79-34-5	1,1,2,2-Tetrachloroethane		
108-88-3	Toluene		
108-90-7	Chlorobenzene		
100-41-4	Ethylbenzene		
100-42-5	Styrene		
1330-20-7	Xylene (total)		

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ____________ Contract: ________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) ______ Lab Sample ID: ________

Sample wt/vol: ______ (g/mL) ______ Lab File ID: ________

Level: (low/med) ______ Date Received: ________

% Moisture: ______ decanted: (Y/N) ___ Date Extracted: ________

Concentrated Extract Volume: ______ (uL) Date Analyzed: ________

Injection Volume: ______ (uL) Dilution Factor: ______

GPC Cleanup: (Y/N) ___ pH: ____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg)______	Q
108-95-2	Phenol		
111-44-4	bis(2-Chloroethyl)ether		
95-57-8	2-Chlorophenol		
541-73-1	1,3-Dichlorobenzene		
106-46-7	1,4-Dichlorobenzene		
95-50-1	1,2-Dichlorobenzene		
95-48-7	2-Methylphenol		
108-60-1	2,2'-oxybis(1-Chloropropane)		
106-44-5	4-Methylphenol		
621-64-7	N-Nitroso-di-n-propylamine		
67-72-1	Hexachloroethane		
98-95-3	Nitrobenzene		
78-59-1	Isophorone		
88-75-5	2-Nitrophenol		
105-67-9	2,4-Dimethylphenol		
111-91-1	bis(2-Chloroethoxy)methane		
120-83-2	2,4-Dichlorophenol		
120-82-1	1,2,4-Trichlorobenzene		
91-20-3	Naphthalene		
106-47-8	4-Chloroaniline		
87-68-3	Hexachlorobutadiene		
59-50-7	4-Chloro-3-methylphenol		
91-57-6	2-Methylnaphthalene		
77-47-4	Hexachlorocyclopentadiene		
88-06-2	2,4,6-Trichlorophenol		
95-95-4	2,4,5-Trichlorophenol		
91-58-7	2-Chloronaphthalene		
88-74-4	2-Nitroaniline		
131-11-3	Dimethylphthalate		
208-96-8	Acenaphthylene		
606-20-2	2,6-Dinitrotoluene		
99-09-2	3-Nitroaniline		
83-32-9	Acenaphthene		

1C

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Matrix: (soil/water) ______ Lab Sample ID: ______________

Sample wt/vol: _______ (g/mL) ____ Lab File ID: ______________

Level: (low/med) _____ Date Received: __________

% Moisture: ______ decanted: (Y/N) ___ Date Extracted: __________

Concentrated Extract Volume: _______ (uL) Date Analyzed: __________

Injection Volume: _____ (uL) Dilution Factor: ________

GPC Cleanup: (Y/N) ___ pH: ____

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) _______	Q
51-28-5	2,4-Dinitrophenol		
100-02-7	4-Nitrophenol		
132-64-9	Dibenzofuran		
121-14-2	2,4-Dinitrotoluene		
84-66-2	Diethylphthalate		
7005-72-3	4-Chlorophenyl-phenylether		
86-73-7	Fluorene		
100-01-6	4-Nitroaniline		
534-52-1	4,6-Dinitro-2-methylphenol		
86-30-6	N-Nitrosodiphenylamine (1)		
101-55-3	4-Bromophenyl-phenylether		
118-74-1	Hexachlorobenzene		
87-86-5	Pentachlorophenol		
85-01-8	Phenanthrene		
120-12-7	Anthracene		
86-74-8	Carbazole		
84-74-2	Di-n-butylphthalate		
206-44-0	Fluoranthene		
129-00-0	Pyrene		
85-68-7	Butylbenzylphthalate		
91-94-1	3,3'-Dichlorobenzidine		
56-55-3	Benzo(a)anthracene		
218-01-9	Chrysene		
117-81-7	bis(2-Ethylhexyl)phthalate		
117-84-0	Di-n-octylphthalate		
205-99-2	Benzo(b)fluoranthene		
207-08-9	Benzo(k)fluoranthene		
50-32-8	Benzo(a)pyrene		
193-39-5	Indeno(1,2,3-cd)pyrene		
53-70-3	Dibenz(a,h)anthracene		
191-24-2	Benzo(g,h,i)perylene		

(1) - Cannot be separated from Diphenylamine

1D

PESTICIDE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

Lab Name: ____________ Contract: ____________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) ______ Lab Sample ID: ______

Sample wt/vol: ______ (g/mL) ______ Lab File ID: ______

% Moisture: ______ decanted: (Y/N) ___ Date Received: ______

Extraction: (SepF/Cont/Sonc) ______ Date Extracted: ______

Concentrated Extract Volume: ______ (uL) Date Analyzed: ______

Injection Volume: ______ (uL) Dilution Factor: ______

GPC Cleanup: (Y/N) ___ pH: ____ Sulfur Cleanup: (Y/N) ___

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) ______	Q
319-84-6	alpha-BHC		
319-85-7	beta-BHC		
319-86-8	delta-BHC		
58-89-9	gamma-BHC (Lindane)		
76-44-8	Heptachlor		
309-00-2	Aldrin		
1024-57-3	Heptachlor epoxide		
959-98-8	Endosulfan I		
60-57-1	Dieldrin		
72-55-9	4,4'-DDE		
72-20-8	Endrin		
33213-65-9	Endosulfan II		
72-54-8	4,4'-DDD		
1031-07-8	Endosulfan sulfate		
50-29-3	4,4'-DDT		
72-43-5	Methoxychlor		
53494-70-5	Endrin ketone		
7421-36-3	Endrin aldehyde		
5103-71-9	alpha-Chlordane		
5103-74-2	gamma-Chlordane		
8001-35-2	Toxaphene		
12674-11-2	Aroclor-1016		
11104-28-2	Aroclor-1221		
11141-16-5	Aroclor-1232		
53469-21-9	Aroclor-1242		
12672-29-6	Aroclor-1248		
11097-69-1	Aroclor-1254		
11096-82-5	Aroclor-1260		

FORM I PEST 3/90

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: ______________ Contract: ______________

Lab Code: ________ Case No.: ________ SAS No.: ________ SDG No.: ________

Matrix: (soil/water) ______ Lab Sample ID: ______________

Sample wt/vol: ________ (g/mL) ____ Lab File ID: ______________

Level: (low/med) ______ Date Received: ______________

% Moisture: not dec. ______ Date Analyzed: ______________

GC Column: ________ ID: ______ (mm) Dilution Factor: ______________

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

Number TICs found: ______

CONCENTRATION UNITS:
(ug/L or ug/Kg) ______

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

FORM I VOA-TIC 3/90

1F

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

EPA SAMPLE NO.

Lab Name: ____________ Contract: ____________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix: (soil/water) ______ Lab Sample ID: ____________

Sample wt/vol: ______ (g/mL) ______ Lab File ID: ____________

Level: (low/med) ______ Date Received: ____________

% Moisture: ______ decanted: (Y/N) ______ Date Extracted: ____________

Concentrated Extract Volume: ______ (uL) Date Analyzed: ____________

Injection Volume: ______ (uL) Dilution Factor: ______

GPC Cleanup: (Y/N) ______ pH: ______

Number TICs found: ______

CONCENTRATION UNITS:
(ug/L or ug/Kg) ______

CAS NUMBER	COMPOUND NAME	RT	EST. CONC.	Q
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				
17.				
18.				
19.				
20.				
21.				
22.				
23.				
24.				
25.				
26.				
27.				
28.				
29.				
30.				

2A

WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

	EPA SAMPLE NO.	SMC1 (TOL) #	SMC2 (BFB) #	SMC3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

		QC LIMITS
SMC1 (TOL)	= Toluene-d8	(88-110)
SMC2 (BFB)	= Bromofluorobenzene	(86-115)
SMC3 (DCE)	= 1,2-Dichloroethane-d4	(76-114)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

page __ of __

FORM II VOA-1 3/90

2B
SOIL VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: ______________________________ Contract: ____________

Lab Code: _________ Case No.: _______ SAS No.: ________ SDG No.: ________

Level:(low/med) _____

	EPA SAMPLE NO.	SMC1 (TOL) #	SMC2 (BFB) #	SMC3 (DCE) #	OTHER	TOT OUT
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

	QC LIMITS
SMC1 (TOL) = Toluene-d8	(84-138)
SMC2 (BFB) = Bromofluorobenzene	(59-113)
SMC3 (DCE) = 1,2-Dichloroethane-d4	(70-121)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

page __ of __

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: ______________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	S7 (2CP) #	S8 (DCB) #	TOT OUT
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

		QC LIMITS	
S1 (NBZ)	= Nitrobenzene-d5	(35-114)	
S2 (FBP)	= 2-Fluorobiphenyl	(43-116)	
S3 (TPH)	= Terphenyl-d14	(33-141)	
S4 (PHL)	= Phenol-d5	(10-110)	
S5 (2FP)	= 2-Fluorophenol	(21-110)	
S6 (TBP)	= 2,4,6-Tribromophenol	(10-123)	
S7 (2CP)	= 2-Chlorophenol-d4	(33-110)	(advisory)
S8 (DCB)	= 1,2-Dichlorobenzene-d4	(16-110)	(advisory)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogate diluted out

page __ of __

FORM II SV-1 3/90

2D
SOIL SEMIVOLATILE SURROGATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Level:(low/med) _____

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	S4 (PHL) #	S5 (2FP) #	S6 (TBP) #	S7 (2CP) #	S8 (DCB) #	TOT OUT
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

		QC LIMITS	
S1 (NBZ)	= Nitrobenzene-d5	(23-120)	
S2 (FBP)	= 2-Fluorobiphenyl	(30-115)	
S3 (TPH)	= Terphenyl-d14	(18-137)	
S4 (PHL)	= Phenol-d5	(24-113)	
S5 (2FP)	= 2-Fluorophenol	(25-121)	
S6 (TBP)	= 2,4,6-Tribromophenol	(19-122)	
S7 (2CP)	= 2-Chlorophenol-d4	(20-130)	(advisory)
S8 (DCB)	= 1,2-Dichlorobenzene-d4	(20-130)	(advisory)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogate diluted out

page __ of __

2E
WATER PESTICIDE SURROGATE RECOVERY

Lab Name: ______________________________ Contract: ____________

Lab Code: _________ Case No.: _______ SAS No.: ________ SDG No.: ________

GC Column(1): ___________ ID: ______(mm) GC Column(2): ___________ ID: ______(mm)

	EPA SAMPLE NO.	TCX 1 %REC #	TCX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #	OTHER (1)	OTHER (2)	TOT OUT
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

	ADVISORY QC LIMITS
TCX = Tetrachloro-m-xylene	(60-150)
DCB = Decachlorobiphenyl	(60-150)

\# Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

page __ of __

2F
SOIL PESTICIDE SURROGATE RECOVERY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

GC Column(1): __________ ID: _____(mm) GC Column(2): __________ ID: _____(mm)

	EPA SAMPLE NO.	TCX 1 %REC #	TCX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #	OTHER (1)	OTHER (2)	TOT OUT
01								
02								
03								
04								
05								
06								
07								
08								
09								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

	ADVISORY QC LIMITS
TCX = Tetrachloro-m-xylene	(60-150)
DCB = Decachlorobiphenyl	(60-150)

\# Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

page __ of __

3A

WATER VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: ____________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene					61-145
Trichloroethene					71-120
Benzene					76-127
Toluene					76-125
Chlorobenzene					75-130

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					14	61-145
Trichloroethene					14	71-120
Benzene					11	76-127
Toluene					13	76-125
Chlorobenzene					13	75-130

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ________________________________

3B

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: ____________ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
1,1-Dichloroethene					59-172
Trichloroethene					62-137
Benzene					66-142
Toluene					59-139
Chlorobenzene					60-133

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
1,1-Dichloroethene					22	59-172
Trichloroethene					24	62-137
Benzene					21	66-142
Toluene					21	59-139
Chlorobenzene					21	60-133

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____

FORM III VOA-2 3/90

3C

WATER SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: ____________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
Phenol					12-110
2-Chlorophenol					27-123
1,4-Dichlorobenzene					36- 97
N-Nitroso-di-n-prop.(1)					41-116
1,2,4-Trichlorobenzene					39- 98
4-Chloro-3-methylphenol					23- 97
Acenaphthene					46-118
4-Nitrophenol					10- 80
2,4-Dinitrotoluene					24- 96
Pentachlorophenol					9-103
Pyrene					26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					42	12-110
2-Chlorophenol					40	27-123
1,4-Dichlorobenzene					28	36- 97
N-Nitroso-di-n-prop.(1)					38	41-116
1,2,4-Trichlorobenzene					28	39- 98
4-Chloro-3-methylphenol					42	23- 97
Acenaphthene					31	46-118
4-Nitrophenol					50	10- 80
2,4-Dinitrotoluene					38	24- 96
Pentachlorophenol					50	9-103
Pyrene					31	26-127

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____
____

FORM III SV-1 3/90

3D

SOIL SEMIVOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: ___________ Level:(low/med) _____

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
Phenol					26- 90
2-Chlorophenol					25-102
1,4-Dichlorobenzene					28-104
N-Nitroso-di-n-prop.(1)					41-126
1,2,4-Trichlorobenzene					38-107
4-Chloro-3-methylphenol					26-103
Acenaphthene					31-137
4-Nitrophenol					11-114
2,4-Dinitrotoluene					28- 89
Pentachlorophenol					17-109
Pyrene					35-142

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Phenol					35	26- 90
2-Chlorophenol					50	25-102
1,4-Dichlorobenzene					27	28-104
N-Nitroso-di-n-prop.(1)					38	41-126
1,2,4-Trichlorobenzene					23	38-107
4-Chloro-3-methylphenol					33	26-103
Acenaphthene					19	31-137
4-Nitrophenol					50	11-114
2,4-Dinitrotoluene					47	28- 89
Pentachlorophenol					47	17-109
Pyrene					36	35-142

(1) N-Nitroso-di-n-propylamine

\# Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____
____

3E

WATER PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Matrix Spike - EPA Sample No.: __________

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC. LIMITS REC.
gamma-BHC (Lindane)					56-123
Heptachlor					40-131
Aldrin					40-120
Dieldrin					52-126
Endrin					56-121
4,4'-DDT					38-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)					15	56-123
Heptachlor					20	40-131
Aldrin					22	40-120
Dieldrin					18	52-126
Endrin					21	56-121
4,4'-DDT					27	38-127

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____

3F

SOIL PESTICIDE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Matrix Spike - EPA Sample No.: ___________

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	MS CONCENTRATION (ug/Kg)	MS % REC #	QC. LIMITS REC.
gamma-BHC (Lindane)					46-127
Heptachlor					35-130
Aldrin					34-132
Dieldrin					31-134
Endrin					42-139
4,4'-DDT					23-134

COMPOUND	SPIKE ADDED (ug/Kg)	MSD CONCENTRATION (ug/Kg)	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
gamma-BHC (Lindane)					50	46-127
Heptachlor					31	35-130
Aldrin					43	34-132
Dieldrin					38	31-134
Endrin					45	42-139
4,4'-DDT					50	23-134

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: ______ out of ______ outside limits
Spike Recovery: ______ out of ______ outside limits

COMMENTS: ____
____

4A
VOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

____

Lab Name: ____________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab File ID: ____________ Lab Sample ID: ____________

Date Analyzed: ____________ Time Analyzed: ____________

GC Column: ________ ID: ______(mm) Heated Purge: (Y/N) ___

Instrument ID: ____________

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	TIME ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

____

____

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4B

SEMIVOLATILE METHOD BLANK SUMMARY

EPA SAMPLE NO.

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ________ SDG No.: ________

Lab File ID: ______________ Lab Sample ID: ______________

Instrument ID: __________ Date Extracted: __________

Matrix: (soil/water) ______ Date Analyzed: __________

Level: (low/med) _____ Time Analyzed: __________

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

COMMENTS:

____

____

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FORM IV SV **3/90**

4C

PESTICIDE METHOD BLANK SUMMARY

EPA SAMPLE NO.

____

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab Sample ID: ____________ Lab File ID: __________

Matrix:(soil/water) _____ Extraction:(SepF/Cont/Sonc) _____

Sulfur Cleanup: (Y/N) __ Date Extracted: ________

Date Analyzed (1): ________ Date Analyzed (2): ________

Time Analyzed (1): ________ Time Analyzed (2): ________

Instrument ID (1): ________ Instrument ID (2): ________

GC Column (1): ________ ID:_____(mm) GC Column (2): ________ ID:_____(mm)

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

COMMENTS: ______________________________________

____

page __ of __

5A

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Lab File ID: ______________ BFB Injection Date: __________

Instrument ID: ___________ BFB Injection Time: __________

GC Column: _________ ID: ______(mm) Heated Purge: (Y/N) ___

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	8.0 - 40.0% of mass 95	
75	30.0 - 66.0% of mass 95	
95	Base peak, 100% relative abundance	
96	5.0 - 9.0% of mass 95	
173	Less than 2.0% of mass 174	( )1
174	50.0 - 120.0% of mass 95	
175	4.0 - 9.0 % of mass 174	( )1
176	93.0 - 101.0% of mass 174	( )1
177	5.0 - 9.0% of mass 176	( )2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

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FORM V VOA 3/90

5B

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: ______________________ Contract: __________

Lab Code: ______ Case No.: _____ SAS No.: ______ SDG No.: ______

Lab File ID: ____________ DFTPP Injection Date: ________

Instrument ID: ________ DFTPP Injection Time: ________

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 80.0% of mass 198	
68	Less than 2.0% of mass 69	( )1
69	Mass 69 relative abundance	
70	Less than 2.0% of mass 69	( )1
127	25.0 - 75.0% of mass 198	
197	Less than 1.0% of mass 198	
198	Base Peak, 100% relative abundance	
199	5.0 to 9.0% of mass 198	
275	10.0 - 30.0% of mass 198	
365	Greater than 0.75% of mass 198	
441	Present, but less than mass 443	
442	40.0 - 110.0% of mass 198	
443	15.0 - 24.0% of mass 442	( )2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01					
02					
03					
04					
05					
06					
07					
08					
09					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					

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FORM V SV 3/90

6A
VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Instrument ID: __________ Calibration Date(s): __________ __________

Heated Purge: (Y/N) ___ Calibration Times: __________ __________

GC Column: _________ ID: ______(mm)

LAB FILE ID: RRF10 = ____________ RRF20 = ____________

RRF50 = ____________ RRF100= ____________ RRF200= ____________

COMPOUND	RRF10	RRF20	RRF50	RRF100	RRF200	$\overline{RRF}$	% RSD
Chloromethane							
Bromomethane *							*
Vinyl Chloride *							*
Chloroethane							
Methylene Chloride							
Acetone							
Carbon Disulfide							
1,1-Dichloroethene *							*
1,1-Dichloroethane *							*
1,2-Dichloroethene (total)							
Chloroform *							*
1,2-Dichloroethane *							*
2-Butanone							
1,1,1-Trichloroethane *							*
Carbon Tetrachloride *							*
Bromodichloromethane *							*
1,2-Dichloropropane							
cis-1,3-Dichloropropene *							*
Trichloroethene *							*
Dibromochloromethane *							*
1,1,2-Trichloroethane *							*
Benzene *							*
trans-1,3-Dichloropropene *							*
Bromoform *							*
4-Methyl-2-Pentanone							
2-Hexanone							
Tetrachloroethene *							*
1,1,2,2-Tetrachloroethane *							*
Toluene *							*
Chlorobenzene *							*
Ethylbenzene *							*
Styrene *							*
Xylene (total) *							*
Toluene-d8							
Bromofluorobenzene *							*
1,2-Dichloroethane-d4							

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

6B

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Instrument ID: __________ Calibration Date(s): __________ __________

Calibration Times: __________ __________

LAB FILE ID: RRF20 = ____________ RRF50 = ____________
RRF80 = ____________ RRF120= ____________ RRF160= ____________

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
Phenol *							*
bis(2-Chloroethyl)ether *							*
2-Chlorophenol *							*
1,3-Dichlorobenzene *							*
1,4-Dichlorobenzene *							*
1,2-Dichlorobenzene *							*
2-Methylphenol *							*
2,2'-oxybis(1-Chloropropane)							
4-Methylphenol *							*
N-Nitroso-di-n-propylamine *							*
Hexachloroethane *							*
Nitrobenzene *							*
Isophorone *							*
2-Nitrophenol *							*
2,4-Dimethylphenol *							*
bis(2-Chloroethoxy)methane *							*
2,4-Dichlorophenol *							*
1,2,4-Trichlorobenzene *							*
Naphthalene *							*
4-Chloroaniline							
Hexachlorobutadiene							
4-Chloro-3-methylphenol *							*
2-Methylnaphthalene *							*
Hexachlorocyclopentadiene							
2,4,6-Trichlorophenol *							*
2,4,5-Trichlorophenol *							*
2-Chloronaphthalene *							*
2-Nitroaniline							
Dimethylphthalate							
Acenaphthylene *							*
2,6-Dinitrotoluene *							*
3-Nitroaniline							
Acenaphthene *							*
2,4-Dinitrophenol							
4-Nitrophenol							
Dibenzofuran *							*
2,4-Dinitrotoluene *							*

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

6C

SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Instrument ID: __________ Calibration Date(s): __________ __________

Calibration Times: __________ __________

LAB FILE ID: RRF20 = __________ RRF50 = __________

RRF80 = __________ RRF120= __________ RRF160= __________

COMPOUND	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD	
Diethylphthalate								
4-Chlorophenyl-phenylether *								*
Fluorene *								*
4-Nitroaniline								
4,6-Dinitro-2-methylphenol								
N-Nitrosodiphenylamine (1)								
4-Bromophenyl-phenylether *								*
Hexachlorobenzene *								*
Pentachlorophenol *								*
Phenanthrene *								*
Anthracene *								*
Carbazole								
Di-n-butylphthalate								
Fluoranthene *								*
Pyrene *								*
Butylbenzylphthalate								
3,3'-Dichlorobenzidine								
Benzo(a)anthracene *								*
Chrysene *								*
bis(2-Ethylhexyl)phthalate								
Di-n-octylphthalate								
Benzo(b)fluoranthene *								*
Benzo(k)fluoranthene *								*
Benzo(a)pyrene *								*
Indeno(1,2,3-cd)pyrene *								*
Dibenz(a,h)anthracene *								*
Benzo(g,h,i)perylene *								*
Nitrobenzene-d5								
2-Fluorobiphenyl *								*
Terphenyl-d14 *								*
Phenol-d5 *								*
2-Fluorophenol *								*
2,4,6-Tribromophenol								
2-Chlorophenol-d4 *								*
1,2-Dichlorobenzene-d4 *								*

(1) Cannot be separated from Diphenylamine

* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

6D

PESTICIDE INITIAL CALIBRATION OF SINGLE COMPONENT ANALYTES

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Instrument ID: __________ Level (x low): low _____ mid _____ high _____

GC Column: __________ ID: _____(mm) Date(s) Analyzed: _______ _______

COMPOUND	RT OF STANDARDS LOW	MID	HIGH	MEAN RT	RT WINDOW FROM	TO
alpha-BHC						
beta-BHC						
delta-BHC						
gamma-BHC (Lindane)						
Heptachlor						
Aldrin						
Heptachlor epoxide						
Endosulfan I						
Dieldrin						
4,4'-DDE						
Endrin						
Endosulfan II						
4,4'-DDD						
Endosulfan sulfate						
4,4'-DDT						
Methoxychlor						
Endrin ketone						
Endrin aldehyde						
alpha-Chlordane						
gamma-Chlordane						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

* Surrogate retention times are measured from Standard Mix A analyses.

Retention time windows are ± 0.04 minutes for all compounds except Methoxychlor, at ± 0.05 minutes.

6E

PESTICIDE INITIAL CALIBRATION OF SINGLE COMPONENT ANALYTES

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Instrument ID: __________ Level (x low): low _____ mid _____ high _____

GC Column: _________ ID: _____(mm) Date(s) Analyzed: _______ _______

COMPOUND	CALIBRATION FACTORS LOW	MID	HIGH	MEAN	%RSD
alpha-BHC					
beta-BHC					
delta-BHC					
gamma-BHC (Lindane)					
Heptachlor					
Aldrin					
Heptachlor epoxide					
Endosulfan I					
Dieldrin					
4,4'-DDE					
Endrin					
Endosulfan II					
4,4'-DDD					
Endosulfan sulfate					
4,4'-DDT					
Methoxychlor					
Endrin ketone					
Endrin aldehyde					
alpha-Chlordane					
gamma-Chlordane					
Tetrachloro-m-xylene					
Decachlorobiphenyl					

* Surrogate calibration factors are measured from Standard Mix A analyses.

%RSD must be less than or equal 10.0 % for all compounds except alpha-BHC beta-BHC, gamma-BHC, DDT, Endrin, and Methoxyclor, where %RSD must be less than or equal to 15.0%

6F
PESTICIDE INITIAL CALIBRATION OF MULTICOMPONENT ANALYTES

Lab Name: ________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ________

Instrument ID: __________ Date(s) Analyzed: ________ ________

GC Column: __________ ID: ______(mm)

COMPOUND	AMOUNT (ng)	PEAK	RT	RT WINDOW FROM	RT WINDOW TO	CALIBRATION FACTOR
Toxaphene		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1016		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1221		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1232		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1242		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1248		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1254		*1				
		*2				
		*3				
		4				
		5				
Aroclor 1260		*1				
		*2				
		*3				
		4				
		5				

* Denotes required peaks

6G

PESTICIDE ANALYTE RESOLUTION SUMMARY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

GC Column (1): __________ ID: _____ (mm) Instrument ID (1): ________

EPA Sample No. (Standard 1): __________ Lab Sample ID (1): ___________

Date Analyzed (1): ____________ Time Analyzed (1): ________

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			

GC Column (2): __________ ID: _____ (mm) Instrument ID (2): ________

EPA Sample No. (Standard 2): __________ Lab Sample ID (2): ___________

Date Analyzed (2): ____________ Time Analyzed (2): ________

	ANALYTE	RT	RESOLUTION (%)
01			
02			
03			
04			
05			
06			
07			
08			
09			

Resolution of two adjacent peaks must be calculated as a percentage of the height of the smaller peak, and must be greater than or equal to 60.0%.

7A

VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: ______________________________ Contract: ____________

Lab Code: _________ Case No.: _______ SAS No.: ________ SDG No.: ________

Instrument ID: ___________ Calibration Date: ___________ Time: __________

Lab File ID: ______________ Init. Calib. Date(s): ___________ ___________

Heated Purge: (Y/N) ___ Init. Calib. Times: ___________ ___________

GC Column: __________ ID: ______(mm)

COMPOUND	RRF	RRF50	MIN RRF	%D	MAX %D
Chloromethane					
Bromomethane			0.100		25.0
Vinyl Chloride			0.100		25.0
Chloroethane					
Methylene Chloride					
Acetone					
Carbon Disulfide					
1,1-Dichloroethene			0.100		25.0
1,1-Dichloroethane			0.200		25.0
1,2-Dichloroethene (total)					
Chloroform			0.200		25.0
1,2-Dichloroethane			0.100		25.0
2-Butanone					
1,1,1-Trichloroethane			0.100		25.0
Carbon Tetrachloride			0.100		25.0
Bromodichloromethane			0.200		25.0
1,2-Dichloropropane					
cis-1,3-Dichloropropene			0.200		25.0
Trichloroethene			0.300		25.0
Dibromochloromethane			0.100		25.0
1,1,2-Trichloroethane			0.100		25.0
Benzene			0.500		25.0
trans-1,3-Dichloropropene			0.100		25.0
Bromoform			0.100		25.0
4-Methyl-2-Pentanone					
2-Hexanone					
Tetrachloroethene			0.200		25.0
1,1,2,2-Tetrachloroethane			0.500		25.0
Toluene			0.400		25.0
Chlorobenzene			0.500		25.0
Ethylbenzene			0.100		25.0
Styrene			0.300		25.0
Xylene (total)			0.300		25.0
Toluene-d8					
Bromofluorobenzene			0.200		25.0
1,2-Dichloroethane-d4					

All other compounds must meet a minimum RRF of 0.010.

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7B

SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: ______________________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Instrument ID: __________ Calibration Date: ___________ Time: __________

Lab File ID: ___________ Init. Calib. Date(s): ___________ ___________

Init. Calib. Times: ___________ ___________

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Phenol			0.800		25.0
bis(2-Chloroethyl)ether			0.700		25.0
2-Chlorophenol			0.800		25.0
1,3-Dichlorobenzene			0.600		25.0
1,4-Dichlorobenzene			0.500		25.0
1,2-Dichlorobenzene			0.400		25.0
2-Methylphenol			0.700		25.0
2,2'-oxybis(1-Chloropropane)					
4-Methylphenol			0.600		25.0
N-Nitroso-di-n-propylamine			0.500		25.0
Hexachloroethane			0.300		25.0
Nitrobenzene			0.200		25.0
Isophorone			0.400		25.0
2-Nitrophenol			0.100		25.0
2,4-Dimethylphenol			0.200		25.0
bis(2-Chloroethoxy)methane			0.300		25.0
2,4-Dichlorophenol			0.200		25.0
1,2,4-Trichlorobenzene			0.200		25.0
Naphthalene			0.700		25.0
4-Chloroaniline					
Hexachlorobutadiene					
4-Chloro-3-methylphenol			0.200		25.0
2-Methylnaphthalene			0.400		25.0
Hexachlorocyclopentadiene					
2,4,6-Trichlorophenol			0.200		25.0
2,4,5-Trichlorophenol			0.800		25.0
2-Chloronaphthalene			0.900		25.0
2-Nitroaniline					
Dimethylphthalate					
Acenaphthylene			1.400		25.0
2,6-Dinitrotoluene			0.200		25.0
3-Nitroaniline					
Acenaphthene			0.900		25.0
2,4-Dinitrophenol					
4-Nitrophenol					
Dibenzofuran			0.300		25.0
2,4-Dinitrotoluene			0.200		25.0

All other compounds must meet a minimum RRF of 0.010.

7C
SEMIVOLATILE CONTINUING CALIBRATION CHECK

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ________

Instrument ID: __________ Calibration Date: __________ Time: __________

Lab File ID: __________ Init. Calib. Date(s): __________ __________

Init. Calib. Times: __________ __________

COMPOUND	$\overline{RRF}$	RRF50	MIN RRF	%D	MAX %D
Diethylphthalate					
4-Chlorophenyl-phenylether			0.500		25.0
Fluorene			1.100		25.0
4-Nitroaniline					
4,6-Dinitro-2-methylphenol					
N-Nitrosodiphenylamine (1)					
4-Bromophenyl-phenylether			0.100		25.0
Hexachlorobenzene			0.100		25.0
Pentachlorophenol			0.100		25.0
Phenanthrene			0.700		25.0
Anthracene			0.700		25.0
Carbazole					
Di-n-butylphthalate					
Fluoranthene			0.600		25.0
Pyrene			0.700		25.0
Butylbenzylphthalate					
3,3'-Dichlorobenzidine					
Benzo(a)anthracene			0.900		25.0
Chrysene			0.900		25.0
bis(2-Ethylhexyl)phthalate					
Di-n-octylphthalate					
Benzo(b)fluoranthene			0.700		25.0
Benzo(k)fluoranthene			0.700		25.0
Benzo(a)pyrene			0.600		25.0
Indeno(1,2,3-cd)pyrene			0.400		25.0
Dibenz(a,h)anthracene			0.300		25.0
Benzo(g,h,i)perylene			0.200		25.0
Nitrobenzene-d5					
2-Fluorobiphenyl			0.700		25.0
Terphenyl-d14			0.500		25.0
Phenol-d5			0.800		25.0
2-Fluorophenol			0.600		25.0
2,4,6-Tribromophenol					
2-Chlorophenol-d4			0.800		25.0
1,2-Dichlorobenzene-d4			0.400		25.0

(1) Cannot be separated from Diphenylamine
All other compounds must meet a minimum RRF of 0.010.

7D

PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: ______ SDG No.: ______

GC Column: __________ ID: _____(mm) Init. Calib. Date(s): ________ ________

EPA Sample No.(PIBLK): __________ Date Analyzed : __________

Lab Sample ID (PIBLK): ____________ Time Analyzed : __________

EPA Sample No.(PEM): __________ Date Analyzed : __________

Lab Sample ID (PEM): ____________ Time Analyzed : __________

PEM COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	RPD
alpha-BHC						
beta-BHC						
gamma-BHC (Lindane)						
Endrin						
4,4'-DDT						
Methoxychlor						

4,4'-DDT % breakdown (1): ________ Endrin % breakdown (1): ________

Combined % breakdown (1): ________

QC LIMITS:

RPD of amounts in PEM must be less than or equal to 25.0%

4,4'-DDT breakdown must be less than or equal to 20.0%

Endrin breakdown must be less than or equal to 20.0%

Combined breakdown must be less than or equal to 30.0%

7E
PESTICIDE CALIBRATION VERIFICATION SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

GC Column: __________ ID: _____(mm) Init. Calib. Date(s): ________ ________

EPA Sample No.(PIBLK): __________ Date Analyzed : __________

Lab Sample ID (PIBLK): __________ Time Analyzed : __________

EPA Sample No.(INDA): __________ Date Analyzed : __________

Lab Sample ID (INDA): __________ Time Analyzed : __________

INDIVIDUAL MIX A COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	RPD
alpha-BHC						
gamma-BHC (Lindane)						
Heptachlor						
Endosulfan I						
Dieldrin						
Endrin						
4,4'-DDD						
4,4'-DDT						
Methoxychlor						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

EPA Sample No.(INDB): __________ Date Analyzed : __________

Lab Sample ID (INDB): __________ Time Analyzed : __________

INDIVIDUAL MIX B COMPOUND	RT	RT WINDOW FROM	TO	CALC AMOUNT (ng)	NOM AMOUNT (ng)	RPD
beta-BHC						
delta-BHC						
Aldrin						
Heptachlor epoxide						
4,4'-DDE						
Endosulfan II						
Endosulfan sulfate						
Endrin ketone						
Endrin aldehyde						
alpha-Chlordane						
gamma-Chlorodane						
Tetrachloro-m-xylene						
Decachlorobiphenyl						

QC LIMITS: RPD of amounts in the Individual Mixes must be less than or equal to 25.0%.

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8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: ________

Lab File ID (Standard): ______________ Date Analyzed: __________

Instrument ID: __________ Time Analyzed: __________

GC Column: _________ ID: ______(mm) Heated Purge: (Y/N) ___

		IS1(BCM) AREA #	RT #	IS2(DFB) AREA #	RT #	IS3(CBZ) AREA #	RT #
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag values outside QC limits with an asterisk.
* Values outside of QC limits.

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8B
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: ______________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Lab File ID (Standard): _______________ Date Analyzed: __________

Instrument ID: __________ Time Analyzed: __________

		IS1(DCB) AREA #	RT #	IS2(NPT) AREA #	RT #	IS3(ANT) AREA #	RT
	12 HOUR STD						
	UPPER LIMIT						
	LOWER LIMIT						
	EPA SAMPLE NO.						
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							

IS1 (DCB) = 1,4-Dichlorobenzene-d4
IS2 (NPT) = Naphthalene-d8
IS3 (ANT) = Acenaphthene-d10

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

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8C
SEMIVOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Lab File ID (Standard): ______________ Date Analyzed: __________

Instrument ID: __________ Time Analyzed: __________

	IS4(PHN) AREA #	RT #	IS5(CRY) AREA #	RT #	IS6(PRY) AREA #	RT #
12 HOUR STD						
UPPER LIMIT						
LOWER LIMIT						
EPA SAMPLE NO.						
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						

IS4 (PHN) = Phenanthrene-d10
IS5 (CRY) = Chrysene-d12
IS6 (PRY) = Perylene-d12

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column used to flag internal standard area values with an asterisk.
* Values outside of QC limits.

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8D
PESTICIDE ANALYTICAL SEQUENCE

Lab Name: ______________________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: ________ SDG No.: ________

GC Column: __________ ID: _____(mm) Init. Calib. Date(s): ________ ________

Instrument ID: ____________

THE ANALYTICAL SEQUENCE OF PERFORMANCE EVALUATION MIXTURES, BLANKS, SAMPLES, AND STANDARDS IS GIVEN BELOW:

MEAN SURROGATE RT FROM INITIAL CALIBRATION
TCX: _______ DCB: _______

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED	TIME ANALYZED	TCX RT #	DCB RT #
01						
02						
03						
04						
05						
06						
07						
08						
09						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						
31						
32						

	QC LIMITS
TCX = Tetrachloro-m-xylene	(± 0.04 MINUTES)
DCB = Decachlorobiphenyl	(± 0.04 MINUTES)

Column used to flag retenetion time values with an asterisk.
* Values outside of QC limits.

9A
PESTICIDE FLORISIL CARTRIDGE CHECK

Lab Name: ____________________ Contract: __________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Florisil Cartridge Lot Number: _________ Date of Analysis: ____________

GC Column(1): __________ ID: _____(mm) GC Column(2): __________ ID: _____(mm)

COMPOUND	SPIKE ADDED (ng)	SPIKE RECOVERED (ng)	% REC #	QC LIMITS
alpha-BHC				80-110
gamma-BHC (Lindane)				80-110
Heptachlor				80-110
Endosulfan I				80-110
Dieldrin				80-110
Endrin				80-110
4,4'-DDD				80-110
4,4'-DDT				80-110
Methoxychlor				80-110
Tetrachloro-m-xylene				80-110
Decachlorobiphenyl				80-110

\# Column to be used to flag recovery with an asterisk.
* Values outside of QC limits.

THIS CARTRIDGE LOT APPLIES TO THE FOLLOWING SAMPLES, BLANKS, MS, AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				

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9B

PESTICIDE GPC CALIBRATION

Lab Name: ______________ Contract: ______

Lab Code: ____ Case No.: ____ SAS No.: ____ SDG No.: ____

GPC Column: ______ Calibration Date: ______

GC Column(1): ______ ID: ____(mm) GC Column(2): ______ ID: ____(mm)

COMPOUND	SPIKE ADDED (ng)	SPIKE RECOVERED (ng)	% REC #	QC. LIMITS REC.
gamma-BHC (Lindane)				80-110
Heptachlor				80-110
Aldrin				80-110
Dieldrin				80-110
Endrin				80-110
4,4'-DDT				80-110

\# Column to be used to flag recovery values with an asterisk
* Values outside of QC limits

THIS GPC CALIBRATION APPLIES TO THE FOLLOWING SAMPLES, BLANKS, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	DATE ANALYZED 1	DATE ANALYZED 2
01				
02				
03				
04				
05				
06				
07				
08				
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				

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10A

PESTICIDE IDENTIFICATION SUMMARY FOR SINGLE COMPONENT ANALYTES

EPA SAMPLE NO.

Lab Name: ______________ Contract: ______________

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Lab Sample ID : ______________ Date(s) Analyzed: ______ ______

Instrument ID (1): ______________ Instrument ID (2): ______________

GC Column(1): ______ ID: ______(mm) GC Column(2): ______ ID: ______(mm)

ANALYTE	COL	RT	RT WINDOW		CONCENTRATION	%D
			FROM	TO		
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					
	1					
	2					

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10B
PESTICIDE IDENTIFICATION SUMMARY
FOR MULTICOMPONENT ANALYTES

EPA SAMPLE NO.

Lab Name: ____________________ Contract: ____________

Lab Code: ________ Case No.: ______ SAS No.: _______ SDG No.: _______

Lab Sample ID : ____________ Date(s) Analyzed: ________ ________

Instrument ID (1): ___________ Instrument ID (2): ___________

GC Column(1): __________ ID: _____(mm) GC Column(2): __________ ID: _____(mm)

			RT WINDOW			MEAN	
ANALYTE	PEAK	RT	FROM	TO	CONCENTRATION	CONCENTRATION	%D
	1						
	2						
	3						
COLUMN 1	4						
	5						
	1						
	2						
	3						
COLUMN 2	4						
	5						
	1						
	2						
	3						
COLUMN 1	4						
	5						
	1						
	2						
	3						
COLUMN 2	4						
	5						
	1						
	2						
	3						
COLUMN 1	4						
	5						
	1						
	2						
	3						
COLUMN 2	4						
	5						

At least 3 peaks are required for identification of multicomponent analytes

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SAMPLE LOG-IN SHEET

Lab Name: ______________________ Page ____ of ____

Received By (Print Name): ______________________ Log-in Date: ____________

Received By (Signature): ______________________

Case Number: ______________

Sample Delivery Group No.: ______________

SAS Number: ______________

REMARKS:

1. Custody Seal(s) Present/Absent* Intact/Broken
2. Custody Seal Nos.: __________ __________
3. Chain-of-Custody Records Present/Absent*
4. Traffic Reports or Packing List Present/Absent*
5. Airbill Airbill/Sticker Present/Absent*
6. Airbill No.: __________ __________
7. Sample Tags Present/Absent*

   Sample Tag Numbers Listed/Not Listed on Chain-of-Custody
8. Sample Condition: Intact/Broken*/ Leaking
9. Does information on custody records, traffic reports, and sample tags agree? Yes/No*
10. Date Received at Lab: __________
11. Time Received: __________

Sample Transfer

Fraction: __________ __________

Area #: __________ __________

By: __________ __________

On: __________ __________

	CORRESPONDING		
EPA SAMPLE #	SAMPLE TAG #	ASSIGNED LAB #	REMARKS: CONDITION OF SAMPLE SHIPMENT, ETC.

* Contact SMO and attach record of resolution

Reviewed By: ______________________

Date: ______________________

Logbook No.: ______________________

Logbook Page No: ______________________

FORM DC-1

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET

LABORATORY NAME ______________________ CITY/STATE ______________________

CASE NO. ________ SDG NO. ________ SDG NOS. TO FOLLOW ________ ________ ________ SAS NO. ________

CONTRACT NO. ______________________ SOW NO. ______________________

All documents delivered in the complete SDG file must be original documents where possible. (REFERENCE EXHIBIT B, SECTION II and SECTION III.)

		PAGE NOs		CHECK	
		FROM	TO	LAB	EPA
1.	<u>Inventory Sheet</u> (Form DC-2) (Do not number)	____	____	____	____
2.	<u>SDG Case Narrative</u>	____	____	____	____
3.	<u>Traffic Report</u>	____	____	____	____
4.	<u>Volatiles Data</u>				
	a. QC Summary				
	Surrogate Percent Recovery Summary (Form II VOA)	____	____	____	____
	Lab Control Sample Recovery (From III VOA)	____	____	____	____
	Method Blank Summary (Form IV VOA)	____	____	____	____
	Tuning and Mass Calibration (Form V VOA)	____	____	____	____
	b. Sample Data	____	____	____	____
	TCL Results - (Form I VOA)			____	____
	Tentatively Identified Compounds (Form I VOA-TIC)			____	____
	Reconstructed total ion chromatograms (RIC) for each sample			____	____
	For each sample:				
	Raw spectra and background-subtracted mass spectra of target compounds identified			____	____
	Mass spectra of all reported TICs with three best library matches			____	____
	c. Standards Data (All Instruments)				
	Initial Calibration Data (Form VI VOA)	____	____	____	____
	RICs and Quan Reports for all Standards	____	____	____	____
	Continuing Calibration (Form VII VOA)	____	____	____	____
	RICs and Quan Reports for all Standards	____	____	____	____
	Internal Standard Area and RT Summary	____	____	____	____
	(Form VIII VOA)	____	____	____	____
	d. QC Data				
	BFB	____	____	____	____
	Blank Data	____	____	____	____
	Matrix Spike Data	____	____	____	____
	Matrix Spike Duplicate Data	____	____	____	____
5.	<u>Semivolatiles Data</u>				
	a. QC Summary	____	____	____	____
	Surrogate Percent Recovery Summary (Form II SV)	____	____	____	____
	MS/MSD Summary (Form III SV)	____	____	____	____
	Method Blank Summary (Form IV SV)	____	____	____	____
	Tuning and Mass Calibration (Form V SV)	____	____	____	____

FORM DC-2-1

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET (Cont.)

CASE NO. ________ SDG NO. ________ SDG NOS. TO FOLLOW ________ ________ ________ SAS NO. ______________

	PAGE NOs		CHECK	
	FROM	TO	LAB	EPA
5. <u>Semivolatiles Data</u> (cont.)				
b. Sample Data	____	____	____	____
TCL Results (Form I SV)				
Tentatively Identified Compounds (Form I SV-TIC)			____	____
Reconstructed total ion chromatograms (RIC) for each sample			____	____
For each sample:				
Raw spectra and background-subtracted mass spectra of target compounds			____	____
Mass spectra of TICs with three best library matches				
GPC chromatograms (if GPC performed)			____	____
c. Standards Data (All Instruments)				
Initial Calibration Data (Form VI SV)	____	____	____	____
RICs and Quan Reports for all Standards	____	____	____	____
Continuing Calibration (Form VII SV)	____	____	____	____
RICs and Quan Reports for all Standards	____	____	____	____
Internal Standard Area and RT Summary (Form VIIIB and Form VIIIC SV)	____	____	____	____
d. QC Data				
DFTPP	____	____	____	____
Blank Data	____	____	____	____
Matrix Spike Data	____	____	____	____
Matrix Spike Duplicate Data	____	____	____	____
6. <u>Pesticides</u>				
a. QC Summary	____	____	____	____
Surrogate Percent Recovery Summary (Form II PEST)	____	____	____	____
MS/MSD Duplicate Summary (Form III PEST)	____	____	____	____
Method Blank Summary (Form IV PEST)	____	____	____	____
b. Sample Data	____	____	____	____
TCL Results - Organic Analysis Data Sheet (Form I PEST)			____	____
Chromatograms (Primary Column)			____	____
Chromatograms from second GC column confirmation			____	____
GC Integration report or data system printout and calibration plots			____	____
Manual work sheets			____	____
UV traces from GPC (if available)			____	____
For pesticides/Aroclors confirmed by GC/MS, copies of raw spectra and copies of background-subtracted mass spectra of target compounds (samples & standards)			____	____

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET (Cont.)

CASE NO. ________ SDG NO. ________ SDG NOS. TO FOLLOW ________ ________ ________ SAS NO. ________

	PAGE NOs		CHECK	
	FROM	TO	LAB	EPA
6. <u>Pesticides</u> (cont.)				
c. Standards Data				
Pesticides Evaluation Standards Summary (Form VIII PEST-1)	___	___	___	___
Pesticides Evaluation Standards Summary (Form VIII, PEST-2)	___	___	___	___
Pesticide/Aroclor Standards Summary (Form IX, PEST)	___	___	___	___
Pesticide/Aroclor Identification (Form X PEST)	___	___	___	___
Standard chromatograms and data system printout for all Standards	___	___	___	___
For pesticides/Aroclors confirmed by GC/MS, copies of spectra for standards used	___	___	___	___
d. QC Data				
Blank Data	___	___	___	___
Matrix Spike Data	___	___	___	___
Matrix Spike Duplicate Data	___	___	___	___
7. <u>Miscellaneous Data</u>				
Original preparation and analysis forms or copies of preparation and analysis logbook pages	___	___	___	___
Internal sample and sample extract transfer chain-of-custody records	___	___	___	___
Screening records	___	___	___	___
All instrument output, including strip charts from screening activities (describe or list)	___	___	___	___
________________________________	___	___	___	___
________________________________	___	___	___	___
8. <u>EPA Shipping/Receiving Documents</u>				
Airbills (No. of shipments ___)	___	___	___	___
Chain-of-Custody Records	___	___	___	___
Sample Tags	___	___	___	___
Sample Log-In Sheet (Lab & DC1)	___	___	___	___
SDG Cover Sheet	___	___	___	___
Miscellaneous Shipping/Receiving Records (describe or list)				
________________________________	___	___	___	___
________________________________	___	___	___	___
9. <u>Internal Lab Sample Transfer Records and Tracking Sheets</u> (describe or list)				
________________________________	___	___	___	___
________________________________	___	___	___	___

FORM DC-2-3

ORGANICS COMPLETE SDG FILE (CSF) INVENTORY SHEET (Cont.)

CASE NO. ________ SDG NO. ________ SDG NOS. TO FOLLOW ________ ________ ________ SAS NO. ____________

	PAGE NOs FROM	PAGE NOs TO	CHECK LAB	CHECK EPA
10 Other Records (describe or list)				
Telephone Communication Log	____	____	____	____
________________________________	____	____	____	____
________________________________	____	____	____	____

11. Comments: ____

____

____

____

Completed by: ________________ ________________ ________
(CLP Lab) (Signature) (Printed Name/Title) (Date)

Audited by: ________________ ________________ ________
(EPA) (Signature) (Printed Name/Title) (Date)

FORM DC-2-4

ATTACHMENT B

CLP DATA REVIEW AND PRELIMINARY REVIEW

SOP NO. HW-6
Revision #7

CLP ORGANICS DATA REVIEW AND PRELIMINARY REVIEW

BY: Date: 3-22-90
Leon Lazarus, Environmental Scientist
Toxic and Hazardous Waste Section

CONCURRED BY: Date: 3/23/90
Louis Bevilacqua, Chief
Toxic and Hazardous Waste Section

APPROVED BY: Date: 3/26/90
Gerard F. McKenna, Chief
Monitoring Management Branch

INTRODUCTION TO DATA VALIDATION

1.0 Scope

1.1 This procedure is applicable to organic data obtained from contractor laboratories working for the Contract Laboratory Program (CLP).

1.2 The data validation is based upon analytical and quality assurance requirements specified in the Statement of Work (SOW).

2.0 Responsibilities

Data reviewers will complete the following tasks as assigned by the Data Review Coordinator:

2.1 Data Assessment - The reviewer must answer every question on the checklist. All response shall be in ink.

2.2 Data Assessment Narrative (Attachment 1) - Data reviewer is required to use these forms and must match the action in the narrative with the action taken on the Form I(s).

2.3 Rejection Summary Form (Attachment 2) - Fill in the total number of analytes measured by different analyses and the number of analytes rejected or flagged as estimated due to corresponding quality control criteria. Place an "X" in the boxes where analyses were not performed or criteria do not apply.

2.4 Organic Regional Data Assessment - Data reviewer is also required to fill out Organic Regional Data Assessment Form (Attachment 3).

2.5 Telephone Record Log - The data reviewer should enter the bare facts of inquiry before initiating any authorized telephone conversation with a CLP laboratory. After the case review has been completed, mail the white copy of the Telephone Record Log to the laboratory and the pink copy to SMD. File the yellow copy in the Telephone Record Log folder and attach a photocopy of the Telephone Record Log to the completed Data Assessment Narrative.

2.6 Forwarded Paperwork - Upon completion of the review, the following are to be forwarded to the Regional Sample Control Center (RSCC) located in the Surveillance and Monitoring Branch:

a. data package
b. completed assessment checklist
c. SMD Contract Compliance Screening (CCS)

Forward four (4) copies of the completed Data Assessment Narrative along with four (4) copies of the Organic Data Assessment Form: one each for the appropriate Regional DPO, the Sample Management Office (SMD), and to the last two addresses of the Data Reviewer Mailing List.

2.7 Filed Paperwork - Upon completion of the review, the following are to be filed within the Monitoring and Management Branch (MMB) files:

a. Telephone record Log (copy)
b. Record of Communication (original)
c. Rejection Summary Form

3.0 Rejection of Data - All values determined to be unacceptable on the Organic Analysis Data Sheet (Form I) must be flagged with an "R". As soon as review criteria causes data to be rejected, that data can be eliminated from any further review or consideration.

4.0 Acceptance Criteria - In order that the reviews be consistent among reviewers, this Standard Operating Procedure (SOP) should be used. Additional guidance can be found in the Functional Guidelines.

5.0 SMO Contract Compliance Screening (CCS) - This is intended to aid the reviewer in locating any problems, both corrected and uncorrected. However, the validation should be carried out even if CCS is not present. Resubmittals received from the laboratory in response to CCS must be used by the reviewer.

ACKAGE COMPLETENESS AND DELIVERABLES

CASE NUMBER: ____________________

LAB: ____________________

SITE: ____________________

	YES	NO	N/A
.0 Data Completeness and Deliverables			
1.1 Have any missing deliverables been received and added to the data package.	☐	___	___
ACTION: Call lab for explanation / resubmittal of any missing deliverables. If lab cannot provide them, note the effect on review of the package under the "Contract Problems/Non-compliance" section of reviewer narrative.			
1.2 Was SMO CCS checklist included with package?	☐	___	___
.0 Cover Letter/Case Narrative			
2.1 Is the Narrative or Cover Letter present?	☐	___	___
2.2 Are Case Number and/or SAS number contained in the Narrative or Cover Letter?	☐	___	___

.0 Data Validation Checklist

The following checklist is divided into three parts. Part A is filled out if the data package contains any VOA analyses, Part B for any BNA analyses and Part C for Pesticide/PCBs.

Does this package contain:

VOA data?	___	___
BNA data?	___	___
Pesticide/PCB data?	___	___

ACTION: Complete corresponding parts of checklist.

YES NO N/A

PART A: VOA ANALYSES

1.0 Traffic Reports and Laboratory Narrative

1.1 Are the Traffic Report Forms present for all samples? [___] ___ ___

ACTION: If no, contact lab for replacement of missing or illegible copies.

1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ___ [___] ___

ACTION: Use professional judgement to evaluate the effect on the quality of the data.

ACTION: If any sample analyzed as a soil contains more than 50% water, all data should be flagged as estimated (J).

ACTION: If both VOA vials for a sample have air bubbles, flag all positive results "J" and all non-detects "R".

2.0 Holding Times

2.1 Have any VOA holding times, determined from date of collection to date of analysis, been exceeded? ___ [___] ___

If unpreserved, aqueous aromatic volatiles must be analyzed within 7 days of collection and non-aromatic volatiles must be analyzed within 14 days. If preserved with hydrochloric acid and stored at 4°C, then both aromatic and non-aromatic volatiles must be analyzed within 14 days. If uncertain about preservation, contact the sampler to determine whether the samples were preserved.

A ten-day holding time for soil samples is recommended.

Table of Holding Time Violations

Sample	Sample Matrix	Preserved ?	(See Traffic Report) Date Sampled	Date Lab Received	Date Analyzed

ACTION: If holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded.

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R").

3.0 Surrogate Recovery (Form II)

3.1 Are the VOA Surrogate Recovery Summaries (Form II) present for each of the following matrices:

	YES	NO	N/A
a. Low Water	[✓]	___	___
b. Med Water	[✓]	___	___
c. Low Soil	[✓]	___	___
d. Med Soil	[✓]	___	___

3.2 Are all the VOA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices:

	YES	NO	N/A
a. Low Water	[✓]	___	___
b. Med Water	[✓]	___	___
c. Low Soil	[✓]	___	___
d. Med Soil	[✓]	___	___

ACTION: Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.

	YES	NO	N/A
3.3 Were outliers marked correctly with an asterisk?	[✓]	___	___

ACTION: Circle all outliers in red.

	YES	NO	N/A
3.4 Was one or more VOA surrogate recovery outside of contract specifications for any sample or method blank?	___	[✓]	___
If yes, were samples reanalyzed?	[✓]	___	___
Were method blanks reanalyzed?	[✓]	___	___

ACTION: If surrogate recoveries are > 10% but all do not meet SOW specifications:

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as estimated detection limits ("UJ").

If any surrogate has a recovery of <10% :

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as unusable ("R").

Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and re-analyses. Check the internal standard areas.

	YES	NO	N/A
3.5 Are there any transcription/calculation errors between raw data and Form II?	___	☐	___

ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

4.0 Matrix Spikes (Form III)

	YES	NO	N/A
4.1 Is the Matrix Spike Duplicate/Recovery Form (Form III) present?	☐	___	___
4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:			
a. Low Water	☐	___	___
b. Med Water	☐	___	___
c. Low Soil	☐	___	___
d. Med Soil	☐	___	___

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

4.3 How many VOA spike recoveries are outside QC limits?

Water	Soils
______ out of 10	______ out of 10

4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water	Soils
______ out of 5	______ out of 5

ACTION: If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for the MS/MSD analysis. Use professional judgement in applying this criterion to other samples in the package.

5.0 Blanks (Form IV)

	YES	NO	N/A
5.1 Is the Method Blank Summary (Form IV) present?	☐	___	___
5.2 Frequency of Analysis: for the analysis of VOA TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	☐	___	___
5.3 Has a VOA instrument blank been analyzed at least once every twelve hours for each GC/MS system used?	☐	___	___

ACTION: If any method blank data are missing, call lab for explanation / resubmittal. If not available, reject all associated positive data ("R").

5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

	YES	NO	N/A
Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?	☐	___	___

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are <u>not</u> used to qualify data. Do not confuse them with the other QC blanks discussed below.

	YES	NO	N/A
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for VOAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor.	___	☐	___
6.2 Do any field/trip/rinse blanks have positive VOA results (TCL and/or TIC)?	___	☐	___

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.

YES NO N/A

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks.

	Sample conc > CRQL but < 10x blank	Sample conc < CRQL & is < 10x blank value	Sample conc > CRQL value & >10x blank value
Methylene chloride Acetone Toluene 2-butanone	Flag sample result with a 'U'; cross out 'B' flag	Reject sample result and report CRQL; cross out 'B' flag	No qualification is needed

	Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & > 5 blank value
Other Contaminants	Flag sample result with a 'U'; cross out 'B' flag	Reject sample result and report CRQL; cross out 'B' flag	No qualification is needed

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

6.3 Are there field/rinse/equipment blanks associated with every sample? ☐ ___ ___

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 GC/MS Tuning and Mass Calibration (Form V)

7.1 Are the GC/MS Tuning and Mass Calibration Forms (Form V) present for Bromofluorobenzene (BFB)? ☐ ___ ___

7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the BFB provided for each twelve hour shift? ☐ ___ ___

7.3 Has a tuning performance compound been analyzed for every twelve hours of sample analysis per instrument? ☐ ___ ___

ACTION: If any tuning data are missing, take action specified in 3.2 above.

ACTION: List date, time, instrument ID, and sample analyses for which no associated GC/MS tuning data are available.

YES NO N/A

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

7.4 Have the ion abundance criteria been met for each instrument used? ☐ ___ ___

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If tuning calibration is in error, flag all associated sample data as unusable ("R"). However, if expanded ion criteria are met (See 1988 Functional Guidelines), the data reviewer may accept data with appropriate qualifiers.

7.5 Are there any transcription / calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ___ ☐ ___

7.6 Have the appropriate number of significant figures (two) been reported? (Check at least two values, but if errors are found check more values.) ☐ ___ ___

ACTION: If large errors exist, call lab for explanation / resubmittal, make necessary corrections and note errors under "Conclusions".

7.7 Are the spectra of the mass calibration compound acceptable? ☐ ___ ___

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

8.0 Target Compound List (TCL) Analytes

8.1 Are the Organic Analysis Data Sheets (Form I VOA) present with required header information on each page, for each of the following:

a. Samples and/or fractions as appropriate ☐ ___ ___

b. Matrix spikes and matrix spike duplicates ☐ ___ ___

c. Blanks ☐ ___ ___

	YES	NO	N/A
8.2 Are the VOA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?			
a. Samples and/or fractions as appropriate	☐	___	___
b. Matrix spikes and matrix spike duplicates (Mass spectra not required)	☐	___	___
c. Blanks	☐	___	___
ACTION: If any data are missing, take action specified in 3.2 above.			
8.3 Are the response factors shown in the Quant Report?	☐	___	___
8.4 Is chromatographic performance acceptable with respect to:			
Baseline stability	☐	___	___
Resolution	☐	___	___
Peak shape	☐	___	___
Full-scale graph (attenuation)	☐	___	___
Other:________________________	☐	___	___
ACTION: Use professional judgement to determine the acceptability of the data.			
8.5 Are the lab-generated standard mass spectra of the identified VOA compounds present for each sample?	☐	___	___
ACTION: If any mass spectra are missing, take action specified in 3.2 above. If Lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".			
8.6 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?	☐	___	___
8.7 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?	☐	___	___
8.8 Do sample and standard relative ion intensities agree within 20%?	☐	___	___
ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at the calculated detection limit).			

9.0 Tentatively Identified Compounds (TIC)

	YES	NO	N/A
9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "J" qualifier?	[✓]	___	___
9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:			
a. Samples and/or fractions as appropriate	[✓]	___	___
b. Blanks	[✓]	___	___
ACTION: If any TIC data are missing, take action specified in 3.2 above.			
ACTION: Add "J" qualifier if missing and "N" qualifier to all <u>identified</u> TIC compounds on Form I, Part B.			
9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene—a VOA TCL—and should not be reported as a TIC)?	___	[✓]	___
ACTION: Flag with "R" any TCL compound listed as a TIC.			
9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?	[✓]	___	___
9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?	[✓]	___	___
ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.			

10.0 Compound Quantitation and Reported Detection Limits

	YES	NO	N/A
10.1 Are there any transcription / calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?	___	[✓]	___
10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?	[✓]	___	___

	YES	NO	N/A
ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.			
11.0 Standards Data (GC/MS)			
11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant. Reports) present for initial and continuing calibration?	[___]	___	___
ACTION: If any calibration standard data are missing, take action specified in 3.2 above.			
12.0 GC/MS Initial Calibration (Form VI)			
12.1 Are the Initial Calibration Forms (Form VI) present and complete for the volatile fraction?	[___]	___	___
ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.			
12.2 Are response factors stable for volatiles over the concentration range of the calibration (RSD <30%)?	[___]	___	___
ACTION: Circle all outliers in red.			
ACTION: When RSD >30%, non-detects may be qualified using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region II policy.)			
12.3 Do any compounds have an average RRF < 0.05?	___	[___]	___
ACTION: Circle all outliers in red.			
ACTION: If any volatile compound has an average RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").			

	YES	NO	N/A
12.4 Are there any transcription / calculation errors in the reporting of average response factors (RRF) or %RSD? (Check at least two values but if errors are found, check more.)	___	[✓]	___

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

13.0 GC/MS Continuing Calibration (Form VII)

	YES	NO	N/A
13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the volatile fraction?	[✓]	___	___
13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?	[✓]	___	___

ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.

____

____

____

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

	YES	NO	N/A
13.3 Do any continuing calibration standard compounds have a RRF < 0.05?	___	[✓]	___

ACTION: Circle all outliers in red.

ACTION: If any volatile compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").

	YES	NO	N/A
13.4 Do any compounds have a % difference between initial and continuing calibration RRF > 25%?	___	[✓]	___

ACTION: Circle all outliers in red and qualify associated sample data as outlined in the table below:

YES NO N/A

% DIFFERENCE

25-50	50-90	>90
'J' positive results, no action for non detects	'J' positive results, 'UJ' non detects	'J' positive results, "R" non detects

13.5 Are there any transcription / calculation errors in the reporting of average response factors (RRF) or difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more.) ___ [___] ___

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

14.0 Internal Standards (Form VIII)

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits for each continuing calibration? [___] ___ ___

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit

(Attach additional sheets if necessary.)

ACTION: If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results and non-detects (U values) quantitated with this internal standard. If extremely low area counts are reported, or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable ("R").

14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard? [___] ___ ___

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

15.0 Field Duplicates

	YES	NO	N/A
15.1 Were any field duplicates submitted for VOA analysis?	☐	___	___

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

YES NO N/A

PART B: BNA ANALYSES

.0 Traffic Reports and Laboratory Narrative

1.1 Are the Traffic Report Forms present for all samples? [✓ ___] ___ ___

ACTION: If no, contact lab for replacement of missing or illegible copies.

1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data? ___ [✓ ___] ___

ACTION: Use professional judgement to evaluate the effect on the quality of the data.

ACTION: If any sample analyzed as a soil contains more than 50% water, all data should be flagged as estimated (J).

.0 Holding Times

2.1 Have any BNA holding times, determined from date of collection to date of extraction, been exceeded? ___ [✓ ___] ___

Samples for BNA analysis, both soils and waters, must be extracted within seven days of the date of collection. Extracts must be analyzed within 40 days of the date of extraction.

Table of Holding Time Violations

			(See Traffic Report)		
Sample	Sample Matrix	Date Sampled	Date Lab Received	Date Extracted	Date Analyzed

ACTION: If holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded.

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. The reviewer may determine that non-detect data are unusable ("R").

3.0 Surrogate Recovery (Form II)

	YES	NO	N/A
3.1 Are the BNA Surrogate Recovery Summaries (Form II) present for each of the following matrices:			
a. Low Water	[✓]	___	___
b. Med Water	[✓]	___	___
c. Low Soil	[✓]	___	___
d. Med Soil	[✓]	___	___
3.2 Are all the BNA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices:			
a. Low Water	[✓]	___	___
b. Med Water	[✓]	___	___
c. Low Soil	[✓]	___	___
d. Med Soil	[✓]	___	___

ACTION: Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.

	YES	NO	N/A
3.3 Were outliers marked correctly with an asterisk?	[✓]	___	___

ACTION: Circle all outliers in red.

	YES	NO	N/A
3.4 Were two or more base-neutral <u>OR</u> acid surrogate recoveries out of specification for any sample or method blank?	___	[✓]	___
If yes, were samples reanalyzed?	[✓]	___	___
Were method blanks reanalyzed?	[✓]	___	___

ACTION: If all BNA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SOW specifications, <u>for the affected fraction only (i.e. base-neutral OR acid compounds)</u>:

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as estimated detection limits ("UJ").

If any base-neutral or acid surrogate has a recovery of <10% :

1. Flag all positive results for that fraction (i.e. all acid or base-neutral compounds) "J".
2. Flag all non-detects for that fraction "R".

Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and re-analyses. Check the internal standard areas.

	YES	NO	N/A
3.5 Are there any transcription/calculation errors between raw data and Form II?	___	[✓]	___

ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

1.0 Matrix Spikes (Form III)

	YES	NO	N/A
4.1 Is the Matrix Spike Duplicate/Recovery Form (Form III) present?	[✓]	___	___
4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:			
a. Low Water	[✓]	___	___
b. Med Water	[✓]	___	___
c. Low Soil	[✓]	___	___
d. Med Soil	[✓]	___	___

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

4.3 How many BNA spike recoveries are outside QC limits?

Water	Soils
______ out of 22	______ out of 22

4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water	Soils
______ out of 11	______ out of 11

ACTION: If MS and MSD both have less than 10% recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples.

	YES	NO	N/A
5.0 Blanks (Form IV)			
5.1 Is the Method Blank Summary (Form IV) present?	☐	___	___
5.2 Frequency of Analysis: for the analysis of BNA TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent?	☐	___	___
5.3 Has a BNA instrument blank been analyzed for each GS/MS system used.	☐	___	___

ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, reject all associated positive data ("R").

5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

	YES	NO	N/A
Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?	☐	___	___

ACTION: Use professional judgement to determine the effect on the data.

5.0 Contamination

NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.

	YES	NO	N/A
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BNAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor.	___	☐	___
6.2 Do any field/rinse blanks have positive BNA results (TCL and/or TIC)?	___	☐	___

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.

YES NO N/A

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks.

	Sample conc > CRQL but < 10x blank	Sample conc < CRQL & is < 10x blank value	Sample conc > CRQL value & >10x blank value
Common Phthalate Esters	Flag sample result with a 'U'; cross out 'B' flag	Reject sample result and report CRQL; cross out 'B' flag	No qualification is needed
	Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & > 5 blank value
Other Contaminants	Flag sample result with a 'U'; cross out 'B' flag	Reject sample result and report CRQL; cross out 'B' flag	No qualification is needed

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

6.3 Are there field/rinse/equipment blanks associated with every sample? [___] ___ ___

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 GC/MS Tuning and Mass Calibration (Form V)

7.1 Are the GC/MS Tuning and Mass Calibration Forms (Form V) present for Decafluorotriphenylphosphine (DFTPP)? [___] ___ ___

7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the DFTPP provided for each twelve hour shift? [___] ___ ___

7.3 Has a tuning performance compound been analyzed for every twelve hours of sample analysis per instrument? [___] ___ ___

ACTION: If any tuning data are missing, take action specified in 3.2 above.

ACTION: List date, time, instrument ID, and sample analyses for which no associated GC/MS tuning data are available.

YES NO N/A

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

7.4 Have the ion abundance criteria been met for each instrument used? [___] ___ ___

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If tuning calibration is in error, flag all associated sample data as unusable ("R"). However, if expanded ion criteria are met (See 1988 Functional Guidelines), the data reviewer may accept data with appropriate qualifiers.

7.5 Are there any transcription / calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ___ [___] ___

7.6 Have the appropriate number of significant figures (two) been reported? (Check at least two values, but if errors are found check more values.) [___] ___ ___

ACTION: If large errors exist, call lab for explanation / resubmittal, make necessary corrections and note errors under "Conclusions".

7.7 Are the spectra of the mass calibration compound acceptable? [___] ___ ___

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

.0 Target Compound List (TCL) Analytes

8.1 Are the Organic Analysis Data Sheets (Form I BNA) present with required header information on each page, for each of the following:

a. Samples and/or fractions as appropriate [___] ___ ___

b. Matrix spikes and matrix spike duplicates [___] ___ ___

c. Blanks [___] ___ ___

	YES	NO	N/A
8.2 Are the BNA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?			
a. Samples and/or fractions as appropriate	☐	___	___
b. Matrix spikes and matrix spike duplicates (Mass spectra not required)	☐	___	___
c. Blanks	☐	___	___
ACTION: If any data are missing, take action specified in 3.2 above.			
8.3 Are the response factors shown in the Quant Report?	☐	___	___
8.4 Is chromatographic performance acceptable with respect to:			
Baseline stability	☐	___	___
Resolution	☐	___	___
Peak shape	☐	___	___
Full-scale graph (attenuation)	☐	___	___
Other:________________________	☐	___	___
ACTION: Use professional judgement to determine the acceptability of the data.			
8.5 Are the lab-generated standard mass spectra of the identified BNA compounds present for each sample?	☐	___	___
ACTION: If any mass spectra are missing, take action specified in 3.2 above. If Lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".			
8.6 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?	☐	___	___
8.7 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?	☐	___	___
8.8 Do sample and standard relative ion intensities agree within 20%?	☐	___	___
ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected, flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (at the calculated detection limit).			

	YES	NO	N/A
9.0 Tentatively Identified Compounds (TIC)			
9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "J" qualifier?	☐	___	___
9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:			
a. Samples and/or fractions as appropriate	☐	___	___
b. Blanks	☐	___	___
ACTION: If any TIC data are missing, take action specified in 3.2 above.			
ACTION: Add "J" qualifier if missing and "N" qualifier to all <u>identified</u> TIC compounds on Form I, Part B.			
9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene—a VOA TCL—and should not be reported as a TIC)?	___	☐	___
ACTION: Flag with "R" any TCL compound listed as a TIC.			
9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?	☐	___	___
9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?	☐	___	___
ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.			
.0.0 Compound Quantitation and Reported Detection Limits			
10.1 Are there any transcription / calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?	___	☐	___
10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?	☐	___	___

	YES	NO	N/A

ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

11.0 Standards Data (GC/MS)

	YES	NO	N/A
11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant. Reports) present for initial and continuing calibration?	☐	___	___

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

2.0 GC/MS Initial Calibration (Form VI)

	YES	NO	N/A
12.1 Are the Initial Calibration Forms (Form VI) present and complete for the BNA fraction?	☐	___	___

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

	YES	NO	N/A
12.2 Are response factors stable for BNAs over the concentration range of the calibration (RSD <30%)?	☐	___	___

ACTION: Circle all outliers in red.

ACTION: When RSD >30%, non-detects may be qualified using professional judgement. Flag all positive results "J". When RSD >90%, flag all non-detects as unusable ("R"). (Region II policy.)

	YES	NO	N/A
12.3 Do any compounds have a RRF < 0.05?	___	☐	___

ACTION: Circle all outliers in red.

ACTION: If any BNA compound has an average RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").

	YES	NO	N/A
12.4 Are there any transcription / calculation errors in the reporting of average response factors (RRF) or %RSD? (Check at least two values but if errors are found, check more.)	___	[___]	___

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

13.0 GC/MS Continuing Calibration (Form VII)

	YES	NO	N/A
13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the BNA fraction?	[___]	___	___
13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?	[___]	___	___

ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.

____

____

____

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation / resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

	YES	NO	N/A
13.3 Do any continuing calibration standard compounds have a RRF < 0.05?	___	[___]	___

ACTION: Circle all outliers in red.

ACTION: If any BNA compound has a RRF < 0.05, flag positive results for that compound as estimated ("J"), and flag non-detects for that compound as unusable ("R").

	YES	NO	N/A
13.4 Do any compounds have a % difference between initial and continuing calibration RRF > 25%?	___	[___]	___

ACTION: Circle all outliers in red and qualify associated sample data as outlined in the table below:

YES NO N/A

% DIFFERENCE

25-50	50-90	>90
'J' positive results, no action for non detects	'J' positive results, 'UJ' non detects	'J' positive results, "R" non detects

13.5 Are there any transcription / calculation errors in the reporting of average response factors (RRF) or difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more.) ___ [___] ___

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

14.0 <u>Internal Standards (Form VIII)</u>

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits for each continuing calibration? [___] ___ ___

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit

(Attach additional sheets if necessary.)

ACTION: If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results and non-detects (U values) quantitated with this internal standard. If extremely low area counts are reported, or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable ("R").

14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard? [___] ___ ___

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

	YES	NO	N/A
5.0 Field Duplicates			
15.1 Were any field duplicates submitted for BNA analysis?	☐	___	___

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

PART C: PESTICIDE/PCB ANALYSES

	YES	NO	N/A
1.0 Traffic Reports and Laboratory Narrative			
1.1 Are the Traffic Report Forms present for all samples?	[___]	___	___
ACTION: If no, contact lab for replacement of missing or illegible copies.			
1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data?	___	[___]	___
ACTION: Use professional judgement to evaluate the effect on the quality of the data.			
ACTION: If any sample analyzed as a soil contains more than 50% water, all data should be flagged as estimated (J).			
.0 Holding Times			
2.1 Have any PEST/PCB holding times, determined from date of collection to date of extraction, been exceeded?	___	[___]	___
Samples for PEST/PCB analysis, both soils and waters, must be extracted within seven days of the date of collection. Extracts must be analyzed within 40 days of the date of extraction.			
.0 Surrogate Recovery (Form II)			
3.1 Are the PEST/PCB Surrogate Recovery Summaries (Form II) present for each of the following matrices:			
a. Low Water	[___]	___	___
b. Med Water	[___]	___	___
c. Low Soil	[___]	___	___
d. Med Soil	[___]	___	___
3.2 Are all the PEST/PCB samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices:			
a. Low Water	[___]	___	___
b. Med Water	[___]	___	___
c. Low Soil	[___]	___	___
d. Med Soil	[___]	___	___

	YES	NO	N/A
ACTION: Call lab for explanation / resubmittals. If missing deliverables are unavailable, document effect on data under "Conclusions" section of reviewer narrative.			
3.3 Were outliers marked correctly with an asterisk?	[___]	___	___
ACTION: Circle all outliers in red.			
3.4 Was surrogate (DBC) recovery outside of the contract specification for any sample or blank?	___	[___]	___
ACTION: No qualification is done if surrogates are diluted beyond detection. If recovery is below contract limit (but above zero), flag all results for that sample "J". If recovery is zero, flag positive results "J" and non-detects "R". If recovery for the blank is zero, flag non-detects for all associated samples "R". If recovery is above contract limit, flag all positive results for that sample "J", unless in the reviewers professional judgement the high recovery is due to co-eluting interference (check the associated blank - if recovery is high there also, flag the sample data).			
3.5 Are there any transcription/calculation errors between raw data and Form II?	___	[___]	___
ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			

.0 Matrix Spikes (Form III)

	YES	NO	N/A
4.1 Is the Matrix Spike Duplicate/Recovery Form (Form III) present?	[___]	___	___
4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:			
a. Low Water	[___]	___	___
b. Med Water	[___]	___	___
c. Low Soil	[___]	___	___
d. Med Soil	[___]	___	___
ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.			

4.3 How many PEST/PCB spike recoveries are outside QC limits?

Water	Soils
______ out of 12	______ out of 12

YES NO N/A

4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water	Soils
______ out of 6	______ out of 6

ACTION: If MS and MSD both have less than zero recovery for an analyte, negative results for that analyte should be rejected, and positive results should be flagged "J". The above applies only to the sample used for MS/MSD analysis. Use professional judgement in applying this criterion to other samples.

5.0 Blanks (Form IV)

5.1 Is the Method Blank Summary (Form IV) present? [___] ___ ___

5.2 Frequency of Analysis: for the analysis of Pesticide TCL compounds, has a reagent/method blank been analyzed for each set of samples or every 20 samples of similar matrix (low water, med water, low soil, medium soil), whichever is more frequent? [___] ___ ___

5.3 Chromatography: review the blank raw data - chromatograms, quant reports or data system printouts.

Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs? [___] ___ ___

ACTION: Use professional judgement to determine the effect on the data.

.0 Contamination

NOTE: "Water blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.

6.1 Do any method/instrument/reagent blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor. ___ [___] ___

6.2 Do any field/rinse blanks have positive PEST/PCB results? ___ [___] ___

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

NOTE: Only field/rinse blanks taken the same day as the samples are used to qualify data. Blanks may not be qualified because of contamination in another blank. Blanks may be qualified for surrogate, spectral, tuning or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks.

Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL & > 5x blank value
Flag sample result with a "U"; cross out "B" flag	Reject sample result and report CRQL; cross out "B" flag	No qualification is needed

	YES	NO	N/A
6.3 Are there field/rinse/equipment blanks associated with every sample?	☐	___	___

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 Calibration and GC Performance

7.1 Are the following Gas Chromatograms and Data System Printouts for both Primary and Confirmation (confirmation standards not required if there are no positive results above CRQL) column present:

	YES	NO	N/A
a. Evaluation Standard Mix A	☐	___	___
b. Evaluation Standard Mix B	☐	___	___
c. Evaluation Standard Mix C	☐	___	___
d. Individual Standard Mix A	☐	___	___
e. Individual Standard Mix B	☐	___	___
f. Multi-component Pesticides Toxaphene & Chlordane	☐	___	___
g. Aroclors 1016/1260	☐	___	___
h. Aroclors 1221, 1232, 1242, 1248, and 1254	☐	___	___

ACTION: If no, take action specified in 3.2 above

	YES	NO	N/A
7.2 Is Form VIII Pest-1 present and complete for each GC column (primary and confirmation) and each 72 hour sequence of analyses?	[___]	___	___

ACTION: If no, take action specified in 3.2 above.

	YES	NO	N/A
7.3 Are there any transcription/calculation errors between raw data and Form VIII?	___	[___]	___

ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

	YES	NO	N/A
7.4 Has the total breakdown on quantitation or confirmation column exceeded 20% for DDT?	___	[___]	___
- for Endrin?	___	[___]	___
or if Endrin aldehyde <u>and</u> 4,4'-DDD co-elute and there is a peak at their retention time, has the combined DDT and Endrin breakdown exceeded 20%?	___	[___]	___

ACTION:

a. If DDT breakdown is greater than 20% on quantitation column beginning with the samples following the last <u>in control</u> standard:

1. Flag all positive DDT results "J".
2. If DDT was not detected but DDD and/or DDE are positive, flag the DDT non-detect "R".
3. Flag positive DDD and DDE results "JN".
4. If DDT breakdown is > 20% on confirmation column <u>and</u> DDT is identified on quantitation column but not on confirmation column, use professional judgement to determine whether DDT should be reported on Form I (if reported, flag result "N").

b. If Endrin breakdown is > 20% on quantitation column, beginning with the samples following the last <u>in control</u> standard:

1. Flag all positive Endrin results "J".
2. If Endrin was not detected, but Endrin Aldehyde and/or Endrin Ketone are positive, flag the Endrin non-detect "R".
3. Flag Endrin Ketone positive results "JN".
4. If Endrin breakdown is > 20% on confirmation column <u>and</u> Endrin is identified on quantitation column but not on confirmation column, use professional judgement to determine whether Endrin should be reported on Form I (if reported, flag result "N").

c. If the combined breakdown is used (it can only be used if the conditions in 7.4 above are met) and is > 20% on quantitation column beginning with the last <u>in control</u> standard, take the actions specified in 7.4 a and b above. If the combined breakdown is >20% on confirmation column <u>and</u> Endrin or DDT is identified on quantitation column but not on confirmation column, use professional judgement to determine whether Endrin or DDT should be reported on Form I (if reported, flag result "N").

	YES	NO	N/A
7.5 Is the linearity check RSD of all four calibration factors <10% for the quantitation column?	☐	___	___

ACTION: If no, flag positive hits for all pesticide and PCB analytes "J" for all associated samples. Do not flag toxaphene or DDT if they are quantified from a 3-point calibration curve.

	YES	NO	N/A
7.6 Is the % difference between the EVAL A and each analysis (quantitation and confirmation) DBC retention time within QC limits (2% for packed column, 0.3% for capillary [I.D. < 0.32 mm], 1% for megabore [0.32 < I.D. < 2 mm]) ?	☐	___	___

ACTION: DBC retention time cannot be evaluated if DBC is not detected. If it is present and has a retention time out of QC limits, then use professional judgement to determine the reliability of the analysis and flag results "R", if appropriate.

	YES	NO	N/A
7.7 Was the proper analytical sequence followed for each 72 hour period of analyses (page PEST D-36 in 8/87 SOW).	☐	___	___

ACTION: If no, use professional judgement to determine the severity of the effect on the data and accept or reject it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.

.0 Pesticide/PCB Standards Summary

	YES	NO	N/A
8.1 Is Form IX present and complete for each GC column and 72 hr sequence of analyses?	☐	___	___

ACTION: If no, take action specified in 3.2 above.

	YES	NO	N/A
8.2 Are there any transcription/calculation errors between raw data and Form IX?	___	☐	___

ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

	YES	NO	N/A
8.3 Is DDT retention time for packed columns > 12 min (except OV-1 and OV-101 columns)?	☐	___	___

ACTION: If no, check that there is adequate resolution between individual components. If not, flag results for compounds that interfere with each other (co-elute) "R".

	YES	NO	N/A
8.4 Do all standard retention times fall within the windows established for the first IND A and IND B analyses?	☐	___	___

	YES	NO	N/A
ACTION: Beginning with the samples following the last <u>in control</u> standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and, DBC is visible non-detects are valid. If peaks are present and cannot be identified through "pattern recognition" or a consistent shift in standard retention times, flag all affected compound results "R".			
8.5 Are the continuing calibration standard calibration factors within 15% (for quantitation column) or 20% (for confirmation column) of the initial (at beginning of 72 hr sequence) calibration factors?	[✓]	___	___
ACTION: If no, flag all associated positive results "J". Use professional judgement to determine whether or not to flag non-detects.			
9.0 <u>Pesticide/PCB Identification</u>			
9.1 Is Form X complete for every sample in which a pesticide or PCB was detected?	[✓]	___	___
ACTION: If no, take action specified in 3.2 above.			
9.2 Are there any transcription errors between raw data and Form X?	___	[✓]	___
ACTION: If large errors exist, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".			
9.3 Are retention times of sample compounds within the calculated retention time windows for both quantitation and confirmation analyses?	[✓]	___	___
Was GC/MS confirmation provided when required (when compound concentration is > 10 ug/ml in final extract)?	[✓]	___	___
ACTION: Reject ("R") all positive results (meeting quantitation column criteria, but missing confirmation by a second column or GC/MS (if appropriate). Also, reject ("R") all positive results not meeting retention time window criteria unless associated standard compounds are similarly biased (i.e. base on RRT to DBC).			
9.4 Check chromatograms for false negatives, especially for the multiple peak components toxaphene and PCB's. Were there any false negatives?	___	[✓]	___
ACTION: If appropriate PCB standards were not analyzed, or if the lab performed no confirmation analysis, flag the appropriate data with an "R".			

	YES	NO	N/A
10.0 Compound Quantitation and Reported Detection Limits			
10.1 Are there any transcription / calculation errors in Form I results? Check at least two positive values. Were any errors found?	___	☐	___

NOTE: Simple peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. The reviewer should use professional judgement to decide whether a much larger concentration obtained on one column versus the other indicates the presence of an interfering compound. If an interfering compound is indicated, the lower of the two values should be reported and qualified as presumptively present at an estimated quantity ("JN"). This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has obscured the attempt at a second column confirmation.

	YES	NO	N/A
10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?	___	☐	___

ACTION: If errors are large, call lab for explanation / resubmittal, make any necessary corrections and note errors under "Conclusions".

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

	YES	NO	N/A
..0 Chromatogram Quality			
11.1 Were baselines stable?	☐	___	___
11.2 Were any electropositive displacement (negative peaks) or unusual peaks seen?	___	☐	___
11.3 Were early eluting peaks (for early eluting analytes) resolved to baseline?	☐	___	___

ACTION: For 11.1 and 11.2, comment only. For 11.3, reject ("R") those analytes that are not sufficiently resolved.

12.0 Field Duplicates

	YES	NO	N/A
12.1 Were any field duplicates submitted for PEST/PCB analysis?	[__]	___	___

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

PAGE __OF__

TOTAL REVIEW

CLP DATA ASSESSMENT

Functional Guidelines for Evaluating Organics Analysis

Case No.__________SDG No.________LABORATORY________SITE__________

DATA ASSESSMENT:

The current functional guidelines (1988) for evaluating organic data have been applied.

All data are valid and acceptable except those analytes which have been qualified with a "J" (estimated), "U" (non-detects), "R" (unusable), or "JN" (presumptive evidence for the presence of the material at an estimated value). All action is detailed on the attached sheets.

Two facts should be noted by all data users. First, the "R" flag means that the associated value is unusable. In other words, due to significant QC problems the analysis is invalid and provides <u>no information</u> as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact to keep in mind is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains error.

Reviewer's
Signature:_____________________________Date:___/____/19___

Verified By:___________________________Date:___/_____/19___

DATA ASSESSMENT:

1. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded will be qualified as estimated, "J". The non-detects (sample quantitation limits) will be flagged as estimated, "J", or unusable, "R", if the holding times are grossly exceeded.

The following action was taken in the samples and analytes shown due to excessive holding time.

DATA ASSESSMENT:

2. BLANK CONTAMINATION:

Quality assurance (QA) blanks, i.e., method, trip field, rinse and water blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field blanks measure cross- contamination of samples during field operations. If the concentration of the analyte is less than 5 times the blank contaminant level (10 times for the common contaminants), the analytes are qualified as non- detects, "U". The following analytes in the samples shown were qualified with "U" for these reasons:

A) Method blank contamination

B) Field or rinse blank contamination ("water blanks" or "distilled water blanks" are validated like any other sample)

C) Trip blank contamination

DATA ASSESSMENT:

3. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper identification of compounds, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organics is bromofluorobenzene (BFB) and for semi-volatiles is decafluorotriphenyl- phosphine (DFTPP).

If the mass calibration is in error, all associated data will be classified as unusable, "R".

DATA ASSESSMENT:

4. CALIBRATION:

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an experimental sequence. The continuing calibration checks document that the instrument is giving satisfactory daily performance.

A) RESPONSE FACTOR:

The response factor measures the instrument's response to specific chemical compounds. The response factor for the Target Compound List (TCL) must be $\geq$ 0.05 in both the initial and continuing calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". All non-detects for that compound will be rejected ("R").

DATA ASSESSMENT:

5. CALIBRATION:

A) PERCENT RELATIVE STANDARD DEVIATION (%RSD) AND PERCENT DIFFERENCE (%D):

Percent RSD is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent D compares the response factor of the continuing calibration check to the mean response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be <30% and %D must be <25%. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J" and non-detects are flagged "UJ" (if %D or RSD >50%). If there is a gross deviation of %RSD and %D, the non-detects may be rejected ("R").

For the PCB/PESTICIDE fraction, %RSD for aldrin, endrin, DDT, and dibutylchlorendate must not exceed 10%. Percent D must be within 15% on the quantitation column and 20% on the confirmation column.

DATA ASSESSMENT:

6. SURROGATES:

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

DATA ASSESSMENT:

7. INTERNAL STANDARDS PERFORMANCE:

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every experimental run. The internal standard area count must not vary by more than a factor of 2 (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary more than ±30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated, "J", and all non-detects as "UJ", or "R" if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgment to determine either partial or total rejection of the data for that sample fraction.

DATA ASSESSMENT:

8. COMPOUND IDENTIFICATION:

A) VOLATILE AND SEMI-VOLATILE FRACTIONS:

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within ± 0.06 RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TIC) the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

B) PESTICIDE FRACTION:

The retention times of reported compounds must fall within the calculated retention time windows for the two chromatographic columns and a GC/MS confirmation is required if the concentration exceeds 10 ng/ml in the final sample extract.

DATA ASSESSMENT:

9. MATRIX SPIKE/SPIKE DUPLICATE, MS/MSD:

The MS/MSD data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of the data.

DATA ASSESSMENT:

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued):

DATA ASSESSMENT:

10. OTHER QC DATA OUT OF SPECIFICATION:

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued on next page if necessary):

12. CONTRACT PROBLEMS____NON-COMPLIANCE:

13. This package contains re-extraction, re-analysis or dilution. Upon reviewing the QA results, the following form I(s) are identified to be used.

DATA ASSESSMENT:

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT (continued):

SOP NO. HW-2

Evaluation of Metals Data for the Contract Laboratory Program (CLP)

based on

SOW. 7/88
REV. 2/89

(SOP Revision X)

PREPARED BY: Hanif Sheikh DATE: 2-16-90
Hanif Sheikh, Quality Assurance Chemist
Toxic and Hazardous Waste Section

CONCURRED BY: Louis Bevilacqua DATE: 2/16/90
Louis Bevilacqua, Section Chief
Toxic and Hazardous Waste Section

APPROVED BY: L Bevilacqua for GFM DATE: 2/16/90
Gerard F. McKenna, Chief
Monitoring Management Branch

STANDARD OPERATING PROCEDURE Page 1 of 35

Title: Evaluation of Inorganic Data for the Contract Laboratory Program

Date: Feb. 1990
Number: HW-2
Revision: 10

1.0 Scope

1.1 This procedure is applicable to inorganic data obtained from contractor laboratories working for Hazardous Waste Site Contract Laboratory Program (CLP).

1.2 The data validation is based upon analytical and quality assurance requirements specified in Statement of Work (SOW) 7/88.

2.0 Responsibilities - Data reviewers will complete the following tasks as assigned by the Da Review Coordinator:

2.1. For a total review:

2.1.1 Data Assessment - "Total Review-Inorganics" Checklist Appendix (A.1). The reviewer must answer every question on the checklist.

2.1.2 Data Assessment - Data Assessment Narrative (Appendix A.2) The answer on the checklist must match the action in the narrative (appendix A.2) and on Form I's. Do not use pencil to write the narrative.

2.1.3 Contract Non-Compliance - SMO Report (Appendix A.3) This report is to be completed only when a serious contract violation is encountered, or upon the request of the Data Review Manager or Deputy Project Officer (DPO). Forward 5 copies: one each for internal files, appropriate Regional DPO, Sample Management Office (SMO) and last two addresses of Mailing List for Data Reviewers (Appendix A.4). In other cases, all contract violations should be appended to end of Data Assessment Narrative (Sec. A.2.2).

2.1.4 Data Summary Sheet - Summary of Inorganic Quality Control Data (Appendix A.5). Enter in ink on Data Summary Sheet required QC values from Forms I through IX. Cir all values that require data qualification "Action".

2.1.5 CLP Data Assessment Summary Forms

2.1.5.1 Appendix A.6
Fill in the total number of analytes analyzed by different analyses and the number of analytes rejected or flagged as estimated due to corresponding quality control criteria. Place an "X" in boxes where analyses were not performed, or criteria do not apply.

2.1.5.2 Appendix A.7
Data reviewer is also required to fill out Inorganic Regional Data Assessment form (Appendix A.7) provided by EPA Headquarters. Codes listed on the form will be used to describe the Data Assessment Summary.

2.1.6 Data Review Log: It is recommended that each data reviewer should maintain a log of reviews completed to include:

a. date of start of case review
b. date of completion of case review
c. site
d. case number
e. contract laboratory
f. number of samples
g. matrix
h. hours worked
i. reviewer's initials

2.1.7 Telephone Record Log - the data reviewer should enter the bare facts of inquiry, before initiating any phone conversation with CLP laboratory. After the case review has been completed, mail white copy of Telephone Record Log to the laboratory and pink copy to SMO. File yellow copy in the Telephone Record Log folder, and attach a xerox copy of the Telephone Record Log to the completed Data Assessment Narrative (Appendix A.2).

2.1.8 Forwarded Paperwork

2.1.8.1 Upon completion of review, the following are to be forwarded to the Regional Sample Control Center (RSCC) located in the Surveillance and Monitoring Branch:

a. data package
b. completed data assessment checklist (Appendix A.1,original)
c. SMO Contract Compliance Screening (CCS)
d. Data Summary Sheet (Appendix A.5) along with completed Data Assessment Narrative (Appendix A.2)
e. Record of Communication (copy)
f. CLP Reanalysis Request/Approval Record (original + 3 copies)
g. Appendix A.7 (original).

2.1.8.2 Forward 4 copies of completed Data Assessment Narrative (Appendix A.2) along with 2 copies of the Inorganic Data Assessment Form (Appendix A.7) and Telephone Record Log , if any,: one each for appropriate Regional DPO, Sample Management Office (SMO), and last two addressees of Mailing List for Data Reviewers (Appendix A.4) (the Inorganic Data Assessment form does not go to the last two addressees).

2.1.9 Filed Paperwork - Upon completion of review, the following are to be filed within MMB files:

a. Four copies of completed Data Assessment Narrative (Appendix A.2) each carrying Appendix A.7.
b. Telephone Record Log (copy)
c. SMO Report (copy Appendix A-3)
d. CLP Data Assessment Summary Form (Appendix A.6).
e. CLP Reanalysis Request/Approval Record (copy)

3.0 Data Completeness
Indicate incomplete data package on the computer tracking sheet located in MMB office. Authorized contractor personnel may contact the laboratory after discovery of an incomplet data package. If a laboratory will not return phone calls or does not respond to requests notify MMB coordinator of Region II for resolution.

4.0 Rejection of Data - All values determined to be unacceptable on the Inorganic Analysis Dat Sheet (Form I) must be lined over with a red pencil. As soon as any review criteria cause data to be rejected, that data can be eliminated from any further review or consideratio

5.0 Acceptance Criteria - In order that reviews be consistent among reviewers, acceptance criteria as stated in Appendix A.1 (pages 4-25) should be used. Additional guidance c be found in the National Inorganic Functional Guidelines of October 1, 1989.

6.0 SMO Contract Compliance Screening (CCS) - This is intended to aid reviewer in locating a problems, both corrected and uncorrected. However, the validation should be carried o even if CCS is not present. Resubmittals received from laboratory in response to CCS mu be used by the reviewer.

7.0 Request for Reanalysis - Data reviewers must note all items of contract non-compliance within Data Assessment Narrative.If holding times and sample storage times have not be exceeded, DPO may request reanalysis if items of non-compliance are critical to data assessment. Requests are to be made on "CLP Re-Analysis Request/Approval Record".

8.0 Record of Communication - Provided by the Regional Sample Control Center (RSCC) to indicate which data packages have been received and are ready to be reviewed.

9.0 Rounding off numbers - The data reviewer will follow the standard practice.

	YES	NO	N/A
A.1.1 Contract Compliance Screening Report (CCS) - Present?	[___]	___	___
ACTION: If no, contact RSCC.			
A.1.2 Record of Communication (from RSCC) - Present?	[___]	___	___
ACTION: If no, request from RSCC.			
A.1.3 Trip Report - Present and complete?	[___]	___	___
ACTION: If no, contact RSCC for trip report.			
A.1.4 Sample Traffic Report - Present or on file?	[___]	___	___
Legible?	[___]	___	___
ACTION: If no, request from Regional Sample Control Center (RSCC).			
A.1.5 Cover Page - Present?	[___]	___	___
Is cover page properly filled in and signed by the lab manager or the manager's designee?	[___]	___	___
ACTION: If no, prepare Telephone Record Log, and contact laboratory.			
Do numbers of samples correspond to numbers on Record of Communication?	[___]	___	___
Do sample numbers on cover page agree with sample numbers on:			
(a) Traffic Report Sheet?	[___]	___	___
(b) Form I's?	[___]	___	___
ACTION: If no for any of the above, contact RSCC for clarification.			

	YES	NO	N/A
A.1.6 Form I (Final Data) - Are all Form I's present and complete?	[___]	___	___
ACTION: If no, prepare telephone record log and contact laboratory for submittal.			
Are correct units (ug/l for waters and mg/kg for soils) indicated on Form I's?	[___]	___	___
Are soil sample results for each parameter corrected for percent solids?	[___]	___	___
Are EPA sample # s and corresponding laboratory sample ID # s the same as on the Cover Page, Form I's and in the raw data?	[___]	___	___
Are computation/transcription errors less than 10% of reported values?	[___]	___	___
Are all "less than IDL" values properly coded with "U"?	[___]	___	___
Was a brief physical description of samples given on Form I's?	[___]	___	___
Were the result qualifiers used correctly with final data?	[___]	___	___
ACTION: If no for any of the above, prepare Telephone Record Log, and contract laboratory for corrected data.			
Were any samples diluted beyond requirements of contract?	___	[___]	___
If yes, were dilutions noted on Form I's?	[___]	___	___
ACTION: If no, note under Contract-Problem/Non-Compliance of the"Data Assessment Narrative".			

A.1.7 Holding Times - (aqueous and soil samples)

(Examine sample traffic reports and digestion/distillation logs.)

	YES	NO	N/A
Mercury analysis (28 days). . . . . . . exceeded?	___	[___]	___
Cyanide distillation (14 days). . . . . exceeded?	___	[___]	___

	YES	NO	N/A
Other Metals analysis (6 months). . . . exceeded?	___	[___]	___

NOTE: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist.

ACTION: If yes, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was preserved properly.

A.1.8 Raw Data

		YES	NO	N/A
A.1.8.1	Digestion Log* for flame AA/ICP (Form XIII) present?	[___]	___	___
	Digestion Log for furnace AA Form XIII present?	[___]	___	___
	Distillation Log for mercury Form XIII present?	[___]	___	___
	Distillation Log for cyanides Form XIII present?	[___]	___	___
	Are pH values (pH<2 for all metals, pH>12 for cyanide) present in Digestion/Distillation Logs?	[___]	___	___

*Weights, dilutions and volumes used to obtain values.

		YES	NO	N/A
	Percent solids calculation present for soils/sediments?	[___]	___	___
	Are preparation dates present on Digestion Log?	[___]	___	___
A.1.8.2	Measurement read out record present? ICP	[___]	___	___
	Flame AA	[___]	___	___
	Furnace AA	[___]	___	___
	Mercury	[___]	___	___
	Cyanides	[___]	___	___

		YES	NO	N/A
A.1.8.3	Are all raw data to support all sample analyses and QC operations present?	[___]	___	___
	Legible?	[___]	___	___
	Properly Labeled?	[___]	___	___

ACTION: If no for any of the above, write Telephone Record Log and contact laboratory. Flag metal data as estimated if pH of sample is greater than 2. Flag cyanide data as estimated if pH sample is less than 12.

A.1.9 Data Validation and Verification

A.1.9.1 Calibration

		YES	NO	N/A
A.1.9.1.1	Is record of at least 2 point calibration present for ICP analysis?	[___]	___	___
	Is record of 5 point calibration present for Hg analysis?	[___]	___	___

ACTION: If no for any of the above, write in the Contract Problem/Non-Compliance section of the "Data Assessment Narrative".

		YES	NO	N/A
A.1.9.1.2	Is record of 4 point calibration present for:			
	Flame AA?	[___]	___	___
	Furnace AA?	[___]	___	___
	Cyanides?	[___]	___	___

NOTE:
1. If less than 4 standards are measured in absorbance mode, then the remaining standards in concentration mode must be run immediately after calibration and be within ±10% of true value.
2. For all AA (except Hg) and Cyanide analyses, one calibration standard is at CRDL level. If not, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".

	YES	NO	N/A

ACTION: Flag associated data as estimated if standards are not within ±10% of true values (except CRDL calibration standard). Do not flag the data as estimated in linear range indicated by good recovery of standard.

A.1.9.1.3 Is correlation *coefficient less than 0.995 for:

	YES	NO	N/A
Mercury Analysis?	___	[___]	___
Cyanide Analysis?	___	[___]	___
Atomic Absorption Analysis?	___	[___]	___

ACTION: If yes, flag the associated data as estimated.

A.1.9.2 Form II A (Initial and Continuing Calibration Verification)-

	YES	NO	N/A
A.1.9.2.1 Present and complete for every metal and cyanide?	[___]	___	___
Present and complete for AA and ICP when both are used for same analyte?	[___]	___	___

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.

A.1.9.2.2 Circle all values on data summary sheet that are outside contract windows. Are all calibration standards (initial and continuing) within control limits?

	YES	NO	N/A
Metals 90-110%	[___]	___	___
Hg - 80-120%	[___]	___	___
Cyanides 85-115%	[___]	___	___

---

* The reviewer will calculate correlation coefficient.

YES NO N/A

ACTION: Flag as estimated (J) all positive data (not flagged with a "U") analyzed between a calibration standard with %R between 75-89% (65-79% for Hg; 70-84% for CN) or 111-125% (121-135% for Hg; 116-130% for CN) recovery and nearest good calibration standard. Qualify results <IDL as estimated (UJ), if the ICV or CCV %R is 75-89% (CN, 70-84% ; HG, 65-79%). Reject (red-line) as unacceptable data if recovery of the ICV or CCV is outside the range 75-125% (CN, 70-130%; Hg, 65-135%). Qualify five samples on either side of verification standard out of control limits.

Was continuing calibration performed every 10 samples or every 2 hours? [___] ___ ___

ACTION: If no, flag the excess samples (eleventh and up) data as estimated (J).

Was ICV for cyanides distilled? [___] ___

ACTION: If no, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".

A.1.9.3 Form II B (CRDL Standards for AA and ICP) -

A.1.9.3.1 Was a CRDL standard (CRA) analyzed after initial calibration for all AA metals (except Hg)? [___] ___ ___

*Was a mid-range calib. verification standard distilled and analyzed for cyanide analysis? [___] ___ ___

Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run? [___] ___ ___
(Note: CRI for AL,Ba,Ca,Fe,Mg,Na,or K is not required.)

ACTION: If no for any of the above, flag as estimated all data falling within the affected ranges.
The affected ranges are:
AA Analysis - **True Value ± CRDL
ICP Analysis - **True Value ± 2CRDL
CN Analysis - **True Value ± 0.5 x True Value.

* Find the results of mid-range standard in the raw data.
**True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL

		YES	NO	N/A
A.1.9.3.2	Was CRI analyzed after ICV/ICB and before the final CCV/CCB, and for every four hours of ICP run?	[___]	___	___
	ACTION: If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".			
A.1.9.3.3	Circle all values on summary sheet that are outside acceptance windows.			
	Are CRA and CRI standards within control limits: Metals 80 - 120%R?	[___]	___	___
	Is mid-range standard within control limits: Cyanide 80 - 120%R?	[___]	___	___
	ACTION: Flag as estimated all data within the affected ranges if the recovery of the standard is between 50-79%; flag only positive data if the recovery is between 121-150%; reject (red line) all data if the recovery is less than 50%; reject only positive data if the recovery is greater than 150%.			
A.1.9.4	Form III (Initial and Continuing Calibration Blanks)			
A.1.9.4.1	Present and complete?	[___]	___	___
	For both AA and ICP when both are used for same analyte?	[___]	___	___
	Was an initial calibration blank analyzed?	[___]	___	___
	Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (whichever is more frequent)?	[___]	___	___
	ACTION: If no, prepare Telephone Record Log, contact laboratory and write in the contract-problems/non-compliance section of the Data Assessment Narrative.			

		YES	NO	N/A
A.1.9.4.2	Circle all calibration blank values on Data Summary Sheet that are above CRDL (or 2 x IDL when IDL > CRDL). Are all calibration blanks (when IDL<CRDL) less than or equal to Contract Required Detection Limits (CRDL)?	[___]	___	___
	Are all calibration blanks less than two times Instrument Detection Limit (when IDL>CRDL)?	[___]	___	___

<u>ACTION</u>: If no for any of the above, flag as estimated (J) all positive data less than or equal to calibration blank values analyzed between calibration blank with value over CRDL (or 2xIDL) and nearest good calibration blank. Flag five samples on either side of the calibration blank.

A.1.9.5 <u>FORM III (Preparation Blank)</u> -

(Note: The preparation blank for mercury is the same as the calibration blank.)

		YES	NO	N/A
A.1.9.5.1	Was one prep. blank analyzed for: each 20 samples?	[___]	___	___
	each batch?	[___]	___	___
	each matrix type?	[___]	___	___
	both AA and ICP when both are used for same analyte?	[___]	___	___

<u>ACTION</u>: If no for any of the above, flag as estimated (J) all associated positive data <10 x IDLs for which prep. blank was not analyzed.

<u>NOTE</u>: If only one blank was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

		YES	NO	N/A
A.1.9.5.2	Is concentration of prep. blank greater than CRDL when IDL is less than or equal to CRDL?	___	[___]	___
	If yes, is the concentration of the sample with the least concentrated analyte less than 10 times the prep. blank value?	___	[___]	___

		YES	NO	N/A
	ACTION: If yes, reject (red-line) all associated data greater than CRDL concentration but less than ten times the prep. blank value found in the raw data.			
A.1.9.5.3	Do concentrations of prep. blank fall below two times IDL when IDL is greater than CRDL?	[___]	___	___
	ACTION: If no, reject (red-line) all positive data that has a concentration less than 10 times the prep. blank value in the raw data.			
A.1.9.5.4	Is concentration of prep. blank below the negative CRDL?	___	[___]	___
	ACTION: If yes, reject (red-line) all associated data that has a concentration less than 10xCRDL.			
A.1.9.6	Form IV (1CP Interference Check Sample)			
A.1.9.6.1	Present and complete?	[___]	___	___
	(NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)			
	Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?	[___]	___	___
	ACTION: If no, flag as estimated (J) all samples for which AL, Ca, Fe, or Mg is higher than in ICS.			
A.1.8.6.2	Circle all values on Data Summary Sheet that are more than + 20% of true or established mean value. Are all Interference Check Sample results inside of control limits (+ 20%)?	[___]	___	___
	If no, is concentration of Al, Ca, Fe, or Mg lower than in ICS?	[___]	___	___
	ACTION: If no, flag as estimated (J) those positive results for which ICS recovery is between 121-150%; flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject positive results only (not flagged with a "U").			

A.1.9.7 Form V A (Spiked Sample Recovery - Pre-Digestion/Pre-Distillation)- (Note: Not required for Ca, Mg, K, and Na (both matrices), Al, and Fe (soil only.)

		YES	NO	N/A
A.1.9.7.1	Present and complete for: each 20 samples?	[___]	__	___
	each matrix type?	[___]	__	___
	each conc. range (i.e. low, med., high)?	[___]	__	___
	For both AA and ICP when both are used for same analyte?	[___]	__	___

ACTION: If no for any of the above, flag as estimated (J) all positive data less than four times spiking level for which spiked sample was not analyzed.

NOTE: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).

		YES	NO	N/A
A.1.9.7.2	Was field blank used for spiked sample?	___	[__]	___

ACTION: If yes, flag all positive data less than 4 x spike added as estimated (J) for which field blank was used as spiked sample.

NOTE: Matrix spike analysis should be performed on a field blank when it is the only aqueous sample in SDG.

		YES	NO	N/A
A.1.9.7.3	Circle all values on Data Summary Sheet that are outside control limits (75% to 125%). Are all recoveries within control limits?	[___]	__	__
	If no, is sample concentration greater than or equal to four times spike concentration?	[___]	__	__

ACTION: If yes, disregard spike recoveries for analytes whose concentrations are greater than or equal to four times spike added. If no, circle those analytes on Form V for which sample concentration is less than four times the spike concentration.

	YES	NO	N/A
Are results outside the control limits (75-125%) flagged with "N" on Form I's and Form VA?	[___]	___	___

<u>ACTION</u>: If no, write in the Contract - Problem/Non - Compliance section of "Data Assessment Narrative".

A.1.9.7.4 <u>Aqueous</u>

Are any spike recoveries:

	YES	NO	N/A
(a) less than 30%?	___	[___]	___
(b) between 30-74%?	___	[___]	___
(c) between 126-150%?	___	[___]	___
(d) greater than 150%?	___	[___]	___

<u>ACTION</u>: If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated aqueous data as estimated (J); if between 126-150%, flag as estimated (J) all associated aqueous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a "U".

<u>NOTE</u>: If pre-digestion spike result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, disregard spike recovery on Form V. Flag the associated data as estimated(J).

A.1.9.7.5 <u>Soil/Sediment</u>

Are any spike recoveries:

	YES	NO	N/A
(a) less than 10%?	___	[___]	___
(b) between 10-74%?	___	[___]	___
(c) between 126-200%?	___	[___]	___
(d) greater than 200%?	___	[___]	___

<u>ACTION</u>: If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".

A.1.9.8 Form VI (Lab Duplicates)

		YES	NO	N/A
A.1.9.8.1	Present and complete for: each 20 samples?	[___]	___	___
	each matrix type?	[___]	___	___
	each concentration range (i.e. low, med., high)?	[___]	___	___
	both AA and ICP when both are used for same analyte?	[___]	___	___

ACTION: If no for any the above, flag as estimated (J) all data >CRDL* for which duplicate sample was not analyzed.

Note: 1. If one duplicate sample was analyzed for more than 20 samples, then first 20 samples do not have to be flagged as estimated.
2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in Hg/L on wet weight basis and calculate RPD or Difference for each analyte.

		YES	NO	N/A
A.1.9.8.2	Was field blank used for duplicate analysis?	___	[___]	___

ACTION: If yes, flag all data >CRDL* as estimated (J) for which field blank was used as duplicate.

NOTE: Duplicate analysis should be performed on a field blank when it is the only aqueous sample in SDG.

		YES	NO	N/A
A.1.9.8.3	Are all values within control limits (RPD 20% or difference < ±CRDL)?	[___]	___	___
	If no, are all results outside the control limits flagged with an * on Form I's and VI?	[___]	___	___

ACTION: If no, write in the Contract - Problems/Non-Compliance section of "Data Assessment Narrative".

NOTE: 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.

* Substitute IDL for CRDL when IDL > CRDL.

	YES	NO	N/A
2. If lab duplicate result is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria.			
A.1.9.8.4 Is any value for sample duplicate pair less than CRDL* and other value greater than or equal to 10 x *CRDL?	___	[___]	___
ACTION: If yes, flag the associated data as estimated (J).			
A.1.9.8.5 <u>Aqueous</u> Circle all values on Data Summary Sheet that are: RPD > 50%, or Difference > ± CRDL*			
Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL?	___	[___]	___
Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL?	___	[___]	___
ACTION: If yes, flag the associated data as estimated.			
A.1.9.8.6 Soil/Sediment Circle all values on Data Summary Sheet that are: RPD > 100%, or Difference > 2 x CRDL*			
Is any RPD (where sample and duplicate are both greater than or equal to 5 times *CRDL) : > 100%?	___	[___]	___
Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x*CRDL) : > 2x*CRDL?	___	[___]	___

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

YES NO N/A

ACTION: If yes, flag the associated data as estimated.

A.1.9.9 Field Duplicates

A.1.9.9.1 Were field duplicates analyzed? [___] ___ ___

ACTION: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in ug/l on wet weight basis and calculate RPDs or Difference for each analyte.

NOTE:
1. Do not calculate RPD when both values are less than IDL.
2. Flag all associated data only for field duplicate pair.

A.1.9.9.2 Is any value for sample duplicate pair less than *CRDL and other value greater than or equal to 10 x *CRDL? ___ [___] ___

ACTION: If yes, flag the associated data as estimated.

A.1.9.9.3 Aqueous

Circle all values on Form VI for field duplicates that are:
RPD > 50%, or
Difference > ± CRDL*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL? ___ [___] ___

Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL? ___ [___] ___

ACTION: If yes, flag the associated data as estimated.

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

	YES	NO	N/A

A.1.9.9.4 Soil/Sediment

Circle all values on Form VI for field duplicates that are:
RPD >100%, or

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than 5 times *CRDL) :

	YES	NO	N/A
>100%?	___	[_ _]	___

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x *CRDL):

	YES	NO	N/A
>2x *CRDL?	___	[_ _]	___

ACTION: If yes, flag the associated data as estimated.

A.1.9.10 Form VII (Laboratory Control Sample) (Note: LCS - not required for aqueous Hg and cyanide analyses.)

A.1.9.10.1 Was one LCS prepared and analyzed for:

	YES	NO	N/A
every 20 water samples?	[___]	_ _	___
every 20 solid samples?	[___]	_ _	___
both AA and ICP when both are used for same analyte?	[___]	_ _	___

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory for submittal of results of LCS. Flag as estimated (J) all data for which LCS was not analyzed.

NOTE: If only one LCS was analyzed for more than 20 samples, then first 20 samples close to LCS do not have to be flagged as estimated.

* Substitute IDL for CRDL when IDL > CRDL.

**Use absolute values of sample and duplicate to calculate the difference.

A.1.9.10.2 <u>Aqueous LCS</u>

Circle all LCS values outside control limits (80 - 120%- except aqueous Ag and Sb).

	YES	NO	N/A
Is any LCS recovery: less than 50%?	___	[__]	___
between 50% and 79%?	___	[__]	___
between 121% and 150%?	___	[__]	___
greater than 150%?	___	[__]	___

<u>ACTION</u>: Less than 50%, reject (red-line) all data; between 50% and 79%, flag all associated data as estimated (J); between 121% and 150%, flag all positive (not flagged with a "U") results as estimated; greater than 150%, reject all positive results.

A.1.9.10.3 <u>Solid LCS</u>

<u>NOTE</u>: 1. If "Found" value of LCS is rejectable due to duplicate injections or analytical spike recovery criteria, regardless of LCS recovery, flag the associated data as estimated (J).
2. If IDL of an analyte is equal to or greater than true value of LCS, disregard the "Action" below even though LCS is out of control limits.

	YES	NO	N/A
Is LCS "Found" value higher than the control limits on Form VII?	___	[__]	___

<u>ACTION</u>: If yes, qualify all associated positive data as estimated.

	YES	NO	N/A
Is LCS "Found" value lower than the Control limits on Form VII?	___	[__]	___

<u>ACTION</u>: If yes, qualify all associated data as estimated.

		YES	NO	N/A
A.1.9.11	<u>Form IX (ICP Serial Dilution)</u> -			

<u>NOTE</u>: Serial dilution analysis is required only for initial concentrations equal to or greater than 10 x IDL.

		YES	NO	N/A
A.1.9.11.1	Was Serial Dilution analysis performed for:			
	each 20 samples?	[___]	___	___
	each matrix type?	[___]	___	___
	each concentration range (i.e. low, med.)?	[___]	___	___

<u>ACTION</u>: If no for any of the above, flag all positive data greater than or equal to 10xIDLs as estimated (J) for which Serial Dilution Analysis was not performed, and summarize the deficiency on the DPO report.

		YES	NO	N/A
A.1.9.11.2	Was field blank(s) used for Serial Dilution Analysis?	___	[___]	___

<u>ACTION</u>: If yes, flag all associated data ≥ 10 x IDL as estimated (J).

<u>NOTE</u>: Serial dilution analysis should be performed on a field blank when it is the only aqueous sample in SDG.

		YES	NO	N/A
A.1.9.11.3	Are results outside control limit flagged with an "E" on Form I's and Form IX when initial concentration on Form IX is equal to 50 times IDL or greater.	[___]	___	___

<u>ACTION</u>: If no, write in the contract-problem/non-compliance section of the "Data Assessment Narrative".

		YES	NO	N/A
A.1.9.11.4	Circle all values on Data Summary Sheet that are outside control limit for initial concentrations equal to or greater than 10 x IDLs only. Are any % difference values:			
	> 10%?	___	[___]	___
	≥ 100%?	___	[___]	___

YES NO N/A

ACTION: Flag as estimated (J) all associated equal to or greater than 10xIDLs for which percent difference is greater than 10% but less than 100%. Reject (red-line) all associated sample results equal to or greater than 10xIDLs for which PD is greater than or equal to 100%.

A.1.9.12 Furnace Atomic Absorbtion (AA) QC Analysis

A.1.9.12.1 Are duplicate injections present in furnace raw data (except during full Method of Standard Addition) for each sample analyzed by GFAA? [___] ___ ___

ACTION: If no, reject the data on Form I's for which duplicate injections were not performed.

A.1.9.12.2 Do the duplicate injection readings agree within 20% Relative Standard Deviation (RSD) or Coefficient of Variation (CV) for concentration greater than CRDL? [___] ___ ___

Was a dilution analyzed for sample with post digestion spike recovery less than 40%? [___] ___ ___

ACTION: If no for any of the above, flag all the associated data as estimated (J).

A.1.9.12.3 Is *post digestion spike recovery less than 10% or greater than 150% for any result? ___ [___] ___

ACTION: If yes, reject (red-line) the affected data if recovery is <10%; reject data not flagged with "U" if spike recovery is >150%.

NOTE: Reject the data only if the affected sample was not subsequently analyzed by Method of Standard Addition.

---

* Post digestion spike is not required on the pre-digestion spiked sample when predigesti spike recovery is within control limits of 75-125% or when SR>4xSA.

		YES	NO	N/A
A.1.9.13	Form VIII (Method of Standard Addition Results)			
A.1.9.13.1	Present?	[___]	___	___
	If no, is any Form I result coded with "S" or a "+"?	___	[___]	___
	ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII.			
A.1.9.13.2	Is coefficient of correlation for MSA less than 0.990 for any sample?	___	[___]	___
	ACTION: If yes, reject (red-line) affected data.			
A.1.9.13.3	Was *MSA required for any sample but not performed?	___	[___]	___
	Is coefficient of correlation for MSA less than 0.995?	___	[___]	___
	Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical run?	___	[___]	___
	ACTION: If yes for any of the above, flag all the associated data as estimated (J).			
A.1.9.13.4	Was proper quantitation procedure followed correctly as outlined in the SOW on page E-16 through E-17?	[___]	___	___
	ACTION: If no, note exception under contract problem/non-compliance of data assessment narrative, or prepare a separate list.			
A.1.9.14	Dissolved/Total or Inorganic/Total Analytes -			
A.1.9.14.1	Were any analyses performed for dissolved as well as total analytes on the same sample(s).	___	[___]	___
	Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?	___	[___]	___

* MSA is not required on LCS and prep. blank.

<u>NOTE</u>:
1. If yes, prepare a list comparing differences between all dissolved (or inorganic) and total analytes. Compute the differences as a percent of the total analyte only when dissolved concentration is greater than CRDL as well as total concentration.
2. Apply the following questions only if inorganic (or dissolved) results are (i) above CRDL, and (ii) greater than total constituents.
3. At least one preparation blank, ICS, and LCS should be analyzed in each analytical run.

	YES	NO	N/A
A.1.9.14.2 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 10%?	___	[__]	___
A.1.9.14.3 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 50%?	___	[__]	___

ACTION: If more than 10%, flag both dissolved (or inorganic) and total values as estimated (J); if more than 50%, reject (red-line) the data for both values.

A.1.9.15 Form I to IX

A.1.9.15.1 Are all the Form I through Form IX labeled with:

	YES	NO	N/A
Laboratory name?	[___]	___	___
Case/SAS number?	[___]	___	___
EPA sample No.?	[___]	___	___
SDG No.?	[___]	___	___
Contract No.?	[___]	___	___
Correct units?	[___]	___	___
Matrix?	[___]	___	___

ACTION: If no for any of the above, note under contract problem/non-compliance section of the "Data Assessment Narrative".

	YES	NO	N/A
A.1.9.15.2 Do any computation/transcription errors exceed 10% of reported values on Forms I-IX for:			
(NOTE: Check all forms against raw data.)			
(a) all analytes analyzed by ICP?	___	[___]	___
(b) all analytes analyzed by GFAA?	___	[_ _]	___
(c) all analytes analyzed by AA Flame?	___	[_ _]	___
(d) Mercury?	___	[_ _]	___
(e) Cyanide?	___	[_ _]	___

<u>ACTION</u>: If yes, prepare Telephone Log, contact laboratory for corrected data and correct errors with red pencil and initial.

A.1.9.16 <u>Form I (Field Blank)</u> -

Circle all field blank values on Data Summary Sheet that are greater than CRDL, 2 x IDL when IDL > CRDL.

	YES	NO	N/A
Do concentrations of field blank(s) fall below CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?	[___]	_ _	___
If no, was field blank value already rejected due to other QC criteria?	[___]	_ _	___

<u>ACTION</u>: If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank value.

	YES	NO	N/A
A.1.9.17 <u>Form X, XI, XII (Verification of Instrumental Parameters).</u>			
A.1.9.17.1 Is verification report present for:			
Instrument Detection Limits (quarterly)?	[___]	___	___
ICP Interelement Correction Factors (annually)?	[___]	___	___
ICP Linear Ranges (quarterly)?	[___]	___	___
<u>ACTION</u>: If no, contact DPO of the lab.			
A.1.9.17.2 <u>Form X (Instrument Detection Limits)</u> - (Note: IDL is not required for Cyanide.)			
Are IDLs present for: all the analytes?	[___]	___	___
all the instruments used?	[___]	___	___
For both AA and ICP when both are used for same analyte?	[___]	___	___
<u>ACTION</u>: If no for any of the above, prepare Telephone Record Log and contact laboratory.			
Is IDL greater than CRDL for any analyte?	___	[___]	___
If yes, is the concentration on Form I of the sample analyzed on the instrument whose IDL exceeds CRDL, greater than 5 x IDL?	[___]	___	___
<u>ACTION</u>: If no, flag as estimated all values less than five times IDL of the instrument whose IDL exceeds CRDL.			

	YES	NO	N/A
A.1.9.17.3 Form XI (Linear Ranges)			
Was any sample result higher than high linear range of ICP.	___	[___]	___
Was any sample result higher than the highest calibration standard for non-ICP parameters?	___	[___]	___
If yes for any of the above, was the sample diluted to obtain the result on Form I?	[___]	___	___

ACTION: If no, flag the result reported on Form I as estimated(J).

	YES	NO	N/A
A.1.9.18 Percent Solids of Sediments			
Is soil content in sediment(s) less than 50%?	___	[___]	___

ACTION: If yes, qualify as estimated all data not previously rejected or flagged due to other QC criteria.

Case# ____________ Site ____________ Matrix: Soil ____

SDG# ____________ Lab ____________ Water ____

Contractor ____________ Reviewer ____________ Other ____

A.2.1 The case description and exceptions, if any, are noted below with reason(s) for rejection or qualification as estimated value(s) J.

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.2: Data Assessment Narrative

Date: Feb. 1990
Number: HW-2
Revision: 10

A.2.1 (continuation)

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.2: Data Assessment Narrative

Date: Feb. 1990
Number: HW-2
Revision: 10

A.2.1 (continuation)

A.2.2 Contract-Problems/Non-Compliance

MMB Reviewer: ______________________ Date: __________
Signature

Contractor Reviewer: ______________________ Date: __________
Signature

Verified by: ______________________ Date: __________

CONTRACT NON-COMPLIANCE
(SMO REPORT)

Regional Review of Uncontrolled Hazardous Waste Site Contract Laboratory Data Package

CASE NO. ____________

The hardcopied (laboratory name)______________________________ Inorganic data package received at Region II has been reviewed and the quality assurance a performance data summarized. The data reviewed included:

SMO Sample No.:______________________________

Conc. & Matrix:______________________________

Contract No. WA87-K025,K026,K027(SOW787) requires that specific analytical work be done and that associated reports be provided by the contractor to the Regions, EMSL-LV, and SMD. T general criteria used to determine the performance were based on an examination of:

- Data Completeness
- Matrix Spike Results
- Calibration Standards Results
- Duplicate Analysis Results
- Blank Analysis Results
- MSA Results

Items of non-compliance with the above contract are described below.

Comments:______________________________

Reviewer's Initial ____________ Date ____________

INFO/MAILING LIST FOR DATA REVIEWERS

1. USEPA Region I (ESD)
60 Westview Street
Lexington, MA 02173
Deb Szaro
(617) 861-4312
CT, ME, MA, NH, RI, VT
CAA, Resource Analysts, York,
E3I, Skinner, TMA

2. USEPA Region II (ESD)
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Lisa Gatton Vidulich
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NJ, NY, PR, VI
Century, Chemtech, US Test, Nanco,
ETC, Gadson, EMS, Galson, ICM

3. USEPA Region III (CRL)
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5. USEPA Region V (ESD)
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9. USEPA Region IX (ESD)
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Labs (For VOA Only), Weyerheuser Co.
Columbia Testing, Silver Valley

11. Carla Dempsey - (OS-230)
USEPA
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Washington, DC 20460
FTS 382-5746

12. Edward Kantor
USEPA
EMSL-LV
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Las Vegas, NV 89119

13. Sample Management Office
Viar and Company
P.O. BOX 818
Alexandria, VA 22313

APPENDIX A 5 SUMMARY OF INORGANICS QUALITY CONTROL DATA

LABORATORY:______________ CASE NO.____________ SOW NO._____ SAMPLE TYPE/SDG:______________

SITE/STUDY DESCRIPTION:________________________ SAMPLE NOS:______________________________

____

Field Blank ________________

FIELD DUP. #'S:______________ LAB DUP. #'S:______________ MATRIX SPIKE #:____________

SERIAL DILUTION SAMPLE NO.____________ COMPLETION DATE:_________ REVIEWERS INITIALS:__________

	XI		I	IIA				IIB		III						IV		V		VI	VII	IX	
Parameter	Detection Limits UG/L		Field Blank	Calib. Ver. %R				CRDL Std Ver. % R		Calibration Blanks				PREP	BLAN	ICP ICS % R		Mtrx	Spik	Lab Dup RPD/Diff	LCS % R	Ser Dil % D	Meth
	CRDL	IDL		Init	Continued 1	2	3	Init	Fin	Init	Continued 1	2	3			Init	Fin						
Al	200																						
Sb	60																						
As	10																						
Ba	200																						
Be	5																						
Cd	5																						
Ca	5000																						
Cr	10																						
Co	50																						
Cu	25																						
Fe	100																						
Pb	5																						
Mg	5000																						
Mn	15																						
Hg	0.2																						
Ni	40																						
K	5000																						
Se	5																						
Ag	10																						
Na	5000																						
Tl	10																						
V	50																						
Zn	20																						
CN	10																						

CLP DATA ASSESSMENT SUMMARY FORM (INORGANICS)

Type of Review:____________________ Date:________________ Case #:________

Site:____________________________ Lab Name:____________________

Reviewer's Initials:__________ Number of Samples:______________

Analytes Rejected Due to Exceeding Review Criteria:*

	Holding Times	Calibration	Prep Blank	Field Blank	Inter-ferences	Spike Recovery	Duplicates		Detection Limits	LCS	Serial Dilution	MSA	Total Analytes	Rejection
							Lab	Field						
ICP														
Flame AA														
Furnace AA														
Mercury														
Total														
Other														

Analytes Flagged as Estimated (J) Due to Exceeding Criteria For:*

ICP														
Flame AA														
Furnace AA														
Mercury														
Total														
Other														

Note:
Asterisk (*) Indicates additional exceedances of review criteria.

INORGANIC REGIONAL DATA ASSESSMENT

Region____

CASE NO.____ SITE____

LABORATORY____ NO. OF SAMPLES/ MATRIX____

SDG#____ REVIEWER (IF NOT ESD)____

SOW#____ REVIEWER'S NAME____

DPO: ACTION____ FYI____ COMPLETION DATE____

DATA ASSESSMENT SUMMARY

		ICP	AA	Hg	CYANIDE
1.	HOLDING TIMES	____	____	____	____
2.	CALIBRATIONS	____	____	____	____
3.	BLANKS	____	____	____	____
4.	ICS	____			
5.	LCS	____	____		
6.	DUPLICATE ANALYSIS	____	____	____	____
7.	MATRIX SPIKE	____	____	____	____
8.	MSA		____		
9.	SERIAL DILUTION	____			
10.	SAMPLE VERIFICATION	____	____	____	____
11.	OTHER QC	____	____	____	____
12.	OVERALL ASSESSMENT	____	____	____	____

O = Data has no problems/or qualified due to minor problems.
M = Data qualified due to major problems.
Z = Data unacceptable.
X = Problems, but do not affect data.

ACTION ITEMS:____

AREAS OF CONCERN:____

NOTABLE PERFORMANCE:____

APPENDIX D

SAMPLE HANDLING PROTOCOL

SAMPLE HANDLING PROTOCOL
FOR
LOW, MEDIUM AND HIGH CONCENTRATION SAMPLES
OF
HAZARDOUS WASTE

10/86

This Sample Handling Protocol describes the procedures and paperwork to be used when sending samples to the assigned Corps of Engineers Quality Assurance (QA) Laboratory for "external" QA purposes. This protocol also applies to all samples for chemical analysis to be collected by the Contractor for CE purposes for Superfund, DERA or IRP projects. For Superfund projects, MRDED-L normally provides all sample bottles and coolers while for DERA and IRP, MRDED-L provides only sample bottles and coolers for QA purposes; however, the contractor must use the same types of bottles. (External QA sample results are compared to contract laboratory results as part of the process for final validation of data.) The number of QA field splits or duplicates shall be one per matrix type or one for each ten samples of each matrix type sent to the contract laboratory whichever is greater. Examples of matrix types are groundwater, surface water, sediment, soil, solid waste, leachate, etc. See examples below.

Each sample shall include the number of subsamples or containers with preservatives as needed for each type of analysis required.

Example of Number of QA Samples Needed

Number of Samples of a Matrix Type Sent to Contract Lab	Number of QA Field Splits or Duplicates Needed
1	1
3	1
12	1
17	2
25	3

Also required for external QA purposes is one blank sample for each matrix type or one for each ten samples of each matrix type sent to the contract laboratory, whichever is greater. The Corps QA Laboratory will furnish the sample bottles for the QA blanks and field splits or duplicates described above. Field blanks may be clean or background soil samples, water samples from background wells, sampler rinsates, or distilled water blanks as appropriate to the sample type and as recommended by the QA laboratory. Remember that a similar number of field blanks and field splits or duplicates are also needed for internal Quality Control (QC) purposes by the contract laboratory.

I. LOW CONCENTRATION SAMPLES - Low level samples are considered to be those collected off-site, around the perimeter of a waste site, or in areas where hazards are thought to be significantly reduced by normal environmental processes.

A. Waters.

1) Organics.

a) Bottle and Preservative Requirements.

- Four 1-liter (or two 80 ounce or two half-gallon) amber glass bottles (Teflon-lined caps), iced to 4°C (may not be held at site over 24 hours). Remember: Leave headspace!

- Two 40 mL glass VOA vials (Teflon-lined caps), iced to 4° C (may not be held at site over 24 hours). Fill completely! All air bubbles should be excluded.

- The samples above are needed when Method 624 or 1624 is used to analyze for volatile (or purgeable) organics, when Method 625 or 1625 is used to analyze for Acid/Base Neutral (A/B/N) extractable organics, and when Method 608 is used to analyze for pesticides and PCB's. Other methods may have different preservation techniques. Be sure to preserve the sample properly if a method other than 608, 624, 625, 1624, or 1625 is planned.

b) Paperwork/Labels.

- Chain of Custody Record. See attached example. It is important to note that only one site may be listed per form even if the sites have the same project number. Top original goes with the samples; a copy should be saved for the sampler's files.

- Receipt for Samples. See attached example. This form complies with the requirements that the owner, operator, or agent-in-charge is legally entitled to i) a receipt describing the samples obtained from the site and; ii) a portion of each such sample equal in weight or volume to the portion retained, if requested. The original form is retained for the Project Coordinator and a copy is given to the owner, operator, or agent-in-charge.

- Labels/Sample Tags. See attached example. You must label the sample with a date, time of collection, site name, and brief description on a label that will not float/soak off - no masking tape, please. Use only indelible ink on all labels and tags. Numbered sample tags should be used on all samples.

c) Packaging and Shipping.

- Waterproof metal (or equivalent strength plastic) ice chests or coolers only.

- After filling out the pertinent information on the sample label and tag, put the sample in the bottle or vial and screw on the lid. For bottles other than VOA vials, secure the lid with strapping tape. (Tape on VOA vials may cause contamination.) Then, secure the string from the numbered approved tag around the lid.

- Mark volume level on bottle with grease pencil.
- Place about 3 inches of inert cushioning material such as vermiculite in the bottom of the cooler.
- Enclose the bottles in clear plastic bags through which sample tags and labels are visible, and seal the bag. Place bottles upright in the cooler in such a way that they <u>do not touch</u> and will not touch during shipment.
- Put in additional inert packing material to partially cover sample bottles (more than half-way). Place bags of ice around, among, and on top of the sample bottles.
- Fill cooler with cushioning material.
- Put paperwork (chain of custody record) in a waterproof plastic bag and tape it with masking tape to the inside lid of the cooler.
- Tape the drain shut.
- Secure lid by taping. Wrap the cooler completely with strapping tape at a minimum of two locations. Do not cover any labels.
- Attach completed shipping label to top of the cooler.
- Put "This Side Up" labels on all four sides and "Fragile" labels on at least two sides.
- Affix numbered and signed custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

Remember that each cooler cannot cannot exceed the weight limit set by the shipper.

2) <u>Inorganics.</u>

a) <u>Bottle and Preservative Requirements.</u>

- <u>Metals</u>. One 1-liter high density polyethylene bottle (Teflon-lined cap), adjust to $\mathrm{pH} \leq 2$ with 1:1 HNO_3 (usually 3 mL). See notes 1 and 2 below.
- <u>Cyanides</u>. One 1-liter high density polyethylene bottle (Teflon-lined cap), adjust to $\mathrm{pH} > 12$ with NaOH (usually

2 mL of 10N NaOH or 4 pellets), and 4°C. See note 1 below.

- <u>Sulfide</u>. One 1-liter high density polyethylene bottle (Teflon-lined cap), 4 mL 2.0 N zinc acetate and adjust pH > 9 with NaOH, and 4 C. See note 1 below.

- <u>Fluoride</u>. One 1-liter high density polyethylene bottle (Teflon-lined cap), no preservative, and 4°C.

- <u>pH</u>. No preservative. Must be measured immediately in field. Do not ship.

- <u>Ammonia, Total Nitrogen, Organic Nitrogen, Nitrate/Nitrite</u>. For each analyte, one 1-liter high density polyethylene bottle (Teflon-lined cap), adjust to pH < 2 with H_2SO_4 (usually 4 mL 1:1 H_2SO_4), and 4°C.

- <u>Oil and Grease, Total Organic Carbon (TOC)</u>. For each analyte, one 1-liter glass bottle (Teflon-lined cap), 4 mL 1:1 H_2SO_4 (to pH < 2), and 4°C. See note 1 below.

<u>Notes</u>:

1. For quality control purposes, larger sample volumes of some samples are needed. If a water sample is sent from only one sample location, <u>two</u> 1-liter bottles for each separately preserved sample are needed. If there are more sample locations, one out of every five will require two 1-liter bottles for each separately preserved sample.

2. Water samples may require filtration on site before shipment. (This usually applies only to ground water samples which are visibly cloudy.) Be sure to refer to the project Sampling and Analysis Plan for detailed instructions.

b) <u>Paperwork/Labels</u>.

- <u>Inorganic Paperwork</u> is the same as described for organics (see I.A.1.b) above) and includes the Chain of Custody Record, Receipt for Samples, and Labels/Sample Tags. See previous examples and explanations.

c) <u>Packaging and Shipment</u>

- Follow packaging and shipping requirements listed for organics (see Section I.A.1)c) above). "Fragile" labels are optional for coolers not containing glass bottles.

In cases where ice is not required (metals), fill cooler with only packing material. Once again, remember that the cooler must not exceed the shipper's weight limit.

B. Soils/Sediments (Organics and Inorganics)

1) Bottle and Preservative Requirements

→ o Two 8-ounce glass wide mouth jars at least 3/4 full (Teflon-lined caps), no preservative, and iced to 4°C - one jar for organics and one jar for inorganics. For analysis of volatiles in soil, either 2-40 mL VOA vials with Teflon septa completely full with no headspace are needed in addition (preferably) or 1 additional 8 oz. jar with Teflon-lined lid completely full. No preservatives and iced to 4°C are also required for volatile samples.

Note: For quality control purposes, larger sample volumes of some samples are needed. If a soil sample is sent from only one sample location, four 8-ounce bottles are needed, two for organics and two for inorganics. If there are more sampling locations, one out of every five will require four 8-ounce bottles.

2) Paperwork/Labels

o Follow paperwork requirements listed for water samples in Section I.A.1)b) above. See attached examples of forms.

3) Packaging and Shipping

o Follow packaging and shipping requirements in Section I.A.1)c) above. Be sure that the shipping cooler does not exceed the shipper's weight limits.

II. MEDIUM CONCENTRATION SAMPLES - Medium level samples are most often those collected on-site, in areas of moderate dilution by normal environmental processes.

A. Waters/Liquids (Organics and Inorganics)

Note: Samples are not known to contain highly toxic compounds such as dioxin.

1) Bottle and Preservative Requirements

o Four 32-ounce wide mouth glass jars (Teflon-lined caps), no preservatives, and iced to 4°C for A/B/N extractable organics.

o Two 40 mL glass VOA bottles (Teflon-lined caps), Iced to 4°C. Fill completely. No preservatives.

- Two 16-ounce wide mouth glass jars nearly-full (Teflon-lined caps), no preservative - one for metals and one for cyanides.

2) Paperwork/Labels

- See previous examples. Follow paperwork requirements in I.A.1)b) for low concentration samples.

3) Packaging and Shipping

- Secure sample jar lids with strapping tape or evidence tape. At the same time secure string from USEPA numbered tag around lid.
- Mark volume level of bottle with grease pencil.
- Position jar in Ziploc bag so that tags may be read.
- Place about 1/2 inch of cushioning material in the bottom of metal can.
- Place jar in can and fill remaining volume of can with cushioning material.
- Close the can using three clips to secure the lid.
- Write sample number on can lid. Indicate "This Side Up" by drawing an arrow and place "Flammable Liquid N.O.S." label on can. Personnel who ship samples must be sure to comply with DOT shipping regulations and not knowingly over classify a sample prior to shipment. If the person shipping a sample knows that the sample is not a "Flammable Liquid" (i.e., a water phase sample or a soil sample), he should not classify it as "Flammable Liquid."
- Place about 1 inch of packing material in bottom of cooler.
- Place cans in cooler and fill remaining volume of cooler with packing material.
- Put paperwork in plastic bags and tape with masking tape to inside lid of cooler.
- Tape drain shut.
- After acceptance by shipper, tape cooler completely around with strapping tape at two locations. Secure lid by taping. Do not cover any labels.
- Place lab address on top of cooler.

Note: Write "Flammable Liquid N.O.S." on side of cooler if this is not marked on the margin of your DOT label.

- For all medium and high concentration shipments, complete shipper's hazardous material certification form.

- o Put "This Side Up" labels on all four sides, "Flammable Liquid N.O.S." and "Danger-Peligro" on all sides.

Note: "Danger-Peligro" labels should be used only when net quantity of samples in cooler exceeds 1 quart (32 ounces) for liquids or 25 pounds for solids. In other words, for our purposes "Danger-Peligro" labels will never be used for Flammable Solids N.O.S.

- o Affix numbered custody seals on front right and back left of cooler. Cover seals with wide, clear tape.

B. Soils/Sediments/Solids (Organics and Inorganics)

1) Bottles and Preservatives

- o Two 8-ounce wide mouth glass jars, 3/4 full (Teflon-lined caps), no preservatives, one jar for organics and one jar for inorganics (metals and cyanide) or
- o Four 4-ounce wide mouth glass jars, each 3/4 full (Teflon-lined caps), no preservative; two jars for organics and two jars for inorganics.

2) Paperwork/Labels

- o See previous examples. Follow paperwork requirements listed in section I.A.1)b) for low concentration samples.

3) Packaging and Shipping

- o Follow packaging and shipping requirements listed in Section II.A.3) for medium concentration water/liquids above substituting "Flammable Liquid N.O.S." with "Flammable Solid N.O.S."

III. HIGH CONCENTRATION SAMPLES (HAZARDOUS; DETERMINED NOT TO BE A D.O.T. - DEFINED POISON A) - High concentration samples include those from drums, surface impoundments, direct discharges, and chemical spills, where there is little or no evidence of environmental dilution. High concentration (or high hazard) samples are suspected to contain greater than 15% concentration of any individual chemical substituent.

A. Liquids (Organics and Inorganics)

1) Bottle and Preservative Requirements

- o One 8-ounce wide mouth glass jar filled 1/2 to 3/4 full (Teflon-lined cap). No preservative.

2) Paperwork/Labels

a) See previous examples. Follow paperwork requirements listed in Section I.A.1)b above.

b) Shipper may require special forms to be completed before shipment of high hazard concentration samples.

3) Packaging and Shipping

- Follow packaging and shipping requirements listed in Section II.A.3) above for medium concentration water/liquids.

B. Soils/Sediments/Solids (Organics and Inorganics)

1. Bottle and Preservative Requirements

- One 8-ounce wide mouth glass jar filled 1/2 to 3/4 full (Teflon-lined cap). No preservative.

2. Paperwork/Labels

- See attached examples. Follow paperwork requirements in Section I.A.1)b) above.

3. Packaging and Shipping

- Follow packaging and shipping requirements listed in Section II.A.3) for medium concentration water/liquids, substituting "Flammable Liquid N.O.S." with "Flammable Solid N.O.S."

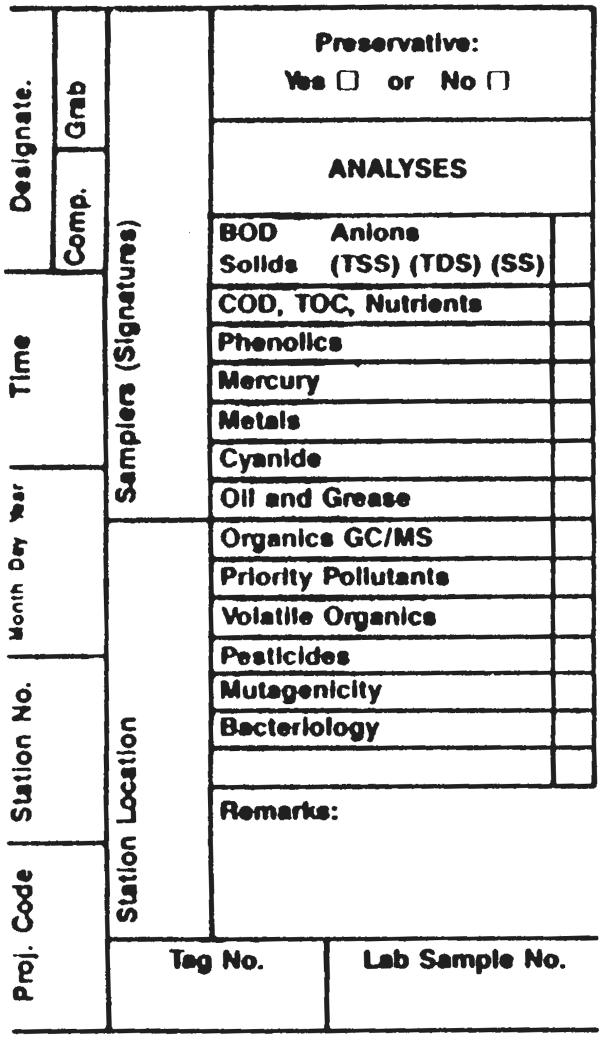
TABLE 1

ppm = mg/L or µg/mL or mg/kg

ppb = µg/L or µg/kg or ng/g

(204)

Low and Medium Concentration Example



Proj. Code

Station No.

Month Day Year

Time

Designate.

Comp. Grab

Station Location

Samplers (Signatures)

Preservative:
Yes ☐ or No ☐

ANALYSES

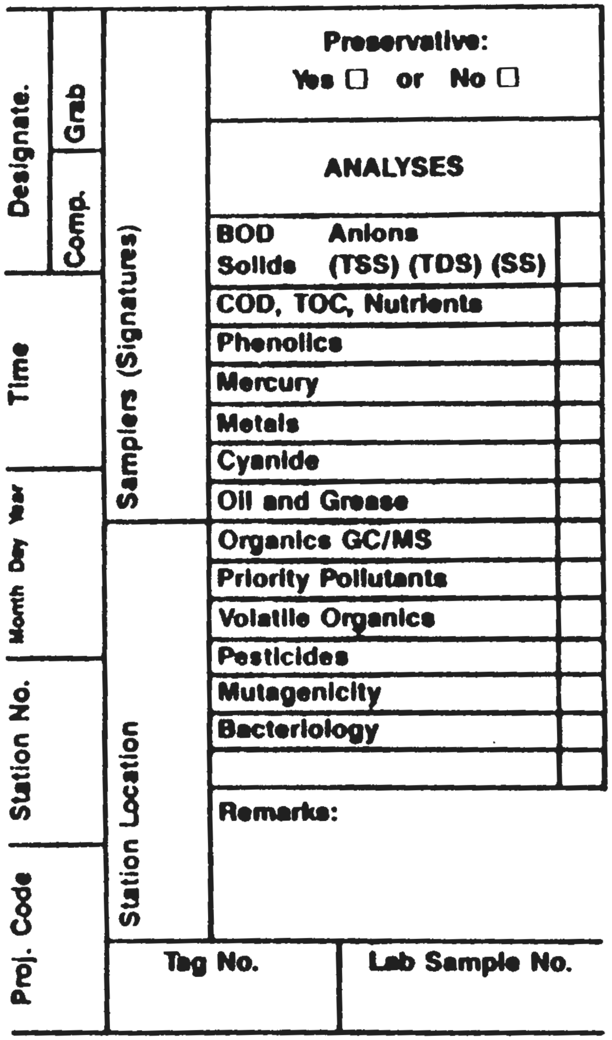
BOD Anions Solids (TSS) (TDS) (SS)	☐
COD, TOC, Nutrients	☐
Phenolics	☐
Mercury	☐
Metals	☐
Cyanide	☐
Oil and Grease	☐
Organics GC/MS	☐
Priority Pollutants	☐
Volatile Organics	☐
Pesticides	☐
Mutagenicity	☐
Bacteriology	☐
	☐

Remarks:

Tag No.	Lab Sample No.

(205)

High Concentration Example



Proj. Code

Station No.

Month Day Year

Time

Designate.

Comp. Grab

Station Location

Samplers (Signatures)

Preservative:
Yes ☐ or No ☐

ANALYSES

BOD Anions Solids (TSS) (TDS) (SS)	☐
COD, TOC, Nutrients	☐
Phenolics	☐
Mercury	☐
Metals	☐
Cyanide	☐
Oil and Grease	☐
Organics GC/MS	☐
Priority Pollutants	☐
Volatile Organics	☐
Pesticides	☐
Mutagenicity	☐
Bacteriology	☐
	☐

Remarks:

Tag No.	Lab Sample No.

Low and Medium Example

CHAIN OF CUSTODY RECORD

Proj. No.	**Project Name**					**No. Of Containers**							**Remarks**
Samplers *(Signature)*													
Sta. No.	**Date**	**Time**	**Comp.**	**Grab**	**Station Location**								

Important: Samples are first relinquished by the sampler (as above) who also signs the Shippers Certification from Federal Express.

Relinquished by: *(Signature)*	**Date / Time**	**Received by: *(Signature)***	**Relinquished by: *(Signature)***	**Date / Time**	**Received by: *(Signature)***
Relinquished by: *(Signature)*	**Date / Time**	**Received by: *(Signature)***	**Relinquished by: *(Signature)***	**Date / Time**	**Received by: *(Signature)***
Relinquished by: *(Signature)*	**Date / Time**	**Received for Laboratory by: *(Signature)***	**Date / Time**	**Remarks:**	

Low and Medium Concentration Example

RECEIPT FOR SAMPLES

Proj. No.

Project Name

Name of Facility

Samplers *(Signature)*

Facility Location

Split Samples Offered

( ) Accepted or ( ) Declined

Sta. No.	Date	Time	Comp.	Grab	Split Samples	Organic/Inorganic Traffic Report Nos.	Station Description	No. Of Containers Collected	Remarks Sample Matrix
						Note: This form is required even if split samples are refused.			

Transferred by: *(Signature)*

Received by: *(Signature)* **Telephone**

Date **Time**

Title **Date** **Time**

HAZARDOUS MATERIALS & WASTE SHIPPING PAPERS AND MANIFESTS

243 West Main Street
Kutztown, PA 19530
(215) 683-6721

D-12

EXAMPLE

FEDERAL EXPRESS
SHIPPER'S CERTIFICATION FOR HAZARDOUS MATERIALS
(excluding radioactive materials)

Two completed and signed copies of this certification shall be handed to carrier. (Use block letters.)

WARNING: Failure to comply in all respects with the applicable regulations of the Department of Transportation, 49 CFR, Parts 100-199 and, for international shipments, the IATA Restricted Articles Regulations may be a breach of the applicable law, subject to legal penalties. This certification shall in no circumstance be signed by an IATA Cargo Agent or a consolidator for international shipments.

CHECK AS APPROPRIATE

This shipment is within the limitations prescribed for: (mark one) ☐ passenger & cargo aircraft < 3.2 ounces ☐ cargo-only aircraft > 3.2 ounces

No. of Pkgs.	Article No. (Int'l only)	Proper Shipping Name of Materials as shown in 49 CFR, part 172.101 and additional description requirements specified in 49 CFR 172.203, and (for int'l shipments) the IATA Restricted Articles Regulations.	Class Specified in 49 CFR 172.101	IATA Packing Note No. Applied (Int'l only)	Net Quantity per Package	Flash Point (closed cup) For Flammable Liquids °C	°F.
# of coolers		FLAMMABLE LIQUID N.O.S.	FLAMMABLE LIQUID UN 1993		# of jars x ounces in each.		

CARGO AIRCRAFT ONLY (If Net Quantity is greater than 3.2 ounces)

LIMITED QUANTITY (Always write this)

Special Handling Information:

SAMPLES FOR LABORATORY ANALYSIS

I hereby certify that the contents of this consignment are fully and accurately described above by Proper Shipping Name and are classified, packed, marked, and labelled, and in proper condition for carriage by air according to applicable national government regulations.

Name and full address of Shipper FIELD ADDRESS	Name and title of person signing Certification YOUR NAME YOUR TITLE
	Emergency telephone no. Office & Field #'s (including area code)
Date *	Signature of the Shipper (see WARNING above) YOUR SIGNATURE

Federal Express Airbill No. *	Origin Station	Destination Station

FEC 5-3147 REV JAN 78
C41730147

* SELF EXPLANATORY

DISTRIBUTION: White Copy – Attached to Airbill
Canary Copy – Attached to Airbill
Pink Copy – Attached to Package
Goldenrod Copy – Shipper

HAZARDOUS MATERIALS & WASTE SHIPPING PAPERS AND MANIFESTS

Transportation Skills Programs, Inc.
243 West Main Street
Kutztown, PA 19530
(215) 683-6721

HAZARDOUS MATERIALS & WASTE SHIPPING PAPERS & MANIFESTS

Shipping papers or hazardous waste manifests, in many cases provide the necessary information which enables proper loading and stowing — proper handling and, in an accident or emergency — the information required by Emergency Response Personnel to safely handle the problem.

And providing shipping papers and manifests has become a much more complex task because of the many and varied information requirements under both EPA and DOT regulations.

Each regulated shipment of a hazardous material, substance or waste, requires documentation that clearly spells out the type and class of commodity being offered and transported.

This session will examine those requirements and provide an up-date on new requirements. First HAZARDOUS MATERIALS:

(See Appendix 1)

When a shipper offers a shipment of hazardous material to a common, contract or private carrier, the shipper is required to provide a document that outlines what the shipment is, in a specific and sequential manner.

Whether the transportation document is a bill of lading, a shipping invoice or an air bill, as long as the required DOT information is provided according to the regulations, DOT has no requirement for a specific document.

Once the shipper/consignee information is entered on the document, the DOT regulations require the following sequence.

First, the number and types of containers. This may also appear after the basic description.

Then the proper DOT shipping name, as spelled out in the hazardous materials table in section 172.101 in 49 CFR. Remember, if the name for the hazardous material does not appear in the hazardous material table, it is not a proper DOT shipping name.

This would be followed by the Hazardous Class and the ID Number. Then the Gross weight or quantity of the shipment.

And finally, the shipper or his representative would sign the certification. And this signature may be a true signature, printed or manually reproduced. Incidentally, a true signature is required by some air carriers for air shipments and all hazardous waste manifests require a true signature, as you will see later.

When the information is entered on a document, it should be shown first, before any other information on other non-hazardous commodities that may also be included on the same document.

However, when a situation arises where a shipper cannot or does not enter the hazardous material information first, he has three other options which allow to properly comply with the DOT shipping paper requirements.

First, the shipping paper will contain a column that will be marked HM or ardous material . . . and when the shipper enters the required DOT informatio he will enter an "X" in the HM column in front of the Proper DOT shipping na Or on "RQ", for a hazardous substance. Or the shipper may also enter the formation in a contrasting color.

Or the shipper may take the copy of the shipping order which the carrier ta and highlight the hazardous materials entries with a hi-liter pen.

If the information is not provided in one of these four ways . . . then it is an impr shipping paper and the shipper would be in violation for providing it and the car would be in violation for using it to transport the shipment.

Whenever the regulations require more than one hazard class to be identi within the basic description, the prime hazard class must always be repeated a the proper shipping name, for placarding purposes.

a shipper will offer a shipment of hazardous material where the basic descrip includes two hazardous classes . . . for example, Flammable Liquid Poison n.o.s. . . . the shipper must repeat the primary hazard class in the descripti ensure proper placard selection. For example, Flammable Liquid, Poison or Poison B, n.o.s. . . . Flammable Liquid.

If this same shipment were being offered in the water mode, not only would shipper enter the prime hazard class, but would also enter at least two of the ch ical or technical names of the materials that make it hazardous.

Now let's examine the shipping paper requirements for HAZARDOUS S STANCES:

(See Appendix 2 for example)

Hazardous substances are also hazardous materials but are now more stringe regulated by both EPA and DOT. Certain hazardous materials if released a dentally, may pose a severe health problem for persons exposed to them in environment.

Hazardous substances were first regulated by EPA in 40 CFR in Section 11 This section listed approximately 300 chemicals that if released accidentall intentionally, pose a major threat to the environment and people. There are shipping paper or labels and marking requirements under the EPA regulati In 117.3, the list outlined the chemical and then showed a specific figure cal a "REPORTABLE QUANTITY" after the name in pounds and kilogra The "Reportable Quantity" or "RQ" represented the specific amount of chemical that was released that would require notification to the EPA On-Sc Coordinator in the specific EPA region where the release took place . . . or t phone reporting, as soon as possible to the U.S. Coast Guard National Response Center at 800-424-8802. Once the release was reported, the person responsible for the release was required to clean up the release.

Soon after the EPA regulations for hazardous substances became law, the DOT amended their regulations to include these materials, and added additional shipping paper, manifest and marking requirements for hazardous substance.

The requirements for DOT and EPA are:

When a shipper or generator offers a hazardous material or waste that is designated as a hazardous substance by the letter "E" in column 1, in the 172.101 table . . . they must check the gross weight of each packaging, to determine if the additional regulations apply.

Whenever the letter "E" precedes the Proper DOT shipping name in column 2, in the 172.101 table . . . the weight of the material in one container determines compliance responsibilities.

Let's take an example. Assume a shipper is offering ten (10) five gallon containers of "ALDRIN". When we check ALDRIN in the 172.101 table, we see the letter "E" in column 1 . . . and the notation "RQ-1/.454". This notation means that if the weight in one container or packaging equals or exceeds one pound or .454 kilograms . . . the shipment is now a Hazardous Substance shipment and requires the following additional information on the shipping papers. First, the notation "RQ" must be entered before or after the proper DOT shipping name on the shipping papers.

The "RQ" now alerts anyone coming into contact with the shipment, whether in storage or transportation, that if an amount equal to or greater than the "RQ" is accidentally released or spilled into any surface or underground water system . . . or on land adjacent to a surface or underground water system . . . the person responsible for the release must notify, as soon as possible, the U.S. Coast Guard at 800-424-8802. In addition, if the release took place in transportation, the release must also file a HAZARDOUS SUBSTANCE & MATERIALS INCIDENT REPORT with the department of Transportation within 15 days of the date of the accident. The critical characteristic of these new hazardous substance regulations is that it may not always be apparent when a hazardous material is also a hazardous substance. For example, suppose a shipper offered a shipment of hazardous material that contained a number of hazardous materials. Because the shipper now has a mixture or solution of several hazardous materials . . . the proper shipping name would be FLAMMABLE LIQUID N.O.S. But when we check out the specific commodities, notice that it is also classed as a Poison B as well as flammable liquid. Considering that the gross weight of each drum is 550 pounds and we now have the requirement to identify the shipment as a "HAZARDOUS SUBSTANCE" and the additional requirement to identify the Poison B. Therefore, the description on the shipping paper would be . . . Ten (10) Drums — "RQ" - FLAMMABLE LIQUID, POISONOUS N.O.S. . . . FLAMMABLE LIQUID. It is also important to remember that when a shipper or generator will use an N.O.S. Proper shipping name . . . and the shipment will contain a "reportable quantity" of a hazardous substance within one container . . . the chemical or technical name of the hazardous substance must be included in the basic description.

It will become a real problem for shippers, generators, transporters and carriers when a hazardous material or waste is described under an n.o.s. or not other-wise specified name on the shipping papers or manifest . . . but will contain a reportable quantity of a hazardous substance within the mixture of solution. The fact that the N.O.S. DOT shipping name does not show the letter "E" in front of the shipping name in column 1, does not remove the shipper's or generator's responsibility for entering the "RQ" for any shipment of a hazardous material or waste where the hazardous substance equals or exceeds the reportable quantity for that commodity within one container, packaging, truck, cargo tank, freight container or tank car.

The "RQ" notation serves two purposes. It advises anyone coming into contact with the shipment that the container has a reportable quantity of a hazardous substance and, therefore, can be extremely dangerous . . . and two, that if an amount equal to or greater than the reportable quantity is released accidentally or intentionally, the person in charge of the shipment must notify the U.S. Coast Guard National Response Center . . . or the EPA On-Scene Coordinator at the Regional EPA office in the EPA region where the release of the hazardous substance took place.

One last important point on HAZARDOUS SUBSTANCES.

Under the new SUPERFUND law, EPA has designated additional hazardous materials as hazardous substances. . .and established a "REPORTABLE QUANTITY" of one pound. DOT has not incorporated these hazardous substances or designated them as hazardous substances in the 172.101 hazardous materials table. And even though they will not be designated hazardous substances under DOT, the EPA regulations for the release of one pound of these materials into the environment requires immediate notification to the National Response Center. Failure to notify calls for heavy penalties.

An example would be ACETONE. When you check the hazardous materials table, you'll see that there is no "E" to designate this as a hazardous substance . . . nor reportable quantity after the proper DOT shipping name. But ACETONE is a "reportable quantity" hazardous substance under SUPERFUND. . .and the "RQ" has been established under those new regulations as one pound. If a shipper or generator offered a shipment of ACETONE or WASTE ACETONE to a carrier and there was not information on the shipping paper or hazardous waste manifest advising the carrier or transporter that if he released more than one pound of this material. . .then, if the carrier or transporter did release one (1) pound or more into the environment, did not report it to the National Response

Center . . . and the release was discovered later . . . the shipper or generator . . . and carrier. . .or transporter would be liable for the penalties under "SUPERFUND". To protect his company, and the carrier, a shipper or generator should enter additional "RQ" information on the shipping paper or manifest. . .even though it is not required by DOT and EPA at the present time. It should not be part of the basic description—but should be entered elsewhere on the document.

Now let's review in depth, the requirements for a Uniform Hazardous Waste Manifest (See Appendix 3). The regulations for the new manifest have been promulgated by both DOT and EPA. While the regulations establish that the United States will have one manifest, the regulations allowed each individual state to add additional information requirements to the federal manifest. At the present time, there are 23 states that have adopted a state manifest and may or may not require the generator to use it. For example, if a generator will ship his or her hazardous waste to another state for disposal, and the consignment state has adopted a state manifest and requires its use, the generator may not use his or her state's manifest, but must use the consignment state's manifest. If the consignment state does not have a manifest, but the generator's state adopted a state manifest and requires its use, the generator must use his or her state manifest, even though the waste is consigned to another state. And finally, if the consignment state and the generating [illegible] may acquire a manifest from any source. The regulations for the acquisition of manifests appear in a new section in CFR 40—Section 262.20 - ACQUISITION OF MANIFESTS:

"Section 262.20 General Requirements.

(a) A generator who transports, or offers for transportation, hazardous waste for offsite treatment, storage, or disposal must prepare a Manifest OMB control number 2000-0404 on EPA form 8700-22, and if necessary, EPA form 8700-22A, according to the instructions included in the Appendix to Part 262.

• •

40 CFR is amended by revising 262.21 in its entirety as follows:

Section 262.21 Acquisition of Manifests.

(a) If the State to which the shipment is manifested (consignment State) supplies the Manifest and requires its use, then the generator must use that Manifest.

(b) If the consignment State does not supply the Manifest, but the State in which the generator is located (generator State) supplies the Manifest and requires its use, then the generator must use that State's Manifest.

(c) If neither the generator State nor the consignment State supplies the Manifest, then the generator may obtain the Manifest from any source."

We'll examine the new Uniform Hazardous Waste Manifest and outline the new requirements. First, you'll notice there are two requirements for information—a federal and a state requirement. The required federal information is in those sections which have numerical designations 1 through 20. State information, if required, would be in the shaded sections and have alphabetical designations A through K. Again, the state sections would be used when there are state regulations that require that specific information.

Section 1:

The Generator's EPA Identification Number, followed by a five digit number determined by the Generator. Therefore, the manifest document number, which is the tracking number, is the generator's EPA ID Number and the five numbers selected by the generator. If the State also requires a manifest number, that may be shown in Section A, in the shaded section.

Section 2:

The number of total pages in the manifest, for example "Page 1 of 1."

Sections 3 & 4:

The Generator's name, mailing address and telephone number, and EPA Identification Number. If the state also requires the State ID Number, that may be shown in Section B, in the shaded section.

Sections 5 & 6:

[illegible] Identification Number. If the Transporter also has a State Waste Haulers ID Number and telephone number, it may be added in Section C in the shaded section, with the telephone number.

Sections 7 & 8:

The 2nd Transporter's name and EPA ID Number, and the state ID and telephone number, if required.

Sections 9 & 10:

The name, address, and EPA ID Number of the Treatment, Storage or Disposal Facility to which the hazardous waste is designated. Again, the ID and telephone number in Sections G and H, if required by the state.

Section 11:

The DOT/EPA description. The basic description includes the proper name, which is found in the hazardous materials table in Section 172.101. The hazard class and ID number, which is found after the shipping name in columns 3 and 3A in the 172.101 table. This section can be a little complex because of new DOT shipping information.

For example, if it's a straight shipping name like WASTE ACETONE, no problem, because the name would be WASTE ACETONE, FLAMMABLE LIQUID, UN1090. (See Appendix 5).

But suppose a generator were offering a shipment of hazardous waste that is 40 percent ACRYLONITRILE and 60 percent CHLOROBENZENE. Because the waste would meet the criteria of both a flammable liquid and a poison B, the proper shipping name would be WASTE FLAMMABLE LIQUID, POISONOUS N.O.S. and because the N.O.S. name is being used, the generator would now have to show the two constituents in the basic description. The new regulations require a generator or shipper to identify, by chemical or technical name, any constituent that isn't shown in the basic description when it is a hazardous substance or a poison B. And also repeat the prime hazard class when more than one hazard class is used to describe the hazardous material or waste. And, if there is a "reportable quantity" hazardous substance in the mixture, as there is with both ACRYLONITRILE and CHLOROBENZENE meeting the definition of "RQ's," then the entry "RQ" must be shown in the basic description, before or after the proper name.

Based on the above, the proper shipping name would be shown as "RQ" WASTE FLAMMABLE LIQUID, POISONOUS N.O.S. ACRYLONITRILE, CHLOROBENZENE, FLAMMABLE LIQUID UN1992. Again, repeat the prime hazard class when more than one hazard classification is shown in the basic description. (See Appendix 6).

Let's go back to WASTE ACETONE for a minute. As we have covered in other presentations, any hazardous material or waste that does not have an assigned "RQ" value under DOT or EPA's Clean Water Act, and meets the definition of ignitable, reactive, corrosive, or toxic has a statutory "RQ" value of one pound under CERCLA - Superfund. And, when you check the "RQ" for ACETONE in the proposed Section 302.4, you will see the statutory "RQ" for ACETONE is one pound. DOT didn't adopt the CERCLA "RQ" values, but that doesn't mitigate generator liability in the event the transporter discharges more than one pound in a 24-hour period and fails to report it. Both generator and transporter are now liable for all penalties, remedial costs, and punitive damages. The way to show the "RQ" of one pound is to use the "RQ" value section on the top of the manifest. For example, since ACETONE has an "RQ" of one pound, the generator could now indicate the "RQ" value by entering the following information on the manifest: WASTE ACETONE - FLAMMABLE LIQUID, UN1090 and then the designation (5). This would now advise the transporter that ACETONE has an "RQ" of one pound, and if discharged in excess of that "RQ" and not recovered, notification to the National Response Center is mandatory. (See Appendix 5).

However, if the Uniform Hazardous Waste Manifest issued by a state or acquired from another source does not have the "RQ" information box on the top, then follow these guidelines:

When a hazardous waste has an "RQ" value of one pound under CERCLA, but is not a regulated hazardous substance under DOT, the generator and transporter are equally, jointly, and severally liable for a release of one pound, recovered or not, into the environment (land, air, or water) for failure to report the discharge, remedial costs, punitive damages, etc.

When a hazardous material or waste has a statutory "RQ" of one pound under CERCLA - Superfund, but no "RQ" value under DOT, show the reporting responsibility, not as a part of the basic DOT description, but elsewhere on the manifest. Remember, if any "RQ" entry is shown in the basic description and the hazardous material or waste does not meet the DOT criteria as a "hazardous substance," the generator is in violation for providing the manifest and the transporter is in violation for accepting it. As you will see in the example in Appendix 7, put an asterisk in front of the DOT/EPA shipping name, and then provide the "RQ" reporting information. Again, remember, even if the discharge is recovered, it still must be reported to EPA or the National Response Center.

Section 12:

Enter the number and types of containers using the specific code required by EPA.

Sections 13 & 14:

Enter the total quantity and the unit measurement—weight or volume. If EPA waste code numbers are required by the state, enter them in the shaded section I.

Section 15:

Enter any specific handling instructions in this section and if an alternate TSD Facility has been selected, enter it in this section.

Section 16:

The Generator's Certification which must bear the printed name of the signer, a true signature, and the date the manifest was signed.

Section 17:

The 1st Transporter's driver's printed name, true signature, and the date the manifest was accepted and signed by the driver.

Section 18: /

The 2nd Transporter's driver's printed name, true signature, and date of signature and acceptance of shipment.

Section 19:

Discrepancy Indication Space: When a hazardous waste shipment arrives and there is a significant discrepancy, it must be noted in this section. If the discrepancy is not resolved within 15 days, you must submit a letter to the Regional EPA Administrator outlining what the TSD Facility did to resolve the discrepancy and enclose a copy of the manifest with the letter. If the State has received EPA authorization to manage the Hazardous Waste Management System, send the letter and copy of the manifest to the appropriate state official.

Section 20:

TSD Facility personnel accepting the shipment certify their acceptance of the hazardous waste with a printed name, true signature, and date.

When a generator completes the hazardous waste manifest and offers the shipment to the transporter, he or she must provide at least one copy for each transporter and two copies for the Treatment, Storage, and Disposal Facility. When the Tra porter delivers the waste shipment to the TSD Facility, the Facility will sign at least three copies—return one to the transporter—retain one copy for his or her files—and mail one certified copy back to the original generator. Each transporter would also sign the manifest with a true signature, printed name, and date of acceptance.

There is also a requirement by some states for the generator and the TSD Facility to also mail one copy of the manifest to the State Agency responsible for environmental enforcement. The generator would mail one copy to the State when he or she offers the shipment, and the TSD Facility would mail one copy to the State when the shipment is accepted at the TSD Facility.

A generator must determine that he or she has received a manifest copy for each shipment of a hazardous waste within 35 days after it leaves his or her plant or location. If a generator does not receive copies of each manifest back within 35 days after they are offered, the generator now has ten days to determine what happened to the copy of the shipment. If the generator is unable to get a copy back, he or she must notify EPA or a state designated agency in writing on company letterhead, explaining exactly what the generator did to try and get a copy, and enclose a copy of the manifest with this letter.

There are cases where a generator will describe a hazardous waste under one of two proper DOT Shipping Names: HAZARDOUS WASTE, LIQUID OR SOLID N.O.S., or WASTE HAZARDOUS SUBSTANCE, LIQUID OR SOLID N.O.S.

HAZARDOUS WASTE, LIQUID OR SOLID N.O.S. is used to describe a hazardous waste that does not meet any of the definitions for a hazardous material as outlined in Part 173 in CFR 49, but does meet the definition of a hazardous or toxic waste using EPA Toxicity Standards. There may also be cases when a waste does not meet any of the EPA criteria but the generator wants to treat it as a waste. Then it could be described as HAZARDOUS WASTE, LIQUID OR SOLID N.O.S. ORM-E. This name may never be used to identify a hazardous waste that in fact meets one of the classes of hazardous materials shown in 173.2. WASTE HAZARDOUS SUBSTANCE, LIQUID OR SOLID N.O.S. would be used when a generator ships a mixture or solution of hazardous substances where the hazard classes for the hazardous substances are ORM-E.

Remember, anytime a generator will use the name HAZARDOUS WASTE, LIQUID OR SOLID N.O.S., or WASTE HAZARDOUS SUBSTANCE, LIQUID OR SOLID N.O.S., and the packaging will contain a reportable quantity of a hazardous substance or Poison B in that packaging, the technical or chemical names of the hazardous substances and Poison B must be included in the basic description on he shipping papers or manifest. And finally, each person who accepts a shipment of hazardous waste must provide a true signature, printed name, and date on the manifest. Stamped, typed or manually produced signatures are forbidden on hazardous waste manifests.

There is one exception to the hazardous waste manifest requirement that exists in he rail mode. Because a freight train may necessarily pass between many different points and rail personnel, a hazardous waste manifest is not required to be provided to the train crew picking up a shipment of hazardous waste in bulk in tank cars or rail cars. The generator would provide a standard train manifest or shipping paper with all the required EPA/DOT information. Once this has been provided to the train crew, the generator would then mail the three copies of the hazardous waste manifest to the final consignee or the TSD Facility. When the train crew delivered the shipment, the TSD Facility would provide one signed copy for the train crew, retain one copy for his or her files, and return one certified copy to the generator, within 35 days after it was shipped.

If there is a case where a highway transporter will interline with the rail carrier at some point distant from the TSD Facility or final consignee, then the generator will forward four copies of the manifest by mail, to the last interlining highway carrier. The carrier will sign for his or her acceptance of the shipment and provide one copy to the train crew and deliver three copies to the TSD Facility. The Facility will certify acceptance of the shipment, provide one copy to the transporter, retain one copy in his or her files, and return one copy to the original generator.

Here are some additional points to remember when preparing shipping papers or hazardous waste manifests. If a shipper or generator will take an exception for a limited quantity of a hazardous material or waste, each shipping paper or manifest requires the notation, "LIMITED QUANTITY" or "LTD/QTY" entered on the document.

If a shipper or generator offers a hazardous material or waste under an N.O.S. or end-use name and where the proper DOT shipping name will not include the proper chemical or technical name of Poison B which is a constituent, for example, FLAMMABLE LIQUID, POISONOUS or POISON B, N.O.S., then the name of the Poison B must be included in the basic description of the material, in the same section with the shipping name and hazard class.

Waste that is classified as a FLAMMABLE SOLID - DANGEROUS WHEN WET, or uses a proper shipping name like CALCIUM METAL, which is classed as a FLAMMABLE SOLID - DANGEROUS WHEN WET, the basic description on the shipping papers or manifest must include the words "DANGEROUS WHEN WET."

One last point on shipping documentation. Recently DOT proposed regulations that will require shippers and generators to provide carriers and transporters with the OSHA Material Safety Data Sheet covering each hazardous material or waste being offered for transportation. At the present time, the proposal covers bulk shipments, that hazardous material or waste moving in portable tanks, tank cars, and cargo tanks. It may be expanded later to include all shipments of hazardous materials and waste. That will remain to be seen. Currently, the new OSHA regulations concern themselves with labels and markings on containers under 110 gallons. At the present time, DOT has jurisdiction over shipping paper and hazardous waste manifest information. There may be changes in the future, but for the time being, OSHA has no requirements for shipping paper information.

As mentioned before, shipping papers and hazardous waste manifests are the key to safer transportation and protection. And making sure each person coming into contact with shipments of hazardous materials and waste is provided with the right information will afford the greatest protection and ensure compliance with the applicable state and federal regulations.

States requiring the use of that state's hazardous waste manifest when generating or disposing of hazardous waste:

ALABAMA
ARKANSAS
CALIFORNIA
CONNECTICUT
DISTRICT OF COLUMBIA
DELAWARE
ILLINOIS
LOUISIANA
MAINE
MARYLAND
MASSACHUSETTS
MICHIGAN
MISSOURI
NEW JERSEY
NEW YORK
NEW HAMPSHIRE
OKLAHOMA
PENNSYLVANIA
RHODE ISLAND
SOUTH CAROLINA
TEXAS
VERMONT
WISCONSIN

When determining which individual State Uniform Hazardous Waste Manifest is required, the generator would comply with the following regulations in descending order. If 262.21(a) does not apply, the generator must comply with 262.21(b). If neither of these paragraphs apply, the generator would then comply with 262.21(b) as shown below:

"Section 262.20 General Requirements.

(a) A generator who transports, or offers for transportation, hazardous waste for offsite treatment, storage, or disposal must prepare a Manifest OMB control number 2000-0404 on EPA form 8700-22, and, if necessary, EPA form 8700-22A, according to the instructions included in the Appendix to Part 262.

* *

5. 40 CFR is amended by revising 262.21 in its entirety as follows:

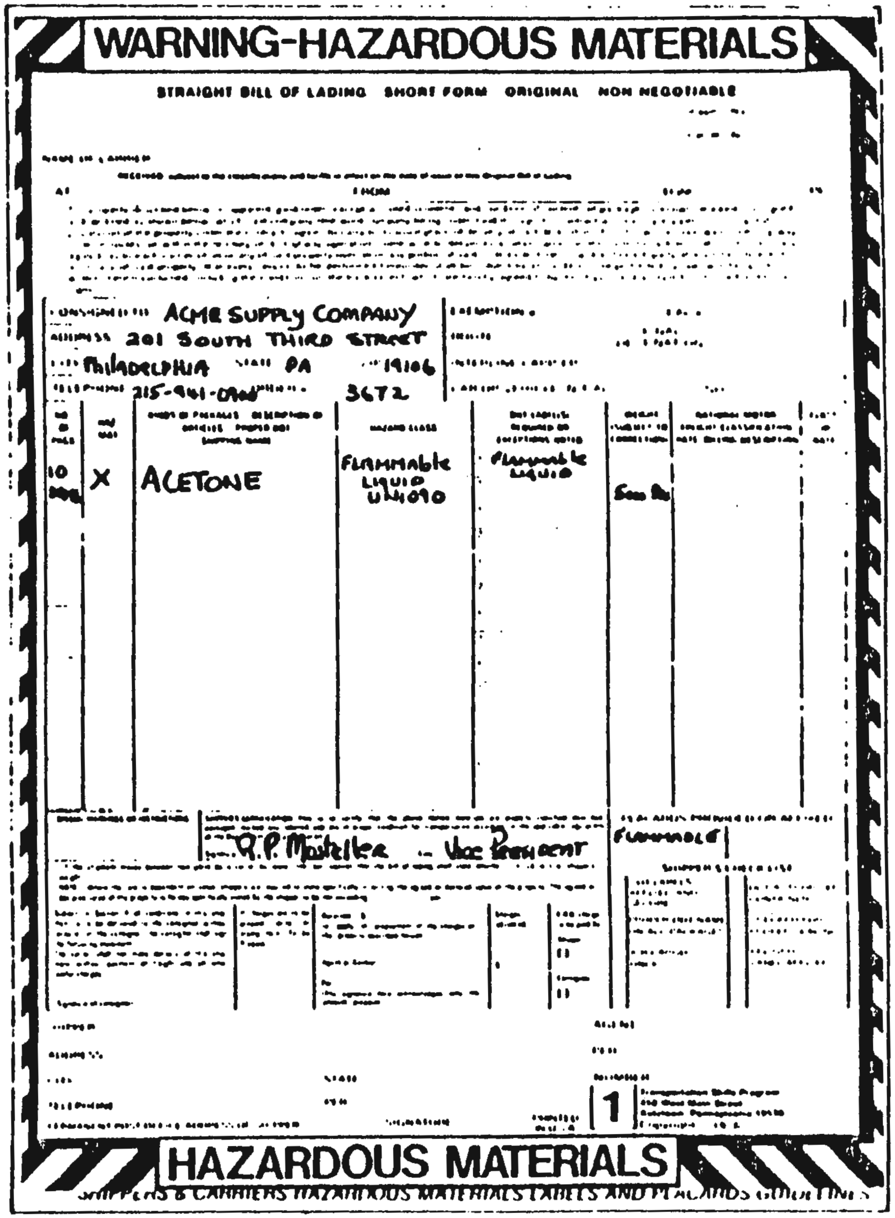
ection 262.21 Acquisition of Manifests.

(a) If the State to which the shipment is manifested (consignment State) supplies e Manifest and requires its use, then the generator must use that Manifest.

(b) If the consignment State does not supply the Manifest, but the State in which e generator is located (generator State) supplies the Manifest and requires its se, then the generator must use that State's Manifest.

(c) If neither the generator State nor the consignment State supplies the Manifest, en the generator may obtain the Manifest from any source."

ncidentally, the Uniform Hazardous Waste Manifest Continuation Sheet, in many ses, has not been adopted by states, and therefore, must be acquired from another urce. Be sure to check your state regulations to determine your compliance sponsibilities.



WARNING-HAZARDOUS MATERIALS

STRAIGHT BILL OF LADING SHORT FORM ORIGINAL NON NEGOTIABLE

ACME SUPPLY COMPANY
201 SOUTH THIRD STREET
PHILADELPHIA PA 19106
215-941-0900 3672

10	X	ACETONE	Flammable Liquid UN1090	Flammable Liquid	See

R.P. Mosteller – Vice President

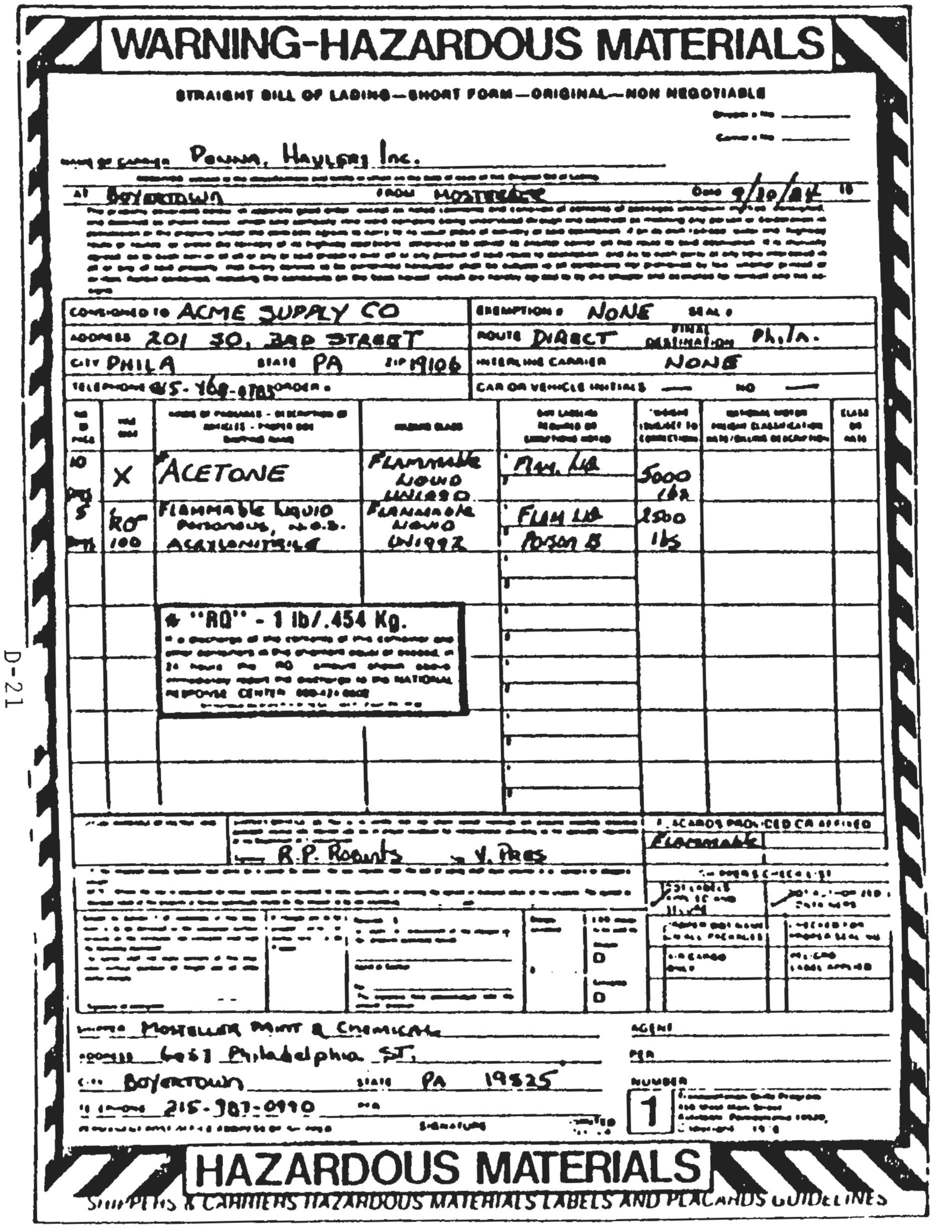
FLAMMABLE

1

HAZARDOUS MATERIALS

SHIPPERS & CARRIERS HAZARDOUS MATERIALS LABELS AND PLACARDS GUIDELINES

Appendix 1



WARNING-HAZARDOUS MATERIALS

STRAIGHT BILL OF LADING—SHORT FORM—ORIGINAL—NON NEGOTIABLE

Name of Carrier Penna. Haulers Inc.

At Boyertown From Mosteller Date 9/10/84

Consigned to ACME SUPPLY CO

Address 201 SO. 3RD STREET

City PHILA State PA Zip 19106

Telephone 215-368-8785 Order #

Exemption # NONE Seal #

Route DIRECT Final Destination Phila.

Interline Carrier NONE

Car or Vehicle Initials — No —

No. of Pkgs	HM	Description of Articles – Proper DOT Shipping Name	Hazard Class	DOT Labels Required	Weight (Subject to Correction)	National Motor Freight Classification	Class or Rate
10 Drs	X	ACETONE	Flammable Liquid UN1090	Flam. Liq	5000 lbs		
5 Drs	RQ 100	Flammable Liquid Poisonous, n.o.s. Acrylonitrile	Flammable Liquid UN1992	Flam Liq Poison B	2500 lbs		

* "RQ" - 1 lb/.454 Kg.
If a discharge of the contents of the container and other containers in the shipment equal or exceed, in 24 hours the RQ amount shown above immediately report the discharge to the NATIONAL RESPONSE CENTER 800-424-8802

R.P. Roberts V. Pres

PLACARDS PROVIDED OR AFFIXED Flammable

SHIPPER'S CHECKLIST

Shipper Mosteller Paint & Chemical

Address 651 Philadelphia St.

City Boyertown State PA 19525

Telephone 215-367-0990

Agent

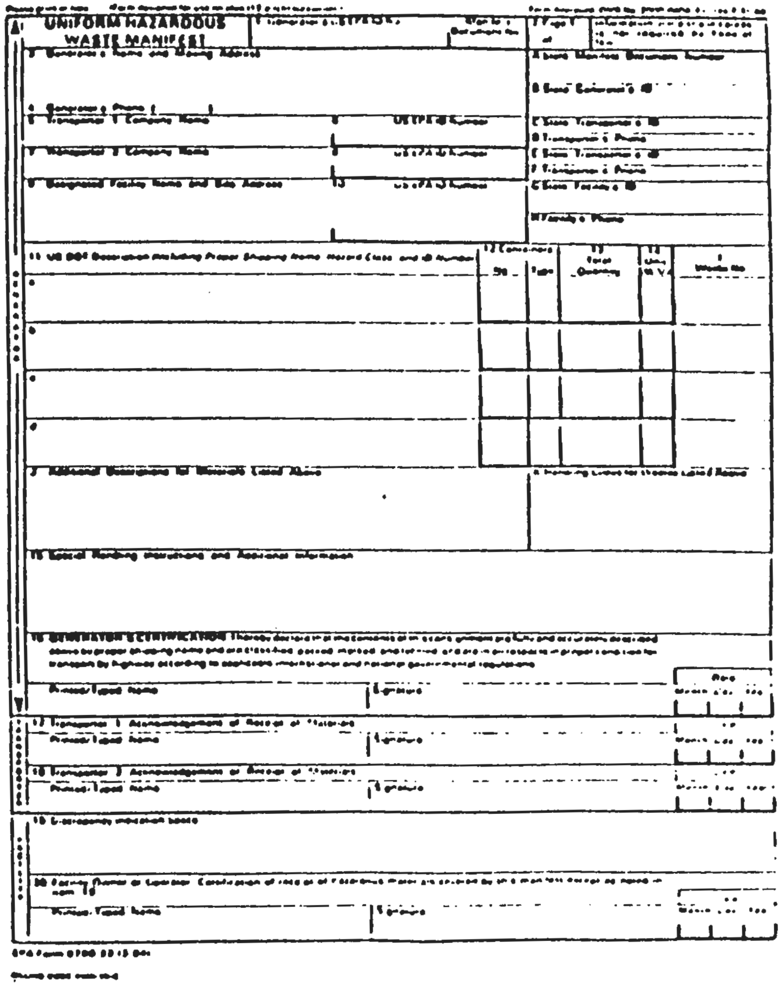
Per

Number 1

HAZARDOUS MATERIALS

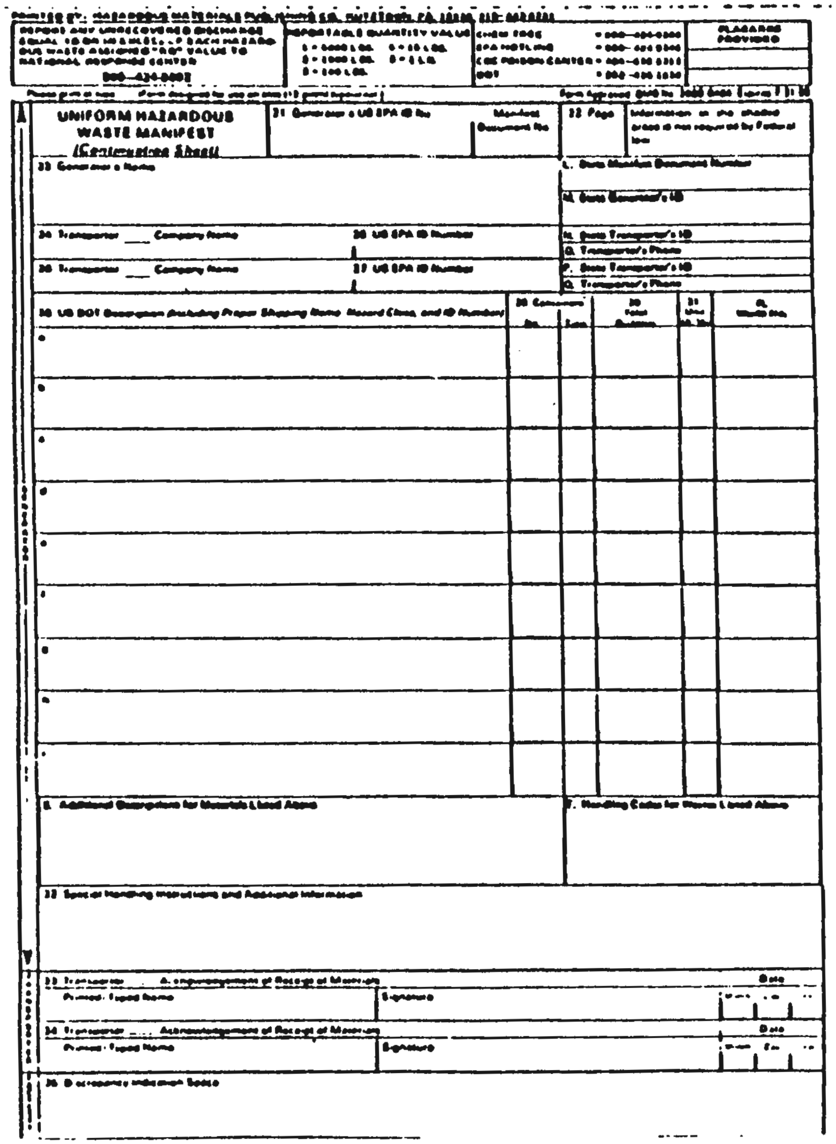
SHIPPERS & CARRIERS HAZARDOUS MATERIALS LABELS AND PLACARDS GUIDELINES

Appendix 2



UNIFORM HAZARDOUS WASTE MANIFEST

Appendix 3



UNIFORM HAZARDOUS WASTE MANIFEST
(Continuation Sheet)

22 Page

23 Generator's Name

24 Transporter ___ Company Name

25 US EPA ID Number

26 Transporter ___ Company Name

27 US EPA ID Number

28 US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)

29 Containers

30 Total Quantity

Waste No.

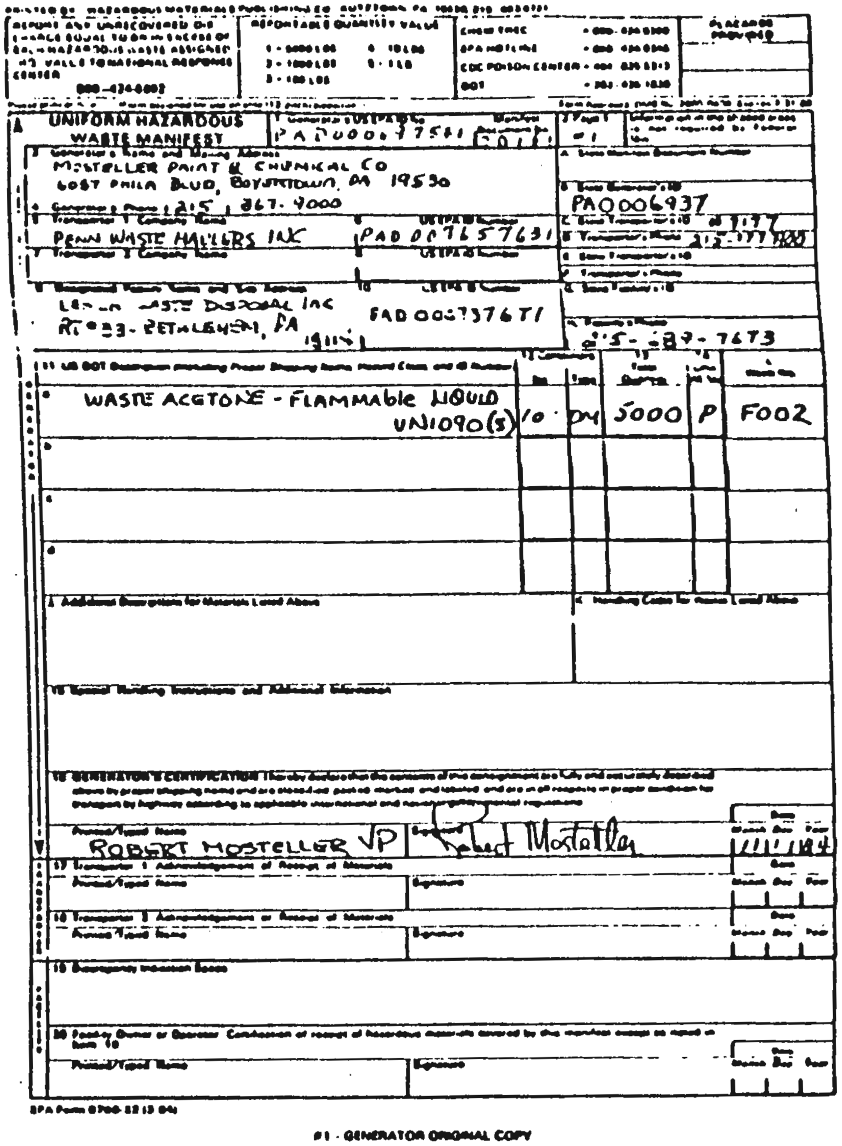
Printed/Typed Name

Signature

Date

Appendix 4

27091



UNIFORM HAZARDOUS WASTE MANIFEST

PAD000177581

00117

1

MOSTELLER PAINT & CHEMICAL CO
6057 PHILA BLVD, BOYERTOWN, PA 19530
(215) 367-4000

PAQ006937

PENN WASTE HAULERS INC

PAD007657631

6177

215-777-7000

LEHIGH WASTE DISPOSAL INC
RT 33 - BETHLEHEM, PA
1911

FAD0037376T1

215-837-7673

WASTE ACETONE - FLAMMABLE LIQUID UN1090(S)	10	DM	5000	P	F002

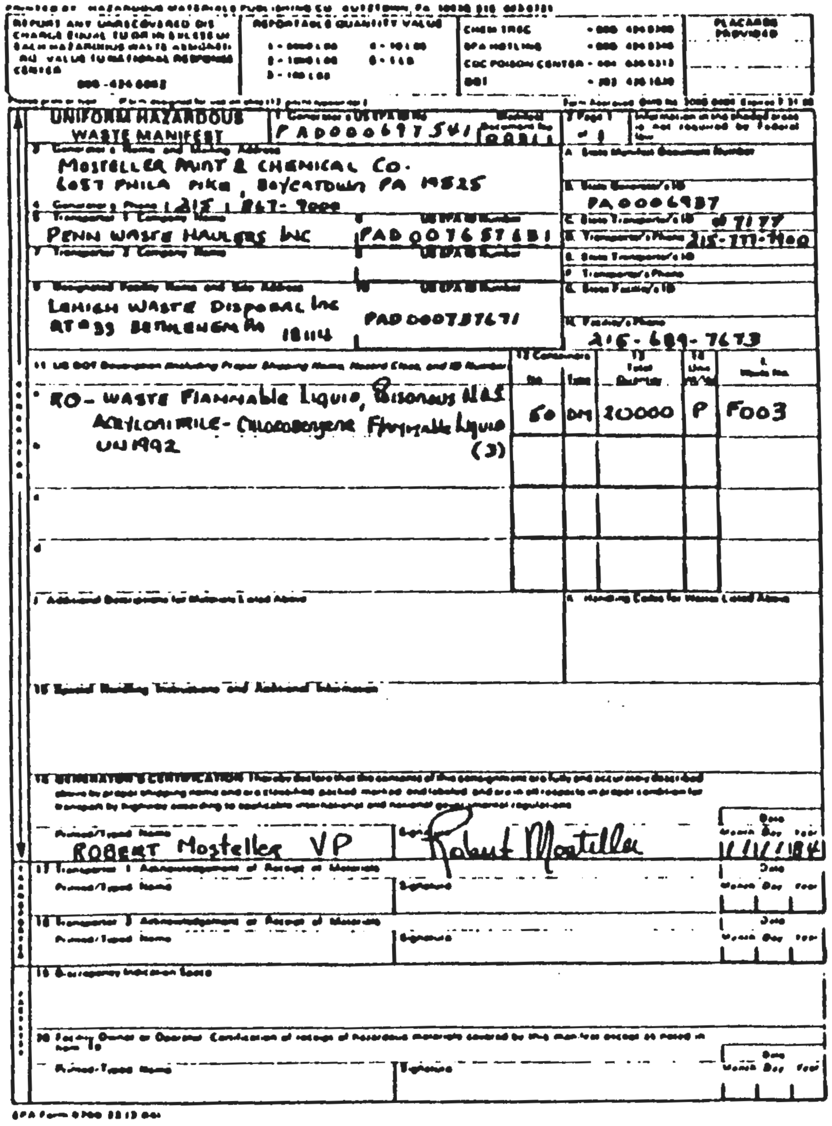
ROBERT MOSTELLER VP

Robert Mosteller

11 11 84

#1 - GENERATOR ORIGINAL COPY

Appendix 5



UNIFORM HAZARDOUS WASTE MANIFEST

PAD000697541 0081

1

MOSTELLER PAINT & CHEMICAL CO.
6057 PHILA PIKE, BOYERTOWN PA 19525

(215) 367-7000

PA0006937

PENN WASTE HAULERS INC

PAD007657631

7177

215-777-7400

LEHIGH WASTE DISPOSAL INC
RT#33 BETHLEHEM PA 18114

PAD000737671

215-689-7673

RQ- WASTE FLAMMABLE LIQUID, POISONOUS N.O.S. ACRYLONITRILE- CHLOROBENZENE Flammable Liquid UN1992 (3)	60	DM	20000	P	F003

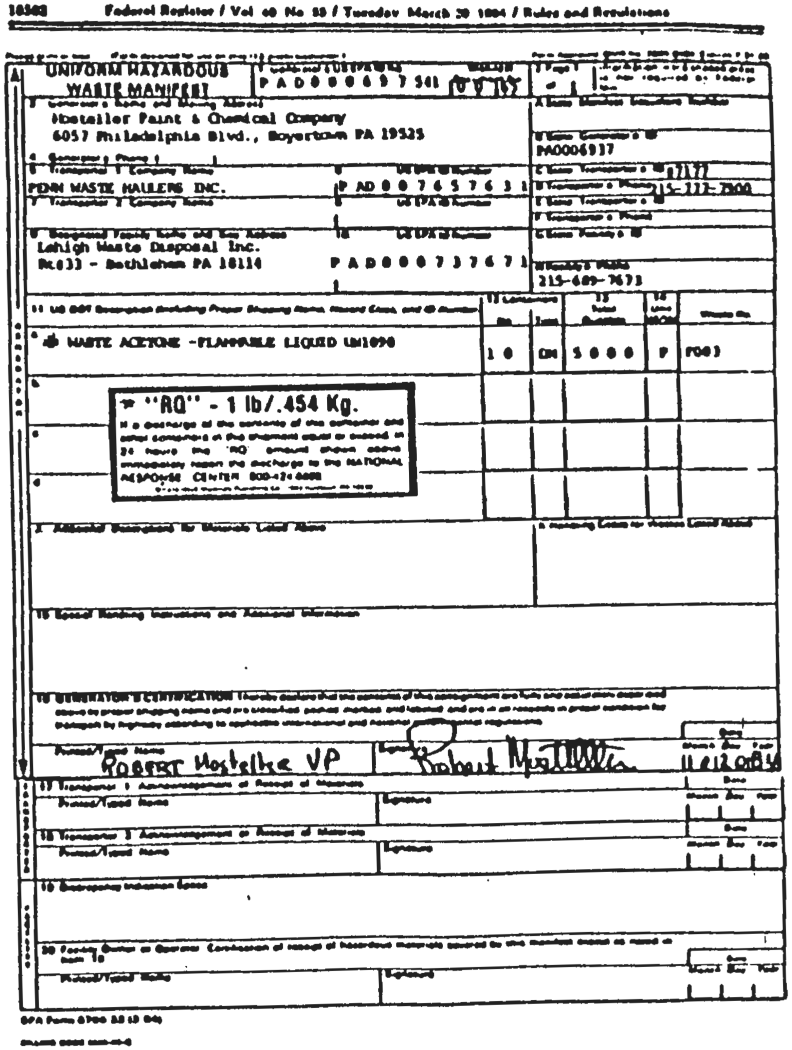
ROBERT Mosteller VP

Robert Mosteller

11 11 84

Appendix 6

18



Federal Register / Vol. 49, No. 61 / Tuesday, March 20, 1984 / Rules and Regulations

UNIFORM HAZARDOUS WASTE MANIFEST

PAD000697541 00185

1

Mosteller Paint & Chemical Company
6057 Philadelphia Blvd., Boyertown PA 19525

PA0006937

PENN WASTE HAULERS INC.

PAD007657631

7177

215-777-7400

Lehigh Waste Disposal Inc.
Rt.#33 - Bethlehem PA 18114

PAD000737671

215-689-7673

WASTE ACETONE -FLAMMABLE LIQUID UN1090	10	DM	5000	P	F003

"RQ" - 1 lb/.454 Kg.

If a discharge of the contents of this container and other containers in the shipment equal or exceed in 24 hours the "RQ" amount shown above immediately report the discharge to the NATIONAL RESPONSE CENTER 800-424-8802

ROBERT Mosteller VP

Robert Mosteller

11 12 084

Appendix 7

10

EMERGENCY TELEPHONE RESPONSE GUIDE

In the event of any of the following, call the DOT at 202-426-1830 immediately:

1. **A person is killed**
2. **A person is hospitalized**
3. **Property Damage in excess of $50,000**
4. **Any location where a continuing danger exists**

In the event of an accidental or intentional release of a "Hazardous Substance" in a "REPORTABLE QUANTITY" amount the person in charge of the release or incident shall immediately notify:

U.S. COAST GUARD
NATIONAL RESPONSE CENTER
800-424-8802
(District of Columbia - 202-426-2675)

FOR EMERGENCY ASSISTANCE OR INFORMATION IN THE EVENT OF A RELEASE OR ACCIDENT OF HAZARDOUS MATERIALS, SUBSTANCE OR WASTE:

CHEMTREC - TOLL FREE 800-424-9300

When Biological Materials are accidentally released, notify:

Director, CDC, Atlanta, GA. 404-633-5313

BUREAU OF ALCOHOL, TOBACCO & FIREARMS
Toll Free - 800-424-9555

EPA HOT LINE — 800-424-9346

ORGANICS TRAFFIC REPORT

E 1217

① Case Number: FROM USEPA SAMPLING COORDINATOR/VIAR CONTACT

Sample Site Name/Code:

TOD*

TOD SITE NAME

② SAMPLE CONCENTRATION
(Check One)

___ Low Concentration
___ Medium Concentration

③ SAMPLE MATRIX
(Check One)

CHECK AS APPROPRIATE

___ Water
___ Soil/Sediment

④ Ship To:

LAB NAME & ADDRESS FROM USEPA SAMPLING COORDINATOR/VIAR CONTACT

Attn:

Transfer

Ship To:

⑤ Regional Office: *

Sampling Personnel:

*

(Name)

Office number

(Phone)

Sampling Date: COLLECTION DATE, USE BEGIN / END FOR COMPOSITE SAMPLES

(Begin) (End)

⑥ For each sample collected specify number of containers used and mark volume level on each bottle.

	Number of Containers	Approximate Total Volume
Water (Extractable)	* FOR LOW CONC.	1 GALLON
Water (VOA)	* FOR LOW CONC.	80 mls
Soil/Sediment	* FOR LOW OR MEDIUM CONC.	4 - 8 OUNCES
Water (Ext/VOA)	* FOR MEDIUM CONC.	4 - 8 OUNCES
Other		

Peel-off bottle labels:

E 1217

E 1217

E 1217

E 1217

E 1217

E 1217

E 1217

E 1217

⑦ Shipping Information

*

Name of Carrier

*

Date Shipped:

*

Airbill Number:

⑧ Sample Description

___ Surface Water
___ Ground Water
___ Leachate
___ Mixed Media
___ Solids
___ Other (specify) ______

CHECK AS APPROPRIATE

⑨ Sample Location

SAME AS ON ALL FORMS

⑩ Special Handling Instructions:
(e.g., safety precautions, hazardous nature)

FOR MEDIUM CONCENTRATION INDICATE POSSIBLE HAZARDS

SIC0077

*SELF EXPLANATORY

U.S. ENVIRONMENTAL PROTECTION AGENCY – HWI Sample Management Office
P.O. Box 818 Alexandria, VA 22313 – 703/557-2490 FTS/557-2490

INORGANICS TRAFFIC REPORT

Sample Number
ME 08821

① Case Number: [illegible]
Sample Site Name/Code: [illegible]
TDD #
TDD SITE NAME

② SAMPLE CONCENTRATION
(Check One)
___ Low Concentration
___ Medium Concentration

③ SAMPLE MATRIX
(Check One) CHECK AS APPROPRIATE
___ Water
___ Soil/Sediment

④ Ship To:
LAB NAME & ADDRESS FROM USEPA SAMPLE COORDINATOR/MANAGER
Attn:
Transfer Ship To:

⑤ Sampling Office: *
Sampling Personnel: [illegible]
(Name) *
(Phone) OFFICE NUMBER
Sampling Date: COLLECTION DATE. WILL BEGIN & END FOR COMPOSITE.
(Begin) ___ (End) [illegible]

⑥ Shipping Information:
Name Of Carrier: *
Date Shipped: *
Airbill Number: *

⑦ Sample Description:
(Check One) CHECK AS APPROPRIATE.
___ Surface Water
___ Ground Water
___ Leachate INDICATE
___ Mixed Media SAMPLE LOCATION
___ Solids ON LINE
___ Other ___ (specify)
MATCHES ORGANIC SAMPLE NO. E1212

⑧ Mark Volume Level On Sample Bottle
Check Analyses required
___ Task 1 & 2 METALS
___ Task 3 Ammonia
Sulfide CHECK AS APPROPRIATE
Cyanide
___ TOC
___ Fluoride & pH

Peel-off bottle labels:

ME8823 Task 1 & 2
ME8823 Task 1 & 2
ME8823 Task 3
ME8823 Task 3
ME8823 Task 3
ME8823 Task 3
ME8823 Task 3

SMO COPY

* SELF EXPLANATORY

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

LOW and MEDIUM EXAMPLE

REGION

CHAIN OF CUSTODY RECORD

PROJ. NO. TDD #	PROJECT NAME NOTE: ONLY ONE SITE PER FORM SITE NAME FROM TDD
SAMPLERS: (Signature) ALL SIGNATURES THAT APPEAR ON BOTTLE TAG	

INDICATE CONCENTRATION IN THIS CORNER!

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CON-TAINERS	SPECIFY BOTTLE	SIZE, PARAMETERS	AND PRESERVATIVES	IN THESE	COLUMNS			REMARKS ITR # OTR # INORGANIC
SITE SAMPLE #			X or	X	SAME AS ON ALL FORMS	*								WATER/LOW CC SOIL/SED

IMPORTANT: Samples are first relinquished by the sampler (as above) who also signs the Shipper Certification from Federal Express

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks SHIPPED FEDERAL EXPRESS TO: LAB NAME) AIRBILL # CUSTODY SEAL #'s	

NOTE: Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

RECEIPT FOR SAMPLES

?.. NO.: TDD#

PROJECT NAME: Site Name (from TDD)

Name of Facility: Actual Facility Name

?..?LERS: (Signature)

Facility Location: Street Address
City, State
No P.O. Box Numbers

?plit Samples Offered

( ) Accepted OR ( ) Declined

STA. NO.	DATE	TIME	COMP.	GRAB	SPLIT SAMPLES	Organic/Inorganic Traffic report #'s	STATION DESCRIPTION	NO. OF CON-TAINERS COLLECTED	~~REMARKS~~ SAMPLE MATRIX
Site Sample#			X OR	X	Yes OR No	ME9823/E1217	Same as on all forms		
					Note: This form is required even if split samples are refused.				

?ransferred by: (Signature) Samplers Above

?ate

Time

Received by: (Signature) of Site Offical

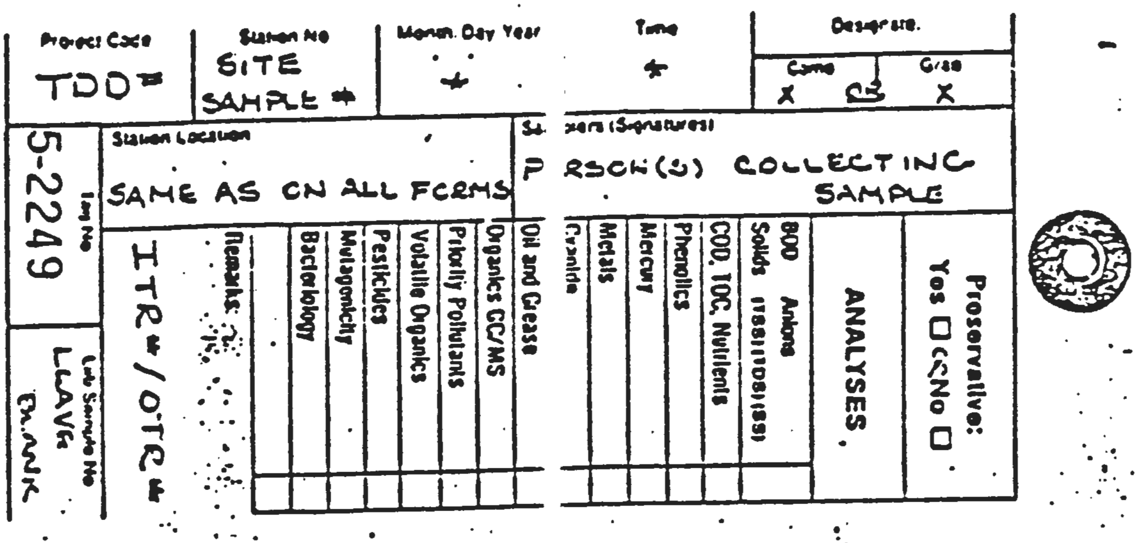
Telephone

Title

Date

Time

EXAMPLE



Project Code TDD #	Station No SITE SAMPLE #	Month Day Year *	Time *	Designate: Comp X C3 Grab X

Tag No 5-2249

Lab Sample No LEAVE BLANK

Station Location SAME AS ON ALL FORMS

Samplers (Signatures) PERSON(S) COLLECTING SAMPLE

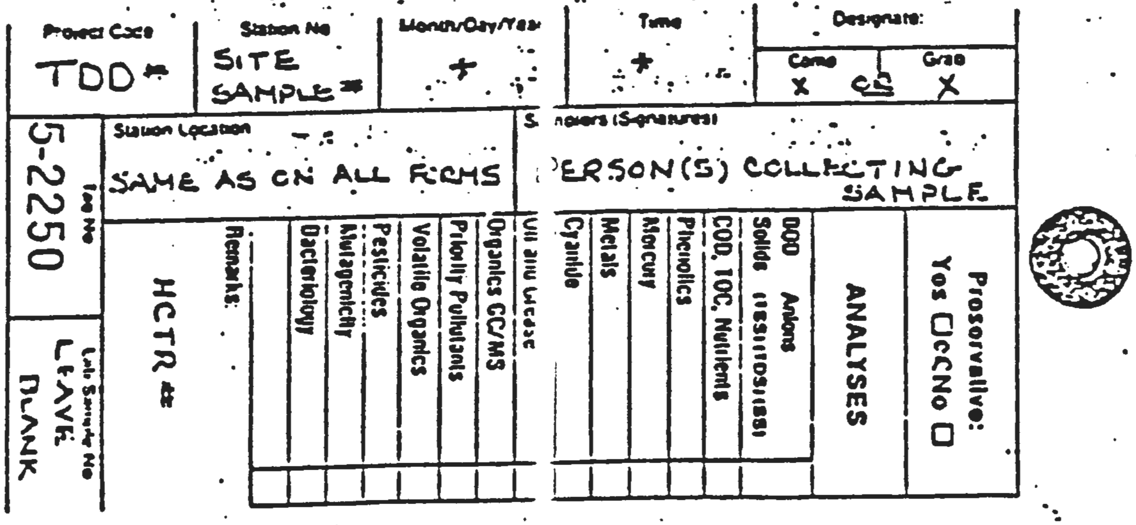
Preservative: Yes ☐ No ☐

ANALYSES

- BOD Anions
- Solids (TSS)(TDS)(SS)
- COD, TOC, Nutrients
- Phenolics
- Mercury
- Metals
- Cyanide
- Oil and Grease
- Organics GC/MS
- Priority Pollutants
- Volatile Organics
- Pesticides
- Mutagenicity
- Bacteriology

Remarks: ITR#/OTR#

HIGH CONCENTRATION EXAMPLE



Project Code TDD #	Station No SITE SAMPLE #	Month/Day/Year *	Time *	Designate: Comp X C3 Grab X

Tag No 5-2250

Lab Sample No LEAVE BLANK

Station Location SAME AS ON ALL FORMS

Samplers (Signatures) PERSON(S) COLLECTING SAMPLE

Preservative: Yes ☐ No ☐

ANALYSES

- BOD Anions
- Solids (TSS)(TDS)(SS)
- COD, TOC, Nutrients
- Phenolics
- Mercury
- Metals
- Cyanide
- Oil and Grease
- Organics GC/MS
- Priority Pollutants
- Volatile Organics
- Pesticides
- Mutagenicity
- Bacteriology

Remarks: HCTR #

* SELF EXPLANATORY

Example For High Conc. Samples

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

REGION

CHAIN OF CUSTODY RECORD Note: For One Site Only

PROJ. NO. TDD #	PROJECT NAME Site Name (as on TDD)
SAMPLERS: (Signature) All signatures that appear on bottle tag	

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS 8 ounce	List Extracts Requested on Haz. Waste Prep. Sheet					REMARKS EPA TAG #	HIGH CONC. TRAFFIC #	SAMPLE MATRIX
Site Sample #			X or	X		1								Soil/Wa

Must Agree w/EPA Bottle Tags

IMPORTANT!: Samples are first relinquished by the sampler (as above) who also signs the shippers certification from Federal Express

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks Include: Shipped via Federal Express Airbill # ______ List Custody Seal #'s from cooler	

Note → Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

— HIGH CONCENTRATION EXAMPLE —

RECEIPT FOR SAMPLES

PROJ. NO. TDD #

PROJECT NAME SITE NAME FROM TDD

Name of Facility ACTUAL FACILITY NAME

SAMPLERS: (Signature) ALL SIGNATURES OF THOSE INVOLVED

Facility Location STREET ADDRESS CITY, STATE (NO P.O. BOX NUM

Split Samples Offered ( ) Accepted ( ) Declined

1 STA. NO.	* DATE	* TIME	COMP.	GRAB	SPLIT SAMPLES	TAG NUMBERS	STATION DESCRIPTION	NO. OF CONTAINERS	REMARKS
SITE SAMPLE #			X OR	X	YES OR NO	HCTR # / EPA TAG #	SAME AS ON ALL FORMS	FILL IN # COLLECTED	INDICATE LIQUID OR

Transferred by: (Signature) SAMPLERS ABOVE

Date * **Time** *

Received by: (Signature) SIGNATURE OF SITE OFFICIAL **Telephone** INCL AREA

Title * **Date** * **Time** *

Environmental Protection Agency
Office of Enforcement

National Enforcement Investigations Center
Denver Federal Center, Bldg. 53, Box 25
Denver, CO 80225

HAZARDOUS WASTE SAMPLE PREPARATION REQUEST

Region No.: *

Regional Contact: USEPA SAMPLING COORDINATOR/ phone no. VIA CONTACT

Project Name: SITE NAME FROM TDD
TDD #

NEIC project no.:

Region Sample No.	SAMPLE DESCRIPTION	Collection Date	Collection Time	A Total Metals	B Acid Extractable Metals	C Total Mercury	D Strong Acid Anions	H Volatile Organics	J Base/Neutral, Acid, TCDD	K Pesticides, PCB	Other	KNOWN OR SUSPECTED HAZARDS	NEIC sample no
HCTR #	SAME AS ON ALL FORMS	*	*									WRITE IN WHAT YOU	
												SUSPECT EACH TO BE A HIGH CONCENTRATION	
	NOTE: If requesting											SAMPLE AND ANY INDIVIDUAL PARAMETERS	
	priority pollutant analyses for:											SUSPECTED TO BE HIGH FOR EACH SAMPLE.	
	Ⓐ HAZARDOUS SOLID - SOIL				✓	✓		✓	✓	✓			
	Ⓑ HAZARDOUS SOLID - CLOSED DRUM OR TANK			✓		✓		✓	✓	✓			
	Ⓒ HAZARDOUS LIQUID - INCLUDING LIQUID IN OPEN/ CLOSED DRUMS OR TANK			✓				✓	✓	✓			
	IF QUESTIONS ON EXTRACT OPTIONS - SEE USEPA SAMPLING COORDINATOR												

Ship Extracts To: WRITE IN LAB NAME(S)
AND ADDRESS(ES)
WITH ATTENTIONS

Date Samples Received at NEIC ______________ By ______________

EXAMPLE

FEDERAL EXPRESS
SHIPPER'S CERTIFICATION FOR HAZARDOUS MATERIALS
(excluding radioactive materials)

Two completed and signed copies of this certification shall be handed to carrier. (Use block letters.)

WARNING: Failure to comply in all respects with the applicable regulations of the Department of Transportation, 49 CFR, Parts 100-199 and, for international shipments, the IATA Restricted Articles Regulations may be a breach of the applicable law, subject to legal penalties. This certification shall in no circumstance be signed by an IATA Cargo Agent or a consolidator for international shipments.

CHECK AS APPROPRIATE

This shipment is within the limitations prescribed for: (mark one) ☐ passenger & cargo aircraft ☐ cargo-only aircraft

< 25 pounds > 25 [illegible]

No. of Pkgs.	Article No. (Int'l only)	Proper Shipping Name of Materials as shown in 49 CFR, part 172.101 and additional description requirements specified in 49 CFR 172.203, and (for Int'l shipments) the IATA Restricted Articles Regulations.	Class Specified in 49 CFR 172.101	IATA Packing Note No. Applied (Int'l only)	Net Quantity per Package	Flash Point (closed cup) For Flammable Liquids °C.	°F.
# of coolers		FLAMMABLE SOLID, N.O.S.	FLAMMABLE SOLID UN 1325		# of jars x ounces in each		–

CARGO AIRCRAFT ONLY (If Net Quantity is greater than 25 pounds)

LIMITED QUANTITY (Always write this)

Special Handling Information:

SAMPLES FOR LABORATORY ANALYSIS

I hereby certify that the contents of this consignment are fully and accurately described above by Proper Shipping Name and are classified, packed, marked, and labelled, and in proper condition for carriage by air according to applicable national government regulations.

Name and full address of Shipper FIELD ADDRESS	Name and title of person signing Certification YOUR NAME YOUR TITLE
	Emergency telephone no. Office & Field #'s [illegible]
Date *	Signature of the Shipper (see WARNING above) YOUR SIGNATURE

Federal Express Airbill No. *	Origin Station	Destination Station

FEC 3-214 REV JAN 78
2041730147

DISTRIBUTION: White Copy – Attached to Airbill
Canary Copy – Attached to Airbill
Pink Copy – Attached to Package
Goldenrod Copy – Shipper

* SELF EXPLANATORY

APPENDIX E

RESPONSE TO REVIEW COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION II
JACOB K. JAVITS FEDERAL BUILDING
NEW YORK, NEW YORK 10278

FEB 01 1991

Rec'd 14 FEB 91 1515 hrs

Randy Battaglia
Environmental Coordinator
Seneca Army Depot
Romulus, NY 14511-5001

Dear Randy:

Enclosed are EPA's comments on the Revised-Draft RI/FS Ash Landfill Work Plan and a directory for EPA guidance documents for Jim Miller.

Comments that contained outstanding issues and those that were partially addressed are evaluated in the attached review.

The comments are divided into sections A (p. 1) ,B (p. 19), C (p. 26) and D (p. 32) as they are in the 12/90 RI/FS work plan, Appendix E. Each comment lists: 1) the original comments on the 3/90 RI/FS work plan, 2) SEAD/ESE's response to these comments, and 3) EPA's evaluation of SEAD/ESE's responses made in the 12/90 Revised-Draft RI/FS Work Plan.

The two day meeting scheduled on Wednesday, 2/27/91 and Thursday 2/28/91 should primarily focus on the resolution of the Ash Landfill RI/FS comments and disscussion on the OB/OD Grounds scoping document. Comments to the OB/OD Ground scoping document will be forwarded to you (Express Mail) on Tuesday, 2/12/90.

If you have any questions regarding this correspondence, call me at (212) 264-1841.

Sincerely,

Miriam Martinez

Miriam Martinez
Remedial Project Manager
Federal Facilities Section

cc:
K. Gupta, NYSDEC
B. Wing, FFS
J. Healey, Alliance

A. Evaluation of Responses to U.S. EPA Region II Comments - Federal Facilities Section, Miriam Martinez, Project Manager, (May 8, 1990)

Section 1.0 - Introduction

Comment 1 p. 1-1 - Paragraph 2 states that the ash landfill contains a number of potential sources of contamination, including: (1) a former incinerator; (2) the former cooling pond; (3) a former landfill; and (4) former burn pits.

The Work Plan, however, provides no information on these specific source areas. The following comments/questions apply.

- Please identify the cooling pond in Figure 1-2.
- To what extent is the incinerator "building" being investigated as a potential source area in this current investigation (i.e., perhaps building drains and the two dry wells/sumps etc. should be identified and sampled)? Will the FS identify remedial alternatives for building closure? Is the building subject to closure requirements under the Resource Conservation and Recovery Act (RCRA) (40 CFR 264)? Should the building be defined as a separate operable unit? What plan of action will be taken regarding identifying the diesel underground storage tank as a contamination point source? Will action be taken to close this tank?
- Do the former "burning pits" have characteristics different from the other landfill waste, and therefore require consideration as a separate operable unit? The burning pits appear to be within the limits of the landfill, yet do they exist under the current cap?
- Figure 1-2 identifies a former "construction debris disposal area". Is this area to be investigated during the RI?
- As indicated above, the Work Plan does not provide an adequate discussion and/or description of these potential source areas.

Response Agree. All potential source areas have been discussed in the work plan (WP). This list of potential sources includes the incinerator, cooling pond, underground diesel fuel tank, ash landfill, burning pits, debris disposal area, debris piles, and grease pit and fill areas. The building's remedial alternatives will be examined after the remedial investigation (RI), as will the underground diesel fuel tank. The construction debris disposal area will be studied under a separate solid waste management unit (SWMU) classification report.

Evaluation Data Gaps - Section 1.0. does not clearly state that the remaining potential source areas discussed above will be investigated in this RI, therefore, the scope of the RI remains unclear. In addition, the response to this comment states that the building's remedial alternatives will be examined after the remedial investigation, as will the underground diesel fuel tank; however, this information is not mentioned in Section 1.0 of the RWP. Additionally, the paragraph regarding the "burning pits" was not adequately addressed in the RWP.

-Although Figure 1.1-2 does show all nine primary contamination sources, the scale is too small and therefore, does not provide adequate detail. Source areas can barely be seen on the map. It is recommended that figure 2.2-3 be used for all illustrations.

Section 2.0

Comment 2 p. 2-2 - Section 2.3 <u>Hydrogeology</u> states: "Swampy areas to the north and northwest of the landfill may be the result of surface discharge". Swampy areas should be illustrated on site maps or drawings as they may impact the implementability of remedial actions.

Response Agree. The swampy areas are included in Figures 1.1-2 and 2.1-1.

Evaluation This comment is partially addressed. Surface runoff/discharge patterns are considered a plausible migration pathway in Section 3.1.2 (page 3-3, RWP). This area needs to be shown in <u>all</u> figures.

Data Gap - A swampy area is not included in Figure 1.1-2 (page 1-5, RWP), but is included in Figure 2.1-1 (page 2-3, RWP). The location of this swampy area is not illustrated clearly and <u>does not help delineate the edge of the wetland closest to the landfill</u>.

Section 3.0 - Scoping of the RI/FS

Comment 3 p. 3-1 - Paragraph 1 states: "The primary objective of this current investigation is to verify and supplement the existing database to define properly the environmental risk associated with the site and develop appropriate plans for site remediation."

-In order to satisfy the above-stated objective "to verify and supplement the existing database", the existing database must be fully outlined and discussed within Section 3.0 Scoping of the RI/FS. Only then, can a field sampling program be developed to verify and supplement the current database, to the extent required to assess risks to human health and the environment, and establish appropriate remedial alternatives. It does not appear that the existing data base has been adequately analyzed and/or incorporated into the current study.

Response Agree. The existing database has been adequately analyzed and has been incorporated into the conceptual site model.

Evaluation Data Gaps - Although numerous figures have been added to Section 2.0 as a means of presenting background information, most of these figures do not illustrate the boundaries of the Ash Landfill, which they should. It is recommended that landfill boundaries be included on figures to aid in interpreting data and results.

-Section 2.4.6 discloses the results of the 1988 ICF Soil Gas Survey. This section suggests that the results of the survey are illustrated in Figure 2.4-4 (page 2-54, RWP). Figure 2-4, however, presents the locations of surface water/seeps at the landfill. Soil gas results should be illustrated.

Comment 4 - p. 3-1 - Section 3.1 <u>Conceptual Site Model</u> - The RI/FS Guidance under CERCLA (EPA 1988) requires the development of a conceptual model which visually illustrates primary sources, primary release mechanisms, secondary sources, secondary release mechanisms, migration pathways, exposure routes and human and environmental receptors (refer to Figure 2-2 of the RI/FS Guidance). The Army does not provide this type of illustration.

Response Agree. The conceptual site model has been redeveloped and is included with a visual illustration in Section 3.1.

Evaluation Data Gaps - Section 3.1.1. identifies nine potential source areas, but includes conceptual models for only four of these. Of the nine sources identified, it remains unclear: (1) which sources have contributed to the existing ground water contamination plume, and (2) which are specifically included within the scope of this investigation. Again Section 1.0 only states that the "construction debris dump" will be investigated under a separate program.

-Human receptors should be expanded to include SEAD personnel (i.e., base workers, etc.).
-Data Need for the FS is not discussed.

Comment 5 p. 3-1 - Section 3.1 Conceptual Site Model states: "In the landfill, the sources of contamination are located within or near the more permeable weathered zone of the shale bedrock, at depths of 3 to 10 ft below existing grade. Based upon the results of the previous investigations, the most heavily contaminated zone encompasses an area approximately 100 by 300 ft in plan dimension." The following comments apply to these statements:

1) Which prior investigations and/or surveys (e.g., sampling events, geophysical surveys etc.) are being referred to here, and how strong is the evidence that the source has been identified?

2) The Army does not illustrate the location of the "most heavily contaminated zone". Therefore, it is not possible to assess how adequately the existing data supports this depiction of the source.

Response Agree. This section has been written to illustrate the possible contamination sources identified and properly reference prior investigations.

Evaluation Data Gap - The RWP states that "the most heavily contaminated zone within the landfill encompasses an area of approximately 250 feet extending east-west and 800 feet extending north-south, if both organic and inorganic contaminant sources are to be considered (ICF, 1989). If only volatile organic sources are to be considered, an area of about 100 by 300 feet has been identified as contaminated" (page 3-4, RWP). The second statement is not referenced by any particular study. In addition, SEAD/ESE gives a general description of the site of the contaminated area within the landfill but, doesn't specifically indicate where in the landfill this "most heavily contaminated zone" is located, nor is a figure provided.

Comment 6 Page 3-2, Paragraph 1 states: "However, soils disturbed by construction and utility line construction may form more permeable (preferred) channels to provide accelerated downgradient migration". The location of underground utilities if known or documented should be illustrated in a figure as these utilities will have strong implications during the evaluation of sampling data and the assessment of contaminant transport.

-The discussion of migration pathways in this section does not adequately reflect the complexity of the site. For instance, there is the possibility of contaminant transport in the overburden, and the fractured shale. There is also the potential for radial ground water transport from the landfill, including migration to the north, south and east. There is the potential for surface discharge to tributaries which impact Lake Seneca. Further, page 2-2 suggests surface discharge may have created swamps to the north of the landfill. It is evident that the potential for contaminant migration from the landfill is more diverse and complex than the Work Plan suggests.

-The Project Scoping section must outline all complexities of the site, in order to effectively identify data gaps and potential remedial responses. Paragraph 1 states: "Furthermore, the deep water-bearing strata beneath the shales of the Hamilton Group are recharged primarily from areas north of SEAD." What is the basis for this? The Army should provide data or a published reference to support this statement.

- A 1980 U.S. Army Toxic and Hazardous Materials Installation Assessment Report suspected that explosives, herbicides, and radioactive residues may have been disposed at the site. The Army should determine if the exploratory and sampling techniques outlined in the Work Plan are compatible with the possible presence of these materials (i.e., whether these techniques may inadvertently detonate any buried unexploded ordinance). Additional safety measures need to be taken to protect worker safety in the event that radioactive materials are uncovered. A field geiger counter could be used in conjunction with the air monitoring equipment in order to detect for radiation. Pesticide and herbicide analyses should be added to the list of target compounds to be analyzed for in the soil, surface water, and ground water samples.

Response Agree. The possible migration pathways have been included in the conceptual site model. Information showing the location of the underground utilities has been included in Section 2.0. There is no evidence of explosive or radioactive material in the landfill area. The hazards of unexploded ordnance are covered in the Safety, Health, and Emergency

Response Plan (SHERP). Pesticide and herbicide analyses have been included in the WP.

Evaluation Data Gaps - The RWP does not include information regarding the potential of encountering explosive or radioactive residues within the landfill mass. Contrary to the original RI/FS Work Plan, SEAD/ESE state that there is no evidence of explosive or radioactive material in the landfill area. Considering the historical uses of the SEAD facility, at a minimum, a field geiger counter should be used as a screening device for potential radiation exposure.

Comment 7 Page 3-3, Paragraph 2 discusses offsite receptors. Given the close proximity of the landfill to the property boundary, it would be useful to provide a figure which illustrates the land use adjacent to the base. For instance, residential areas, parks, schools, etc. could be illustrated, as well as locations of private and public drinking water wells. Environmental/wildlife receptors (flora/fauna) will also need to be identified.

-It is also appropriate to discuss the potential future land use of these areas, and any additional exposures relevant to these future land uses.

Response Agree. Information detailing land use adjacent to the base has been included in Section 2.0.

Evaluation Data Gaps - Although figure 2.1-1 illustrates the location of these offsite areas/properties in relation to SEAD it is recommended that this information is placed in the figures that have the scale of 1" = 400 ft.

Comment 8 p. 3-11 - Section 3.4.1.2 - <u>Other Guidance to be Considered</u> identifies to-be-considered (TBC) criteria. This section should include as TBC criteria, the health-based criteria for carcinogens and systemic toxicants presented in Volume I of the RCRA Facility Investigation (RFI) Guidance Manual (EPA 530/SW-89-031) published by EPA in May 1989.

-These criteria specify environmental concentrations for soils, and are utilized as target levels for cleanup of releases from regulated waste management units under RCRA.

Response Agree. The criteria presented in Volume I the RCRA Facility Investigation (RFI) Guidance Manual (1989) have been included in this section.

Evaluation Although the above response is acceptable, the specified criteria have not been incorporated into Table 3.3-1 of the RWP.

Data Gap - Soil and Ground Water Cleanup criteria for systemic toxicants and carcinogens, as specified in the RFI Guidance, should be included in Table 3.3-1.

Comment 9 p. 3-14 - Paragraph 1 discusses the need to collect data to support the risk assessment (RA) and states: "The level of data quality required will be related to the precision of any model used in the analysis. For models in which gross assumptions are made, qualitative data may be adequate, whereas quantitative data may be required for sophisticated models." The data needs of the risk assessment need to be determined during project scoping. Of importance are identifying critical exposure points for each medium of concern (e.g., surficial soils must be sampled to assess dermal exposure, etc.) In addition, the analytical data quality needs of the RA must be established. The Work Plan does not provide this level of analysis.

Response Agree. The data needs have been analyzed in the scoping section and conceptual site model, Section 3.0.

Evaluation Data Gaps - Section 3.4 which discusses data quality objectives (DQOs), does not assure that the analytical requirements of the risk assessment (RA) will be met. Analytical requirements of the RA are established by comparing the available health criteria with the quantitation limits associated with the proposed analytical methods for the RI. In cases where the method detection limit exceeds critical health criteria, a lower detection limit is required. This level of detail is still not provided.

-Note also that the RWP does not propose to analyze surface soil samples for VOCs (page 4-13, 4.2.2.3, RWP). These samples should be analyzed for the complete TCL/TAL.

Comment 10 p. 3-14 - Section 3.6 - <u>Data Gaps</u> does not identify data gaps associated with physical conditions at the site (i.e., permeability of the shallow aquifer, transmissivity of the bedrock, etc.).

This section also does not identify data needs of the feasibility study (FS). The following comments apply.

1.) What is the design of the current landfill cap?
2.) What is the structural integrity of the current landfill cap?

3.) What is the potential for differential settlement of the landfill if another cap is placed on the existing landfill?

4.) Is the continued leaching of chemicals from the landfill into the ground water a result of failure of the existing cap, or conditions associated with site hydrogeology?

It is recommended that the contractor evaluate the need for specific engineering analyses, to evaluate the structural integrity of the existing landfill cap and waste volume. Figure 2-1 of this report identifies specific analyses which could be conducted during the RI to satisfy this requirement (also refer to comment on page A-2)

Response Agree. An investigation of the physical condition has been included in the WP. Also, according to base personnel, the existing ash landfill does not have an "engineered landfill cap".

Evaluation Data Gaps - Neither Section 3.4 <u>Data Needs and DQOs</u>, nor Section 3.5 <u>Data Gaps</u> (pages 19-31, RWP), identify data gaps and/or data needs associated with the physical conditions at the site (i.e., permeability of the shallow aquifer, transmissivity of the bedrock, etc.), or data needs of the feasibility study, especially those involving engineering analysis of landfill waste.

Section 4.0 - Task Plan for the RI

Comment 11 p. 4-2, Section 4.2.1.1 <u>Well Survey</u> - In addition to the well survey proposed as an RI task, it would be advantageous to the overall study if a select number of offsite wells (preferably private wells) were sampled as part of the RI. This would provide accurate data on the ground water quality of local wells. This survey would be improved if a records search was made of state and local records to identify any wells in this area that show evidence of being contaminated.

Response Agree. The well survey will include a review of state and municipal records, along with a door-to-door survey to identify potential users in the area.

Evaluation The comment is partially addressed. The RWP (page 4-3) states that it will perform a records search to identify any wells in the area that show evidence of being contaminated. - Data Gaps - The RWP does not propose to sample any of the offsite wells as part of the RI.

Comment 12	p. 4-6 - Section 4.2.2 Soil Investigation - This section states that: "The primary data gap . . . is the absence of a specific source definition". This is correct. However, all suspected source areas should be identified in this section, and the focus of this effort should be to confirm or deny these previously suspected areas as actual sources, while continuing the search for new sources.
Response	Agree. All possible source areas identified in the conceptual site model, Section 3.0, will be investigated in the RI.
Evaluation	Data Gaps - It is recommended that two to three soil borings be installed within the "debris piles" to characterize this potential source area. No reference to a separate investigation of this area has been cited in the RWP.
Comment 13	p. 4-8 - Section 4.2.2.2 Soil Gas Survey - This section states: "The survey will consist of 100 sampling locations". Establishing a fixed number of sample locations may identify contamination sources, however, it may not isolate the limits of the contaminated area. The number of sample locations should be adjusted in the field as necessary, to define the limits of the contaminated areas.
Response	Agree. Information obtained by the proposed geophysical survey will be used to identify possible source areas of subsurface contamination. A soil/gas soil headspace survey will be performed to evaluate further specific anomalies inferred in the study area.
Evaluation	Response partially acceptable. The above strategy is provided in Section 4.2.2.2 Soil Gas Survey (page 4-9, RWP). - Data Gaps - Insufficient information describing the soil gas survey is provided in the RWP. No methodology on strategy for implementing this activity is provided in the revised "Field Sampling and Analysis Plan" (RFSAP), nor is a separate "Soil Gas Survey Work Plan" referenced in the RWP or the RFSAP.
Comment 14	p. 4-8 - Paragraph 1 states: "The exact locations of the test pits will be selected in the field by the field team leader . . . The locations will be based on the results of the SEAD Burning Pit/Landfill Site Investigation Report (March 1989) soil gas, sampling, and geophysics studies in the landfill area". It is recommended that preliminary test pit locations be presented in the Appendix A Field Sampling Plan along with a brief analysis of the SI results. The field team leader may then, in response to actual field conditions, modify these

locations as required to best characterize these areas.

Response Test pits will not be required during the RI. Additional soil borings will be substituted for the test pits.

Evaluation Test pitting is an excellent method of obtaining waste samples from landfills. It is a quick and efficient way to determine the amount of buried waste/metal/drums and as a result should probably be included in the RI. Test pits could be excavated to refusal. The RWP states that "overburden soil thickness is relatively uniform within and to the west of the landfill, but soil thickness increases to the east. The wells installed west of the landfill are relatively shallow, with bedrock encountered from 6 to 10 feet below land surface". Since some waste deposited in the landfill is presumably heavy (having a specific gravity greater than 1), it could migrate down to the confining weathered and fractured shale layer. Excavating to this confining layer would give a good indication of how much waste exists and its locations (the "hot spots") within the landfill. At a minimum, ground water could be reached by test pitting. Obtaining a visual description of the interface between the ground water and the dry soil above is important because, quite frequently, volatile contaminants and other light fractions often congregate at the water table (float on top of the water table).

-As a result, test pitting could be used to determine the lateral and vertical extent of contamination within the landfill. Also, test pitting could help determine the magnitude of waste (if any) at the bedrock interface and at the ground water interface, the vertical thickness of fill material, and the boundaries of the landfill.

Comment 15 p. 4-10 - Section 4.2.3.2 <u>Surface Water Sampling/Analysis</u> --This section indicates that two surface water samples will be collected from "swampy area north of the landfill". The location of this and other swampy areas in the vicinity of the landfill should be clearly illustrated on a figure in this Work Plan. It may also be necessary to delineate the edge of the wetland closest to the landfill to assess whether or not regulations related to wetland areas apply to site-related remedial response actions.

- In addition, if contamination transport to the swampy areas is suspected, it would be important to collect and analyze sediment samples as well.

Response	Agree. Surface water and sediment samples will be collected in the swampy areas shown in the site maps included in this section.
Evaluation	This comment is partially addressed. Analysis of sediment samples is included in the appropriate section of the RWP. - Data Gaps - The sample area located north of the landfill is indicated on Figure 4.2-4 (page 4-17, RWP) but, only approximately. The location of this swampy area is not illustrated clearly and does not help delineate the edge of the wetland closest to the landfill. Additionally, surface water/sediment samples should be analyzed for "TCL volatiles, TAL metals" not "VOCs, TCL metals" as stated on page 4-14 in the RWP.
Comment 16	p. 4-10 - Section 4.2.3.2 states: "The ninth and tenth samples will be obtained offpost from potentially affected drainage systems". It is recommended that all "springs" identified in the Spring Survey be sampled as well. Spring samples may be used to identify preferential contaminant transport pathways.
Response	Agree. Ten surface water and sediment samples are proposed, but additional samples will be taken, if required, based on the RI.
Evaluation	The comment is partially addressed. -Data Gaps - The RWP (page 4-19) states "a survey will be performed to define the presence of any springs within a 1-mile radius of the ash landfill" and they "will be sampled as part of the surface water/sediment sampling effort"; however, Table 4.3-1 does not include sampling of springs (page 4-27, RWP). Sampling of springs should be included in Table 4.3-1.
Comment 17	p. 4-20 - Paragraph 2 states: "Based on the preliminary risk assessment and review of available data, two chemical classes, VOCs and metals, are of concern at the site". It is noted that the Work Plan includes no analysis of existing data, therefore, the above statement is unsupported in the Work Plan. Without such analyses, it does not appear that the remedial investigation and subsequent risk assessment should be limited to metals and VOCs. - What is the "Preliminary risk assessment" that is being referred to? - It is recommended that a percentage of the samples

collected in all media at the ash landfill be analyzed for a complete Target Compound List (TCL) analysis. This is to confirm the results of the prior studies, which suggest that the contaminants of concern are limited to VOCs and metals, using the analytical and QA/QC methods required for CERCLA-site investigations. Analyses are recommended for semi-volatile organic compounds, pesticides, herbicides, PCBs, and cyanide.

Response A more comprehensive sampling procedure has been recommended in this WP. Follow-up exposure assessments will have sufficient information to address the range of potential contaminants in a manner consistent with RAGS (EPA, 1989).

Insufficient data have been developed at this point to prepare a comprehensive risk assessment. The preliminary risk referenced in the previous WP was based on the presence of a contaminant, not on the expected exposure-assessment-derived toxicity effects. The revised WP will provide additional information to establish an estimate of the reasonable media (soil, surface water, or groundwater) concentrations. The WP includes recommendations for the type of sampling and analytical results needed to complete a baseline risk assessment and to support remedial activities. Appropriate quality assurance/quality control (QA/QC) requirements are also addressed.

Evaluation This comment has been partially addressed.

- Data Gaps - Although Table 4.3.1 has been updated appropriately, portions of the text have not. For instance, Table 4.3.1 indicates ground water samples will include analysis for volatiles, semivolatiles, total metals, and pesticides/PCBs. Section 4.2.1.3, however states that all ground water samples "will be analyzed for VOCs and total and dissolved metals" only. The RWP text should be modified to be consistent with Table 4.3.1. Also, Table 4.3.1 does not specify any analysis for "dissolved metals". This analysis should be included in the RI. Also, surface samples collected from soil borings will not be analyzed for VOCs; no rationale is stated for this omission.

-As a final consideration, the above response suggests that recommendations for the types of sampling and analysis needed to support remedial actions are provided in the RWP. These recommendations are not provided in the RWP.

Comment 18 p. 4-21 - Section 4.6 RI Summary Report states: "A draft summary RI report will be prepared at completion of the site investigation and evaluation of data". The RI/FS Guidance under CERCLA specifies two reports are required following completion of the field investigation: (1) the "Preliminary Site Characterization Summary Report"; and (2) the Draft RI Report. It is unclear which report is being referred to here. The Work Plan should identify both reports. (Note - the RI/FS Guidance (EPA, 1989) presents a suggested format for the RI report in Table 3.13 which should be utilized during report preparation.)

Response Both reports will be included in the draft RI. It is expected that the results of all the studied areas will be consolidated prior to completion of the draft RI report.

Evaluation Response not acceptable. No changes pursuant to the above comment has been incorporated in the RWP.

- Data Gaps - The RWP does not propose to submit a "Preliminary Site Characterization Summary Report" as requested in this comment.

Comment 19 p. 5-2 - Section 5.3 Identification of Applicable Technologies, states: "After potential remedial technologies have been chosen, operable units will be defined for each site condition requiring remediation". The following comments apply:

1) Operable units should be initially defined during project scoping, along with the identification of preliminary remedial alternatives.
2) RI/FS Guidance requires that the FS include a determination of the areas or volumes of media to which general response actions apply. This determination is essential for each operable unit to effectively develop and evaluate each remedial alternative on the basis of effectiveness, implementability, and cost. The Work Plan does not identify this.

Response **The site will be handled as one operable unit with several possible suboperable units within this unit. After potential remedial technologies have been chosen, the suboperable units will be defined for each site condition requiring remediation. Each suboperable unit should meet at least one response objective.**

-All remedial alternatives that pass the initial screening process will be further evaluated and compared according to

Section 5.2.

Evaluation This comment has partially been addressed. Section 5.0 Task Plan for the FS has been rewritten to include a greater discussion of the FS process.

-Data Gaps - The use of suboperable units is appropriate, however, these should be identified and the technologies listed in Table 5.1-1 should specify which suboperable unit and/or media each specific technology will address.

-The FS discussion does not state that "volumes or areas of media" which require remediation will be determined.

Comment 20 p. 5-3 - Section 5.4 Screening of Technologies, discusses the approach to the technologies evaluations. However, the section is unclear and does not specifically conform to EPA Guidance. The following EPA requirements are not stated:

1) First, the universe of potential technologies and process options are screened on the basis of technical implementability. During this step, entire classes of technologies are eliminated from consideration.
2) Second, following the initial screening, all process options associated with each technology type are evaluated on the basis of effectiveness, technical implementability, and cost. One representative process option is then selected for each technology groupage.

The top sentence indicates a "phased approach" to alternative development may occur. This suggests that alternatives may be developed for each operable unit in phases. However, Section 5.5 states: "Each remedial alternative will be an overall site remedy". This suggests that alternatives will be developed which address all operable units, together.

- This section needs to clarify the FS approach to: (1) the identification of operable units; and (2) the alternative development process.

Response Agree. This section has been rewritten to include the screening of technologies on the basis of suitability to site characteristics, compatibility with waste characteristics, and technology limitations.

Evaluation This comment has been partially addressed.

-Data Gaps - Although additional information is provided in Section 5.1.4, the approach is still not consistent with the CERCLA RI/FS Guidance which specifies two levels of technology screening. The first is based on technical implementability, and the second is based on effectiveness, implementability, and cost.

-Also, SEAD/ESE should include a preliminary listing of suboperable units in Section 5.0 (refer to the evaluation of the response to Comment 19).

Comment 21 p. 6-4 - Section 6.2 Project Schedule - This section should provide a detailed schedule for all field investigation activities, including; drilling, soil sampling, ground sampling, etc.

Response The schedule will be negotiated between EPA/NYSDEC and SEAD.

Evaluation Response not acceptable.

- Data Gaps - A schedule should be provided in the RQAPP which specifies the sequence of field activities, and estimates the length of field time that each component of the RI will require in weeks or months.

Appendix A - Field Sampling and Analysis Plan

Comment 22 p. A-2 - Paragraph 4 Boring Log Data - As part of the feasibility study geotechnical information is usually required when designing a remediation system. Although included on Figure A-1, this information should be recorded. Field Boring Log, the text does not specifically enumerate recording blow count as part of performing the Standard Penetration Test ASTM D 1586.

- As geotechnical information is critical when evaluating remedial alternatives, soil samples representative of specific soil types, locations at the site, and stratigraphic horizons should be retained and analyzed for soil mechanical properties. Tests that should be performed include the following:

- Gradation (Grain size analysis with hydrometer): ASTM D-422;
- Atterburg Limits: ASTM D-4318 and 427;
- Modified Proctor Compaction (soil moisture/density relationship);
- Water Content: ASTM D-2216
- One-Dimensional Consolidation: ASTM D-2435 or 4186 samples for the above test need to be undisturbed samples obtained with a thin walled tube sampler (shelby tube) used in conjunction with a drill rig and performed according to ASTM D-1587.

- Permeability of Soil: ASTM D-2434 for coarse soil with little fines or by manufacturer methods on a tri-axial sheer device for fine grained soils.

- Table 2-1 includes quantities required in order to perform such tests. For all but the first three above mentioned tests, larger quantities of soil are required that can be obtained from a split spoon sampler with a hollow stem auger drill rig. These samples should be obtained from the test pit evaluations. The samples retained for geotechnical analysis should be screened in the field with a photoionization detector for volatile organics. Geotechnical testing laboratories commonly do not have the capability to perform these tests in any other than Level D protection. An upper limited value or volatile organics would have to be chosen below which geotechnical laboratory technicians could safely handle the soil.

- Table 2.2 identified additional analyses which should be conducted during the RI to provide the data needed for ground water treatment system design.

Response Agree. Blow counts will be recorded. Test pits have been excluded from the RI.

Evaluation The comment has not been addressed.

- Data Gaps - Data needs of the FS have not been defined in Section 3.5 Data Gaps of the RWP. In addition, Table 4-3-1 of the RWP does not specify any geotechnical analysis of soil boring samples (i.e., gradation, atterburg, limits, etc.) nor any of the recommended analyses for ground water (e.g., pH, TOC, Temp., DO_2, TDS specific conductance, total hardness, Fe+3, NH_4+, K+).

-Refer to the evaluation of the response to Comment 16 regarding the elimination of test pits from this program.

Comment 23 p. F-2 - Appendix F Scope of Work

-Section 1.5 Units to be Investigated Under this Contract, states that this investigation will focus on four SWMUs (cooling water pond, ash landfill, burning pits, abandoned incinerator building). The Work Plan, however, does not give an adequate discussion of the RI/FS objectives as they relate exclusively to each SWMU. For instance, is the incinerator building to be evaluated in the FS as an operable unit, and will remedial activities such as decontamination/ demolition be considered?

-The Work Plan should identify the interrelationship of each

SWMU to operable unit identification. It may also be appropriate to identify potential remedial alternatives specific to each SWMU.

Response Each of the possible contamination sources will be handled as one operable unit within the ash landfill area.

Evaluation Response generally acceptable. Preliminary remedial alternatives have been identified in Table 3.2-1 of the RWP, for the various media of concern. For consistency, however, the term "suboperable units" should be used in subsequent discussions.

Comment 24 The current analytical protocol for the RI is limited to metals and VOCs, and EP toxicity testing. It is recommended that a subpart of all environmental samples be analyzed for all Target Compounds List (TCL) analytes including; semivolatile organics, pesticides, PCBs, herbicides and cyanide. This data is required to develop a risk assessment in accordance with the "Risk Assessment Guidance for Superfund" (EPA 1990). Consideration should also be given to explaining the proposed EP toxicity protocol for the more current TCLP analysis cited under RCRA.

Evaluation Comment not effectively addressed.

- Data Gaps - The RWP states in some sections that compounds on the Target Compound List (TCL) will be analyzed for, but references to the TCL are inconsistent, often inaccurate, and incomplete. This suggests the analytical protocol may not be acceptable.

-For instance, Section 4.2.3 states that surface water samples will be analyzed for "VOCs, TCL metals, acid extractables, and pesticides". There are no metals on the TCL; rather the Target Analyte List (TAL) should be referenced for metals. The reference to VOCs should be "TCL volatiles". Also, the protocol does not include; base neutral extractables, herbicides, and cyanide.

-The RWP should be corrected to include the full TCL/TAL. The correct way to reference these analyses in the text is to state that; "media samples will be analyzed for the full TCL (volatile organics, semivolatile organics, pesticides, herbicides, PCBs, and cyanide), and the full TAL (metals).

Comment 25 The Work Plan does not include a general waste management plan for classification, storage and disposal of all waste materials generated during the RI (i.e., drill cutting,

	purge/development well water, excavated soils etc.). -A contingency plan for handling and disposing all hazardous materials generated during the RI should be developed.
Evaluation	Comment not addressed. - Data Gaps - The RFSAP has not provided an adequate discussion of waste management for RI-generated wastes.
Comment 26	In order to fully scope remedial alternatives, stream sediment sampling and analysis and geotechncial soil mechanics tests should be included in this study. More detail is needed in identifying the incinerator building as a possible point source for contamination.
Evaluation	Comment partially addressed. Sediment sampling is included in the RWP. - Data Gaps - Geotechnical testing of soil samples is not proposed.

B. Evaluation of Responses to U.S. EPA Region II Comments - Federal Facilities Section, Miriam Martinez, Project Manager, (May 15, 1990)

Comment 27 p. 2-3. Since floating product appeared to be diesel fuel was detected on site, we suggest that aerial photographs might reveal areas of soil discoloration corresponding to oil spills. -It was asserted that there are no location-specific ARARs to be considered for this site. However, the site is not too far from the prime vineyards of N.Y. State on the eastern bank of Lake Seneca. It may be that the requirements of the Farmland Protection Policy Act of 1981 (see 7 CFR 658) should be examined.

Response Agree. The sampling parameters have been expanded and will include cadmium. Radioactive residues are not known to exist in the landfill area. In addition, location-specific ARARs concerning wetlands have been included in this section, but the criteria included in 7 Code of Federal Regulations (CFR) 658 (Farmland Protection Policy Act of 1981) are not applicable.

Evaluation The specific reason why the above stated location-specific ARAR does not apply, should be stated.

Comment 28 p. 3-2. According to the Work Plan no significant connection exists between the upper aquifer and the lower aquifer. The work plan does not provide basis for supporting such conclusions. Previous studies conducted in this area indicate that hard shale exists below approximately 10 feet of overburden and weathered shale. Fractures or joints might be capable of transmitting significant quantities of water in the hard shale zone. The Work Plan should include information on the fracture and joining patterns for this formation and in situ tests should be performed to more conclusively define the hydraulic conductivity of the various zones of potential migration.

Response Agree. Existing information concerning site hydrogeology is included in Section 2.0, Site Conditions. The RI will include hydraulic conductivity tests for the potential migration zones.

Evaluation The comment is partially addressed. Additional information is provided in Section 2.4.4 of the RWP regarding the aquifer characteristics (i.e., hydraulic conductivity) under the site. The RWP still concludes that "no significant connection exists between the upper and lower aquifer", but does not provide additional information to justify this statement. Supporting

	information should be included.
	Data Gaps - Section 4.2.1.4 of the RI proposes to conduct slug tests on five newly installed shallow wells. No slug testing is proposed for the deep monitoring wells; therefore, the RI does not propose to assess the hydraulic conductivity of the bedrock layer.
Comment 29	p. 3-3 - The plume of contamination is described as moving above the bedrock in the shallow aquifer. Volatilization of contaminants from the ground water into residential basements is a potential exposure scenario, and should be addressed in the assessment.
Response	Agree. This will be included in the conceptual site model.
Evaluation	Response not acceptable.
	-Data Gaps - Page 3-7 of the RWP states that direct dermal contact through showering is a potential exposure pathway to contaminants in ground water. However, neither the text nor the conceptual model (Figure 3.1-1) specify volatilization of ground water as a release mechanism, nor inhalation of contaminants as a potential exposure route from ground water.
Comment 30	p. 4-4 - Figure 4-1 - Analytical data for water samples taken from wells PT-11, PT-23 and PT-26 were received with the work plan, but these wells are not shown in Figure 4-1, the Proposed Sampling Locations. Are these wells on site, and will they be sampled in the remedial investigation?
Response	Agree. The locations of all existing monitor wells are shown in Figure 4.2-1. All existing wells will be sampled in the RI.
Evaluation	The comment is partially addressed. PT-11 and PT-26 (but not PT-23) have been included in Figure 4.2-1 (page 4-5, RWP).
Comment 31	p. 4-5 - Will the background monitoring well (MW-2) be located up-gradient of all potential on-post source areas not yet characterized?
Response	The background well will be located upgradient of all the potential onpost contamination sources identified in the conceptual site model.
Evaluation	The comment is partially addressed.
	-Data Gaps - An upgradient deep well is proposed (MW-41D) to evaluate the background water quality conditions in the deep zone. No upgradient shallow well is proposed to

evaluate the background water quality conditions in the upper aquifer. (Note that the well numbering scheme has been changed in the RWP).

Comment 32 p. 4-11, 12 - An HNU analyzer will be utilized to take real time measurements.

- at the excavation area continuously upon approach and continuously during excavation;
- at the backhoe operation continuously with screening of each bucket of soil and daily of excavated soil piles; and
- at the monitor well installation continuously during the penetration and removal of coring tube, continuously during the cleaning of equipment, and during the 5-minute intervals when the borehole is open.

Comments on the Air Monitoring Plan

Comment 33 Inhalation has been properly identified as an exposure pathway of concern. For the baseline risk assessment, inhalation of volatilized VOCs from soils and surface water and of particulates must be addressed. EPA should receive a copy of the baseline risk assessment for review.

-With regard to monitoring, EPA recommends that particulates be sampled for as well as VOCs. New York State Department of Environmental Conservation (NYSDEC) has guidance regarding short term dust concentrations at the site perimeter (15 minute standard of 150 ug/m^3). NYSDEC should be contacted for further details. Monitoring particulates during the RI work may also be useful in determining emission rates if excavation is required for site remediation.

-For public safety, it is inappropriate to compare concentrations to worker safety standards because they do not consider sensitive populations and are valid for 8 hour exposure periods. NYSDEC also has guidance for established fence-line action levels. EPA has attached a copy of this guidance.

-Consideration must be given to whether HNU has a low enough detection limits for the contaminants of concern. EPA can assist with this inform.

Response The HNU will be used to determine if respiratory protection is needed during the RI.

Evaluation The comment has not been adequately addressed. ESE and SEAD acknowledge the comments regarding the utilization of an HNu; however, they do not respond to the specific issues cited above.

-Data Gaps - The RWP does not discuss how SEAD/ESE intends to address the issues of volatilization (and the subsequent inhalation) of VOCs from site media, and/or inhalation/ingestion of particulates within the Risk Assessment.

-The RWP does not include or specify monitoring for particulates during field work. The RWP also does not reference the NYSDEC guidance for establishing fence-line action levels, or provide an analysis of whether the HNu has a low enough detection limit for the contaminants of concern.

Comment 34 p. 4-20, 21 - The risk assessment work plan does not address future potential contaminant concentrations in affected media or potential future uses of affected areas/media. These issues must be addressed in the baseline/no action risk assessment.

Response See comment 48, May 8, 1990.

Evaluation This comment has not been adequately addressed.

-Data Gaps - The RWP should provide some discussion in Section 4.5 Risk Assessment as to how issues regarding future "predicted" contaminant concentrations will be determined, and how future land usage will be evaluated.

Comment 35 p. A-13 - Section A.2.3 - Ground Water Sampling, the Draft RI/FS indicates each monitoring well screen will be sampled once. WMD recommend two sampling rounds be conducted, in different seasons.

Response Disagree. Not feasible for proposed RI/FS.

Evaluation Response acceptable; however, comment deferred to EPA for consideration.

Comment 36 The Draft RI/FS indicates civilian and military personnel on the base that contains the ash landfill. It is not indicated if the potable water on this base is undergoing a continuous monitoring program. EPA recommends a monitoring program for the contaminants of concern be instituted to safeguard the health of the personnel at the Seneca Army Depot.

Evaluation Comment not addressed.

-Data Gaps - Section 4.2.1 Ground Water Investigation does not discuss the implementation of a ground water monitoring program to safeguard the health of base personnel.

Comment 37	Lake Seneca receives surface water runoff from the landfill area, as indicated in the RI/FS. Thus, there is a possibility of contamination transport via this mechanism. EPA recommends surface water sampling along these tributaries as well as at the outfall into Lake Seneca.
Evaluation	Comment partially addressed. Although no sampling is proposed specifically at the outfall to Lake Seneca, sampling within the drainage areas and tributaries leading to the lake is proposed in the RWP.
Comment 38	Please be aware for drinking water analysis for VOCs, the only acceptable means is the EPA Series methodology.
Evaluation	Comment not addressed. -Data Gaps - SEAD/ESE proposes use of Method SW 8240 which is not suitable for assessing drinking water quality. The required method for analyzing for VOCs in drinking water is EPA Method 524.2 (EPA 600/4-88-039, December 1988).
Comment 39	Although the RA includes the task of delineation of floodplains (p. 4-33), a floodplains assessment of impacted areas should be included in the list of field investigations to be performed (pp. 4-37, 38). In addition to the delineation of the floodplain of concern (the 500-year floodplain), the assessment should include an analysis of appropriate measures to protect the region from flooding.
Comment 40	The planned characterization of endangered or threatened species at SEAD (p. 3-26) should be performed consistent with the Endangered Species Act of 1973, as amended (16 USC 1531), including consultation with the Fish and Wildlife Service. The following person can be contacted to request a determination of the presence of endangered or threatened species, or critical habitats. (Include a map of the affected area when making the request.) Mr. Leonard Corin Field Supervisor, U.S. Fish and Wildlife Service, 100 Grange Place, Room 202, Cortland, New York 13045.
Comment 41	Section 3.3.2.1 states that, "There are no registered historical buildings, nor have there been any significant archeological findings, within the SEAD area." However, it does not appear that a proper cultural resource survey has been

undertaken. A determination of the presence of, and potential impacts on, cultural resources, in compliance with the National Historic Preservation Act, is a necessary component of the RI/FS process. Included in such a study is a determination ofthe presence or absence of such resources in each of the study areas where earth-disturbing activities would occur in association with any possible remedial actions. This process is referred to as a stage I survey. Information on the survey can be found in the CERCLA/SARA Review Manual, which can be sent to you upon request.

- Historical information can be obtained from the New York State Historic Preservation Office. These and other sources should be used to assist the archaeologists carrying out the survey in determining the nature and extent of any necessary subsurface testing.

Comment 42 A determination must be made of the presence or absence of, and direct or indirect impact on, significant agricultural lands. The Soil Conservation Service and the local Soil Conservation District should be contacted. Further information on this process can be found in the CERCLA/SARA Review Manual.

Comment 43 p. 4-33, Objective #5 - Although the current understanding of the nature of contaminants at the site suggests that the potential for indicator chemicals bioaccumulating through the food chain is low, we recommend that the methods used in a bioaccumulation study be investigated as well as presented in the work plan.

Comment 44 p. 4-35, states "if this screening indicates the potential for significant bioaccumulation, tissue sampling ... Review of current data does not indicate a need for this sampling." We suggest to do the screening first, to see if you come up with the same assumption.

Comment 45 p. C-10, section 1.4, mentions a limited wetland northwest of the incinerator. This area needs to be included in all figures.

Comment 46 p. C-53, section 4.7.1, indicates that final locations for the soil sampling will be determined after the approval of the USACE project manager. We request consultation with

EPA/NYSDEC.

C. Evaluation of Responses to NYSDEC Comments - Federal Projects Section, Kamal Gupta (April 19, 1990)

Comment 47 The parameters for soil and water sample analysis, as presented in Table 4-3 of the report indicates that the samples will be tested for volatile organics and few metals (mercury, arsenic, selenium, ICAP: Ba, Cd, Cr, Pb and Ag). The list does not include testing for semivolatiles, pesticides/PCBs and many other metals. It is also not clear that the volatile organics include all the volatiles listed in the Target Compound List (TCL) or not. The potential contaminants listed for the site include heavy metals, herbicides, explosives and radioactive residues. NYSDEC recommends that the samples be analyzed for full Target Compound List (Attachment "A") and a radiation survey for alpha, beta and gamma particles should be performed. Additionally, the detection limit for lead has been indicated as 44.7 ug/l (see page C-63). The Contract Required Quantitation Limit for lead is 5 ug/l. Please ensure that the testing laboratory meets all quantitation limits as indicated in the attached TCLs.

Response Table 4-3 Agree. The samples will be analyzed for the property parameters and full target compound list (TCL). Radioactive residues and explosives are not known to exist in the landfill area. The quantitation limit for lead has been changed to 5.0 ppb.

Evaluation This comment has been partially addressed. Table 4.3-1 (page 4-27, RWP) includes analysis for semivolatiles, pesticides/PCBs and total metals for soil and water samples. The detection limit for lead has been changed.

-Data Gaps - Table 4.3-1 does not specify that volatiles will be analyzed for the full TCL. A statement to this effect should be added to the table. Explosives, radioactive materials, and herbicides are not considered potential contaminants by SEAD/ESE in the RWP. Screening for radionuclides should be conducted during the RI, therefore; this should be included in the RWP. SEAD/ESE should also consider including analysis for herbicides for a subset of the media samples collected.

Comment 48 The purpose and scope of the study, Section 3-1, is to identify potential environmental risks attributable to site contaminants. To accomplish this task, Section 5.2 endeavors to evaluate potential receptors, "critical" migration pathways and establish clean-up levels that are protective of the environment. However, as proposed, this study will not provide enough information to make a proper judgement about environmental impact at the site. There are no proposals for ecological characterization of the site, no identification of ecological receptors and no determination of important or critical habitats used by fish and wildlife species or populations at the site.

-The NYSDEC recommends that the enclosed Attachment "B", Habitat Based Assessment (HBA), be used in the evaluation of the existing ecological values of the site and adjacent areas and the subsequent environmental risk assessment. We recommend Step 1 and Step 3 of the HBA during Phase I of the RI/FS process.

-The work plan, Section 3.4.2, discusses the identification of applicable or relevant and appropriate requirements (ARARs); however, Article 15 (Water Resources Law) and Article 24 (Freshwater Wetland Act) are not included as location specific ARARs. There are several New York State regulated wetlands located on the Seneca Army depot which could be impacted by released from the site. In addition, many of the tributaries along Seneca Lake have seasonal salmoid runs from the lake and/or support aquatic life.

-The work plan indicates that the site contaminants may have migrated to Seneca Lake through surface runoff. However, the study does not propose any sediment sampling. The NYSDEC feels that sediment sampling should be accomplished within the drainage patterns leaving the site and wetlands potentially receiving runoff from the site.

-It is important that the work plan include an evaluation of the existing environment, analysis of sediments within the stream system or wetlands and identify all potential ARARs.

Response Agree. Ecological characterization and receptors have been included in the scoping section, Section 2.0, and risk assessment (RA) section (Section 4.5), of the WP Wetland ARARs have been included in the location-specific ARARs section. In addition, sediment sampling will be included in the RI.

Evaluation This comment has been partially addressed. The RWP proposes: (1) site surveys (avian observation, vegetation analysis); (2) analysis to aquatic/terrestrial receptors to determine species richness and evenness; (3) a wetlands assessment; and (4) a survey of critical or sensitive habitats and endangered species. Sediment sampling is also proposed in drainage areas.

-Data Gaps - Article 15 (Water Resources Law) and Article 24 (Freshwater Wetland Art) are not included as location specific ARARs. In addition, no reference to the NYSDEC "Habitat Based Assessment" were noted in Section 4.5.2.

-EPA recommends that the wetlands delineation be performed according to the "Federal Manual for Identifying and Delineating Wetlands" (an Interagency Cooperation Publication, dated January 1989).

Comment 49 Another concern with this site is the protection of private water supplies downgradient of the Ash Landfill. In addition, if contaminated ground water reaches private residences, exposure via basement seepage and vapor inhalation is also possible. As is clearly shown on Figures 13, 14 and 15 of the report, the contaminant plume currently extends past the perimeter road to the west of the landfill, therefore, off-site impact is a possibility. The proposed location of the new monitoring wells shown in Figure 4-1 of the report will help define the width of the contaminant plume but will do nothing to track its downgradient extent. To ensure that private citizens downgradient of the Ash Landfill will not be exposed to the contaminants in ground water at least two monitoring wells must be installed off-site to the west of the railroad tracks and a program initiated to sample private wells downgradient of the landfill. If contaminants are found in the private wells, interim remedial measures may be necessary to avoid human exposure. If contaminants are not found, information on the hydraulic conductivity of the aquifer(s) of concern may give an estimation of the time before contaminants reach the downgradient private wells. Thus, measurement of the hydraulic conductivity of the aquifer(s) in question is essential.

Response Agree. Hydraulic conductivity will be included in the RI. Private wells offsite are currently being sampled.

Evaluation The comment has partially been addressed. Two monitoring wells are proposed to be installed off-site to the west of the railroad track (one shallow and one deep).

-The RWP states (page 4-3) that three private offsite wells (one deep and two shallow) have been sampled and are "free from any of the contaminants identified at the Ash Landfill

	area". The RWP also states that other wells in the area will be identified in "the inventory" and that their "water quality will be reviewed, where available". -Data Gaps - The RWP does not mention that offsite wells will be sampled or are currently being sampled. Also, sufficient justification that the offsite wells are free of contamination has not been provided.
Comment 50	The January 4, 1990 sample results provided include results for sites PT-11, 23 and 26, and, Farmhouse (shallow, deep) and Barn Well. Figure 4-1 should be revised to include these locations.
Response	Agree. Well locations PT-11, PT-23, and PT-26 have been included in the revised well location figures.
Evaluation	The comment is partially addressed. PT-11 and PT-26 are included in Figure 4.2-1 but, Location PT-23, the Farmhouse and the Barn Well are not.
Comment 51	The remedial investigation must include air sample collection and compound specific laboratory analysis. This will establish the present impact of the site on air quality and also provide background levels to use in conjunction with data generated during remedial activities.
Response	Disagree. Air sampling is not identified as an important task in the revised scoping and conceptual site model. However, dust sampling of the incinerator building for analysis of incinerator-operation-related contaminants will be included in the RI.
Evaluation	The use of air sampling instead of air monitoring is discretionary, and to be decided by the regulatory agency. As a result, the above response may be acceptable. The following comments, however, are noted. -Data Gaps - The RWP needs to include a greater discussion as to how the air pathway will be evaluated in the risk assessment. In addition, the air monitoring program should include monitoring for dust/particulates during all invasive field work.
Comment 52	p. 3-2 - What data are currently available to justify the conclusion that there is no connection between shallow ground water and deep aquifers?
Response	Based on the general geology of the site, it is unlikely that there is a connection between the shallow ground water and

deep aquifers.

Evaluation This response is not adequate.

-Data Gaps - More information should be provided to justify the statement "There is no evidence of a significant connection between the shallow ground water and the deeper aquifers" (page 3-3, RWP).

Comment 53 p. A-6, A-7, A-9. Text on page A-6 and Figure A-7 indicate that the two inch well casing will be made of stainless-steel pipe; however, on Page A-9 a polyvinyl chloride (PVC) casing is described. The use of PVC in constructing long-term wells are not acceptable to NYSDEC. This discrepancy should be cleared up.

Response Disagree. The wells will be constructed with polyvinyl chloride (PVC) casing as are the existing wells.

Evaluation The Region II QA Manual suggests the use of PVC casing in well construction only in cases where trace metals are suspected. Thus, the use of PVC is not appropriate.

Comment 54 p. A-13. The recommended procedure for ground water sampling during a remedial investigation includes quarterly sampling to evaluate seasonal differences. Analytical parameters should include the full TCL (target compound list) at least for the first sampling event. Subsequent events may use a modified parameter list based on the findings of first sampling round and the concurrence of NYSDEC. The need for additional sampling will be evaluated after the quarterly sampling has been concluded. Ground water levels should be measured monthly or such selected intervals to evaluate seasonal differences in water table elevation.

Response The wells will be analyzed for the full TCL. The existing ground water monitor data will be incorporated into the data obtained during the RI to evaluate seasonal differences. Further discussion is required with regard to this issue.

Evaluation The comment is partially addressed. Incorporating the existing ground water monitoring data with the data obtained during the RI will not necessarily help evaluate seasonal differences. Further discussion on this issue is required.

Comment 55 p. C-63. Detection limits for ground water samples should be, at a minimum, equal to the NYSDOH Maximum Contaminant Limits (MCLs) found in 10 NYCRR Part 5. This is particularly important when drinking water supplies are

	threatened, as they are in this case.
Response	Contact-Required Quantitation Limits (CRQL) will be used as minimum criteria.
Evaluation	Response unacceptable. -Data Gaps - CRQLs are not necessarily set at levels below state or federal standards or criteria for drinking water. A comparison of CRQLs with relevant standards is required to evaluate this. In cases where the CRQL exceeds relevant standards, a lower detection limit should be requested for that parameter.

D. Evaluation of Responses to U.S. EPA II Comments - Federal Facilities Section, Miriam Martinez, Project Manager (May 23, 1990)

Comments 55 p. 4-8 - Toxicity Characteristic Leaching Procedure (TCLP) has replaced EPTOX. Use TCLP in place of EPTOX for soil boring and test pit samples. This method is attached.

Response Agree. TCLP will be included in RI section 4.0.

Evaluation Comment not addressed.

-Data Gaps - TCLP analysis is not included in Section 4.0 of the RWP. SEAD/ESE should provide justification for this omission.

Comment 56 p. 4-14,15 - Sampling Equipment

a. Since metals will be sampled for, a 10% nitric acid rinse is to be inserted between steps b and c. For carbon steel split spoons, this rinse is to be reduced to 1% HNO_3. A tap water rinse is to follow the nitric acid rinse.

b. The deionized water rinse, step c, is to follow the solvent rinse, step d. The equipment is to air dry, as in step e.

Purging Equipment

a. All of the downhole equipment is to be washed on the outside and flushed on the inside with non-phosphate detergent solution, then rinsed thoroughly inside and outside with tap water, followed by deionized water.

Drilling and Excavation Equipment

a. Down hole sampling tools, such as split spoons, are to be decontaminated according to the previous procedure for sampling equipment.

b. Well casings and screens are to be steam cleaned prior to installation.

Response Agree. All comments have been incorporated.

Evaluation The above comments have not been addressed.

-Data Gaps - Section 4.2.7 has not been revised in accordance with the procedures specified above. The decontamination procedures in the RWP (Section 4.2.7, page 4-23) have not been modified from the draft WP, and are not in compliance with Region II CERCLA Quality Assurance Manual, Revision I, October, 1989, nor are they consistent with procedures in the Revised QAPP (RQAPP) (Appendix C). The correct decontamination procedure is as follows:

1. Wash and scrub with low phosphate detergent,
2. Tap water rinse,

3. Rinse with 10% HNO_3 ultrapure (rinse with 1% HNO_3 if the equipment being decontaminated is constructed of carbon steel),
4. Tap water rinse,
5. An acetone only rinse, or a methanol rinse followed by a hexane rinse (solvents must be pesticide grade or better),
6. Thorough rinse with deionized demonstrated analyte free water,
7. Air dry, and
8. Wrap in aluminum foil for transport.

The above procedures should be included both in the RWP and in the RQAPP (Appendix C, page C-51) to maintain continuity.

Comment 57 (p. 4-17)	1. Rinsate blanks are required for soil samples, and are to be analyzed as water samples for volatile organics and metals. 2. The frequency for rinsate blanks is one per decontamination event, not to exceed one per day. 3. The EP Toxicity procedure has been replaced by the TCLP procedure.
Response	Agree. All comments have been incorporated. The EP Toxicity procedure has been replaced by TCLP procedure.
Evaluation	The above comments have not been addressed. -Data Gaps - Table 4.3-1 (page 4-28, RWP) does not include rinsate blanks for soil samples. The RWP does not include TCLP analysis.

Comment 58	Data is to be validated according to Region II data validation SOPs,
(p. 4-9)	not the Functional Guidelines. Copies of the SOPs are attached.
Response	Agree. The Region II data validation standard operating procedures (SOPs) have been included.
Evaluation	Response generally acceptable. Section 8.4 of the (RQAPP) states that although EPA CLP analytical protocols will not be followed, the EPA CLP data validation procedures will be followed. The following SOPs are provided in Attachment B of the RQAPP:

- SOP No. HW-6, Revision #7 - CLP Organics Data Review and Preliminary Review (March 1990); and

- SOP No. HW-2, Evaluation of Metals Data for the CLP, based on SOW 7/88, Rev. 2/89. SOP Revision X.

	-Data Gaps - Note that EPA CLP validation protocols must be modified when they are used to validate data obtained using non-CLP methods. SEAD/ESE should propose such modifications and coordinate this activity with the Region II QA office.
Comment 59 (app. A)	The soil gas sampling procedure is to be included in Appendix A.
Response	Disagree. The soil gas sampling procedure is included in the Soil Gas Work Plan, under a separate cover.
Evaluation	The comment has not been addressed. -Data Gaps - Section 4.2.2.2 of the RWP discusses the soil gas survey, however, provides no discussion of the strategy and/or methods to be employed, nor is there any reference given to a separate "Soil Gas Survey Work Plan". If this document exists, it should be referenced and provided for review, or else the soil gas survey should be discussed in detail within the RWP and the FSAP.
Comment 60 (app. A)	1. Why is 5 ppm the screening level at which to stop drilling? Isn't this level rather high? 2. What is the criteria for choosing the one and only sample per boring to undergo chemical analysis?
Response	Agree. Four discrete samples will be taken from each soil boring.
Evaluation	The above comments have not been adequately addressed. See evaluations for each comment below. 1. -Data Gaps - No response to this comment is provided. Also, the RFSAP (Appendix A) does not identify the screening level at which to stop drilling. 2. This comment no longer applies, as the RWP proposes to collect samples at regular intervals. Note that the RWP and the RFSAP are inconsistent when identifying the number of samples to be collected per boring.
Comment 61 (p. A-4, 5)	1. Use a smaller stainless steel tool, such as a spoon scoop, for filling VOC vials and homogenizing the rest of the sample. (The correct term for mixing a sample is homogenization. Compositing is the technique of mixing equal portions of 2 or more separate sample points or intervals.)

2. Keep in mind that the sample selection procedure described entails the need for many sample bottles, as each sampling interval is to be packaged for laboratory analysis prior to making the sample selection.

3. Is only one sample per boring considered a representative sampling event? I suggest taking at least 2 or 3 samples with at least one being collected from a set depth.

Response Agree. Four discrete samples will be taken from each soil boring.

Evaluation The above comments have partially been addressed. See evaluations of each comment below.

1. -Data Gaps - Section A.1.3 of the RQAPP has not been modified to include the use of a stainless steel spoon scoop in place of the trowel. Also, the term "homogenization" has not been used to describe sample mixing.

2. Discrete intervals are now proposed for selecting samples, therefore, this comment no longer applies.

3. Three samples are proposed per boring in the RFSAP; however the RWP proposes collection of four. The RWP and the RFSAP should be made to be consistent.

Comment 62 (p. A-13, 14) 1. Sampling must begin within 3 hours of purging.

2. The one gallon intermediate container is to be Teflon, and cleaned between samples in the same manner as the bailer. The use of an intermediate container is not required, sample bottles and filtering devices can be filled directly from the bailer.

3. Describe the metals filtering procedure. The apparatus is to be glass, polyethylene or polypropylene. The filter is to be cellulose-based 0.45 micron nominal pore size. Samples are acidified with concentrated nitric acid after filtering. See the attached method.

Response Agree. A Teflon bailer will be used. The down hole portion of the pump in contact with the water) will be Teflon tubing; two 60-milliliter (ml) vials with Teflon septum will be used. Dissolved metals will not be analyzed for in this project.

Evaluation The above comments have been partially addressed. See evaluation of each comment below.

1. The RQAPP does not specifically state that sampling will occur within 3 hours of purging; however, Section A.2.3 states "after 2 hours have elapsed, the well will be allowed to recharge within 75 percent of its static level before sampling" (p. A-14).

2. -Data Gaps - The type of material which comprises the intermediate 1 gallon container is not specified on p. A-15 of the RQAPP; however, the use of this container pertains only to the collection of samples for metals analyses (i.e., VOCs samples will be taken directly from the bailer).

3. -Data Gaps - Inconsistencies have been identified with regard to the collection of filtered samples. Section 4.2.1.3 of the RWP states that all ground water samples will be analyzed for total and dissolved metals. This, however is not reflected in Table 4.3-1 of the RWP, nor the above response which indicated analysis for dissolved metals will not occur. It is recommended that such analysis be included.

Comment 63 (p. A-13, 14)
1.State the parameters to be collected. Volatile organic samples are to be collected in 2 40 ml vials, and are to be acidified with 1:1 HCl to pH < 2, as previously described in my comment on Section A.2.3. Metals samples are to be acidified with concentrated HNO_3 to pH <2, as described in another comment on Section A.2.3.

Response
Agree. The parameters have been included.

Evaluation
This comment has partially been addressed. The above information is presented in Table 4.2-1 (page C-41, RQAPP); however, it is recommended that this information also be provided in the RFSAP.

-Data Gaps - Cyanide aqueous samples should be preserved with NaOH to pH>12; not pH<2, as proposed in Table 4.2-1 the RQAPP (Region II CERCLA Quality Assurance Manual, page 267).

Comment 64 (p. A-23)
1.VOC samples are to be collected in 2 40 ml vials per sample.
For metals and TCLP samples, the soil is to be homogenized as previously described in Section A.1.3.

Response
Test pit samples have been deleted from the SP.

Evaluation
This comment has partially been addressed.

Thorough mixing of soil samples is proposed following collection of the sample for VOC analysis, as recommended (p. A.1.3, FSAP). See Evaluation to Comment 29, Section 3.1, regarding the elimination of Test Pits for this program.

-Data Gaps - Table 4.2.1 of the RQAPP proposes 1-40 ml vial per sample for VOC analysis, rather than the recommended two 40 ml vials per sample.

Comment 65 (p. C-17)	The ESE laboratory in Gainesville, Florida currently holds a contract for organic analysis in the Contract Laboratory Program (CLP). For this project, the lab is approved for volatile organic sample analysis. However, ESE does not hold a CLP contract for inorganic analysis. The lab must successfully analyze performance evaluation (PE) samples supplied by this office. PE samples successfully analyzed for metals from other programs within the past 6 months may be submitted to this office for consideration.
Response	The ESE laboratory is already analyzing performance evaluation samples. However, the ESE laboratory will not do the analytical work for this project.
Evaluation	This comment has not been addressed. -Data Gaps - Although ESE laboratories are not involved in this RI, the above mentioned policies will apply to the selected laboratory. Therefore, further discussion of the qualifications of the chosen laboratory must be provided.
Comment 66 (p.C-32)	1. Rinsate blanks are to be prepared for soil samples at the same rate stated above. Rinse blanks are to be prepared for volatile organic and metal analytes but are not required for TCLP.
Response	Agree. This has been included in the revised QAPP.
Evaluation	The above comment has not been addressed. -Data Gaps - Table 4.3-1 (page 4-28, 4-29) does not propose to include rinsate blanks when collecting soil samples.
Comment 67 (p. C-38)	Step 3 - If bubbles are discovered in a filled VOC vials, then the sample must be retaken in a new vial. Simply topping off a vial with a bubble in it, is not sufficient, as the bubble may have de-gassed a portion of the sample.
Response	Agree. This has been included in the revised QAPP.
Evaluation	The above response is unclear. Page C-40 states, "If a bubble is discovered, the cap should be removed, sample must be retaken and the bottle resealed and the bubble must not be evident. Simply topping off a vial with a bubble in it is not acceptable as the bubble may have degassed a portion of the sample". These two statements are contradictory. The first statement implies that the same vial will be used to resample

and the second statement says a vial cannot be reused or "topped off". If bubbles are discovered in a filled vial, then the sample must be retaken in a new vial.

Comment 68 (p. C-39)
1.Sample containers are to be cleaned and quality controlled (by analysis) in accordance with the CLP Sample Bottle Repository Statement of Work (SBR-SOW). The following are vendors who held bottle contracts and their commercial equivalent:
a. I-Chem, Series 300 bottles
b.Eagle Pitcher, Level I bottles.
Analytical QC results of bottle blanks must be sent to this office prior to any field activities.

Response
The ESE laboratory uses commercially purchased containers from I-Chem.

Evaluation
The above response does not address the comments.
-Data Gaps - SEAD/ESE do not indicate whether QC results will be sent to the Region II office. Also, in the response to Comment 12, SEAD/ESE state that the ESE laboratories will not be involved in this project. Thus, the above reference to ESE Laboratories appears inappropriate.

Comment 69 (p. C-39)
1.The deionized water used for cleaning procedures, the ultrapure water used to prepare equipment rinsate blanks, and the organic-free water used to prepare trip blanks must be found to be analyte-free by analysis for all parameters of concern. Analytical QC results for water blanks must be sent to this office prior to any field activities. The water is then to be analyzed monthly during field activities.

Response
Agree. This has been included in the QAPP.

Evaluation
This comment has partially been addressed. Page C-53 (RWP) states, "tap water used for decontamination purposes will be obtained from SEAD. A sample of the water will be collected and analyzed for the TCL compounds prior to the field effort".

-Data Gaps - The RQAPP does not mention that the deionized water (used for cleaning procedures), the ultrapure water (used for equipment rinsate blanks), or the organic-free water (used to prepare trip blanks) will be analyzed or sent to Region II. The RQAPP also does not mention that the water will be analyzed monthly during field activities.
-Also, where does it state in the RQAPP that water used in the above procedures will be analyzed for all parameters of

concern before the beginning of any field activities?

Comment 70 1. See my previous comments on Section 4.2.6 of the work plan.
2. Organic samples are not to be filtered.
3. For the metals filtering apparatus, change the decon procedure as follows:
   a. change rinse in (b) to tap water
   b. use 10% nitric acid in (c)
   c. remove (d) and (f).

See the attached policy and procedure for metals filtration.

Response Agree. This comment will be included in the revised QAPP. However, filtration will not be proposed for metals.

Evaluation The above comments have been partially addressed. See the evaluation for each comment below.
1. -Data Gaps - Section 4.2.7 (page 4-23, RWP) has not been modified in accordance with the above recommended changes (refer to Comment 2).
2. The above response suggests that filtering of organic samples will not occur. Also, no reference to filtering VOC samples was found in Section A.2.3 <u>Ground Water Sampling</u> of the RFSAP, as requested by EPA.
3. The decontamination procedures discussed in the RQAPP (page C-51) have been revised, but still do not comply with EPA Region II policy (refer to Comment 2, or the Region II CERCLA Quality Assurance Manual, page 38).

Comment 71 1. For soil, sampling, see my previous comments on Section A.1.2.
(p. C-43-51) of Appendix A, FSAP. In addition, the content of Section A.1.3. from Appendix A should be included here. See my previous comments on Section A.1.3. of Appendix A, FSAP.

Response Agree. The QAPP has been changed accordingly. However, sampling pits have been excluded from the WP.

Evaluation 1. -Data Gaps - The previous comments on Section A.1.2 have not been fully addressed (refer to Comment 8); also, information from Section A.1.3 of the draft WP has not been incorporated into the RQAPP.

Comment 22 1. SW-846 methods may be used for volatile organics and metals
(p. C-58) analyses. However, all CLP Statement of Work (SOW) quality control procedures must be followed. These QC

procedures are found in Exhibit E in both SOWs:

a. CLP-SOW for Organic Analysis, dated 1/88,
b. CLP-SOW for Inorganic Analysis, dated 7/88.

Note that for dissolved metals analyses, the environmental samples must be matrix matched to the standards used in the analysis.

Response Quality control (QC) for each SW-846 method will be used. The deliverables will be prepared according to Exhibit B in CLP SBR-SOW.

Evaluation Response unclear.

1. -Data Gaps - SOPs for evaluation of metals and organics are provided in Appendix B of the RQAPP. However, Section 8.4 of the RQAPP states that, the goal of the program is to ensure that analytical data meet the general QA criteria for EPA Level III classification <u>without</u> following the full EPA CLP analysis protocol. Therefore, although Section 8.4 states that EPA CLP validation protocols will be followed, it does not appear that CLP SOW QA/QC procedures will be followed in the laboratory.

   Note also that SEAD/ESE do not state how the EPA CLP data validation protocols will be modified to make them suitable for use in validating data generated using non-CLP methods. These proposed modifications must be provided to the Region II QA office for review prior to the RI.
2. The above response states deliverables will be prepared, as requested.

Comment 72 1. Volatile organic samples are to be acidified with 1:1 HCl to
(p. D-2) pH<2. If acidification causes sample effervescence, do not acidify the samples. See the attached procedure.

Response Agree. This has been included in the WP.

Evaluation Comment not addressed.

-Data Gaps - Although Section 4.3 of the RQAPP has been revised accordingly, this comment has not been addressed in Appendix D (Sample Handling Protocol). No changes or additions have been made to Appendix D.

Comment 73 1. Only metals samples may be filtered.
(p. D-4)

Response Agree. No plans have been proposed to filter metals.

Evaluation The comment has not been addressed.

	-Data Gaps - Appendix D (Sample Handling Protocol) has not been modified in accordance with this comment.
Comment 74 (p. D-5)	1. Collection of volatile organic samples in 2 40 ml vials is preferred over 1 8oz. bottle.
Response	Volatile organics will be collected in two 40 Ml vials.
Evaluation	The comment has not been addressed in Appendix D (Sample Handling Protocol). -Data Gaps - No changes or additions have been made to Appendix D.
Comment 75	p. 4-16 - Paragraph 2: The required documentation should be listed (i.e., chain of custody, sample receipt, and other forms). Information as to what the documentation is and how to fill it out should also be included here.
Response	Disagree. This is covered in the QAPP and Sampling Handling section.
Evaluation	Response not acceptable. -Data Gaps - An inadequate discussion of "Sampling Handling" exists in Section 4.3 of the RQAPP (Appendix C). In addition, as specified in the above comment, the required documentation should be listed (at least briefly) in the RWP.
Comment 76	p. 4-17 - There is a typo in the table; "rinsate" is misspelled as "rinseate".
Response	Agree. See comment 42.
Evaluation	This comment is not addressed. Rinsate is still misspelled as "rinseate" in Table 4.3-1.
Comment 77	p. 4-17 - Table 4-3: According to Appendix D, pg. D-1, the USACE laboratory would require a minimum of 2 replicate samples to be collected for 19 field samples taken. Table 4-3 indicates that 19 ground water samples will be collected and only one replicated sample will be analyzed by the USACE laboratory. Is this deviation in protocol addressed in the plan?
Response	Agree. See comment 42.
Evaluation	Response not adequate. -Data Gaps - According to Appendix D (page D-1, RWP), the usage laboratory would require a minimum of three replicate samples to be collected for 28 field samples taken. Table 4.3-1 (page 4-27, RWP), however, indicates that 28 ground water samples will be collected and only two replicated samples will be analyzed by the usage laboratory.

Comment 78 p. 4-17 - Table 4-3: Why are replicate samples, rinsate samples and trip blanks QC samples for the ESE laboratory and QA samples for the USACE laboratory? The samples should remain as one item either QC or QA samples.

Response Agree. See comment 42.

Evaluation This comment is not addressed. QC and QA are still two separate items in Table 4.3-1 (page 4-27, RWP).

Comment 79 p. 4-17 - Table 4-13: It is imperative that the analytical methods selected for the RI provide analytical results with detection limits that are below critical toxicological limits in order to support risk assessment (RA) development. Likewise, quantitation limits of importance for technology evaluations in the feasibility study (FS) should be assessed.

Table 4.3 does not provide detection limits for each method. It is recommended that the Army provide verification that the selected analyses adequately support RA and FS activities.

Response Agree.

Evaluation Response not adequate.

-Data Gaps - Detection limits for each analytical method selected are not included in Table 4.3-1 (page 4-27, RWP). In addition, Section 3.4 Data Needs and DQOs does not state that lower detection limits will be utilized in cases where such limits exceed critical health/environmental criteria; nor are FS data needs discussed.

Comment 80 p. A-4 - Paragraph 1 states that all borings will be backfilled to the surface. If visibly contaminated soils are encountered such as if floating petroleum product is present atop the water table, such soils should not be used to backfill the borings. This would lead to accelerated contamination of the ground water. It is recommended that a detailed waste management plan be developed to provide for the screening and final disposition of all hazardous material generated during the RI, (i.e., drill cuttings, purge, and development well water, excavated soils, etc.). The plan should identify appropriate limiting values and screening techniques suitable for hazardous waste classification, and include a contingency plan for the management (storage/disposal) of this material.

A total volatile organics limiting value could be used as a limit

	past which soil cannot be used for backfill. This would also hold true for the test pits and the excess soil generated when installing the monitoring wells. This soil should be drummed and disposed of according to all federal, state, and local regulations.
Response	Disagree. The confining layer will not be breached by the soil borings; therefore, the cuttings should not lead to an accelerated contamination of the groundwater. All excess soil and development water will be handled by the contractor in accordance with federal, state, and local regulations.
Evaluation	This comment has not been adequately addressed. -Data Gaps - The RFSAP gives no specific reference to waste management for RI-generated materials. It is also noted that pursuant to the <u>Compendium Of Superfund Field Operations Methods</u>, Section 3.2.6.2 and 3.2.6.3 (EPA, 1987), wastes generated through investigative activities (e.g., drilling) are governed principally by RCRA requirements with regard to packaging, labeling, transporting, storing, and record keeping. These requirements are stated in 40 CFR 262 entitled "Standard Applicable to Generators of Hazardous Wastes." Some state laws have primacy over RCRA requirements, however, to determine this, the appropriate state agency must be contacted. -If testing conducted on a waste that was generated onsite (RCRA extraction, organic screening, inorganic and organic analysis, etc.) shows that the waste is nonhazardous, the material can be handled as a non-RCRA waste and disposed of onsite at the direction of EPA. For hazardous waste materials, onsite disposal should not be practiced. The material should be properly packaged and disposed of in a RCRA-approved offsite facility.
Comment 81	In paragraph 3, it should be specified that decontaminated tools and bowls be used to process soil samples and that one bowl and trowel will be dedicated to each sample.
Response	Disagree. Decontamination will be per QAPP.
Evaluation	Response is not acceptable. -Data Gaps - Decontamination procedures presented in Section 4.6.2 of the RQAPP are generally consistent with Region II requirements, with the exception that the "DI rinse" should follow, not precede, the solvent rinse; and the RQAPP proposes the use of pesticide-grade isopropanol instead of acetone or methanol followed by hexane. Such deviations

should be approved by EPA-Region II prior to use.

Comment 82 p. A-11 - Paragraph 2, Well Development - During well development, it is the usual practice to collect data including temperature, pH, conductivity and turbidity. Although these parameters are mentioned in the list of pg. A-11, no mention is made of the methods to be utilized or the goal criteria for each parameter (i.e., temperature must remain within ±1°C for three consecutive readings).

Response Disagree. Temperature, pH, and conductivity will be stabilized to within 10 percent.

Evaluation Response is generally acceptable. However, it is recommended that the following standard well development procedures be listed in the RFSAP.

1. The water level in the well should be measured to ±0.01 feet prior to development.
2. The amount of water in one well volume should be calculated.
3. The well should be purged. After each well volume is removed, a sample should be collected and analyzed for pH, temperature and conductivity. Development should continue until three consecutive and consistent readings (not two) are obtained (within 10% of each other for temperature and conductivity, ±1.0 for pH). If three consecutive and consistent volume cannot be obtained, development should continue to a maximum of ten volumes (not five).
4. If recharge is insufficient in a well to perform procedure discussed above, the well should be purged dry on three consecutive working days. Wells which are developed to dryness are not subject to the above stabilization criteria.

Attachment A

Comment 83 Project Organization and Responsibility - Section 1.0 addresses most of the requirements for this section. A table which lists key personnel and their telephone numbers should be included so that field and laboratory personnel know who to contact if there is a problem. The project manager, field team leader, analytical laboratory coordinator, data validation coordinator, health and safety officer and quality assurance officer should be listed.

-Section 1.0 describes a principal engineer. Is this the same

as the project director shown in Figure 1-1? The text also refers to a program manager. Is this the same as the CE project officer shown in Figure 1-1?
-Descriptions in Sections 1.1, 1.2 and 1.3 can be omitted from this section.

Evaluation The comment has not been addressed.
-Data Gaps - No response to this comment has been provided to clarify the above issues. It is noted that the previous Section 1.0 now corresponds to Section 2.0 of the revised QAPP. Section 2.0, does not include a table which lists key personnel and their telephone numbers; however, telephone nos. are not specifically required by QAMS-005.

Comment 84 QA Objectives for the Measurement Data in Terms of Precision, Accuracy, Completeness, representativeness and Comparability - Section 3.0 addresses QA objectives for precision, accuracy, and completeness.
-Table 3-2 lists matrix spikes/matrix spike duplicates (MS/MSD) and QCC samples for metals. SW-846 calls for a spike sample and a duplicate sample for metals. Are the limits identical for MSD and QCC?

Evaluation Note that ESE should also perform an MS on cyanide.

Comment 85 Calibration Procedures and Frequency - Sections 1.1 and 5.1 cover instrument calibration procedures and frequency.
Section 5.1.2.1 says that GC/MS will be tuned with BFB on a daily basis. Method 8240 requires that this tune is done for each 12 hour shift.

Evaluation Comment not addressed. The RQAPP states that "the GC/MS will be tuned daily" (page C-98).

Comment 86 The description of data validation should be expanded to include validation of complete data packages according to Region II guidelines. The procedure for identifying and treating outliers should be discussed.

Evaluation Comment partially addressed. Section 8.4 of the RQAPP (page C-131) states that EPA CLP procedures for data validation will be followed. Procedures are presented as Attachment B to the RQAPP.
-Section 9.5 discusses QC outliers, however, specific procedures for identifying and treating outliers are not provided or referenced.
-In Tables 5-3, 5-4, and 5-5, the corrective action procedure

for an MS/MSD that is out of the limits sounds like that for an out of control CCV sample.

Comment 87 Table 5-6 gives Contract Required Detection Limits for metals. The CRDL for lead should be 3 ug/l regardless of the method. Why cite CLP guidelines here when the analyses will be done by SW-846 methods? The methods described in these guidelines are not identical. The CLP guidance in the reference is not the most recent version [2/88 for organics analysis and 7/88 for inorganics analysis and 7/88 for inorganics analysis].

-Describe field QC procedures in addition to laboratory QC procedures.

Evaluation This comment has not been addressed.

-Data Gaps - Field data validation is discussed in Section 8.4.2 (page c-132, RQAPP; however, specific procedures are not provided or referenced.

-The table with Contract Required Detection Limits for metals, has been removed from the QAPP.

Comment 88 Performance and System Audits - Include a schedule of performance audits in Section 5.4.

Evaluation Comment not addressed. No schedule of performance audits are included in Section 10.0 of the RQAPP.

Comment 89 p. A-6, A-7, A-9. Text on page A-6 and Figure A-7 indicate that the two inch well casing will be made of stainless-steel pipe; however, on Page A-9 a polyvinyl chloride (PVC) casing is described. The use of PVC in constructing long-term wells are not acceptable to NYSDEC. This discrepancy should be cleared up.

Response Disagree. The wells will be constructed with polyvinyl chloride (PVC) casing as are the existing wells.

Evaluation The Region II QA Manual suggests the use of PVC casing in well construction only in cases where trace metals or non-volatile compounds are suspected. Thus, the use of PVC may not be appropriate. Comment is deferred to EPA/NYSDEC for final determination.

Comment 90 p. A-13. The recommended procedure for ground water sampling during a remedial investigation includes quarterly sampling to evaluate seasonal differences. Analytical parameters should include the full TCL (target compound list)

	at least for the first sampling event. Subsequent events may use a modified parameter list based on the findings of first sampling round and the concurrence of NYSDEC. The need for additional sampling will be evaluated after the quarterly sampling has been concluded. Ground water levels should be measured monthly or such selected intervals to evaluate seasonal differences in water table elevation.
Response	The wells will be analyzed for the full TCL. The existing ground water monitor data will be incorporated into the data obtained during the RI to evaluate seasonal differences. Further discussion is required with regard to this issue.
Evaluation	The comment is partially addressed. Incorporating the existing ground water monitoring data with the data obtained during the RI will not necessarily help evaluate seasonal differences. Further discussion on this issue is required.
Comment 91	p. 4-14 - What is the source of drinking water at the Depot? Where will the "tap water" used for decontamination be obtained?
Response	The drinking water source for SEAD is Lake Seneca.
Evaluation	The comment is partially addressed. -Data Gaps - SEAD/ESE do not respond to the second question regarding the source of "tap water" for decontamination.

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 -7010

Thomas C. Jorling
Commissioner

Recd [illegible] 23 [illegible]

JAN 1 8 1991

Mr. Randall Battaglia
Environmental Coordinator
Department of the Army
Seneca Army Depot
Romulus, NY 14541

Dear Mr. Battaglia:

Re: Seneca Army Depot NYS Id. No. 850006
Draft Final RI/FS Work Plan for the
Ash Landfill Site

The New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health have reviewed the above document and the following comments are forwarded:

1. The document is replete with acronyms which makes it difficult to read even though a table of acronyms is provided. Several editorial suggestions to lessen the burden on the reader for future documents follow.

   a. The table of contents should list the page number for the acronyms since not all readers will read all sections, yet they will need to know what the meaning of the acronyms in their section of interest are.

   b. The acronym Ca is a very poor choice to mean cadmium. Ca to chemists is calcium and cadmium is Cd.

   c. Other choices are similarly poor and an effort should be made to have more meaningful acronyms or eliminate the use of the acronym. For example, T12DCLE is defined as trans-1,2-dichloroethene and 12DCLE is 1,2-dichloroethane. Using the same DCLE to represent double bonds and single bonds is confusing.

   d. All tables and figures should have units and acronyms defined on them and extraneous materials eliminated. "Appendix G Previous Field Data" is an example of a totally unintelligible submittal. The acronyms for site ID such as PT, MW, SW, SS, DTCH, and Test Names such as 112 TCE, 111 TCE etc. are undefined in the table or acronym list. It would not be prudent to guess their meaning either. The "Values" have no units and the "Boolean" is not defined nor its utility known in the context of a work plan or any other hazardous waste site evaluation or remedial process.

2\. OK <u>1.0 Introduction</u> Potential Contamination Sources: This list of potential contamination sources and the list at page 3-3 do not include a possible solvent dump which is indicated on figure 1.1-2. Also, item 9, reported fill areas south of the incinerator, are not shown on figure 1.1.-2.

3\. <u>Potential Hazardous Wastes and Sample Testing Parameters</u>: The 3/90 Draft Final Work Plan stated herbicides and radioactive residues among others as potential contaminants. Reference to these two classes of materials is not included in this latest plan for reasons unknown. In response to our comment No. 1 of our letter dated April 19, 1990, it is stated that radioactive residues and explosives are not known to exist in the landfill. The discrepancy in the two work plans and unconfirmed past disposal practices, warrants at least a few samples from all media be tested for herbicides and radioactive materials along with the full target compound list (TCL) material.

In this latest work plan, it is stated that groundwater samples will be analyzed for VOCs and total and dissolved metals (page 4-7), and the surface soil samples (0 to 2 ft-bls) and intermediate zone soil samples (3 to 4 ft-bls) will be analyzed for the TCL excluding volatiles. We do not agree with these parameters for groundwater and soil samples. We believe that all these samples should be tested for full TCL plus herbicides and radioactive materials, at least in the first round of sampling. We suggest that a second round of groundwater and surface water samples should also be taken and tested for the parameters found in the first round of sampling.

4\. <u>4.2/2 New Monitoring Well Installation</u>, Screen Location: It is stated that screen location will be determined in field based on information from split-spoon samples, standard penetration testing, observations regarding the moisture content of recovered soil samples, and direct measurement with a water-level tape of the water table. We agree that the above information would be useful in fine tuning the screen location, but based on available information, we believe a determination on general screen location should be made. We, therefore, propose that the shallow wells be screened from the top of the competent bedrock to 3 feet above water table and bedrock wells screened from 3 feet above lower water table to 17 feet below lower water table.

It is further stated in the work plan that the deep wells will be installed to a maximum depth of 200 feet below surface (page 4-7). Since the water table of the lower aquifer is approximately at 48 feet, the work plan has not given any reason for placement of deep wells so much below the lower water table. We believe that if groundwater near the lower water table is found to be contaminated, then only in second phase, groundwater in lower reaches should be tested.

5. A2.2 Monitoring Well Installation, Well Development page A-13: One of the criteria for well development is stated as until the well water is clear to the unaided eye. In order to standardize this criteria, we recommend well development until the turbidity of the well water is below 50 nephelometric turbidity unit (NTU).

6. Sampling of Residential Wells: Section 4.2.1.3 of the RI calls for the collection of water samples from groundwater monitoring wells. At the same time that the sampling in Section 4.2.1.3 is conducted, the Department of Health (DOH) and Seneca County Health Department (SCHD) staff will collect samples from the private wells of houses located downgradient of this site. Therefore, we request a notice at least two weeks in advance of collection of groundwater samples.

7. A.2.3 Groundwater Sampling: The methodology for the collection of groundwater samples for metals analysis is acceptable with the following modification: the first half must be for filtered analysis and the remaining aliquot for total analysis. An alternate method would be to utilize separate sample collection containers.

8. A.2.4 Air Monitoring: In order to ensure that the community is protected from the releases of harmful levels of contaminants, during on-site field activities, continuous real time monitoring should be conducted for volatile organic compounds (VOCs) and particulates at the downwind site perimeter. If the level of VOCs at the downwind site perimeter is 5 ppm above background levels measured upwind from the work area, then all activities must be stopped and corrective measures implemented to control the source of the release. If the level of airborne particulates at the downwind site perimeter exceeds the action level of 150 $\mu g/m^3$ that is established in the New York State Department of Environmental Conservation's Technical and Administrative Guidance Memorandum entitled "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites", then all work activities must be stopped and corrective measures implemented to control the release of the airborne particulates.

9. 3.3.11 Federal and State of New York ARARs: The standards and guidance values contained in DOW TOGS 1.1.1 must be included as ARARs. Guidance values have been developed using the same methodologies as the standards and therefore merit inclusion.

Ecological Issues:

10. Page E-11: The response to review comments in Appendix E states that there is agreement to NYSDEC comment 2 of the letter of April 19, 1990 (page E-63). Comment 2 states that a Habitat Based Assessment should be used in evaluating the existing ecological values of the site and adjacent areas. Agreeing to comment 2 is viewed as agreement to the evaluation procedures in the Habitat

Based Assessment. The Remedial Investigation/Feasibility Study must have a discrete presentation of ecological resources that exist and are potentially at risk from contamination. Kendaia Creek drains some of the Seneca Army depot lands and subsequently flows into Seneca Lake, an extremely important aquatic resource in New York State. Kendaia Creek, based on earlier studies, is known to be contaminated. Resources other than Seneca Lake may be at risk. In order that all natural resources potentially at risk can be identified, a Habitat Based Assessment should be performed during the Remedial Investigation/Feasibility Study.

There are two anomalies, however, that should be pointed out. The response to comment 2 says that wetland ARARs have been addressed in the location specific ARARs section. NYS ARARs have not been mentioned in Section 3.3.1.1. Article 24 of the Environmental Conservation Law (ECL) dealing with wetlands needs to be specified. Additionally, Article 15 of the ECL needs to be identified in discussing surface water ARARs. These ARARs were previously pointed out in the Habitat Based Assessment referenced in NYSDEC comment 2. Other ARARs identified in the Habitat Based Assessment may be applicable to the site and if so, should be included in Section 3.3.1.1.

11. Sediments in surface waters have been contaminated according to earlier studies. During the RI/FS there will be attempts to secure more sediment samples where seeps can be located and further sediment samples in surface waters. The search for seeps should be under varied hydrological conditions since many seeps can be expected to be intermittent. They can also be expected to be substantial contributors to Seneca lake.

Sediment evaluations should follow the methodologies in "Sediment Criteria - December 1989", a copy of which is enclosed.

12. Page 4-37: It is stated that some field investigations must be undertaken to accomplish the objectives of the ecological risk assessment. Surveys are likely to include small mammal trapping and sampling sufficient for comparisons of species richness and evenness. It is suggested that, if samples are taken, that they should be preserved adequately to do tissue analysis should other information indicate that tissue analysis is warranted.

If you have any questions, please call me at (518) 457-3976.

Sincerely,

Kamal Gupta

Kamal Gupta
Federal Projects Section
Bureau of Eastern Remedial Action
Division of Hazardous Waste Remediation

Enclosure
cc: G. Kittel, SEAD
M. Martinez, USEPA, Region II
R. Tramontano, NYSDOH

Sediment Criteria - December 1989

Used as Guidance by the Bureau of Environmental Protection, Division of Fish and Wildlife, New York State Department of Environmental Conservation

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Note: This document is used as guidance by the Division of Fish and Wildlife. It is neither a standard nor a policy of the Department.

TABLE OF CONTENTS

I. Introduction and Overview of Sediment Criteria Methodology

On February 2 and 3, 1989, the USEPA presented to its Science Advisory Board (SAB) a methodology for deriving sediment criteria for non-polar (or non-ionic) organic chemicals. It is known as the equilibrium partitioning (EP) approach. A briefing document was given to the SAB which summarized the theoretical basis for the EP methodology and supporting lab and field data, and included the first list of interim criteria derived by the method (EPA 1989).

The methodology has been discussed in the scientific community for several years. It is based on the theory that toxics in sediments will exert their effect, either toxicity or bioaccumulation, to the extent that the chemical becomes freely bioavailable in the sediment interstitial (pore) water. It has been determined that the best sediment parameter with which to make predictions of bioavailability of non-polar organics in sediments is the fraction of organic carbon in the sediment. For sediments which exceed 0.5% total organic carbon the concentration of the chemical in the pore water can be predicted dividing the bulk sediment concentration by the product of the sediment/organic carbon partition coefficient (K_{oc}) and the fraction organic carbon. Few K_{oc} are accurately known, however it has been determined that K_{ow} (octanol/water partition coefficient) is very nearly equal to K_{oc} and may be substituted for K_{oc} in this calculation. By setting the pore water concentration equal to the water quality standard or criterion for the chemical a sediment criterion can be calculated by solving for the bulk sediment concentration. The sediment criterion algorithm normalized for organic carbon (OC) follows:

$$\text{Sediment Criterion, ug/gOC} = (\text{AWQS/GV, ug/l}) \times (K_{ow}\text{, l/kg}) \times \frac{1\ \text{Kg}}{1.000\ \text{gOC}}$$

where AWQS/GV is the ambient water quality standard or guidance value for a chemical

K_{ow} is the octanol/water partition coefficient for the chemical: units are those for K_{oc}.

and $\frac{1\ \text{Kg}}{1.000\ \text{gOC}}$ is a unit conversion factor.

To derive a sediment criterion for a specific sediment, the OC normalized value is multiplied by the OC concentration in the sediment. For example, table 1 contains a carbon normalized sediment criterion for PCB of 1.4 ug/gOC which is derived as follows:

$$\text{PCB Sediment Criterion} = 0.001\ \text{ug/l} \times 10^{\overset{6.14}{\cancel{5.2}}} \times \frac{1\ \text{Kg}}{1.000\ \text{g OC}} = 1.4\ \text{ug/gOC}$$

To obtain a site-specific criterion for a sediment with 3% total OC multiply the OC normalized criterion by the fraction of organic carbon:

$$\text{Site-specific criterion} = 1.4\ \text{ug/gOC} \times 30\ \text{gOC/Kg} = 42\ \text{ug/kg}$$

Sediment with contaminants in excess of the criteria would be predicted to contain interstitial water in excess of the AWQS/GV. The PCB AWQS that is the basis for the sediment criterion of 1.4 μg/gOC is designed to protect wildlife which consume other biota. Therefore, exceedance of the sediment criterion would be predicted to cause accumulation of PCB in surface water biota to levels that would be harmful to wildlife consumers of the biota.

Table 1 contains sediment criteria for a number of non-polar organic chemicals. For many of the chemicals, there is more than one criterion, reflecting the varied environmental protection objectives of the AWQS/GV/C used to calculate the criteria. Exceedance of the aquatic toxicity based criterion for a chemical would be predicted to cause toxicity to benthic or epibenthic life. Exceedance of the human health residue based criterion would be predicted to cause accumulation of the chemicals in aquatic animals to levels that would exceed a human health tolerance, action level or cancer risk dose (depending on the basis of the AWQS/GV/C). Exceedance of the wildlife residue based criterion for a chemical would be predicted to cause accumulation of the chemical in aquatic animals to levels that would be harmful to wildlife consumers of the animals.

There are a number of sediment criteria in Table 1 whose AWQS/GV/C is followed by the footnote "-". The human health based water quality criteria followed by this footnote are 1 X 10^{-6} cancer risk AWQC derived by the method for calculating water quality standards and guidance values in 6NYCRR 701.12. The wildlife based water quality criteria followed by this footnote are derived by dividing fish flesh criteria from Newell et al. (1987) by bioaccumulation factors.

Table 2 provides sediment criteria for five substances in 1% OC and 3% OC sediments. There are differences between sediment criteria derived using current TOGS values and proposed Division of Fish and Wildlife (DFW) values because DFW has proposed use of low cancer risk based criteria in the case of human health and somewhat more protection for wildlife resulting from revised wildlife risk assessments. The EPA criteria for PCB are considerably higher because the water quality criteria upon which the sediment criteria are based were derived using bioaccumulation factors that are known to be too low and higher fish flesh criteria for wildlife than is prudent.

Although the methodology described above is intended for non-polar organics, there are phenolics in Table 1. Phenolics are generally considered polar or ionic chemicals. However, at pH around neutrality phenolics do not ionize, and they act like non-ionic chemicals. Sorption of phenolics to sediments is known to be an important environmental fate process. Phenolics are also a major environmental contaminant. Therefore, sediment criteria were calculated for the phenolics by the non-polar formula.

For non-polar chemicals with log K_{ow} less than about 2.0 the sediment criteria for typical sediments of 0.5-5% total OC is always less than the AWQS/GV/C that was used to derive the criterion. This can be interpreted to mean that virtually all of the chemical in the sediment is bioavailable. It would not appear to make sense to actually implement sediment criteria that are less than the AWQS/GV/C. Therefore, for non-polar organic chemicals with K_{ow} <2 the sediment criterion should be considered to be the same as the AWQS/GV/C.

Until the non-polar method receives SAB approval and subsequent public review, there will likely be controversy about its use. If its use at a particular site is questioned, then the criteria should be used in conjunction with sediment toxicity and bioaccumulation tests. A limited number of such tests should be conducted to site-specifically calibrate the criteria.

For polar organics (except for phenols) and metals there are no algorithms to calculate sediment criteria in order to account for variable sediment characteristics which may affect metals toxicity. However, following the logic above, in order to ensure compliance with water quality standards, interstitial (pore) water should not exceed AWQS/GV/C for polar organics in TOGS 1.1.1. This application of AWQS/GV/C is complicated by the fact that dissolved organic carbon (DOC) in pore water is generally quite a bit higher than in the water column. DOC tends to reduce toxicity and bioaccumulation of chemicals. Since water column DOC is usually low AWQS/GV/C are not modified by DOC known to occur in specific waters. If partitioning between DOC and a chemical is known, then the effect of DOC on toxicity or bioaccumulation may be accounted for, and AWQS/GV/C may be applied to pore water. K_{DOC} is known for many chemicals. Also, chemicals with low K_{oc} do not show uptake suppressed by DOC. Appended are some methods for collecting interstitial water, along with references.

For metals, the primary concern in sediments is toxicity to benthic (bottom) organisms. The Ontario Ministry of the Environment reviewed a number of methods to derive sediment criteria, each with a somewhat different level of benthos protection, and calculated metals criteria for each as data was available (MOE 1988). Persaud (1989) derived from MOE (1988) no-effect levels and lowest effect levels for metals (Persaud 1989 is a personal communication which is expected as a formal document in late 1989). Table 4 presents the geometric mean of these two values. Calculation of the geometric mean of a no-effect and lowest effect level is one method used for deriving water quality criteria. It is also appropriate for calculating sediment criteria. The methods used to derive these criteria do not account for variability of bioavailability of metals in sediments with differing organic content, particle size distribution or iron and manganese oxide content. Implementation of these metals sediment criteria is discussed below.

Although there currently is no algorithm for metals to calculate sediment criteria, EPA is working on the problem. Recently, a finding was made that may lead to such an algorithm. A paper by D.M. Di Toro et al was presented at the November 1989 meeting of the Society of Environmental Toxicology and Chemistry in Toronto which indicates that bioavailability of cadmium (and probably other heavy metals) in sediments is largely determined by the amount of acid volatile sulfide (AVS) in sediments that is available to bind with cadmium. While confirming studies have not been completed, there is sufficient promise to this approach to warrant advising users of sediment criteria to include quantification of AVS among the measurements of each sediment sample taken where metals are of concern. It appears to be important to avoid contact of sediment samples with air to minimize oxidation of iron and manganese sulfide, and it would be useful to measure AVS at several depths of sediment cores. At this time, interpretation of this data will be site-specific but by 1991, it may be possible to use this data to calculate sediment criteria for the metals. Therefore, it is worthwhile to begin AVS measurement now.

For the measurement technique DiToro et al cited Morse (1987). Appendix 2 is a procedure used by DiToro et al which presumably is derived from Morse et al (1987).

There is concern that use of bioaccumulation based sediment criteria derived by the EP method may not be appropriate if the surface water impairment of concern is an elevated residue in pelagic fish. The SAB is addressing this question. It seems to be well accepted that residues in benthic animals are accurately modeled by the EP method, but for low K_{ow} chemicals (less than about 10^5), residues in pelagic fish may not be clearly related to pore water concentrations. However, for high K_{ow} chemicals (greater than about 10^5) biomagnification through the aquatic food chain is known to occur, and EP criteria may actually be underprotective. For these chemicals, there may be an alternative approach to derive sediment criteria. Recent studies with PCB and 2,3,7,8-TCDD indicate that residues in fish can be predicted by sediment to fish bioaccumulation factors. Accumulation in edible fillet with 3% lipid from sediment with 3% OC is about 0.1-1 times the sediment concentration for 2,3,7,8-TCDD and about 1-10 times the sediment concentration for PCB. Using these sediment to fish accumulation factors, sediment criteria can be back calculated from fish residue levels of concern. Table 3 presents some of these criteria. Complete documentation for this approach can be provided in the near future.

Sediment criteria derived by this sediment-to-fish approach are comparable to those derived by the EP method. For PCB the EP criterion in Table 2 of 0.24 ug/kg may be compared to the criterion in Table 3 of 0.6 - 0.06 ug/kg because they are both 1 x 10^{-5} cancer risk based; as can be seen the former falls within the range of the latter. Similarly the PCB wildlife based criterion in Table 2 of 18 ug/kg falls within the range of the PCB wildlife based criteria in Table 3 of 100-10 ug/kg. For 2.3.7.8-TCDD the cancer risk based criterion from Table 2 of 6 x 10^{-5} ug/kg falls within the range of the cancer risk criteria range in Table 3 of 1.4 x 10^{-5} to 1.4 x 10^{-4} ug/kg. The 2.3.7.8-TCDD wildlife based criterion from Table 2 of 0.006 ug/kg falls within the wildlife criteria range in Table 3 of 0.03 - 0.003 ug/kg. The good agreement between these two methods supports the scientific validity of the resultant sediment criteria.

This sediment criteria report will be amended upon completion and review of the EPA Science Advisory Board Report on the EP method for deriving sediment criteria..

II. Use of Sediment Criteria in Risk Management Decisions

As is indicated above, exceedance of sediment criteria can be expected to result in some specific adverse effects. The volume and location of sediment exceeding the criterion, the magnitude of the effect expected, the length of time sediments will be contaminated, and the certainty that the effect will occur, will all play a role in making decisions about how much sediment to clean up in order to eliminate or minimize the adverse effects. The effect of these factors on risk management decisions is discussed below.

Where the volume of sediment exceeding criteria is small and the sediment is fairly accessible, the pragmatic solution may be to remediate all the sediment. Where volumes are large and/or difficult to remediate (either because of accessibility or sensitivity of the impaired habitat), it may be practical to sort out and proceed with remediation of those sediments whose remediation is practicable and feasible. For the sediments which cannot feasibly be treated or removed, further risk management evaluations may be warranted.

The magnitude of the effect caused by a contaminated sediment will depend on the magnitude of the exceedance of the criterion. Where the criterion is based on direct toxicity to aquatic life or indirect toxicity to wildlife via consumption of contaminated fish, a slight exceedance of a criterion would be expected to cause only a slight adverse effect. Increases in the magnitude of exceedance will cause increases in the magnitude of the effects. It may be useful to attempt to quantify the magnitude of predicted adverse impacts where remediation of sediments is expected to be difficult or costly to accomplish. This may be accomplished by desk-top investigation into the basis for a criterion, or site-specific sediment criterion and/or bioaccumulation tests. Decisions about the volume of sediment to remediate may then be made considering predicted residual effects from any unremediated sediments. Where the sediment criterion is based on human exposure to a carcinogen in fish, shellfish or other edible biota, exceedance of the sediment criterion would be predicted to cause a greater than 10^{-6} incremental cancer risk for humans. The actual risk that society is willing to accept may be factored into cleanup decisions. Presumably, once it is predicted that an FDA or EPA tolerance or action level would be exceeded, then cleanup would have to be made to the associated sediment concentration. As with the fish and wildlife toxicity based sediment criteria, site-specific bioaccumulation tests could be conducted to verify that sediments cause the predicted level of biota residues.

Once the source of contaminants to sediments is cut off, the length of time a particular area of sediments will contain unacceptable levels of contaminants will depend on the persistence of the chemicals and the site-specific dynamics of the sediment which control sedimentation, resuspension, biological and chemical degradation and other fate processes. If a chemical is not persistent (e.g. sediment levels would be expected to fall to acceptable levels within six months; then sediment remediation <u>may</u> not be necessary. Even for a persistent chemical, it may not be necessary to remediate the sediments if the contaminated area is a deposition zone, if burying of the contaminated sediments would be expected to occur within a short time, and if resuspension was unlikely.

The confidence in the EP sediment criteria for non-polar organics depends on a number of factors: that exceedance of a water quality standard or criterion in sediment interstitial water will cause an adverse effect, that no other factors other than OC affect bioavailability and that the K_{ow} or K_{oc} used is accurate. It is difficult to place uncertainty bounds on water quality standards and criteria. Methods to derive them have been developed and fine-tuned for a number of years. It is assumed that they have no uncertainty. Currently, EPA also makes this assumption about its sediment criteria approach. Regarding other factors, at this time EPA (1989) has concluded that all other factors contribute a minor amount to bioavailability of contaminants.

For the uncertainty of K_{oc}, EPA has used the correlation between K_{oc} and K_{ow} to place 95% uncertainty bounds about their proposed interim sediment criteria of about (in general) one order of magnitude in either direction. This may be interpreted to mean that there is a high degree of confidence that exceedance of a criterion by about ten times will be associated with onset of impacts. For sediment criteria based on bioaccumulation this would mean that there is a high degree of confidence that at ten times the criteria aquatic animals exposed to the sediments would accumulate contaminants to levels that would exceed human health or wildlife related tolerances, action levels, fish flesh criteria etc. For sediment criteria based on toxicity to aquatic life this would mean that there is a high degree of confidence that sediments with contaminants at ten times the criteria would exhibit chronic toxicity to benthic animals. Onset of chronic toxicity may be difficult to detect in natural systems. Since water quality criteria to prevent <u>acute</u> toxicity are generally about ten times the chronic criteria, it may be generalized that for sediments with contaminants at 100 times (factors of 10 for uncertainty and acute:chronic ratios, respectively) toxicity based criteria there is a high degree of confidence that there will be onset of acute toxicity to benthic animals. Such effects would likely be evident as an impacted or depauperate benthic community.

It must also be noted that due to uncertainty about actual partitioning of a chemical between water and sediments there is the possibility that the sediment criteria are somewhat underprotective rather than overprotective.

Uncertainty of the metals criteria can not be characterized so simply. The criteria are based on empirical evidence from both lab and field studies without an attempt to normalize for any toxicity controlling factors in the sediment. Variability of toxicity of metals in any given sediment is evident from Table 4 which provides criteria, all of which are lower than the upper 95% confidence limit of pre-industrial metal concentrations in Great Lake sediments. This is interpreted to mean that in some sediments relatively low levels of metals, even below "high" background, are toxic, whereas in other sediments fairly high levels, i.e. up to and possibly even above "high" background, may not be toxic. However, for all metals, except iron, the "Limit of Tolerance" exceeds "high" background by a considerable amount, and at these levels significant and noticeable toxicity would be expected in all sediments. Site-specific tests could be conducted to determine the magnitude of effects caused by contaminants in sediments. Such tests could be used to determine whether onset of effects occurs at sediment concentrations somewhat above or below the sediment criterion.

Where contaminated sediments are not remediated, sediment criteria will be useful in quantifying residual damages for preparation of a natural resource damage claim.

Interpretation and application of sediment criteria should be conducted in coordination with the Division of Fish and Wildlife.

Much of the above implementation guidance can be outlined in a strategy for use of the sediment criteria and actions to take when criteria are exceeded.

1. Compare sediment concentrations with sediment criteria.

   a. quantify the area or volume of sediment in excess of the criteria.

   b. describe the significance of exceedances in terms of the basis of the criteria: e.g. would only bioaccumulation be expected or both bioaccumulation and toxicity, and based on quantity of exceedance would impacts be expected to be isolated or widespread through the ecosystem of concern.

2. Compare sediment concentrations with unimpacted, local background concentrations; consider significance of criteria exceedances in light of background concentrations, in particular, for naturally occurring substances such as metals.

3. If sediment concentrations are less than criteria, remediation is not necessary to ensure compliance with standards.

4. If sediments exceed criteria, and especially if exceedance is widespread in the ecosystem of concern, a number of steps can be taken to verify the need for remediation.

   a. For non-polar organic chemicals with K_{ow} <3.0, further remedial investigation or sediment remediation is not necessary if it can be demonstrated that the source of sediment contamination will be eliminated and the sediment will cleanse itself within one year. For these chemicals the greatest value of sediment criteria may be for documentation of a significant release.

   b. For sediments exceeding aquatic toxicity based criteria, including metals:

      i. conduct assessments of ecological communities to estimate degree of impairment: correlate sample specific ecological results with sediment concentrations.

ii. collect sediment samples and conduct acute and chronic toxicity tests with fish and benthic invertebrates: correlate with toxicity test results with sediment contaminant concentrations.

iii. For organics, exceedance of aquatic toxicity based criteria in Table 1 by 100 times in significant portions of the ecosystem indicates the likelihood that biota are impaired and remediation should be considered necessary.

iv. For metals. Table 4 contains "limits of tolerance". If these values are exceeded in significant portions of the ecosystem of concern, it is highly likely that biota are impaired and remediation should be considered necessary.

c. For sediments exceeding human health bioaccumulation based criteria:

i. collect data on residues in edible biota and compare with tolerances/action levels/guidance and/or 1 X 10^{-6} cancer risk levels. or

ii. collect sediment samples. test with representative edible biota. measure residue.

d. For sediments exceeding wildlife risk bioaccumulation based criteria:

i. identify biota which consume aquatic life and study them to determine whether they have been impaired by contaminants in their food supply.

ii. collect sediment samples, test with wildlife food supply and measure residues: compare with residue levels known to be toxic to wildlife.

5. When sediment concentrations and criteria are less than detection, ecological assessments are necessary to directly measure toxicity of sediments or residues in biota if it is suspected that sediments were contaminated by releases

a. generally, it is expected that low level impacts would be associated with presence of contaminants in sediments below detection.

b. however, if impacts are found to be of unacceptable magnitude, then iterative ecological assessments may be necessary to quantify the volume of sediments to remediate.

III. Division of Fish and Wildlife sediment criteria contact is Arthur J. Newell, Room 530, 50 Wolf Road, Albany, New York 12233-4756, 518/457-1769.

IV Detailed Criteria for contaminants, see tables and appendix.

References

EPA. 1989. Briefing report to the EPA Science Advisory Board on the equilibrium partitioning approach to generating sediment quantity criteria. U.S. EPA. Office of Water Regulations and Standards. EPA 440/5-89-002.

Newell, A.J., D.W. Johnson and L.K. Allen. 1987. Niagara River Biota Contamination Project: Fish flesh criteria for piscivorous wildlife. NYSDEC, Bur. Env. Prot., Technical Report 87-3. 182 pp.

Ontario Ministry of the Environment (MOE). 1988. Development of Sediment quality Guidelines. Phase II - Guideline Development. Prepared by Beak Consultants.

Morse, J.W., F.J. Millero, J.C. Cornwell and D. Rickard. 1987. The chemistry of the hydrogen sulfide and iron sulfide systems in natural waters. Earth Science Reviews 24:1-42.

Persaud, D. 1989. Personal communication - Development of Provincial Sediment Quality Guidelines. Ontario Ministry of the Environment.

TABLE 1

Sediment Criteria, Derived for a Variety of Environmental Protection Objectives. (Sediment criteria are normalized to organic carbon (OC) content as ug/gOC; to obtain criteria for bulk sediments in ug/kg multiply criteria by fraction OC;i.e. for 1% multiply by 10, for 2% OC by 20, etc.)

			Aquatic Toxicity Basis		Human Health Residue Basis		Wildlife Residue Basis	
Substance	Log K_{ow}	Freshwater or Marine F or M	AWQS/GV/C* ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC
Acenapthene	4.33	F		730**				
Anilene		F		0.0662**				
		M		0.248**				
Aldrin and Dieldrin	5.0	F&M			0.001++	0.1		
		F&M	0.084+	8.4	0.00001+	0.001	0.0077+	0.77
Azinphosmethyl	2.4	F	0.005++	0.001				
		M	0.01++	0.003				
Azobenzene	3.82	F&M			0.07+	0.5		
Benzene	2.0	F&M			6++	0.6		
Benzo(a)pyrene and some other PAHs♦	6.04	F			0.0012++	1.3		
		M			0.0006++	0.7		
Benzidene	1.4	F	0.1++	0.003				
Bis(2-chloro-ethyl) ether	1.73	F&M			0.2+	0.01		
Bis(2-ethylhexyl) phthalate	5.3	F	0.6++	119.7				
Carbofuran	2.26	F	1++	0.2				

Table 1 (continued)

Substance	Log K_{ow}	Freshwater or Marine F or M	Aquatic Toxicity Basis		Human Health Residue Basis		Wildlife Residue Basis	
			AWQS/GV/C* ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC
Endosulfan	3.55	F	0.009++	0.03				
		M	0.001++	0.004				
Endrin	5.6	F&M	0.002++	0.8			0.0019+	0.8
		F		1.04**		0.0532**		
		M		0.215**		0.0532**		
Ethyl Parathion	2.1	F		0.081**				
Heptachlor & Heptachlor epoxide	4.4	F&M	0.001++	0.03	0.00003+	0.0008	0.0038+	0.1
		F				0.11**		
		M				0.104**		
Hexachlorobenzene	6.18	F&M	<5+	<7568	0.0001+	0.15	0.008+	12
Hexachloro-butadiene	3.74	F&M			0.06+	0.3	0.07+	0.4
		F	1++	5.4				
		M	0.3++	1.6				
Hexachloro-cyclohexanes	3.8	F		0.157**				
		F	0.01++	0.06				
		M	0.004++	0.03				
		F&M			0.009+	0.05	0.23+	1.5
Hexachlorocyclo-pentadiene	3.99	F	0.45++	4.4				
		M	0.07++	0.7				
Isodecyldiphenyl phosphate	5.4	F	1.73++	434				

Table 1 (continued)

Substance	Log K_{ow}	Freshwater or Marine F or M	Aquatic Toxicity Basis: AWQS/GV/C* ug/l	Aquatic Toxicity Basis: Sediment Criterion ug/gOC	Human Health Residue Basis: AWQS/GV/C ug/l	Human Health Residue Basis: Sediment Criterion ug/gOC	Wildlife Residue Basis: AWQS/GV/C ug/l	Wildlife Residue Basis: Sediment Criterion ug/gOC
2,3,7,8-Tetra-chlorodibenzo-dioxin	7.0	F&M F&M	<0.001+	<10	$1X10^{-6}$++ $2X10^{-10}$+	0.01 $2X10^{-6}$	$2X10^{-8}$+	0.0002
1,1,22-Tetrachloro-ethane	2.56	F&M			0.7+	0.3		
Tetrachloro-ethylene	2.88	F&M			1++	0.8		
O-Toluidine	1.4	F&M			18+	0.45		
Toxaphene	3.3	F&M	0.005	0.01	0.009+	0.02		
Trichlorobenzenes	4.26	F&M	5++	91				
1,1,2-Trichloro-ethane	2.17	F&M			4+	0.59		
Trichloroethylene	2.29	F&M			11++	2		
Triphenyl phosphate	4.59	F	4++	156				
Vinyl chloride	0.6	F&M			18+	0.07		

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* AWQS/GV/C = Ambient water quality standard or guidance value in TOGS 1.1.1 or other water quality criterion.

\+ AWQGV proposed by Division of Fish and Wildlife.

++ Current NYS AWQS or GV in TOGS 1.1.1.

** EPA proposed interim sediment criteria; taken from an EPA briefing document for the EPA Science Advisory Board.

♦ The sediment criterion for benzo(a)pyrene also applies to benz(a)anthracene, benzo(b)fluoranthene, benzo-(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and, methylbenz(a)anthracenes. These PAH have the same TOGS 1.1.1. guidance value as benzo(a)pyrene.

TABLE 3

Sediment Criteria Derived by the Sediment-to-fish Bioaccumulation Method

	PCB		2,3,7,8-TCDD	
	Fish Residue ug/kg	Sediment Criterion*, ug/kg	Fish Residue ug/kg	Sediment Criterion,* ug/kg
Tolerance or Advisory	2000	2000-200	0.01	0.1-0.01
10^{-6} Cancer Risk @ ½ lb/week fish consumption	0.6	0.6-0.06	1.4×10^{-5}	$1.4\times10^{-4}-1.4\times10^{-5}$
Wildlife Fish Flesh Criterion	100	100-10	0.003	0.03-0.003

* For PCB and 2,3,7,8-TCDD, the ranges result from dividing the Fish Residue by a fish to sediment accumulation factor of 1-10 and 0.1-1, respectively.

APPENDIX 1

Collection of Interstitial Water

At this time, there is not a specific recommendation for a site-specific method to collect interstitial water. It is recommended that regulated parties investigate the subject and propose to DEC a method which will provide a sample to best characterize the bioavailable metals in site-specific interstitial water. As a start, it is suggested at least four methods should be considered along with some references.

1. Centrifugation (Edmunds and Bath 1976; Giesy et al. 1988; Landrum et al. 1987; Engler 1977);

2. Squeezing (Reeburgh 1967; Bender et al. 1987; Kalil and Goldhaker 1973);

3. Suction (Knezovich and Harrison 1987); and

4. Equilibrium by using dialysis membrane or fritted glass sampler (Hesslin 1976; Mayer 1976; Bottomley and Bayly 1984; Pittinger et al. 1988).

Additional literature which should be considered are Carignan et al. 1985, Bray et al. 1973, Lyons et al. 1979, Word et al. 1987, and Jenne and Zachara 1987.

These suggestions and references were obtained from a draft ASTM guidance document on sediment collection, storage, characterization, and manipulation. However, this document is not yet available for circulation or reproduction.

REFERENCES (for collection of interstitial water)

Bender, M., W. Martin, J. Hess, F. Sayles, L. Ball, and C. Lambert. 1987. A whole-core squeezer for interfacial pore-water sampling. Limnol. Oceanogr. 32:1214-1225.

Bottomley, E.Z. and I.L. Bayly. 1984. A sediment porewater sampler used in root zone studies of the submerged macrophyte, *Myriophyllum spicatum*. Limnol. Oceanogr. 29:671-673.

Bray, J.T., L. Bricker, and B. Troup. 1973. Phosphate in interstitial waters of anoxic sediments oxidation effects during sampling procedure. Science 180:1362-1364.

Carignan, R., F. Rapin, and A. Tessier. 1985. Sediment porewater sampling for metal analysis: a comparison of techniques. Geochim. Cosmochim. Acta 49:2493-2497.

Edmunds, W.M., and A.H. Bath. 1976. Centrifuge extraction and chemical analysis of interstitial waters. Environ. Sci. Technol. 10:467-472.

Engler, R.M., J. Brannon, J. Rose, and G. Bigham. 1977. A practical selective extraction procedure for sediment characterization. In T.F. Ven (ed.), Chemistry of Marine Sediments, Ann Arbor Sci., Ann Arbor, MI. pp. 163-171.

Giesy, J.P., R.L. Graney, J.L. Newsted, C.J. Rosiu, A. Benda, R.G. Kreis and F.J. Horvath. 1988. Comparison of three sediment bioassay methods using Detroit River sediments. Environ. Toxicol. Chem. 7:483-498.

Hesslin, R.H. 1976. An in situ sampler for close interval pore water studies. Limnol. Oceanogr. 21:912-914.

Jenne, E.A., and J.M. Zachara. 1987. Factors influencing the sorption of metals. In K.L. Dickson, A.W. Haki, and W.A. Brungs (eds.), Fate and Effects of Sediment-Bound Chemicals in Aquatic systems. Pergamon Press, New York, pp. 83-98.

Kalil, E.K., and M. Goldhaker. 1973. A sediment squeezer for removal of pore waters without air contact. J. Sediment. Petrol. 43:553-557.

Knezovich, J.P., and F.L. Harrison. 1987. A new method for determining the concentrations of volatile organic compounds in sediment interstitial water. Bull. Environ. Contam. Toxicol. 38:937-940.

Landrum, P.F., S.R. Nihart, B.J. Eadie, and L.R. Herche. 1987. Reduction in bioavailability of organic contaminants to the amphipod *Pontoporeia hoyi* by dissolved organic matter of sediment interstitial waters. Environ. Toxicol. Chem. 6:11-20.

Lyons, W.B., J. Gaudette, and G. Smith. 1979. Pore water sampling in anoxic carbonate sediments: oxidation artifacts. Nature 277:48-49.

Mayer, L.M. 1976. Chemical water sampling in lakes and sediments with dialysis bags. Limnol. Oceanogr. 21:909-911.

Pittinger, C.A., Va.C. Hand, J.A. Masters, and L.F. Davidson. 1988. Interstitial water sampling in ecotoxicological testing: partitioning of a cationic surfactant. W.J. Adams, G.A. Chapman, W.D. Landis (eds.), Toxicology and Hazard Assessment, Vol. 10, pp. 138-148. ASTM 971, American Soc. Testing Materials, Philadelphia, PA.

Reeburgh, W.S. 1967. An improved interstitial water sampler. Limnol. Oceanogr. 12:163-165.

Word, J.Q., J.A. Ward, L.M. Franklin, V.I. Cullinan, and S.L. Kiesser. 1987. Evaluation of the equilibrium partitioning theory for estimating the toxicity of the nonpolar organic compound DDT to the sediment dwelling amphipod *Rhepoxynius abronius*. Battelle/Marine Research Laboratory Report. Task 1, WA56. Sequim, Washington. 60 pp.

APPENDIX 2

ACID VOLATILE SULFIDE

Procedure Used at Manhattan College

The apparatus consists of the following vessels:

A 500-mL Erlynmeyer flask fitted with a three-hole stopper, where the sample to be analyzed is placed.

Three 250-mL Erlynmeyer flasks. Into the first is placed 175-200 mL of pH 4 buffer (0.05M potassium hydrogen phthlate). The second and third contain 175-200 mL of a 0.1M silver nitrate solution. Each of these is fitted with a two-hole stopper.

The four flasks are connected in sequence with appropriately shaped glass and Tygon tubing. All fittings must be air tight.

A nitrogen gas line is introduced into the first vessel through one hole of the stopper. A thistle tube with a stopcock is placed in the second hole. The exit line from the first to the second vessel is placed in the third hole. The second, third and fourth stoppers contain the entry and exit lines, the entry line being below the liquid surface and the exit line, above.

Between the nitrogen tank and the first vessel, an oxygen-scrubbing system must be placed. This system consists of a vanadous chloride solution in the first scrubbing tower and the matrix of the analyte (usually seawater or freshwater) in the second tower. The solution used in the first tower is prepared in the following manner. Four grams of ammonium metavanadate is boiled with 50 mL of concentrated hydrochloric acid and diluted to 500 mL. This solution is then transferred to the tower. Amalgamated zinc, prepared by taking about 15 grams of zinc, covering it with deionized water and adding 3 drops of concentrated hydrochloric acid before adding a small amount of mercury to complete the amalgamation, is then added to the vanadous chloride solution in the first tower. The solution should now be blue or green. When nitrogen is bubbled through it for a time it will turn purple. When the solution is exhausted, it will turn back to blue or green. It may be replenished by adding more amalgamated zinc or a few drops of concentrated hydrochloric acid.

The sample or standard to be analyzed is placed in the first vessel after the entire system has been purged with nitrogen for about an hour. The usual sample size is 10-15 grams of wet sediment. Any water used in the transfer of the sample to the vessel must be completely deaerated. The system is again purged for 5-10 minutes. Deaerated 6M hydrochloric acid is now added from the thistle tube qs to achieve a final concentration in the vessel of 0.5M.

The system is now run for an hour with the nitrogen at a bubble rate of about four/sec. The sample vessel should be swirled every five or ten minutes. When the reaction is complete and all hydrogen sulfide produced has been converted to silver sulfide in the third vessel, the solution in that vessel should be relatively clear and the precipitate should have settled to the bottom. There should be no precipitate in the fourth vessel.

The suspension in the third vessel is passed through a 1.2 micron GF glass fiber filter, which is dried at 102°C. and weighed.

A standard can be prepared from appropriate quantities of iron(II) sulfate and sodium sulfide, the latter being best added from a solution standardized against lead perchlorate.

Typical silver sulfide precipitates are in the range 10-30 mg. When a blank is run (sample without acid), about 0.9 mg silver sulfide is obtained. When the acid is run without a sample, about 0.6 mg silver chloride is obtained.

Seneca Army Depot Ash Landfill RI/FS Final Work Plan
Responses to Evaluation Comments From USEPA Region II and NYSDEC,

Discussed February 26 and 27, 1991

(A) Miriam Martinez, EPA (May 8, 1990)

Item	Reference	Response/Action
1	Pg. 1-1 Sec. 1.0 Intro.	Agree. This WP will be used to investigate the ash landfill area, which contains the several potential contamination sources listed on page 1-1 and 2. As stated in the last paragraph of Section 1.0, the ash landfill area will be investigated as one site with the several possible contamination sources listed in page 1-1 and 2. The burning pits were covered in Section 1.0. These pits are believed to have been used for refuse that occasionally contained possible hazardous items. Figure 1.1-2 shows the potential source areas locations in comparison to the western part of SEAD.
2	Pg. 2-2 Sec. 2.3	Agree. The swampy area shown in Figure 2.1-1, will be included on all relevant figures. This area does not necessarily indicate a wetland area.
3	Pg. 3-1 Para. 1	Agree. The nine potential source areas identified in Figure 1.1-2 have been shown on all subsequent figures which are used to illustrate proposed sampling locations. In addition, the soil gas results are illustrated in Figure 2.4-14 of the WP.
4	Pg. 3-1 Sec. 3-1	Agree. All of the nine potential contamination sources have been included in conceptual site model figures (Figures 3.1-2 through 3.1-6). The figures have also been expanded to include the contamination release mechanism, pathways, and the base personnel as receptors. The data needs for the FS and sampling requirements for the RI are covered in Sections 3.1.5 - Sampling Requirements for the SEAD Landfill/Burning Pits Site and 3.2 - Scoping of Potential Remedial Action Alternatives.

Item	Reference	Response/Action
5	Pg. 3-1 Sec. 3-1	Agree. Both statements referenced in this comment were taken from Seneca Army Depot Burning Pit/Landfill Site Investigation (ICF, 1989). In addition, contaminated areas referenced in both statements are shown in Figure 3.1-1 of the WP.
6	Pg. 3-2 Para. 1	Disagree. As stated in the December RI/FS Draft-Final WP, there is no evidence of explosive or radioactive material in the landfill. As a safety precaution, a field Geiger counter has been included in the SHERP, Section 4.2. The Geiger counter will be used to conduct a radioactive survey during drilling and sampling operations. If any radioactive material is detected, the site will be evacuated and the RI/FS will be re-scoped to handle this issue.
7	Pg. 3-3 Para. 2	Agree. As discussed in the February 27th Meeting in New York, the location of the farmland area has been included in all the relevant figures.
8	Pg. 3-11 Sec. 3.4.1.2	Disagree. Table 3.3-1 covers groundwater and surface water ARARs. Reference to Volume I of the RCRA Facility Investigation (RFI) Guidance Manual (1989) has been included in Section 3.3.1.2 - Other Guidance to be Considered. In addition, the EPA Office of Solid Waste and Emergency Response (OSWER) Directive #9355.4-02, which establishes an interim cleanup level for total lead at CERCLA sites, has been included in Section 3.3.1.1 - Federal and State of New York ARARs.
9	Pg. 3-14 Para. 1	Agree. Based on the information presented in Table 3.2-1, Section 3.4 has been revised to state that the SDWA MCLs will be incorporated as the preliminary DQOs for the groundwater and surface water sampling. The analytical requirements and quantitation limits proposed for the RI will be based on the SW-846 analytical method identified in Table 3.3-1. Subsequent confirmation rounds will use methods determined to be appropriate after the first round. Soil sampling will be analyzed by the same

Item	Reference	Response/Action
		analytical methods used for water samples. In addition, the surface soil samples will be analyzed for complete TCL/TAL.
10	Pg. 3-14 Sec. 3.6	Agree. Section 3.4 of the WP has been revised to include the physical conditions data need. In addition, an evaluation of parameters useful in identifying future treatment technologies and an evaluation of the geophysical/hydrologic conditions has been included in the data gaps list (Section 3.5 of the WP). See comment #22 for an explanation of the geotechnical requirements for the RI/FS.
11	Pg. 4-2 Sec. 4.2.1.1	Agree. All offsite wells, identified during the well inventory, will be plotted on a site map for inclusion in the summary RI report. In addition, privately owned wells will be sampled and analyzed for the same parameters as the proposed and existing monitor wells of the SEAD ash landfill during the RI (see Section 4.2.1.3).
12	Pg. 4-6 Sec. 4.2.2	Agree. One soil boring is proposed for each of the three debris piles north of the ash landfill.
13	Pg. 4-7 Sec. 4.2.2	The RI contractor will provided the soil-gas procedures.
14	Pg. 4-8 Para. 1	Agree. Unidentifiable anomalies will be investigated using test pits for visual inspection, as needed. If an obvious point contributor is encountered, while the test pit is dug, analytical sampling will be performed for confirmation. The soil from the test pit will be returned to the excavation. The RI contractor will provide the criteria necessary for test pit excavations.
15	Pg. 4-10 Sec. 4.2.3.2	The boundaries of the swampy area are subject to change, based on seasonal fluctuations. This swampy area does not necessarily indicate a wetland area. This area is generally associated with poor drainage. In addition, surface water/sediment samples will be analyzed for TCL/TAL and herbicides.

Item	Reference	Response/Action
16	Pg. 4-10 Sec. 4.2.3.2	Agree. Spring sampling has been included in Table 4.3-1.
17	Pg. 4-20 Para. 2	Agree. All recommended analysis are included in Table 4.3-1.
18	Pg. 4-21 Sec. 4.6	Agree. Section 4.6 has been rewritten to include the Preliminary Site Characterization Summary Report.
19	Pg. 5-2 Sec. 5-3	Disagree. The site will be handled as one operable unit, with the possibility of identifying several suboperable units after the RI and RA. If suboperable units are identified, potential remedial technologies will be defined for each site condition requiring remediation. In addition, a discussion of volumes or areas of media has been included in Section 5.1.4 of the WP.
20	Pg. 5-3 Sec. 5-4	Agree. The two levels of technology screening addressed in the CERCLA RI/FS guidance has been included in Section 5.1.5 of the WP. In addition, the preliminary listing of sub-operable units is the same as the list of possible contamination sources discussed in Sections 1.0 and 3.0 of the WP.
21	Pg. 6-4 Tab. 6-1	The tentative project schedule has been included in Table 6.2-1.
22	Pg. A-2 Para. 4	Agree. The data needs of the FS are covered in Section 3.5 of the WP. Recommended analyses for groundwater are included in Table 4.3-1. Any geotechnical analysis of soil borings or possible test pit samples will be identified after the first round of sampling. Since geotechnical testing laboratories generally will not perform these test in other than Level D protection, soil characterization must first be performed.
23	Pg. F-2 Sec. 1.5	Disagree. The preliminary remedial alternatives identified in Table 3.2-2 offer general methods for remediation of the entire site. As discussed in comment #19, if suboperable units are identified after the RA, potential

Item	Reference	Response/Action
		remedial technologies will be defined for each site condition requiring remediation. However at the request of EPA Region II, existing SWMU classification numbers have been included in the lists of potential contamination sources in Sections 1.0 and 3.0.
24	General	Agree. The WP has been corrected to include the full TCL/TAL and herbicides analyses.
25	General	Agree. Waste will be managed as discussed in Section 4.2.9 of the WP and Section A.6 of Appendix A.
26	General	See comment #22.

(B) Miriam Martinez, EPA (May 15, 1990)

27	Pg. 2-3	The criteria included in 7 CFR 658 has been included in Section 3.3.2 - Location-Specific ARARs.
28	Pg. 3-2	Agree. In order to judge the hydraulic properties of the lower aquifer, as well as the possible vertical connection between the surficial and lower aquifers, nested wells will be used. This will include existing shallow well PT-16, nested with the proposed deep well MW-38D, and proposed shallow well MW-36 nested with proposed deep well MW-35D. To assess the possible vertical connection between the shallow and lower aquifer, the static water level of the nested shallow wells will be measured and recorded prior to, during, and after the purging of the nested deep wells. Slug tests will be performed on the four newly constructed deep wells to assess the hydraulic properties of the lower aquifer.
29	Pg. 3-3	Agree. Volatile emissions (release mechanism), inhalation (exposure route) and direct dermal contact (exposure route) have been addressed in the Conceptual Site Model, Figures 3.1-2 through 6.
30	Pg. 4-4 Fig. 4-1	Monitor well PT-23 has been included.

Item	Reference	Response/Action
31	Pg. 4-5	Agree. The extraction procedure (EP) toxicity test will be replaced in the WP by the RCRA Toxicity Characteristics Leaching Procedures (TCLP) analysis. This test will be used for the applicable sampling.
32	Pg. 4-11 & Pg. 4-12	Since air sampling is not identified as an important task during the site characterization and early RI phases, establishing a fence-line action level is not necessary during this RI. However for the safety of the RI personnel, an air monitoring program for the field work has been included in Section 4.2 of the SHERP (Appendix B) and Section 4.2.5 of the WP. If ambient levels exceed 50 ppm on the HNU analyzer, perimeter air samples collected. In addition, the useful range for sensitivity of the HNU is 0.1 to 2,000 ppm.
34	Pg. 4-20	Comment Withdrawn. This level of detail is not necessary for WP. & Pg. 4-21
35	Pg. A-13 Sec. A.2.3	Comment Withdrawn. Proposed RI will probably involve more than one round of sampling.
36	Sec. 4.2.1	Withdrawn. SEAD wells are sampled quarterly for MCLs, under the Safe Drinking Water Act (SDWA).
37	General	Withdrawn. Sampling proposed is adequate for this RI.
38	General	Withdrawn. Method SW 846 will be used for the first round of RI.
39	General	Withdrawn. A 500 year floodplain delineation is not within the scope of this RI.
40	Pg. 3-26	Based on Minutes of February 27 and 28, 1991 Meeting in New York, SEAD will send letter from Fish and Wildlife Service to EPA regarding the characterization of the Endangered Species Act of 1973.
41	Sec. 3.3.2.1	Based on Conference Call held February 11, 1991, SEAD will provide a copy of existing Cultural Resource Survey.

Item	Reference	Response/Action
		EPA will contact an archeologist to check on prehistoric buildings on SEAD.
42	General	EPA will send guidance on significant agricultural lands to SEAD. The RI contractor will conduct this survey, if necessary.
43	Pg. 4-33	Agree. The methods for the bioaccumulation study will be included.
44	Pg. 4-35	Agree. See comment #43 above.
45	Pg. C-10	Disagree. No determination has been made as to whether this is a wetland. This area is called a swampy area in the figures and is used to show poor drainage areas. EPA will check on wetlands delineation.
46	Pg. C-53 Sec. 4.7.1	Agree. The final locations for the soil sampling will be determined after consultation with EPA/NYSDEC and approval of the USACE project manager.
(C) Kamal Gupta, NYSDEC (April 19, 1990)		
47	Tab. 4-3	Agree. Full TCL/TAL and herbicides analysis is included in Table 4.3-1. See comment #6 for discussion of radioactive survey.
48	Sec. 3.0	Agree. The WP has been revised to include Article 15 - Water Resources Law (Section 3.3.1.1), Article 24 - Freshwater Wetland Act (Section 3.3.2.3), and the NYSDEC Habitat Based Assessment (Section 3.3.2.2). As discussed in comment #45, EPA Region II will check on wetlands delineation.
49	Sec. 4.0	Agree. See comment #11 for sampling of offsite wells. According to SEAD personnel, the privately owned wells, located approximately 1,000 ft west of SEAD, have been sampled and found to be free from any of the contaminants identified at the ash landfill area.

Item	Reference	Response/Action
50	Fig. 4-1	Agree. Monitor well PT-23 has been included in the WP figures. In addition, the Farmhouse and Barn wells have also been included.
51	General	The air monitoring required for the RI is covered in the WP. Air sampling has not been identified as an important task during the site characterization and early RI phases. However, the WP does include dust sampling of the incinerator building. See comment #34.
52	Pg. 3-2	Agree. See comment #28.
53	Pg. A-6, A-7, and A-9	Disagree. See comment #89.
54	Pg. A-13	Existing groundwater sampling events which occurred during times of high-level and low-level groundwater elevations, along with their respective groundwater quality results will be evaluated during the project. This will ensure that seasonal representations of groundwater quality will be identified and incorporated with the data obtained during this RI.
55	Pg. C-63	Disagree. The CRQL standards identified are relevant for this sampling effort.

(D) Miriam Martinez, EPA (May 23, 1990)

Item	Reference	Response/Action
55	Pg. 4-8 Sec. 4.2.2.3	Agree. TCLP analysis is not included in the WP. All necessary characterization will be performed as stated in Section 4.2.9 of the WP.
56	Pg. 4-14 7 Pg. 4-15 Sec. 4.2.6	Agree. The decontamination procedure stated in this comment will be incorporated into the Work Plan where sampling equipment is discussed. In addition, isopropanol will be omitted from the procedure used to clean purging equipment and drilling augers (as stated in pages C-51, 52, and 53). Also, all well casings will be steamed cleaned prior to installation.

Item	Reference	Response/Action
57	Pg. 4-17 & Pg. 4-18 Tab. 4-3	Agree. The frequency of collecting equipment rinse blanks has been changed to the following: one rinse blank collected each day a decontamination event is carried out, not to exceed one per day. This frequency applies to both water and soil sample blanks. Also, sediment samples have been added to Table 4.3-1.
58	Pg. 4-9 Sec. 4.3	Agree. Forms will be included upon receipt from EPA.
59	App. A	Disagree. The soil gas sampling procedure will be provided by the RI Contractor.
60	Pg. A-2 A.1.2	Disagree. The RI contractor has stated that the WP and SHERP are acceptable as stated. In addition, four discrete samples will be taken from each soil boring and sent to the lab for analysis.
61	Pg. A-4 & Pg. A-5 A.1.3	Agree. Four discrete samples will be taken from each soil boring. In addition, all soil samples collected for VOC will be placed into 40 ml glass sample bottles with a stainless steel spatula. The remaining soil will be homogenized in a stainless steel bowl with a stainless steel spoon prior to being placed into the sample containers.
62	Pg. A-13 & Pg. A-14 A.2.3	Agree. The aqueous samples collected will be analyzed for total metals, since EPA Region II and NYSDEC do not accept results for dissolved metals. In addition, as stated in Amelia Jackson's (USEPA) Memo to Miriam Martinez (3/11/91), the purging procedure discussed on pg. C-72 of the WP is acceptable as stated.
63	Table 4.2.1 App. C	Agree. The parameters will be included in Appendix A and C.

Item	Reference	Response/Action
64	Pg. A-23 A.4.2	See previous comment. In addition, test pit procedures will be provided by the RI contractor.
65	Pg. C-17 Sec 1.1	The laboratory which has been proposed for this project is Aquatec in Burlington, Vermont. The USACE Missouri River Division (MRD) will be validating this lab for this project. As discussed in the February 28th meeting in New York, Amelia Jackson will be provided with the results of their Performance Evaluation (PE) samples, upon generation.
66	Pg. C-32 Tab. 2-1	Agree. See comment #57. TCLP analysis will be the responsibility of the RI contractor.
67	Pg. C-38 Sec. 2.4	Agree. If bubbles are present in a VOC sample vial, then the sample will be discarded, a new aliquot of sample collected, and preserved properly.
68	Pg. C-39 Sec. 2.4.1.1	Agree. The sample bottle supplier has not been identified. USACE will provide the QC procedures used by the supplier when available.
69	Pg. C-39 Sec. 2.4.1.1	Agree. Only one type of water will be used for the final rinse in in the decontamination procedure. This water will be demonstrated as analyte free for the organic and inorganic parameters of interest, by testing a sample of the water at the tap prior to the start of the sampling event. The WP has been changed to include this statement.
70	Pg. C-41, Pg. C-42, & Pg. C-43 Sec. 2.4.1.2	Agree. The decontamination procedures have been corrected as per comment #56. In addition, filtering of samples will not be done.
71	Pg. C-43, Pg. C-51 Sec. 2.4.2	This comment has been resolved as per comments #60 and #61.

Item	Reference	Response/Action
22	Pg. C-58 Sec. 3.0	Quality control (QC) for each SW-846 method will be used, with all recommended QA/QC procedures mandatory.
72	Pg. D-2 I.A.1.a	The volatile organics will be acidified to pH<2 with HCL as stated on page C-43 of the WP. Appendix D must be changed by USACE.
73	Pg. D-4 I.A.2.a Note 2	Disagree. Filtering of samples will not be done.
74	Pg. D-5 I.B.1	See comment #63. Appendix D must be changed by USACE.
75	Pg. 4-16 Para. 2	Examples of the proper chain of custody forms are provided in Appendix D.
76	Table 4.3-1	Agree. The word rinsate has been corrected in Table 4.3-1.
77	P. 4-17 Table 4.3-1	Agree. Three replicate samples will be shown on Table 4.3-1. However, the USACE Quality Assurance lab analyzing the split samples will dictate the specific number and type of samples they wish to receive. According to Amelia Jackson, these split samples will be in addition to the splits collected by the USEPA oversight contractor.
78	Pg. 4-17 Table 4.3-1	Disagree. QC and QA will remain two separate items.
79	Pg. 4-17 Table 4.3-1	Disagree. The detection limits that correspond to the methods proposed in Table 4.3-1 will be used.
80	Pg. A-4 Para. 1	Agree. Waste containerization and disposal is covered in the WP. Actual disposal will be the responsibility of the RI contractor.

Item	Reference	Response/Action
81		Agree. See comment #56.
82	Pg. A-11 Para 2	Disagree. The procedures stated on pages A-13, for well development, and C-72 for purging are acceptable as stated.
83	Sec. 1.0	The USACE will provide the key names of the personnel involved in this project. Any deviations must be approved by Kevin Healy (USACE Project Manager), Randy Battaglia (SEAD Project Manager), and Miriam Martinez (USEPA Project Manager).
84	App. C Sec. 3.0	All QA/QC criteria specified in the analytical method being used will be complied with. Table 3.3-1 of Appendix C has been changed to indicate a matrix spike for cyanide.
85	App. C Pg. C-98	Agree. The GC/MS will be tuned every 12 hours.
86	App. C	Agree. The instructions contained in the Region II validation SOPs regarding handling of outliners will be followed. The corrective action procedures for MS/MSD and CCV will be in accordance with Method SW 846 and EPA validation SOPs.
87	C-132 & C-133	Withdrawn. Section 8.4.2 (pg. C-132 and 133) are acceptable as is according to Ms. Amelia Jackson. Detection limits are in Table 7.2-1.
88	Attch. A	As discussed in comment #65, the laboratory, Aquatec, will undergo validation by the USACE-MRD (which includes analysis of PE samples). However, the USACE QA group does not have an established field auditing program. Therefore, USEPA's personnel will have to conduct field audits.
89	Pg. A-6, A-7, & A-9	Disagree. The wells will be constructed with PVC casing, as are the existing wells. However, SEAD will state in the ROD that the USEPA-Region II SOP for selecting well casings will be adhered to when selecting casing material

Item	Reference	Response/Action
		for wells which will be sampled to determine whether the remedial action chosen has worked.
90	Pg. A-13	See comment #54.
91	Pg. 4-14	The tap water used in the decontamination procedure will be from a potable water source.

(E) Kamal Gupta, NYSDEC (January 18, 1991)

1a	Table of Contents	Disagree. This is not standard practice.
1b	General	Agree. The acronym for calcium has been changed to Ca. Cadmium will be Cd.
1c	General	Agree. The acronyms have been revised and are based on the U.S. Army Toxic and Hazardous Materials Agency Manual.
1d	General	Agree. See comment above.
2	Sec. 1.0	Agree. The list of potential contamination sources in Sections 1.0 and 3.0 have been revised to include all items shown in the figures.
3	General	Agree. All groundwater, surface water, soil samples collected during the RI will be sampled for herbicides and full TCL/TAL. A second round sampling (if necessary) will be conducted based on the first round results. A Geiger counter will be used to conduct a radioactive survey during drilling and sampling operations. If any radioactive material is detected, the site will be evacuated and the RI/FS will be re-scoped to handle this issue.
4	Sec. 4.2	Agree. Shallow wells will be screened from the top of the bedrock to greater than 3 ft above the water table. Bedrock wells will be screened from approximately 3 ft above the lower water table to 17 ft below the lower

Item	Reference	Response/Action
		water table. In addition, since the depth to water in the lower aquifer, as determined from nearby wells in this portion of Seneca County, is approximately 48 ft-bls and the deep well at the farmhouse west of SEAD has a reported depth of approximately 120 ft-bls, the deep wells will be installed to a maximum depth of 200 ft-bls or the first water zone encountered, once having penetrated at least 20 ft into the bedrock. If no water is encountered to a depth of 200 ft-bls, the boring will be grouted to the surface and a new location chosen.
5	Sec. A.2	Agree. Well development until the turbidity of the well water is below 50 NTUs will be the goal of the development operations.
6	Sec. 4.2.1.3	Agree. The RI contractor will notify DOH and SCHD at least two weeks prior to collection of groundwater samples.
7	Sec. A.2.3	Samples will not be filtered.
8	Sec. 4.2.4	Disagree. Air sampling will be conducted for the field sampling effort and according to Section 4.2 of the SHERP. See comment #34.
9	Sec. 3.3.1.1	Agree. The DOW TOGS 1.1.1 standards have been included in Section 3.3.1.1 of the WP.
10	Sec. 3.3.2.2	Agree. See comment #48.
11	General	Agree. The methodologies presented in the NYSDEC Sediment Criteria has been included in Section 3.3.1.1 of the WP.
12	Pg. 4-37	Noted.

APPENDIX F

SCOPE OF WORK

23 Aug 89

ANNEX D

REMEDIAL INVESTIGATIONS AND FEASIBILITY STUDIES
AT THE
INCINERATOR ASH LANDFILL
SENECA ARMY DEPOT, ROMULUS, NEW YORK

1.0 GENERAL STATEMENT OF SERVICES

1.1 Background. As part of its continuing program of evaluating its hazardous waste management practices, the Army is performing Remedial Investigations/Feasibility Studies (RI/FS) at Seneca Army Depot (SEAD). A recently completed site investigation of the abandoned ash landfill area (Solid Waste Management Unit (SWMU) Designations SEAD-3, SEAD-6, SEAD-14 and SEAD-15) has documented the existence of a narrow plume of groundwater contamination which is believed to extend to, and possibly beyond, the Depot's western boundary. The contaminants of concern are chlorinated volatile organic compounds (VOC's); trans-1,2-dichloroethene, trichloroethene and, to a lesser extent, 1,2-dichloroethene, vinyl chloride and chloroform. Additionally, some heavy metals were found at concentrations above background. The RI/FS investigations are to be conducted to determine the magnitude of environmental contamination and appropriate remedial actions. The US Army Corps of Engineers, Huntsville Division, on behalf of SEAD, is contracting for the required work.

1.2 Location. Seneca Army Depot is a US Army facility located in Seneca County, New York. SEAD occupies approximately 10,600 acres. It is bounded on the west by State Route 96A and on the east by State Route 96. The cities of Geneva and Rochester are located to the northwest (14 and 50 miles, respectively); Syracuse is 53 miles to the northeast and Ithaca is 31 miles to the south. The surrounding area is generally used for farming.

1.3 Regulatory Status. The Incinerator Ash landfill area of Seneca Army Depot was included on the Federal Facilities National Priorities List on 13

July 1989. Consequently, all work to be performed under this contract shall be performed according to CERCLA guidance as put forth in the Draft "Guidance for Conducting Remedial Investigations/Feasibility Studies under CERCLA", dated March 1988 (Reference 11.21).

1.4 Previous Investigations. Previous investigations have been performed at various SEAD units. An "Installation Assessment and Update" (USATHAMA Reports No. 157 (1980) and 157(U) (1987), respectively) were conducted by the U.S. Army Toxic and Hazardous Materials Agency. The purpose of the assessments was to identify potentially contaminated areas at the Depot. The U.S. Army Environmental Hygiene Agency's Groundwater Contamination Survey No. 38-26-0868-88, "Evaluation of Solid Waste Management Units, Seneca Army Depot" identifies and describes all solid waste management units (SWMU's) at SEAD. In addition, a confirmation study has been performed and closure plans are being developed for the burning pads (SEAD-23). USATHAMA also conducted a "Site Investigation Report" in March 1989 for the Burning Pit/Landfill. A complete list of previous investigations is presented as References in Section 11.0.

1.5 Units to be Investigated Under this Contract. The RI/FS investigations will be focused on the incinerator ash landfill area, which is comprised of the following designated SWMU's.

1.5.1 Incinerator Cooling Water Pond, SWMU No. SEAD-3
1.5.2 Incinerator Ash landfill, SWMU No. SEAD-6
1.5.3 Refuse Burning Pits SWMU No. SEAD-14
1.5.4 Abandoned Incinerator (Building 2207), SWMU No. SEAD-15
1.5.5 Solvent Dump
1.5.6 Cooking Grease Pit Disposal Area, SEAD 8
1.5.7 Buried Debris Piles

1.6 Security Requirements. Compliance with SEAD security requirements is mandated. These requirements are presented in Section 9.0.

2.0 OBJECTIVE

The objective of this Scope of Work is to perform a complete RI/FS at the incinerator ash landfill area as defined by Office of Solid Waste and Emergency Response Directive 9355, beginning with the RI/FS scoping process and ending with a signed Record of Decision, at the identified site.

3.0 DETAILED DESCRIPTION OF SERVICES

3.1 General Requirements. All work performed by the AE shall, so far as possible, be designed and implemented in a manner which complements earlier investigations and shall conform to this Statement of Work (SOW). The AE, through Work Plans and RI/FS Reports, shall present a complete description of the RI/FS process as applied to the facility. All work shall be performed under the general supervision of both a Professional Engineer registered in the State of New York and a Certified Professional Geologist.

3.2 RI/FS Work Plan Preparation. The AE shall prepare three documents; a RI/FS Project Scoping Document, a RI/FS Work Plan Document, and a Community Relations Plan Document which are intended to do the following: (1) to provide a consolidated report on site history, current site activities, and resulting environmental impacts; (2) to familiarize the AE's personnel who are working on the project with site conditions; and (3) to provide project plans and proposed tasks by which the AE's personnel shall conduct RI/FS activities. It is intended that only one set of documents, addressing all of the site components listed in paragraph 1.5, be prepared. Each of the components of the site shall be separately addressed within the set of documents. The initial site visit, geophysical surveys, and soil-gas investigations shall not be performed until an "abbreviated" SHERP, as discussed in Section 5.0, is reviewed and approved. No remaining field work may be performed until the formal plans are reviewed and approved by the Contracting Officer. All work must be performed according to the plans. The documents shall be prepared as follows:

3.2.1 (Task D-1) Site Visit and Review Existing Data. The AE shall perform a visual inspection of the site, review the records, reports and other data provided by the Contracting Officer and the facility, or made available to the AE from sources such as public records, the USEPA, the State Regulators, the State Geological Survey, or from interviews with local residents and officials who have knowledge of past site activities. Prior to commencement of the site visit, an "abbreviated" SHERP must be prepared and submitted in accordance with Section 5.0.

3.2.2 (Task D-2) RI/FS Project Scoping Document. This Task corresponds to a portion of EPA Task 1 in Appendix B of the RI/FS Guidance

Manual. The AE shall prepare and submit a RI/FS Project Scoping Document which provides a summary of site conditions, gives an overview of the RI/FS process and describes how the process will be implemented at Seneca Army Depot. The RI/FS Project Scoping Process shall contain, as a minimum, the following elements:

3.2.2.1 Physical Characteristics of the Site. The AE shall provide a site description which includes location, ownership, topography, geology, hydrology, land use, waste type, estimates of waste volume, synopsis of findings and results of previous investigations, and other pertinent details. The description shall also include historical events of concern such as chemical storage and disposal practices, results and findings of previous studies and a "quality assurance" evaluation of the existing data in order to estimate its reliability.

3.2.2.2 Conceptual Site Model. From the analysis of the data reviewed, the AE shall make a preliminary determination of the physical characteristics of the site and prepare a Conceptual Site Model of the known contaminants. The model is to give an overview of site conditions, probable and potential contaminants of concern, severity of contamination, and the potential impacts on the environment. As a minimum the Conceptual Site Model shall include potential routes of migration, potential receptors and anticipated impacts.

3.2.2.3 Develop and Evaluate Preliminary Remedial Action Objectives and Alternatives. The AE shall present an overview of the remedial actions that could be reasonably used to mitigate adverse site conditions. The choice of alternatives shall be based on proven effectiveness of the technology and the anticipated cost of implementation. This is not meant to be a detailed investigation of all potentially available remedial technology.

3.2.2.4 Preliminary Identification of ARAR's and TBC Requirements. The AE shall make a preliminary determination of potential contaminant, location, and action specific ARAR's based upon an evaluation of existing site data.

3.2.2.5 Develop Data Needs and Data Quality Objectives. The AE shall evaluate the existing data and determine the additional data necessary to characterize the site, complete the conceptual site model, better define the ARAR's, and narrow the range of preliminary identified remedial alternatives. The AE shall consider the intended uses of existing data as well as data to be collected under this contract and determine the type, quantity, and quality of additional data needed for each site.

3.2.2.6 NYSDEC and EPA Review Comments. The AE shall review all NYSDEC and EPA Region II review comments on the RI/FS Project Scoping Document. The AE shall provide a technical opinion as to the merit of all comments and Army responses. Any objections the AE has to any of the comments shall be justified and will be presented for regulatory review and disposition by CEHND. The AE shall incorporate those comments which the AE has not objected to.

3.2.3 (Task D-3) Geophysical Investigations. The AE shall perform the Geophysical Investigations program during the RI/FS Work Plan preparation phase of the RI/FS. It is specifically intended that the geophysical explorations be performed during Work Plan preparation so that the data can be utilized to assist in preparing the Soil-Gas Investigation and the Field Sampling Plans which select and justify subsequent, more detailed site characterization activities.

3.2.3.1 (Subtask D-3.1) Geophysical Investigation Plan. The AE shall prepare and submit a brief work plan which describes specific equipment, methods and personnel which the AE proposes to utilize to accomplish the geophysical investigations. The plan shall propose specific locations for proposed geophysical investigations and shall include justification for the method selected for use at each site in order to meet the objective of the geophysical investigations which is to obtain information on the physical, subsurface conditions at source areas for the site.

3.2.3.2 (Subtask D-3.2) Geophysical Surveys. The AE shall perform Geophysical Surveying according to the requirements of the approved GOP. The AE shall perform a minimum of 10,000 linear feet of geophysical survey over 10 acres. The AE shall utilize a method of geophysical investigation capable of detecting buried 55-gallon drums and debris, if existing, to a depth of 15 feet. The purpose of the geophysical surveys is to obtain detailed information necessary for source characterization. The AE shall utilize sufficient location control in the field to ensure that geophysical anomalies located are recoverable to an accuracy of plus or minus one foot. The AE shall report the results of the geophysical investigations as a letter report submitted no later than the submission date of the draft RI/FS Work Plan. Prior to commencement of the geophysical surveys, an "abbreviated" SHERP must be prepared and submitted in accordance with Section 5.0.

3.2.4. (Task D-4) Soil-Gas Investigations. The AE shall perform the Soil-Gas Sampling and Analysis program during the RI/FS Work Plan preparation phase of this RI/FS. It is specifically intended that the soil-gas investigation be performed during Work Plan preparation so that the data can be utilized to assist in preparing the Field Sampling Plan which selects and justifies subsequent, more detailed site characterization activities.

3.2.4.1 (Subtask D-4.1) Soil-Gas Investigation Work Plan. The AE shall submit a brief work plan which proposes soil-gas sampling locations and which describes the sampling equipment, personnel, and procedures to be used. The plan shall recommend specific numbers of soil-gas samples to be collected at each site investigated and the target analytes for each site investigated. The work plan will also specify safety procedures to be utilized during the soil-gas sampling, using the AE's corporate Safety, Health and Emergency Response Plan, (SHERP). However, the detailed RI/FS SHERP will not be required with this submittal.

3.2.4.2 (Subtask D-4.2) Soil-Gas Sampling and Analysis. The AE shall perform soil-gas sampling and analyses at a minimum of 100 locations at the facility. The purpose of the soil-gas sampling program shall be to locate sources and migration routes of volatile petroleum hydrocarbons and/or volatile chemicals in the soil and groundwater. Samples collected shall be analyzed by GC/MS. The AE shall report the results of the Soil-Gas Sampling as a letter report submitted no later than the submission date of the draft RI/FS Work Plan. Prior to commencement of the soil-gas investigations, an "abbreviated" SHERP must be prepared and submitted in accordance with Section 5.0.

3.2.5 (Task D-5) RI/FS Work Plan. This Task corresponds to a portion of EPA Task 1 in Appendix B of the RI/FS Guidance Manual. The AE shall prepare an RI/FS Work Plan Document. Quality Control/Quality Assurance procedures, Standard Operating Procedures, methods, equipment, and specific personnel along with their qualifications that the AE proposes to utilize to accomplish the RI/FS shall be identified and discussed at appropriate locations within the plan. As a minimum the RI/FS Work Plan shall include the following:

3.2.5.1 <u>(Subtask D-5.1)-Safety, Health and Emergency Response Plan (SHERP).</u> The AE shall prepare and submit a Safety, Health and Emergency Response Plan (SHERP) that the AE's personnel, subcontractors and visitors to the site shall use while the field investigations are being conducted. This portion of the RI/FS Work Plan shall be prepared according to Section 5 of this SOW and the requirements of the SEAD Safety office.

3.2.5.2 <u>(Subtask D-5.2) Quality Assurance Project Plan.</u> The AE shall prepare and submit a Quality Assurance Project Plan (QAPP) according to the requirements of Section 6 of this SOW. This portion of the RI/FS Work Plan shall also describe in detail, the following: 1) Site Background; 2) Quality control and quality assurance procedures to be exercised including organization and responsibilities; 3) QA objectives; 4) Sampling procedures; 5) Sample custody; 6) Calibration procedures; 7) Analytical procedures; 8) Data reduction, validation and reporting; 9) Internal quality control; 10) Performance and system audits; 11) Preventive maintenance; 12) Data assessment procedures; 13) Corrective actions; and, 14) Quality assurance reports.

3.2.5.3 <u>(Subtask D-5.3) Field Sampling Plan.</u> The AE shall prepare and submit, as part of the RI/FS Work Plan, a Field Sampling Plan (FSP). The FSP shall describe in detail all sampling and analysis activities to be exercised including site background, sampling objectives, sampling locations and frequency, designations, equipment and procedures and handling and analysis requirements to be applied at each site. Section 3.3.1 of this SOW provides for numerous field investigation activities which will be applied to the project. It is intended that the AE, in the Field Sampling Plan, propose and justify how the field investigation activities will be allocated to specific RI/FS sites. In addition to the specific requirements of the RI/FS Guidance Document, the AE shall provide the following subplans as part of the FSP.

3.2.5.3.1 <u>Soil Boring and Monitoring Well Installation Plan.</u> The AE shall prepare and submit a Soil Boring and Monitoring Well Installation Plan according to the requirements of Section 7 of this SOW. This portion of the RI/FS Work Plan shall include proposals for locations of specific wells and borings based upon previous investigations, the AE's own evaluation of the sites, and the results of the Soil-Gas Investigation.

3.2.5.3.2 Test Pit Excavation Plan. The AE shall prepare and submit a Test Pit Excavation Plan proposing excavation and logging methods, decontamination procedures, and locations for test pit excavation into known and suspected waste disposal sites. A total of 20 pits will be required at the landfill area. The purpose of the test pits is to obtain information necessary for source characterization. Each pit shall be a minimum of 3 feet deep, to bedrock, or to ground-water, whichever is encountered first. Each pit shall be approximately four feet wide and ten feet long. Each pit shall be visually and photographically logged from the natural ground surface. No one shall ever actually enter any test pit. At each pit an average of two soil or waste samples shall be collected from the excavator bucket. Each pit shall be backfilled with the material excavated from it within 48 hours of the initial excavation. If an excavation is left unattended, the AE shall mark and barricade it to prevent accidental entry by personnel or livestock.

3.2.5.3.4 Air Monitoring Plan. The AE shall prepare and submit an Air Monitoring Plan which proposes and justifies air monitoring methods, equipment and personnel to be used during air monitoring. Air monitoring will be required at two sites to develop baseline conditions prior to test pit excavation and then again during test pit excavations to determine if significant release of contaminants to the air are occurring.

3.2.5.4 NYSDEC and EPA Review Comments. The AE shall review all NYSDEC and EPA Region II review comments on the RI/FS Work Plans. The AE shall provide a technical opinion as to the merit of all comments and Army responses. Any objections the AE has to any of the comments shall be justified and will be presented for regulatory review and disposition by CEHND. The AE shall incorporate those comments which the AE has not objected to.

3.2.6 (Task D-6 Community Relations Plan. The AE shall prepare and submit a Community Relations Plan (CRP) according to the requirements of the RI/FS Guidance Manual, Appendix B, Task 2. It shall describe how and when the community will be informed of RI/FS activities and findings. The Plans shall describe how the RI/FS is to be implemented and managed, describe the information expected from each task and how the information will be gathered, interpreted and incorporated into the RI/FS Reports. The Plan will describe the full FI/FS process, through implementation of Remedial Action, (even though this SOW does not carry the RI/FS process to that point) so that the entire process is described. It is intended that the plan and descriptions use non-technical jargon wherever possible in preparing the Community Relations Plan.

3.3 Phase I Remedial Investigation/Feasibility Studies. The objective of Phase I of this SOW is to perform the RI/FS activities corresponding to USEPA's Phase I Remedial Investigation and USEPA Phase I and USEPA Phase II Feasibility Studies. The AE shall perform the RI and FS activities approximately concurrently, and submit the data in combined RI/FS reports. When all the field work and data analyses are complete, the AE shall prepare a Phase I RI/FS Report. The AE shall also present specific recommendations for Phase II Remedial Investigations and Feasibility Studies that may be necessary to complete the RI/FS.

3.3.1 Phase I Remedial Investigations.

3.3.1.1 (Task D-7) Field Investigations. The work required in this Section corresponds to EPA Task 3 in Appendix B of the RI/FS Guidance Manual. The AE shall perform field investigations in order to characterize the site and determine the nature and extent of soil and groundwater contamination. The work shall be performed according to the approved work plan and as follows:

3.3.1.1.1 (Subtask D-7.1) Install Soil Borings. The AE shall install 10 soil borings at locations determined in the approved FSP. The average depth of the borings shall be 15 feet deep, but individual borings may be shallower or deeper. A total of 150 linear feet of drilling is provided for under this subtask. Ten soil samples will be collected as part of this subtask for subsequent chemical analysis under Subtask D-7.1.

3.3.1.1.2 (Subtask D-7.2) Install Shallow Wells. The AE shall install 10 shallow groundwater monitoring wells at locations determined in the approved FSP. The maximum depth of the wells shall be 20 feet deep, but individual wells may be shallower or deeper. A total of 200 linear feet of drilling is provided for under this subtask.

3.3.1.1.3 (Subtask D-7.3) Test Pit Excavations. The AE shall excavate 20 test pits at locations determined in the approved FSP. Forty soil samples will be collected as part of this task for subsequent chemical analyses under subtask D-8.1.

3.3.1.1.4 (Subtask D-7.4) Surface Water Sampling. The AE shall collect one round of surface water samples at locations determined in the approved FSP. Ten field samples shall be collected at ten locations for analysis under subtask D-8.2.

3.3.1.1.5 (Subtask D-7.5) Air Monitoring. The AE shall conduct Air Monitoring at locations determined in the approved FSP. The purpose of the air monitoring is to obtained detailed information necessary for the Baseline Risk Assessment.

3.3.1.1.6 (Subtask D-7.6) Surveying. Each new soil boring, monitoring well, test pit and surface water sampling point shall be located according to the requirements of Section 8.0 of this Statement of Work.

3.3.1.2 (Task D-8) Chemical Sampling and Analysis. The work required in this Section corresponds to EPA Tasks 4 and 5 in Appendix B of the RI/FS Guidance Manual. The AE shall collect and analyze samples in a manner determined in the approved FSP. The total number of samples to be collected by the AE along with required and approved analysis methods are shown in Tables 1 and 3 The AE shall prepare cost estimates assuming that the entire Table 1 list will be analyzed. During contract negotiations the AE and Contracting Officer will agree on a unit price for each method. If all analyses specified in this SOW are not required, the price shall be reduced according to the agreed unit price. The AE shall submit a Table which provides the results of each round of analytical data as soon as it is received from the laboratory, and not wait for the next scheduled report submission.

3.3.1.2.1 (Subtask D-8.1) Analysis of Soil Samples. The AE shall analyze 50 soil samples previously collected from the 10 soil borings and the 20 test pits. The total number of soil and QA/QC samples and analysis are summarized in Table 2-17. The AE shall submit a Table which provide s the results of each round of analytical data as soon as it is received from the laboratory, and not wait for the next scheduled report submission.

3.3.1.2.2 (Subtask D-8.2) Collection and Analysis of Groundwater Samples. The AE shall collect and chemically analyze one groundwater sample from each of the 10 new groundwater monitoring wells installed and each of 10 existing wells. A total of 20 wells will be sampled under this subtask. In addition, the AE shall chemically analyze the ten surface water samples collected in Subtask D-7.4. The total number of water and QA+/QC samples to be taken and the required analyses are summarized in Table 2-18. The AE shall submit a Table which provides the results of each round of analytical data as soon as it is received from the laboratory, and not wait for the next scheduled report submission.

3.3.1.3 (Task D-9) Baseline Risk Assessment. The work required in this Section corresponds to EPA Task 6 in Appendix B of the RI/FS Guidance Manual. Using the information gathered from the record search, the field work and data analyses, the AE shall prepare and submit a quantitative Risk Assessment. The Risk Assessment shall provide an evaluation of the potential threat to human health, the environment, and ecology in the absence of any remedial action and provide the basis for determining whether or not remedial action is necessary. The Risk Assessment Report shall be prepared using the guidance presented in the RI/FS Guidance Manual and, as a minimum, contain a baseline risk assessment, an exposure assessment, and a standards analysis. The Risk Assessment shall be submitted with the Phase I RI/S Report. The AE shall provide information including, but not necessarily limited to, the following:

3.3.1.3.1 (Subtask D-9.1) Identification of Contaminants of Concern. Using the information gathered from field work, record search, and consultation with appropriate local, State and Federal Officials the AE shall identify the contaminants which are of concern. The AE shall provide a summary of each identified contaminant describing why it was selected, and the effects of its chronic and acute toxicity to humans and the environment.

3.3.1.3.2 (Subtask D-9.2) Exposure Assessment. The AE, using modeling, shall identify actual or potential exposure paths and routes, characterize potentially exposed populations, and estimate expected exposure levels. As part of the Exposure Assessment, the following Task shall also be performed:

3.3.1.3.2.1 (Subtask D-9.2.1) Water Well Survey. The AE shall make a reasonable effort to determine the existence of all operating water wells used for human consumption within one mile of the Installation that may be affected by deteriorated water quality on the Installation. A "house-to-house" survey is not intended. However, whenever possible, the AE shall include well location, depth, screened interval, water use, and number of people served by the well. This task may be performed through the examination of records available at public sources, backed by occasional field checks. The information shall be provided both in tabular form and on suitable maps.

3.3.1.3.2.2 <u>(Subtask D-9.2.2)</u> <u>Spring Survey.</u> The AE shall make a reasonable effort to determine the existence of all springs used for human consumption within one mile of the Installation that may be affected by deteriorated water quality on the Installation. The information shall be provided both in tabular form and on suitable maps.

3.3.1.3.3 <u>(Subtask D-9.3)</u> <u>Toxicity Assessment.</u> The AE shall make a comparison of acceptable levels of contamination with actual levels identified during the exposure assessment. The comparison shall be based upon available ARARs, TBCs and other toxicological data, where existing.

3.3.1.3.4 <u>(Subtask D-9.4)</u> <u>Risk Characterization.</u> The AE shall, based upon other components of the Risk Assessment, characterize the risk associated with the site. The AE shall consider the carcinogenic risk, noncarcinogenic risk and the environmental risk. The characterization shall include a summary of each projected exposure route for contaminants of concern and the distribution of risk across various sectors of the population. Such factors as weight-of evidence associated with toxicity information, the estimated uncertainty of the component parts, and the assumptions contained within the estimates shall be discussed.

3.3.1.3.5 <u>(Subtask D-9.5)</u> <u>Propose Applicable or Relevant and Appropriate Requirements (ARAR's) and To Be Considered (TBC) Requirements.</u> The AE shall develop and propose contaminant and location specific "Applicable or Relevant and Appropriate Requirements" (ARAR's) and To Be Considered (TBC) Requirements which, after review and possible modification as directed by the Contracting Officer, will be utilized to evaluate subsequent proposed remedial actions. ARAR's and TBC's shall be prepared using guidance presented in the RI/FS Guidance Manual.

3.3.1.4 (Task D-10) Treatability Study Requirements Assessment. The work required in this Section corresponds to EPA Task 7 in Appendix B of the RI/FS Guidance Manual. The AE shall assess existing data on technologies identified as Remedial Action Alternatives to determine data needs required to undertake treatability investigations following completion of alternatives development. The AE shall recommend if specific Treatability Studies are required or if the existing situation is well enough understood and described in scientific, engineering and other technical literature such that site specific treatability studies do not appear to be necessary. The AE shall develop a Conceptual Treatability Study Plan. Actual implementation of the Treatability Study Plan is not part of this SOW. The Treatability Study shall be submitted with the Phase I RI/S Report.

3.3.2 (Task D-11) Phase I Feasibility Study. The work required in this Section corresponds to EPA Task 9 in Appendix B of the RI/FS Guidance Manual. The primary objective of this phase of the FS is to develop an appropriate range of waste management options that protect human health and the environment.

3.3.2.1 (Subtask D-11.1) Develop Remedial Action Objectives. The AE shall develop remedial action objectives which protect human health and the environment and then describe general response action which will satisfy the remedial action objectives.

3.3.2.2 (Subtask D-11.2) Identify and Evaluate Alternative Remedial Actions. The AE shall describe all available technologies that could be reasonably used as remedial actions at SEAD. The AE shall then screen the list to remove any potential Remedial Actions which are clearly illogical, inadequate, unfeasible, or otherwise ill-suited to the site. Remedial actions presented past the initial screening shall consist of only those representing proven technologies adequate to address site conditions. A detailed evaluation including the strengths and weaknesses of each technology shall be performed. The initial screening shall be based upon effectiveness, implementability and cost. Where appropriate, the AE may combine feasible remedial actions. The "no action" alternative shall be described in detail as part of this task. Additional data needed shall also be described.

3.3.3 <u>(Task D-12)</u> <u>Prepare Phase I RI/FS Report</u>. The work required in this Section corresponds to EPA Tasks 8 and 11 in Appendix B of the RI/FS Guidance Manual. At the completion of the preceding tasks, the AE shall prepare the Remedial Investigation/ Feasibility Study Report, fully documenting all Phase I work performed. The report shall be prepared according to the requirements of this SOW and the referenced guidance documents. The report shall also describe the recommended work to be performed during the Phase II RI/FS and make specific recommendations, and provide the justification, for sampling locations and analytes proposed for Phase II. As part of this report the AE shall evaluate the need for interim or expedited remedial actions at each of the sites. If the AE recommends that either is appropriate, he shall so propose and justify. The AE shall also propose and justify additional investigations to be undertaken as part of the Phase II Remedial Investigations, if any, for the Contracting Officer's review and approval.

3.4 <u>(Task D-13)</u> <u>Record of Decision.</u> The work required in this Section corresponds to EPA Task 12 in Appendix B of the RI/FS Guidance Manual. The AE shall prepare and submit a document for the signature of the SEAD Commander addressing the decision to implement the approved remedial action alternative.

4.0 SUBMITTALS AND PRESENTATIONS

4.1 <u>Format and Content</u>. The Engineering Reports, consisting of work plans and RI/FS reports, presenting all data, analysis, and recommendations shall be prepared in accordance with the suggested RI/FS Format as presented in the RI/FS Guidance Manual. Each submittal shall be accompanied by an EPA completeness checklist (where existing), completed by the AE, which references the specific location within the submitted report, of the required item. All drawings shall be of engineering quality in drafted form with sufficient detail to show interrelations of major features on the installation site map. When drawings are required, data may be combined to reduce the number of drawings. The report shall consist of 8-1/2" x 11" pages with drawings folded, if necessary, to this size. A decimal paragraphing system shall be used, with each section and paragraph of the reports having a unique decimal designation. The report covers shall consist of vinyl 3-ring binders and shall hold pages firmly while allowing easy removal, addition, or replacement of pages. A report title page shall identify the AE, the Corps of Engineers, Huntsville Division, and the date. The AE identification shall not dominate the title page. Each page of draft and draft-final reports shall be stamped "DRAFT" and "DRAFT-FINAL" respectively. Each report shall identify the members and title of the AE's staff which had significant specific input into the report's preparation or review. Submittals shall include incorporation of all previous review comments accepted by the AE as well as a section describing the disposition of each comment. Disposition of comments submitted with the final report shall be separate from the report document. All final submittals shall be sealed by both the registered Professional Engineer-In-Charge and the Certified Professional Geologist.

4.2 Presentations. The AE shall make presentations of work performed according to the schedule in paragraph 4.6. The presentation will consist of a summary of the work accomplished and anticipated followed by an open discussion among those present. The AE shall provide a minimum of two persons at the meetings which are expected to last one day each, with the exception of the presentation to EPA, which is expected to last two days.

4.3 Conference Notes. The AE will be responsible for taking notes and preparing the reports of all conferences, presentations, and review meetings. Conference notes will be prepared in typed form and the original furnished to the Contracting Officer (within five (5) working days after date of conference) for concurrence and distribution to all attendees. This report shall include the following items as a minimum:

a. The date and place the conference was held with a list of attendees. The roster of attendees shall include name, organization, and telephone number.

b. Written comments presented by attendees shall be attached to each report with the conference action noted. Conference action as determined by the Government's Project Manager shall be "A" for an approved comment, "D" for a disapproved comment, "W" for a comment that has been withdrawn and "E" for a comment that has an exception noted.

c. Comments made during the conference and decisions affecting criteria changes, must be recorded in the basic conference notes. Any augmentation of written comments should be documented by the conference notes.

4.4 Confirmation Notices. The AE will be required to provide a record of all discussions, verbal directions, telephone conversations, etc., participated in by the AE and/or representatives on matters relative to this contract and the work. These records, entitled "Confirmation Notices", will be numbered sequentially and shall fully identify participating personnel, subject discussed, and any conclusions reached. The AE shall forward to the Contracting Officer as soon as possible (not more than five (5) work days), a reproducible copy of said confirmation notices. Distribution of said confirmation notices will be made by the Government.

4.5 Progress Reports and Charts. The AE shall submit progress reports to the Contracting Officer with each request for payment. The progress reports shall indicate work performed, and problems incurred during the payment period. Upon award of this delivery order, the AE shall, within 15 days, prepare a progress chart to show the proposed schedule for completion of the project. The progress chart shall be prepared in reproducible form and submitted to the Contracting Officer for approval. The actual progress shall be updated and submitted by the 15th of each month and may be included with the request for payment.

4.6 Schedule of Deliverables and Review Meetings.

Deliverable/Meeting	Date
Draft Abbreviated SHERP	3 Oct 89
Final Abbreviated SHERP	17 Oct 89
Geophysical Investigation Work Plan	17 Oct 89
Geophysical Investigation Letter Report	9 Nov 89
Soil-Gas Investigation Work Plan	9 Nov 89
Gov't Comments Provided	16 Nov 89
Soil-Gas Investigation Letter Report	5 Dec 89
Draft RI/FS Scoping Document, Work Plan, and Community Relations Plan	19 Dec 89

Comment Review Meeting at Seneca AD	25 Sep 90
Revised Draft-Final RI/FS Scoping Document and Work Plan	6 Dec 90
Review Meeting at EPA Region II, New York, NY	27-28 Feb 91
Gov't Comments Provided	8 Feb 91
Final RI/FS Scoping Document and Work Plan	30 Apr 91

The overall completion date for this delivery order shall be 31 May 1991.

4.7 Submittals.

4.7.1 General Submittal Requirements.

4.7.1.1 Distribution. The AE is responsible for reproduction and distribution of all documents. The AE shall furnish copies of submittals to each addressee listed in paragraph 4.7.3 in the quantities listed in the document submittal list. Submittals are due at each of the addressees not later than the close of business on the dates shown in paragraph 4.6.

4.7.1.2 Partial Submittals. Partial submittals will not be accepted unless prior approval is given.

4.7.1.3 Cover Letters. A cover letter shall accompany each document and indicate the project, project phase the date comments are due, to whom comments are submitted, the date and location of the review conference, etc., as appropriate. (Note that, depending on the recipient, not all letters will contain the same information.) The contents of the cover letters should be coordinated with CEHND-PM-EP prior to the submittal date. The cover letter shall not be bound into the document.

4.7.1.4 Supporting Data and Calculations. The tabulation of criteria, data, circulations, and etc., which are performed but not included in detail in the report shall be assembled as appendices. Criteria information provided by CEHND need not be reiterated, although it should be referenced as appropriate. Persons performing and checking calculations are required to place their full names on the first sheet of all supporting calculations, and etc., and initial the following sheets. These may not be the same individual. Each sheet should be dated. A copy of this scope of work shall be included as appendix A in the Draft RI/FS report only.

4.7.1.5 Reproducibles. One camera-ready, unbound copy of each submittal shall be provided to the Contracting Officer in addition to the submittals required in the document and submittal list. All final submittals shall also be provided on floppy disks compatible with the Intel 310/80286 computer in ASCII format and in Word Star 2000 release 2.0 format.

4.7.2 Specific Submittal Requirements.

a. Abbreviated SHERP (Draft, Final) (Tasks D-1, D-3.2, D-4.2).
b. Geophysical Investigation Work Plan (Final) (Subtask D-3.1).
c. Geophysical Investigation Report (Final) (Subtask D-3.2).
d. Soil-Gas Investigation Work Plan (Final) (Subtask D-4.1).
e. Soil-Gas Investigation Report (Final) (Subtask D-4.2).
f. RI/FS Work Plan (Draft, Draft-Final, Final) (Tasks D-2, D-5, D-6)
g. RI/FS Report (Draft, Draft-Final, Final) (Task D-12).
h. Record of Decision (Draft, Draft-Final, Final) (Task D-13).

4.7.3 Addressees.

Commander
U.S. Army Corps of Engineers
Huntsville Division
ATTN: CEHND-ED-PM (Mr. Robert Nure ~~Walt Perro~~)
~~PO Box 1600~~
Huntsville, AL 35807-4301
106 WINN DR
35806-1957

Commander
U.S. Army Depot Systems
Command (DESCOM)
ATTN: AMSDS-EN-FD
(Mr. Tim Toplisek)
Chambersburg, PA 17201

Commander
U.S. Army Environmental
Hygiene Agency (USAEHA)
ATTN: HSHB-ME-S
Building 1677
Aberdeen Proving Ground, MD 21010-5422

Commander
U.S. Army Material Command (USAMC)
ATTN: AMCEN-A (Mr. Bob King)
5001 Eisenhower Ave.
Alexandria, VA 22333-0001

Commander
U.S. Army Corps of Engineers
Toxic and Hazardous Materials Agency
ATTN: CETHA-IR-D (Ms. Katherine Gibson)
Aberdeen Proving Ground, MD 21010-5401

Commander
U.S. Army Corps of Engineers,
North Atlantic Division,
ATTN: CENAD-CO-EP
90 Church Street
New York, NY 10007-9998

Commander
U.S. Army Corps of Engineers
Missouri River Division
ATTN: CEMRD-ED-EA (Mr. Doug Plac[illegible])
12565 West Center Road
~~PO Box 103, Downtown Station~~
Omaha, NE 68101-0103

Commander
U.S. Army Corps of Engineers
Missouri River Division
ATTN: CEMRD-ED-GL
12565 West Center Road
~~PO Box 103, Downtown Station~~
Omaha, NE 68101-0103

Commander
Seneca Army Depot
ATTN: SDSSE-HE (Randy Battaglia)
Romulus NY 14541

Commander
HQUSACE
ATTN: CEMP-RI
20 Massachusettes Ave., NW
Room 2209
Washington, D.C. 20314-1000

4.6.4 Document and Submittal List.

	Abbrev. Draft	SHERP Final	Geophys. Wk. Plans	Geophys. Reports	Soil-Gas Wk. Plns	Soil-Gas Reports
CEHND-ED-PM	6	6	6	6	6	6
USAMC	0	0	1	1	1	1
DESCOM	0	0	2	2	2	2
CETHA-IR-D	2	2	2	2	2	2
CEMRD-ED-EA	3	3	3	3	3	3
CEMRD-EA-GL	0	0	1	1	1	1
SDSSE-HE	10	10	10	10	10	10
CENAD-CO-EP	0	0	0	0	0	0
USAEHA	0	0	0	0	0	0
CEMP-RI	0	0	0	0	0	0
TOTAL	21	21	25	25	25	25

	RI/FS Work Plans			~~RI/FS Report~~		
	Draft	Draft-Final	Final	Draft	Draft-Final	Final
CEHND-ED-PM	6	6	6	6	6	6
USAMC	1	1	1	1	1	1
DESCOM	2	2	2	2	2	2
CETHA-IR-D	2	2	2	2	[illegible]	2
CEMRD-ED-EA	3	3	3	3	[illegible]	3
CEMRD-EA-GL	1	1	1	1	1	1
SDSSE-HE	10	23	23	10	10	10
CENAD-CO-EP	1	1	1	1	1	1
USAEHA	1	1	1	7	7	7
CEMP-RI	0	0	0	1	0	1
TOTAL	27	40	40	~~34~~	~~33~~	~~34~~

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	~~Record of Decision~~		
	Draft	Draft-Final	Final
CEHND-ED-PM	6	6	6
USAMC	1	1	1
DESCOM	2	2	2
CETHA-IR-D	2	2	2
CEMRD-ED-EA	3	3	3
CEMRD-EA-GL	[illegible]	1	1
SDSSE-HE	10	10	10
CENAD-CO-EP	1	1	1
USAEHA	0	0	0
CEMP-RI	1	0	1
~~TOTAL~~	~~27~~	~~26~~	~~27~~

DELETE

5.0 SAFETY REQUIREMENTS.

Site activities in conjunction with this project may pose unique safety, chemical, and/or biological exposure hazards which require specialized expertise to effectively address and eliminate. The AE shall prepare and submit a Safety, Health and Emergency Response Plan (SHERP) to the Contracting Officer (CO) which shall address accident prevention, personal protection against chemical exposures, and emergency response procedures. The SHERP shall establish in detail the protocols necessary for protecting workers and on-site personnel, the public, and the environment from any hazards associated with well installation, soil borings, water sampling, and sediment sampling equipment and procedures; and from hazards associated with potential exposures from chemicals, agents, or situations suspected or known to be on the site. A Draft SHERP shall be submitted as a separately bound document to the CO for approval prior to the commencement of any on-site activity which, with revisions, will stand as the Final SHERP for this site. For initial site entry activities, geophysical surveys, and soil-gas investigation, an "abbreviated" SHERP shall be prepared and approved. This "abbreviated" SHERP need not be as detailed as the Final SHERP covering all other field activities. However, as a minimum, the "abbreviated" SHERP shall address tasks to be performed, the potential hazards (if any) resulting from those activities, and the measures to be implemented (personal protective equipment, monitoring, etc.) to protect personnel while on-site. Remaining field work shall not be performed until the Final SHERP has been reviewed and approved by the CO. All work shall be performed according to the approved SHERPs. The SHERPs shall be prepared in accordance with the requirements specified in this section. The SHERPs must be prepared and administered by a Certified Industrial Hygienist (CIH). Qualifications for the CIH shall consist of training and experience commensurate with the hazards to be encountered for the project. The SHERP shall comply with all federal, state, and local health and safety requirements, e.g., the Occupational safety and Health Administration (OSHA) requirements (29 CFR 1910 and 1926), the U.S. Environmental Protection Agency (USEPA) hazardous waste requirements (40 CFR 260-270), the U.S. Army Corps of Engineers

Safety and Health Requirements Manual (EM 385-1-1), and the U.S. Army Materiel Command Safety Manual, AMC-R 385-100. The SHERPs shall include but not limited to:

5.1 Organization/Administration. The AE shall assign responsibilities for safety activities and procedures. A Certified Safety Professional (CSP) shall be designated to implement the SHERPs for all onsite activities. A person certified in first aid/CPR by the Red Cross or equivalent, shall be continuously present on-site during operations.

5.2 Standard Operating Procedures (SOPs). The AE shall outline standard operating procedures (SOPs) for preventing accidents, and protecting personnel from injury and occupational illness for all operations having a significant accident potential. Approved SOPs will be made available to prime and subcontractor personnel for personnel information guidance and compliance.

5.3 Identification of Hazards. The AE shall review existing records and data to identify potential hazards associated with the designated drilling and sampling sites and to evaluate their impact on field operations. The AE shall develop action levels for controlling worker exposure to the identified hazards in accordance with appropriate requirements.

5.4 Personal Protective Equipment. The AE shall provide appropriate personal protective equipment (PPE) to ensure workers, official visitors and government employees are protected from exposure to recognized physical hazards and protected from exposure to hazardous chemical concentrations above the action level (Levels A, B, C, D, and modifications) for each operation stated for each work zone. The level of protection shall be specified in the SOP for each operation. The AE shall provide and maintain all PPE.

5.5 Safety and Health Training. The AE shall, as a minimum provide training to his employees complying with the requirements of 29 CFR 1910.120. The program shall inform employees, official visitors and government employees of the special hazards and procedures (including PPE, its use and inspection) to control these hazards during field operations. Employees shall be trained in emergency procedures, areas of restricted access, methods of decontamination, and general safety. All prime and subcontractor personnel shall complete this program prior to beginning on-site work. The AE shall keep individual training records on all workers associated with the project and submit a copy of these records in the draft SOP.

5.6 Monitoring. The AE shall provide continuous monitoring of the identified hazards associated with the designated drilling sites for controlling worker exposure during field operation. When applicable, National Institute for Occupational Safety and Health (NIOSH) approved sampling and analytical methods must be used.

5.7 Emergency Procedures. The AE shall establish procedures to take emergency action in the event of immediate hazards, i.e.,a chemical agent leak or spill, fire, or personal injury. The AE designated CSP shall serve as the emergency coordinator. Personnel and facilities providing support in emergency procedures shall be identified. Specify the emergency equipment to be present on-site and the Emergency Response Plan procedures, as required by 29 CFR 1910.120 (1) (1) (ii).

5.8 Medical Surveillance. Prime and subcontractor personnel shall have medical examinations prior to commencement of work. The medical examination results shall be evaluated by a board-certified or board-eligible licensed physician practicing occupational medicine to determine if the individual is physically fit for the work to be performed and that no physical condition or disease would be aggravated by exposure to the identified hazards. Medical records shall be available for review by the CO upon request. Specify exam content and frequency.

5.9 First Aid. The AE shall provide appropriate emergency first aid equipment suitable for treatment of exposure to identified hazards, including chemical agents. A vehicle shall be made available to transport injured workers to medical facilities identified in the SHERP.

5.10 Accident Prevention, Recording and Recordkeeping. An accident prevention plan and description of work phase safety plans shall be addressed, as discussed in Paragraphs 01.A.03 thru 01.A.06 and Appendix Y of COE EM 385-1-1 for those topics not specifically addressed by this listing. The AE shall immediately notify the CO of any accident/incident. Within two working days of any reportable accident the AE shall complete and submit to the CO an Accident Report on ENG Form 3394 in accordance with AR 385-40 and OCE supplement 1 to that regulation.

5.11 Safety Inspection. The AE shall conduct regular safety inspections to determine if operations are being conducted in accordance with established SOPs.

5.12 Site Layout and Control. Include a site map, work zone delineation, on/off-site communications, site access controls, and security (physical and procedural). The AE will determine three areas; exclusion, contamination reduction and support, for each work site. No person shall be allowed entry into the exclusion and contamination reduction areas unless in compliance with Sections 5.4, 5.5, and 5.8.

5.13 Air Monitoring Program. Specify the types and frequency of air monitoring/sampling to be performed. Include real-time (direct-reading) monitoring and integrated (TWA) sampling for specific contaminants of concer, as appropriate. Discuss instrumentation and calibration to be performed.

5.14 Health and Safety Work Precautions. Buddy system, eating and drinking precautions, smoking and ignition sources, potentially hazardous noise, explosive atmosphere, illumination, heat or cold stress, confined space entry precautions, eye wash stations, fire extinguishers, sanitation, and routine safety inspections shall be discussed.

5.15 Personnel and Equipment Decontamination. Specify decon facilities and procedures for personnel protective equipment, sampling equipment, and heavy equipment.

5.16 Logs, Reports, and Recordkeeping. Safety inspection reports, accident/incident reports, medical certifications, training logs, monitoring results, etc. All exposure and medical monitoring records to be maintained according to OSHA standard 29 CFR 1910.20.

5.17 Unexploded Ordnance. The facility is a military installation and has been used for storage, evaluation and disposal of ordnance and or explosive materials as well as for military training. If explosive contamination or unexploded ordnance is discovered at any time during operations at the site the AE shall mark the location, immediately stop operations in the affected area, and notify the CO. The Government will make appropriate arrangements for evaluation and proper disposal of the device. It is anticipated that in the unlikely event that such conditions arise, they will be overcome with only slight delays to the AE. It is the express intention of the Government that the AE is not to drill, excavate, or otherwise disturb the subsurface in areas where ordnance or explosives may reasonably be suspected unless specific, detailed plans to do so are prepared and approved.

5.18 <u>Suggested SHERP Format.</u>

STAFF ORGANIZATION

- Principal Engineer
- Program Manager
- Certified Industrial Hygienist
- Certified Safety Professional
- First Aid/CPR Personnel
- Field Personnel
- Subcontractor Personnel

HAZARD COMMUNICATION AND TRAINING

- Comprehensive Health and Safety Indoctrination
- Specialized Training
- Visitor Training
- Pre-Investigation Health and Safety Briefing
- Post-Investigation Health and Safety Briefing
- Morning Safety Meetings

MEDICAL SURVEILLANCE

- Medical Surveillance
- Licensed Occupational Physician
- Medical Examinations

EXPOSURE MONITORING

- Environmental and Personnel Monitoring
- Meteorological Monitoring
- Sampling and Analytical Methods
- Heat/Cold Stress Monitoring

HEALTH AND SAFETY EQUIPMENT

- Personal Protective Equipment
- Environmental Monitoring Equipment
- Decontamination Equipment
- Emergency Equipment
- Emergency-Use Respirators
- Spill Control Equipment
- Fire Extinguishers
- First Aid Equipment and Supplies
- Emergency Eye Wash/Shower (ANSI Z358.1)
- Personnel Hygiene
- Personnel Decontamination
- Communications

STANDARD OPERATING PROCEDURES

- Health and Safety Site Plan
- Site Description
- Site Inspection
- Site Security
- Site Entry Procedures
- Responsibilities
- Work Zones
- Hazard Evaluation
- Activity Hazard Analysis
- Accident Prevention
- Accident Reporting
- Safe Work Practices

Confined Space Entry Procedures
Material Handling Procedures
Levels of Protection
Decontamination Procedures
Emergency Information
Emergency Response Plan
Illumination
Sanitation
Well Installation/Logging
Sampling
Land Survey
Laboratory Analysis
Logs, Reports, and Recordkeeping

6.0 QUALITY ASSURANCE PROJECT PLAN REQUIREMENTS

The AE shall prepare and submit the Quality Assurance Project Plan (QAPP) according to the requirements of this section, ER 1110-1-263, and the definitions given in Paragraph 6.9. The site specific field and laboratory QC/QA plan shall be included. The AE shall propose only methods and procedures in the work plans acceptable to EPA and the State of New York.

6.1 Approval. The work plan must be approved by the CO prior to performing any field work. In the event corrections or comments are made by the CO on the draft plan, any necessary changes shall be implemented by the AE before final approval.

6.2 AE Responsibility for Chemical Analyses. It is the responsibility of the AE to properly collect, transport, analyze and present the data pertaining to chemical analysis. If the AE or his subcontractor does not follow the specified criteria and approved work plans and thereby jeopardizes the samples, the Contracting Officer will disapprove the samples and direct the AE to resample, analyze, and present the data at no additional cost to the Government. If directed to do so by the Contracting Officer, the AE shall collect and send representative "split" samples to the US Army Corps of Engineers, Missouri River Division Laboratory (CEMRD-ED-GC, 402-221-7324). The

AE will not be responsible for the analysis of the "split" samples or subsequent reporting results. The AE, however, is required to defend his results if there is disagreement between the samples analyzed by the AE and the samples analyzed by the CEMRD laboratory.

6.3 <u>Content</u> <u>and</u> <u>Format</u>. The plan shall address each of the topics in Paragraphs 6.4 through 6.8.5. The following outline shall be used as applicable.

SECTION 1.0 PROJECT ORGANIZATION AND RESPONSIBILITY
SECTION 2.0 SAMPLING
    2.1 Selection of Sampling Locations
    2.2 Samples to be Collected
        2.1.1 Soil/Sediment Samples
        2.1.2 Groundwater Samples
        2.1.3 Soil-Gas Samples
        2.1.4 QC/QA Samples
    2.3 Sample Collection Methods
    2.4 Sample Containers
    2.5 Sample Preservation
    2.6 Identification
    2.7 Transportation and Custody
SECTION 3.0 ANALYSES
    3.1 Parameters
    3.2 Analytical Methods
    3.3 Laboratory QC/QA
SECTION 4.0 DATA ANALYSIS AND REPORTING
SECTION 5.0 PROGRAM CONTROLS
SECTION 6.0 AIR MONITORING

6.4 <u>Project</u> <u>Organization</u> <u>and</u> <u>Responsibility</u>. The project organization for the prime contractor and any subcontractors shall be clearly defined with a discussion of quality control responsibilities. The AE's Quality Control (QC) Officer shall report to a responsible senior officer of the company that is QC management shall be separate from project management. A list of key individuals shall be provided, including those with QC responsibilities.

The project-related qualifications of the AE's analytical laboratory shall be addressed in terms of equipment, facilities, and personnel. Names of laboratory supervisors, chemists, technicians and QC officers shall be given with brief resumes chronologically listing education and experience. The project schedule and list of responsible persons shall be stated.

6.5 Sampling. Unless otherwise specified in this SOW and contract, all sampling and sample custody procedures shall be consistent with EPA and State of New York guidelines.

6.5.1 Selection of Sampling Locations. For sampling sites to be chosen in the field, the plan shall describe the rationale that will govern their selection. The plan shall provide the location of each known sampling point on a site map. The plan shall discuss geological and hydrological influences on sample location, and provisions to insure that samples are representative of the site through the use of appropriate field control samples.

6.5.2 Samples to be Collected. The plan shall list or tabulate the samples to be collected, showing the number of samples, types, locations and analytes. The list shall include field controls. Samples collected and prepared in the field shall include: soil samples, groundwater samples, and field control samples, as described in succeeding paragraphs.

6.5.2.1 Soil Samples. The plan shall list or tabulate samples to be collected from the soil borings and test pits for chemical analysis, indicating number, location, depth and analyses required.

6.5.2.2 Groundwater Samples. Each of the groundwater monitoring wells shall be sampled once, by the procedure specified in Paragraph 6.5.3.2. All sampling of wells installed under this delivery order shall be accomplished within a period not exceeding five consecutive days. All samples to be analyzed for metals shall be filtered at the time of collection through filter membranes with a nominal pore size of 0.45 microns.

6.5.2.3 Field Control Samples. A minimum of 10% of all groundwater samples collected shall be QC/QA (5% QC, 5% QA). At least two sampling blanks (1 QC, 1 QA) and two duplicates (1 QC, 1 QA) shall be collected. If samples are to be tested for volatiles, at least two travel blanks shall be included

(1 QC, 1 QA). A minimum of 10% of all soil samples collected shall be QC/QA (5% QC 5% QA). Soil QC/QA shall be splits/duplicates. At least two duplicates/splits shall be collected (1 QC/1 QA).

6.5.2.4 Summary. The types and numbers of samples required are summarized in "Types and Numbers of Samples Collected", Table 1.

6.5.3 Sample Collection Methods and Equipment. The plan shall include specific sampling procedures and equipment to be used to collect the various samples. Appropriate references or descriptions shall be given as needed including sample sizes, containers, equipment, etc. Collection and preservation methods shall be consistent with the specified analytical methods and other standards.

6.5.3.1 Prevention of Cross-Contamination. The plan will describe cleaning of equipment and precautions for preventing contamination of samples during collection.

6.5.3.2 Groundwater Sampling. Before a sample is collected from a well, the depth to water from the surveyed reference point shall be measured and recorded. Then the well shall be pumped or bailed with clean equipment to remove a quantity of water equal to at least five times the submerged volume of the casing. If the well does not recharge fast enough to permit removing five casing volumes, the well shall be pumped or bailed dry, and allowed to recharge for four hours. If the well has recharged to greater than 50 percent of the static water level, then two to three well volumes shall be removed. If the well does not recover to 50 percent of the static water level in four hours, then the well shall be pumped dry a second time and sampled as soon as sufficient recharge has occurred. The sample taken from the well for chemical analyses shall be collected from the screened portion of the well and not from the overlying riser section or the underlying sand-sump section of the well. The plan shall describe details of the sample collection procedure.

6.5.3.3 Collection of Soil Samples. The plan shall include complete details of the proposed procedure for collecting soil samples.

6.5.4 Sample Containers. List the composition and volume of containers to be used according to sample type (soil, water, air, etc.) and analyte. Describe cleaning and other preparation of containers.

6.5.5 Sample Preservation. List or tabulate the required preservation methods and maximum holding times, by sample type and analyte.

6.5.6 Identification. Describe the proposed system for identifying, labeling and tracking samples. Include recording of field data in permanently bound notebooks, and the system for relating field data to the proper samples.

6.5.7 Transportation and Custody. Describe packing, shipping or other transportation and custody documentation, in accordance with "Sample Handling Procedures," HND Guideline, September, 1986.

6.6 Analyses.

6.6.1 Parameters. The plan shall tabulate the samples to be collected and analyses to be performed. Tables 1 and 2 lists required analyses and approved methods. Analysis as listed in the Table shall be performed on each field sample as well as on field controls sent to the AE's laboratory or subcontract laboratory. Laboratory controls (internal QC samples) are not listed, but shall be included in the approved QAPP. Alternate methods and variation in procedures to those in the Tables may be used if approved by the CO and described in the approved plan.

6.6.2 Analytical Methods. Each proposed method must be specified exactly and in detail by one of the following: (1) Reference to an accepted published method, e.g., an EPA, SM, or ASTM method, if the published procedure is followed exactly, or (2) reference to an accepted published method with a description of any deviations from the published procedure, or (3) complete description of the procedure, e.g., copies of laboratory instructions. Descriptions of any pre-treatment or preparation of the sample required before the actual analysis shall be included. Include the required concentration ranges, and data on the sensitivity (detection limits), precision and accuracy, by analyte and sample matrix in the descriptions of methods. Detection limits shall correspond to the Contract Laboratory Program of the USEPA. Indicate how pre-existing data on sensitivity, precision and accuracy were determined, and procedures to be used to validate the methods for the matrices in question.

6.7 Data Analysis and Reporting. For each analytical method and major measurement parameter, the following information shall be provided:

6.7.1. The data analysis scheme including units and equations required to calculate concentrations or the value of the measured parameter.

6.7.2. Plans for treating results that appear unusual or questionable. Describe the feedback systems used to identify problems by means of the results obtained from control samples. Limits of data acceptability shall be included with the corrective action to be taken when these limits are exceeded. Personnel responsible for initiating and carrying out corrective action shall be indicated. Describe how re-establishment of control is demonstrated. Unacceptable contamination levels in blanks, and the maximum acceptable disagreement between replicate samples and between field duplicate/split samples shall be stated in the Quality Assurance Project Plan. These limits shall correspond to those required by the Contract Laboratory Program of the USEPA. Corrective action to be taken when these limits are exceeded shall be described, and the circumstances that require collection of new samples at no additional cost to the Government shall be specified.

6.7.3. Description of the data management systems, including the collection of raw data, data storage and data quality assurance documentation.

6.7.4. Identification of individuals to be involved in the reporting sequence.

6.7.5. Description or illustration of the proposed data reporting format. Only quantified concentrations of analytes shall be reported.

6.7.6. Procedures to assess the precision, accuracy and completeness of all measurement parameters. The AE shall report precision based on standards and known additions. If statistical procedures are used for data review before reporting, include descriptions.

6.8 Program Controls

6.8.1 Calibration Procedures and Frequency. List field and laboratory instrumentation, specifying manufacturers, models, accessories, etc., with procedures used for calibration and frequency of checks. The instrumentation and calibration should be consistent with the requirements of the contract and the analytical method requirements.

6.8.2 Internal Quality Control Checks. Internal quality control checks are necessary to evaluate performance reliability for each measurement parameter. The numbers and types of internal QC checks and samples proposed (e.g. blanks, duplicates, splits, "spiked" samples and reference standards, as applicable) shall be defined clearly in the work plan and summarized by methods and analytes. The laboratory's established practice for including control samples among the samples tested, and any additional controls required by the present project, shall be described.

6.8.3 Preventive Maintenance. A system for preventive maintenance for facilities and instrumentation shall be described. Preventive maintenance shall be performed by qualified personnel. Records shall be maintained and shall be available for inspection by the CO on request and subsequent repairs, adjustments and calibrations shall be recorded.

6.8.4 External Certification. Prior to any sampling activities under this SOW, the AE's analytical laboratory must be validated by the US Army Corps of Engineers, Missouri River Division (CEMRD-ED-GC, 402-221-7324) or its representative for the contaminants of concern. It is the responsibility of the AE's laboratory to achieve validation from CEMRD independent of CEHND and this delivery order. The AE should start the validation process as soon as this delivery order is awarded since the process takes approximately six (6) to eight (8) weeks.

6.8.5 Laboratory QC. Laboratory QC results shall be submitted to the QA laboratory as soon as it becomes available.

6.9 Definitions. The following terms and meanings are given as they are applied here, since usage and terminology in this field are not yet standardized.

6.9.1 Field Blank Sample is a trip blank, rinsate sample, field background soil blank sample submitted with the field samples for QC/QA purposes.

6.9.2 Field Control Samples are field splits, duplicates/replicates and Field Blank Samples submitted with the field samples for QC/QA purposes.

6.9.3 Trip or Travel Blanks are Type II Reagent Grade organic-free deionized water in 2 x 40 mL VOA vials that accompany the sample containers to the field and back to the laboratory. Trip blanks are used only for coolers containing aqueous samples for volatile organic analysis. These blanks, as well as all other samples being submitted for volatile organic analysis, are to contain no headspace.

6.9.4 Rinsate Blanks are collected rinse water (Type II Reagent Grade) from the final rinses of the sampling equipment. Rinsate blanks are to be used in conjunction with volatile, semi-volatile and in-organic analysis of water samples. Sample preservation and containers shall be appropriate for the analytes of interest.

6.9.5 Soil Blanks (Background) are used to establish background levels of metals and other analytes in soils. These are normally collected from visually clean soil near the site. The field background soil blank sample is usually counted along with the field samples. It is collected in duplicate and submitted to the AE's laboratory and the QA laboratory along with the field samples.

6.9.6 Splits are two or more subsamples of one large sample. These are taken after compositing a large soil sample (after samples for volatile analyses have been removed). Splits are used for both QA and QC purposes for soil samples for all analytes excluding volatiles. It is acceptable to split soil samples into three portions after compositing (field sample, split for QA, and split for QC).

6.9.7 Duplicates or Triplicates are separate samples collected at the same location and time as the original sample. Duplicates or triplicates are preferred over splits for volatile organic analyses of soil samples because compositing leads to loss of volatile components. Water samples for QA/QC checking are also duplicate or triplicate samples.

6.9.8 Check/Calibration Standards are used to calibrate field instruments such as the VOA meter and are used to establish control limits for analytical parameters.

6.9.9 Quality Assurance Samples are collected by the sampling team for use by the government's QA laboratory. The purpose of the sample in to assure the government that the data generated by the AE's analytical laboratory are of suitable quality.

6.9.10 Quality Control Samples are collected by the sampling team for use by the AE's laboratory. The identity of these samples is held blind to the analysts and laboratory personnel until data are in deliverable form. The purpose of the sample is to provide site specific field originated checks that the data generated by the AE's analytical laboratory are of suitable quality.

6.9.11 Internal QC Sample or Laboratory Control. A reference standard, standard addition, replicate sample, blank or other sample are samples in which the analyte concentration is known or can be calculated, which is placed among the samples to be analyzed in order to evaluate or demonstrate validity of the analytical results.

6.9.12 Reference Standard. A sample prepared from pure reagents to contain one or more analytes at known concentrations.

6.9.13 Standard Addition or "Spiked" Sample. A field sample to which known concentrations of one or more analytes have been added.

6.9.14 Laboratory Replicate Samples. Subsamples of a single field sample which are divided at the laboratory and analyzed as separate samples.

6.9.15 Replicate Analyses. Multiple analyses performed on the same sample.

6.9.16 Laboratory Blank. A sample prepared at the laboratory from pure materials containing none of the analyte. Laboratory blanks include method blanks, reagent blanks and others.

TABLE 1
Total Types and Numbers of Samples Collected
SUMMARY OF BASIC CONTRACT REQUIREMENTS

		Quality Assurance and Quality Control					
	Field	Splits/Dups		Rinsates		Trip Blanks	
	Samples	QC(AE)	QA(CE)	QC(AE)	QA(CE)	QC(AE)	QA(CE)
GROUNDWATER(1):							
Volatiles	20	1	1	1	1	1	1
B/N/A						NR	NR
Pesticides/PCB's						NR	NR
TRPH						NR	NR
Total Metals	20	1	1	1	1	NR	NR
Total Dis. Metal	20	1	1	1	1		
SURFACE WATER(2):							
Volatiles	10	1	1	1	1	1	1
B/N/A						NR	NR
Pesticides/PCB's						NR	NR
TRPH						NR	NR
Total Metals	10	1	1	1	1	NR	NR
Total Dis. Metal	10	1	1	1	1		
SURFACE SOILS:							
Volatiles				NR	NR	NR	NR
B/N/A				NR	NR	NR	NR
Pesticides/PCB's				NR	NR	NR	NR
TRPH				NR	NR	NR	NR
Metals				NR	NR	NR	NR
Other:_________				NR	NR	NR	NR
SUBSURFACE SOILS(3):							
Volatiles	50	3	3	NR	NR	NR	NR
B/N/A				NR	NR	NR	NR
Pesticides/PCB's				NR	NR	NR	NR
TRPH				NR	NR	NR	NR
Metals	50	3	3	NR	NR	NR	NR
EP TOX	50	3	3	NR	NR	NR	NR

(1) At least one monitoring well shall sampled to check "background."
(2) One of the surface water samples shall be collected to test "background."
(3) Field samples must include at least one "background" soil sample from each area.

TABLE 2-17
Types and Numbers of Samples Collected

		Quality Assurance and Quality Control					
	Field	Splits/Dups		Rinsates		Trip Blanks	
	Samples	QC(AE)	QA(CE)	QC(AE)	QA(CE)	QC(AE)	QA(CE)
GROUNDWATER:							
Volatiles	______	______	______	______	______	______	______
B/N/A	______	______	______	______	______	NR	NR
Pesticides/PCB's	______	______	______	______	______	NR	NR
TRPH	______	______	______	______	______	NR	NR
Metals	______	______	______	______	______	NR	NR
Other:__________	______	______	______	______	______	______	______
SURFACE WATER:							
Volatiles	______	______	______	______	______	______	______
B/N/A	______	______	______	______	______	NR	NR
Pesticides/PCB's	______	______	______	______	______	NR	NR
TRPH	______	______	______	______	______	NR	NR
Metals	______	______	______	______	______	NR	NR
Other:__________	______	______	______	______	______	______	______
SURFACE SOILS:							
Volatiles	______	______	______	NR	NR	NR	NR
B/N/A	______	______	______	NR	NR	NR	NR
Pesticides/PCB's	______	______	______	NR	NR	NR	NR
TRPH	______	______	______	NR	NR	NR	NR
Metals	______	______	______	NR	NR	NR	NR
Other:__________	______	______	______	NR	NR	NR	NR
SUBSURFACE SOILS:							
Volatiles	__50_	__3_	__3_	NR	NR	NR	NR
B/N/A	______	______	______	NR	NR	NR	NR
Pesticides/PCB's	______	______	______	NR	NR	NR	NR
TRPH	______	______	______	NR	NR	NR	NR
Metals	__50_	__3_	__3_	NR	NR	NR	NR
EP TOX	__50_	__3_	__3_	NR	NR	NR	NR

TABLE 2-18
Types and Numbers of Samples Collected

		Quality Assurance and Quality Control					
	Field Samples	Splits/Dups		Rinsates		Trip Blanks	
		QC(AE)	QA(CE)	QC(AE)	QA(CE)	QC(AE)	QA(CE)
GROUNDWATER:							
Volatiles	20	1	1	1	1	1	1
B/N/A						NR	NR
Pesticides/PCB's						NR	NR
TRPH						NR	NR
Total Metals	20	1	1	1	1	NR	NR
Total Dis. Metal	20	1	1	1	1		
SURFACE WATER:							
Volatiles	10	1	1	1	1	1	1
B/N/A						NR	NR
Pesticides/PCB's						NR	NR
TRPH						NR	NR
Total Metals	10	1	1	1	1	NR	NR
Total Dis. Metal	10	1	1	1	1		
SURFACE SOILS:							
Volatiles				NR	NR	NR	NR
B/N/A				NR	NR	NR	NR
Pesticides/PCB's				NR	NR	NR	NR
TRPH				NR	NR	NR	NR
Metals				NR	NR	NR	NR
Other:				NR	NR	NR	NR
SUBSURFACE SOILS:							
Volatiles				NR	NR	NR	NR
B/N/A				NR	NR	NR	NR
Pesticides/PCB's				NR	NR	NR	NR
TRPH				NR	NR	NR	NR
Metals				NR	NR	NR	NR
Other:				NR	NR	NR	NR

TABLE 3
SUGGESTED METHODS FOR SAMPLE ANALYSIS

Analyte	Technique	Soil	Groundwater	Surface Water(1)
Arsenic (As)	GF	3050/7060	7060	206.2
	H	7061	7061	206.3
Barium (Ba)	DA	3050/7080	3005/7080	208.1
	GF	----	----	208.2
	ICP	3050/6010	3005/6010	200.7
Cadmium (Cd)	DA	3050/7130	3005/7130	213.1
	GF	3050/7131	3020/7131	213.2
	ICP	3050/6010	3005/6010	200.7
Chromium (Cr)	DA	3050/7190	3005/7190	218.1
	GF	3050/7190	3020/7191	218.2
	ICP	3050/6010	3005/6010	200.7
Lead (Pb)	DA	3050/7420	3005/7420	239.1
	GF	3050/7421	3020/7421	239.2
	ICP	3050/6010	3005/6010	200.7
Mercury (Hg)	CV	7471	7470	245.1
Selenium (Se)	GF	3050/7740	7740	270.2
	H	7741	7741	270.3
Silver (Ag)	DA	7760	7760	272.1
	GF	----	----	272.2
	ICP	3050/6010	3005/6010	200.7
EP Toxicity	---	1310	----	----
Volatile Organics	GC/MS	8240	8240	624

DA=Direct Aspiration
GF=Graphite Furnace
H=Hydride
CV=Cold Vapor

ICP=Inductively Coupled Plasma
GC=Gas Chromatograph
GC/MS=Gas Chromatograph/Mass Spectroscopy

(1) Surface water samples may also be analyzed by the SW-846 methods listed for groundwater.

(2) USATHAMA Methods.

7.0 SOIL BORING AND MONITORING WELL REQUIREMENTS.

The following requirements shall be incorporated into the AE's Soil Boring and Monitoring Well Installation Plan and followed in the field. The plan shall be prepared using the following outline as applicable:

SECTION 1.0 INTRODUCTION AND BACKGROUND
SECTION 2.0 WELL AND BORING LOCATIONS AND DEPTHS
SECTION 3.0 DRILLING EQUIPMENT
SECTION 4.0 DRILLING PROCEDURES
SECTION 5.0 CONTAMINATION PREVENTION AND DECONTAMINATION PROCEDURES
SECTION 6.0 WELL DESIGN AND INSTALLATION
SECTION 7.0 WELL DEVELOPMENT
SECTION 8.0 IN-SITU PERMEABILITY
SECTION 9.0 PROJECT ASSIGNMENTS & PERSONNEL QUALIFICATIONS

7.1. Location. Monitoring well locations shall be proposed by the AE as part of the plan prior to commencement of drilling activities. The AE shall obtain written approval from the facility engineer, to drill at each site to avoid disturbing buried utilities.

7.2. Design of Monitoring Wells. The design and installation of all monitoring wells shall follow as closely as practical the design for properly installed, low-yield domestic water supply wells. Recommended practices for such wells are set out in "Manual of Water Well Construction Practices", U.S. EPA Publ. EPA 570/9-75-001 (Reference 11.2). Additional design recommendations are given in "Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities", USEPA Publ. No. EPA 530/SW-611 (Reference 11.1). State and local certification requirements for drillers shall be met. State and local design and installation requirements shall be met. The AE shall be responsible for obtaining any soil boring or well drilling permits required by state or local authorities and for complying with state or local regulations concerning submission of well logs and samples.

7.3 Containerization of Drill Cuttings and Development Water. The AE shall contain all drill cuttings and well development water in DOT approved 55 gallon drums. The AE shall, at the end of each phase of drilling, provide documentation based upon the results of the required chemical analyses, evaluation of site conditions and knowledge of regulatory requirements, which recommend the disposition for each drum of waste. For each drum considered to contain regulated amounts of hazardous waste, the AE shall recommend a specific, optimum disposal method, along with the price for disposal. The AE shall label and manifest, according to RCRA regulations, each drum of material which is to be handled as hazardous waste. Actual disposal shall be the responsibility of the Government.

7.3. Installation of Monitoring Wells.

7.3.1 General Requirements. The AE shall provide all drilling equipment, materials and personnel required to install the wells, as well as a qualified geologist or geotechnical engineer who shall be on-site for all drilling, installation, development and testing operations. The AE shall submit proposed drilling methods in the Monitoring Well Installation Plan. Any changes to the approved drilling methods must be submitted to the Contracting Officer for prior approval.

7.3.2. Protection of Water Yielding Zones. The use of any liquid, including water, is to be avoided during drilling and will only be permitted by the Contracting Officer in cases where he determines that it is absolutely necessary for successful installation of the well. If water is required during drilling or well installation, only non-chlorinated potable water will be permitted. Any proposed use of water must be approved by the Contracting Officer beforehand. Grease or oil on drill rod joints will not be permitted. Dispersing agents (such as phosphates) or acids shall not be used. There shall be no attempt made to chemically disinfect the well. The rigs, drill tools, and associated equipment shall be cleaned with steam and washed and rinsed with a decontaminating liquid prior to commencement of drilling at each well and boring location. It is expressly required that toxic and/or contaminating substances shall not be used during any part of the drilling, well installation or well development processes. All drilling activities and methods shall be sufficient to prohibit the introduction of contaminants from one water bearing stratum to another via the well bore or completed well.

7.3.3 Well Design.

7.3.3.1 Boring Diameter. The boring shall be of sufficient diameter to permit at least two (2) inches of annular space between the boring wall and all sides of the centered riser and screen.

7.3.3.2 Well Riser and Screen.

7.3.3.2.1 Riser. Well riser shall consist of new threaded, flush joint, stainless steel pipe with a two (2) inch nominal diameter. Well risers shall, as a minimum, conform to the requirements of ASTM D-1785 Schedule 40 pipe and shall is clearly identified as the material which is specified.

7.3.3.2.2 Screen. The well screen shall be five (5) feet in length and shall be constructed of stainless steel similar to the well riser. The screen shall be noncontaminating, factory constructed and of "continuous wrap" or "mill-slot" design. Field slotted or cut screen is not permitted. The slot size shall be determined by the AE and designed to be compatible with aquifer and filter pack material. The AE shall provide a sieve analysis of one or more representative samples of the aquifer material in which the screen is placed and which demonstrates that the screen is compatible with the aquifer material. The sieve analysis shall be conducted in accordance with ASTM C 117 and C 136 and results shall be submitted to the Contracting Officer with the field boring logs.

7.3.3.2.3 Screen Location. The AE shall have the responsibility of placing the well screen in the appropriate location in the bore hole so that the completed monitoring well functions satisfactorily.

7.3.3.2.4 Sand-Sump. There shall be a 2-foot minimum length "sand-sump" placed below the base of the screen. The sand-sump shall be a blank section of riser conforming to the requirements of riser as described above. The sand-sump will be installed only if the screen can be placed at the appropriate interval without the sand-sump penetrating any underlying aquitards.

7.3.3.2.5 Joining Screen and Riser. Screen and riser sections shall be joined by threaded, flush-joint couplings, to form watertight unions, that retain 100% of the strength of the screen. Solvent glue shall not be used at any time in construction of the wells. The bottom of the deepest screen or casing section shall be sealed with a threaded cap or plug of inert, non-corroding material similar in composition to the screen itself.

7.3.3.2.6 Well Plumbness and Alignment. All risers and screens shall be set round, plumb, and true to line. Centralizers shall be used to assure plumbness and alignment of the wells. Centralizers shall not be installed on the well screen.

7.3.3.3 Filter Pack. The AE shall select and use clean, inert, siliceous materials to construct a uniform and continuous filter pack designed to prevent migration of fines into the screen. Carbonate or crushed stone material shall not be used. The filter pack shall be placed by tremie pipe from the bottom of the boring to approximately two (2) feet above the top of the well screen. Natural development methods may be used when appropriate.

7.3.3.4 Bentonite Seal and Grout. A minimum two (2) foot seal, consisting of tamped bentonite pellets or bentonite slurry shall be placed into the annular space between the riser and boring wall at the top of the filter pack. Non-shrinking cement grout shall then be placed from the top of the bentonite seal to the ground surface. The cement grout shall consist of a mixture of portland cement (ASTM C-150), and water in the proportion of not more than seven (7) gallons of clean water per bag of cement (One cubic foot or 94 pounds). Additionally, 3% by weight of bentonite powder shall be added if permitted by State regulations.

7.3.4 Soil Sampling for Geotechnical Analysis. During drilling of soil borings and monitoring wells, soil samples shall be collected and geotechnical analysis shall be performed as outlined below.

7.3.4.1 Dry, hollow stem or solid auger methods of drilling shall be used wherever subsurface conditions allow.

7.3.4.2 Soil samples shall be taken continuously for the first 10 feet and at 5-foot intervals thereafter.

7.3.4.3 Sampling shall be done with a split-spoon sampler ASTM D-1586 or thin wall sampler ASTM D-1587 using standard sampling techniques.

7.3.4.4 Samples shall be stored in labeled, air-tight plastic or glass containers by the AE until such time as they are needed for testing or the contract is complete.

7.3.4.5 All soil samples shall be visually classified by the Unified Soil Classification System. The AE shall verify the classification by laboratory analyses consisting of the following:

Test Description	# Required/ Well
a. Grain-size distribution (ASTM D-421 & 422)	3
b. Atterburg limits (ASTM D-423 & 424)	3
c. Moisture content (ASTM D-2216)	3

Specific soil samples to be tested, along with type of test, will be determined by the AE after reviewing the boring logs. Laboratory analyses shall use equipment and methods described in EM-1110-2-1906 or ASTM manuals.

7.3.5 Protection of Well. At all times during the progress of the work, precautions shall be used to prevent tampering with the well or the entrance of foreign material into it. Upon completion of the well, a suitable vented cap shall be installed to prevent material from entering the well. The well riser shall be surrounded by a larger diameter steel casing set into a concrete pad and rising 24" to 36" above ground level. The steel casing shall be provided with lock and cap. A minimum three foot square, four inch thick concrete pad, sloped away from the well shall be constructed around the well casing at the final ground level elevation. A survey marker shall be permanently placed in each pad as detailed in Section 8.0 of this SOW. Four, two-inch or larger diameter steel posts shall be equally spaced around the well and embedded in the concrete pad. The ground immediately surrounding the top of the well shall be sloped away from the well. There shall be no openings in the protective casing wall below its top.

7.3.6 Temporary Capping. Any well that is to be temporarily removed from service, or left incomplete due to delay in construction, shall be capped with a watertight cap and equipped with a "vandal proof" cover satisfying applicable state or local regulations or recommendations.

7.3.7 Field Logs. The field geologist or geotechnical engineer shall maintain suitable logs detailing drilling and well construction practices. One copy of each field log including the required color slides, shall be submitted to the Contracting Officer not later than 10 calendar days after each well is completed. The well will not be accepted by the Contracting Officer until the logs are received and approved. Information provided in the logs shall include but not be limited to the following:

7.3.7.1 Reference elevation for all depth measurements.

7.3.7.2 Depth of each change of stratum.

7.3.7.3 Thickness of each stratum.

7.3.7.4 Identification of the material of which each stratum is composed according to the Unified Soil Classification System, or standard rock nomenclature, as necessary.

7.3.7.5 Depth interval from which each formation sample was taken.

7.3.7.6 Depth at which hole diameter (bit sizes) change.

7.3.7.7 Depth at which groundwater is first encountered.

7.3.7.8 Depth to the static water level and changes in static water level with well depth.

7.3.7.9 Total depth of completed well.

7.3.7.10 Depth or location of any loss of drill water circulation, loss of tools or equipment.

7.3.7.11 Location of any fractures, joints, faults, cavities or weathered zones.

7.3.7.12 Depth of any grouting or sealing.

7.3.7.13 Nominal hole diameters.

7.3.7.14 Amount of cement used for grouting or sealing.

7.3.7.15 Depth and type of well casing.

7.3.7.16 Description (to include length, location, diameter, slot sizes, material, and manufacturer) of well screen(s).

7.3.7.17 Any sealing-off of water-bearing strata.

7.3.7.18 Static water level upon completion of the well and after development.

7.3.7.19 Drilling date or dates.

7.3.7.20 Construction details of monitoring well.

7.3.8 <u>Final</u> <u>Logs.</u> The field logs shall be edited and drafted for inclusion into the final report.

7.4. <u>Well</u> <u>Development</u>. After each well has been constructed, but no sooner than 48 hours after grouting is completed, the AE shall direct a program for the development of the well by pumping and/or surging, without the use of acids, dispersing agents or explosives. Development shall continue for a period of 4 hours (minimum), and until groundwater removed from the well is clear and free of sand and drilling fluids and until parameter (pH, temperature, etc.) stabilization has occurred. No water or other liquid may be introduced into the well other than formation water from that well. After final development of the well, the AE shall collect approximately 1 liter of water from the well in a clear glass jar, place the jar in front of a standard color chart, and photograph it with a 35mm color slide. The AE shall shake the jar of well development water immediately prior to photography to ensure that all solids are suspended. The AE shall submit the slide as part of the well log. The photograph shall be a suitably back-lit close up which shows the clarity or turbidity of the water.

7.5. <u>In-Situ</u> <u>Permeabilities</u>. After development of monitoring wells, the AE shall calculate for each, the in-situ permeability of the screened stratum in accordance with "Methods of Determining Permeability, Transmissibility and Drawdown," or other equivalent methods. However, no water or other liquid may be introduced into the well other than formation water from that well.

7.6. <u>AE</u> <u>Responsibility</u> <u>for</u> <u>Monitoring</u> <u>Wells</u>.

7.6.1 It is the responsibility of the AE to properly plan, design, install, develop, and test monitoring wells so that they are suitable to produce groundwater samples representative in quantity and quality of subsurface conditions. The AE shall ensure that the requirements of this scope of work and best construction practices are carried out.

7.6.2 If the AE, due to his inadequate design or construction, installs monitoring wells that are not functional or not in accordance with specifications, the Contracting Officer will disapprove the well and direct the AE to repair or replace it at the Contacting Officer's discretion. This work shall be done at no additional cost to the Government.

7.6.3 If a monitoring well is disapproved by the Contracting Officer, or is abandoned by the AE for any reason, the hole shall be backfilled with neat cement grout from top to bottom by the AE at no additional cost to the Government.

8.0 SURVEY REQUIREMENTS.

8.1 Control Points. Plastic or wooden hubs shall be used for all basic control points. A minimum of three (3) concrete monuments with 3.25-inch domed brass or aluminum alloy survey markers (caps) and witness posts shall be established at the site. The concrete monuments shall be located within the project limits, be set 50 feet from the edge of any existing roads in the interior of the project limits and be a minimum of 1,000 feet apart. The placement of all monuments, hubs etc., shall be coordinated with SEAD to prevent destruction due to regular landscaping activities. Horizontal control (1:10000) and vertical control (1:5000) of third order or better shall be established for the network required for all the monuments. The caps for the new monuments shall be stamped in a consecutively numbered sequence as follows:

SEAD-1-1989	SEAD-2-1989	SEAD-3-1989
USAED-HUNTSVILLE	USAED-HUNTSVILLE	USAED-HUNTSVILLE

The dies for stamping the numbers and letters into these caps shall be of 3/16-inch in size. All coordinates are to be referenced to the State Plane Coordinate System and all elevations are to be referenced to the 1929 North American Vertical Datum.

8.2 Location Surveys. A 3.25-inch diameter domed survey marker (cap) composed of brass, bronze or aluminum alloy shall be permanently set in the concrete pad surrounding each well. Coordinates and elevations shall be established for each boring and monitoring well. The coordinates shall be to the closest 1.0-foot and referenced to the State Plane Coordinate System. Elevations to the closest 0.01-foot shall be provided for the survey marker and for top of the casing at each well. These elevations shall be referenced to the National Geodetic Vertical Datum of 1929.

8.3 The location, identification, coordinates and elevations of all the control points recovered and/or established at the site, and all of the wells, soil borings, test pits, and surface water sampling points shall be plotted on a planimetric map (at a scale of 1"=50 feet) to show their location with respect to surface features within the project area. A tabulated list of the monuments and the monitoring wells, including their coordinates and elevations, a "Description Card" for each monument established or used for this project and all field books and computations shall be prepared and submitted to the Huntsville Division (CEHND), ATTN: CEHND-ED-CS. The tabulation shall consist of the designated number of the well or monument, the X- and Y-coordinates and all the required elevations. The Description Card shall show a sketch of each monument; its location with relative to reference marks, buildings, roads, towers, etc.; a written description telling how to locate the monument from a known point; the monument name or number and the adjusted coordinates and elevations. These items shall be submitted to CEHND no later than the Draft Report Submission.

9.0 SECURITY REQUIREMENTS

9.1 The following requirements must be followed by the AE at Seneca Army Depot to facilitate entry and exit of AE employees and to maintain security.

9.1.1 Personnel Registration:

9.1.1.1 A list of all AE employees, sub-contractors and suppliers indicating firm name and address will be furnished through POC/COR to the Counterintelligence Division, Building 710, 72 hours prior to commencement of work.

9.1.1.2 A confirmation of employment SDSSE-SC Form 268 will be executed by the AE concerning each employee, to include all sub-contractors and their personnel. No forms will be transferred to another file if the AE has other on-going contracts at SEAD. The AE will provide a list of personnel who are authorized to sign Form 268 for the firm. A sample of each signature is required. Counterintelligence Division must be notified, in writing, of any changes to this list. All completed forms will be provided through COR/POC to the Counterintelligence Division 72 hours prior to commencement of work. Failure to complete Form 268 correctly will result in employee's denial of access to Seneca. The Counterintelligence Division must be notified, in writing through POC/COR to Counterintelligence, at least 72 hours prior to requesting any action. The chain of command for all AE actions will be through POC/COR to Counterintelligence Division. There will be no exceptions.

9.1.1.3 Camera permits require written notice from the POC/COR prior to access. Open camera permits will not be issued. The following information is required:

(a) Camera make, model and serial number.

(b) Contract name and name of individual responsible for the camera.

(c) Dates camera will be used.

(d) Where it will be used.

(e) What will be photographed and why.

9.1.1.4 If a rental, leased or privately owned vehicle is required in place of a company vehicle, the following information is needed.

(a) Name of individual driving.

(b) Year, make, model, color and license plate of the vehicle.

(c) Typed letter on company letterhead indicating that the company assumes responsibility for rental, leased or privately owned vehicles.

9.1.1.5 All access media will be destroyed upon expiration date of contract. If an extension is required a list of employee names and new expiration date must be furnished to the Counterintelligence Division. Contract extensions must be made prior to the contract expiration date or new Form 268s will be required for each individual that requires an extension.

9.1.2 Traffic Regulations:

9.1.2.1 Traffic Laws, State of New York, apply with emphasis on the following regulations.

9.1.2.2 Speed Limit: Controlled Area - as posted
Ammo Area - 50 mph
Limited/Exclusion Area - 25 mph

9.1.2.3 All of the above are subject to change with road conditions or as otherwise posted.

9.1.3 Parking: AE vehicles (trucks, rigs, etc.) will be parked in areas designated by the Director of Law Enforcement and Security. Usually parking will be permitted within close proximity to the work site. Do not park within 30 feet of a depot fence, as these are clear zones.

9.1.4 Gates:

9.1.4.1 Post 1, Main Gate - NY Highway 96, Romulus, New York is open for personnel entrance and exit 24 hours daily, 7 days a week.

9.1.4.2 Post 3, entrance to North Depot Troop Area, located at end of access road from Route 96-A is open 7 days a week for personnel and vehicle entrance and exit.

9.1.5 Security Regulations:

9.1.5.1 Prohibited Property:

9.1.5.1.1 Cameras, binoculars, weapons and intoxicating beverages will not be introduced to the installation, except by written permission of the Director/Deputy Director of Law Enforcement and Security.

9.1.5.1.2 Matches or other spark producing devices will not be introduced into the Limited/Exclusion or Ammo Area's except when the processor of such items is covered by a properly validated match or flame producing device permit.

9.1.5.1.3 All vehicles and personal parcels, lunch pails, etc. are subject to routine security inspections at any time while on depot property.

9.1.5.1.4 All building materials, equipment and machinery must be cleared by the Director of Engineering and Housing who will issue a property pass for outgoing equipment and materials.

9.1.6 AE Employee Circulation:

9.1.6.1 AE employees are cleared for entrance to the location of contract work only. Sight-seeing tours or wandering from work site is NOT AUTHORIZED.

9.1.6.2 Written notification will be provided to the Counterintelligence Division (Ext. 30202) at least 72 hours prior to overtime work or prior to working on non-operating days.

9.1.6.3 Security Police (Ext. 30448/30366) will be notified at least two hours in advance of any installation or movement of slow moving heavy equipment that may interfere with normal flow of traffic, parking or security.

9.1.7 Unions: Representatives will be referred to the Depot Industrial Labor Relations Officer (Ext. 41317).

9.1.8 Offenses: (Violations of law or regulations)

9.1.8.1 Minor: Offenses committed by AE personnel which are minor in nature will be reported by the Director of Law Enforcement and Security to the Contracting Officer who in turn will report such incidents to the AE for appropriate disciplinary action.

9.1.8.2 Major: Serious offenses committed while on the installation will be reported to the FBI. Violators may be subject to trial in Federal Court.

9.1.9 Explosive Laden Vehicles:

9.1.9.1 Vehicles such as vans, cargo trucks, etc. carrying explosives will display placards or signs stating "EXPLOSIVES".

9.1.9.2 Explosive ladened vehicles will not be passed.

9.1.9.3 When an explosive laden vehicle is approaching, pull over to the side and stop.

9.1.9.4 When catching up with an explosive laden vehicle, slow down and allow that vehicle to remain at least 100 feet ahead.

9.1.9.5 When approaching an intersection where an explosive laden vehicle is crossing - STOP - do not enter the intersection until such time as the explosive carrier has passed thru, and cleared the intersection.

9.1.9.6 When passing a vehicle that is parked, and displaying "Explosive" signs, slow down to 10 miles per hour, and take every precaution to allow more than ample clearance.

9.1.10 Clearing Post: All AE employees are required to return all identification badges, and passes on the last day of employment on the depot. The AE is responsible for the completion of all turn-ins by his employees, and informing the Counterintelligence Division and the depot organization administering the contract, for termination of any employee's access to the depot.

10.0 PUBLIC AFFAIRS.

The AE shall not publicly disclose any data generated or reviewed under this contract. The AE shall refer all requests for information to CEHND. Reports and data generated under this contract shall become the property of the Department of Defense and distribution to any other source by the AE, unless authorized by the Contracting Officer, is prohibited.

11.0 REFERENCES

11.1 "Procedures Manual for Groundwater Monitoring at Solid Waste Disposal Facilities," USEPA Publ. No. EPA/530/SW-611.

11.2 "Manual of Water Well Construction Practices, " USEPA Publ. NO. EPA/570/9-75-001.

11.3 "Methods of Determining Permeability, Transmissibility, and Drawdown," U.S. Geological Survey Water Supply Paper No. 1536-1, 1963.

11.4 "U.S. Corps of Engineers Safety and Health Requirements Manual," U.S. Army Engineering Manual No. EM-385-1-1, April 1981.

11.5 "Code of Federal Regulations, "Volume 40, Parts 260 through 265 plus 270, July 1986.

11.6 "American Society for Testing and Materials," ASTM D-421, D-422, D-423, D-424, D-2216, and D-2436.

11.7 "Code of Federal Regulation," Volume 40, Part 300, July 1987.

11.8 "Methods for Chemical Analysis of Water and Wastes," U.S. Environmental Protection Agency, Publ. No. EPA/625/6-7-003a.

11.9 "Test Methods for Evaluating Solid Wastes," USEPA Publ. No. SW- 846,

July 1982.

11.10 "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act," 40 CFR 136, Federal Register, Oct 26, 1984.

11.11 "RCRA Groundwater Monitoring Technical Enforcement Guidance Document" (Draft) Office of Waste Programs Enforcement, USEPA, August 1985.

11.12 "Handbook for Analytical Quality Control in Water and Wastewater Laboratories," EPA Manual 600/4-79-019, March 1979.

11.13 "Safety and Occupational Health Document Requirements for Hazardous Waste Site Remedial Actions," U.S. Army Engineering Regulation (ER) 385-1-192.

11.14 "Engineer Guidance Design Manual for Architect-Engineer," US Army Corps of Engineer. ENDM-1110-1-1. Rev. 1986.

11.15 RCRA Corrective Action Plan, OSWER Directive 9902.3, November, 1986.

11.16 U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), Initial Installation Assessment of Seneca Army Depot, N.Y. Report no. AMXTH-IR-A-157, 1980.

11.17 U.S. Army Environmental Hygiene Agency (USAEHA), Final Report, Army Pollution Abatement Program Study No. D-1031-W, Landfill Leachate Study, Seneca Army Depot, 1981.

11.18 U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), Update of the Initial Installation Assessment of Seneca Army Depot, N.Y. Report no. AMXTH-IR-A-157(U), 1988.

11.19 "Evaluation of Solid Waste Management Units, Seneca Army Depot", Interim Final Report, Groundwater Contamination Survey No.38-26-0868-88, U.S. Army Environmental Hygiene Agency.

11.20 "Remedial Investigations/Feasibility Studies, Seneca Army Depot Burning Pit/Landfill, Site Investigation", Draft Final Report, ICF Technology Inc., March 1989.

11.21 Draft, "Guidance For Conducting Remedial Investigations/Feasibility Studies Under CERCLA", U.S. EPA, Office of Solid Waste and Emergency Response, March 1988.

11.22 ER 1110-1-263.

APPENDIX G

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF WATER, TECHNICAL AND OPERATIONAL GUIDANCE SERIES 1.1.1

JL —
JH —
SMC —
MC-LAST

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 - 3505

Thomas C. Jorling
Commissioner

MEMORANDUM

TO: Distribution

FROM: Joseph Kelleher, Chief, Chemical Systems Section, BWFD, DOW; By: Robert Wither RW

Joe Kelleher

SUBJECT: Division of Water TOGS 1.1.1

DATE: November 19, 1990

Attached for your information is a copy of the revised TOGS 1.1.1 dated September 25, 1990. If you have any questions, please give me a call at (518) 457-6716.

RECEIVED
NOV 21 1990
BUREAU OF REMEDIAL ACTION
DIVISION OF HAZARDOUS WASTE REMEDIATION

<u>DISTRIBUTION</u>

Marsden Chen, DHWR, BERA
Stephen Hammond, DHWR, BCRA
Ed Belmore, DHWR, BWRA

Attachment

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

September 25, 1990

MEMORANDUM

TO: Bureau Directors, Regional Water Engineers, Section Chiefs

SUBJECT: Division of Water Technical and Operational Guidance Series (1.1.1.)
AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES
(Originator: John Zambrano)

I. Purpose

The attachment to this memorandum provides a compilation of ambient water quality standards and guidance values for toxic and non-conventional pollutants for use in department programs, including the SPDES permit program.

II. Discussion

This edition includes the following major changes from the previous edition, dated April 1, 1987:

1. inclusion of all DEC groundwater standards that result from the references in paragraph 703.5(a)(2) to the Subpart 5-1 maximum contaminant levels (MCLs) and Part 170 standards of the Department of Health (DOH). These standards include the general standards for principal organic contaminants (POCs) and unspecified organic contaminants (UOCs), which became effective on January 9, 1989;

2. for approximately 45 substances, replacement of groundwater standards or guidance values with the POC standard of 5 ug/L or the UOC standard of 50 ug/L to reflect the adoption of these two general standards;

3. a partial tabulation of additional substances that are regulated by the groundwater POC standard;

4. for the following substances, revision of surface water guidance values from 50 ug/L to 5 ug/L based on the POC standard of the DOH:

    - Dibromodichloromethane
    - 1,1-Dichloroethane
    - trans-1,2-Dichloroethylene
    - Dichlorofluoromethane
    - Dichloropropanes
    - Ethylbenzene
    - Methyl chloride
    - Methylene chloride
    - Toluene
    - 1,1,1-Trichloroethane
    - Trichlorofluoromethane
    - Trichlorotrifluoroethanes
    - Trimethylbenzenes
    - Xylenes

5. addition of new or revised specific guidance values for chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans, ethylene glycol, radium 226, benzene and zinc;

6. specification of a number of guidance values as individual isomers rather than as the sum of two or more isomers. This includes:

    - Alkyl diphenyl oxide sulfonates
    - Aminomethylene phosphonic acid salts
    - Aryltriazoles
    - Dichloropropanes
    - Methoxyethylbenzenes
    - Tetrachlorobenzenes
    - Trichlorobenzenes
    - Trichlorotrifluoroethanes
    - Trimethylbenzenes
    - Trimethylpyridines
    - Xylenes

7. a tabulation of substances for which the department recently has proposed standards; and

8. identification (by a footnote in Table 1) of standards that the department recently has proposed for deletion.

By including the relevant Part 5 MCLs and Part 170 standards in this document, it is no longer necessary for the user to review these DOH regulations to determine the applicable DEC standards [unless the DOH revises their regulations prior to the successful completion of the DEC's proposed rule making]. The inclusion of standards proposed for revision, addition or deletion will be useful for planning.

III. Guidance

The Quality Evaluation Section will use the attachment for development of water quality-based effluent limits. The Criteria and Standards Section will maintain and revise it on a regular basis.

Salvatore Pagano
Director
Division of Water

Attachment

cc: Dr. Banks
Mr. Campbell
Ms. Chrimes
Mr. Brunning
Regional Directors for Environmental Quality

WATER QUALITY STANDARDS AND GUIDANCE VALUES

New York State
Department of Environmental Conservation
Division of Water
Albany, New York

September 25, 1990

TABLE OF CONTENTS

INTRODUCTION

Division of Water standards and guidance values for toxic and non-conventional pollutants are presented in Table 1. This Table includes all the department's numerical standards and guidance values except standards for dissolved oxygen, dissolved solids, coliforms, pH, color, odor and turbidity.

Section I of this Introduction provides a description of the columns in Table 1. Section II provides guidance on certain aspects of development, interpretation and use of standards and guidance values.

I. COLUMN DESCRIPTIONS

A. Water Classes

Standards and guidance values are developed for specific classes of surface waters and groundwaters for protection of the best usages assigned to each class. Best usages are described in Parts 701-703. A summary description related to toxic pollutants is presented below:

Water Classes		Protection For
Fresh Surface Waters and Groundwaters	A, A-S, AA, AA-S	Drinking Water Source
	GA	Drinking Water Source
	A, A-S, AA, AA-S, B, C	Fishing and Fish Propagation
	D	Fishing and Fish Survival
Saline Surface Waters	SA, SB, SC	Fishing and Fish Propagation
	I	Fishing and Fish Propagation
	SD	Fishing and Fish Survival

B. Type

Standards and guidance values are designated for either protection of human health or aquatic life. In the column headed "Type," human health values are designated by the letter "H," and aquatic life values are designated by the letter "A."

For some substances, water classes A, A-S, AA and AA-S will concurrently list human health and aquatic type values. In these situations, the more stringent value applies.

C. Substance (CAS No.)

The substance or group of substances for which a standard or guidance value has been derived are presented in this column in alphabetical order. Where the entry includes more than one substance, the value applies to the sum of the substances, unless otherwise indicated. The Chemical Abstract Service Registry Numbers (CAS No.) are given, where applicable, to provide positive identification. An index of CAS numbers begins on page 54. Because a substance may be known by names other than the one used in this document, identification of the CAS number can be essential for locating the substance.

With the exceptions noted earlier, all of the Division of Water's ambient standards and guidance values are presented in Table 1. Because a few of these standards or guidance values include groups of substances that contain a large or unlimited number of substances, not all substances covered by these standards and guidance values are individually identified in this document. Therefore, a determination of the individual substances encompassed by the standard or guidance value may be necessary. The standard "phenolic compunds (total phenols)" is an example of this type of standard. Although all phenolic compounds are included in this standard, neither Table 1 nor the CAS index lists all individual phenolic compounds.

Other examples are the two groundwater general standards that apply to an unlimited number of individual substances. Because of the importance of the principal organic contaminant standard (POC) (page 40), a partial list of individual substances encompassed by this standard, are provided in Table 2, and the CAS numbers for these substances are included in the index. For additional information on the applicability of the groundwater POC standard see item II B on page 4.

D. Standard

Standards are ambient water quality values that have been promulgated and placed into regulation. The standards for the surface water classes have been extracted from Parts 701 and 702 of Title 6. Groundwater standards were extracted from Part 703 and from the Department of Health's regulations Subpart 5-1 and Part 170 of Title 10.

Surface water standards were last revised in 1985 and groundwater standards (Part 703) in 1978.

E. Guidance Value

Guidance values are utilized where a standard for a substance is not available for a particular water class and type of value. Although individual guidance values are not in regulation, they are developed according to the same scientific procedures used to derive standards. The scientific procedures are in regulation.

In addition to specific guidance values, the regulations allow the use of a general organic guidance value of 50 ug/L. Although the general value of 50 ug/L appears in the water quality regulations (subdivision 701.15(e)), the substance- specific determinations remain as guidance values.

For a guidance value, other than the general organic guidance value, the department will initiate rule making to adopt an ambient water quality standard.

Standards and guidance values are the maximum allowable concentration in units of ug/L, unless otherwise indicated. Where standards or guidance values are expressed as a function of hardness, hardness is in units of parts per million (ppm), expressed as calcium carbonate.

F. Notes

The letters in this column designate the specific procedure used to derive the standard or guidance value. The key to the letter designations is provided on page 53, following Table 2.

II. DEVELOPMENT, INTERPRETATION AND USE

A. Development of Standards and Guidance Values

Guidance values are developed as needed with priorities primarily reflecting greater expected or observed occurrence in the environment and greater toxicity. Most requests for development of guidance values originate through the use and discharge information that is generated through the State Pollutant Discharge Elimination System (SPDES) permit program. Standards are proposed for rule making with similar priority considerations.

As stated previously guidance values are utilized where a standard is not available for a substance. All guidance values that have been developed for surface waters and groundwaters are presented in Table 1. If no guidance value is presented in Table 1 for a specific substance and water class, a request for development of a guidance value should be made to the Criteria and Standards Section.

The department recently has proposed the addition, revision or deletion of standards for a number of substances. For planning purposes, the standards proposed for addition and revision are presented in Addendum I; standards proposed for deletion are indicated by a footnote in Table 1.

B. Principal Organic Contaminant (POC) Standard for Groundwater

The POC standard for groundwater (Table 1, page 40) is a general standard. Consequently, its applicability to individual substances must be determined. Although it is not possible to list all substances to which the POC standard applies (unlimited number), this document does include a large number of them. A guide to the determinations made for this document follows:

1. Where Table 1 lists a groundwater standard or guidance value for a substance, the value in Table 1 applies, and it is not necessary to make any further determination of the applicability of the POC standard.

2. Table 2 provides a partial list of additional substances for which the groundwater POC standard of 5 ug/L is applicable. Table 1 and Table 2 do not overlap for any substance.

3. If a substance does not have a groundwater value in Table 1 and is not listed in Table 2, a determination of applicability is necessary, using the POC definition. The POC definition, which is specified in the Department of Health regulations 10 NYCRR Subpart 5-1, is presented in Table 3. Because some POC determinations will require judgements concerning chemical structure and comparisons with the substances that formed the basis of the POC classes, final determinations will be made by the Criteria and Standards Section in cooperation with the Department of Health.

C. Analytical Methods

Sections 700.2 and 703.4 provide the analytical requirements to determine compliance with water quality standards and guidance values. These regulations include specific analytical references and also refer to "...other methods approved by the commissioner..." The Division of Water maintains a compilation of methods approved by the Commissioner in a separate Technical and Operational Guidance Series (TOGS) document.

There are a number of water quality standards and guidance values for which there is no approved analytical procedure. Use of these values should be accompanied by the identification of an acceptable analytical method.

D. SPDES Effluent Limits

Ambient water quality standards and guidance values are used to derive water quality-based effluent limitations for use in SPDES permits. Guidance for the derivation of these limitations is provided in a separate TOGS document. There are, however, a number of topics that warrant discussion here.

1. Hydrologic Flow Base and Averaging Period

The use of ambient water quality standards or guidance values to derive water quality-based effluent limitations requires selection of a receiving water flow and the specification of an averaging period for the effluent limitation. Their selection will be a function of the variability of the receiving water flow and effluent load and the time period associated with the critical health or aquatic effect. In general, health or aquatic standards and guidance values that are based on adverse effects that develop over time periods greater than a month will receive effluent limitations based on the minimum average 30 consecutive day receiving water flow with a one-in-ten year occurrence (MA30CD/10) and calculated as a monthly average. Values based on shorter-term adverse effects will generally receive effluent limitations based on MA7CD/10 flow and calculated as a daily maximum. Specific determinations, however, are made at the time of permit issuance.

2. Chemical Species

Some ambient standards and guidance values apply to a specific toxic species rather than all forms (total) of the substance. Changes in the form of a substance can occur in the receiving water. As a result, the form of the substance that is specified as an effluent limitation may differ from the form of the ambient standard or guidance value.

3. Groundwater Effluent Limitations

Section 703.6 provides specific effluent limitations for discharges to class GA waters. Section 703.7 provides for the establishment of additional effluent limitations. In accordance with section 703.7, ambient guidance values and the POC standard for GA waters shall apply as effluent limitations. In addition, for substances having an ambient groundwater standard of 50 ug/L, the effluent limitation shall also be 50 ug/L.

4. Total of Organic Chemicals

Paragraph 701.15(f) of the surface water quality regulations specifies, for the purpose of deriving effluent limitations, an ambient value of 100 ug/L for the total of organic substances having a standard or guidance value established pursuant to the human-health methodologies. The only substances included in this total are those listed in Table 1 of this TOGS that have both the symbol "§" above the name and a health type standard or guidance value for surface water.

A groundwater effluent limitation shall be established at 100 ug/L for the total of certain organic substances. The substances included in this total are those listed in Table 1 of this TOGS that have both the symbol "§" above the name and a standard or guidance value for groundwater. It should be noted that this includes all substances covered by the principal organic contaminant groundwater standard (Table 1, page 40), whether they are listed in this TOGS or not, but does not include substances covered by the unspecified organic contaminant groundwater standard that are not specifically listed in Table 1 of this TOGS.

An ambient groundwater standard of 100 ug/L (Table 1, page 45) applies to the total of principal organic contaminants and unspecified organic contaminants. This standard is proposed for deletion.

TABLE 1

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: September 25, 1990

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Acenaphthene (83-32-9)	A, A-S, AA, AA-S	20		H	C
	GA		20	H	C
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Acrylic acid (79-10-7)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Acrylonitrile (107-13-1)	A, A-S, AA, AA-S		0.07	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Alachlor (15972-60-8)	A, A-S, AA, AA-S			H	
	GA	35.0		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Aldicarb (116-06-3)	A, A-S, AA, AA-S	7		H	B
	GA			H	
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Aldicarb & Methomyl (116-06-3; 16752-77-5)	A, A-S, AA, AA-S			H	
	GA	0.35		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Aldrin (309-00-2)	A, A-S, AA, AA-S		0.002	H	A
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C	*		A	
	D	*		A	
	SA, SB, SC	*		A	
	I		*	A	
	SD	*		A	

Remarks: * Refer to entry for "Aldrin and Dieldrin."

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Aldrin & Dieldrin (309-00-2; 60-57-1)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	0.001		A	M*
	D	0.001		A	M*
	SA, SB, SC	0.001		A	M*
	I		0.001	A	M
	SD	0.001		A	M*

Remarks: * NOTE in promulgated standards is incorrect. Correct NOTE is M.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Alkyl dimethyl benzyl ammonium chloride (68391-01-5)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C	*		A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Refer to entry for "Quaternary ammonium compounds."

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Alkyl diphenyl oxide sulfonates (Not Applicable)	A, A-S, AA, AA-S		50*	H	E
	GA		50*	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each alkyl diphenyl oxide sulfonate individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Aluminum, ionic (Not Applicable)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	100		A	I
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Ametryn (834-12-8)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Aminocresols (95-84-1; 2835-95-2; 2835-99-6)	A, A-S, AA, AA-S	*		H	
	GA	*		H	
	A, A-S, AA, AA-S, B, C	**		A	
	D	**		A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Refer to entry for phenolic compounds.
** Refer to entry for phenols, total unchlorinated.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		50*	H	E
Aminomethylene	GA		50*	H	E
phosphonic acid salts	A, A-S, AA, AA-S, B, C			A	
(Not Applicable)	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: Applies to each aminomethylene phosphonic acid salt individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		1	H	B
Aminopyridines	GA		1	H	B
(462-08-8;	A, A-S, AA, AA-S, B, C			A	
504-24-5;	D			A	
504-29-0)	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Ammonia and	A, A-S, AA, AA-S	2,000*		H	R
Ammonium	GA	2,000*		H	R
(7664-41-7;	A, A-S, AA, AA-S, B, C	**		A	H
Not Applicable)	D	**		A	H
	SA, SB, SC			A	
	I			A	
	SD			A	

(Aquatic standards are proposed for revision; see Addendum 3.)

Remarks: * $NH_3 + NH_4^+$ as N.

** Unionized ammonia only as NH_3; formulas for calculating standards at varying pH and temperature for different Classes are as follows:

A, A-S, AA, AA-S, B, C

Standard (mg/L) = 0.031 [f(T)/g(pH)]

T = temperature in °C and

$g(pH) = 1$; if $pH \geq 7.7$

$g(pH) = 10^{[0.74\ (7.7-pH)]}$; if $pH < 7.7$

$f(T) = 1$; if $T \geq 10°C$

$$f(T) = \frac{1 + 10^{(9.73-pH)}}{1 + 10^{(pK_T-pH)}}; \quad \text{if } T < 10°C$$

$$pK_T = 0.090 + \frac{2730}{(T + 273.2)}$$

D;

Standard (mg/L) = 0.15 [f(T)/g(pH)]

$g(pH) = 1 + 10^{[1.03\ (7.32-pH)]}$

f(T) as above

AMMONIA STANDARDS (Continued):
FRESHWATER STANDARDS BASED ON FORMULA ON PAGE 3

Standards for Classes A, A-S, AA, AA-S, B, C

Un-ionized Ammonia (mg/Liter NH_3)

pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	0.0018	0.0027	0.0040	0.0040	0.0040	0.0040	0.0040
6.75	0.0027	0.0041	0.0061	0.0061	0.0061	0.0061	0.0061
7.00	0.0042	0.0063	0.0094	0.0094	0.0094	0.0094	0.0094
7.25	0.0064	0.0096	0.0144	0.0144	0.0144	0.0144	0.0144
7.50	0.0098	0.0148	0.0220	0.0220	0.0220	0.0220	0.0220
7.75	0.0138	0.0208	0.0310	0.0310	0.0310	0.0310	0.0310
8.00	0.0139	0.0209	0.0310	0.0310	0.0310	0.0310	0.0310
8.25	0.0140	0.0210	0.0310	0.0310	0.0310	0.0310	0.0310
8.50	0.0142	0.0211	0.0310	0.0310	0.0310	0.0310	0.0310
8.75	0.0145	0.0214	0.0310	0.0310	0.0310	0.0310	0.0310
9.00	0.0150	0.0219	0.0310	0.0310	0.0310	0.0310	0.0310

Total Ammonia (mg/Liter NH_3)

pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	6.82	6.82	6.83	4.65	3.21	2.24	1.58
6.75	5.87	5.87	5.89	4.01	2.76	1.93	1.37
7.00	5.06	5.06	5.07	3.45	2.38	1.67	1.13
7.25	4.36	4.36	4.37	2.98	2.06	1.44	1.02
7.50	3.77	3.77	3.78	2.58	1.78	1.25	0.89
7.75	2.99	2.99	3.00	2.05	1.42	1.00	0.72
8.00	1.70	1.70	1.70	1.17	0.81	0.58	0.42
8.25	0.97	0.97	0.97	0.67	0.47	0.34	0.25
8.50	0.56	0.56	0.56	0.39	0.28	0.20	0.15
8.75	0.33	0.33	0.33	0.23	0.17	0.13	0.10
9.00	0.20	0.20	0.20	0.14	0.11	0.09	0.07

Standards for Class D

Un-ionized Ammonia (mg/Liter NH_3)

pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	0.008	0.013	0.019	0.019	0.019	0.019	0.019
6.75	0.014	0.021	0.031	0.031	0.031	0.031	0.031
7.00	0.021	0.032	0.048	0.048	0.048	0.048	0.048
7.25	0.030	0.046	0.069	0.069	0.069	0.069	0.069
7.50	0.040	0.061	0.091	0.091	0.091	0.091	0.091
7.75	0.049	0.074	0.110	0.110	0.110	0.110	0.110
8.00	0.056	0.084	0.125	0.125	0.125	0.125	0.125
8.25	0.061	0.091	0.135	0.135	0.135	0.135	0.135
8.50	0.065	0.096	0.141	0.141	0.141	0.141	0.141
8.75	0.068	0.100	0.145	0.145	0.145	0.145	0.145
9.00	0.071	0.104	0.147	0.147	0.147	0.147	0.147

Total Ammonia (mg/Liter NH_3)

pH	0°C	5°C	10°C	15°C	20°C	25°C	30°C
6.50	31.9	31.9	31.9	21.8	15.0	10.5	7.41
6.75	29.5	29.5	29.5	20.1	13.9	9.69	6.86
7.00	25.7	25.7	25.7	17.6	12.1	8.48	6.00
7.25	20.8	20.8	20.8	14.2	9.84	6.89	4.88
7.50	15.5	15.5	15.5	10.6	7.34	5.15	3.66
7.75	10.6	10.6	10.6	7.29	5.06	3.56	2.55
8.00	6.84	6.84	6.84	4.71	3.28	2.33	1.68
8.25	4.22	4.22	4.22	2.92	2.05	1.47	1.08
8.50	2.54	2.54	2.54	1.78	1.27	0.93	0.70
8.75	1.53	1.53	1.53	1.09	0.80	0.60	0.47
9.00	0.94	0.94	0.94	0.69	0.52	0.41	0.33

To convert these values to mg/Liter N, multiply by 0.822.

- From EPA, 1983. Ambient Water Quality Criteria For Ammonia - Draft. USEPA, Washington, D.C., 189 pp + iii + three appendices.

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: September 25, 1990

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Aniline (62-53-3)	A, A-S, AA, AA-S		1	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Anthracene (120-12-7)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Antimony (Not Applicable)	A, A-S, AA, AA-S		3	H	B
	GA		3	H	B
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Arsenic (Not Applicable)	A, A-S, AA, AA-S	50		H	Q
	GA	25		H	S
	A, A-S, AA, AA-S, B, C	190*		A	H
	D	360*		A	H
	SA, SB, SC	63*		A	H
	I		36*	A	H
	SD	120*		A	H

Remarks: * Dissolved arsenic form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Aryltriazoles (Not Applicable)	A, A-S, AA, AA-S		50*	H	E
	GA		50*	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each aryltriazole individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Atrazine (1912-24-9)	A, A-S, AA, AA-S			H	
	GA	7.5		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: September 25, 1990

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	NOTES
		STANDARD	GUIDANCE VALUE		
§ Azinphosmethyl (86-50-0)	A, A-S, AA, AA-S		0.07	H	A
	GA	4.4		H	S
	A, A-S, AA, AA-S, B, C	0.005		A	J
	D			A	
	SA, SB, SC	0.01		A	J
	I		0.01	A	J
	SD			A	
§ Azobenzene (103-33-3)	A, A-S, AA, AA-S		0.5	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Barium (Not Applicable)	A, A-S, AA, AA-S	1,000		H	Q
	GA	1,000		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Benefin (1861-40-1)	A, A-S, AA, AA-S			H	
	GA	35.0		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Benz(a)anthracene (56-55-3)	A, A-S, AA, AA-S		0.002	H	D
	GA		0.002	H	D
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Benzene (71-43-2)	A, A-S, AA, AA-S		0.7	H	A
	GA	ND*		H	S
	A, A-S, AA, AA-S, B, C		6	A	M
	D		6	A	M
	SA, SB, SC		6	A	M
	I		6	A	M
	SD		6	A	M

Remarks: * Proposed for revision; see Addendum 3.

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: September 25, 1990

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		0.02	H	A
Benzidine	GA	5		H	Q
(92-87-5)	A, A-S, AA, AA-S, B, C	0.1		A	H
	D	0.1		A	H
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	E
Benzisothiazole	GA		50	H	E
(271-61-4)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		0.002	H	D
Benzo(b)fluoranthene	GA		0.002	H	D
(205-99-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		0.002	H	D
Benzo(k)fluoranthene	GA		0.002	H	D
(207-08-9)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		0.002	H	A
Benzo(a)pyrene	GA	ND		H	S
(50-32-8)	A, A-S, AA, AA-S, B, C		0.0012	A	M
	D		0.0012	A	M
	SA, SB, SC		0.0006	A	M
	I		0.0006	A	M
	SD		0.0006	A	M
Beryllium	A, A-S, AA, AA-S		3	H	B
(Not Applicable)	GA		3	H	B
	A, A-S, AA, AA-S, B, C	*		A	H
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * 11 ug/L, when hardness is less than or equal to 75 ppm; 1,100 ug/L, when hardness is greater than 75 ppm. Aquatic standards apply to acid-soluble form.

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

Date of Revision: September 25, 1990

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	NOTES
		STANDARD	GUIDANCE VALUE		
§ Bis(2-chloroethyl) ether (111-44-4)	A, A-S, AA, AA-S		0.03	H	A
	GA	1.0		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Bis(2-ethylhexyl) phthalate (117-81-7)	A, A-S, AA, AA-S		4	H	A
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C	0.6		A	I
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Boric Acid, Borates & Metaborates (as Boron) (11113-50-1; 10043-35-3; 1303-96-4)	A, A-S, AA, AA-S		125	H	B
	GA		125	H	B
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: Applies only to boric acid, borates and metaborates (as boron equivalents).

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Boron (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	1,000		H	R
	A, A-S, AA, AA-S, B, C	10,000		A	J
	D			A	
	SA, SB, SC	1,000		A	J
	I		1,000	A	J
	SD			A	

Remarks: Aquatic standards and guidance value apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Bromacil (314-40-9)	A, A-S, AA, AA-S			H	
	GA	4.4		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Bromide (Not Applicable)	A, A-S, AA, AA-S		2,000	H	B
	GA		2,000	H	B
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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		STANDARD	GUIDANCE VALUE		
§	A, A-S, AA, AA-S		50	H	E
Bromodichloromethane	GA		50	H	E
(75-27-4)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	E
Bromoform	GA		50	H	E
(75-25-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Butachlor	GA	3.5		H	S
(23184-66-9)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	E
Butoxyethoxyethanol	GA		50	H	E
(112-34-5)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	E
Butoxypropanol	GA		50	H	E
(5131-66-8)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	Q
Butylate	GA	50		H	Q
(2008-41-5)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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§	A, A-S, AA, AA-S		50	H	E
Butyl benzyl phthalate	GA		50	H	E
(85-68-7)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	E
Butyl isopropyl phthalate	GA		50	H	E
(Not Applicable)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Cadmium	A, A-S, AA, AA-S	10		H	Q
(Not Applicable)	GA	10		H	S
	A, A-S, AA, AA-S, B, C	*		A	I
	D	**		A	H
	SA, SB, SC		2.7	A	M
	I		2.7	A	M
	SD		2.7	A	M

(Aquatic standards and guidance values are proposed for revision.)

Remarks:
* exp(0.7852 [ln (ppm hardness)] - 3.490)
** exp(1.128 [ln (ppm hardness)] - 3.828)
Aquatic standards and guidance values apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S			H	
Captan	GA	17.5		H	S
(133-06-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Carbaryl	GA	28.7		H	S
(63-25-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S	15		H	B
Carbofuran	GA		15	H	B
(1563-66-2)	A, A-S, AA, AA-S, B, C	1.0		A	J
	D	10		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

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		STANDARD	GUIDANCE VALUE		
Carbon chloroform extract (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	200*		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * Proposed for deletion.					
§ Carbon tetrachloride (56-23-5)	A, A-S, AA, AA-S		0.4	H	A
	GA	5		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Carboxin (5234-68-4)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Chloramben (Not Applicable)	A, A-S, AA, AA-S		50*	H	Q
	GA	50*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.					
§ Chlordane (57-74-9)	A, A-S, AA, AA-S		0.02	H	A
	GA	0.1		H	S
	A, A-S, AA, AA-S, B, C		0.002	A	M
	D		0.002	A	M
	SA, SB, SC		0.002	A	M
	I		0.002	A	M
	SD		0.002	A	M

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Chloride (Not Applicable)	A, A-S, AA, AA-S	250,000		H	R
	GA	250,000		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		*	H	
Chlorinated dibenzo-p-dioxins and Chlorinated dibenzofurans (Not Applicable)	GA	0.000035♦	*	H	
	A, A-S, AA, AA-S, B, C	0.000001♣		A	M
	D	0.000001♣		A	M
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Guidance value for total chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans is 0.0000002 ug/L equivalents of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). The 2,3,7,8-TCDD equivalent for a congener is obtained by multiplying the concentration of that congener by its toxicity equivalence factor (TEF) from the table below. The guidance value for Class GA waters does not include the congener 2,3,7,8-TCDD.

A guidance value for an individual congener can be calculated by dividing 0.0000002 ug/L by the TEF for that congener.

The basis for the guidance value for 2,3,7,8-TCDD is NOTE A; for all other congeners it is NOTE D.

♦ Applies only to 2,3,7,8-TCDD. The basis for the standard is NOTE S.

♣ Applies only to 2,3,7,8-TCDD.

Human Health Toxicity Equivalence Factors (TEFs) for Individual Congeners

CONGENER	TEF
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1
Other tetrachlorodibenzo-p-dioxins	0.01
2,3,7,8-Pentachlorodibenzo-p-dioxin	0.5
Other pentachlorodibenzo-p-dioxins	0.005
2,3,7,8-Hexachlorodibenzo-p-dioxins	0.05
Other hexachlorodibenzo-p-dioxins	0.0005
2,3,7,8-Heptachlorodibenzo-p-dioxin	0.005
Other heptachlorodibenzo-p-dioxins	0.00005
Octachlorodibenzo-p-dioxin	0.005
2,3,7,8-Tetrachlorodibenzofuran	0.1
Other tetrachlorodibenzofurans	0.001
2,3,4,7,8-Pentachlorodibenzofuran	0.5
1,2,3,7,8-Pentachlorodibenzofuran	0.05
Other pentachlorodibenzofurans	0.005
2,3,7,8-Hexachlorodibenzofurans	0.1
Other hexachlorodibenzofurans	0.001
2,3,7,8-Heptachlorodibenzofurans	0.005
Other heptachlorodibenzofurans	0.00005
Octachlorodibenzofuran	0.005

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		STANDARD	GUIDANCE VALUE		
§ Chlorobenzene (108-90-7)	A, A-S, AA, AA-S	20		H	C
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C	5		A	I
	D	50		A	L
	SA, SB, SC		5	A	I
	I		5	A	I
	SD		50	A	L
§ Chloroform (67-66-3)	A, A-S, AA, AA-S	0.2*		H	A
	GA	100*		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * Proposed for revision; see Addendum 3.					
§ 2-Chloronaphthalene (91-58-7)	A, A-S, AA, AA-S	10		H	D
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 5-Chloro-o-toluidine (95-79-4)	A, A-S, AA, AA-S		0.7	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Chromium (Not Applicable)	A, A-S, AA, AA-S	50		H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C	*		A	H
	D	**		A	H
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * exp(0.819 [ln (ppm hardness)] + 1.561) ** exp(0.819 [ln (ppm hardness)] + 3.688) Aquatic standards apply to acid-soluble form.					
Chromium (hexavalent) (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	50		H	S
	A, A-S, AA, AA-S, B, C	11		A	H
	D	16		A	H
	SA, SB, SC	54		A	H
	I		50	A	H
	SD	1,200		A	H
Remarks: * Aquatic standards and guidance value apply to acid-soluble form.					

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Chrysene (218-01-9)	A, A-S, AA, AA-S		0.002	H	D
	GA		0.002	H	D
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Cobalt (Not Applicable)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	5		A	I
	D		110	A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: Aquatic standard and guidance value apply to acid-soluble form.

Copper (Not Applicable)	A, A-S, AA, AA-S	200		H	R
	GA	200		H	R
	A, A-S, AA, AA-S, B, C	*		A	H
	D	**		A	H
	SA, SB, SC	2.0		A	H
	I		2.9	A	H
	SD	3.2		A	H

(Standards for Classes SA, SB, SC and SD are proposed for revision; see Addendum 2.)

Remarks: * exp(0.8545 [ln (ppm hardness)] - 1.465)
** exp(0.9422 [ln (ppm hardness)] - 1.464)

Aquatic standards apply to acid-soluble form. Aquatic guidance value applies to dissolved form.

Cyanide (Not Applicable)	A, A-S, AA, AA-S	100		H	R
	GA	100		H	R
	A, A-S, AA, AA-S, B, C	5.2*		A	H
	D	22*		A	H
	SA, SB, SC	1.0*		A	H
	I		1.0*	A	H
	SD	1.0*		A	H

Remarks: * As free cyanide - the sum of HCN and CN^- expressed as CN.

§ Dalapon (Not Applicable)	A, A-S, AA, AA-S		50*	H	Q
	GA	50*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ DDT, DDD & DDE (50-29-3; 72-54-8; 72-55-9)	A, A-S, AA, AA-S	0.01		H	A
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C	0.001		A	H
	D	0.001		A	H
	SA, SB, SC	0.001		A	H
	I		0.001	A	H
	SD	0.001		A	H
§ Demeton (8065-48-3; 298-03-3; 126-75-0)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	0.1		A	J
	D			A	
	SA, SB, SC	0.1		A	J
	I		0.1	A	J
	SD			A	
§ Diazinon (333-41-5)	A, A-S, AA, AA-S			H	
	GA	0.7		H	S
	A, A-S, AA, AA-S, B, C	0.08		A	J
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Dibromochloromethane (124-48-1)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Dibromodichloromethane (594-18-3)	A, A-S, AA, AA-S		5	H	Q
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 2,2-Dibromo-3-nitrilopropionamide & Dibromoacetonitrile (10222-01-2; 3252-43-5)	A, A-S, AA, AA-S		50*	H	E
	GA		50*	H	E
	A, A-S, AA, AA-S, B, C		20	A	J
	D		50	A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to 2,2-dibromo-3-nitrilopropionamide only.

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§	A, A-S, AA, AA-S		50	H	E
Di-n-butyl phthalate	GA	50		H	Q
(84-74-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Dicamba	GA	0.44		H	S
(1918-00-9)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S	30*		H	C
1,2-Dichlorobenzene &	GA	4.7		H	S
1,4-Dichlorobenzene	A, A-S, AA, AA-S, B, C	**		A	
(95-50-1; 106-46-7)	D	**		A	
	SA, SB, SC		**	A	
	I		**	A	
	SD		**	A	
Remarks: * Applies to 1,4-Dichlorobenzene only. ** Refer to entry for Dichlorobenzenes.					
§	A, A-S, AA, AA-S	20		H	C
1,3-Dichlorobenzene	GA	5		H	Q
(541-73-1)	A, A-S, AA, AA-S, B, C	*		A	
	D	*		A	
	SA, SB, SC		*	A	
	I		*	A	
	SD		*	A	
Remarks: * Refer to entry for Dichlorobenzenes.					
Dichlorobenzenes	A, A-S, AA, AA-S			H	
(95-50-1; 106-46-7;	GA			H	
541-73-1)	A, A-S, AA, AA-S, B, C	5		A	I,N
	D	50		A	L
	SA, SB, SC		5	A	I,N
	I		5	A	I,N
	SD		50	A	L
§	A, A-S, AA, AA-S		5	H	Q
1,1-Dichloroethane	GA	5		H	Q
(75-34-3)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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		STANDARD	GUIDANCE VALUE		
§ 1,2-Dichloroethane (107-06-2)	A, A-S, AA, AA-S	0.8		H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 1,1-Dichloroethylene (75-35-4)	A, A-S, AA, AA-S		0.07	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ trans-1,2-Dichloroethylene (156-60-5)	A, A-S, AA, AA-S		5	H	Q
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Dichlorofluoromethane (75-43-4)	A, A-S, AA, AA-S		5	H	Q
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 2,4-Dichlorophenol (120-83-2)	A, A-S, AA, AA-S	0.3		H	C
	GA	*		H	
	A, A-S, AA, AA-S, B, C	**		A	
	D	**		A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Refer to entry for Phenolic compounds (total phenols).
** Refer to entry for Phenols - total chlorinated.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ 2,4-Dichlorophenoxyacetic acid (94-75-7)	A, A-S, AA, AA-S	100		H	Q
	GA	4.4		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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§ Dichloropropanes (78-99-9; 78-87-5; 142-28-9; 594-20-7; 26638-19-7)	A, A-S, AA, AA-S		5*	H	Q
	GA	5*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each isomer (1,1-, 1,2-, 1,3-, and 2,2-) individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Dieldrin (60-57-1)	A, A-S, AA, AA-S		0.0009	H	A
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C	*		A	
	D	*		A	
	SA, SB, SC	*		A	
	I		*	A	
	SD	*		A	

Remarks: * Refer to entry for "Aldrin and Dieldrin."

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Diethyl phthalate (84-66-2)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ N,N-Dimethyl aniline (121-69-7)	A, A-S, AA, AA-S		1.0	H	D
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Dimethylformamide (68-12-2)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Dimethyl phthalate (131-11-3)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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§ Dimethyl tetrachloro-terephthalate (1861-32-1)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 2,6-Dinitrotoluene (606-20-2)	A, A-S, AA, AA-S		0.07	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Di-n-octyl phthalate (117-84-0)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Diphenamid (957-51-7)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Diphenylhydrazines (122-66-7; 530-50-7)	A, A-S, AA, AA-S		0.05*	H	A
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * (1,2-) isomer only.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Dithane (142-59-6)	A, A-S, AA, AA-S			H	
	GA	1.75		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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		STANDARD	GUIDANCE VALUE		
§ Dodecylguanidine acetate and Dodecylguanidine hydrochloride (2439-10-3; 13590-97-1)	A, A-S, AA, AA-S		50	H	B
	GA		50	H	B
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Dyphylline (479-18-5)	A, A-S, AA, AA-S	50		H	D
	GA		50	H	D
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Endosulfan (115-29-7)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	0.009		A	H
	D	0.22		A	H
	SA, SB, SC	0.001		A	H
	I		0.001	A	H
	SD	0.034		A	H
§ Endrin (72-20-8)	A, A-S, AA, AA-S	0.2		H	Q
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C	0.002		A	H
	D	0.002		A	H
	SA, SB, SC	0.002		A	H
	I		0.002	A	H
	SD	0.002		A	H
§ Ethylbenzene (100-41-4)	A, A-S, AA, AA-S		5	H	Q
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Ethylene chlorohydrin (107-07-3)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		50	H	E
Ethylene glycol	GA		50	H	E
(107-21-1)	A, A-S, AA, AA-S, B, C		500*	A	J
	D		1,000*	A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Units are mg/L.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		0.05	H	A
Ethylene oxide	GA		0.05	H	A
(75-21-8)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Ethylenethiourea	GA	ND		H	S
(96-45-7)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Ferbam	GA	4.18		H	S
(14484-64-1)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	Q
Fluometuron	GA	50		H	Q
(2164-17-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	E
Fluoranthene	GA		50	H	E
(206-44-0)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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§	A, A-S, AA, AA-S		50	H	E
Fluorene	GA		50	H	E
(86-73-7)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Fluoride	A, A-S, AA, AA-S	1,500		H	R
(Not Applicable)	GA	1,500		H	S
	A, A-S, AA, AA-S, B, C	*		A	J
	D	**		A	J
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * (0.02) exp(0.907 [ln (ppm hardness)] + 7.394)
** (0.1) exp(0.907 [ln (ppm hardness)] + 7.394)

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Foaming agents	A, A-S, AA, AA-S			H	
(Not Applicable)	GA	500		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: Determined as methylene blue active substances (MBAS) or by other tests as specified by the Commissioner.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S			H	
Folpet	GA	50		H	Q
(133-07-3)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Gross alpha radiation	A, A-S, AA, AA-S	*		H	Q
(Not Applicable)	GA	*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * 15 picocuries per liter, excluding radon and uranium.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
Gross beta radiation (Not Applicable)	A, AA	*		H	R
	A-S, AA-S		*	H	R
	GA	*		H	R
	A, A-S, AA, AA-S, B, C			A	R
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * 1,000 picocuries per liter, excluding strontium-90 and alpha emitters.					
§ Guaifenesin (93-14-1)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Heptachlor & Heptachlor epoxide (76-44-8; 1024-57-3)	A, A-S, AA, AA-S	0.009		H	A
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C	0.001		A	H
	D	0.001		A	H
	SA, SB, SC	0.001		A	H
	I		0.001	A	H
	SD	0.001		A	H
Herbicides (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	100*		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * Proposed for deletion.					
§ Hexachlorobenzene (118-74-1)	A, A-S, AA, AA-S		0.02	H	A
	GA	0.35		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Hexachlorobutadiene (87-68-3)	A, A-S, AA, AA-S	0.5		H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C	1.0		A	J
	D	10		A	K
	SA, SB, SC	0.3		A	J
	I		0.3	A	J
	SD	3.0		A	K

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		STANDARD	GUIDANCE VALUE		
§ Hexachlorocyclohexanes (58-89-9; 319-84-6; 319-85-7; 319-86-8; 608-73-1; 6108-10-7)	A, A-S, AA, AA-S		0.02	H	A
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C	0.01		A	H
	D	2		A	H
	SA, SB, SC	0.004		A	H
	I		0.004	A	H
	SD	0.16		A	H
§ Hexachlorocyclo-pentadiene (77-47-4)	A, A-S, AA, AA-S	1.0		H	C
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C	0.45		A	J
	D	4.5		A	K
	SA, SB, SC	0.07		A	J*
	I		0.07	A	J*
	SD	0.7		A	K

Remarks: * NOTE in promulgated standards is incorrect. Correct NOTE is J.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	NOTES
		STANDARD	GUIDANCE VALUE		
§ 2-Hexanone (591-78-6)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Hexazinone (51235-04-2)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Hydrazine (302-01-2)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	*		A	J
	D	**		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * 5 ug/L at less than 50 ppm hardness and 10 ug/L at greater than or equal to 50 ppm hardness.
** 50 ug/L at less than 50 ppm hardness and 100 ug/L at greater than or equal to 50 ppm hardness.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	NOTES
		STANDARD	GUIDANCE VALUE		
Hydrogen sulfide (7783-06-4)	A, A-S, AA, AA-S		**	H	
	GA		**	H	
	A, A-S, AA, AA-S, B, C	2.0*		A	H
	D			A	
	SA, SB, SC	2.0*		A	H
	I		2.0*	A	H
	SD			A	

Remarks: * Undissociated.
** Refer to entry for Sulfides.

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		STANDARD	GUIDANCE VALUE		
§ Hydroquinone (123-31-9)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C	2.2		A	J
	D	4.4		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 1-Hydroxyethylidene-1,1-diphosphonic acid (2809-21-4)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 2-(2-Hydroxy-3,5-di-tert-pentylphenyl)-benzotriazole (25973-55-1)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Indeno (1,2,3-cd) pyrene (193-39-5)	A, A-S, AA, AA-S		0.002	H	D
	GA		0.002	H	D
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Iron (Not Applicable)	A, A-S, AA, AA-S	300		H	Q
	GA	300*		H	S
	A, A-S, AA, AA-S, B, C	300		A	J
	D	300		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Also see entry for "Iron and Manganese."

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Iron and Manganese (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	500		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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§ Isodecyl diphenyl phosphate (29761-21-5)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	1.73		A	I
	D	22		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Isophorone (78-59-1)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Isothiazolones, total (isothiazolinones) (includes 5-chloro-2-methyl-4-isothiazolin-3-one & 2-methyl-4-isothiazolin-3-one) (Not Applicable)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	1		A	J
	D	10		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Kepone (143-50-0)	A, A-S, AA, AA-S			H	
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Lead (Not Applicable)	A, A-S, AA, AA-S	50		H	Q
	GA	25		H	S
	A, A-S, AA, AA-S, B, C	*		A	H
	D	**		A	H
	SA, SB, SC	8.6		A	H
	I		8.6	A	H
	SD	220		A	H

Remarks: * exp(1.266 [ln (ppm hardness)] - 4.661)
** exp(1.266 [ln(ppm hardness)] - 1.416)
Aquatic standards and guidance value apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Linear alkyl benzene sulfonates (LAS) (Not Applicable)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	40*		A	J
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * LAS with side chains greater than 13 carbons only.

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SUBSTANCE (CAS NO)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Magnesium	A, A-S, AA, AA-S	35,000		H	B
(Not Applicable)	GA		35,000	H	B
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Malathion	GA	7.0		H	S
(121-75-5)	A, A-S, AA, AA-S, B, C	0.1		A	H
	D			A	
	SA, SB, SC	0.1		A	H
	I		0.1	A	H
	SD			A	
§	A, A-S, AA, AA-S			H	
Maneb	GA	1.75		H	S
(12427-38-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Manganese	A, A-S, AA, AA-S	300		H	Q
(Not Applicable)	GA	300*		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * Also see entry for "Iron and Manganese."					
§	A, A-S, AA, AA-S		50	H	E
Mercaptobenzothiazole	GA		50	H	E
(149-30-4)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Mercury	A, A-S, AA, AA-S	2		H	Q
(Not Applicable)	GA	2		H	S
	A, A-S, AA, AA-S, B, C		0.2	A	H
	D		0.2	A	H
	SA, SB, SC		0.1	A	H
	I		0.1	A	H
	SD		0.1	A	H

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SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		50	H	E
Methacrylic acid	GA		50	H	E
(79-41-4)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S	35		H	R
Methoxychlor	GA	35		H	S
(72-43-5)	A, A-S, AA, AA-S, B, C	0.03		A	H
	D			A	
	SA, SB, SC	0.03		A	H
	I		0.03	A	H
	SD			A	
§	A, A-S, AA, AA-S		50*	H	E
Methoxyethylbenzenes	GA		50*	H	E
(4013-34-7; 3558-60-9)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each isomer [(2-Methoxyethyl)benzene and (1-Methoxyethyl)benzene] individually.

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		0.002	H	D
Methylbenz(a)-anthracenes	GA		0.002	H	D
(Not Applicable)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		5	H	Q
Methyl chloride	GA	5		H	Q
(74-87-3)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
2-Methyl-4-chloro-phenoxyacetic acid	GA	0.44		H	S
(94-74-6)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	NOTES
		STANDARD	GUIDANCE VALUE		
§ Methylene bisthiocyanate (6317-18-6)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C	1.0		A	J
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Methylene chloride (75-09-2)	A, A-S, AA, AA-S		5	H	Q
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 4-(1-Methylethoxy)-1-butanol (31600-69-8)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 2-Methylethyl-1,3-dioxolane (126-39-6)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Methyl methacrylate (80-62-6)	A, A-S, AA, AA-S			H	
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Metribuzin (21087-64-9)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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§	A, A-S, AA, AA-S		0.04	H	A
Mirex	GA	5		H	Q
(2385-85-5)	A, A-S, AA, AA-S, B, C	0.001		A	H
	D	0.001		A	H
	SA, SB, SC	0.001		A	H
	I		0.001	A	H
	SD		0.001	A	H
§	A, A-S, AA, AA-S	10		H	C
Naphthalene	GA		10	H	C
(91-20-3)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Niacinamide	A, A-S, AA, AA-S	500		H	B
(98-92-0)	GA	50*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * Proposed for deletion.					
Nickel	A, A-S, AA, AA-S			H	
(Not Applicable)	GA			H	
	A, A-S, AA, AA-S, B, C	*		A	H
	D	**		A	H
	SA, SB, SC	7.1		A	H
	I		7.1	A	H
	SD	140		A	H
Remarks: * exp (0.76 [ln (ppm hardness)] + 1.06) ** exp (0.76 [ln (ppm hardness)] + 4.02) Aquatic standards and guidance value apply to acid-soluble form.					
§	A, A-S, AA, AA-S			H	
Nitralin	GA	35.0		H	S
(4726-14-1)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Nitrate and Nitrite	A, A-S, AA, AA-S	10,000*		H	Q
(expressed as N)	GA	10,000		H	R
(Not Applicable)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Remarks: * Applies only to nitrate.					

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		3**	H	A
Nitrilotriacetic acid	GA		3**	H	A
(Not Applicable)	A, A-S, AA, AA-S, B, C	5,000*		A	J
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to Nitrilotriacetate.
** Includes related forms that convert to nitrilotriacetic acid upon acidification to a pH of 2.3 or less. Proposed as standards; see Addendum 3.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Nitrite	A, A-S, AA, AA-S			H	
(Not Applicable)	GA	*		H	
	A, A-S, AA, AA-S, B, C	**		A	J
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Refer to entry for "Nitrate and Nitrite."
** Value is 100 ug/L for warm water fishery waters and 20 ug/L for cold water fishery waters.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S	30		H	C
Nitrobenzene	GA	5		H	Q
(98-95-3)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		50	H	E
N-Nitrosodiphenylamine	GA		50	H	E
(86-30-6)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Organic nitrogen	A, A-S, AA, AA-S			H	
(Not Applicable	GA	500*		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Proposed for deletion.

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SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Organic phosphates and carbamates (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	100*		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Proposed for deletion.

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Oxamyl (23135-22-0)	A, A-S, AA, AA-S			H	
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Oxygen consumed (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	2,000*		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Proposed for deletion.

		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Paraquat (4685-14-7)	A, A-S, AA, AA-S			H	
	GA	2.98		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Parathion & Methyl parathion (56-38-2; 298-00-0)	A, A-S, AA, AA-S			H	
	GA	1.5		H	S
	A, A-S, AA, AA-S, B, C	0.008		A	I,N
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Pentachloronitro-benzene (82-68-8)	A, A-S, AA, AA-S			H	
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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§	A, A-S, AA, AA-S	*		H	
Pentachlorophenol	GA	*		H	
(87-86-5)	A, A-S, AA, AA-S, B, C	0.4		A	I
	D	**		A	L
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Refer to entry for Phenolic compounds (total phenols).
** Refer to entry for Phenols, total chlorinated.

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§	A, A-S, AA, AA-S		50	H	E
Phenanthrene	GA		50	H	E
(85-01-8)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

§	A, A-S, AA, AA-S	*		H	
Phenol	GA	*		H	
(108-95-2)	A, A-S, AA, AA-S, B, C	**		A	L
	D	**		A	L
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Refer to entry for Phenolic compounds (total phenols).
** Refer to entry for Phenols, total unchlorinated.

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§	A, A-S, AA, AA-S	1		H	R
Phenolic compounds	GA	1		H	S
(total phenols)	A, A-S, AA, AA-S, B, C			A	
(Not Applicable)	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

§	A, A-S, AA, AA-S	*		H	
Phenols, total chlorinated	GA	*		H	
(Not Applicable)	A, A-S, AA, AA-S, B, C	1.0		A	L
	D	1.0		A	L
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Refer to entry for Phenolic compounds (total phenols).

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Phenols, total unchlorinated (Not Applicable)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	5.0		A	L
	D	5.0		A	L
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Phenyl ether (101-84-8)	A, A-S, AA, AA-S	10		H	C
	GA		10	H	C
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Phenylpropanolamine (14838-15-4)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Phorate & Disulfoton (298-02-2; 298-04-4)	A, A-S, AA, AA-S			H	
	GA	ND		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Picloram (Not Applicable)	A, A-S, AA, AA-S		50*	H	Q
	GA	50*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Includes: related forms that convert to the organic acid upon acidification to a pH of 2 or less; and esters of the organic acid.

§ Polychlorinated biphenyls (Not Applicable)	A, A-S, AA, AA-S	0.01		H	A
	GA	0.1		H	S
	A, A-S, AA, AA-S, B, C	0.001		A	H
	D	0.001		A	H
	SA, SB, SC	0.001		A	H
	I		0.001	A	H
	SD	0.001		A	H

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Principal organic contaminant (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	5*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * This standard applies to any and every individual substance that is a principal organic contaminant as defined in 10 NYCRR Subpart 5-1 (see Table 3), except any substance that has a standard for class GA waters listed elsewhere in this Table. Refer to the Introduction of this TOGS for additional assistance on the applicability of the POC standard.

A less stringent guidance value for an individual substance may be substituted for this standard if so determined by the Commissioner of the New York State Department of Health, pursuant to 10 NYCRR §5-1.51(g).

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Prometon (1610-18-0)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Propachlor (1918-16-7)	A, A-S, AA, AA-S			H	
	GA	35.0		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Propanil (709-98-8)	A, A-S, AA, AA-S			H	
	GA	7.0		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Propazine (139-40-2)	A, A-S, AA, AA-S			H	
	GA	16.0		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Propham (122-42-9)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER		TYPE	NOTES
		STANDARD	GUIDANCE VALUE		
§ Pyrene (129-00-0)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Pyridine (110-86-1)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Quaternary ammonium compounds (including dimethyl benzyl ammonium chloride & dimethyl ethyl benzyl ammonium chloride) (Not Applicable)	A, A-S, AA, AA-S			H	
	GA			H	
	A, A-S, AA, AA-S, B, C	10		A	J
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Radium 226 (Not Applicable)	AA	*		H	R
	A, A-S, AA-S		*	H	R
	GA	*		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * 3 picocuries per liter.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Radium 226 and Radium 228 (Not Applicable)	A, A-S, AA, AA-S	*		H	Q
	GA	*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * 5 picocuries per liter.

SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Selenium (Not Applicable)	A, A-S, AA, AA-S	10		H	Q
	GA	10		H	Q
	A, A-S, AA, AA-S, B, C	1.0*		A	I
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Aquatic standard applies to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Silver	A, A-S, AA, AA-S	50		H	Q
(Not Applicable)	GA	50		H	S
	A, A-S, AA, AA-S, B, C	0.1*		A	I
	D	**		A	H♣
	SA, SB, SC			A	
	I			A	
	SD	2.3		A	H

Remarks: * Ionic silver.
** exp (1.72 [ln (ppm hardness)] - 6.52)
♣ NOTE in promulgated standards is incorrect. Correct NOTE is H. Standards for D and SD Classes apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S			H	
Simazine	GA	50		H	Q
(122-34-9)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Sodium	A, A-S, AA, AA-S			H	
(Not Applicable)	GA	20,000		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Strontium 90	A, A-S, AA, AA-S	*		H	Q
(Not Applicable)	GA			H	
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * 8 pCi/L
If two or more radionuclides are present, the sum of their doses shall not exceed annual potential dose of 4 millirems per year.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S	50		H	C
Styrene	GA	5		H	Q
(100-42-5)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
Sulfate	A, A-S, AA, AA-S	250,000		H	Q
(Not Applicable)	GA	250,000		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Sulfides, total	A, A-S, AA, AA-S		50*	H	C
(Not Applicable)	GA		50*	H	C
	A, A-S, AA, AA-S, B, C	**		A	
	D			A	
	SA, SB, SC	**		A	
	I		**	A	
	SD			A	

Remarks: * Expressed as hydrogen sulfide.
** Refer to entry for "Hydrogen Sulfide."

Sulfite	A, A-S, AA, AA-S			H	
(Not Applicable)	GA			H	
	A, A-S, AA, AA-S, B, C	200		A	J
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		50	H	Q
Tebuthiuron	GA	50		H	Q
(34014-18-1)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Terbacil	GA	50		H	Q
(5902-51-2)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S	10		H	C
Tetrachlorobenzenes	GA	5*	10**	H	
(634-66-2;	A, A-S, AA, AA-S, B, C			A	
634-90-2; 95-94-3)	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each isomer (1,2,3,4-, 1,2,3,5-, and 1,2,4,5-) individually; basis is NOTE Q.
** Basis is NOTE C.

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ 1,1,2,2-Tetrachloroethane (79-34-5)	A, A-S, AA, AA-S		0.2	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Tetrachloroethylene (127-18-4)	A, A-S, AA, AA-S		0.7	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C		1	A	M
	D		1	A	M
	SA, SB, SC		1	A	M
	I		1	A	M
	SD		1	A	M
§ Tetrachloroterephthalic acid (2136-79-0)	A, A-S, AA, AA-S		50	H	Q
	GA	50		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Tetrahydrofuran (109-99-9)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Thallium (Not Applicable)	A, A-S, AA, AA-S		4	H	B
	GA		4	H	B
	A, A-S, AA, AA-S, B, C	8		A	I
	D	20		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: Aquatic standards apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Theophylline (58-55-9)	A, A-S, AA, AA-S	40		H	B
	GA		40	H	B
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

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		MICROGRAMS/LITER			
SUBSTANCE (CAS NO.)	WATER CLASSES	STANDARD	GUIDANCE VALUE	TYPE	NOTES
§ Thiram (137-26-8)	A, A-S, AA, AA-S			H	
	GA	1.75		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Toluene (108-88-3)	A, A-S, AA, AA-S		5	H	Q
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ o-Toluidine (95-53-4)	A, A-S, AA, AA-S		0.6	H	A
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Tolyltriazole (29385-43-1)	A, A-S, AA, AA-S		50	H	E
	GA		50	H	E
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Total of organic chemicals (Not Applicable)	A, A-S, AA, AA-S			H	
	GA	100*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * **Proposed for deletion. Applies to the total of principal organic contaminants and unspecified organic contaminants, as each is defined in 10 NYCRR Subpart 5-1.**

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		0.01	H	A
Toxaphene	GA	ND		H	S
(8001-35-2)	A, A-S, AA, AA-S, B, C	0.005		A	H
	D	1.6		A	H
	SA, SB, SC	0.005		A	H
	I		0.005	A	H
	SD		0.07	A	H
§	A, A-S, AA, AA-S		50	H	E
Tributyltin oxide	GA		50	H	E
(56-35-9)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S	10		H	C
Trichlorobenzenes	GA	5*	10**	H	
(87-61-6; 120-82-1;	A, A-S, AA, AA-S, B, C	5		A	I,N
108-70-3; 12002-48-1)	D	50		A	L
	SA, SB, SC	5		A	I,N
	I		5	A	I,N
	SD	50		A	L

Remarks: * Applies to each isomer (1,2,3-, 1,2,4-, and 1,3,5-) individually; basis is NOTE Q.
** Basis is NOTE C.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		5	H	Q
1,1,1-Trichloroethane	GA	5		H	Q
(71-55-6)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S	0.6		H	A
1,1,2-Trichloroethane	GA	5		H	Q
(79-00-5)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		3	H	A
Trichloroethylene	GA	5		H	Q
(79-01-6)	A, A-S, AA, AA-S, B, C		11	A	M
	D		11	A	M
	SA, SB, SC		11	A	M
	I		11	A	M
	SD		11	A	M

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Trichlorofluoromethane (75-69-4)	A, A-S, AA, AA-S		5	H	Q
	GA	5		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ (2,4,5-Trichlorophenoxy)-acetic acid (93-76-5)	A, A-S, AA, AA-S			H	
	GA	35		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ 2-(2,4,5-Trichloro-phenoxy)propionic acid (93-72-1)	A, A-S, AA, AA-S	10		H	Q
	GA	0.26		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Trichlorotrifluoroethanes (354-58-5; 76-13-1; 26523-64-8)	A, A-S, AA, AA-S		5*	H	Q
	GA	5*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each isomer (1,1,1-trichloro-2,2,2-trifluoroethane and 1,1,2-trichloro-1,2,2-trifluoroethane) individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§ Trifluralin (1582-09-8)	A, A-S, AA, AA-S			H	
	GA	35.0		H	S
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§ Trihalomethanes, total (67-66-3; 124-48-1; 75-27-4; 75-25-2)	A, A-S, AA, AA-S			H	
	GA	100*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Proposed for deletion. Applies only to the four substances identified by CAS number in this entry.

NEW YORK STATE AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES

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SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		5*	H	Q
Trimethylbenzenes	GA	5*		H	Q
(526-73-8; 95-63-6;	A, A-S, AA, AA-S, B, C			A	
108-67-8; 25551-13-7)	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each isomer (1,2,3-, 1,2,4-, and 1,3,5-) individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		50*	H	E
Trimethylpyridines	GA		50*	H	E
(1462-84-6; 108-75-8)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each isomer (2,3,6- and 2,4,6-) individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		50	H	E
Triphenyl phosphate	GA		50	H	E
(115-86-6)	A, A-S, AA, AA-S, B, C	4		A	J
	D	40		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Tritium	A, A-S, AA, AA-S	*		H	Q
(Not Applicable)	GA			H	
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * 20,000 picocuries per liter; if two or more radionuclides are present, the sum of their annual dose equivalent to the total body or any organ shall not exceed 4 millirems per year.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Unspecified organic contaminant	A, A-S, AA, AA-S			H	
(Not Applicable)	GA	50*		H	Q
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * This standard applies to any and every individual substance that is an unspecified organic contaminant as defined in 10 NYCRR Subpart 5-1 (see Table 3), except any substance that has a standard for class GA waters listed elsewhere in this document. A less stringent guidance value for an individual substance may be substituted for this standard if so determined by the Commissioner of the New York State Department of Health, pursuant to 10 NYCRR §5-1.51(g).

Proposed for deletion as a general standard.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Uranyl ion	A, A-S, AA, AA-S			H	
(Not Applicable)	GA	5,000		H	R
	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
Vanadium	A, A-S, AA, AA-S			H	
(Not Applicable)	GA			H	
	A, A-S, AA, AA-S, B, C	14		A	J
	D	190		A	K
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: Aquatic standards apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S		0.3	H	A
Vinyl chloride	GA	2		H	Q
(75-01-4)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S		5*	H	Q
Xylenes	GA	5*		H	Q
(95-47-6; 108-38-3;	A, A-S, AA, AA-S, B, C			A	
106-42-3; 1330-20-7)	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

Remarks: * Applies to each isomer (1,2-, 1,3-, and 1,4-) individually.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
Zinc	A, A-S, AA, AA-S	300		H	R
(Not Applicable)	GA	300		H	R
	A, A-S, AA, AA-S, B, C	30		A	I
	D	*		A	H
	SA, SB, SC	58		A	H
	I		45	A	I
	SD	170		A	H

(Aquatic standards are proposed for revision; see Addendum 3.)

Remarks: * exp (0.83 [ln (ppm hardness)] + 1.95)
Aquatic standards and guidance value apply to acid-soluble form.

SUBSTANCE (CAS NO.)	WATER CLASSES	MICROGRAMS/LITER STANDARD	MICROGRAMS/LITER GUIDANCE VALUE	TYPE	NOTES
§	A, A-S, AA, AA-S			H	
Zineb	GA	1.75		H	S
(12122-67-7)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	
§	A, A-S, AA, AA-S			H	
Ziram	GA	4.18		H	S
(137-30-4)	A, A-S, AA, AA-S, B, C			A	
	D			A	
	SA, SB, SC			A	
	I			A	
	SD			A	

TABLE 2

ADDITIONAL SUBSTANCES INCLUDED IN THE GROUNDWATER PRINCIPAL ORGANIC CONTAMINANT STANDARD OF 5 ug/L
(Partial List)

(STANDARD APPLIES TO CLASS GA WATERS; TYPE IS H AND BASIS IS NOTE Q)

SUBSTANCE [CAS NUMBER]

Acrolein [107-02-8]
Acrylamide [79-06-1]
Allyl chloride [107-05-1]
4-Aminobiphenyl [92-67-1]
Bis(2-chloro-1-methylethyl) ether [108-60-1]
Bis(2-chloroethoxy)methane [111-91-1]
Bis(chloromethyl) ether [542-88-1]
Bromobenzene [108-86-1]
Bromochloromethane [74-97-5]
Bromomethane [74-83-9]
n-Butylbenzene [104-51-8]
sec-Butylbenzene [135-98-8]
tert-Butylbenzene [98-06-6]
m-Chloroaniline [108-42-9]
o-Chloroaniline [95-51-2]
p-Chloroaniline [106-47-8]
Chloroethane [75-00-3]
1-Chloro-2-nitrobenzene [88-73-3]
1-Chloro-3-nitrobenzene [121-73-3]
1-Chloro-4-nitrobenzene [100-00-5]
Chloroprene [126-99-8]
Chlorothalonil [1897-45-6]
2-Chlorotoluene [95-49-8]
4-Chlorotoluene [106-43-4]
Chlorotrifluoropropanes [NA]*
1,2-Dibromo-3-chloropropane [96-12-8]
Dibromomethane [74-95-3]
3,3'-Dichlorobenzidine [91-94-1]
trans-1,4-Dichloro-2-butene [110-57-6]
Dichlorodifluoromethane [75-71-8]
cis-1,2-Dichloroethylene [156-59-2]

TABLE 2 (con't)

1,1-Dichloropropene [563-58-6]
cis-1,3-Dichloropropene [10061-01-5]
trans-1,3-Dichloropropene [10061-02-6]
3,4-Dichlorotoluene [95-75-0]
2,4-Dichlorotoluene [95-73-8]
2,5-Dichlorotoluene [19398-61-9]
2,3-Dichlorotoluene [32768-54-0]
2,6-Dichlorotoluene [118-69-4]
m-Diisopropylbenzene [99-62-7]
o-Diisopropylbenzene [577-55-9]
p-Diisopropylbenzene [100-18-5]
3,3'-Dimethylbenzidine [119-93-7]
alpha, alpha-Dimethylphenethylamine [122-09-8]
1,3-Dinitrobenzene [99-65-0]
2,4-Dinitrotoluene [121-14-2]
Endrin aldehyde [7421-93-4]
Ethylene dibromide [106-93-4]
Hexachloroethane [67-72-1]
Hexachlorophene [70-30-4]
Hexachloropropene [1888-71-7]
Isodrin [465-73-6]
Isopropylbenzene [98-82-8]
p-Isopropyltoluene [99-87-6]
Methacrylonitrile [126-98-7]
Methyl iodide [74-88-4]
m-Nitroaniline [99-09-2]
o-Nitroaniline [88-74-4]
p-Nitroaniline [100-01-6]
5-Nitro-o-toluidine [99-55-8]
Pentachlorobenzene [608-93-5]
Pentachloroethane [76-01-7]
p-Phenylenediamine [106-50-3]
Phenylhydrazine [100-63-0]
n-Propylbenzene [103-65-1]
1,1,1,2-Tetrachloroethane [630-20-6]
1,2,3-Trichloropropane [96-18-4]
2,3,6-Trichlorotoluene [2077-46-5]
2,4,5-Trichlorotoluene [6639-30-1]
sym-Trinitrobenzene [99-35-4]

* Standard applies to each isomer individually.

EXPLANATION OF NOTES
IN
TABLES 1 AND 2

Category	Note	NYCRR Title	NYCRR Reference	Procedure
Human	A	6	701.4	Oncogenic
	B	6	701.5	Non-oncogenic
	C	6	701.6	Aesthetic
	D	6	701.7	Chemical correlation
	E	6	701.15(e)	50 ug/L individual organic chemical
	Q	10	Part 5	Regulations for drinking water supplies (NYSDOH)
	R	10	Part 170	Regulations for sources of drinking water (NYSDOH)
	S	6	703.5(a)(3)	Regulations for groundwater
Aquatic	H	6	701.8(b)	USEPA published criteria
	I	6	701.9(a)	Propagation (chronic toxicity tests available)
	J	6	701.9(b)	Propagation (chronic toxicity tests not available)
	K	6	701.10	Survival (acute toxicity tests)
	L	6	701.11	Aquatic-food tainting
	M	6	701.12	Bioaccumulation
	N	6	701.13	Chemical and aquatic species correlation

INDEX OF TABLE 1 AND TABLE 2 ENTRIES BY CHEMICAL ABSTRACTS SERVICE (CAS) REGISTRY NUMBER

[Where entry includes multiple substances, underlining identifies the specific substance that corresponds to the CAS number listed. Entries having no CAS numbers are indicated by "NA" (not applicable).]

INDEX OF TABLE 1 AND TABLE 2
(Continued)

INDEX OF TABLE 1 AND TABLE 2
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INDEX OF TABLE 1 AND TABLE 2
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TABLE 3

DEFINITIONS FOR PRINCIPAL ORGANIC CONTAMINANT AND UNSPECIFIED ORGANIC CONTAMINANT

Principal Organic Contaminant:

Principal organic contaminant (POC) means any organic chemical compound belonging to the following classes, except for trichloromethane (chloroform), dibromochloromethane, bromodichloromethane, tribromomethane (bromoform) and any other organic contaminant with a specific MCL listed in 10 NYCRR Section 5.1-52, Table 3:

(1) Halogenated alkane: Compound containing carbon (C), hydrogen (H) and halogen (X) where X = fluorine (F), chlorine (Cl), bromine (Br) and/or iodine (I), having the general formula $C_nH_yX_z$, where $y + z = 2n + 2$; n, y and z are integer variables; n and z are equal to or greater than one and y is equal to or greater than zero.

(2) Halogenated ether: Compound containing carbon (C), hydrogen (H), oxygen (O) and halogen (X) (where X = F, Cl, Br and/or I) having the general formula $C_nH_yX_zO$, where $y + z = 2n + 2$; the oxygen is bonded to two carbons; n, y and z are integer variables; n is equal to or greater than two, y is equal to or greater than zero and z is equal to or greater than one.

(3) Halobenzenes and substituted halobenzenes: Derivatives of benzene which have at least one halogen atom attached to the ring and which may or may not have straight or branched chain hydrocarbon, nitrogen or oxygen substituents.

(4) Benzene and alkyl- or nitrogen-substituted benzenes: Benzene or a derivative of benzene which has either an alkyl- and/or a nitrogen- substituent.

(5) Substituted, unsaturated hydrocarbons: A straight or branched chain unsaturated hydrocarbon compound containing one of the following: halogen, aldehyde, nitrile, amide.

(6) Halogenated non-aromatic cyclic hydrocarbons: A non-aromatic cyclic compound containing a halogen.

Unspecified Organic Contaminant:

Unspecified organic contaminant (UOC) means any organic chemical compound not otherwise specified in this Subpart.

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* Both definitions excerpted from 10 NYCRR Subpart 5-1.

ADDENDUM I

PROPOSED STANDARDS

SUBSTANCE	WATER CLASSES	STANDARD (micrograms per liter)	TYPE
Ammonia	A, A-S, AA, AA-S, B, C	**	Aquatic
	D	**	Aquatic

Remark: ** Un-ionized ammonia as NH_3; tables below provide the standard in ug/l at varying pH and temperature for different classes and specifications. Linear interpolation between the listed pH values and temperatures is applicable.

Classes A, A-S, AA, AA-S, B, C with the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°-30°C
6.50	0.7	0.9	1.3	1.9
6.75	1.2	1.7	2.3	3.3
7.00	2.1	2.9	4.2	5.9
7.25	3.7	5.2	7.4	11
7.50	6.6	9.3	13	19
7.75	11	15	22	31
8.0-9.0	13	18	25	35

Classes A, A-S, AA, AA-S, B, C without the (T) or (TS) Specification

pH	0°C	5°C	10°C	15°C	20°-30°C
6.50	0.7	0.9	1.3	1.9	2.6
6.75	1.2	1.7	2.3	3.3	4.7
7.00	2.1	2.9	4.2	5.9	8.3
7.25	3.7	5.2	7.4	11	15
7.50	6.6	9.3	13	19	26
7.75	11	15	22	31	43
8.0-9.0	13	18	25	35	50

Class D

pH	0°C	5°C	10°C	15°C	20°C	25°-30°C
6.50	9.1	13	18	26	36	51
6.75	15	21	30	42	59	84
7.00	23	33	46	66	93	131
7.25	34	48	68	95	140	190
7.50	45	64	91	130	180	260
7.75	56	80	110	160	220	320
8.0-9.0	65	92	130	180	260	370

Benzene	A, A-S, AA, AA-S	0.7	Health (water source)
	GA	0.7	Health (water source)
Cadmium (acid-soluble)	SA, SB, SC, I	7.7	Aquatic
	SD	21	Aquatic
Chlorine, Total Residual	A, A-S, AA, AA-S, B, C	5	Aquatic
	D	19	Aquatic
	SA, SB, SC, I	7.5	Aquatic
	SD	13	Aquatic
Chloroform	A, A-S, AA, AA-S	7	Health (water source)
	GA	7	Health (water source)
Copper (dissolved)	A, A-S, AA, AA-S, B, C	*	Aquatic
	D	**	Aquatic
	SA, SB, SC, I	2.9	Aquatic
	SD	2.9	Aquatic

Remarks: * exp (0.8545 [ln (ppm hardness)] - 1.465)
** exp (0.9422 [ln (ppm hardness)] - 1.464)

Nitrilotriacetic acid	A, A-S, AA, AA-S	3	Health (water source)
	GA	3	Health (water source)

Remarks: Includes related forms that convert to nitrilotriacetic acid upon acidification to a pH of 2.3 or less.

Zinc (acid soluble)	A, A-S, AA, AA-S, B, C	*	Aquatic
	D	**	Aquatic
	SA, SB, SC, I	45	Aquatic
	SD	95	Aquatic

Remarks: * exp (0.8473 [ln (ppm hardness)] + 0.1549)
** exp (0.8473 [ln (ppm hardness)] + 0.8604)

Radium 226	A	*	Health (water source)

Remarks: * 3 picocuries per liter.

APPENDIX H

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF FISH AND WILDLIFE, SEDIMENT CRITERIA

Sediment Criteria - December 1989

Used as Guidance by the Bureau of Environmental Protection, Division of Fish and Wildlife, New York State Department of Environmental Conservation

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Note: This document is used as guidance by the Division of Fish and Wildlife. It is neither a standard nor a policy of the Department.

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I. Introduction and Overview of Sediment Criteria Methodology

On February 2 and 3, 1989, the USEPA presented to its Science Advisory Board (SAB) a methodology for deriving sediment criteria for non-polar (or non-ionic) organic chemicals. It is known as the equilibrium partitioning (EP) approach. A briefing document was given to the SAB which summarized the theoretical basis for the EP methodology and supporting lab and field data, and included the first list of interim criteria derived by the method (EPA 1989).

The methodology has been discussed in the scientific community for several years. It is based on the theory that toxics in sediments will exert their effect, either toxicity or bioaccumulation, to the extent that the chemical becomes freely bioavailable in the sediment interstitial (pore) water. It has been determined that the best sediment parameter with which to make predictions of bioavailability of non-polar organics in sediments is the fraction of organic carbon in the sediment. For sediments which exceed 0.5% total organic carbon the concentration of the chemical in the pore water can be predicted dividing the bulk sediment concentration by the product of the sediment/organic carbon partition coefficient (K_{oc}) and the fraction organic carbon. Few K_{oc} are accurately known, however it has been determined that K_{ow} (octanol/water partition coefficient) is very nearly equal to K_{oc} and may be substituted for K_{oc} in this calculation. By setting the pore water concentration equal to the water quality standard or criterion for the chemical a sediment criterion can be calculated by solving for the bulk sediment concentration. The sediment criterion algorithm normalized for organic carbon (OC) follows:

$$\text{Sediment Criterion, ug/gOC} = (\text{AWQS/GV, ug/l}) \text{ X } (K_{ow}\text{, l/kg}) \text{ X } \frac{1 \text{ Kg}}{1{,}000\text{gOC}}$$

where AWQS/GV is the ambient water quality standard or guidance value for a chemical

K_{ow} is the octanol/water partition coefficient for the chemical; units are those for K_{oc}.

and $\frac{1 \text{ Kg}}{1{,}000 \text{ gOC}}$ is a unit conversion factor.

To derive a sediment criterion for a specific sediment, the OC normalized value is multiplied by the OC concentration in the sediment. For example, table 1 contains a carbon normalized sediment criterion for PCB of 1.4 ug/gOC which is derived as follows:

$$\text{PCB Sediment Criterion} = 0.001 \text{ ug/l X } 10^{\overset{6.14}{\cancel{6.2}}} \times \frac{1 \text{ Kg}}{1{,}000 \text{ g OC}} = 1.4 \text{ ug/gOC}$$

To obtain a site-specific criterion for a sediment with 3% total OC multiply the OC normalized criterion by the fraction of organic carbon:

$$\text{Site-specific criterion} = 1.4 \text{ ug/gOC X } 30 \text{ gOC/Kg} = 42 \text{ ug/kg}$$

Sediment with contaminants in excess of the criteria would be predicted to contain interstitial water in excess of the AWQS/GV. The PCB AWQS that is the basis for the sediment criterion of 1.4 g/gOC is designed to protect wildlife which consume other biota. Therefore, exceedance of the sediment criterion would be predicted to cause accumulation of PCB in surface water biota to levels that would be harmful to wildlife consumers of the biota.

Table 1 contains sediment criteria for a number of non-polar organic chemicals. For many of the chemicals, there is more than one criterion, reflecting the varied environmental protection objectives of the AWQS/GV/C used to calculate the criteria. Exceedance of the aquatic toxicity based criterion for a chemical would be predicted to cause toxicity to benthic or epibenthic life. Exceedance of the human health residue based criterion would be predicted to cause accumulation of the chemicals in aquatic animals to levels that would exceed a human health tolerance, action level or cancer risk dose (depending on the basis of the AWQS/GV/C). Exceedance of the wildlife residue based criterion for a chemical would be predicted to cause accumulation of the chemical in aquatic animals to levels that would be harmful to wildlife consumers of the animals.

There are a number of sediment criteria in Table 1 whose AWQS/GV/C is followed by the footnote "+". The human health based water quality criteria followed by this footnote are 1 X 10^{-6} cancer risk AWQC derived by the method for calculating water quality standards and guidance values in 6NYCRR 701.12. The wildlife based water quality criteria followed by this footnote are derived by dividing fish flesh criteria from Newell et al. (1987) by bioaccumulation factors.

Table 2 provides sediment criteria for five substances in 1% OC and 3% OC sediments. There are differences between sediment criteria derived using current TOGS values and proposed Division of Fish and Wildlife (DFW) values because DFW has proposed use of low cancer risk based criteria in the case of human health and somewhat more protection for wildlife resulting from revised wildlife risk assessments. The EPA criteria for PCB are considerably higher because the water quality criteria upon which the sediment criteria are based were derived using bioaccumulation factors that are known to be too low and higher fish flesh criteria for wildlife than is prudent.

Although the methodology described above is intended for non-polar organics, there are phenolics in Table 1. Phenolics are generally considered polar or ionic chemicals. However, at pH around neutrality phenolics do not ionize, and they act like non-ionic chemicals. Sorption of phenolics to sediments is known to be an important environmental fate process. Phenolics are also a major environmental contaminant. Therefore, sediment criteria were calculated for the phenolics by the non-polar formula.

For non-polar chemicals with log K_{ow} less than about 2.0 the sediment criteria for typical sediments of 0.5-5% total OC is always less than the AWQS/GV/C that was used to derive the criterion. This can be interpreted to mean that virtually all of the chemical in the sediment is bioavailable. It would not appear to make sense to actually implement sediment criteria that are less than the AWQS/GV/C. Therefore, for non-polar organic chemicals with K_{ow} <2 the sediment criterion should be considered to be the same as the AWQS/GV/C.

Until the non-polar method receives SAB approval and subsequent public review, there will likely be controversy about its use. If its use at a particular site is questioned, then the criteria should be used in conjunction with sediment toxicity and bioaccumulation tests. A limited number of such tests should be conducted to site-specifically calibrate the criteria.

For polar organics (except for phenols) and metals there are no algorithms to calculate sediment criteria in order to account for variable sediment characteristics which may affect metals toxicity. However, following the logic above, in order to ensure compliance with water quality standards, interstitial (pore) water should not exceed AWQS/GV/C for polar organics in TOGS 1.1.1. This application of AWQS/GV/C is complicated by the fact that dissolved organic carbon (DOC) in pore water is generally quite a bit higher than in the water column. DOC tends to reduce toxicity and bioaccumulation of chemicals. Since water column DOC is usually low AWQS/GV/C are not modified by DOC known to occur in specific waters. If partitioning between DOC and a chemical is known, then the effect of DOC on toxicity or bioaccumulation may be accounted for, and AWQS/GV/C may be applied to pore water. K_{DOC} is known for many chemicals. Also, chemicals with low K_{OC} do not show uptake suppressed by DOC. Appended are some methods for collecting interstitial water, along with references.

For metals, the primary concern in sediments is toxicity to benthic (bottom) organisms. The Ontario Ministry of the Environment reviewed a number of methods to derive sediment criteria, each with a somewhat different level of benthos protection, and calculated metals criteria for each as data was available (MOE 1988) Persaud (1989) derived from MOE (1988) no-effect levels and lowest effect levels for metals (Persaud 1989 is a personal communication which is expected as a formal document in late 1989). Table 4 presents the geometric mean of these two values. Calculation of the geometric mean of a no-effect and lowest effect level is one method used for deriving water quality criteria. It is also appropriate for calculating sediment criteria. The methods used to derive these criteria do not account for variability of bioavailability of metals in sediments with differing organic content, particle size distribution or iron and manganese oxide content. Implementation of these metals sediment criteria is discussed below.

Although there currently is no algorithm for metals to calculate sediment criteria, EPA is working on the problem. Recently, a finding was made that may lead to such an algorithm. A paper by D.M. Di Toro et al was presented at the November 1989 meeting of the Society of Environmental Toxicology and Chemistry in Toronto which indicates that bioavailability of cadmium (and probably other heavy metals) in sediments is largely determined by the amount of acid volatile sulfide (AVS) in sediments that is available to bind with cadmium. While confirming studies have not been completed, there is sufficient promise to this approach to warrant advising users of sediment criteria to include quantification of AVS among the measurements of each sediment sample taken where metals are of concern. It appears to be important to avoid contact of sediment samples with air to minimize oxidation of iron and manganese sulfide, and it would be useful to measure AVS at several depths of sediment cores. At this time, interpretation of this data will be site-specific but by 1991, it may be possible to use this data to calculate sediment criteria for the metals. Therefore, it is worthwhile to begin AVS measurement now.

For the measurement technique DiToro et al cited Morse (1987). Appendix 2 is a procedure used by DiToro et al which presumably is derived from Morse et al (1987).

There is concern that use of bioaccumulation based sediment criteria derived by the EP method may not be appropriate if the surface water impairment of concern is an elevated residue in pelagic fish. The SAB is addressing this question. It seems to be well accepted that residues in benthic animals are accurately modeled by the EP method, but for low K_{ow} chemicals (less than about 10^5), residues in pelagic fish may not be clearly related to pore water concentrations. However, for high K_{ow} chemicals (greater than about 10^5) biomagnification through the aquatic food chain is known to occur, and EP criteria may actually be underprotective. For these chemicals, there may be an alternative approach to derive sediment criteria. Recent studies with PCB and 2,3,7,8-TCDD indicate that residues in fish can be predicted by sediment to fish bioaccumulation factors. Accumulation in edible fillet with 3% lipid from sediment with 3% OC is about 0.1-1 times the sediment concentration for 2,3,7,8-TCDD and about 1-10 times the sediment concentration for PCB. Using these sediment to fish accumulation factors, sediment criteria can be back calculated from fish residue levels of concern. Table 3 presents some of these criteria. Complete documentation for this approach can be provided in the near future.

Sediment criteria derived by this sediment-to-fish approach are comparable to those derived by the EP method. For PCB the EP criterion in Table 2 of 0.24 ug/kg may be compared to the criterion in Table 3 of 0.6 - 0.06 ug/kg because they are both 1 x 10^{-6} cancer risk based; as can be seen the former falls within the range of the latter. Similarly the PCB wildlife based criterion in Table 2 of 18 ug/kg falls within the range of the PCB wildlife based criteria in Table 3 of 100-10 ug/kg. For 2.3.7.8-TCDD the cancer risk based criterion from Table 2 of 6×10^{-5} ug/kg falls within the range of the cancer risk criteria range in Table 3 of 1.4×10^{-5} to 1.4×10^{-4} ug/kg. The 2.3.7.8-TCDD wildlife based criterion from Table 2 of 0.006 ug/kg falls within the wildlife criteria range in Table 3 of 0.03 - 0.003 ug/kg. The good agreement between these two methods supports the scientific validity of the resultant sediment criteria.

This sediment criteria report will be amended upon completion and review of the EPA Science Advisory Board Report on the EP method for deriving sediment criteria..

II. Use of Sediment Criteria in Risk Management Decisions

As is indicated above. exceedance of sediment criteria can be expected to result in some specific adverse effects. The volume and location of sediment exceeding the criterion. the magnitude of the effect expected. the length of time sediments will be contaminated. and the certainty that the effect will occur. will all play a role in making decisions about how much sediment to clean up in order to eliminate or minimize the adverse effects. The effect of these factors on risk management decisions is discussed below.

Where the volume of sediment exceeding criteria is small and the sediment is fairly accessible. the pragmatic solution may be to remediate all the sediment. Where volumes are large and/or difficult to remediate (either because of accessibility or sensitivity of the impaired habitat). it may be practical to sort out and proceed with remediation of those sediments whose remediation is practicable and feasible. For the sediments which cannot feasibly be treated or removed, further risk management evaluations may be warranted.

The magnitude of the effect caused by a contaminated sediment will depend on the magnitude of the exceedance of the criterion. Where the criterion is based on direct toxicity to aquatic life or indirect toxicity to wildlife via consumption of contaminated fish, a slight exceedance of a criterion would be expected to cause only a slight adverse effect. Increases in the magnitude of exceedance will cause increases in the magnitude of the effects. It may be useful to attempt to quantify the magnitude of predicted adverse impacts where remediation of sediments is expected to be difficult or costly to accomplish. This may be accomplished by desk-top investigation into the basis for a criterion, or site-specific sediment criterion and/or bioaccumulation tests. Decisions about the volume of sediment to remediate may then be made considering predicted residual effects from any unremediated sediments. Where the sediment criterion is based on human exposure to a carcinogen in fish, shellfish or other edible biota, exceedance of the sediment criterion would be predicted to cause a greater than 10^{-6} incremental cancer risk for humans. The actual risk that society is willing to accept may be factored into cleanup decisions. Presumably, once it is predicted that an FDA or EPA tolerance or action level would be exceeded, then cleanup would have to be made to the associated sediment concentration. As with the fish and wildlife toxicity based sediment criteria, site-specific bioaccumulation tests could be conducted to verify that sediments cause the predicted level of biota residues.

Once the source of contaminants to sediments is cut off, the length of time a particular area of sediments will contain unacceptable levels of contaminants will depend on the persistence of the chemicals and the site-specific dynamics of the sediment which control sedimentation, resuspension, biological and chemical degradation and other fate processes. If a chemical is not persistent (e.g. sediment levels would be expected to fall to acceptable levels within six months) then sediment remediation may not be necessary. Even for a persistent chemical, it may not be necessary to remediate the sediments if the contaminated area is a deposition zone, if burying of the contaminated sediments would be expected to occur within a short time, and if resuspension was unlikely.

The confidence in the EP sediment criteria for non-polar organics depends on a number of factors: that exceedance of a water quality standard or criterion in sediment interstitial water will cause an adverse effect, that no other factors other than OC affect bioavailability and that the K_{ow} or K_{oc} used is accurate. It is difficult to place uncertainty bounds on water quality standards and criteria. Methods to derive them have been developed and fine-tuned for a number of years. It is assumed that they have no uncertainty. Currently, EPA also makes this assumption about its sediment criteria approach. Regarding other factors, at this time EPA (1989) has concluded that all other factors contribute a minor amount to bioavailability of contaminants.

For the uncertainty of K_{ow}, EPA has used the correlation between K_{oc} and K_{ow} to place 95% uncertainty bounds about their proposed interim sediment criteria of about (in general) one order of magnitude in either direction. This may be interpreted to mean that there is a high degree of confidence that exceedance of a criterion by about ten times will be associated with onset of impacts. For sediment criteria based on bioaccumulation this would mean that there is a high degree of confidence that at ten times the criteria aquatic animals exposed to the sediments would accumulate contaminants to levels that would exceed human health or wildlife related tolerances, action levels, fish flesh criteria etc. For sediment criteria based on toxicity to aquatic life this would mean that there is a high degree of confidence that sediments with contaminants at ten times the criteria would exhibit chronic toxicity to benthic animals. Onset of chronic toxicity may be difficult to detect in natural systems. Since water quality criteria to prevent <u>acute</u> toxicity are generally about ten times the chronic criteria, it may be generalized that for sediments with contaminants at 100 times (factors of 10 for uncertainty and acute:chronic ratios, respectively) toxicity based criteria there is a high degree of confidence that there will be onset of acute toxicity to benthic animals. Such effects would likely be evident as an impacted or depauperate benthic community.

It must also be noted that due to uncertainty about actual partitioning of a chemical between water and sediments there is the possibility that the sediment criteria are somewhat underprotective rather than overprotective.

Uncertainty of the metals criteria can not be characterized so simply. The criteria are based on empirical evidence from both lab and field studies without an attempt to normalize for any toxicity controlling factors in the sediment. Variability of toxicity of metals in any given sediment is evident from Table 4 which provides criteria, all of which are lower than the upper 95% confidence limit of pre-industrial metal concentrations in Great Lake sediments. This is interpreted to mean that in some sediments relatively low levels of metals, even below "high" background, are toxic, whereas in other sediments fairly high levels, i.e. up to and possibly even above "high" background, may not be toxic. However, for all metals, except iron, the "Limit of Tolerance" exceeds "high" background by a considerable amount, and at these levels significant and noticeable toxicity would be expected in all sediments. Site-specific tests could be conducted to determine the magnitude of effects caused by contaminants in sediments. Such tests could be used to determine whether onset of effects occurs at sediment concentrations somewhat above or below the sediment criterion.

Where contaminated sediments are not remediated, sediment criteria will be useful in quantifying residual damages for preparation of a natural resource damage claim.

Interpretation and application of sediment criteria should be conducted in coordination with the Division of Fish and Wildlife.

Much of the above implementation guidance can be outlined in a strategy for use of the sediment criteria and actions to take when criteria are exceeded.

1. Compare sediment concentrations with sediment criteria.

   a. quantify the area or volume of sediment in excess of the criteria.

   b. describe the significance of exceedances in terms of the basis of the criteria: e.g. would only bioaccumulation be expected or both bioaccumulation and toxicity, and based on quantity of exceedance would impacts be expected to be isolated or widespread through the ecosystem of concern.

2. Compare sediment concentrations with unimpacted, local background concentrations; consider significance of criteria exceedances in light of background concentrations, in particular, for naturally occurring substances such as metals.

3. If sediment concentrations are less than criteria, remediation is not necessary to ensure compliance with standards.

4. If sediments exceed criteria, and especially if exceedance is widespread in the ecosystem of concern, a number of steps can be taken to verify the need for remediation.

   a. For non-polar organic chemicals with K_{ow} <3.0, further remedial investigation or sediment remediation is not necessary if it can be demonstrated that the source of sediment contamination will be eliminated and the sediment will cleanse itself within one year. For these chemicals the greatest value of sediment criteria may be for documentation of a significant release.

   b. For sediments exceeding aquatic toxicity based criteria, including metals:

      i. conduct assessments of ecological communities to estimate degree of impairment: correlate sample specific ecological results with sediment concentrations.

ii. collect sediment samples and conduct acute and chronic toxicity tests with fish and benthic invertebrates: correlate with toxicity test results with sediment contaminant concentrations.

iii. For organics, exceedance of aquatic toxicity based criteria in Table 1 by 100 times in significant portions of the ecosystem indicates the likelihood that biota are impaired and remediation should be considered necessary.

iv. For metals, Table 4 contains "limits of tolerance". If these values are exceeded in significant portions of the ecosystem of concern, it is highly likely that biota are impaired and remediation should be considered necessary.

c. For sediments exceeding human health bioaccumulation based criteria:

i. collect data on residues in edible biota and compare with tolerances/action levels/guidance and/or 1 X 10^{-6} cancer risk levels, or

ii. collect sediment samples, test with representative edible biota, measure residue.

d. For sediments exceeding wildlife risk bioaccumulation based criteria:

i. identify biota which consume aquatic life and study them to determine whether they have been impaired by contaminants in their food supply.

ii. collect sediment samples, test with wildlife food supply and measure residues; compare with residue levels known to be toxic to wildlife.

5. When sediment concentrations and criteria are less than detection, ecological assessments are necessary to directly measure toxicity of sediments or residues in biota if it is suspected that sediments were contaminated by releases.

a. generally, it is expected that low level impacts would be associated with presence of contaminants in sediments below detection.

b. however, if impacts are found to be of unacceptable magnitude, then iterative ecological assessments may be necessary to quantify the volume of sediments to remediate.

III. Division of Fish and Wildlife sediment criteria contact is Arthur J. Newell, Room 530, 50 Wolf Road, Albany, New York 12233-4756, 518/457-1769.

IV. Detailed Criteria for Contaminants, see tables and appendix.

References

EPA. 1989. Briefing report to the EPA Science Advisory Board on the equilibrium partitioning approach to generating sediment quantity criteria. U.S. EPA. Office of Water Regulations and Standards. EPA 440/5-89-002.

Newell, A.J., D.W. Johnson and L.K. Allen. 1987. Niagara River Biota Contamination Project: Fish flesh criteria for piscivorous wildlife. NYSDEC, Bur. Env. Prot., Technical Report 87-3. 182 pp.

Ontario Ministry of the Environment (MOE). 1988. Development of Sediment quality Guidelines. Phase II - Guideline Development. Prepared by Beak Consultants.

Morse, J.W., F.J. Millero, J.C. Cornwell and D. Rickard. 1987. The chemistry of the hydrogen sulfide and iron sulfide systems in natural waters. Earth Science Reviews 24:1-42.

Persaud, D. 1989. Personal communication - Development of Provincial Sediment Quality Guidelines. Ontario Ministry of the Environment.

TABLE 1

Sediment Criteria, Derived for a Variety of Environmental Protection Objectives. (Sediment criteria are normalized to organic carbon (OC) content as ug/gOC; to obtain criteria for bulk sediments in ug/Kg multiply criteria by fraction OC;i.e. for 1% multiply by 10, for 2% OC by 20, etc.)

			Aquatic Toxicity Basis		Human Health Residue Basis		Wildlife Residue Basis	
Substance	Log K_{ow}	Freshwater or Marine F or M	AWQS/GV/C* ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC	AWQS/GV/C ug/l	Sediment Criterion ug/gOC
Acenapthene	4.33	F		730**				
Anilene		F		0.0662**				
		M		0.248**				
Aldrin and Dieldrin	5.0	F&M			0.001++	0.1		
		F&M	0.084+	8.4	0.00001+	0.001	0.0077+	0.77
Azinphosmethyl	2.4	F	0.005++	0.001				
		M	0.01++	0.003				
Azobenzene	3.82	F&M			0.07+	0.5		
Benzene	2.0	F&M			6++	0.6		
Benzo(a)pyrene and some other PAHs♦	6.04	F			0.0012++	1.3		
		M			0.0006++	0.7		
Benzidene	1.4	F	0.1++	0.003				
Bis(2-chloro-ethyl) ether	1.73	F&M			0.2+	0.01		
Bis(2-ethylhexyl) phthalate	5.3	F	0.6++	119.7				
Carbofuran	2.26	F	1++	0.2				

Table 1 (continued)

Substance	Log K_{ow}	Freshwater or Marine F or M	Aquatic Toxicity Basis AWQS/GV/C* ug/l	Aquatic Toxicity Basis Sediment Criterion ug/gOC	Human Health Residue Basis AWQS/GV/C ug/l	Human Health Residue Basis Sediment Criterion ug/gOC	Wildlife Residue Basis AWQS/GV/C ug/l	Wildlife Residue Basis Sediment Criterion ug/gOC
Endosulfan	3.55	F	0.009++	0.03				
		M	0.001++	0.004				
Endrin	5.6	F&M	0.002++	0.8			0.0019+	0.8
		F		1.04**		0.0532**		
		M		0.215**		0.0532**		
Ethyl Parathion	2.1	F		0.081**				
Heptachlor & Heptachlor epoxide	4.4	F&M	0.001++	0.03	0.00003+	0.0008	0.0038+	0.1
		F				0.11**		
		M				0.104**		
Hexachlorobenzene	6.18	F&M	<5+	<7568	0.0001+	0.15	0.008+	12
Hexachlorobutadiene	3.74	F&M			0.06+	0.3	0.07+	0.4
		F	1++	5.4				
		M	0.3++	1.6				
Hexachlorocyclohexanes	3.8	F		0.157**				
		F	0.01++	0.06				
		M	0.004++	0.03				
		F&M			0.009+	0.05	0.23+	1.5
Hexachlorocyclopentadiene	3.99	F	0.45++	4.4				
		M	0.07++	0.7				
Isodecyldiphenyl phosphate	5.4	F	1.73++	434				

Table 1 (continued)

Substance	Log K_{ow}	Freshwater or Marine F or M	Aquatic Toxicity Basis AWQS/GV/C* ug/l	Aquatic Toxicity Basis Sediment Criterion ug/gOC	Human Health Residue Basis AWQS/GV/C ug/l	Human Health Residue Basis Sediment Criterion ug/gOC	Wildlife Residue Basis AWQS/GV/C ug/l	Wildlife Residue Basis Sediment Criterion ug/gOC
2,3,7,8-Tetrachlorodibenzo-dioxin	7.0	F&M F&M	<0.001+	<10	$1X10^{-6}$++ $2X10^{-10}$+	0.01 $2X10^{-6}$	$2X10^{-8}$+	0.0002
1,1,22-Tetrachloro-ethane	2.56	F&M			0.7+	0.3		
Tetrachloro-ethylene	2.88	F&M			1++	0.8		
O-Toluidine	1.4	F&M			18+	0.45		
Toxaphene	3.3	F&M	0.005	0.01	0.009+	0.02		
Trichlorobenzenes	4.26	F&M	5++	91				
1,1,2-Trichloro-ethane	2.17	F&M			4+	0.59		
Trichloroethylene	2.29	F&M			11++	2		
Triphenyl phosphate	4.59	F	4++	156				
Vinyl chloride	0.6	F&M			18+	0.07		

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* AWQS/GV/C = Ambient water quality standard or guidance value in TOGS 1.1.1 or other water quality criterion.

\+ AWQGV proposed by Division of Fish and Wildlife.

++ Current NYS AWQS or GV in TOGS 1.1.1.

** EPA proposed interim sediment criteria; taken from an EPA briefing document for the EPA Science Advisory Board.

◆ The sediment criterion for benzo(a)pyrene also applies to benz(a)anthracene, benzo(b)fluoranthene, benzo-(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and, methylbenz(a)anthracenes. These PAH have the same TOGS 1.1.1. guidance value as benzo(a)pyrene.

TABLE 3

Sediment Criteria Derived by the Sediment-to-fish Bioaccumulation Method

	PCB		2,3,7,8-TCDD	
	Fish Residue ug/kg	Sediment Criterion*, ug/kg	Fish Residue ug/kg	Sediment Criterion,* ug/kg
Tolerance or Advisory	2000	2000-200	0.01	0.1-0.01
10^{-6} Cancer Risk @ ½ lb/week fish consumption	0.6	0.6-0.06	$1.4X10^{-5}$	$1.4X10^{-4}-1.4X10^{-5}$
Wildlife Fish Flesh Criterion	100	100-10	0.003	0.03-0.003

* For PCB and 2,3,7,8-TCDD, the ranges result from dividing the Fish Residue by a fish to sediment accumulation factor of 1-10 and 0.1-1, respectively.

APPENDIX 1

Collection of Interstitial Water

At this time, there is not a specific recommendation for a site-specific method to collect interstitial water. It is recommended that regulated parties investigate the subject and propose to DEC a method which will provide a sample to best characterize the bioavailable metals in site-specific interstitial water. As a start, it is suggested at least four methods should be considered along with some references.

1. Centrifugation (Edmunds and Bath 1976; Giesy et al. 1988; Landrum et al. 1987; Engler 1977);
2. Squeezing (Reeburgh 1967; Bender et al. 1987; Kalil and Goldhaker 1973);
3. Suction (Knezovich and Harrison 1987); and
4. Equilibrium by using dialysis membrane or fritted glass sampler (Hesslin 1976; Mayer 1976; Bottomley and Bayly 1984; Pittinger et al. 1988).

Additional literature which should be considered are Carignan et al. 1985, Bray et al. 1973, Lyons et al. 1979, Word et al. 1987, and Jenne and Zachara 1987.

These suggestions and references were obtained from a draft ASTM guidance document on sediment collection, storage, characterization, and manipulation. However, this document is not yet available for circulation or reproduction.

REFERENCES (for collection of interstitial water)

Bender, M., W. Martin, J. Hess, F. Sayles, L. Ball, and C. Lambert. 1987. A whole-core squeezer for interfacial pore-water sampling. Limnol. Oceanogr. 32:1214-1225.

Bottomley, E.Z. and I.L. Bayly. 1984. A sediment porewater sampler used in root zone studies of the submerged macrophyte, Myriophyllum spicatum. Limnol. Oceanogr. 29:671-673.

Bray, J.T., L. Bricker, and B. Troup. 1973. Phosphate in interstitial waters of anoxic sediments oxidation effects during sampling procedure. Science 180:1362-1364.

Carignan, R., F. Rapin, and A. Tessier. 1985. Sediment porewater sampling for metal analysis: a comparison of techniques. Geochim. Cosmochim. Acta 49:2493-2497.

Edmunds, W.M., and A.H. Bath. 1976. Centrifuge extraction and chemical analysis of interstitial waters. Environ. Sci. Technol. 10:467-472.

Engler, R.M., J. Brannon, J. Rose, and G. Bigham. 1977. A practical selective extraction procedure for sediment characterization. In T.F. Ven (ed.), Chemistry of Marine Sediments, Ann Arbor Sci., Ann Arbor, MI. pp. 163-171.

Giesy, J.P., R.L. Graney, J.L. Newsted, C.J. Rosiu, A. Benda, R.G. Kreis and F.J. Horvath. 1988. Comparison of three sediment bioassay methods using Detroit River sediments. Environ. Toxicol. Chem. 7:483-498.

Hesslin, R.H. 1976. An in situ sampler for close interval pore water studies. Limnol. Oceanogr. 21:912-914.

Jenne, E.A., and J.M. Zachara. 1987. Factors influencing the sorption of metals. In K.L. Dickson, A.W. Haki, and W.A. Brungs (eds.), Fate and Effects of Sediment-Bound Chemicals in Aquatic systems. Pergamon Press, New York, pp. 83-98.

Kalil, E.K., and M. Goldhaker. 1973. A sediment squeezer for removal of pore waters without air contact. J. Sediment. Petrol. 43:553-557.

Knezovich, J.P., and F.L. Harrison. 1987. A new method for determining the concentrations of volatile organic compounds in sediment interstitial water. Bull. Environ. Contam. Toxicol. 38:937-940.

Landrum, P.F., S.R. Nihart, B.J. Eadie, and L.R. Herche. 1987. Reduction in bioavailability of organic contaminants to the amphipod Pontoporeia hoyi by dissolved organic matter of sediment interstitial waters. Environ. Toxicol. Chem. 6:11-20.

Lyons, W.B., J. Gaudette, and G. Smith. 1979. Pore water sampling in anoxic carbonate sediments: oxidation artifacts. Nature 277:48-49.

Mayer, L.M. 1976. Chemical water sampling in lakes and sediments with dialysis bags. Limnol. Oceanogr. 21:909-911.

Pittinger, C.A., Va.C. Hand, J.A. Masters, and L.F. Davidson. 1988. Interstitial water sampling in ecotoxicological testing: partitioning of a cationic surfactant. W.J. Adams, G.A. Chapman, W.D. Landis (eds.), Toxicology and Hazard Assessment, Vol. 10, pp. 138-148. ASTM 971, American Soc. Testing Materials, Philadelphia, PA.

Reeburgh, W.S. 1967. An improved interstitial water sampler. Limnol. Oceanogr. 12:163-165.

Word, J.Q., J.A. Ward, L.M. Franklin, V.I. Cullinan, and S.L. Kiesser. 1987. Evaluation of the equilibrium partitioning theory for estimating the toxicity of the nonpolar organic compound DDT to the sediment dwelling amphipod *Rhepoxynius abronius*. Battelle/Marine Research Laboratory Report. Task 1, WA56. Sequim, Washington. 60 pp.

APPENDIX 2

ACID VOLATILE SULFIDE

Procedure Used at Manhattan College

The apparatus consists of the following vessels:

A 500-mL Erlynmeyer flask fitted with a three-hole stopper, where the sample to be analyzed is placed.

Three 250-mL Erlynmeyer flasks. Into the first is placed 175-200 mL of pH 4 buffer (0.05M potassium hydrogen phthlate). The second and third contain 175-200 mL of a 0.1M silver nitrate solution. Each of these is fitted with a two-hole stopper.

The four flasks are connected in sequence with appropriately shaped glass and Tygon tubing. All fittings must be air tight.

A nitrogen gas line is introduced into the first vessel through one hole of the stopper. A thistle tube with a stopcock is placed in the second hole. The exit line from the first to the second vessel is placed in the third hole. The second, third and fourth stoppers contain the entry and exit lines, the entry line being below the liquid surface and the exit line, above.

Between the nitrogen tank and the first vessel, an oxygen-scrubbing system must be placed. This system consists of a vanadous chloride solution in the first scrubbing tower and the matrix of the analyte (usually seawater or freshwater) in the second tower. The solution used in the first tower is prepared in the following manner. Four grams of ammonium metavanadate is boiled with 50 mL of concentrated hydrochloric acid and diluted to 500 mL. This solution is then transferred to the tower. Amalgamated zinc, prepared by taking about 15 grams of zinc, covering it with deionized water and adding 3 drops of concentrated hydrochloric acid before adding a small amount of mercury to complete the amalgamation, is then added to the vanadous chloride solution in the first tower. The solution should now be blue or green. When nitrogen is bubbled through it for a time it will turn purple. When the solution is exhausted, it will turn back to blue or green. It may be replenished by adding more amalgamated zinc or a few drops of concentrated hydrochloric acid.

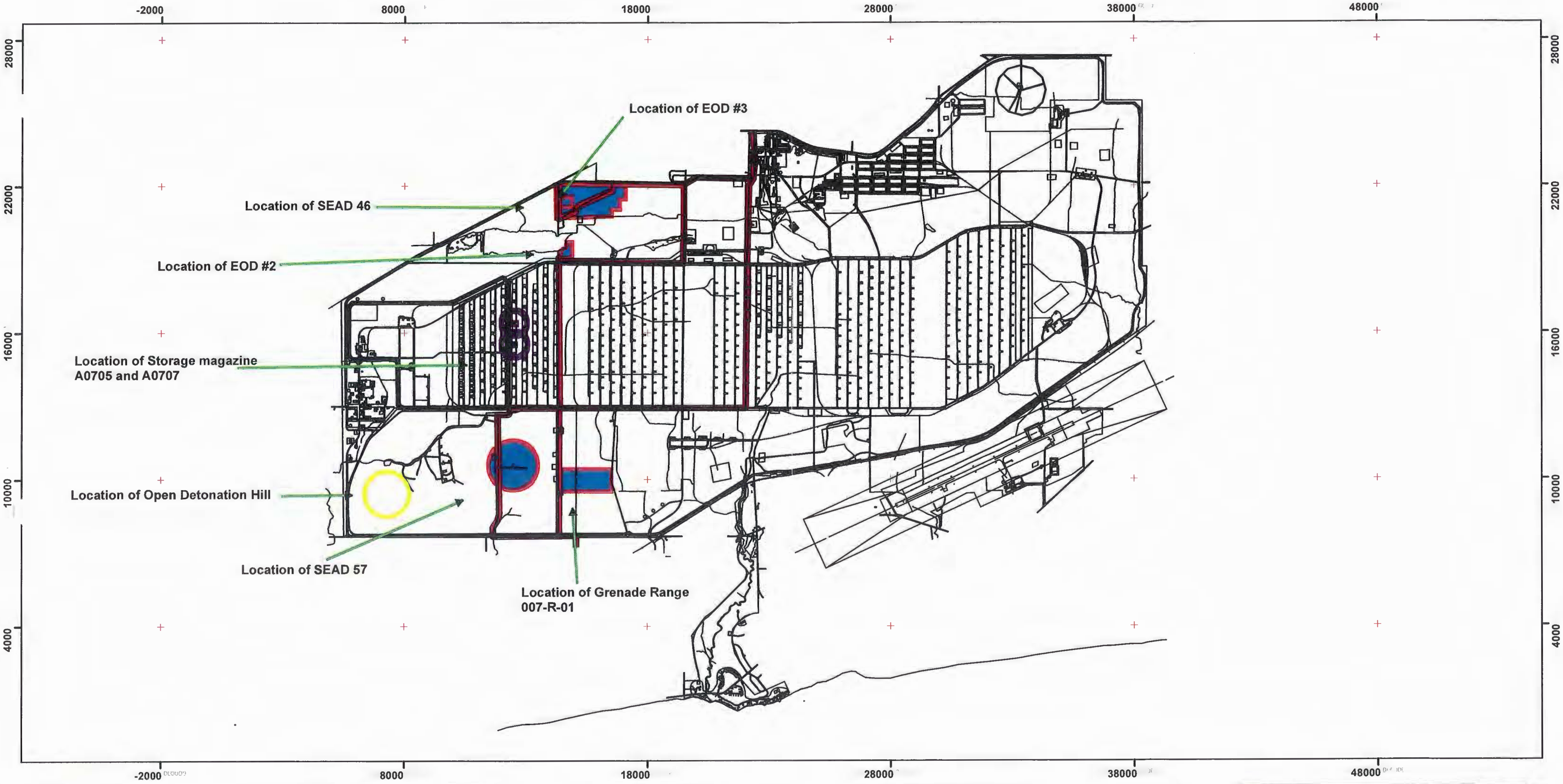
The sample or standard to be analyzed is placed in the first vessel after the entire system has been purged with nitrogen for about an hour. The usual sample size is 10-15 grams of wet sediment. Any water used in the transfer of the sample to the vessel must be completely deaerated. The system is again purged for 5-10 minutes. Deaerated 6M hydrochloric acid is now added from the thistle tube <u>qs</u> to achieve a final concentration in the vessel of 0.5M.

The system is now run for an hour with the nitrogen at a bubble rate of about four/sec. The sample vessel should be swirled every five or ten minutes. When the reaction is complete and all hydrogen sulfide produced has been converted to silver sulfide in the third vessel, the solution in that vessel should be relatively clear and the precipitate should have settled to the bottom. There should be no precipitate in the fourth vessel.

The suspension in the third vessel is passed through a 1.2 micron GF glass fiber filter, which is dried at 102°C. and weighed.

A standard can be prepared from appropriate quantities of iron(II) sulfate and sodium sulfide, the latter being best added from a solution standardized against lead perchlorate.

Typical silver sulfide precipitates are in the range 10-30 mg. When a blank is run (sample without acid), about 0.9 mg silver sulfide is obtained. When the acid is run without a sample, about 0.6 mg silver chloride is obtained.



🟦 Munitions Response Area of Clearance

☐ Storage Magaxine Location
NEW 100 lbs, Maximum Separation Distance 500 Feet

☐ Open Detonation Hill PAED 1000 ft.

☐ Routes of Travel for site access

997750 + Grid Coordinates (New York State Plane, Central)

748750

N
W E
S

0 1,875 3,750 7,500 11,250 15,000 Feet

PARSONS

DESIGNED BY: BJM	Seneca Army Depot LOCATION AND TRAFFIC PLAN
DRAWN BY: BJM	DATE PRINTED: May 22, 2006
CHECKED BY:	PROJECT NUMBER: 745054-01400
SUBMITTED BY: BJM	AIREAL PHOTOGRAPH: none
	FIGURE NUMBER: Figure 1
	FILE: O:\Seneca\MR\Parsons\ESS
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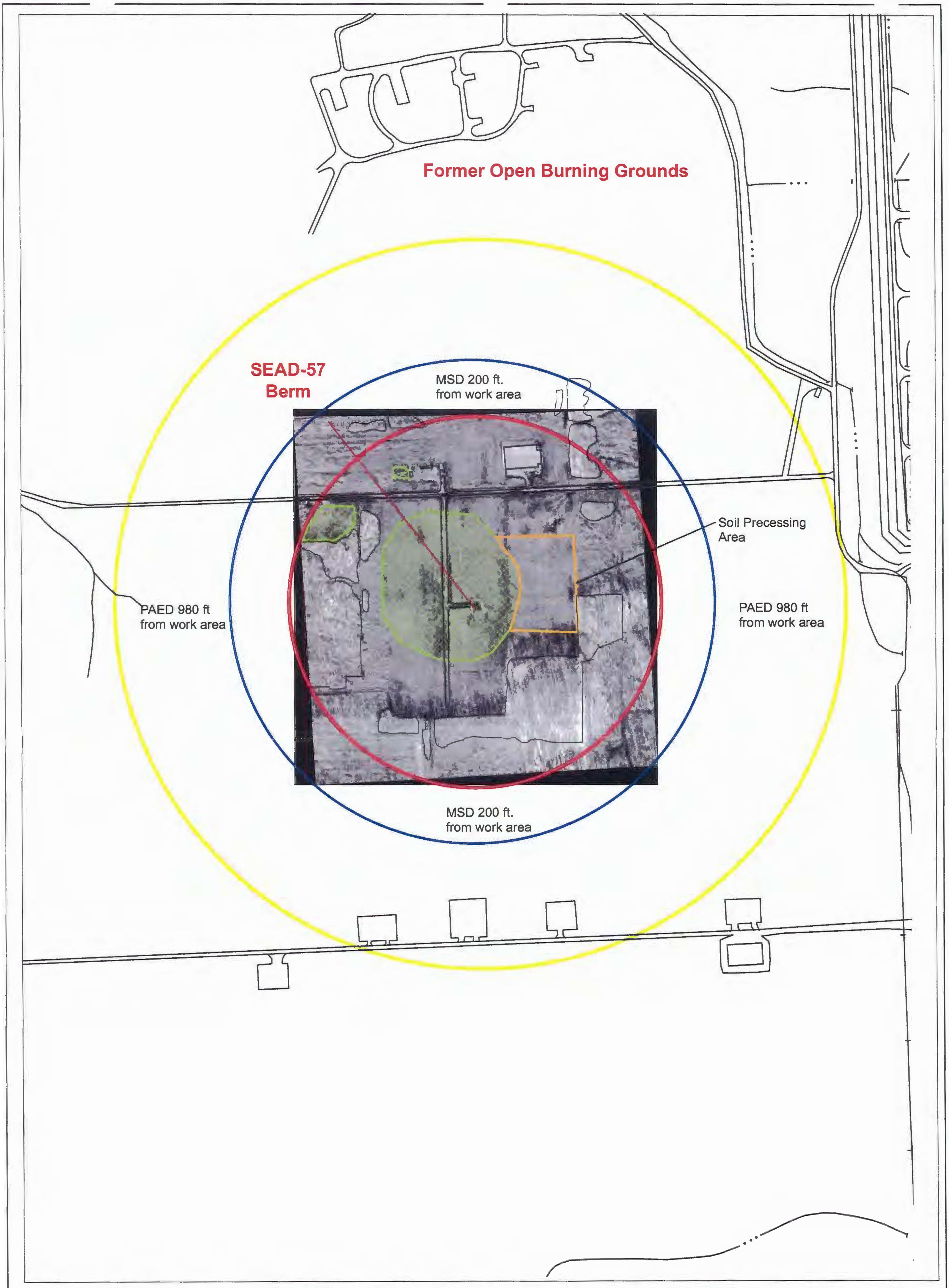

Proposed Area of Clearance

▨ Area of Excavation (14 acres)

🟥 SEAD 57 Area 1000 feet from center of berm
(limit of work area)

🟨 SEAD 57 Public Access Exclusion Distance PAED (980 feet)
from limit of work area

🟦 SEAD 57 Minimum Seperation Distance MSD (200 feet)
from limit of work area

☐ Woods Area

N
W E
S

300 150 0 300 600 Feet

PARSONS

DESIGNED BY: BJM	Proposed Area of Clearance SEAD-57	
DRAWN BY: BJM		
CHECKED BY:	Print Date: May 22, 2006	PROJECT NUMBER: 744538-03300
	Aerial photograph: 1989 2-ft. Resolution	PAGE NUMBER: Figure 2
SUBMITTED BY: BJM	FILE: O:Seneca/MR/Parsons/S57_ESS	SCALE: 1:1200

🟨 PAED Distance 345 feet from limit of work area

🟥 Grenade Range Limit of Work (25 Acres)

🟦 Minimum Seperation Distance 200ft
from limit of work area

997750 + Grid Coordinates (New York State Plane, Central)
748750

PARSONS

DESIGNED BY: BJM	Public Access Exclusion Distance Grenade Range 007-R-01	
DRAWN BY: BJM		
CHECKED BY:	DATE: May 22, 2006	PROJECT NUMBER: 744538-01100
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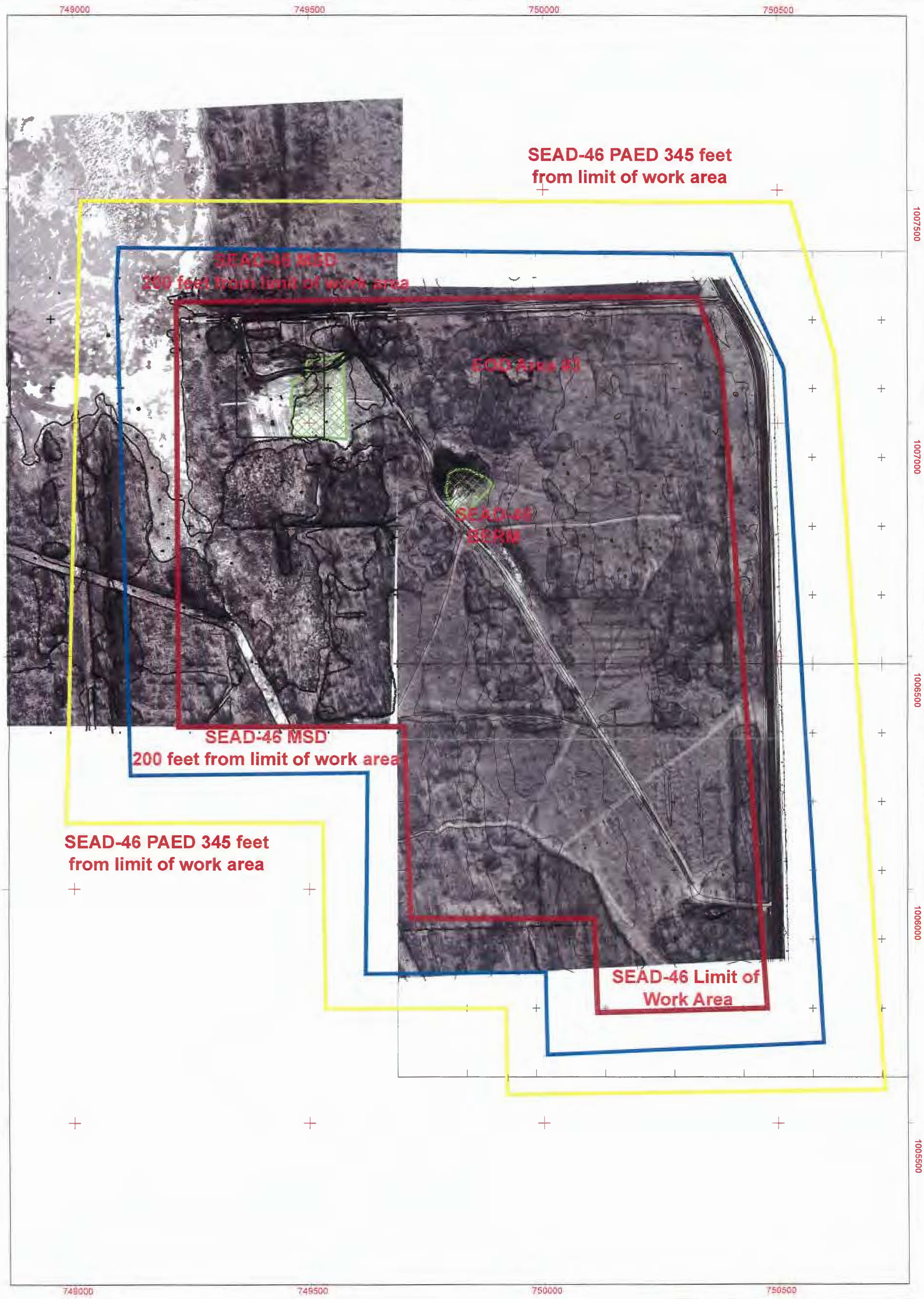
SUBMITTED BY: BJM	FILE: GR_RNG.APR	SCALE: 1:2,400



🟥 SEAD46 Limit of Work Area

▨ SRA Excavation Area

🟨 PAED 345 feet

🟦 SEAD46 Minimum Seperation Distence (MSD)

997750 + Grid Coordinates (New York State Plane, Central)
748750

N W E S

150 75 0 150 300 450 Feet

Note: Grids investigated intrusively during the EE/CA will not be re-surveyed

PARSONS

DESIGNED BY: BJM	Public Access Exclusion Distance SEAD 46
DRAWN BY: BJM	
CHECKED BY:	DATE: May 22, 2006 — PROJECT NUMBER: 736703-01000
SUBMITTED BY: BJM	AERIAL PHOTOGRAPH: 1998 2 ft Resolution — FN: Figure 4
	FILE: SEAD_46.APR — SCALE: 1:4,063.277841

- ▨ Area Requiring Resurvey - (5 Acres)
- 🟥 EOD2 Area Limit of Work
- 🟨 EOD2 PAED 345 feet from limit of work
- 🟦 EOD2 MSD 200 feet from limit of work
- 🟩 Area Mapped During EE/CA in EOD# 2 Area

997750
748750

Grid Coordinates
(New York State Plane, Central)

N
W E
S

175 87.5 0 175 Feet

PARSONS

DESIGNED BY: BJM	MPPEH Removal/Survey Area EOD# 2 SEAD 002-R-01	
DRAWN BY: BJM		
CHECKED BY:	DATE PRINTED: May 22, 2006	PROJECT NUMBER: 736703-01000
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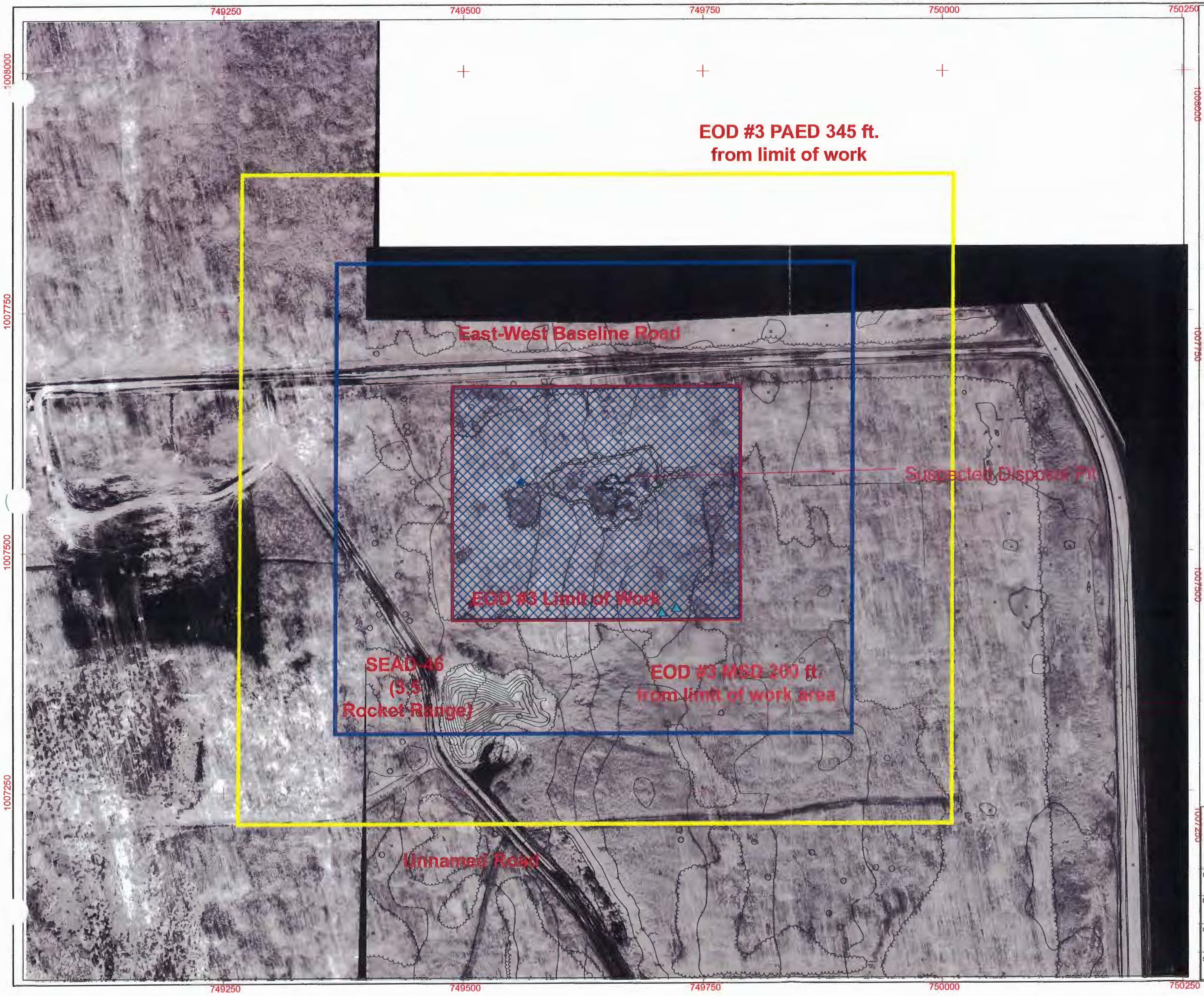
SUBMITTED BY: BJM	FILE: EOD2.APR	SCALE: 1:2,004



EOD 3 Area

OE Items Recovered During EE/CA

★ M2-Fuze lighter
▲ Rifle grenade - illum. (Expended)
◆ Slap Flare -(Illumination)

▨ Area Requiring Resurvey - (5 Acres)

□ Minimum Seperation Distance 200ft from Limit of Work Area

□ PAED 345ft from limit of work area

997750 + 748750 Grid Coordinates (New York State Plane, Central)

N W E S

180 90 0 180 Feet

PARSONS

DESIGNED BY: BJM	MPPEH Removal Area / Survey Area EOD #3 SEAD 002-R-01
DRAWN BY: BJM	
CHECKED BY:	DATE PRINTED: May 22, 2006 — PROJECT NUMBER: 745054-03300
	AERIAL PHOTOGRAPH: 1989 2 ft Resolution — FN: Figure 6
SUBMITTED BY: BJM	FILE: EOD3.mdx — SCALE: 1:2,000